STATE OF HAWAI'I
DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESOURCE MANAGEMENT DIVISION
HONOLULU, HAWAI'I 96814

January 28, 2025

Board of Agriculture
Honolulu, Hawai'i

Subject:	REQUEST FOR ACCEPTANCE OF ANNUAL LEASE RENT AS DETERMINED BY INDEPENDENT APPRAISAL FOR RENT RE-OPENINGS FOR VARIOUS LOTS LOCATED STATEWIDE; TMK NOS.: (1) 4-1-009:266, (2) 1-1-003:028, (2) 2-7-008:015, (2) 5-2-004:123, (4) 1-9-001:011, (4) 2-8-022:006
Authority:	Section 166-9 and 166E-6, Hawaii Revised Statutes ("HRS"), and Sections 4-153-3(a)(8) and 18, and 4-158-2(a)(11) and 21, Hawaii Administrative Rules ("HAR")
Lease:	Various listed in Exhibit "A"
Lessee:	Various
Land Status:	Properties set aside to the Department of Agriculture by various Governor's Executive Orders
Character of Use:	Various

REMARKS:

Pursuant to the provisions of Sections 4-153-3(a)(8) and 18, 4-158-2(a)(11) and 21, and 4-158-8(b)(1), HAR, the Board of Agriculture ("Board") is required to establish and approve annual lease rentals by independent appraisal for conversions of leases, and re-openings of base and additional rentals for existing leases in the Ag Park and Non-Agricultural Lands program.

The Department of Agriculture contracted ACM Consultants, Inc., to determine the fair market rents of various Ag Park and Non-Agricultural Park Lands leases for rents re-opened on various dates and lease conversions. ACM Consultants, Inc., recently completed the appraisal reports and the new lease rents are presented in the table attached as Exhibit "A." A location map of the parcels is attached as Exhibit "B."

Staff believes the new rental rates are fair and reflect the current market conditions for the agricultural leases. Accordingly, staff recommends that the Board accept the new rental values as determined by ACM Consultants, Inc.

A1

RECOMMENDATION:

That the Board accept the fair market rentals for the various Ag Park and Non-Agricultural Park Lands leases as listed in Exhibit "A." The new rental rates will take effect upon the extension dates or upon issuance of a new lease, as may be appropriate for each lease.

Respectfully submitted,

BRIAN KAU, P.E.
Administrator & Chief Engineer
Agricultural Resource Management Division

Attachments: Exhibits "A" and "B"

APPROVED FOR SUBMISSION:

SHARON HURD
Chairperson, Board of Agriculture

Exhibit "A"

SUMMARY OF VALUE CONCLUSIONS

Board of Agriculture, January 28, 2025

Parcel TMK	Lease No.	Gross Acres	Appraised Fair Market Rental	% Rent on Gross Proceeds	Purpose	Character of Use
ISLAND OF O'AHU						
(1) 4-1-009:266	S-5380	31.170	$760.00		Reopening	Pasture
ISLAND OF MAUI						
(2) 1-1-003:028	RP-5932	1.100	$405.00	1.5%	Conversion	Diversified Agriculture
(2) 2-7-008:015		1.840	$4,808.00	1.5%	Disposition	Diversified Agriculture
ISLAND OF MOLOKA'I						
(2) 5-2-004:123	S-9021	7.236	$733.00	1.5%	Reopening	Diversified Agriculture
ISLAND OF KAUA'I						
(4) 1-9-001:011	S-4392	4.080	$1,335.00	1.5%	Conversion	Diversified Agriculture
(4) 2-8-022:006	S-5381	66.100	$970.00		Reopening	Pasture

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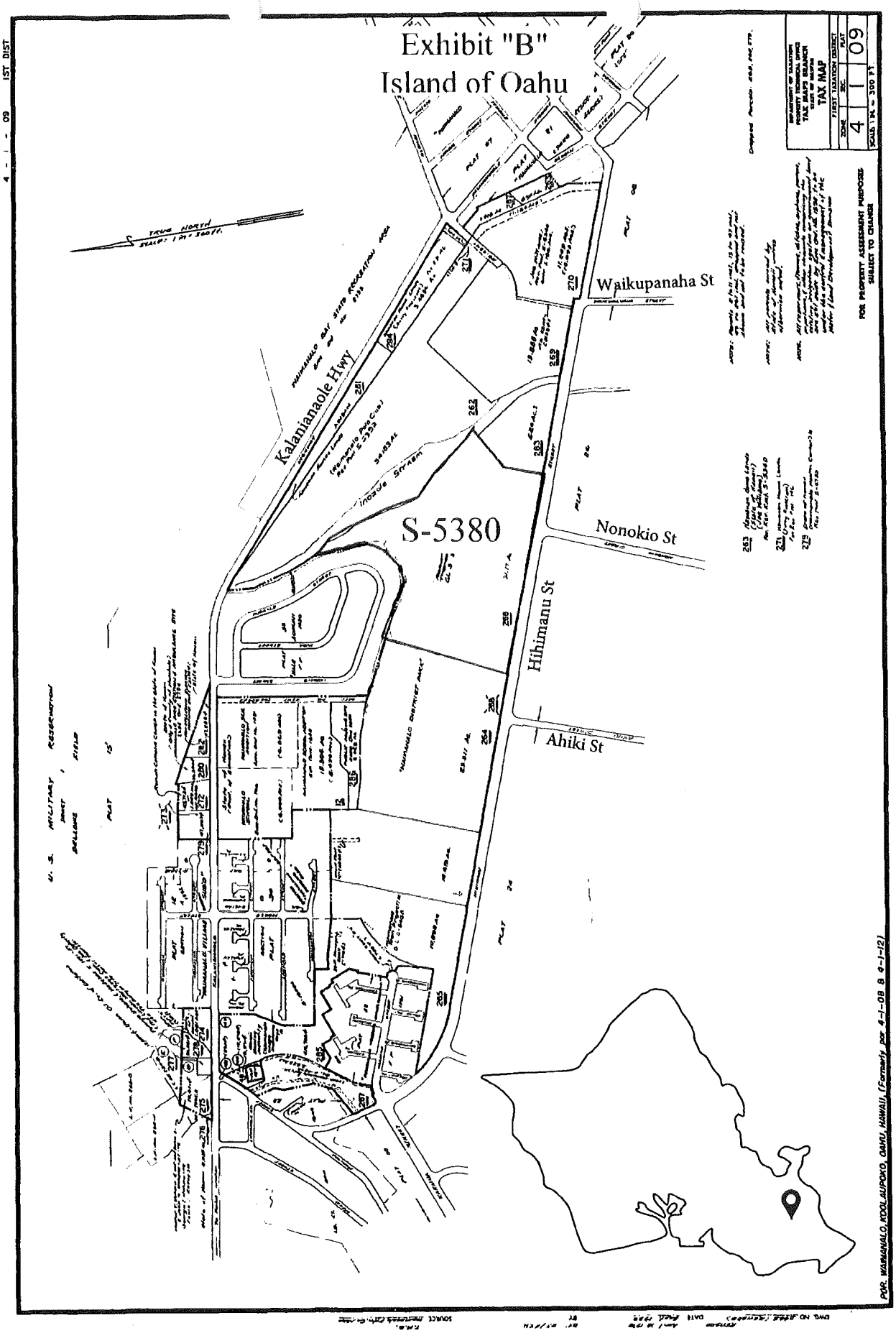
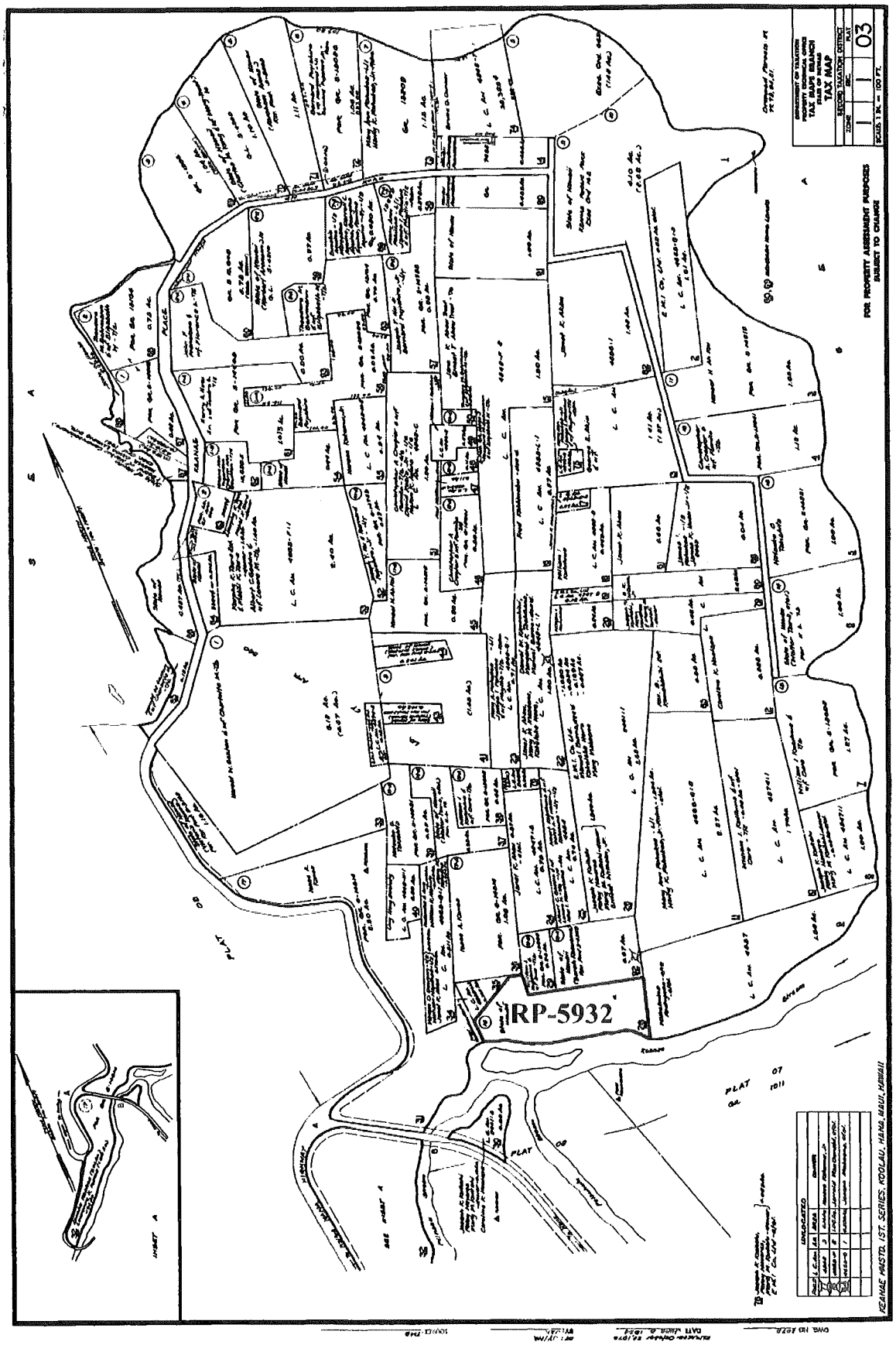


Exhibit "B"
Island of Oahu
Waikupanaha St
Kalanianaole Hwy
S-5380
Nonokio St
Hihimanu St
Ahiki St
TAX MAP
FIRST TAXATION DISTRICT
ZONE 4 SEC 1 PLAT 09
SCALE 1" = 300 FT
FOR PROPERTY ASSESSMENT PURPOSES
SUBJECT TO CHANGE
POR. WAIMANALO, KOOLAUPOKO, OAHU, HAWAII (Formerly por. 4-1-08: 8, 4-1-12)
4 - 1 - 09 1ST DIST

Exhibit "B"
Island of Maui



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(2) 2-7-008:015

Exhibit "B"
Island of Maui

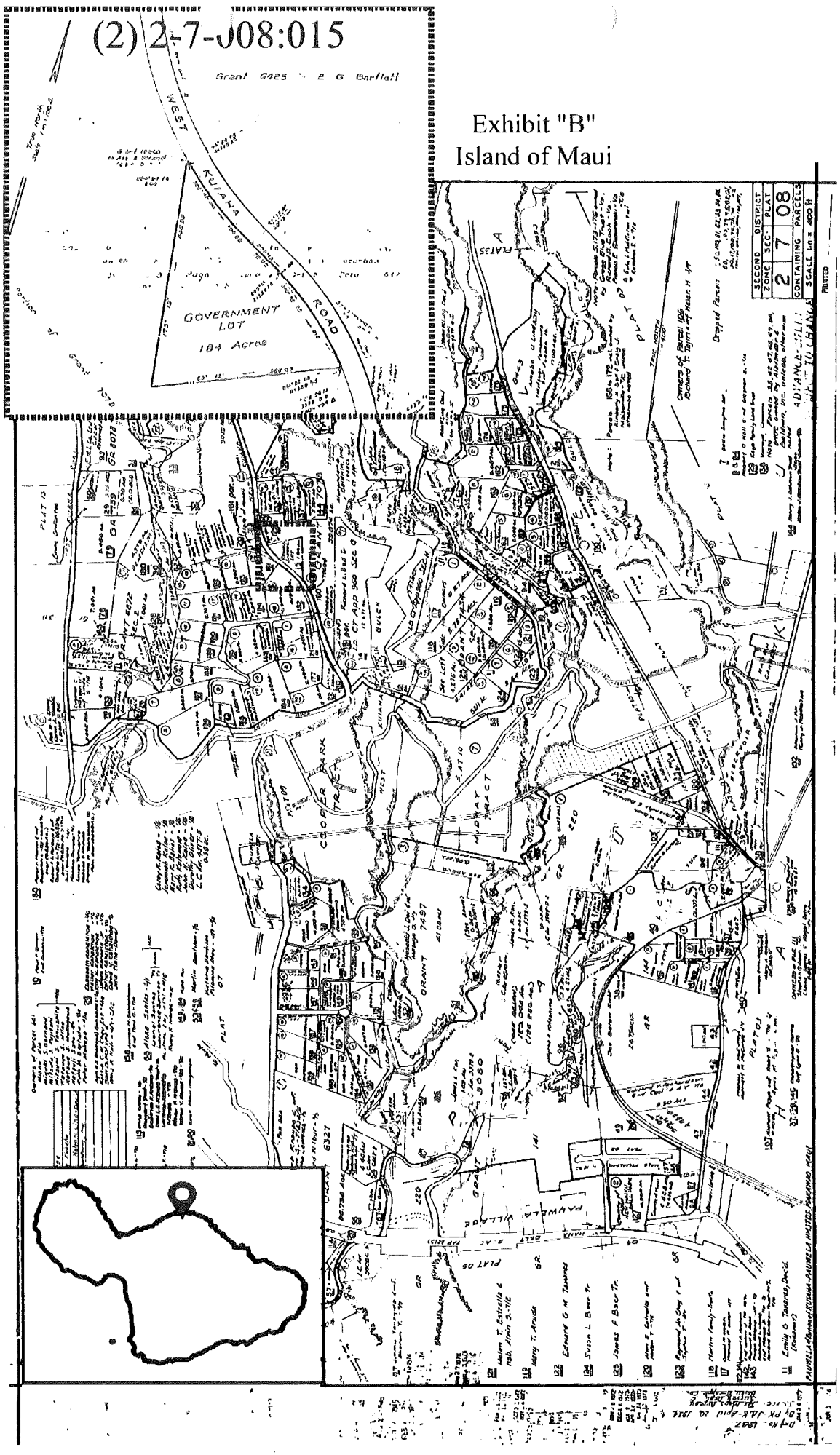

Exhibit "B"
Island of Molokai

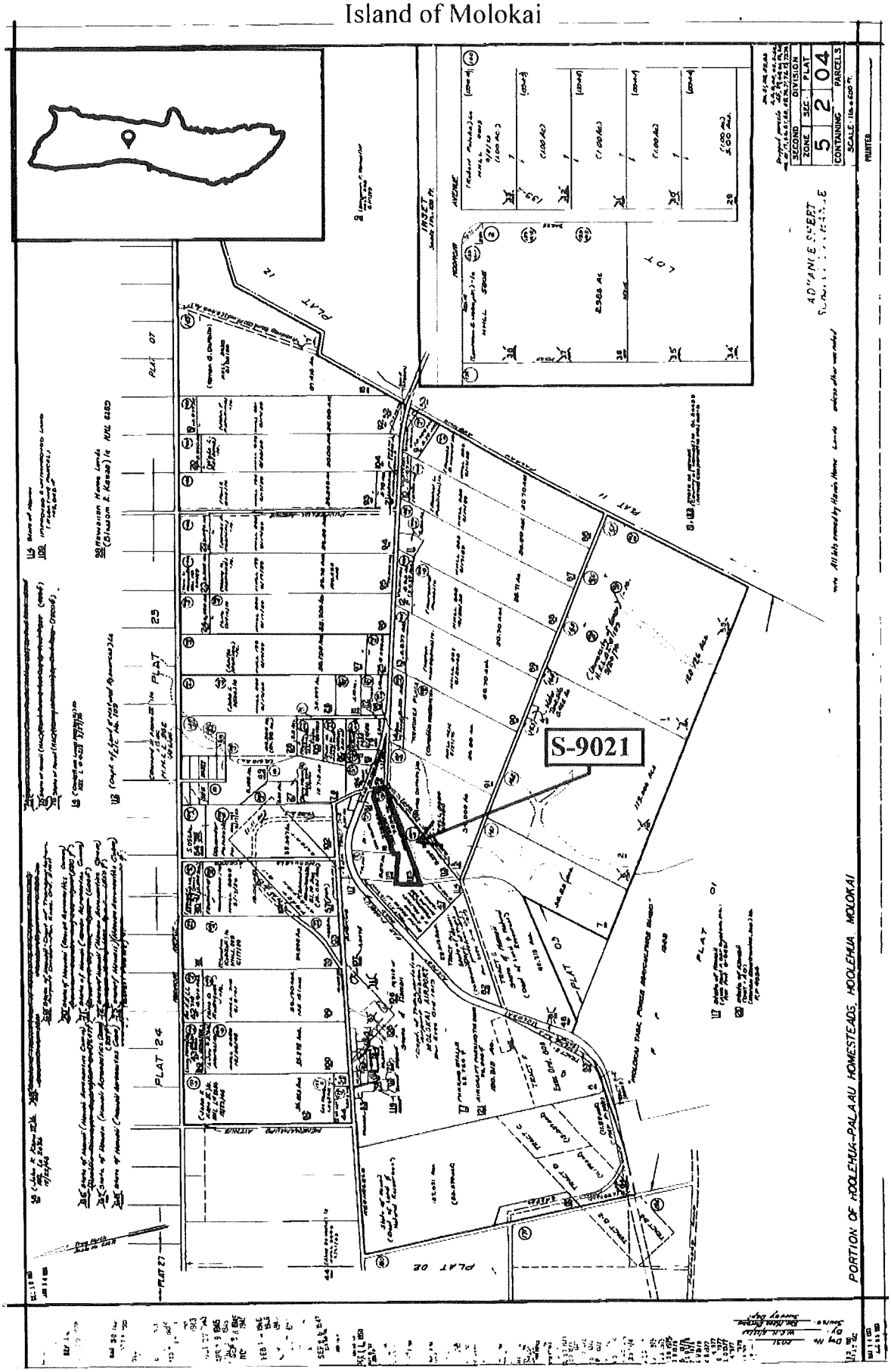

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Exhibit "B"
Island of Kauai

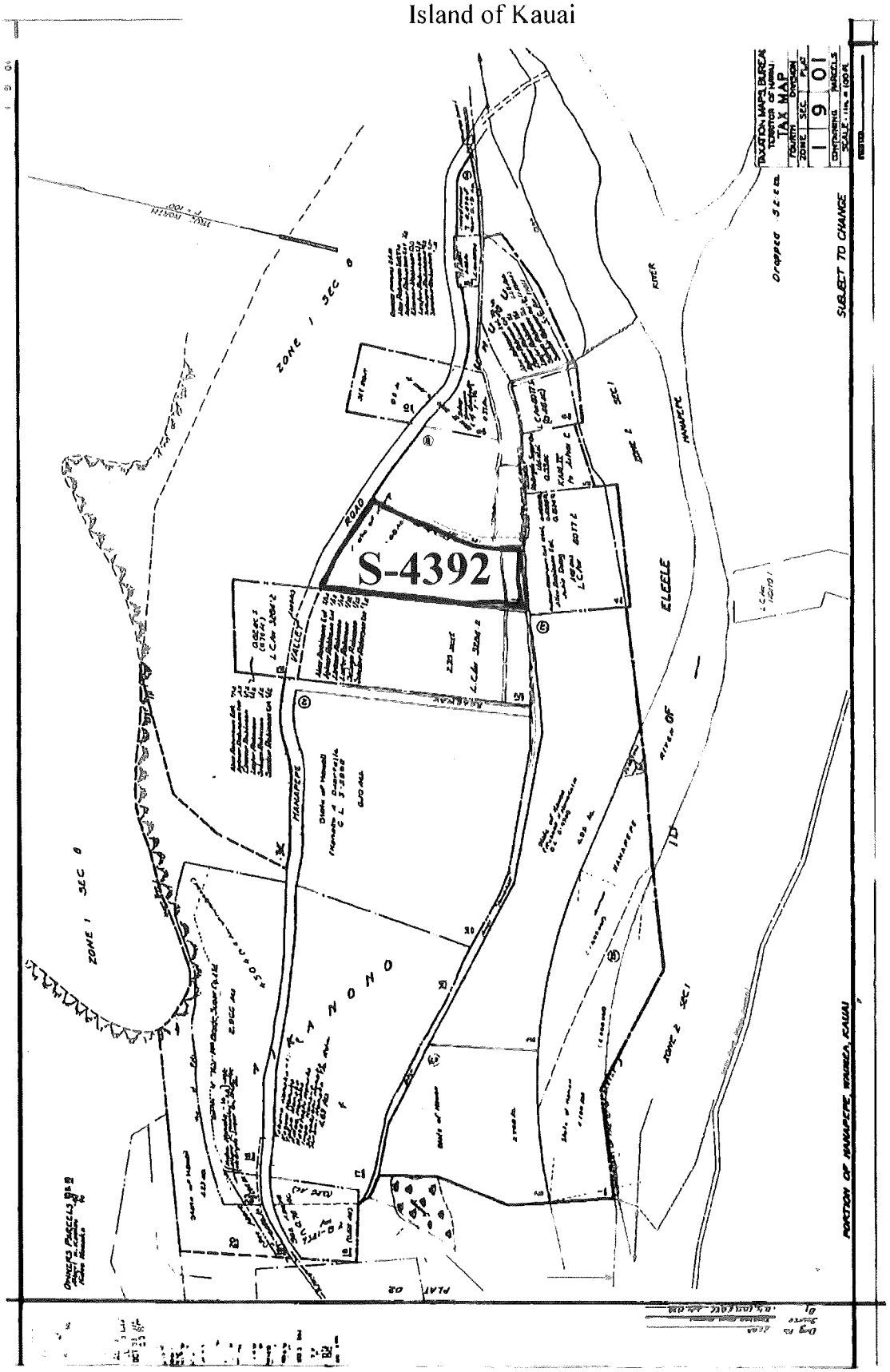
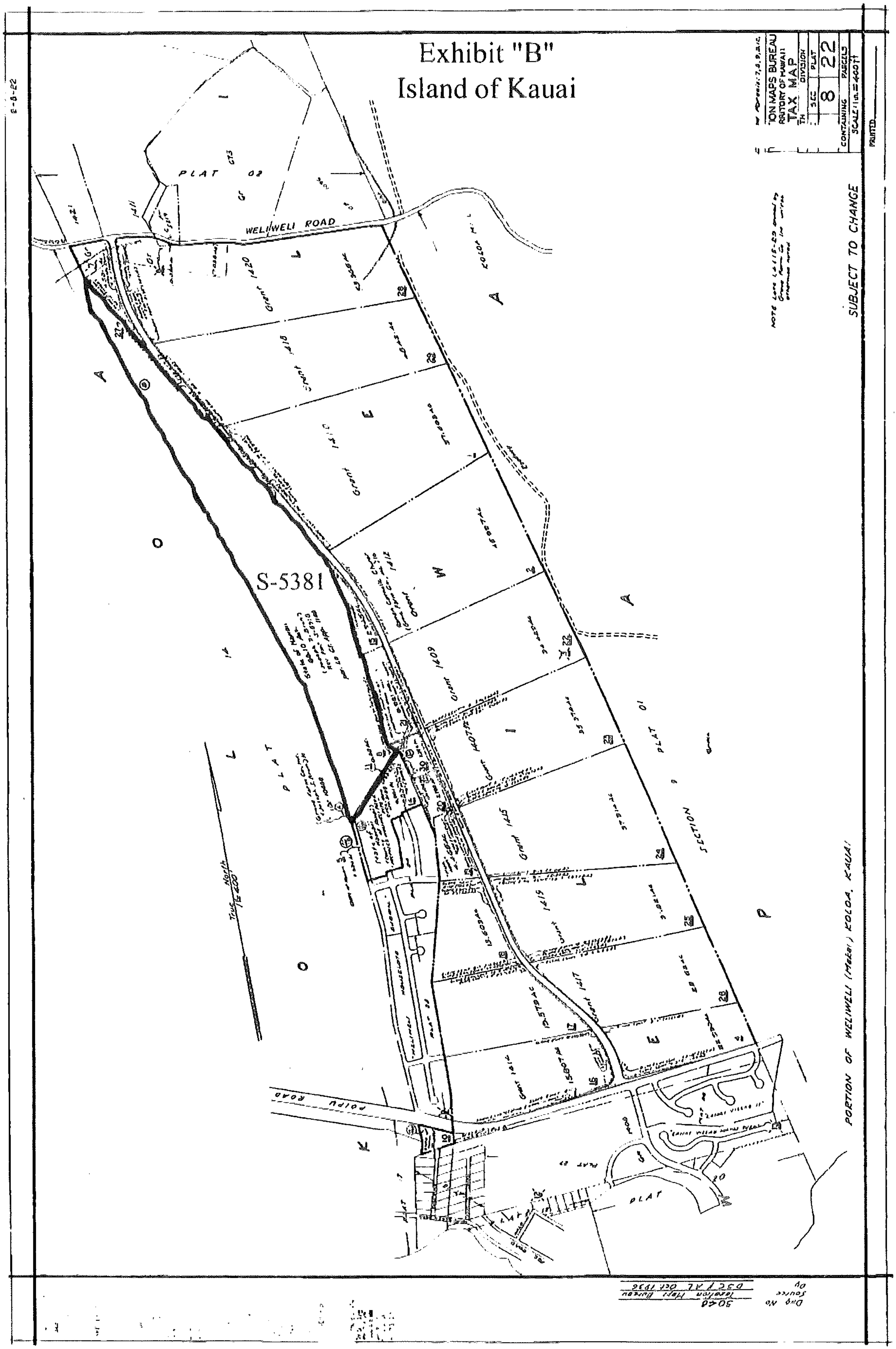


Exhibit "B"
Island of Kauai



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STATE OF HAWAI'I
DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESOURCE MANAGEMENT DIVISION
HONOLULU, HAWAI'I

January 28, 2025

Board of Agriculture
Honolulu, Hawai'i

Subject:	REQUEST APPROVAL FOR CONVERSION OF REVOCABLE PERMIT NO. S-7732 TO A NEW GENERAL LEASE FOR G&C FREITAS RANCH, INC. (FKA: GEORGE FREITAS DAIRY, INC.); TMK: (3) 5-5-007:011, PORTION OF GOVERNMENT LANDS OF HUALUA, NORTH KOHALA, ISLAND OF HAWAI'I
Authority:	Section 166E-4 and 11, Hawaii Revised Statutes ("HRS"), and Section 4-158-8, Hawaii Administrative Rules ("HAR")
Permittee:	G&C Freitas Ranch, Inc., (FKA: George Freitas Dairy, Inc.)
Land Area:	Approximately 77.40 acres
Tax Map Key:	(3) 5-5-007:011 (Exhibit "A")
Lease Term:	Month-to-Month
Land Status:	Encumbered by Governor's Executive Order No. 4430, dated April 11, 2013, to the Department of Agriculture for Agricultural Purposes
Annual Base Rent:	$1,240.00 per year
Character of Use:	Pasture

BACKGROUND:

George Freitas Dairy, Inc., was issued Revocable Permit No. S-7732 by the Board of Land and Natural Resources in 2011, for pasture purposes. On April 11, 2013, Revocable Permit No. S-7732 was transferred to the Department of Agriculture by Governor's Executive Order No. 4430.

Since obtaining RP-7732 in 2011, George Freitas Dairy, Inc., have utilized the subject property for pasture purposes. In 2018, the permittee changed their entity name from George Freitas Dairy, Inc., to G&C Freitas Ranch, Inc.

G&C Freitas Ranch, Inc., requests approval to convert the month-to-month revocable permit to a new 35-year Non-Agricultural Park Lands lease pursuant to Sections 166E-4 and 11, HRS, and 4-158-8,

HAR. The conversion of the month-to-month permit will provide G&C Freitas Ranch, Inc., with the needed stability to grow their current cattle operation and complete improvements to the property.

In issuing the new converted lease, the requirements of Section 4-158-8(b), HAR, state that the Department shall:

- Require an appraisal of the parcel in accordance with Section 4-158-21, HAR;
- Impose other lease terms, provisions, restrictions, and conditions as provided in these chapters as may be required to protect the State's interest;
- Require the payment of annual lease rent by appraisal and a premium computed at twenty-five percent of the annual base rent for each year of lease equal to the number of years that person occupied the land, but not to exceed seven (7) years; and
- Require those qualifying under subsection (a) to meet the bona fide farmer criteria as defined in Section 4-158-1.

An appraisal has been conducted pursuant to Section 4-158-21, HAR, for the purpose of determining the fair market rental for the subject parcel. Upon the commencement of the lease, the annual base rental was appraised at $1,240.00 for the initial lease term. Additionally, commensurate with the administrative rules, the Lessee will pay a premium equal to twenty-five percent of the annual base rental for the new lease for a period not to exceed seven (7) years from the commencement of the converted lease term. Further, the Board and Permittee mutually agree to cancel the existing Revocable Permit No. S-7732 subject to the execution of the converted general lease documenting the effective date.

RECOMMENDATION:

That the Board of Agriculture approve the following:

1) Find that by allowing the conversion of this Revocable Permit to a new long-term lease, the State would realize greater returns and reduce disruptions to current ongoing farming operations and is, therefore, in the public's interest.

2) Approve the Permittee's request to convert Revocable Permit S-7732 to a new Non-Agricultural Park Lands lease of not more than thirty-five (35) years for its initial lease term, subject to the conversion provisions of Chapter 4-158-8, HAR, with rent re-openings at the expiration of the 15th and 25th years.

3) Accept the fair market base rental rate of $1,240.00 per year.

4) Approve the Mutual Cancellation of Revocable Permit S-7732, subject to the execution of the effective date of the new general lease.

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All related documents are subject to the review and approval as to form by the Department of the Attorney General, and such other terms and conditions as may be prescribed by the Chairperson to best serve the interests of the State.

Respectfully submitted,

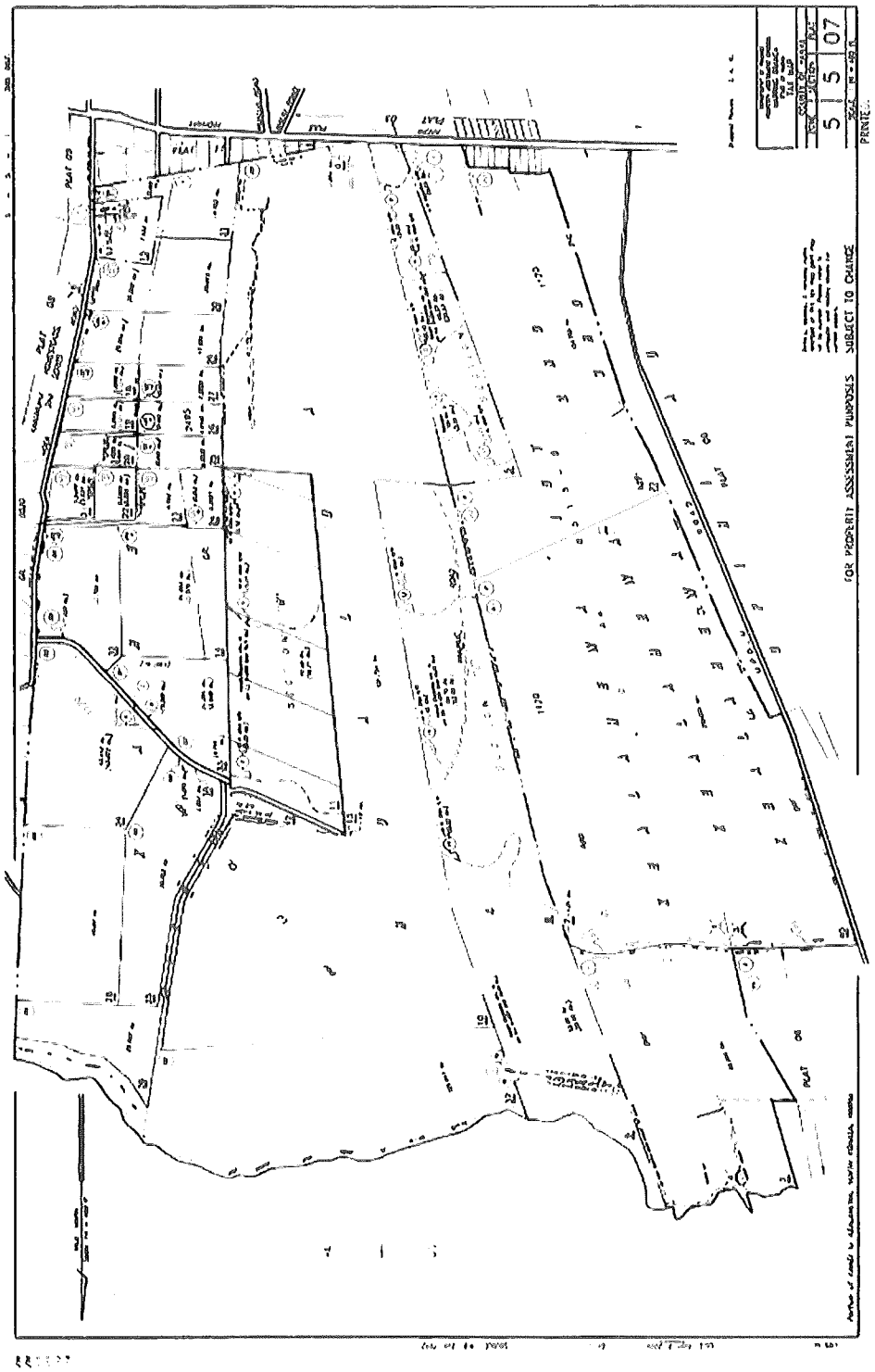
BRIAN KAU, P.E.
Administrator and Chief Engineer
Agricultural Resource Management Division

Attachments - Exhibit "A"

APPROVED FOR SUBMISSION:

SHARON HURD
Chairperson, Board of Agriculture

EXHIBIT "A"



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STATE OF HAWAI'I
DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESOURCE MANAGEMENT DIVISION
HONOLULU, HAWAI'I 96814

January 28, 2025

Board of Agriculture
Honolulu, Hawai'i

Subject: REQUEST FOR APPROVAL FOR THE TRANSFER OF PUBLIC LANDS FROM THE DEPARTMENT OF LAND AND NATURAL RESOURCES TO THE DEPARTMENT OF AGRICULTURE, PURSUANT TO ACT 90, SLH 2003, CODIFIED AS CHAPTER 166E, HAWAII REVISED STATUTES; TMK NOS.: (3) 4-3-010:008, (3) 4-3-010:002, (3) 4-2-008:002, and (3) 4-1-006:007 ISLAND OF HAWAI'I

Authority: Section 166E-3, Hawaii Revised Statutes ("HRS")

BACKGROUND:

Act 90, Sessions Laws of Hawaii ("SLH") 2003, established the Non-Agricultural Park Lands Program within the Hawai'i Department of Agriculture ("HDOA"), and was codified as Chapter 166E, HRS. Under this program, the Legislature found that certain public lands classified for agricultural use by the Department of Land and Natural Resources ("DLNR") should be transferred to the HDOA for purposes and in a manner consistent with Article XI, Section 10, of the Hawai'i State Constitution.

The purpose of this chapter is to ensure the long-term productive use of public lands leased or available to be leased by the DLNR for agricultural purposes by allowing these lands to be transferred to the HDOA for leasing and management.

In accordance with provisions of Act 90, SLH 2003, the Board of Agriculture ("BOA") must mutually approve of the selected encumbrances for transfer. Staff verified compliance of four (4) encumbrances for approval by BOA as listed in the attached Exhibit "A."

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RECOMMENDATION:

Staff reviewed the list of proposed encumbrances and performed its due diligence and recommends that the Board approve the transfer of the four (4) encumbrances as listed above.

Respectfully submitted,

BRIAN KAU, P.E.
Administrator and Chief Engineer
Agricultural Resource Management Division

APPROVED FOR SUBMISSION

SHARON HURD
Chairperson, Board of Agriculture

EXHIBIT "A"

Doc. No.	Lessee	Tax Map Key (TMK)	Character of Use	Leased Area (Acreage)
S-4477	SC Ranch Co, Inc.	(3) 4-3-010:008	Pasture	7042.250
S-4478	Boteilho Hawaii Enterprise, Inc.	(3) 4-3-010:002	Pasture	5705.000
S-4472	Ernest DeLuz Ranch, LLC	(3) 4-2-008:002	Pasture	1902.000
S-4473	Ernest and Marian DeLuz	(3) 4-1-006:007	Pasture	3110.000

State of Hawai'i
Department of Agriculture
Plant Industry Division
Pesticide Branch

January 28, 2025

Board of Agriculture
Honolulu, Hawai'i

Subject: Request for: (1) Preliminary approval of the proposed amendments to Chapter 4-66, Hawaii Administrative Rules necessary to comply with State Certification Plan updates with the U.S. Environmental Protection Agency and with Act 220 (2023); and (2) Authorization for the Chairperson to schedule public hearings and appoint one or more hearings officers in connection with the proposed amendments to Chapter 4-66.

PROCEDURAL BACKGROUND:
Hawaii Administrative Rules ("HAR") Chapter 4-66 was last updated in 2019 due to the implementation of Act 45 of the twenty-ninth legislative session. In 2019 and 2020, the Pesticides Branch was required to update the State's Certification Plan by the United States Environmental Protection Agency ("U.S. EPA"). To obtain approval, the Pesticides Branch updated the Certification Plan to mirror requirements set forth in the Code of Federal Regulations ("CFR"). The included submittal provides for changes and amendments to specific language related to the Certification Plan and updated civil and criminal penalties from Act 220 of the thirty-second legislative session.

BACKGROUND:
Administrative rules for any part of government should be updated intermittently to ensure government programs function efficiently and effectively. HAR Chapter 4-66 was last updated on August 23, 2019 after the passing of Act 45 of the twenty-ninth legislative session in July 2018. Two events necessitated the update of HAR Chapter 4-66: the Pesticides Branch received approval for the State Certification Plan from the U.S. EPA on November 28, 2022, and Act 220 of the thirty-second legislative session was passed on July 5, 2023.

The approved State Certification Plan requires replacing instances of "shall" to "must" to clarify what is required, not recommended, and match the language more widely used in Federal law. Amendments to the certification plan of restricted use pesticides ("RUP") applicators are necessary to comply with the U.S. EPA approved State plan. U.S. EPA approval of the State Certification Plan allows for the use of one set of rules needed to be followed to comply with both the State and Federal government.

Fines for violations of Hawaii Revised Statutes ("HRS") chapter 149A have not increased for 23 years for commercial pesticide applicators and nearly 50 years for private pesticide applicators. Updates to the maximum civil and criminal penalties will reduce repeat violators and provide a more substantial deterrent for violating HRS Chapter 149A. An existing amendment authorizes the head of the Plant Industry Division to refer collections to the Department of the Attorney General (consistent with the current practice authorized by the Board of Agriculture).

On October 2, 2024, the proposed amendments were discussed with the Governor's Advisory Committee on Pesticides, and comments were accepted and approved. The minutes from the Advisory Committee are attached.

The proposed amendments to HAR chapter 4-66 are attached in Ramseyer format and may be viewed in person at 1428 South King Street, Honolulu, HI 96814 or online at: https://hdoa.hawaii.gov/blog/main/proposed-administrative-rules/.

AUTHORITY: Pursuant to section 4-1-23, HAR, the Board is authorized to initiate rulemaking on its own motion.

RECOMMENDATION: The Pesticides Branch of HDOA, Plant Industry Division recommends that the Board: (1) preliminarily approve the proposed rule amendments necessary to comply with State Certification Plan updates with the U.S. Environmental Protection Agency and with Act 220 (2023); and (2) authorize the Chairperson to schedule public hearings and appoint one or more hearings officers in connection with the proposed amendments to Chapter 4-66.

It is respectfully requested that the Board follow the recommendations set forth above.

Submitted by:

GREG TAKESHIMA
Pesticides Branch Manager

CONCURRED:

SHARON HURD
Acting Administrator, Plant Industry

APPROVED FOR SUBMISSION:

SHARON HURD
Chairperson, Board of Agriculture

HAWAII ADMINISTRATIVE RULES

TITLE 4

DEPARTMENT OF AGRICULTURE

SUBTITLE 6

DIVISION OF PLANT INDUSTRY

CHAPTER 66

PESTICIDES

Historical Note: This chapter is based substantially upon Regulation 1 entitled "Pesticide Regulation" of the division of plant industry, department of agriculture. [Eff 2/22/74; am 12/10/77; R 7/13/81]

§4-66-1 Objectives. The objectives of these rules are to implement the requirements of chapter 149A, Hawaii Revised Statutes (HRS), which provides for the registration, licensing, certification, recordkeeping, usage, and other activities related to the safe and efficacious use of pesticides. [Eff 7/13/81; comp 12/16/06; am and comp 08/23/19; comp] (Auth: HRS §149A-33) (Imp: HRS §149A-33)

§4-66-2 Definitions. As used in this chapter:

"Act" means the Hawaii Pesticides Law, chapter 149A, Hawaii Revised Statutes.

"Adjuvant" means any substance added to a spray tank to improve and enhance the performance of the pesticide being applied.

"Agricultural commodity" means any plant, or plant product, or animal or animal product, produced by, but not limited to, farmers, ranchers, vineyardists, plant propagators, aquaculturists, floriculturists, orchardists, foresters, or other comparable persons for sale.

"Board" means board of agriculture.

"Certification" means the authorization granted by the state or federal government to a person to use, handle, or supervise the use of restricted use pesticides.

"Certification standard" means a requirement for certification.

"Changed use pattern" means a significant change from a use pattern approved in connection with the

registration of a pesticide product. Examples of significant changes include, but are not limited to, changes from nonfood to food use, outdoor to indoor use, ground to aerial application, terrestrial to aquatic use, and nondomestic to domestic use.

"Chemigation" means applying pesticides through irrigation systems.

"Commercial applicator" or "commercial pesticide applicator" means a certified applicator, whether or not a private applicator with respect to some uses, who uses or supervises the use of any pesticide that is classified for restricted use for any purpose or on any property other than as provided by the definition of "Private pesticide applicator" in section 149A-2, Hawaii Revised Statutes.

"Competent" means the state of being able and qualified to perform a particular function in pesticide application, the degree of competence being directly related to the nature of the activity and the associated responsibility.

"Department" means the State of Hawaii, Department of Agriculture.

"Domestic application" means application of a pesticide directly to humans or pets, or application of a pesticide in, on, or around all structures, vehicles, or areas associated with the household or home life, patient care areas of health related institutions, or areas where children spend time, including but not limited to:

(1) Gardens, non-commercial greenhouses, yards, patios, houses, pleasure marine craft, mobile homes, campers and recreational vehicles, non-commercial campsites, home swimming pools and kennels;
(2) Articles, objects, devices or surfaces handled or contacted by humans or pets in all structures, vehicles or areas listed above;
(3) Patient care areas of nursing homes, mental institutions, hospitals, and convalescent homes; and
(4) Educational, lounging and recreational areas of preschools, nurseries and day camps.

"Drift" or "pesticide spray drift" means the movement of pesticide dust or droplets through the air at the time of application or soon after, to any site other

than the area intended.

"Enclosed space production" or "greenhouse production" means production of an agricultural plant indoors or in a structure or space that is covered in whole or in part by any nonporous covering and that is large enough to permit a person to enter.

"Environment" includes water, air, land, and all plants and humans and other animals living therein, and the interrelationships that exist among these.

"EPA" means the United States Environmental Protection Agency.

"FIFRA" means the Federal Insecticide, Fungicide, and Rodenticide Act, title 7 United States Code (USC) sections 136 et seq., as amended.

"Finished bait" means an end use bait product that requires no preparation or mixing.

"Front panel" means that portion of the label of a pesticide product that is ordinarily visible to the purchaser under the usual conditions of display for sale.

"Fungicide" means any substance or mixture of substances intended for preventing, destroying, repelling or mitigating any fungus, bacterium, or virus. Fungicides include:

(1) Products intended for use as seed or plant treatments to destroy or prevent fungus diseases;

(2) Products intended for use in disinfecting, sanitizing, or sterilizing premises or other inanimate objects to prevent or destroy organisms that cause diseases of humans or other animals;

(3) Products for use in reducing bacterial counts in water or air; and

(4) Products intended for use as wood preservatives that prevent rot or decay in wood by preventing or destroying organisms which cause decay or rot;

Products not considered fungicides include:

(1) Products intended for use in preventing or destroying any fungus or virus on or in living man or other animals and those on or in processed food, beverages or pharmaceuticals (the term processed foods includes processed animal feed and the term pharmaceuticals is

intended to include cosmetics); and

(2) Paints that are treated to protect the paint itself and bear no claim for preventing or destroying fungi after application to any surface.

"Hazard" means a situation where there exists a possibility that a given pesticide will cause injury or have unreasonable adverse effects on the environment.

"Head" means the administrative head of the division of plant industry, Hawaii department of agriculture, or any officer or employee to whom authority has been duly delegated.

"Herbicide" means any substance or mixture of substances intended for preventing, destroying, repelling or mitigating any weed including any algae or other aquatic weed, or any plant parts growing where not wanted.

"Insecticide" means any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any insect. The term shall not include pharmaceutical products approved by the United States Food and Drug Administration for use, under prescription by a licensed physician on humans or by a licensed veterinarian on animals.

"LC_{50}" means a concentration of substance, expressed as parts per million parts of medium, which is lethal to fifty per cent of the test population of animals under test conditions acceptable for registration under FIFRA.

"LD_{50}" means a single dermal or oral dose of a substance, expressed as milligrams per kilogram (mg/kg) of body weight, which is lethal to fifty per cent of the test population of animals under test conditions acceptable for registration under FIFRA.

"License" means the process of being allowed to register a pesticide product pursuant to provisions of chapter 149A, Hawaii Revised Statutes.

"Licensed sales outlet" or "Dealer" means a specified site authorized by annual permit to sell or distribute restricted use pesticides pursuant to section 149A-17, Hawaii Revised Statutes, where restricted use pesticides are kept for sale or distribution and where records of such sale, distribution, or disposition of restricted use pesticides are kept and that meet the requirements established in section 4-66-52.

"Licensed pesticide dealer representative" or "pesticide dealer representative" means a person authorized to sell restricted use pesticides in a permitted sales outlet and who has successfully passed an examination required by the head and obtained a permit pursuant to section 4-66-52.

"Licensee" means a person who has been licensed to register a product pursuant to the provisions of section 149A-13, Hawaii Revised Statutes.

"Mode of action" means the manner that a pesticide impacts key biochemical processes responsible for its effect.

"Nematicide" or "Nematocide" means any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating nematodes inhabiting soil, water, plants, or plant parts.

"Non-target organisms" means those flora and fauna (including humans) that are not intended to be controlled, injured, killed, or detrimentally affected in any way by a pesticide.

"Permittee" means any applicant to whom a permit has been granted.

"Person" means any individual, firm, corporation, association, or partnership or any organized group of persons whether incorporated or not.

"Personal protective equipment" (PPE) means devices and apparel that are worn to protect the body from contact with pesticides or pesticide residues, including, but not limited to, coveralls, chemical-resistant suits, chemical-resistant gloves, chemical-resistant footwear, respiratory protection devices, chemical resistant aprons, chemical-resistant headgear, and protective eyewear, as further defined in title 40, Code of Federal Regulations section 170.507 [~~(2018)~~] (2023).

"Pesticide" means:

(1) Any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest; and

(2) Any substance or mixture of substances intended for use as a plant regulator, defoliant, or desiccant.

A product that is not intended to prevent, destroy, repel, or mitigate a pest, or to defoliate, desiccate or regulate the growth of plants, is not considered to be a

pesticide. The following types of products or articles are not considered to be pesticides unless a pesticidal claim is made on the label or in connection with the sale and distribution:

(a) Deodorizers, bleaches, and cleaning agents;

(b) Products not containing toxicants, intended only to attract pests for survey or detection purposes, and labeled accordingly; and

(c) Products that are intended to exclude pests only by providing a physical barrier against pest access, and that contain no toxicants, such as certain pruning paints to trees.

"Private pesticide applicator" or "private applicator" means a certified pesticide applicator who uses or supervises the use of any pesticide that is classified for restricted use for purposes of producing any agricultural commodity on property owned or rented by the applicator or the applicator's employer or if applied without compensation other than trading of personal services between producers of agricultural commodities on the property of another person.

"Reasonable" means that which is appropriate, fair and sensible for a particular situation as understood by a person of average caution under the same or similar circumstances.

"Reentry" means the action of entering an area or site where a pesticide has been applied.

"Rodenticide" means any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating animals belonging to the Order Rodentia of the Class Mammalia such as rats, mice, gophers, rabbits, hares, and closely related species.

"Runoff" means rainfall or snowmelt events that flow over land or impervious surfaces, such as paved streets, parking lots, and building roof tops, that directly enters into lakes, rivers, wetlands, coastal waters, or other surface waters, and does not soak into the ground.

"Surface water" means water upon the surface of the earth in bounds created naturally or artificially including, but not limited to, lakes, rivers, ponds, streams, other watercourses, reservoirs, and coastal waters subject to the jurisdiction of the State of Hawaii. Water from natural springs is surface water when it exits from the spring onto the earth's surface.

"Under the direct supervision of a certified applicator" means that, unless otherwise prescribed by a pesticide's labeling, a pesticide shall be considered to be applied under the direct supervision of a certified applicator if it is applied by a competent person acting under the instructions and control of a certified applicator who is immediately able to communicate with the non-certified applicator, even though the certified applicator is not physically present at the time and place the pesticide is applied, and as further defined in section 171.201 of title 40, Code of Federal Regulations [~~(2018)~~] (2023).

"Unreasonable adverse effects on the environment" means any unreasonable risk to humans or the environment, taking into account the economic, social, and environmental costs and benefits of the use of the pesticide.

"Use" or "to use a pesticide" means any of the following:

(1) Pre-application activities involving mixing and loading the pesticide.

(2) Applying the pesticide, including, but not limited to, supervising the use of a pesticide by a non-certified applicator.

(3) Other pesticide-related activities, including, but not limited to, transporting or storing pesticide containers that have been opened, cleaning equipment, and disposing of excess pesticides, spray mix, equipment wash waters, pesticide containers, and other pesticide-containing materials.

"Use pattern" means the manner in which a pesticide is applied and includes the following parameters of pesticide application:

(1) Target pest;

(2) Crop or animals treated;

(3) Application site; and

(4) Application technique, rate and frequency.

[Eff 7/13/81; am and comp 12/16/06; am and comp 08/23/19; comp] (Auth: HRS §149A-33) (Imp: HRS §149A-33)

§4-66-3 Administration, enforcement, and penalty.

The head may take any action as may be necessary in the administration and enforcement of the Act, these rules, and the penalty provisions as provided by law. [Eff 7/13/81; am and comp 12/16/06; am and comp 08/23/19; comp]
(Auth: HRS §149A-33) (Imp: HRS §149A-33)

§4-66-4 Incorporation of 40 CFR part 156 [~~(2017)~~] (2023); contents of the pesticide label; generally. (a) Title 40, part 156, Code of Federal Regulations (CFR), published by the Office of the Federal Register, as amended as of July 1, [~~2017,~~] (2023), is made a part of this chapter subject to the substitutions and amendments set forth in sections 4-66-4 to 4-66-31. 40 CFR part 156 [~~(2017)~~] (2023)[, ~~adopted _____, is appended at the end of this chapter.~~] can be found at: https://www.govinfo.gov/content/pkg/CFR-2023-title40-vol26/pdf/CFR-2023-title40-vol26-part156.pdf.

(b) 40 CFR section 156.10(a)(1) [~~(2017)~~] (2023) is incorporated in this section. The federal term "Act" in 40 CFR section 156.10(a)(1) [~~(2017)~~] (2023) is supplemented with the indicated state term, as incorporated and amended in this section:

"Act" includes the Hawaii Pesticides Law, chapter 149A, Hawaii Revised Statutes. [Eff 7/13/81; am and comp 12/16/06; am and comp 08/23/19; am and comp] (Auth: HRS §§149A-15, 149A-33; 40 CFR §156.10) (Imp: HRS §§149A-15, 149A-33; 40 CFR §156.10)

§4-66-5 Label; name, brand, or trademark. 40 CFR section 156.10(b)(1) [~~(2017)~~] (2023) is incorporated in this section. The federal terms "Administrator" and "Registration" in 40 CFR section 156.10(b)(1) [~~(2017)~~] (2023) are supplemented with the indicated state term, as incorporated and amended in this section:

(1) "Administrator" includes the administrative head of the division of plant industry, Hawaii department of agriculture, or any officer or employee to whom authority has been duly delegated.

(2) "Registration" includes the state term "license", which means the process of being

allowed to register a pesticide product pursuant to the provisions of chapter 149A, Hawaii Revised Statutes. [Eff 7/13/81; comp 12/16/06; am and comp 08/23/19; am and comp] (Auth: HRS §§149A-14, 149A-33; 40 CFR §156.10) (Imp: HRS §§149A-15, 149A-33; 40 CFR §156.10)

§4-66-6 Label; name and address of producer, registrant, or person for whom produced. 40 CFR section 156.10(c) [~~(2017)~~] (2023) is incorporated in this section. [Eff 7/13/81; comp 12/16/06; am and comp 08/23/19; am and comp] (Auth: HRS §§149A-15, 149A-33; 40 CFR §156.10) (Imp: HRS §§149A-15, 149A-33; 40 CFR §156.10)

§4-66-7 Label; net weight or measure of contents. 40 CFR section 156.10(d) [~~(2017)~~] (2023) is incorporated in this section. [Eff 7/13/81; am and comp 12/16/2006; am and comp 08/23/19; am and comp] (Auth: HRS §§149A-15, 149A-33; 40 CFR §156.10) (Imp: HRS §§149A-15, 149A-33; 40 CFR §156.10)

§4-66-8 Label; product registration number. 40 CFR section 156.10(e) [~~(2017)~~] (2023) is incorporated in this section. [Eff 7/13/81; comp 12/16/06; am and comp 08/23/19; am and comp] (Auth: HRS §§149A-15, 149A-33; 40 CFR §156.10) (Imp: HRS §§149A-15, 149A-33; 40 CFR §156.10)

§4-66-9 Label; producing establishment registration number. 40 CFR section 156.10(f) [~~(2017)~~] (2023) is incorporated in this section. [Eff 7/13/81; comp 12/16/06; am and comp 08/23/19; am and comp] (Auth: HRS §§149A-15, 149A-33; 40 CFR §156.10) (Imp: HRS §§149A-15, 149A-33; 40 CFR §156.10)

§4-66-10 Label; ingredient statement; generally. 40 CFR section 156.10(g)(1) [~~(2017)~~] (2023) is

incorporated in this section. [Eff 7/13/81; comp 12/16/06; am and comp 08/23/19; am and comp] (Auth: HRS §§149A-15, 149A-33; 40 CFR §156.10) (Imp: HRS §§149A-15, 149-33; 40 CFR §156.10)

§4-66-11 Label; position of ingredient statement. 40 CFR section 156.10(g)(2)(i) to (ii) [~~(2017)~~] (2023) is incorporated in this section. [Eff 7/13/81; comp 12/16/06; am and comp 8/23/19; am and comp] (Auth: HRS §§149A-15, 149A-33; 40 CFR §156.10) (Imp: HRS §§149A-15, 149A-33; 40 CFR §156.10)

§4-66-12 Label; names to be used in ingredient statement. 40 CFR section 156.10(g)(3) [~~(2017)~~] (2023) is incorporated in this section. [Eff 7/13/81; comp 12/16/06; am and comp 8/23/19; am and comp] (Auth: HRS §§149A-15, 149A-33; 40 CFR §156.10) (Imp: HRS §§149A-15, 149A-33; 40 CFR §156.10)

§4-66-13 Label; statements of percentages. 40 CFR section 156.10(g)(4) [~~(2017)~~] (2023) is incorporated in this section. [Eff 7/13/81; comp 12/16/06; am and comp 8/23/19; am and comp] (Auth: HRS §§149A-15, 149A-33; 40 CFR §156.10) (Imp: HRS §§149A-15, 149A-33; 40 CFR §156.10)

§4-66-14 Label; accuracy of stated percentages. 40 CFR section 156.10(g)(5) [~~(2017)~~] (2023) is incorporated in this section. [Eff 7/13/81; comp 12/16/06; am and comp 8/23/19; am and comp] (Auth: HRS §§149A-15, 149A-33; 40 CFR §156.10) (Imp: HRS §§149A-15, 149A-33; 40 CFR §156.10)

§4-66-15 Label; deterioration. 40 CFR section 156.10(g)(6) [~~(2017)~~] (2023) is incorporated in this section. [Eff 7/13/81; comp 12/16/06; am and comp 8/23/19; am and comp] (Auth: HRS §§149A-15, 149A-33; 40 CFR §156.10) (Imp: HRS §§149A-15, 149A-33; 40 CFR §156.10)

§4-66-16 Label; inert ingredients. 40 CFR section 156.10(g)(7) [~~(2017)~~] (2023) is incorporated in this section. [Eff 7/13/81; comp 12/16/06; am and comp 8/23/19; am and comp] (Auth: HRS §§149A-15, 149A-33; 40 CFR §156.10) (Imp: HRS §§149A-15, 149A-33; 40 CFR §156.10)

§4-66-17 Label; warning and precautionary statements; generally. 40 CFR section 156.60 [~~(2017)~~] (2023) is incorporated in this section. [Eff 7/13/81; am and comp 12/16/06; am and comp 8/23/19; am and comp] (Auth: HRS §§149A-15, 149A-33; 40 CFR §156.60) (Imp: HRS §§149A-15,149A-33; 40 CFR §156.60)

§4-66-18 Label; required front panel statements. 40 CFR sections 156.62, 156.64, 156.66, and 156.68 [~~(2017)~~] (2023) are incorporated in this section. [Eff 7/13/81; am and comp 12/16/06; am and comp 8/23/19; am and comp] (Auth: HRS §§149A-15, 149A-33; 40 CFR §§156.60 to 156.68) (Imp: HRS §§149A-15, 149A-33; 40 CFR §§156.60 to 156.68)

§4-66-19 Label; other required warnings and precautionary statements. 40 CFR sections 156.70 and 156.78 [~~(2017)~~] (2023) are incorporated in this section. [Eff 7/13/81; comp 12/16/06; am and comp 8/23/19; am and comp] (Auth: HRS §§149A-15, 149A-33; 40 CFR §§156.70, 156.78, 156.80 and 156.85) (Imp: HRS §§149A-15, 149A-33; 40 CFR §§156.70, 156.78, 156.80 and 156.85)

§4-66-20 Label; directions for use; generally. 40 CFR section 156.10(i)(1)(i) [~~(2017)~~] (2023) is incorporated in this section. [Eff 7/13/81; am and comp 12/16/06; am and comp 8/23/19; am and comp] (Auth: HRS §§149A-15, 149A-33; 40 CFR §156.10) (Imp: HRS §§149A-15, 149A-33; 40 CFR §156.10)

§4-66-21 Label; placement of directions for use. 40 CFR section 156.10(i)(1)(ii) [~~(2017)~~] (2023) is incorporated in this section. [Eff 7/13/81; am and comp 12/16/06; am and comp 8/23/19; am and comp] (Auth: HRS §§149A-15, 149A-33; 40 CFR §156.10) (Imp: HRS §§149A-15, 149A-33; 40 CFR §156.10)

§4-66-22 Label; exceptions to requirement for directions for use. 40 CFR section 156.10(i)(1)(iii)(A) to (C) [~~(2017)~~] (2023) is incorporated in this section. [Eff 7/13/81; am and comp 12/16/06; am and comp 8/23/19; am and comp] (Auth: HRS §§149A-15, 149A-33; 40 CFR §156.10) (Imp: HRS §§149A-15, 149A-33; 40 CFR §156.10)

§4-66-23 Label; contents of directions for use. 40 CFR section 156.10(i)(2) [~~(2017)~~] (2023) is incorporated in this section. Eff 7/13/81; am and comp 12/16/06; am and comp 8/23/19; am and comp] (Auth: HRS §§149A-15, 149A-33; 40 CFR §156.10) (Imp: HRS §§149A-15, 149A-33; 40 CFR §156.10)

§4-66-24 Label; statement of use classification; generally. 40 CFR section 156.10(j) [~~(2017)~~] (2023) is incorporated in this section. The federal term "General use" in 40 CFR section 156.10(j) [~~(2017)~~] (2023) is replaced by the indicated state term, as incorporated and amended in this section:

"General use" is replaced with the state term "nonrestricted". [Eff 7/13/81; am and comp 12/16/06; am and comp 8/23/19; am and comp] (Auth: HRS §§149A-15, 149A-33; 40 CFR §156.10) (Imp: HRS §§149A-15, 149A-33; 40 CFR §156.10)

§4-66-25 Repealed. [R 12/16/06]

§4-66-26 Label; restricted use classification. 40 CFR section 156.10(j)(2) [~~(2017)~~] (2023) is incorporated in this section. 40 CFR section 156.10(j)(2)(i)(B)

(2017) is replaced by the indicated paragraph, as incorporated and amended in this section:

"Directly below this statement on the front panel, a summary statement of the terms of restriction imposed as a precondition to registration shall appear. If use is restricted to certified applicators, the following statement is required: "For retail sale to and use only by Certified Applicators or persons under their direct supervision and only for those uses covered by the Certified Applicator's certification." If the head determines that other State regulatory restrictions shall be imposed for the protection of the public, the head may require appropriate terms of restriction as a condition of licensing." [Eff 7/13/81; comp 12/16/06; am and comp 8/23/19; am and comp] (Auth: HRS §§149A-15, 149A-33; 40 CFR §156.10) (Imp: HRS §§149A-15, 149A-33; 40 CFR §156.10)

§4-66-27 Label; prominence and legibility. 40 CFR section 156.10(a)(2) [~~(2017)~~] (2023) is incorporated in this section. The federal terms "Act" and "Regulation" in 40 CFR section 156.10(a)(2) [~~(2017)~~] (2023) are supplemented with the indicated state terms, as incorporated and amended in this section:

(1) "Act" includes the Hawaii Pesticides Law, chapter 149A, Hawaii Revised Statutes.

(2) "Regulation" includes the state term "rule", which refers to title 4, Hawaii Administrative Rules. [Eff 7/13/81; comp 12/16/06; am and comp 8/23/19; am and comp] (Auth: HRS §§149A-15, 149A-33; 40 CFR §156.10) (Imp: HRS §§149A-15, 149A-33; 40 CFR §156.10)

§4-66-28 Label; language to be used. 40 CFR section 156.10(a)(3) [~~(2017)~~] (2023) is incorporated in this section. The federal term "Agency" in 40 CFR section 156.10(a)(3) [~~(2017)~~] (2023) is supplemented with

the indicated state term, as incorporated and amended in this section:

"Head" means the administrative head of the division of plant industry, Hawaii department of agriculture, or any officer or employee to whom authority has been duly delegated. [Eff 7/13/81; am and comp 12/16/06; am and comp 8/23/19; am and comp] (Auth: HRS §§149A-15, 149A-33; 40 CFR §156.10) (Imp: HRS §§149A-15, 149A-33; 40 CFR §156.10)

§4-66-29 Label; placement. 40 CFR section 156.10(a)(4)(i) to (ii) [~~(2017)~~] (2023) is incorporated in this section. The federal term "Act" in 40 CFR section 156.10(a)(4)(i) to (ii) [~~(2017)~~] (2023) is supplemented by the indicated state term, as incorporated and amended in this section:

"Act" includes the Hawaii Pesticides Law, chapter 149A, Hawaii Revised Statutes. [Eff 7/13/81; am and comp 12/16/06; am and comp 8/23/19; am and comp] (Auth: HRS §§149A-15, 149A-33; 40 CFR §156.10) (Imp: HRS §§149A-15, 149A-33; 40 CFR §156.10)

§4-66-30 Label; false or misleading statements.

(a) 40 CFR section 156.10(a)(5) [~~(2017)~~] (2023) is incorporated in this section.

(b) The federal terms "Act" and "Regulation" in 40 CFR section 156.10(a)(5) [~~(2017)~~] (2023) are supplemented with the indicated state term, as incorporated and amended in this section:

(1) "Act" includes the Hawaii Pesticides Law, chapter 149A, Hawaii Revised Statutes, and citation to section 149A-2, Hawaii Revised Statutes.

(2) "Regulation" includes the state term "rule", which refers to title 4, Hawaii Administrative Rules.

(c) The federal term "device" in 40 CFR section 156.10(a)(5) [~~(2017)~~] (2023) is replaced by the indicated state term, as incorporated and amended in this section:

(1) "Device" is replaced with the state term

"nonchemical pest control device". [Eff 7/13/81; am and comp 12/16/06; am and comp 8/23/19; am and comp] (Auth: HRS §§149A-15, 149A-33; 40 CFR §156.10) (Imp: HRS §§149A-15, 149A-33; 40 CFR §156.10)

§4-66-31 Label; final printed form. (a) 40 CFR section 156.10(a)(6)(i) to (ii) [~~(2017)~~] (2023) is incorporated in this section.

(b) The federal terms "Agency" and "Registration" in 40 CFR section 156.10(a)(6)(i) to (ii) [~~(2017)~~] (2023) are supplemented with the indicated state term, as incorporated and amended in this section:

(1) "Agency" includes the state term "head", which means the administrative head of the division of plant industry, Hawaii department of agriculture, or any officer or employee to whom authority has been duly delegated.

(2) "Registration" includes the state term "license", which means the process of being allowed to register a pesticide product pursuant to the provisions of chapter 149A, Hawaii Revised Statutes.

(c) The federal term "microfilm" in 40 CFR section 156.10(a)(6)(ii) (2017) is replaced by the indicated state term, as incorporated and amended in this section:

(1) "Microfilm" is replaced with the state term "text.PDF or similar format". [Eff 7/13/81; am and comp 12/16/06; am and comp 8/23/19; am and comp] (Auth: HRS §§149A-15, 149A-33; 40 CFR §156.10) (Imp: HRS §§149A-15, 149A-33; 40 CFR §156.10)

§4-66-32 Restricted use pesticides. (a) A pesticide or pesticide use classified for restricted use under FIFRA shall be classified as a State restricted use pesticide.

(b) Any pesticides or pesticide uses that meet or exceed any of the following criteria shall be a candidate for State restricted use classification:

(1) Pesticides in toxicity categories I and II as

defined in section 4-66-18 (40 CFR sections 156.62, 156.64, 156.66, and 156.68 [~~(2017)~~] (2023));

(2) Pesticides or pesticide uses that are determined by the head, in consultation with the director of the department of health, to be a health hazard for one or more reasons including, but not limited to, toxicity, body storage, oncogenicity, mutagenicity, and teratogenicity or other reproductive effects;

(3) Pesticides or pesticide uses that can reasonably be anticipated to result in contamination of groundwater or significant reductions in non-target organisms, or fatality to members of endangered species; and

(4) Pesticides or pesticide uses authorized under section 18, the Emergency Exemption provision, of FIFRA.

(c) Any pesticide, pesticide formulation, pesticide product, or pesticide use that meets or exceeds the criteria set forth in section 4-66-32(b) shall be subjected to an internal review process by the department prior to being presented to the board for adoption as a State restricted use pesticide.

(d) The head, in consultation with the advisory committee, shall determine which pesticides, pesticide formulations, pesticide products, or pesticide uses meet or exceed the criteria set forth in section 4-66-32(b) and shall submit those items for review by the department.

(e) Once the review process under section 4-66-32(c), or if applicable, an evaluation under section 4-66-32.1(c), has been completed, the head shall submit a list of those pesticides, pesticide formulations, pesticide products, and pesticide uses deemed appropriate for classification as State restricted use for adoption by the board.

(f) The head may classify a pesticide or pesticide use meeting or exceeding the criteria set forth in section 4-66-32(b) for nonrestricted use if during the department's review process it is determined that measures such as packaging, type of formulation, or method of application eliminate or reduce hazards associated with the pesticide or its use.

(g) The board, upon adoption of those pesticides, pesticide formulations, pesticide products, or pesticide uses recommended for classification as a State restricted use pesticide, shall maintain a list of all State restricted use pesticides at the department Office of the Chairperson. The list of State restricted use pesticides shall also be posted on the department's website. [Eff 7/13/81; am and comp 12/16/06; am and comp 8/23/19; am and comp] (Auth: HRS §§149A-19, 149A-33; 7 USC §136v (a)-(b), 7 USC §136w-1 (a)-(b)) (Imp: HRS §§149A-19, 149A-33)

§4-66-32.1 Evaluation of pesticides uses. (a) The head may, at any time, evaluate a licensed pesticide or pesticide proposed for licensing, to carry out the provisions of the Act. The head shall investigate all reported events and information received that indicates any pesticide may have caused, or is likely to cause, unreasonable adverse effects to humans or the environment. If the head finds from the investigation that unreasonable adverse effects to humans or the environment have occurred or are likely to occur, the pesticide shall be evaluated.

(b) The head shall evaluate any pesticide when unreasonable adverse effects to humans or the environment have been found and documented to a reasonable degree of scientific certainty as being associated with the use of that pesticide. Unreasonable adverse effects to humans or the environment shall include, but not be limited to, the following circumstances:

(1) Public or worker health hazard;

(2) Pesticide residues in drinking water are present in levels that are equal to or exceed twenty per cent of the established federal or State health standards or advisories;

(3) Pesticide residues in food or feed are present in levels exceeding the established tolerances;

(4) Fish or wildlife hazard, including hazards to endangered species;

(5) Toxicity to non-target organisms;
(6) Hazardous packaging;
(7) Misbranded as established in sections 4-66-4 to 4-66-30 (40 CFR part 156 [~~(2017)~~ (2023)]);
(8) Other information suggesting unreasonable adverse effects on humans or the environment associated with the use of a specific pesticide; and
(9) Discovery that data upon which a license was issued are false, misleading, or incomplete.

(c) The evaluation of any pesticide shall consist of identification of unreasonable adverse effects to humans or the environment, including the social, economic, and environmental costs of the pesticide, identification of the uses of the pesticide, identification of the benefits of the pesticide, identification of alternatives to the pesticide, identification of regulatory controls considered by the head in mitigating unreasonable adverse effects on humans or the environment, determination by the head as to whether the effects on humans or the environment are unreasonable, and recommendation by the head for regulatory actions. Evaluation may lead to no change, restriction of use, refusal to issue or renew a license, requirement of an annual use permit, or cancellation or suspension of the license. The evaluation shall be made available to all interested parties to provide them with an opportunity to submit additional information, and comment on the evaluation. [Eff and comp 12/16/06; am and comp 8/23/19; comp] (Auth: HRS §§149A-14, 149A-33) (Imp: HRS §149A-33)

§4-66-33 Pesticide licensing; exceptions. (a) Any manufacturer, packer, seller, distributor, or shipper of a pesticide may apply to license a pesticide.

(b) No person may distribute in the State, any pesticide that is not licensed with the department, except for the following:
(1) Pesticides transferred between EPA registered establishments operated by the same producer for packaging or for use in producing another pesticide, provided the pesticides are labeled to clearly show the identity and purpose for

which the pesticides are being transferred;

(2) Pesticides distributed under an experimental use permit issued by the head;

(3) Pesticides transferred for purpose of disposal when marked to show the pesticides are for disposal only, and accompanied by sufficient information to identify products and to ensure that product can be handled with minimum hazard to humans or the environment;

(4) Pesticides intended solely for export when prepared or packed according to specifications of foreign purchaser;

(5) Pesticides being distributed under a FIFRA, section 18 emergency exemption; and

(6) Upon written notice to the head, pesticides distributed to research laboratories for the purpose of laboratory or enclosed space production tests, or limited replicated field trials of less than one-fourth acre, to determine toxicity or other properties, and from which the producer, researcher, or applicator or any other person conducting the laboratory or enclosed space production tests or field trial, does not expect to receive any benefit in pest control from its use. Notice shall be provided on forms prescribed by the head. [Eff 7/13/81; comp 12/16/06; am and comp 8/23/19; am and comp] (Auth: 40 CFR §152.30; HRS §§149A-13, 149A-19, 149A-33) (Imp: HRS §§149A-13, 149A-19, 149A-33)

§4-66-34 Applications for licensing pesticides and for approval of nonchemical pest control devices. The procedures for licensing pesticides, or approval of nonchemical pest control devices as defined in chapter 460J, Hawaii Revised Statutes, are as follows:

(1) Applications shall be filed by the applicant or by an agent whom the applicant has designated as such by a notarized letter.

(2) Applications shall be made on forms prescribed by the department and shall contain the following information: name and address of the

applicant and any other person whose name will appear on the labeling or in the directions for use, name of the pesticide or nonchemical pest control device as shown on the label, the EPA registration number (for pesticides), the EPA establishment number, and the signature of the applicant or applicant's designated agent.

(3) Applications shall be submitted no less than thirty calendar days prior to the date licensing is desired to take effect.

(4) Applications shall be accompanied by one copy of the final printed label in text.pdf or similar format, the EPA stamped "ACCEPTED" label, if applicable, and any other printed or graphic matter that is required to accompany the pesticide or nonchemical pest control device when offered for sale or distribution, including all claims, directions for use, and any other materials specified by the head.

(5) If requested by the head, the applicant for a pesticide license shall provide the complete formula of the pesticide, including active and inert ingredients, and a description of tests and test results thereof on which claims are based, including efficacy, residue, safety, and other supporting data that shows the pesticide shall perform its intended function without causing unreasonable adverse effects on humans or the environment.

(6) If requested by the head, the applicant for nonchemical pest control device approval shall provide a description of the principles fundamental to the efficacy of the nonchemical pest control device, a description of the tests conducted according to the procedures described below and test results thereof on which claims are based, including efficacy, reliability, safety, and other supporting data that shows the nonchemical pest control device will perform its intended function without causing unreasonable adverse effects on humans or the environment.

(7) Each test submitted pursuant to this section shall be based on a written protocol that

clearly indicates the objectives and all the methods for the conduct of the test. The protocol shall contain, but not be limited to, the following information:

(A) A descriptive title and statement of the purpose of the study;

(B) The name and address of the sponsor and address of the testing facility at which the study was conducted;

(C) Justification for the selection of the test organism;

(D) Where applicable, the number, body weight range, sex, source of supply, species, strain, substrain and age of the organisms tested;

(E) A description of the experimental design, including methods for the control of bias;

(F) Where applicable, a description or identification of the diet for the test animals or fertilization and irrigation schedules for plants used in the test;

(G) Treatments, such as the test frequency and volume for nonchemical pest control devices, and the method and frequency of administration;

(H) The type and frequency of data collection, and measurements to be made;

(I) The records to be maintained;

(J) The date of approval by the sponsor and the signature of the test director; and

(K) A statement of the proposed statistical analyses to be used.

(8) The department may test nonchemical pest control devices to determine the reliability, efficacy and safety of the nonchemical pest control device. The applicant shall provide any nonchemical pest control devices to the department for testing upon request.

(9) The department shall provide the applicant with a description of the tests to be conducted, and estimated schedule to complete the tests.

(10) The applicant may initiate tests required pursuant to (8) above, using qualified testing facilities, with the concurrence of the department. [Eff 7/13/81; am and comp 12/16/06; am and comp 8/23/19; comp] (Auth: HRS §§149A-13, 149A-15, 149A-19, 149A-33, 460J-24.5) (Imp: HRS §§149A-13, 149A-15, 149A-19, 149A-33, 460J-24.5)

§4-66-35 Pesticide licensing; effective date. (a) Licenses shall become effective on the date issued and, unless canceled by the head, shall continue in effect through the date of expiration.

(b) Pesticide products are to be licensed for a period of three years. All licenses shall expire on December 31 of each third year after license issuance.

(c) Provisional licenses may be issued for experimental use permits to cover the duration of the permit.

(d) Any pesticide product licensed under the Act shall not require any further licensing by other persons provided:

(1) The pesticide product is in the manufacturer's or registrant's original unbroken container;

(2) The claims made in the pesticide product's directions for use, use classification, and other information contained in the labeling, do not differ from those made in conjunction with the license currently in effect; and

(3) Any change in the labeling or formula of a licensed pesticide shall be submitted in advance to the head provided:

(A) The licensee shall describe the exact change and upon request, shall submit test results to support any change in labeling claims; and

(B) After the effective date of any change in labeling or formulas, the pesticide shall be marketed only under the new label or formula. The head may permit a reasonable time for disposition of stocks, if in the opinion of the head,

such disposition does not result in any unreasonable adverse effects on humans or the environment. [Eff 7/13/81; am and comp 12/16/06; am and comp 8/23/19; comp] (Auth: HRS §§149A-13, 149A-19, 149A-33) (Imp: HRS §§149A-13, 149A-19, 149A-33)

§4-66-36 Pesticide licenses; corrections. (a) The head shall require the licensee to make necessary changes should the labeling claims of the pesticide be unwarranted, or if the pesticide and its labeling or other material required to be submitted do not comply with the Act or these rules, or when necessary to prevent any unreasonable adverse effect on humans or the environment.

(b) The licensee shall make the necessary corrections within thirty calendar days from receipt of any correction notice. If the licensee fails to make the necessary corrections within thirty calendar days, the head may take any of the following actions, alone or in combination with each other:

(1) Refuse to license the pesticide;

(2) Cancel the pesticide license; and

(3) Change the classification of the pesticide.

(c) Should the head determine that an imminent hazard exists, the head may suspend the license of any pesticide or pesticide use or uses. The licensee shall be notified within twenty four hours of the suspension and given the reasons for the action.

(d) Should the head find that a pesticide or its labeling fails to comply with FIFRA or regulations implementing FIFRA, the head shall notify EPA and may suggest corrections that would bring the labeling into compliance.

(e) Any licensee aggrieved by a determination of the head relative to refusing, canceling, or suspending a pesticide license, may request a hearing as provided in section 149A-14(d), Hawaii Revised Statutes. [Eff 7/13/81 am and comp 12/16/06; am and comp 8/23/19; comp] (Auth: HRS §§149A-13, 149A-14, 149A-19, 149A-33) (Imp: HRS §§149A-13, 149A-14, 149A-19, 149A-33)

§4-66-37 Special local need (SLN) registration. (a) The head may register pesticide products for special local needs. All applicants for registration of pesticides to meet special local needs shall submit the following information:

(1) The name and address of the applicant and any other person whose name shall appear on the labeling or in the directions for use;

(2) The name of the pesticide product, and if application is for an amendment to a federally registered product, the EPA registration number of that product;

(3) A copy of proposed labeling, including all claims made for the product; directions for use to meet the special local need; the complete proposed labeling for a new product, or the proposed supplemental labeling for registration of an additional use of a federally registered product, and the complete formula of the product if the application is for a new product; and any other information specified by the head that is required to be reviewed prior to registration under this section.

(b) The head shall determine whether there is a special local need for registration. Situations the head may consider as not involving a special local need may include, but are not limited to, use to control a pest problem present on a nationwide basis, and use of a pesticide product registered by other states on an interregional or national basis.

(c) The head shall determine whether the claims made for the product in the registration application are warranted. [Eff 7/13/81; comp 12/16/06; am and comp 8/23/19; comp] (Auth: HRS §§149A-19, 149A-22, 149A-33; 7 USC §136v (c); 40 CFR §§162.152, 162.153) (Imp: HRS §§149A-19, 149A-22, 149A-33; 7 USC §136v (c); 40 CFR §§162.152, 162.153)

§4-66-38 Special local need; unreasonable adverse effects. (a) Under the following circumstances, prior to issuing a special local need registration, the head shall determine that use of the product for which registration

is sought would not cause unreasonable adverse effects on humans or the environment, when used in accordance with labeling directions or widespread and commonly recognized practices:

(1) For the use of a product that has a composition not similar to any federally registered product;

(2) For the use of a product involving a use pattern not similar to any federally registered use of the same product, or of a product with a similar composition; or

(3) For the use of a product for which other uses of the same product, or of a product with a similar composition, have had federal registration denied, disapproved, suspended, or canceled by the EPA administrator.

(b) The determination required by subsection (a) shall be based on data and criteria consistent with federal regulations applicable to the type of product or use under consideration. [Eff 7/13/81; am and comp 12/16/06; am and comp 8/23/19; comp] (Auth: HRS §§149A-19, 149A-22, 149A-33; 7 USC §136v (c); 40 CFR §162.153) (Imp: HRS §§149A-19, 149A-22, 149A-33; 7 USC §136v (c); 40 CFR §162.153)

§4-66-39 Special local need; label, packaging and coloration requirements. (a) The head shall review the proposed labeling submitted with the application to determine compliance subject to the following requirements:

(1) A copy of the final printed labeling shall be reviewed by the head as soon as practicable after a registration is issued in order to verify compliance;

(2) A new product registered [~~shall~~] must be accompanied, at the time of use, by labeling meeting all applicable criteria of sections 4-66-4 to 4-66-31. New product labeling [~~shall~~] must also contain a statement identifying "For distribution and use only within the State of Hawaii" and the assigned special local need number.

(3) For a registration of an additional use of a

federally registered product, labeling from the federally registered product [~~shall~~] must be accompanied at the time of use by supplemental labeling that contains:

(A) A statement identifying "For distribution and use only within the State of Hawaii";

(B) Directions for use to meet the special local need which satisfy the criteria of sections 4-66-10 to 4-66-31;

(C) The trade name of the product;

(D) The name and address of the special local need registrant;

(E) The EPA registration number of the federally registered product;

(F) The assigned special local need number;

(G) A statement requiring a person using the product to comply with all applicable directions, restrictions, and precautions found in the labeling of the federally registered product; and

(H) A statement prohibiting the use of the product in a manner inconsistent with federal and accompanying supplemental labeling.

(4) If the head classifies for restricted use a product or product use registered by the head, which is not required to be classified as restricted use by section 4-66-32, then the head shall require supplemental labeling for the product or product use to have additional appropriate precautions, and a statement that the product or product use is for restricted use.

(b) All products registered by the head [~~shall~~] must meet all appropriate federal packaging standards as well as all appropriate standards for coloration established and contained in section 4-66-42.1. Prior to issuing any registration, the head shall determine that the product conforms to these requirements. [Eff 7/13/81; am and comp 12/16/06; am and comp 8/23/19; am and comp] (Auth: HRS §§149A-19, 149A-22, 149A-33; 7 USC §136v (c); 40 CFR §162.153) (Imp: HRS §§149A-19, 149A-22, 149A-33; 7 USC §136v (c); 40 CFR §162.153)

§4-66-40 Special local need; classification.

(a) As part of the registration of any part or use, the head shall classify the product or product use consistent with section 4-66-32.

(b) A product or product use thereof registered by The head shall be classified by the head for restricted use if the product is identical or similar in composition to a federally registered product for which the use has been classified as restricted under federal law or for which a use similar to the registered use has been classified as restricted use under federal law, and the registered product or product use meets the criteria for classification as restricted use pesticides under section 4-66-32. [Eff 7/13/81; am and comp 12/16/06; am and comp 8/23/19; comp] (Auth: HRS§§149A-19, 149A-22, 149A-33; 7 USC §136v (c); 40 CFR §162.153) (Imp: HRS §§149A-19, 149A-22, 149A-33; 7 USC §136v (c); 40 CFR §162.153)

§4-66-41 Special local need; notification and submission of data to the Environmental Protection Agency (EPA). (a) Within ten working days from the date of issuance of amendments or revocation of a registration, the head shall notify EPA in writing, of the action. Notification of registrations, or amendments thereto, shall include the confidential statements of the formula of any new product, and a copy of the draft labeling reviewed and approved by the head, provided that labeling previously approved by the EPA as part of a federal registration need not be submitted.

(b) Notification of registrations or amendments shall be supplemented by sending to EPA a copy of the final printed labeling approved by the head within forty-five days after the effective date of registration or amendment.

(c) Notification of revocation of registration shall indicate the effective date of revocation, and shall state the reasons for revocation.

(d) Within fifteen working days from receipt of a request from EPA, the head shall submit any data used to determine that any unreasonable adverse effect on humans or the environment shall not be caused by a registration

of a product with a composition not similar to any federally registered product, or an additional use of a federally registered product, or a use of a product with a composition similar to that of a federally registered product, or if registration of other uses of the federally registered product has been denied, suspended, or canceled because of health, safety, or environmental concerns. [Eff 7/13/81; am and comp 12/16/06; am and comp 8/23/19; comp] (Auth: HRS §§149A-19, 149A-22, 149A-33; 7 USC §136v (c); 40 CFR §162.153) (Imp: HRS §§149A-19, 149A-22, 149A-33; 7 USC §136v (c); 40 CFR §162.153)

§4-66-42 Repealed. [R 12/16/06]

§4-66-42.1 Coloration of pesticides. (a) The following requirements for the coloration of certain pesticides have been determined necessary for the protection of public health and the environment.

(b) Seed Treatment products.

(1) Pesticide products intended for use in treating seeds must contain an EPA-approved dye to impart an unnatural color to the seed, unless appropriate tolerances or other clearances have been established for residues of the pesticide under title 21 United States Code section 346a (a)-(q) (2017), the Federal Food, Drug and Cosmetic Act.

(2) The following products are exempt from the requirement of paragraph (b)(1) of this section:

(A) Products intended and labeled for use solely for commercial seed treatment, provided that the label bears a statement requiring the user to add an EPA-approved dye with the pesticide during the seed treatment process.

(B) Products intended and labeled for use solely as at-planting or hopper box treatments.

(C) Products, which are gaseous in form or are used as fumigants.

(3) EPA-approved dyes for seed treatment are those listed in sections 180.910, 180.920, or 180.2020, title 40, Code of Federal Regulations [~~(2017)~~] (2023). [Eff and comp 12/16/06; am and comp 8/23/19; comp] (Auth: HRS §§149A-16, 149A-33; 40 CFR §§153.140, 153.155) (Imp: HRS §§149A-16, 149A-33; 40 CFR §§153.140, 153.155)

§4-66-43 Enforcement. (a) As allowed by law, the head may enter any place or conveyance where pesticides or nonchemical pest control devices are manufactured, stored, packed, delivered for transportation, transported, offered for sale or sold, and may inspect and take samples of the pesticides and nonchemical pest control devices. An unbroken package may be taken as the official sample where the pesticide is packed in small bottles, or small packages. Where the pesticide is packed in large containers, the official samples may be a portion taken from one original unopened package in a lot. A chain-of-custody for each sample, from collection through analysis and final disposition, shall be maintained on forms prescribed by the head.

(b) As allowed by law, the head may enter any place or conveyance where pesticides are suspected of being applied on non-target sites or locations, or where pesticides are suspected of being applied in a manner inconsistent with the pesticide label, and may inspect and take official samples where pesticide residue is likely to be present. A chain-of-custody for each sample, from collection through analysis and final disposition, shall be maintained on forms prescribed by the head.

(c) Methods of analyzing samples shall be those adopted and published by the Association of Official Analytical Chemists, Official Methods of Analysis of AOAC International (20th edition 2016), where applicable, and other methods as may be necessary to determine whether the product complies with the Act or these rules.

(d) A notice of violation shall include:

(1) If from an examination or analysis, a pesticide or nonchemical pest control device appears to be in violation of the Act or these rules, a notice in writing shall be sent to

the person against whom proceedings are contemplated, giving that person the opportunity to offer a written explanation. The notice shall state the manner in which the sample failed to meet the requirements of the Act or these rules; and

(2) Any person may, in addition to this written reply to the notice, file with the head within twenty days of receipt of the notice a written request for a hearing in connection therewith.

(e) The head may issue "stop sale" and "removal from sale" orders to vendors regarding any pesticide or nonchemical pest control device that violates or fails to comply with the provisions of the Act or these rules, and may place written or printed "stop sale" and "removal from sale" notices on any pesticide or nonchemical pest control device.

(1) Upon receipt of the "stop sale" or "removal from sale" order, the vendors shall correct the violation and effect full compliance therewith. The articles shall not hereafter be sold, offered for sale, transferred or disposed of except upon authorization by the head; and

(2) No person shall remove, deface or tamper with any "stop sale" and "removal from sale" notice issued by the head.

(f) The head may seize any pesticide or nonchemical pest control device that is distributed, sold, offered for sale, transported, or delivered for transportation in violation of the Act or these rules. No notice or hearing shall be required prior to the seizure of a pesticide or nonchemical pest control device. [Eff 7/13/81; am and comp 12/16/06; am and comp 8/23/19; comp] (Auth: HRS §§149A-11, 149A-20, 149A-21, 149A-33) (Imp: HRS §§149A-11, 149A-20, 149A-21, 149A-33)

§4-66-44 Notice of enforcement action. Publication of judgments of the courts in cases arising under the criminal or seizure provisions of the Act or these rules, and any final order issued by the department for violation of the Act or these rules, may be made in

the form of notices, circulars, or bulletins as the head may direct. [Eff 7/13/81; comp 12/16/06; am and comp 8/23/19; comp] (Auth: HRS §§149A-21, 149A-33) (Imp: HRS §§149A-21, 149A-33)

§4-66-45 Experimental use permits; generally. Experimental use permits may be issued for the intrastate shipment, delivery or use of a pesticide product that is to be tested further to determine the scope and limitations of its usefulness and the effect of its use on humans and the environment. Permits may be issued for products for use in experimental programs under the supervision of applicators certified in demonstration and research pest control and broad scale testing under normal conditions of use. The head may require the information and data concerning the product and the proposed testing program that is deemed necessary to make determinations on the merits of the proposals. [Eff 7/13/81; am and comp 12/16/06; am and comp 8/23/19; comp] (Auth: HRS §§149A-19, 149A-22, 149A-33; 40 CFR §§172.20 to 172.26) (Imp: HRS §§149A-19, 149A-22, 149A-33; 40 CFR §§172.20 to 172.26)

§4-66-46 Experimental use permits; prohibitions. No permits shall be issued for any of the following:

(1) A product containing an active or inert ingredient that is currently subject to an EPA cancellation or suspension of registration order, or that is currently subject to an EPA notice of intent to suspend or cancel registration because of human health, environmental, or efficacy consideration; except that a permit may be issued for such a product for a purpose or in a formulation that:

(A) Is not specifically considered in, or that is not subject to, suspension or cancellation proceedings, after consultation with appropriate EPA officials; or

(B) Was specifically considered during the proceedings but not suspended, canceled,

or subject to a notice of intent to suspend or cancel.

(2) A use of a product that has been the subject of a notice of denial of registration under FIFRA; and

(3) A use of a product, which may involve use in or on food or feed other than as authorized in section 4-66-47. [Eff 7/13/81; am and comp 12/16/06; am and comp 8/23/19; comp] (Auth: HRS §§149A-19, 149A-22, 149A-33; 40 CFR §172.24) (Imp: HRS §§149A-19, 149A-22, 149A-33; 40 CFR §172.24)

§4-66-47 Experimental use permits; exceptions. Upon written notification of the head, no experimental use permit is required for the intrastate shipment or use of a substance or mixture of substances being put through laboratory, enclosed space production, or limited field trials of less than one-fourth acre, in which the following three criteria have been met: (1) the purpose of the laboratory, enclosed space production, or limited field trials is to determine the value of a substance or mixture of substances as a pesticide or to determine its toxicity, or other properties; (2) the tests will be conducted by recognized research personnel; and (3) the research personnel conducting the tests do not expect to receive any benefit, other than the research, in pest control from the use of the substance or mixture of substances.

If these three criteria are met, the substances or mixture of substances are not considered to be pesticides within the meaning of the Act or these rules. No State experimental use permit is required if an experimental use permit has been issued by the EPA for the proposed trial(s).

Written notification shall be submitted on forms prescribed by the head. [Eff 7/13/81; am and comp 12/16/06; am and comp 8/23/19; comp] (Auth: HRS §§149A-19, 149A-22, 149A-33; 7 USC §136v (a)) (Imp: HRS §§149A-19, 149A-22, 149A-33)

§4-66-48 Experimental use permits; provisions for

issuance. (a) A permit is required for a pesticide intended for experimental use that is not exempt under section 4-66-47. If a pesticide is to be tested for a use, which is likely to result in a residue on or in food or feed, a permit for experimental use may be issued provided:

(1) A tolerance or exemption from the requirements of a tolerance has been established under section 408 of the Federal Food, Drug, and Cosmetic Act, codified at title 21 United States Code section 346a (2017); or a regulation established under section 409 of the Federal Food, Drug, and Cosmetic Act, codified at title 21 United States Code section 348 (2017); or

(2) The food or feed product derived from the experimental use permit shall be destroyed or used as feed only for laboratory or experimental animals for testing purposes; or

(3) Convincing evidence is submitted by the applicant that the proposed use shall not result in residues in or on food or feed that would be in excess of that authorized under section 408 of the Federal Food, Drug, and Cosmetic Act, codified at title 21 United States Code section 346a (2017), or a regulation established under section 409 of the Federal Food, Drug, and Cosmetic Act, section 348 of title 21, United States Code (2017), which would be hazardous to humans, other animals, or the environment.

(b) A permit shall be issued only if it is clearly shown in the permit application that the applicant's instructions for use reasonably assure the protection of humans and the environment.

(c) All applications for an experimental use permit shall be filed by a qualified person on a form prescribed by the head. Each application shall contain the following:

(1) Name and address of the shipper, the consignee, and place or places from which the shipment shall be made;

(2) Proposed date of shipment, or proposed shipping period that shall not exceed one year

from the permit application date, and quantity to be shipped;

(3) A statement of the composition of material to be covered by the permit, which shall apply to a single material or similar formulations of the material;

(4) The name, address and telephone number and qualification of the person responsible for conducting the test;

(5) Available data or reference to available data on the analytical method and toxicity of the pesticide;

(6) The purpose or objective of the proposed tests; a description of the proposed testing program including test parameters; a designation of the pest organism or organisms involved; the amount of pesticide product proposed for use; the crops, fauna, flora, sites, modes, dosage rate, and situation of applications on or in which the pesticide is to be used; the number of acres, number of structure sites, or number of animals to be treated or included in the area of experimental use; the proposed dates, or period, or periods during which the testing program is to be conducted and the manner in which supervision of the program shall be accomplished; and the method of destruction or disposal of treated food or feed;

(7) A statement that the pesticide is intended for experimental use only;

(8) Proposed labeling that shall bear:

(A) The prominent statement "For Distribution and Experimental Use Only Within Hawaii" in the container label and any accompanying circular or other labeling;

(B) A warning or caution statement that may be necessary and if complied with is adequate for the protection of those who may handle or be exposed to the experimental formulations;

(C) The name and address of the applicant for the permit;

(D) The name or designation of the

formulation; and

(E) If the pesticide is to be sold to experimental use program participants, a statement of the names and percentages of the principal active ingredients in the product; provided that, if the shipper submits a copy of a valid experimental use permit issued under the provisions of FIFRA, and the accepted labeling related thereto, at the head's discretion, the head may exempt the shipper from the requirement of submitting a part of the application, the data, and information specified in this subsection; and

(9) A statement as to the disposal of any unused portions of the experimental pesticide. [Eff 7/13/81; am and comp 12/16/06; am and comp 8/23/19; comp] (Auth: HRS §§149A-19, 149A-22, 149A-33; 40 CFR §172.24) (Imp: HRS §§149A-19, 149A-22, 149A-33; 40 CFR §172.24)

§4-66-49 Experimental use permits; restrictions.

(a) The head may limit the quantity of a pesticide covered by an experimental use permit to a lesser quantity than requested if available information on effectiveness, toxicity, or other hazards is not sufficient to justify the scope of experimental use proposed in the application, or make other limitations in the permit as may be determined to be necessary for the protection of the public.

(b) A pesticide shipped or delivered solely for experimental use shall not be offered or advertised for general sale or use.

(c) Unless revoked by the head, experimental use permits shall be effective for a specified period of time, depending upon the crop or site to be treated and the testing program submitted. Permits may be renewed upon request if circumstance warrants. Applications for renewal of experimental use permits shall be submitted no less than thirty days prior to the permit expiration dated. [Eff 7/13/81; comp 12/16/06; am and comp 8/23/19; comp] (Auth: HRS §§149A-19, 149A-22,

149A-33; 40 CFR §172.25) (Imp: HRS §§149A-19, 149A-22, 149A-33; 40 CFR §172.25)

§4-66-50 Experimental use permits; reports. At specific intervals to be prescribed by the head, the experimental use permittee shall submit periodic reports to the head regarding the status of the experimental program. The permittee shall immediately report to the head any incidents of unreasonable adverse effects on the environment from use, or from exposure to pesticides covered by an experimental use permit. These periodic reports shall include the following information:

(1) Quantity of the pesticide shipped and used during the reporting period;
(2) Name and address of consignee and ultimate destination and amount of each shipment;
(3) A summary of data on effectiveness, phytotoxicity, or other pertinent information regarding usefulness obtained during the permit period;
(4) Any additional data obtained on residue or analytical methods obtained;
(5) Any additional data obtained on toxicity or unreasonable adverse effects to humans, non-target animals, or the environment;
(6) Any residue data obtained on the treated crop or site on which determination can be made regarding reentry into the treated area;
(7) Disposition of unused pesticide; and
(8) Such other information and data as may be prescribed by the head. [Eff 7/13/81; am and comp 12/16/06; am and comp 8/23/19; comp] (Auth: HRS §§149A-19, 149A-22, 149A-33; 40 CFR §172.25) (Imp: HRS §§149A-19, 149A-22, 149A-33; 40 CFR §172.25)

§4-66-51 Experimental use permits; monitoring and revocation. (a) The head shall monitor the testing program if it is determined necessary for protection of the public health and environment. It shall be the responsibility of the permittee or person supervising the experiment to immediately report to the head any

incidents or adverse reaction from use of, or exposure to the pesticide covered by an experimental use permit.

(b) The head shall revoke an experimental use permit if it is determined that the permit terms or conditions are being violated, or that the permit terms or conditions are inadequate to avoid unreasonable adverse effects on humans or the environment.

(c) Failure to comply with the terms or conditions of any State issued experimental use permit may subject the permittee, or person supervising the experiment, or both, to additional penalties as provided by law. [Eff 7/13/81; am and comp 12/16/06; am and comp 8/23/19; comp] (Auth: HRS §§149A-19, 149A-22, 149A-33; 40 CFR §172.25) (Imp: HRS §§149A-19, 149A-22, 149A-33; 40 CFR §172.25)

§4-66-52 Restricted use pesticide dealer and dealer representative. (a) Persons who sell restricted use pesticides, pesticides requiring an annual use permit or special permit to apply restricted use pesticides by aerial application, shall obtain a dealer sales permit for that purpose from the department. The dealer sales permit shall expire on December 31 of each year and shall be renewed no less than thirty calendar days before January 1 of each year.

(b) Any manufacturer, registrant, or distributor of a restricted use pesticide who has no sales outlet within this State, and who sells or distributes the pesticides directly to the user, shall obtain a Hawaii pesticide dealer sales permit for its principal out-of-state location or outlet.

(c) Application for a restricted use pesticide dealer sales permit shall be made on forms prescribed by the head and shall include the name and address of the applicant, location of the sales outlet, and name or names of the restricted use pesticide dealer representative or representatives at each sales outlet.

(d) All restricted use pesticides dealer sales outlets shall have a pesticide dealer representative. The names of the pesticide dealer representatives shall be submitted together with the application for the dealer sales outlet permit. Each restricted use pesticide dealer representative shall obtain a permit.

(e) Persons seeking to obtain a pesticide dealer representative permit shall apply for examination on forms prescribed by the head. To qualify, an applicant shall pass a written examination at a time and place designated by the head. Examination shall test the applicant's knowledge of pesticide laws, rules, and regulations, pesticide hazards, proper usage, safe storage and distribution and disposal methods. The restricted use pesticide dealer shall notify the head within thirty calendar days of any personnel change in the restricted use pesticide dealer representative position.

(f) A permit issued to a restricted use pesticide dealer representative shall be valid for five years. Renewal shall be by examination. Applications for renewal of restricted use pesticide dealer representative permits shall be submitted no less than thirty days prior to the permit expiration date.

(g) Every restricted use pesticide dealer permitted to sell restricted use pesticides shall be responsible for the acts of all pesticide dealer representatives and individuals employed in the solicitation, sale, distribution and handling of pesticides.

(h) Restricted use pesticide dealer sales outlets shall only distribute, solicit, sell, offer for sale, hold for sale, receive order for sale, or transport restricted use pesticides to a certified pesticide applicator, or non-certified applicator under the supervision of a certified pesticide applicator, and only those restricted use pesticides that are relevant to the certification category of the certified applicator.

(i) Any violation of the Act or these rules, whether committed by the dealer, dealer representative, or by any other officer, agent, or employee of the dealer may result in suspension or revocation of the dealer's permit or the dealer representative's permit, or both, as well as any other penalty provided by law. [Eff 7/13/81; am and comp 12/16/06; am and comp 8/23/19; comp] (Auth: HRS §§149A-11, 149A-17, 149A-18, 149A-19, 14'A-33) (Imp: HRS §§149A-11, 149A-17, 149A-18, 149A-19, 149A-33)

§4-66-53 Dealers' records and reports. (a) Dealers permitted to sell or distribute restricted use pesticides [~~shall~~] must keep a record of each sale, distribution, delivery, theft, spill, or any other activity affecting the amount of restricted use pesticides, pesticides requiring an annual permit pursuant to section 4-66-63.1, and special permit to apply restricted use pesticides by aerial application pursuant to section 4-66-64. These records [~~shall~~] must be kept at each sales outlet on forms or through other media approved by the head.

(b) Records [~~shall~~] must show the name and address of purchaser, a description of the activity affecting the amount of restricted use pesticide or pesticide requiring an annual permit or special permit, date of sale or other activity affecting the inventory amount, identity of the formulation or brand sold and quantity (including product name and EPA registration number and any applicable emergency exemption or special local need registration number), and for sales of restricted use pesticides, the applicator's certification number, certification category and certification expiration date, intended use and the name or initials of the employee making the sale or record entry.

(c) A copy of the permitted sales outlet's records as specified in this section shall be submitted to the head within fifteen calendar days after the end of each calendar month for which the record is being kept. A copy [~~shall~~] must be kept at the permitted sales outlet where the sales were made for a period of [~~one year~~] two years.

(d) Failure to submit a copy of the permitted sales outlet's records to the head within fifteen calendar days after the end of each calendar month shall subject the dealer permitted to sell or distribute restricted use pesticides to penalties pursuant to section 149A-41, Hawaii Revised Statutes or any other penalty provided by law. [Eff 7/13/81; am and comp 12/16/06; am and comp 08/23/19; am and comp] (Auth: HRS §§149A-17, 149A-19, 149A-33) (Imp: HRS §§149A-17, 149A-19, 149A-33)

§4-66-54 Storage, display, and sale of pesticides.

(a) No pesticide shall be stored, displayed, placed for sale or transported where food and food containers, feed, water for human or animal consumption, or any other items are likely to become contaminated and may create a hazard or cause injury to humans, vegetation, crops, livestock, wildlife, beneficial insects and aquatic life.

(b) Pesticides labeled for lawns, gardens and other outdoor uses shall be offered for sale only in garden supply centers or in other retail outlets that have a separate and distinct section for display of pesticides for outdoor use, as distinguished from pesticides formulated and registered for use inside the home.

(c) A prominent sign with legible bold print not less than one-half inch in height to read "pesticide products for garden and lawn or outdoor use only - it is unlawful and may be hazardous to use inside your home" shall be posted in the area where such lawn and garden pesticides are displayed and sold.

(d) Every retailer that sells or distributes pesticide products to the public shall prominently post within ten feet of any pesticide product display or sales area, a warning sign that includes:

(1) Information regarding the proper handling, storage, and disposal of all pesticides sold;

(2) Emergency telephone numbers to call in case of poisoning from the pesticides; and

(3) A statement that use of any pesticide product in a manner inconsistent with its label is prohibited by law.

The warning sign shall be no less than seventeen inches by twenty two inches and contain lettering of sufficient size, no less than sixteen point bold type, which will enable the sign to be read from a distance of six feet under all lighting conditions normally encountered during business hours. [Eff 7/13/81; am and comp 12/16/06; am and comp 8/23/19; comp] (Auth: HRS §§149A-15.5, 149A-31, 149A-33) (Imp: HRS §§149A-15.5, 149A-31, 149A-33)

§4-66-55 Disposal of pesticides and empty

pesticide containers. (a) Pesticides and empty containers shall be disposed of in accordance with label directions and, if applicable, at a facility authorized to accept solid waste pursuant to chapter 11-58.1, Hawaii Administrative Rules, or in accordance with chapter 11-262.1, Hawaii Administrative Rules.

(b) If the disposal method is not specified on the label, the pesticide container shall be triple-rinsed or equivalent, punctured, and placed in the trash for refuse collection or offered for recycling, if appropriate.

(c) Owners of unused pesticides may contact the Department's Pesticide Branch for information on pesticide disposal. [Eff 7/13/81; am and comp 12/16/06; am and comp 8/23/19; comp] (Auth: HRS §§149A-19, 149A-33) (Imp: HRS §§149A-19, 149A-33)

§4-66-56 Certification of applicators. (a) No person shall apply restricted use pesticides unless certified in the category appropriate to the application or under the direct supervision of a certified applicator certified in the appropriate category. An applicator applying restricted use pesticides shall be certified as:

(1) A commercial pesticide applicator; or

(2) A private pesticide applicator.

(b) Commercial pesticide applicators shall be further divided into categories and subcategories based on general patterns of use and sites where specific knowledge related to the use pattern or site is required to demonstrate competency. A person may be certified in as many categories or subcategories as necessary. The commercial pesticide applicator categories and subcategories are as follows:

(1) Category 1, agricultural pest control, which includes the following subcategories:

(A) Crop pest control. For persons using or supervising the use of restricted use pesticides in production of agricultural commodities, including but not limited to grains, seeds, soybeans, feed and forage crops, vegetables, fruits, trees and nuts, as well as non-crop agricultural lands;

(B) Animal pest control. For persons using or supervising the use of restricted use

pesticides to control pests on animals including, but not limited to, beef and dairy cattle, swine, sheep, horses, goats, and poultry, and to places on or in which animals are confined; and doctors of veterinary medicine engaged in the business of application for hire, publicly holding themselves out as pesticide applicators or engaged in large scale use of pesticides;

(C) Soil and non-soil fumigant pest control. For persons using or supervising the use of restricted use pesticides to fumigate soil and to fumigate anything other than soil;

(D) Seed treatment. For persons using or supervising the use of restricted use pesticides other than by fumigation on seeds in seed treatment facilities;

(2) Category 2, forest pest control. For persons using or supervising the use of restricted use pesticides in forests, forest nurseries, and forest seed production;

(3) Category 3, ornamental and turf pest control. For persons using or supervising the use of restricted use pesticides to control pests in the maintenance and production of ornamental plants, trees, shrubs, flowers and turf;

(4) Category 4, aerial pest control. For persons using or supervising the use of restricted use pesticides by aerial application;

(5) Category 5, aquatic pest control. For persons using or supervising the use of restricted use pesticides purposefully applied to standing or running water, excluding applicators engaged in public health related activities included in sections 4-66-56(8) and 4-66-56(9);

(6) Category 6, right-of-way pest control. For persons using or supervising the use of restricted use pesticides in the maintenance of roadsides, powerlines, pipelines, and railway rights-of-way, and similar areas, but excluding aquatic rights-of-way;

(7) Category 7, industrial, institutional, and

structural pest control, which includes the following subcategories:

(A) Fumigation pest control. For persons using or supervising the use of fumigant restricted use pesticides to control termites and other pests in or around food handling establishments, human dwellings, institutions such as schools and hospitals, industrial sites such as warehouses, grain elevators, and any other structures and adjacent area, public or private, and for the protection of stored, processed or manufactured products. The corresponding branch of pest control established pursuant to section 460J-12, Hawaii Revised Statutes, is Branch 1, Fumigation;

(B) Termite pest control. For persons using or supervising the use of restricted use pesticides other than by fumigation to control subterranean and drywood termites in or around human dwellings, institutions such as schools and hospitals, hotels, industrial sites, and any other structures and adjacent area, public or private. The corresponding branch of pest control established pursuant to section 460J-12, Hawaii Revised Statutes, is Branch 3, Termite;

(C) General pest control. For persons using or supervising the use of restricted use pesticides to control pests, in or around food establishments, human dwellings, institutions such as schools, hospitals, industrial sites such as warehouses, and any other structures and adjacent area, public or private; and for the protection of stored, processed or manufactured products, excluding those applicators certified in category 3, ornamental and turf pest control, and subcategories 7(A) and 7(B). The corresponding branch of pest control established pursuant to section 460J-12, Hawaii Revised Statutes,

is Branch 2, General Pest;

(D) Institutional pest control. For persons using or supervising the use of restricted use pesticides exclusive of fumigants to control pests at institutions (e.g., schools, hotels, hospitals, warehouses, industrial sites), or establishments (e.g., grain elevators, restaurants, bakeries, fast food outlets) where they are employed;

(E) Vault fumigation pest control. For persons using or supervising the use of restricted use pesticides to fumigate vaults or chambers, to control pests in agricultural commodities or structural materials, and including stored, processed or manufactured products, exclusive of those individuals licensed as pest control operators and certified in category 7(A), 7(B), or 7(C);

(F) Specialty categories. For persons using or supervising the use of restricted use pesticides where the scope of application is typically limited to a single active ingredient, a single site, a single facility or a single application method, such as using restricted use pesticides for controlling roots in sewer lines, prevention of pests on marine surfaces through the use of restricted use coatings, controlling wood pests through the use of pressure or submergence treatment, and persons who use chlorine gas;

(8) Category 8, public health pest control. For federal, state or other governmental employees and contractors using or supervising the use of restricted use pesticides in public health programs for the management and control of pests having medical and public health importance;

(9) Category 9, regulatory pest control. For state, federal, or other government employees and contractors using or supervising the use

of restricted use pesticides in the control of regulated pests prescribed under the Hawaii Plant Quarantine Law, chapter 150A, Hawaii Revised Statutes, and the Federal Plant Protection Act, title 7, chapter 104, sections 7701-7786, United States Code (2017);

(10) Category 10, demonstration, research and instructional pest control. For persons who demonstrate to the public the proper use and techniques of application of restricted use pesticides or supervise such demonstration, and persons conducting field research with pesticides, and in doing so, use or supervise the use of restricted use pesticides; and

(11) Category 11, chemigation pest control. For persons using or supervising the use of restricted use pesticides other than by fumigation applied through an irrigation system. Certification in this category requires concurrent certification in category 1(A), 2, 3, or 10.

(c) Private pesticide applicators shall be further divided into categories based on general patterns of use and sites where specific knowledge related to the use pattern or site is required to demonstrate competency. A person may be certified in as many categories as necessary. The categories are as follows:

(1) Category 1, general agricultural pest control. For private applicators using or supervising the use of restricted use pesticides in the production of agricultural commodities;

(2) Category 2, agricultural pest control with fumigants. For private applicators using or supervising the use of restricted use pesticides for soil fumigation in the production of an agricultural commodity and the application of restricted use pesticides for fumigation of agricultural products. Certification in this category requires concurrent certification in category 1, general agricultural pest control; and

(3) Category 3, chemigation. For persons conducting agricultural pest control other than by fumigation, with pesticides applied

through irrigation systems. Certification in this category requires concurrent certification in category 1, general agricultural pest control. [Eff 7/13/81; am and comp 12/16/06; am and comp 08/23/19; am and comp] (Auth: HRS §149A-33; 40 CFR §§171.5, 171.101) (Imp: HRS §149A-33; 40 CFR §§171.5, 171.101)

§4-66-57 General standards for certification of applicators. (a) Applicants for certification [~~shall~~] must be at least eighteen years of age and shall possess a history of honesty, truthfulness, financial integrity and fair dealing. Such personal history shall be based on information obtained intra-departmentally, interdepartmentally, and/or through publicly available records;

(b) Competence in the use and handling of restricted use pesticides shall be determined by receiving a passing score of seventy per cent or better on a written examination or any alternate methods employed by the department to determine applicator competency, or both. Examinations are based upon standards that meet or exceed those set forth in this section and section 4-66-58. The examination shall test knowledge applicable to the certification category or subcategory, or both, and to the pesticide or class of pesticides covered by the requested certification.

(c) The department shall ensure that examinations meet the following standards:

(1) Examinations [~~shall~~] must be presented and answered in writing;

(2) Examinations [~~shall~~] must be proctored by an individual designated by the department;

(3) At the time of examination, each person seeking certification [~~shall~~] must present a valid, government-issued photo identification or other similarly reliable form of identification as proof of identity and age;

(4) Each person seeking certification [~~shall~~] must be given instruction on examination procedure before beginning the examination;

(5) Examinations [~~shall~~] must be kept secure

before, during, and after the examination period. No portion of the examination or associated reference materials may be copied or retained by any person other than persons authorized by the department;

(6) There [~~shall~~] must be no verbal or non-verbal communication with anyone other than the proctor during the examination period;

(7) Only reference materials approved by the department may be used during the examination; and

(8) In addition to the written examination the department may employ additional methods for determining applicator competency.

(d) Applicants [~~shall~~] must demonstrate practical knowledge of the principles and practices of pest control. The knowledge [~~shall~~] must include the following areas:

(1) Label and labeling comprehension. Familiarity with pesticide labels and labeling; an understanding of label function, format and terminology; an understanding of instructions, warnings, symbols, and other common labeling requirements; an understanding that it is a violation of federal and State law to use any pesticide in a manner inconsistent with its labeling; an understanding that certification is required in the certification category appropriate to the type and site of the application; an understanding of labeling requirements for supervising non-certified applicators working under the direct supervision of a certified applicator; an understanding of labeling requirements that a certified applicator must be physically present at the site of the application; an understanding of the meaning of product classification as either general or restricted use and that a product may be unclassified; understanding and complying with product-specific notification requirements; and recognizing the difference between mandatory and advisory labeling language;

(2) Safety measures. An understanding of the

risks of acute toxicity, chronic toxicity, and long-term effects of pesticides; an understanding that risk is a function of exposure and pesticide toxicity; recognition of ways in which dermal, inhalation, and oral exposure may occur; knowledge of common types and causes of pesticide mishaps; precautions to prevent injury to applicators and other individuals in or near treated areas; the need for and proper use of personal protective equipment and clothing; symptoms of pesticide poisoning; first aid and other procedures to be followed in case of a pesticide mishap; proper identification, storage, transport, handling, mixing procedures, and disposal methods for pesticides and used pesticide containers; and precautions to be taken to prevent children from having access to pesticides and pesticide containers;

(3) Environment. An understanding of the potential environmental consequences of the use and misuse of restricted use pesticides; an understanding of the influence of weather and other indoor and outdoor climatic conditions; the influence of types of terrain, soil, or other substrate; presence of fish, wildlife, and other non-target organisms; and, drainage patterns;

(4) Pests. An understanding of the importance of correctly identifying target pests and selecting the proper pesticide product for effective pest control; and, verifying that the labeling does not prohibit the use of the product to control the target pest;

(5) Pesticides. Knowledge of the characteristics of various pesticides, including the types of pesticides; types of formulations; compatibility, synergism, persistence, and animal and plant toxicity of the formulations; hazards and residues associated with use; factors that influence effectiveness or lead to problems such as pesticide resistance; and, dilution procedures;

(6) Application equipment. Practical knowledge of

type, maintenance, use, and calibration of pesticide application equipment and an understanding of advantages and limitations of each type of equipment. Additional knowledge of calibration shall be required of applicants using or supervising the use of highly specialized equipment;

(7) Application methods. Practical knowledge and understanding of selecting the appropriate application method; an understanding of methods used to apply various forms and formulations of pesticides; knowledge of which application method to use in a given situation and that use of a fumigant, aerial application, or other special category pesticide requires additional certification; how selection of application method and use of a pesticide may result in proper use, unnecessary or ineffective use, and misuse; a practical understanding of pesticide drift and runoff, and the resulting effect on non-target organisms, such as wildlife, apiaries, humans, human habitation, lakes, rivers, wetlands, coastal waters, surface waters and ground waters; and knowledge of techniques, formulations, and methods to prevent drift and pesticide loss into the environment;

(8) Laws, rules, and regulations. Knowledge of all applicable federal and State laws, rules, and regulations;

(9) Responsibilities of supervisors of non-certified applicators. Practical knowledge of applicable Federal and State supervisory requirements, including any requirements on the product label and labeling, regarding the use of restricted use pesticides by non-certified applicators. Knowledge of the responsibilities of certified applicators supervising non-certified applicators using restricted use pesticides; understanding and complying with [~~title~~]40[~~,~~] CFR section 171.201[~~, Code of Federal Regulations (2018)~~] (2023) (40 CFR section 171.201 (2023) can be found at

https://www.govinfo.gov/content/pkg/CFR-2023-title40-vol26/pdf/CFR-2023-title40-vol26-sec171-201.pdf); knowledge and understanding of the recordkeeping requirements of pesticide safety training for non-certified applicators who use restricted use pesticides under the direct supervision of a certified applicator; providing use-specific written instructions to non-certified applicators who use restricted use pesticides under the direct supervision of a certified applicator; and explaining pertinent federal and State laws, rules and regulations to non-certified applicators who use restricted use pesticides under the direct supervision of a certified applicator; and

(10) Professionalism. Knowledge and understanding of the importance of maintaining chemical security for restricted use pesticides; how to effectively communicate information about pesticide exposures and risks; and, appropriate product stewardship for certified applicators. [Eff 7/13/81; am and comp 12/16/06; am and comp 08/23/19; am and comp] (Auth: HRS §149A-33; 40 CFR §§171.5, 171.103) (Imp: HRS §149A-33; 40 CFR §§171.5, 171.103)

§4-66-58 Specific standards for certification of applicators. In addition to satisfying the requirements of section 4-66-57, applicants for certification [~~shall~~] must demonstrate through written examinations practical knowledge of the principles and practices of pest control and proper and effective use of restricted use pesticides for each particular category or subcategory of certification applied for, as follows:

(a) Commercial applicators

(1) Category 1, agricultural pest control, which includes the following subcategories:

(A) Crop pest control applicators [~~shall~~] must demonstrate practical knowledge of the crops, grasslands, and non-crop agricultural lands and

the specific pests on those areas on which the applicator may be using restricted use pesticides. Applicators in this category [~~shall~~] must demonstrate operational knowledge concerning soil and water problems, pre-harvest intervals, restricted entry intervals, phytotoxicity, potential for environmental contamination, non-target injury and other problems resulting from the use of restricted use pesticides in agricultural areas. The required knowledge includes the potential for phytotoxicity due to a wide variety of plants to be protected, for drift, for persistency beyond the intended period of pest control, and for non-target exposures;

(B) Animal pest control applicators [~~shall~~] must demonstrate practical knowledge of such animals and the animals' associated pests. The required knowledge includes specific pesticide toxicity and residue potential, and the hazards associated with factors such as formulation, application techniques, age of animals, stress and extent of treatment; [~~and~~]

(C) Soil and non-soil fumigant pest control applicators [~~shall~~] must demonstrate practical knowledge of the pest problems and pest control practices associated with performing fumigation applications, including label and labeling comprehension, worker protection measures, restricted entry periods, recordkeeping requirements, and safety measures to minimize adverse health effects. Applicators [~~shall~~] must also demonstrate an

understanding of how applicators and bystanders can be exposed to fumigants, signs and symptoms of exposure to fumigants, first aid procedures, emergency preparedness, the ability to calculate buffer zones, air concentrations of fumigant, and preparation of site-specific fumigant management plans and post-application summaries. Soil and non-soil fumigant pest control applicators must demonstrate practical knowledge of the pest problems and pest control practices associated with performing soil fumigant applications and fumigation applications to sites other than soil as specified in 40 CFR section 171.103(d)(13) and (14) (2023) (40 CFR section 171.103 can be found at https://www.govinfo.gov/content/pkg/CFR-2023-title40-vol26/pdf/CFR-2023-title40-vol26-sec171-103.pdf); and

(D) Seed treatment applicators must demonstrate practical knowledge including recognizing types of seeds to be treated, the effects of carriers and surface active agents on pesticide binding and germination, the hazards associated with handling, sorting and mixing, and misuse of treated seed, the importance of proper application techniques to avoid harm to non-target organisms, and the proper disposal of unused treated seeds.

(2) Category 2, forest pest control applicators [~~shall~~] must demonstrate practical knowledge of the types of forests, forest nurseries, seed production and pest involved. The required knowledge [~~shall~~] must include the cyclic occurrence of certain pests,

population dynamics as a basis for programming pesticide applications, the relevant organisms causing harm and the organisms vulnerability to the pesticides to be applied, how to determine when pesticide use is proper, selection of application method, proper use of application equipment to minimize non-target exposures, and appropriate responses to meteorological factors and adjacent land use. The applicator [~~shall~~] must demonstrate an understanding of the potential for phytotoxicity due to a wide variety of plants to be protected, for drift, for persistence beyond the intended period of pest control, and for non-target exposures. Because forest stands frequently include watersheds, aquatic situations, and harbor wildlife, the applicator [~~shall~~] must demonstrate knowledge of pest control methods that will minimize the possibility of secondary problems such as surface or ground water contamination and unintended effects on wildlife;

(3) Category 3, ornamental and turf pest control applicators [~~shall~~] must demonstrate practical knowledge of pesticide problems associated with the production and maintenance of ornamental trees, shrubs, flowers, groundcover, and turf, including knowledge of potential phytotoxicity due to the wide variety of plants to be protected, for drift, for persistence beyond the intended period of pest control, and for non-target exposures. Because of the frequent proximity of human habitations to application activities, applicators in this category [~~shall~~] must also demonstrate practical knowledge of application methods that will minimize or prevent hazards to humans, pets, and other domestic animals;

(4) Category 4, aerial pest control applicators [~~shall~~] must demonstrate practical knowledge of pest problems and pest control practices associated with performing aerial application of restricted use pesticides as specified in 40 CFR section 171,103(d)(15) (2023) (40 CFR section 171.103 (2023) can be found at https://www.govinfo.gov/content/pkg/CFR-2023-title40-vol26/pdf/CFR-2023-title40-vol26-sec171-103.pdf). Applicators [~~shall~~] must also demonstrate the ability to read and understand labeling requirements specific to aerial applications, how to choose, operate and maintain aerial application equipment, knowledge of factors to consider before and during aerial application such as weather conditions, wind velocity, and how to minimize drift, demonstrate competency in performing an aerial pesticide application, and knowledge of restricted use pesticide recordkeeping requirements;

(5) Category 5, aquatic pest control applicators [~~shall~~] must demonstrate practical knowledge of the characteristics of various aquatic use situations, and the potential for adverse effects on non-target plants, fish, birds, beneficial insects and other organisms in the immediate aquatic environment and downstream. Applicators [~~shall~~] must also demonstrate the principles of limited area applications;

(6) Category 6, right-of-way pest control applicators [~~shall~~] must demonstrate practical knowledge of the types of environments (terrestrial and aquatic) traversed by rights-of-way, recognition of target pests, and techniques to minimize non-target exposure, runoff, drift, and excessive foliage destruction.

Right-of-way pest control applicators [~~shall~~] must also demonstrate knowledge of the potential for phytotoxicity due to a wide variety of plants and pests to be controlled, and for persistence beyond the intended period of pest control. Applicators doing right-of-way work [~~shall~~] must demonstrate knowledge of application equipment, containment of the pesticide within the right-of-way area, and drift control methods and procedures;

(7) Category 7, industrial, institutional, and structural pest control applicators [~~shall~~] must demonstrate a practical knowledge of industrial, institutional, and structural pests, including recognizing those pests and signs of the pest's presence, habitats, life cycles, biology, and behavior as it may be relevant to problem identification and control. Applicators [~~shall~~] must demonstrate practical knowledge of types of formulations appropriate for control of industrial, institutional and structural pests, and methods of application that avoid contamination of food, minimize damage to and contamination of areas treated, minimize acute and chronic exposure of people and pets, and minimize environmental impacts of outdoor application. Applicators in this category [~~shall~~] must also demonstrate knowledge of the pesticide labeling of the products typically used in the applicator's operations, including hazards to the environment, emergency procedures, application methods, disposal, and pertinent laws, rules, and regulations. Applicators in subcategories using or supervising the use of fumigant restricted use pesticides must demonstrate practical knowledge of the pest problems and pest control practices associated with performing

fumigation applications to sites other than soil as specified in 40 CFR section 171.103(d)(14) (2023) (40 CFR section 171.103 can be found at https://www.govinfo.gov/content/pkg/CFR-2023-title40-vol26/pdf/CFR-2023-title40-vol26-sec171-103.pdf);

(8) Category 8, public health pest control applicators [~~shall~~] must demonstrate practical knowledge of pests that are important vectors of disease, including recognizing the pests and signs of the pests' presence, habitats, life cycles, biology and behavior as it may be relevant to problem identification and control. The required knowledge also includes how to minimize damage to and contamination of areas treated, acute and chronic exposure of people and pets, and non-target exposures. Applicators [~~shall~~] must demonstrate competency in nonchemical control methods such as sanitation, waste disposal, and drainage. Applicators [~~shall~~] must also demonstrate knowledge of hazards to the environment, emergency procedures, application methods, disposal, and pertinent laws, rules, and regulations;

(9) Category 9, regulatory pest control applicators [~~shall~~] must demonstrate practical knowledge of regulated pests, applicable laws relating to quarantine and other regulation of regulated pests, and the potential impact on the environment of restricted use pesticides used in suppression and eradication programs. Applicators [~~shall~~] must demonstrate knowledge of factors influencing introduction, spread, and population dynamics of regulated pests;

(10) Category 10, demonstration, research, and instructional pest control applicators [~~shall~~] must demonstrate practical knowledge of the potential problems,

pests, and population levels reasonable expected to occur in a demonstration situation and the effects of restricted use pesticides on target and non-target organisms. Applicators [~~shall~~] must also demonstrate competency in each pest control category applicable to the applicator's demonstration[~~. For purposes of demonstrating proper use of a particular pesticide product, out-of-state technical Representatives visiting or working in the State for thirty days or less per year need not be certified in this category if certified in an equivalent category by a jurisdiction authorized by the EPA to issue certifications. The out-of-state technical representative shall present his or her certification credentials to the head for an equivalency determination prior to applying any restricted use pesticides in the State~~]; and

(11) Category 11, chemigation pest control applicators [~~shall~~] must demonstrate practical knowledge of labeling requirements specific to chemigation, how to choose, operate and maintain application equipment, the use of metering devices, strategies and equipment for backflow prevention, and procedures for irrigation system assessment for the distribution consistency of water, or chemicals, or both.

(b) Private applicators

(1) Category 1, general agricultural pest control applicators [~~shall~~] must demonstrate practical knowledge of agricultural commodities grown in the State and the specific pests relevant to these commodities. Applicators in this category [~~shall~~] must demonstrate practical knowledge of how to avoid

contamination of ground and surface waters, demonstrate an understanding of preharvest intervals, restricted entry intervals, and entry restricted periods and areas. The applicator [~~shall~~] must also demonstrate a practical understanding of phytotoxicity, specific pesticide toxicity, and residue potential when pesticides are applied to animal or animal product agricultural commodities, and the relative hazards associated with using pesticides on animals or places in which animals are confined based on formulation, application technique, age of animal, stress, and extent of treatment. General agricultural pest control applicators [~~shall~~] must demonstrate a complete understanding of the Worker Protection Standard, part 170 of title 40, Code of Federal Regulations [~~(2018)~~] (2023) (40 CFR part 170 (2023) can be found at https://www.govinfo.gov/content/pkg/CFR-2023-title40-vol26/pdf/CFR-2023-title40-vol26-part170.pdf);

(2) Category 2, agricultural pest control fumigant applicators [~~shall~~] must demonstrate practical knowledge of pest problems and pest control practices associated with soil and non-soil fumigant applications. Applicators in this category [~~shall~~] must demonstrate knowledge of label and labeling comprehension, safety measures to minimize adverse health effects, characteristics of soil and non-soil fumigants, selecting appropriate application methods and timing, factors that influence fumigant activity, worker protection measures, personal protective equipment and how to use it properly, restricted entry periods, posting requirements, recordkeeping requirements, an understanding of how applicators and

bystanders can be exposed to fumigants. Applicators [~~shall~~] must also demonstrate knowledge of signs and symptoms of exposure to fumigants, first aid procedures, emergency preparedness, the ability to calculate buffer zones, air concentrations of fumigant, and preparation of site-specific fumigant management plans and post-application summaries. Agricultural pest control fumigant applicators must demonstrate practical knowledge of the pest problems and pest control practices associated with performing soil fumigant applications and fumigation applications to sites other than soil as specified in 40 CFR section 171.105(d) and (e) (2023) (40 CFR section 171.105 can be found at https://www.govinfo.gov/content/pkg/CFR-2023-title40-vol26/pdf/CFR-2023-title40-vol26-sec171-105.pdf); and

(3) Category 3, agricultural chemigation pest control applicators [~~shall~~] must demonstrate practical knowledge of labeling requirements specific to chemigation, how to choose, operate and maintain application equipment, the use of metering devices, strategies and equipment for backflow prevention, and procedures for irrigation system assessment for distribution consistency of water, or chemicals, or both. Applicators in this category [~~shall~~] must also demonstrate a complete understanding of the Worker Protection Standard, title 40, part 170, Code of Federal Regulations [~~(2018)~~](2023) (40 CFR part 170 (2023) can be found at https://www.govinfo.gov/content/pkg/CFR-2023-title40-vol26/pdf/CFR-2023-title40-vol26-part170.pdf).

(c) Any certified commercial pesticide applicator or certified private pesticide applicator who fails to cooperate with an inspection conducted by the department

pursuant to section 149A-36, Hawaii Revised Statutes, may be denied issuance or renewal of certification, or may have certification suspended or revoked.

(d) Any certified commercial pesticide applicator or certified private pesticide applicator who misuses a pesticide, is criminally convicted under section 14(b) of FIFRA, or receives a final order imposing a civil penalty under section 14(a) of FIFRA may be denied issuance or renewal of certification, or may have certification suspended or revoked. [Eff 7/13/81; am and comp 12/16/06; am and comp 08/23/19; am and comp] (Auth: HRS §149A-33; 40 CFR §§171.5, 171.103, 171.105) (Imp: HRS §149A-33; 40 CFR §§171.5, 171.103, 171.105)

§4-66-59 Repealed. [R 12/16/06]

§4-66-60 Certification procedures; certificate renewal. (a) The procedures for certifying commercial applicators and renewal of commercial applicator certifications are as follows:

(1) For initial certification of commercial applicators and renewal of commercial applicator certificates, the applicant [~~shall~~] must be at least eighteen years of age. Application shall be made on forms prescribed by the head. Forms are available at the department or on-line doa.hawaii.gov. The completed form shall be submitted to the department, with the appropriate fee. Once the form is received by the department, and the appropriate fee has been paid, the applicant will be scheduled for examination. To gain entrance to the testing facility, an applicant [~~shall~~] must present a valid, government-issued photo identification or other similarly reliable form of identification as proof of identity and age. The applicant for certification as a commercial applicator shall pass a written examination with a score of seventy per cent or better. The core examination shall cover the general standards and procedures specified in section 4-66-57. Category or subcategory examinations shall cover the specific standards specified in section 4-66-58(a).

(2) To be eligible to take category or subcategory examinations, the applicant shall first obtain a passing score on the core examination. If the applicant fails to pass the core examination, that applicant is eligible to be re-examined no sooner than fourteen calendar days after the date of the failed examination. A passing score on the core examination will be valid for six months after the date of examination.

(3) Certification in a category or subcategory under section 4-66-58 requires a passing score of seventy per cent or better on the category or subcategory examination. If the applicant fails to pass any examination, that applicant

is eligible to be re-examined no sooner than fourteen calendar days after the date of the failed examination. A passing score on the category or subcategory examination will not be valid unless the applicant first obtains a passing score on the core examination. A certificate may be issued if the applicant passes the core examination and any other category and subcategory examinations, meets all other requirements for certification, and complies with all other State and federal requirements.

(4) For renewal of commercial applicator certificates, application for renewal shall be made no sooner than ninety days before and no later than thirty days after expiration of certification. In order for a certified applicator's certification to continue without interruption, the certified applicator shall be recertified before the expiration of his or her current certification. An applicant for recertification shall complete one of the following procedures:

(A) Continuing education. A certified applicator may be found eligible for recertification upon successfully completing a continuing education program by accumulating the prescribed number of hours of training approved for each category or subcategory in which the applicator is certified. The minimum number of training hours required for each specific category is listed in the table below. Completion of the training must be verified by documentation approved by the head. The training must be completed prior to the expiration date on the applicator's certificate. Training must be pertinent to the category or subcategory for which the applicant is seeking to renew certification and shall be a continuing education program of the quality, content, and quantity that will ensure

the applicator continues to maintain the level of competency required by sections 4-66-57 and 4-66-58.

Category	Applicator	Hours of Training Required
1(A)	Crop Pest Control	25
1(B)	Animal Pest Control	20
1(C)	Soil and Non-soil Fumigant Pest Control	30*
1(D)	Seed treatment	20
2	Forest Pest Control	30
3	Ornamental and Turf Pest Control	30
4	Aerial Pest Control	25
5	Aquatic Pest Control	25
6	Right-of-Way Pest Control	30
7(A)	Fumigation Pest Control	25*
7(B)	Termite Pest Control	20
7(C)	General Pest Control	30
7(D)	Institutional Pest Control	30
7(E)	Vault Fumigation Pest Control	25*
7(F)	Specialty Categories	20
8	Public Health Pest Control	24
9	Regulatory Pest Control	20
10	Demonstration, Research, & Instructional Pest Control	30
11	Chemigation Pest Control	5*

*For asterisked items, five hours must be in specific subject matter directly related to the category; or

(B) Written examination. Pass a written examination as provided in section 4-66-60(a)(1).

(5) A certificate may be renewed if the applicant has accumulated the required number of credits prior to the expiration date on the applicator's certificate, or passed the written examination, meets all other requirements for certification, and complies with any other State and federal requirements.

(b) The procedures for certifying private applicators and renewal of private applicator certifications are as follows:

(1) For initial certification of private applicators and renewal of private applicator certificates, the applicant [~~shall~~] must be at least eighteen years of age. Application shall be on forms prescribed by the head. Forms are available at the department or on-line at https://hdoa.hawaii.gov. The completed form shall be submitted to the department, with the appropriate fee. Once the form is received by the department, and the appropriate fee has been paid, the applicant will be scheduled for examination. To gain entrance to the testing facility, an applicant [~~shall~~] must present a valid, government-issued photo identification or other similarly reliable form of identification as proof of identity and age. The applicant for certification as a private applicator shall pass a written examination with a score of seventy per cent or better. The examination shall cover the general standards specified in section 4-66-57 and the specific standards specified in section 4-66-58(b).

(2) The applicant shall pass a written examination for private agricultural pest control applicator with a score of seventy per cent or better to be eligible to take agricultural fumigation applicator or agricultural chemigation pest control applicator examinations. A passing score on the private agricultural pest control applicator examination will be valid for six months after the date of examination. If the applicant fails to pass any examination, that applicant is eligible to be re-examined no sooner than fourteen calendar days after the date of the failed examination. If the applicant passes the examination, meets all of the other requirements for certification, and complies with any other State and federal requirements, a certificate may be issued.

(3) For renewal of private applicator certification, application for renewal shall

be made no sooner than ninety days before expiration of certification. In order for a certified applicator's certification to continue without interruption, the certified applicator shall be recertified before the expiration of his or her current certification. An applicant for recertification shall complete one of the following procedures:

(A) Continuing education. A certified applicator may be found eligible for recertification upon successfully completing a continuing education program by accumulating twenty hours of training credits. Applicators certified in agricultural fumigation, or agricultural chemigation, or both, must accumulate five hours of training specific to each applicable category. Completion of training must be verified by documentation approved by the head. The training must be completed prior to the expiration date shown on the applicator's certificate and the continuing education program shall be of the quality, content, and quantity that will ensure the applicator continues to maintain the level of competency required by sections 4-66-57 and 4-66-58; or

(B) Written examination. Pass a written examination as provided in section 4-66-60(b)(1).

(4) Certification of private applicator under special circumstances. An applicant for private applicator certification who is unable to pass a written examination may request that the department provide certain testing accommodations. The head shall review requests for testing accommodation on a case-by-case basis. The applicant may be offered the opportunity for testing under special circumstances if the head finds the accommodation request is reasonable and will not result in public safety being compromised.

All testing accommodations shall cover the general standards specified in section 4-66-57 and the specific standards specified in section 4-66-58(b). A finding by the head that the requested accommodation is unreasonable or that public safety may be compromised by providing the requested accommodation shall be in writing. Restrictions may be placed on a private applicator who successfully passes certification testing under special circumstances as deemed necessary by the head for the protection of the public and environment. The head shall be solely responsible for determining what constitutes successful passage of certification testing under special circumstances. Renewal of certificates issued under this section can be granted only through the procedures described in this paragraph.

Any applicant aggrieved by a determination of the head relative to certification of private applicator under special circumstances may request a hearing as provided in section 149A-34, Hawaii Revised Statutes.

(c) Procedures to obtain approval of certification credits for continuing education training classes are as follows:

(1) A training class sponsor or provider shall submit a written application to the head, requesting approval of certification credits for each training class no less than thirty calendar days prior to the scheduled date of each class. A fee for expedited approval of certification credits may be assessed for approval requests received less than thirty calendar days prior to the scheduled date of each class. Appropriate subject matter for training classes is set forth in sections 4-66-57 and 4-66-58.

(2) The written application shall include the name and contact information of the sponsor or provider, instructor credentials, a substantive class description or outline of

sufficient detail so evaluation of the course content can be made, a sample of any materials to be provided to the participants, who may attend the class, if any fee will be charged, class evaluation method, and the dates, times, and location of the class. The head shall approve or deny credits within ten business days following receipt of the written application for certification credit.

(3) Approval of training class credit shall be valid for two years, after which time a new written application requesting approval of certification credit shall be submitted.

(4) The number of credits issued for a training session shall be based on an evaluation of course content, instructor qualifications, and the duration of the course by the head. The number of credits approved by the head may be adjusted if department monitoring of the course demonstrates that content and duration either exceeds or fails to meet course description as approved.

(5) Credits shall be awarded to those applicators whose attendance at the session is documented. The training class sponsor or provider shall maintain a record of attendance at the approved sessions.

(6) The record shall show the name, certification number, arrival and departure time for each attendee desiring credits toward certification renewal. The training class sponsor or provider shall forward the record of attendance to the head within thirty calendar days following the course. Failure to timely forward the training class attendance record to the head may result in denial of future training class or certification credit.

(7) Requests to obtain training credit towards certification renewal from sources other than in-person training class attendance may be approved on a case-by-case basis at the sole discretion of the head.

(d) All certifications and renewals issued under this section shall be valid for five years following date

of issuance, unless revoked. The date of issuance is the date the examination was passed. Application for renewal shall be on forms prescribed by the head. Forms are available at the department or on-line at https://hdoa.hawaii.gov.

(e) Changes to Certificates and Replacement Certificates. A certification is valid only for the name, category, address, and employer, if applicable, shown on the certificate or recorded on the application for certification or certification renewal. Any changes to the certificate must be reported to the head by the certificate holder within thirty calendar days of any change. Forms to update the certificate holder's information shall be prescribed by the head. Forms are available at the department or on-line at https://hdoa.hawaii.gov. Failure to notify the head within thirty days of any change in name, applicator category, address, or employer may result in certification revocation, or may subject the certificate holder to additional penalties as provided by law. Applicators may request a replacement certificate to update information, to replace lost certificates, and to consolidate certifications on different certificates. The replacement certificate with appropriate changes shall be issued after payment of appropriate fees. A replacement certificate will expire on the same date as the original certification. If the certificate holder requests consolidation of certificates onto a single certificate, then those certifications will expire on the earliest certificate's expiration date.

(f) Should the certification of any commercial applicator or private applicator be suspended or revoked, the certified applicator shall participate in a remedial education program prior to applying for reinstatement of certification. [Eff 7/13/81; am and comp 12/16/06; am and comp 08/23/19; am and comp] (Auth: HRS §149A-33; 40 CFR §§171.105, 171.107) (Imp: HRS §149A-33; 40 CFR §§171.105, 171.107)

§4-66-61 Conditions on the use of restricted use pesticides by non-certified applicator. A person may apply a restricted use pesticide, provided that:

(1) The person is under the direct supervision of

an applicator certified in each category applicable to the restricted use pesticide being used.

(2) The certified applicator [~~shall~~] must give the non-certified applicator use-specific written instructions in a manner the non-certified applicator can understand. The use-specific instructions [~~shall~~] must include labeling directions, precautions, and requirements applicable to the site, method of application, and pesticide used. The use-specific instructions must also include how the characteristics of the use site (e.g., surface and ground water, endangered species, local population and the conditions of application (e.g., equipment, method of application, formulation) might increase or decrease the risk of adverse effects. The certified applicator must ensure that the non-certified applicator has been instructed within the last twelve months in the safe operation of any equipment the non-certified applicator will use for mixing, loading, transferring, or applying pesticides. The certified applicator [~~shall~~] must ensure that before each day of use equipment used for mixing, loading, transferring, or applying pesticides is in proper operating condition as intended by the manufacturer and can [~~reasonably~~] be used without risk of reasonably foreseeable adverse effects to [~~by~~] the non-certified applicator, other persons, or the environment. The certified applicator [~~shall~~] must ensure that the non-certified applicator has access to the applicable product labeling at all times during use, and if the labeling requires that personal protective equipment be worn, the certified applicator [~~shall~~] must ensure that the non-certified applicator has the appropriate clean personal protective equipment available and the equipment is used correctly for its intended purpose. The certified applicator [~~shall~~] must ensure that

the means to immediately communicate with the certified applicator is available to each non-certified applicator. The certified applicator must be physically present at the site of the use being supervised when required by the product labeling.

(3) The certified applicator shall be responsible for all violations of chapter 149A, Hawaii Revised Statutes and these rules.

(4) The non-certified applicator [~~shall~~] must [~~meet the minimum age requirement to use or apply restricted use pesticides under the supervision of a certified applicator~~] be at least eighteen years of age. The non-certified applicator [~~shall~~] must also meet any other non-certified applicator [~~qualification~~] requirements specified in [~~title 40, part 171, Code of Federal Regulations (2018)~~] 40 CFR section 171.201 (2023) (40 CFR section 171.201 (2023) can be found at https://www.govinfo.gov/content/pkg/CFR-2023-title40-vol26/pdf/CFR-2023-title40-vol26-sec171-201.pdf).

(5) The label of the pesticide being used must not prohibit its use by a non-certified applicator under the direct supervision of a certified applicator.

(6) Failure to abide by chapter 149A, Hawaii Revised Statutes and these rules may result in certification revocation, or subject the certification holder to additional penalties as provided by law. [Eff 7/13/81; am and comp 12/16/06; am and comp 8/23/19; am and comp] (Auth: HRS §149A-33; 40 CFR §171.201) (Imp: HRS §149A-33; 40 CFR §171.201)

§4-66-62 Certified pesticide applicator recordkeeping. (a) Certified pesticide applicators [~~shall~~] must keep records of all restricted use pesticide applications at the applicator's principal place of

business.

(b) These records must be kept for a period of two years and [~~shall~~] must be made available for inspection and copying by the head during reasonable working hours.

(c) Recordkeeping information [~~shall~~] must include:

(1) Brand or common name of pesticide product applied;

(2) EPA registration number;

(3) Type of formulation;

(4) Per cent active ingredient;

(5) Scientific or common name of target pest;

(6) Dilution rate;

(7) Total amount of pesticide used;

(8) Total area covered;

(9) Time and date of application;

(10) Address or location of treated site;

(11) Name of certified applicator and his or her certification number;

(12) Crop, commodity, stored product or other site;

(13) Restricted entry interval and whether posting and oral notification are required; [~~and~~]

(14) Records required under 40 CFR section 171.201(e) (2023); and

(15) Any other information the head deems necessary.

40 CFR section 171.201 (2023) can be found at https://www.govinfo.gov/content/pkg/CFR-2023-title40-vol26/pdf/CFR-2023-title40-vol26-sec171-201.pdf

(d) Commercial applicators that apply any pesticide in agricultural operations shall furnish a written record containing the following information to the agricultural employer before any pesticide is applied:

(1) The specific location and description of the treated area;

(2) Time and date of application;

(3) Product name, EPA registration number, and active ingredient(s);

(4) Restricted entry interval;

(5) Whether posting and oral notification are required; and

(6) Any other product-specific requirements on the product labeling concerning protection of

workers or other persons during or after application.

(e) Commercial applicators [~~shall~~] must retain a copy of the written record furnished to the agricultural employer in compliance with subsection (d). These records must be kept for a period of two years and [~~shall~~] must be made available for inspection and copying by the head during reasonable working hours.

(f) Beginning January 1, 2019, every certified restricted use pesticide applicator shall submit to the department, for departmental use, an annual report of all use of restricted use pesticides. The report shall be submitted to the department no later than thirty days following the end of each calendar year on a form prescribed by the head. The report shall include:

(1) Name of certified applicator and his or her certification number;

(2) EPA registration number of each restricted use pesticide used;

(3) Commercial product name of each restricted use pesticide used;

(4) Active ingredient(s) of each restricted use pesticide used;

(5) The total quantities for each restricted use pesticide used;

(6) The total area treated for each restricted use pesticide used;

(7) The date on which the restricted use pesticide application occurred; and

(8) A general description of the geographic location, including, at a minimum the tax map key number, at which the restricted use pesticides were used.

(g) The department shall produce a summary from the information collected under subsection (f), for public disclosure, by county that includes:

(1) The total quantities used, by EPA registration number, commercial product names, and active ingredients for each restricted use pesticide used; and

(2) The total amount of area in the county in which the restricted use application occurred.

(h) Certified pesticide applicators [~~shall~~] must

create or verify the existence of records documenting that each non-certified applicator who mixes, loads, transfers, or applies restricted use pesticides has the qualifications required under section 4-66-61(4). The records must include the information required under 40 CFR section 171.201(e) (2022) (40 CFR section 171.201 can be found at https://www.govinfo.gov/content/pkg/CFR-2023-title40-vol26/pdf/CFR-2023-title40-vol26-sec171-201.pdf).

(i) [~~Failure~~] Falsification of any records required to be maintained by certified pesticide applicators or any other failure to comply with the recordkeeping requirements may result in certification revocation and subject the certified pesticide applicator to additional penalties as provided by law. [Eff 7/13/81; am and comp 12/16/06; am and comp 08/23/19; am and comp] (Auth: HRS §§149A-33, 149A-26; 40 CFR §171.201) (Imp: HRS §§149A-33, 149A-26, 149A-27; 7 CFR §110, 40 CFR §171.201)

§4-66-63 Repealed. [R 12/16/06]

§4-66-63.1 Annual Use Permit. (a) A pesticide may be designated by the board as requiring an annual use permit for purchase if the department, after an evaluation of pesticide uses in accordance with section 4-66-32.1, determines that existing controls over the pesticide may be inadequate to prevent potential unreasonable adverse effects on humans or the environment and that tracking and controlling use is appropriate.

(b) An annual use permit is required for the purchase and use of picloram. Additional pesticides may be designated as requiring an annual use permit as provided in section 4-66-63.1(a). The board, upon designation of any additional pesticide product as requiring an annual use permit, shall maintain a list of such pesticide products at the department Office of the Chairperson. The list of pesticide products that require an annual use permit shall also be posted on the department's website.

(c) Application for an annual use permit shall be on forms prescribed by the head, and shall include the applicant's name and address, name of applicator, acreage

amount to be treated, location, and other information as the head may require. Forms are available at the department or on-line at https://hdoa.hawaii.gov. An application and permit may be amended during the permit period to add acreage, other locations, additional quantity of pesticide or other changes, as appropriate.

(d) In determining whether to issue an annual use permit, the potential use described in an application will be reviewed for compliance with the pesticide's label directions. The head shall determine the quantity of pesticide to be authorized for each permit and other permit conditions necessary to prevent unreasonable adverse effects to humans or the environment.

(e) Failure to comply with the terms or conditions of any annual use permit may result in permit revocation and subject the permittee to additional penalties as provided by law. [Eff and comp 12/16/06; am and comp 8/23/19; comp] (Auth: HRS §149A-19) (Imp: HRS §149A-32.5)

§4-66-64 Conditions and limitations on aerial application of restricted use pesticides. (a) No person shall apply a restricted use pesticide by manned or unmanned aircraft except by special permit issued by the head and under the following conditions and limitations:

(1) Application for a special permit to apply restricted use pesticides by aerial application shall be made on forms prescribed by the head. Forms are available at the department or on-line at https://hdoa.hawaii.gov;

(2) The special permit application shall include date, name, address and certification number of the applicator, purpose of aerial treatment, restricted use pesticide formulation, dosage, method of aerial treatment, the proposed number of treatments to be made, and a sketch or map that indicates general wind directions, proposed site or sites to be treated, homes, roadways, waterways, and crop plantings in the vicinity;

(3) The head may refuse to issue a special permit for aerial application of restricted use pesticides if it is determined that the

proposed aerial treatment may cause unreasonable adverse effects to humans or the environment or will create a hazard. All refusals shall be in writing and the reasons for refusal stated;

(4) A special permit for aerial application of restricted use pesticides shall specify the time period for which the special permit is valid. The head may specify and limit a special permit for aerial application of restricted use pesticides to cover a single, multiple, or continual treatments when conditions are not expected to change or vary during subsequent treatments that are conducted in the same designated area or areas;

(5) Any special permit for aerial application of restricted use pesticides may be canceled or revoked by the head before its stated expiration date for reasonable cause. Such cancellation or revocation shall be in writing and reasons for cancellation or revocation stated;

(6) The head shall be notified no less than twenty-four hours in advance of the aerial treatment unless another time period is specified as a permit condition; and

(7) The issuance of a special permit for aerial application of a restricted use pesticide shall not relieve the permittee from the penalty provisions of the Act or any liability for any damage or contamination of crops or plants, animals, humans, and the environment resulting from the aerial treatment or contamination of crops or plants, animals, humans, and the environment resulting from the aerial application of restricted use pesticides.

(b) The following provisions shall apply to the operating conditions of manned or unmanned aircraft and equipment used for aerial application of restricted use pesticides:

(1) Spray equipment on manned or unmanned aircraft shall be leakproof. Spray nozzles shall be

equipped with a device to prevent dribble when spray is turned off;

(2) All aerial pesticide dispersal equipment shall be inspected and maintained in good working order according to the manufacturer's instructions; and

(3) Manned or unmanned aircraft used to apply restricted use pesticides, and manned or unmanned aircraft operators, shall comply with all Federal Aviation Administration Regulations.

(c) The head may add further permit conditions as deemed necessary for the protection of the public, or environment, or both.

(d) Failure to comply with the terms or conditions of any special permit for aerial application of restricted use pesticides may subject the permittee, or person supervising the aerial application, or both, to additional penalties as provided by law. [Eff 7/13/81; am and comp 12/16/06; am and comp 8/23/19; comp] (Auth: HRS §149A-33) (Imp: HRS §149A-33)

§4-66-64.1 Conditions and limitations on pesticide application by means other than aerial treatment. (a) No person shall apply a restricted use or nonrestricted use pesticide except under the following conditions and limitations:

(1) All pesticide applications shall be made in accordance with the product label;

(2) Spray equipment nozzles shall be equipped with a device to prevent leakage when spray is turned off;

(3) Self-propelled power rigs used for inter-row or broad-cast applications shall be equipped with a pressure control device and a pressure gauge;

(4) Reasonable methods necessary to minimize the risk of off-target pesticide product movement shall be utilized; and

(5) Power rigs, mist blowers, and other equipment used to disperse any pesticide product shall be inspected and maintained in good working

order according to the manufacturer's instructions. [Eff and comp 8/23/19; comp] (Auth: HRS §149A-33) (Imp: HRS §149A-33)

§4-66-64.2 Conditions and limitations on restricted use pesticide application within buffer zones. (a) Beginning January 1, 2019, no person shall apply a restricted use pesticide on or within one hundred feet of a school property during normal school hours.

(b) This section shall not apply to whole structure fumigation.

(c) If this section is determined to conflict with any pesticide application information listed on the pesticide label, the more restrictive provision shall apply.

(d) Buffer zones may be determined by tax map key number, or if tax map key number is not an appropriate means of establishing the buffer zone, by property boundaries such as fence lines, landscaping, or other method that is reasonably capable of determining the school's property.

(e) School locations may be identified by readily available public records.

(f) The certified applicator shall be responsible for all violations of chapter 149A, Hawaii Revised Statutes and this rule.

As used in this section:

"Buffer zone" means an area in which no restricted use pesticides may be applied.

"Normal school hours" means Monday through Friday from 7:00 a.m. until 4:00 p.m., excluding days when classes are not in session.

"School" means any public or private preschool, kindergarten, elementary, intermediate, middle, secondary, or high school. [Eff and comp 8/23/19; comp] (Auth: HRS §§149A-33, 149A-28) (Imp: HRS §149A-28)

§4-66-65 Repealed. [R 12/16/06]

§4-66-66 Fees. (a) The head shall set forth and collect fees for licensing of restricted use and nonrestricted use pesticides; permitting of restricted use pesticide dealers and dealer representatives; nonchemical pest control devices submitted for approval; certification of applicators; and, document copying as follows:

(1) A fee of $930 shall be assessed for each product licensed in the State for each three-year licensing period. A licensee who desires to continue to have the license in effect shall submit an application for renewal and $930 for each pesticide product license to be renewed. A one-time fee of $330 shall be assessed for each nonchemical pest control device submitted for approval.

(2) A fee of $500 shall be assessed annually for each principal sales outlet permit and a fee of $200 for each branch sales outlet of restricted use pesticide dealers.

(3) A fee of $50 shall be assessed for each examination taken for certification or renewal of certification.

(4) A fee of $50 will be assessed for the issuance of a replacement applicator certificate or replacement of dealer representative permit.

(5) A fee of $100 shall be assessed for the issuance of an initial pesticide applicator certificate or initial restricted use pesticide dealer representative permit, which shall be valid for five years.

(6) A fee of $100 shall be assessed for renewal of a pesticide applicator certificate or renewal of restricted use pesticide dealer representative permit, which shall be valid for five years.

(7) A fee of $50 shall be assessed for each examination taken for pesticide dealer representative permit.

(8) A fee of $.25 per page shall be assessed to copy documents in either paper or electronic

format.

(9) A fee of up to $50 per hour may be assessed for educational services, testing, or training provided by the department staff, or independent contractors hired by the department to provide such services.

(10) A fee of up to $100 may be assessed for expedited approval of sponsor or provider offered continuing education training classes.

(b) Fees shall be waived, upon approval of the head, for personnel of state agencies, the University of Hawaii, and other government agencies, who apply restricted use pesticides for quarantine purposes, public health and forestry pest control, utility and roadway maintenance, research, and demonstration. The head may waive or reduce fees based upon demonstrated financial hardship. [Eff 7/13/81; am and comp 12/16/06; am and comp 8/23/19; comp] (Auth: HRS §149A-33) (Imp: HRS §149A-33)

§4-66-66.1 Enforcement action and penalty assessment schedule; collection of penalties. (a) In proposing enforcement actions, the department may use the "Appendix A, enforcement action and penalty assessment schedule" dated_____, which is appended at the end of this chapter and made a part of this section by reference. In selecting an appropriate penalty, the department shall consider the factors in section 149A-41, Hawaii Revised Statutes.

(b) Notwithstanding subsection (a), the department is not limited to the sanctions shown in the enforcement action and penalty assessment schedule. In its

discretion, the department may deny, cancel, suspend, or revoke a permit, license or certificate, as provided in sections 149A-14, 149A-18 and 149A-34, Hawaii Revised Statutes, separately or in conjunction with the enforcement action. The department may assess an appropriate penalty as provided in the enforcement action and penalty assessment schedule and consistent with sections 141-7 and 149A-41, Hawaii Revised Statutes.

(c) For private applicators and other persons referred to in section 149A-41(b)(2), Hawaii Revised Statutes, the penalty assessment shall apply after the written warning or citation requirement of section 149A-41(b)(2) has been satisfied.

(d) In case of inability to collect the administrative penalty or failure to pay all or any portion of the administrative penalty, the head may refer the matter to the department of the attorney general, who shall recover the amount by action in the appropriate court. [Eff 7/13/81; comp 12/16/06; am and comp 8/23/19; am and comp] (Auth: HRS §§149A-20, 149A-33, 149A-41) (Imp: HRS §§149A-20, 149A-41)

§4-66-67 Severability. If any section of this chapter is declared unconstitutional, or the applicability thereof to any person or circumstance is held invalid, the constitutionality of the remainder of this chapter and applicability thereof to other persons and circumstances shall not be affected. [Eff 7/13/81; comp 12/16/06; comp 8/23/19; comp] (Auth: HRS §149A-52) (Imp: HRS §149A-52)

APPENDIX A

ENFORCEMENT ACTION AND PENALTY ASSESSMENT SCHEDULE

Section 4-66-66.1 of the
Hawaii Administrative Rules

Adopted: _____, ~~2019~~2025

Any person who violates the Act as set forth in Chapter 149A, Hawaii Revised Statutes, or any rule promulgated thereunder, shall be subject to the following enforcement action and penalty:

(a) Warning Notice - First Violation

Any person who violates Chapter 149A, Hawaii Revised Statutes, or any rule issued thereunder, may, at the department's discretion, be issued a written warning notice citing the specific violation and any necessary corrective action to be taken.

Any person who subsequently violates Chapter 149A, Hawaii Revised Statutes, after receipt of a written Warning Notice, or following issuance of a citation for a first violation, shall be deemed a subsequent occurrence for which increased penalties may apply.

(b) Administrative Penalties

(1) Upon finding of any violation of Chapter 149A, Hawaii Revised Statutes, or rule issued thereunder, by a person acting in his or her capacity as:

(A) A licensee or registrant of any pesticide product pursuant to Chapter 149A, Hawaii Revised Statutes;

(B) A certified commercial pesticide applicator;

(C) A licensee or permittee authorized to sell or distribute restricted use pesticides; or

(D) A wholesaler, retailer, or other distributor of any pesticide product,

that person may be assessed an administrative penalty of not more than [~~$5,000.00~~] $10,000.00 per offense.

Generally, the penalty to be assessed upon finding of violation by persons set forth in paragraph (b)(1)(A)-(D) above, may include, but is not limited to:

1st Occurrence:
Monetary penalty: Up to [~~$5,000.00~~] $10,000.00;
Certificate suspension: Up to 6 months;
2nd Occurrence:
Monetary penalty: Up to [~~$5,000.00~~] $10,000.00;
Certificate suspension: Up to 12 months;
3rd or more Occurrences:
Monetary penalty [~~$5,000.00~~] $10,000.00;
Certificate suspension: 12 months.

(2) Upon finding of any subsequent violation of any provision of Chapter 149A, Hawaii Revised Statutes, or any rule issued thereunder, by any person who is a certified private pesticide applicator, or any other person not included in paragraph (b)(1)(A)-(D) above, where the subsequent violation is related to the use of pesticides while on property owned or rented by that person, or the person's employer, may be assessed an administrative penalty of not more than [~~$1,000.00~~] $5,000.00 per offense.

Generally, the penalty to be assessed upon finding of violation by persons set forth in paragraph (b)(2) above, may include, but is not limited to:

1st Subsequent Occurrence:
Monetary penalty: Up to [~~$1,000.00~~] $5,000.00;
Certificate suspension: Up to 6 months;
2nd Subsequent Occurrence:
Monetary penalty: Up to [~~$1,000.00~~] $5,000.00;
Certificate suspension: Up to 12 months;
3rd or more Subsequent Occurrences:
Monetary penalty: [~~$1,000.00~~] $5,000.00;
Certificate suspension: 18 months.

(3) Upon finding of any subsequent violation of any provision of Chapter 149A, Hawaii Revised Statutes, or any rule issued thereunder, by any person who is a certified private pesticide applicator, or any other person not included in paragraph (b)(1)(A)-(D) above, where the subsequent violation is related to licensing, transport, sale, distribution, or application of a

pesticide for commercial purposes may be assessed an administrative penalty of not more than [~~$5,000.00~~] $10,000.00 per offense.

Generally, the penalty to be assessed upon finding of violation by persons set forth in paragraph (b)(3) above, may include, but is not limited to:

1st Subsequent Occurrence:
Monetary penalty: Up to [~~$5,000.00~~] $10,000.00;
Certificate suspension: Up to 12 months;
2nd Subsequent Occurrence:
Monetary penalty: Up to [~~$5,000.00~~] $10,000.00;
Certificate suspension: Up to 24 months;
3rd or more Subsequent Occurrences:
Monetary penalty: [~~$5,000.00~~] $10,000.00;
Certificate suspension: 36 months.

(4) Upon finding of any violation of any provision of Chapter 149A, Hawaii Revised Statutes, or any rule issued thereunder, by persons other than those set forth in paragraphs (b)(1)(A)-(D), (b)(2), and (b)(3) above, may be assessed an administrative penalty, including but not limited to:

Any occurrence:
Monetary penalty: Up to $500.00;
Certificate suspension: Up to 12 months.

(5) Factors to be considered by the department in determining the appropriate amount of an administrative penalty shall include the:

(A) Seriousness of the offense;
(B) Quantity of offenses;
(C) Violation history;
(D) Appropriateness of the penalty to the size of the business;
(E) Effect an administrative penalty may have on the business's ability to continue operation;
(F) Adverse effects to humans or the environment resulting from offense;
(G) Corrective action taken and timeliness of corrective action; and
(H) Administrative penalties assessed against similarly situated persons.

(6) In addition to monetary penalties, administrative enforcement actions may include:

(A) Certificate suspension or revocation for not more than thirty-six months;

(B) License suspension or revocation for not more than twelve months;

(C) Permit suspension or revocation for not more than twelve months; and

(7) Seizure, stop-sale, or removal from sale of any pesticide or nonchemical pest control device that is distributed, sold, offered for sale, transported, or delivered for transportation in violation of Chapter 149A, Hawaii Revised Statutes.

c. Criminal Penalties

(1) Any person who is found to have knowingly violated any provision of Chapter 149A, Hawaii Revised Statutes, or any rule issued thereunder, who:

(A) Has registered or licensed any pesticide product pursuant to Chapter 149A, Hawaii Revised Statutes;

(B) Is a certified commercial pesticide applicator;

(C) Is licensed or permitted to sell or distribute restricted use pesticides; or

(D) Is a wholesaler, retailer, or other distributor of any pesticide product,

shall be guilty of a misdemeanor and upon conviction shall be fined not more than [~~$25,000.00~~] $35,000.00, or imprisoned for not more than one year, or both.

The term "knowingly" shall have the same meaning as defined in section 702-206(2)(a)-(c), Hawaii Revised Statutes (2014).

(2) Any person who is found to have knowingly violated any provision of Chapter 149A, Hawaii Revised Statutes, or any rule issued thereunder, who:

(A) Is a certified private pesticide applicator; or,

(B) Other person not included in paragraph (1) above,

shall be guilty of a misdemeanor and upon conviction shall be fined not more than [~~$1,000.00~~] $5,000.00, or imprisoned for not more than one year, or both.

The term "knowingly" shall have the same meaning as defined in section 702-206(2)(a)-(c), Hawaii Revised Statutes (2014).

(3) Any person, who, with intent to defraud, uses or reveals information relative to formulas of products acquired under the authority of section 3, Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), as amended, shall be fined not more than $10,000.00, or imprisoned for not more than three years, or both.

The term "intent to defraud" shall have the same meaning as defined in section 708-800, Hawaii Revised Statutes (2014).

(4) Liabilities. When construing and enforcing the provisions of Chapter 149A, Hawaii Revised Statutes, and rules promulgated thereunder, the act, omission, or failure of any officer, agent, or other person acting for or employed by any person, shall in every case be also deemed to be the act, omission, or failure of such person as well as that of the person employed.

(5) General penalty. Any person violating any of the provisions of chapter 149A, Hawaii Revised Statutes for which violation a penalty is not otherwise provided, or violating any rule of the department of agriculture, shall be fined not more than $500.00 per offense.

[Eff and comp]
(Auth: HRS §§141-7, 149A-20, 149A-33, 149A-41)
(Imp: HRS §§141-7, 149A-20, 149A-33, 149A-41)

DRAFT Minutes of the Advisory Committee on Pesticides

I. Call to order

Upon determining that there was a quorum of members, the meeting of the Advisory Committee on Pesticides was called to order on October 2, 2024, at 10:08 am by Hawaii Department of Agriculture (HDOA) Deputy to the Chairperson, Dexter Kishida, at the HDOA Boardroom located at 1428 S. King Street, Honolulu, Hawaii.

Members Present:

Dexter Kishida, Deputy to the Chairperson, HDOA for Chairperson, Sharon Hurd
Melvin Tokuda, Department of Health Representative
Troy Sakihara, Department of Land and Natural Resources Representative
Dr. Qing Li, University of Hawaii, College of Tropical Agriculture and Human Resources Representative
Nicholas Testa, Structural Pest Control Industry Representative
Judson Laird, Diversified Ag Industry Representative
Janet Ashman, Hawaii Farm Bureau Federation Representative
Steve Russo, Pesticide Industry Representative
Matt Lyum, Landscape Professional Representative

Members Absent:

Coffee Industry Representative
Environmental Organization Representative
Citizen's Group Representative

Others Present:

Jennifer Waihee-Polk, Deputy Attorney General for HDOA
Greg Takeshima, Acting Plant Industry Administrator, HDOA
Scott Nishimoto, Acting Pesticides Branch Manager, HDOA
Esther Riechert, Environmental Health Specialist/Registration, HDOA/Pesticides Branch
Adam Yamamoto, Environmental Health Specialist/Education, HDOA/Pesticides Branch
Klayton Kubo, Member of the Public

II. Approval of minutes from last meeting

Minutes of the Advisory Committee on Pesticides convened on October 11, 2019. After reviewing the minutes for the meeting held on October 11, 2019, a motion was made by committee member Dexter Kishida to accept the minutes as submitted. The motion did not pass, no second. Minutes remain as draft.

III. Comments from the General Public on Agenda Items

Member of the public, Klayton Kubo, requested to move the agenda item number 6 up. Committee member Janet Ashman made the motion, seconded by committee member, Dexter Kishida.

IV. Requests for Review by the Advisory Committee on Pesticides

1. Item 5 submittal was retracted and removed from the agenda.

2. Request to adopt amendments under Hawaii Administrative Rules, Chapter 4-66, pursuant to section 91-3(a), Hawaii Revised Statutes, to address increased civil penalties pursuant to Act 220, SLH 2023, and conformance to the approved Hawaii State Certification Plan.

   a. Proposed Amendments to Section 4-66, Hawaii Administrative Rules (HAR), provisions in the Code of Federal Regulations (1) be amended and updated to the current revised versions and (2) be updated in Appendices B and C; (3) adoption of updated appendices A and B, and a new appendix C.

   Acting Plant Industry Administrator, Greg Takeshima gave a background. In 2018, the U.S. EPA initiated an update of State certification plans for certified applicators. All State lead agencies which include the Department and is implemented by the Pesticides branch who is designated primacy over the Federal insecticides, Fungicide, and Rodenticide Act were required to receive approval of their state certification plans via U.S. EPA. The Pesticides branch drafted and received approval of the Hawaii State Certification Plan by the U.S. EPA in the 4th quarter of 2022. Changes and updates to HAR, Chapter 4-66 are required to ensure Hawaii's pesticide laws match Federal law. The changes, amendments, additions, and deletions are reflected in the Ramseyer attachment, and are summarized in the submission to the committee. Act 220, SLH 2023 provided updates to several penalties related to pesticide law violations. Those changes are reflected in the Appendix A.

   Klayton Kubo testified that he's been involved in this matter for about 24 years now and has been trying to get some meaningful regulations on repeat offenders of pesticides violations for the last 5 years. He is hopeful that the Governor will sign it into law.

   No other testimony from the public.

   Committee member Steve Russo is not in favor of raising fines. He is concerned that raising penalties with a fine of $10,000 per violation on small businesses for a single occurrence could be crippling and small businesses would be impacted by this and put out of business. Scott Nishimoto, Acting Pesticides Branch Manager, HDOA clarified that these would be the maximum penalty amounts, and not initial penalty amounts.

   After discussion to ensure clarity on penalties, raising the amount of fines, and how monies are being used on pesticide violations, the motion was made to vote and failed. Four (4) voted yes, three (3) voted no, one (1) objected, and one (1) abstained.

3. Proposed amendment to the list of state restricted use pesticides to include new active ingredient, Flupyradifurone.

   Pesticides Branch Environmental Health Specialist employee, Esther Riechert, explained to the committee why flupyradifurone is proposed to be added to the list of State Restricted Use Pesticides. Flupyradifurone is a systemic insecticide that is federally registered for use on a variety of crops such as brassica, cucurbit, coffee, fruiting, leafy, bulb, tuberous and

corn, citrus, pome and stone fruit trees, tree nuts, eggplants, peppers, taro, tomato, bushberries, and ornamentals. In 2015 Bayer CropScience submitted a product that contained a new active ingredient. At the time, flupyradifurone was a new active ingredient and subject to a full groundwater review which was conducted by the University of Hawaii. The results of the review and other environmental fate data indicated that this chemical would potentially leach into groundwater. Despite branch reservations, two (2) were licensed in 2015 as general use products under the condition that no other products containing the active ingredient flupyradifurone will be licensed until an in-field study can be completed. A proposal for the infield groundwater study was submitted in 2017 by UH-WRRC totaling $403,199.00, but due to lack of funding, the study was never conducted.

Committee member Melvin Tokuda made the motion, seconded by committee member, Steve Russo. A motion was made to recommend flupyradifurone to become a restricted use product pending completion of groundwater study. If the study does not support the data of it being a ground water leacher, then the restricted use status will be withdrawn. The motion was made to vote and passed. Five (5) voted yes and four (4) voted no.

4. Proposed amendment to list of state restricted use pesticides to include new active ingredient, Quinclorac.

Pesticides Branch Environmental Health Specialist employee, Esther Riechert, explained to the committee why quinclorac is proposed to be added to the list of State Restricted Use Pesticides. Quinclorac is a systemic herbicide that is federally registered for use on ornamental turf, conservation land, pastures, rice, sorghum, bushberries, institutional premises, rights of ways, and airport. Sometime in 1998-1999, quinclorac was introduced to the state. The initial groundwater review and full groundwater review was conducted, and the results of the review and other environmental fate data indicated that this chemical would potentially leach into groundwater and the Branch would designate the active ingredient as a restricted use in Hawaii. Since then, various registrants submitted product license applications, but they were all withdrawn once they were informed that this active ingredient will be requested to be put on the list of restricted use pesticides. Currently, the Branch does not have any products with this active ingredient in the market.

Committee member Melvin Tokuda approved the motion, seconded by committee member, Judson Laird. A motion was made to vote and passed. Eight (8) voted yes and one (1) abstained.

5. Proposed amendment to list of state restricted use pesticides to include new active ingredient, Thiamethoxam.

Pesticides Branch Environmental Health Specialist employee, Esther Riechert, explained to the committee why thiamethoxam is proposed to be added to the list of State Restricted Use Pesticides. Thiamethoxam is a neonicotinoid insecticide that is federally registered for use on brassica, cucurbits, ginger, bushberries, citrus, peppers, tomatoes, watermelon, nuts, soybeans, stone fruits, tuberous vegetables, corn, ornamentals, turf, structures, and more. It was introduced or requested to be licensed in the State back in 2012. The full groundwater review was finished in 2013 and it suggested it was a potential leacher. There are currently several active products in the State. Mainly for indoor use or seed treatment.

There were a couple of other products for outdoor use as well. They were registered under the assumption that staff on the branch did not know that this product was a potential leacher at the time. In 2022, a letter or email was sent out to all of the registrants with active products, stating that the Branch would request to add this active ingredient to the list of restricted use products. Registrants either responded, did not respond, or withdrew their application.

Committee member Melvin Tokuda made the motion, seconded by committee member, Steve Russo. The motion was moved to vote and failed. Three (3) voted yes, two (2) voted no, and three (3) abstained.

6. Proposed amendment to list of state restricted use pesticides to include new active ingredient, Penflufen.

   Pesticides Branch Environmental Health Specialist employee, Esther Riechert, explained to the committee why penflufen is proposed to be added to the list of State Restricted Use Pesticides. Penflufen is a systemic fungicide that is federally registered for use on artichoke, chayote, cassava, ginger, sweet potato, and yams. In 2012, penflufen was introduced in the State. A full groundwater review was completed in 2013 and it concluded that the active ingredient might be a potential groundwater leacher. In 2014, the product was registered because at the time, the only uses were for seed treatment. Seed treatment has a low possible impact for groundwater usage. Currently, there are three (3) registered products in the State and six (6) Federally. It is currently in the market for seed treatment.

   Committee member Melvin Tokuda made the motion, seconded by committee member, Judson Laird. The motion was made to vote and passed. Six (6) voted yes and two (2) voted no.

V. Old business

No old business was presented or discussed.

VI. New business

No new business was presented or discussed.

VII. Adjournment

A motion for adjournment was made by committee member Dexter Kishida and Seconded by committee member Steve Russo. The meeting was adjourned at 12:35 pm.

JOSH GREEN, M.D.
Governor

SYLVIA LUKE
Lt. Governor

SHARON HURD
Chairperson, Board of Agriculture

DEAN M. MATSUKAWA
Deputy to the Chairperson

State of Hawai'i
DEPARTMENT OF AGRICULTURE
KA 'OIHANA MAHI'AI
1428 South King Street
Honolulu, Hawai'i 96814-2512
Phone: (808) 973-9600 FAX: (808) 973-9613

January 28, 2025

Board of Agriculture
Honolulu, Hawaii

SUBJECT: Request to: (1) Allow the Importation of Four (4) African Black-Footed Penguins, *Spheniscus demersus,* an Animal on the List of Restricted Animals (Part B), by Permit, for Exhibition, by Hyatt Regency Maui Resort and Spa; and (2) Update Permit Conditions for the Importation and Possession of Four (4) African Black-Footed Penguins, *Spheniscus demersus,* an Animal on the List of Restricted Animals (Part B), for Exhibition, by Hyatt Regency Maui Resort and Spa.

I. Summary Description of the Request

PQB NOTES: *The Plant Quarantine Branch (PQB) submittal for requests to import or permits to possess, as revised, distinguishes information provided by the applicant from procedural information, advisory, and evaluative comments presented by PQB. Except for PQB notes, hereafter "PQB NOTES," the information provided in Section II from page 2 through page 9 of this submittal is taken directly from the Hyatt Regency Maui Resort and Spa's application and subsequent written communications provided by the applicant Mrs. Povi Carisa-Abney. For instance, the statements on page 7 regarding effects on the environment are the applicant's statements in response to standard PQB questions and are not PQB's statements. This approach promotes greater applicant participation in presenting import requests in order to expeditiously move these requests to the Board of Agriculture (Board), while also distinguishing applicant provided information from PQB information. The portion of the submittal prepared by PQB, including the Advisory Subcommittee Review, Advisory Committee Review, and Proposed Permit Conditions is identified as Sections III, IV, and V of the submittal, which starts at pages 9, 11, and 15, respectively.*

We have a request to review the following:

COMMODITY: Four (4) African Black-Footed Penguins, *Spheniscus demersus* (Refer to Appendix A for Permit Application).

SHIPPERS: Metro Richmond Zoo,
8300 Beaver Bridge Road
Moseley, VA 23120
Phone No.: (804) 739-5666.

IMPORTER: Povi Carisa-Abney, Wildlife Supervisor
Hyatt Regency Maui Resort and Spa
200 Nohea Kai Drive
Lahaina, Hawaii 96761.
Phone No.: (808) 250-1030. Fax No.: (808) 667-4717.
(Refer to Appendix B for resume).

PQB NOTES: *The PQB has previously approved import permits for Patricia Lonick, Hyatt Regency-Maui, on November 10, 1992 and December 1, 1992 to import Black-Footed Penguins, Spheniscus demersus and Magellanic Penguins, Spheniscus magellanicus. (Refer to Attachment 1 and 2).*

CATEGORY: African Black-Footed Penguins, *Spheniscus demersus,* are on the List of Restricted Animals (Part B). Pursuant to Hawaii Administrative Rules (HAR), Chapter 4-71, all species in the family Spheniscidae may be imported into Hawaii for government use, or private and commercial use, including research, zoological parks, or aquaculture production.

II. Information Provided by the Applicant in Support of the Application

PROJECT: Currently, our facility can no longer produce viable offspring as they are too closely related. We are seeking to obtain 4 penguins of a different bloodline to ensure genetic vitality. We have recently been accepted into Zoological Association of America's (ZAA) Animal Management Program for African Penguins (Refer to Attachment 3 for ZAA Memorandum of Participation) and obtained a Captive-Bred Wildlife Permit through US Fish and Wildlife (MAPER3778561) (Refer to Attachment 4 for U.S. Fish and Wildlife Captive-bred Wildlife Registration Permit). We have also registered our penguins to the Association of Zoos and Aquariums (AZA) Regional Studbook and they have determined our penguin population is genetically unique. These collective histories, compiled and maintained by an AZA Regional Studbook Keeper, are known as the population's genetic and demographic identity and are valuable tools to track and manage each individual as part of a single *ex situ* population. (Refer to Attachment 5 for the AZA Species Survival Plan Program Handbook).

OBJECTIVE: We are also seeking to obtain 4 new penguins in order to comply with AZA's minimum population standard recommendation of 10 penguins for animal enclosure of our size. (Refer to Attachment 6 for the AZA Penguin (Spheniscidae) Care Manual). With the introduction of a new bloodline, it is our hope that our penguins will produce healthy offspring to continue the future of our colony. If we enter a situation of having surplus penguins, we contact ZAA's Animal Management Plant to see if there is a need at other facilities for African Penguins, and follow all recommendations, rules and regulations regarding this species. Additionally, the penguins will be used for exhibition at the Hyatt Regency Maui Resort and Spa.

PROCEDURE: Our penguin habitat was designed to house 12-16 penguins and we now only have 5 penguins. Should we have surplus penguins, our habitat can be restructured to house up to 20 penguins. We have had a very successful colony of penguins at the Hyatt Regency Maui for 38 years. Our 3 "founding" penguins all lived past their expected lifespan and have produced 6 healthy offspring.

DISCUSSION:

1. **Person Responsible:** Povi Carisa-Abney
Wildlife Supervisor, Hyatt Regency Maui
200 Nohea Drive
Lahaina, Hawaii 96761.
Phone No.: (808) 250-1030.
Email Address: povi.carisa-abney@hyatt.com

I am the wildlife supervisor at the Hyatt Regency Maui and have worked with animals for over 30 years, caring for these penguins over the last 5 years. I will use my experience with these animals and other experts in the field to provide these penguins with the best care possible. I am an active member of AZA and have connections at several zoos and aquariums that work with African penguins. I work with a very skilled team of wildlife technicians, and an exotic animal's veterinarian who provide amazing care to our penguins. They include:

Lisa Braun, 3.5 years with African Penguins, 12 years animal experience
Julia Chambers, 2 years with African Penguins, 10 years animal experience (Refer to Attachment 7 for Julia Chamber's resume).
Allison Strassburg, 1 year with African Penguins, 8 years animal experience (Refer to Attachment 8 for Allison Strassburg's resume).
Dr. Paul McCurty: Veterinarian (contracted). 16 years wildlife medicine/12 years as a vet

C3

2. **Safeguard Facility and Practices:** Our penguin habitat (Refer to Attachment 9 for aerial map of facility) is inside the Hyatt Regency Resort Maui at 200 Nohea Drive, Lahaina, HI 96761. I have provided a photo and a map of our penguin enclosure below. This habitat is safeguarded by a lava rock wall to keep penguins inside and to protect from the elements. We have 24-hour security on property, and water features that monitor the penguins' water quality. We also have a quarantine space inside for severe weather, training, and minor medical procedures. Care for major illness/injuries would take place at South Maui Animal Clinic in Kihei, Maui. We follow AZA guidelines for penguin welfare and the Hawaii Department of Agriculture (HDOA) provides yearly inspections. (Refer to Attachment 6 for the AZA Penguin (Spheniscidae) Care Manual).Our penguin habitat is located in the center of our main lobby. It is made up of a sand beach and walkway, a rock beach, hard plastic igloo-style penguin houses, and a waterway with a plastic liner. We have plants growing in all the corners and trees that provide shade. The habitat is kept enclosed by a lava-rock wall and concrete bridge (Refer to Attachment 10 for additional photographs). We have 3 occupied houses, 3 empty houses with space for at least 2 more homes, and each igloo typically houses 2 penguins.

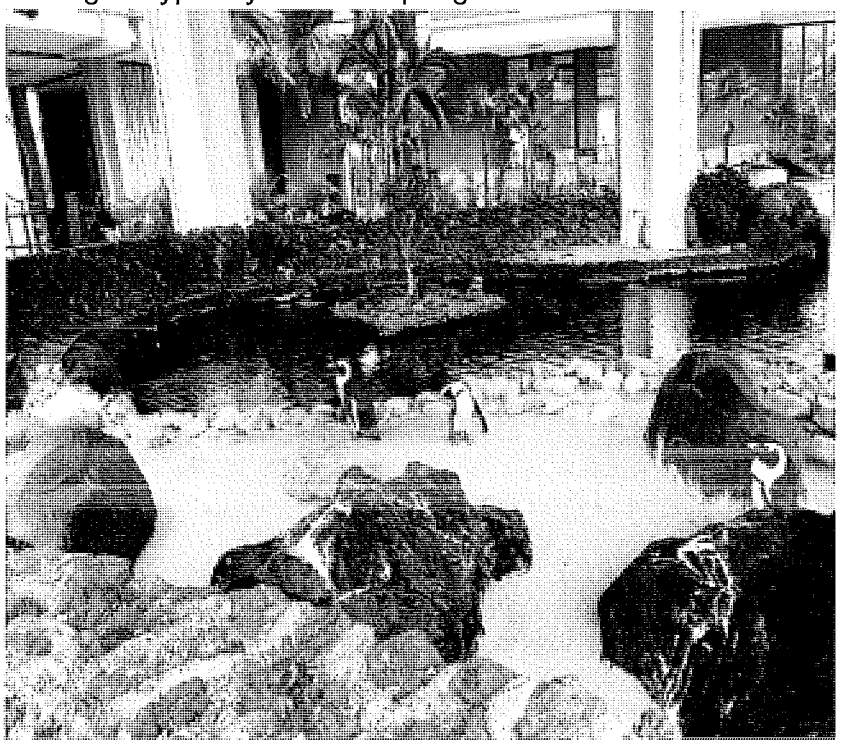


Figure 1. Photograph of Penguin Enclosure

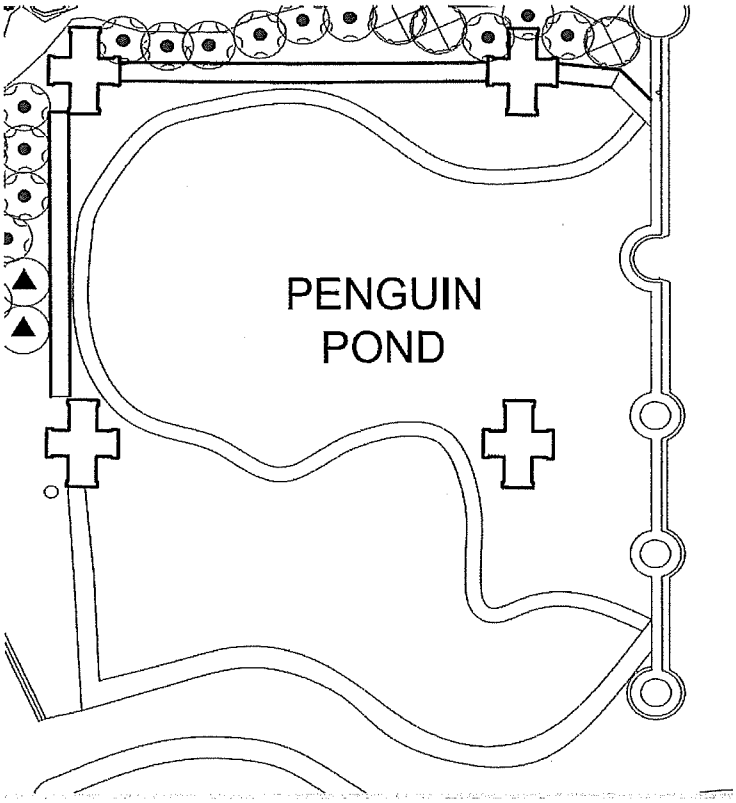


Figure 2. Diagram of the Penguin Enclosure. Dimensions are approximately 37' x 44' or 1,624 sq. ft. total enclosure area.

3. **Method of Disposition:** We are looking to acquire penguins to keep our colony going for generations to come. We have no plans to end this project, but should our penguins have to be re-homed, we would contact ZAA's African Penguin Animal Management Plant to find a suitable home for them. When a penguin dies, we send the body in for a necropsy to better understand the cause of death, then would dispose of the body through cremation.

   We keep our penguins enclosed and they are monitored through our 24-hour security team and multiple security cameras on property. This is not a species that could establish a wild colony in Hawaii due to lack of food (they eat cold-water schooling fish not found in Hawaii).

4. **Abstract of Organisms:**

   a. **African Black-Footed Penguin also known as Jackass Penguin and African Penguin** *(Spheniscus demersus).*

   b. They have no close relatives in Hawaii.

c. The African penguin averages 2 ft. tall and weighs up to 8 lbs. Eggs are laid in pairs and both parents help incubate and feed offspring. After 2-4 years, the chicks will mature and lay their own eggs. Reproductively mature at 4-6, they typically live 10-15 years in the wild but longer in captivity. They tolerate extreme temperatures of 40-100 degrees, regulate heat well, and do well in our moderate climate.

d. Their habitats require shelter, a dry substrate like sand, rock beaches, water and shade.

e. Native range is South Africa.

f. This is not a species that could establish a wild colony in Hawaii due to lack of this species food (they eat cold-water schooling fish not found in Hawaii).

g. African Penguins have not established a viable population anywhere except Africa.

h. African Penguins feed on cold water schooling fish like sardines, anchovies and capelin (not found in Hawaii). This species is not considered a pest or invasive as it does not inhabit anywhere except Africa.

i. This species is not considered domesticated, nor is it cultivated for commercial purposes.

j. This species is declining in its natural environment, mainly due to overfishing, loss of habitat, global warming and human impact.

k. Illnesses and bacteria: salmonellosis, clostridiums, and the polymicrobial contribution to penguin diphtheria, avian malaria and aspergillosis.

l. Not a threat to local wildlife through disease or parasites as they are in an enclosed area and contained water system.

We have had a very successful colony of penguins at the Hyatt Regency Maui for 40 years. Our 3 "founding" penguins all lived past their expected lifespan and have produced 6 healthy offspring. We have come to a point where our penguins are too closely related to produce offspring of genetic vitality, and our current penguins will begin to age out of their healthiest reproductive years. Our enclosure can support the additional penguins and we feel it is important to contribute to this population of endangered species. We have an excellent support team, connections with several

other zoos and aquariums, an active role in the AZA, ZAA, a strong working relationship with our veterinarian, as well as the Department of Agriculture's Quarantine department. It is our goal to provide all of our penguins with the best care and welfare possible, and to work with USDA, ZAA and US Fish and Wildlife to help revive a declining species.

The last of our original penguins passed away on March 1, 2021 at the age of 36, and the other two lived to 25 and 27. We are currently housing their 4 offspring.

- Number of years we have had African Penguins: 40
- Successful births in the last 5 years: 0
- Mortalities in the last 5 years: 2
    - "Oreo", the last original penguin, passed due to cancer/advanced age- 36 years old.
    - "Mai", passed on January 26, 2024, due to a ruptured ovarian follicle- 14 years old.

We will continue to give all our penguins the best nutrition, habitat, medical care, enrichment, social opportunities and overall welfare to ensure our penguins live long, healthy lives.

5. **Effects on the Environment:** There should be very little environmental impact regarding our penguins, as they are kept in a closed system. All water is treated and kept inside the enclosure, not dumped anywhere on property. All penguins' waste and debris are disposed of in sealed plastic garbage bags and placed in our dumpster. The penguins do not have any contact with animals or people outside the enclosure.

    a. Our penguins do not have contact with any animals or people outside their enclosure. Our staff washes hands and/or uses proper PPEs before working with any other species on our property. Penguins in other zoo facilities have been affected by Avian Malaria, but that is a very low risk as we stock *Mosquitofish* (*Gambusia affinis)* in our habitat as a natural way to get rid of mosquitos. Aspergillosis is considered one of the most common causes of respiratory disease in pet birds. It is caused by infection with a fungus of the genus Aspergillus. This can be avoided by keeping our penguin houses and enclosure clean, so we have implemented a daily cleaning schedule for our penguins.

    b. There are very little risks regarding importing this species into Hawaii. We do not have any wild penguin colonies in Hawaii to be impacted. Our

penguins never leave their enclosure, therefore do not pose any risks to endemic species, agricultural industries, natural resources, the economy and human/animal health risks. Nobody besides wildlife staff and our vet will be handling our penguins. Their food source is shipped in from the North Atlantic, and therefore harvesting their food will not impact any local species.

Biosecurity: We have a 3-foot-tall rock wall that completely surrounds our penguin exhibit, as well as a locked gate and bridge over the water area. We have over 150 Avigilon security cameras, 24-hour staff to prevent escape or harassment of the animals. All penguins have their own weatherproof igloo houses to protect them from the elements. Disease and pest exposure is minimal due to the design of the habitat, and that our penguins are not in contact with other animals or people outside their enclosure.

Our most athletic penguin can jump almost 1 foot into the air. The waterway is closed off by an underwater mesh netting under our bridge. All structures are kept away from the wall to prevent a penguin from using such items as a springboard. To my knowledge, in 36 years, we have never had a penguin escape or go missing from our enclosure. Our security team monitors all our security cameras 24 hours a day as well as patrols the property 24 hours a day.

The Hyatt Maui has over 150 Avigilon security cameras installed across the lobby and around the property. Our security team patrols the lobby 18 times a day. We have security, engineering, housekeeping and front desk personnel who are on duty 24 hours a day to help monitor.

PQB NOTES: *The Hyatt Regency Maui Resort & Spa has provided a Biosecurity Manual for their facility that is based off the National Zoo Biosecurity Manual/Guidelines. (Refer to Attachment 11 for the Hyatt Regency Maui Biosecurity Manual). Due to the recent detection of avian influenza in the State, the facility has provided additional protocol for their birds. (Refer to Attachment 16 for the Hyatt Avian Disease Outbreak Plan)*

6. **Alternatives:** We will not be seeking an alternate species, as we want them to be compatible with our existing penguins. If International Animal Exchange does not have African penguins available, we may look at other zoos and aquariums and will update you accordingly.

7. References:

a. Refer to Attachment 5 for the AZA Species Survival Plan Program Handbook and Attachment 6 for the AZA Penguin (Spheniscidae) Care Manual.

b. Refer to Attachment 12 for USDA Presentation by Hyatt Regency Maui.

8. Letters of Recommendation and Testimonials

a. Steven Sarro, African Penguin Species Survival Plan Coordinator (Refer to Attachment 13 for Steven Sarro's Letter of Recommendation).

b. Melita Charan, Roots School, Head of School (Refer to Attachment 14 for Melita Charan's testimonial)

III. Advisory Subcommittee Review

This request was submitted to the Advisory Subcommittee on Land Vertebrates for their review and recommendations. Their recommendations and comments are as follows:

1. I recommend approval ___ / ___ disapproval to allow the importation of four (4) African Black-Footed Penguins, *Spheniscus demersus*, an animal on the List of Restricted Animals (Part B), by permit, for exhibition, by the Hyatt Regency Maui Resort and Spa.

Dr. Allen Allison, Vice President/Assistant Director, Research and Scholarly Studies, Bernice Pauahi Bishop Museum: Recommends approval.

Comments : "I am supportive of the concern expressed by members of the community and members of the Board of Agriculture that African penguins have no association with Hawai'i and that it would be better to feature native species in hotels catering largely to tourists. However, the penguin exhibit at the Hyatt Regency Maui Resort and Spa functions largely as a zoo exhibit. The resort has highly trained staff who manage the exhibit with the same level of professionalism that one would expect of an accredited zoo – with appropriate public outreach, etc. I am therefore supportive of their request to import additional penguins in order to maintain the exhibit.

Populations of the African penguin are continuing to decline and the species is now endangered, in part due to the reduced availability of food due to climate change. Inasmuch as the staff at the Hyatt Regency Maui Resort Spa has demonstrated that they can care for and breed African penguins, I support their request.

> I might add that the endemic Hawaiian nene is a non-indigenous species in England, but the Wildfowl & Wetlands Trust (WWT) Slimbridge, is largely credited with saving the Hawaiian nene from extinction through a captive breeding program."

Dr. Isaac Maeda, DVM, State Veterinarian, HDOA-Animal Industry Division: Recommends approval.

Dr. Carolyn McKinnie, DVM, Senior Veterinary Medical Officer, USDA, APHIS-Animal Care: Recommends approval.

> Comments : "Birds are now regulated under the AWA and standards have been determined. The new bird rules are listed in SubPart G of the AWA. https://www.ecfr.gov/current/title-9/chapter-I/subchapter-A/part-3/subpart-G The Hyatt is required to have an active USDA Exhibitor's license. The Hyatt will need to apply and obtain a license and comply with all the standards and have an avian environmental enhancement plan. As the penguins habitat is in the middle of the lobby area, a suitable barrier from the public will be required, thought the lava rock wall may be sufficient. It is likely an attendant would need to be present when the public is present or in the near vicinity. The security team and 24/hour cameras the applicant uses is a proactive measure in protecting the animals. USDA APHIS recommends that the applicant go to our website and review the bird rule, review all the associated materials and apply for a license. https://www.aphis.usda.gov/awa/bird-standards#:~:text=On%20February%2021%2C%202023%2C%20APHIS,Animal%20Welfare%20Act%20(AWA)."

PQB NOTES: *The Hyatt Regency Maui Resort & Spa received their updated USDA Exhibitor License on July 18, 2024. (Refer to Attachment 15 for USDA-APHIS Inspection Report & License Certificate)*

Dr. Robert Reed, Deputy Director of the United States Geological Survey, Pacific Island Ecosystems Research Center, Hawaii Volcanoes National Park: No response.

Dr. Robert Thomson, Professor, School of Life Sciences, University of Hawaii at Manoa: Recommends approval.

> Comments: "Importation would allow a long-term existing captive rearing program to continue."

Dr. Amber Wright, Associate Professor, School of Life Sciences, University of Hawaii at Manoa: No response.

2. I recommend approval ___ / ___ disapproval to update permit conditions for the importation of four (4) African Black-Footed Penguins, *Spheniscus demersus*, an animal on the List of Restricted Animals (Part B), by permit, for exhibition, by the Hyatt Regency Maui Resort and Spa.

Dr. Allen Allison: Recommends approval.

Comments: "The permit conditions seem reasonable."

Dr. Isaac Maeda: Recommends approval.

Comments: "Add requirement for a negative test for avian influenza listed on the certificate of veterinary inspection in addition to regular non-poultry bird import requirements."

PQB NOTES: *Condition No. 12(a) mandates a declaration confirming that the restricted article(s) tested negative for Newcastle disease and avian influenza within fourteen (14) days prior to importation.*

Dr. Carolyn McKinnie: Recommends approval.

Comments: "From the information submitted, the facility has a good record of maintaining penguins in captivity. It seems important to maintain genetic diversity and its common for our licensed facilities to bring in new breeding stock. In reviewing this material from an Animal Welfare Act lens, it appears on the surface that the facility would meet the requirements using the AWA subpart G requirements. However, the facility needs to apply for a USDA license and proceed through the pre-license process."

Dr. Robert Reed: No response.

Dr. Robert Thomson: Recommends approval.

Comments: "The main risk would seem to be potential for introduction of disease."

Dr. Amber Wright: No response.

IV. Advisory Committee Review:

This request was submitted to the Advisory Committee on Plants and Animals (Advisory Committee) at its meeting on October 11, 2024, held simultaneously in person at the PQB Conference Room located at 1849 Auiki Street and via a Zoom virtual meeting. PQB Acting Land Vertebrate Specialist Jessica Ann Miura provided a synopsis

of the request. All four responding members of the Advisory Subcommittee recommended approval, while Dr. Robert Reed and Dr. Amber Wright did not provide a response.

Ms. Povi Carisa-Abney introduced herself as the Wildlife Supervisor at the Hyatt Regency Maui and thanked the Advisory Committee for considering the hotel's application. She highlighted the importance of community engagement and noted that the penguins are at the heart of their 'ohana. The penguins have been part of the hotel for over 40 years, but due to their genetic relatedness, they can no longer reproduce successfully. She shared that since her last meeting with Board of Agriculture on August 22, 2022, they received three permits: a new captive breeding Fish and Wildlife permit, membership in the Zoological Association of America Breeding Program for African Penguins, and successful completion of a USDA welfare check.

Ms. Carisa-Abney discussed the educational opportunities for local families and schools, noting the central role the penguins play in these programs. She explained that following the Lahaina fires, the penguins have been an important source of healing for the community, displaced families, first responders, and FEMA staff staying at the Hyatt Regency Maui. Activities like visiting the penguins and painting rocks with positive messages offered children a meaningful way to cope with the aftermath.

She explained that as animal caretakers, they are committed to providing the penguins with the best possible life, including the ability to reproduce. Despite nesting attempts, the penguins cannot successfully breed. Expert consultations with zoos and aquariums reiterated the importance of introducing new penguins to diversify the genetic pool to support reproduction.

Ms. Carisa-Abney highlighted Hyatt Regency's strong affiliations with penguin conservation, including partnerships with facilities to help raise funds for conserving wild penguin populations. She noted that only 1% of the African penguin population remains in South Africa and this gives the hotel a unique opportunity to contribute meaningfully to species preservation. She elaborated on the importance of honoring Hawaiian culture by sharing the experience of these birds with guests and the community. She pointed out that many children in Hawai'i do not have an opportunity to see animals that live outside the Hawaiian Islands and that there are no zoos on Maui. Hyatt Regency's goal is to provide this exposure ensuring transparency, adherence to regulations, while safeguarding both native habitats and species in Hawai'i. Ms. Carisa-Abney then opened the floor for questions from Advisory Committee members.

Committee member Robert Hauff recalled within the last three years, the Advisory Committee heard a very similar application from the Hyatt Regency Maui and thought it had been disapproved by the Board of Agriculture. He requested information about the earlier request. Ms. Miura answered the request went to the Board in August 2022 but was deferred due to concerns from some Board members that penguins are not native to Hawai'i. Plant Quarantine Branch Manager Jonathan Ho added the Board

fell one vote short of approval, with one abstention occurring due to a brand-new Board member not having enough time to adequately review the request. Mr. Ho confirmed the Board noted that penguins are not native to Hawai'i. However, a Board member pointed out a permit had recently been approved for another hotel to import swans, which are also not native to Hawai'i. The new Board member abstained from voting, citing that it was their first meeting and they had not had sufficient time to review the request, resulting in discomfort with casting a vote. Requests require six votes one way or another, and the Board decided to defer the request. Mr. Ho noted that, based on the new licenses and the comments presented to the Board, this request would be brought back for further consideration to address their concerns.

Ms. Carisa-Abney confirmed the request was deferred, as it fell one vote short of passing. She stated that Hyatt Regency Maui has spent the past two years addressing all concerns raised during the previous hearing. Ms. Carisa-Abney felt there were misconceptions about their program, noting that the penguins are not exclusively for hotel guests but are actively involved in community programs and conservation education. She further noted that the Hyatt Regency has obtained three additional permits and consulted with Steven Sarro, the African Penguin Species Survival Plan Coordinator and lead African penguin specialist for the Association of Zoos and Aquariums (AZA). His recommendations have been incorporated into the program. The hotel wants to be fully compliant and follow proper protocols.

Committee member Thomas Eisen asked if Ms. Carisa-Abney was knowledgeable about the natural habitat of the penguins in their native environment. Ms. Carisa-Abney confirmed she was and explained their enclosure is modeled to the environment in South Africa, which consists of sandy beaches and rock. She added the Hyatt enclosure provides shelter from the elements and includes a pond for swimming. She also noted that South Africa's climate is similar to Hawai'i's, making it suitable for the penguins to thrive. Mr. Eisen raised concerns about the likelihood that the penguins could survive on their own in the wild. Ms. Carisa-Abney responded they would not survive, as their diet in captivity consists of cold-water fish from the Atlantic, which are significantly different from the fish available in Hawai'i. When asked if the penguins would be sourced from the wild, Ms. Carisa-Abney clarified the penguins would be captive-bred, likely originating from Metro Richmond Zoo in Virginia, which has a successful breeding program and safety protocols for these penguins.

Committee member Pam Mizuno pointed out Dr. McKinney's recommendation for approval included a requirement for the facility to obtain a USDA license before proceeding. Ms. Carisa-Abney confirmed that the Animal Welfare license has been obtained and is documented (Refer to Attachment 15 for USDA-APHIS License Certificate).

Committee member Joshua Fisher remarked on the value of showcasing native species while also recognizing the importance of captive propagation for endangered species. He expressed concern about the increased susceptibility to avian malaria in

penguins but noted he found it interesting that, over the course of 40 years of Hyatt Regency Maui exhibiting penguins, there have been no cases. He attributed this to the hotel's practice of stocking mosquito fish. He agreed that avian influenza screening written into the permit conditions is necessary due to the prevalence of avian influenza throughout North America and should be a consideration if detected in Hawai'i. Ms. Carisa-Abney responded to Mr. Fisher's concerns by explaining the Hyatt Regency takes precautions to mitigate the risk of disease transmission by maintaining a well-stocked pond with mosquito fish and incorporating natural mosquito deterrents, rosemary and lavender, in the sand of the enclosure. She also noted that Steven Sarro has commended the Hyatt Regency's program. Additionally, she assured the Committee that guests and visitors do not handle or have close contact with any birds exhibited by hotel, and they are compliant with all vaccination requirements for their birds. Ms. Carisa-Abney said both Hyatt Regency Maui and Metro Richmond Zoo are willing to follow any other recommendations provided by the Committee.

Mr. Hauff reiterated his concerns regarding avian influenza, stating the application lacked sufficient information for him to comfortably approve the request. He noted the many unknowns surrounding the pathogen and indicated the need to consult with his colleagues at the Department of Health. He also raised concerns about the increased cases in humans and the potential risk of transmission to penguins from guests mingling in the lobby. He remarked that the susceptibility of native wildlife would be devastating. Mr. Hauff suggested he would feel more comfortable if there was an inclusion of a post-import quarantine period and additional testing. He added he was not fully convinced about the value of the education and felt the request would have come across stronger if there had been people from the community testifying. Instead, he proposed that resources could be directed toward native seabird recovery and integrating that into the program. Ms. Carisa-Abney addressed his concerns, explaining there are strong physical barriers between visitors and the penguins, with only trained handlers having direct contact with the animals. The facility providing the penguins to the hotel has no reported cases of avian influenza, and additional testing can be conducted once the penguins arrive in Hawai'i. She added their outreach efforts include active involvement with groups like Maui Forest Bird Recovery Project and Maui Nui Seabird Recovery Project, using the penguins as ambassadors. She also noted she submitted testimonials and letters of recommendation from a local school and community members in support of their program, Attachments 13 and 14.

Mr. Ho responded to Committee member Hauff's concerns about avian influenza by noting that permit condition no.12 includes a requirement for avian influenza testing 14 days prior to import, along with a 7-day isolation period in a mosquito-proof enclosure. He explained that these conditions were reviewed by State Veterinarian and Subcommittee member Dr. Isaac Maeda and align with the Animal Industry Division's import requirements for birds, not just penguins specifically. Mr. Ho stated that while these conditions effectively manage the risk, similar risks exist for any bird currently eligible for import.

Chairperson Takeshima asked if there were any further questions or discussion. Seeing none, he requested a motion to approve. Committee member Eisen made the motion, which was seconded by Committee member Mizuno. Committee member Hauff inquired whether individual votes would be taken. Chairperson Takeshima clarified that, unless there are objections or abstentions, the vote would proceed as a general approval. Mr. Hauff stated for the record that he was objecting. Attorney General Waihee-Polk clarified that objections or abstentions should be stated when the Chairperson calls for them. Committee member Hauff apologized, noting that he was unfamiliar with this voting process. Chairperson Takeshima acknowledged the objection and announced that, due to the objection, a roll call vote would be conducted.

The Committee recommended approval of the request: 7/1.

Recommend Approval: Greg Takeshima, Gracelda Simmons, Maria Haws, Sam 'Ohu Gon (with reservations), Joshua Fisher (with avian influenza screenings), Pam Mizuno (with all requirements of permit condition #12), Tom Eisen

Recommend Disapproval: Robert Hauff

Motion Passed.

IV. Proposed Import Permit Conditions

1. The restricted article(s), four (4) African Black-Footed Penguins, *Spheniscus demersus*, including progeny, shall be used for exhibition, a purpose approved by the Hawaii Department of Agriculture (HDOA), Board of Agriculture (Board), and shall not be given, sold, and/or transferred in Hawaii unless approved by the Board. Release of the restricted article(s) into the environment is prohibited.

2. The permittee, Povi Carisa-Abney, Hyatt Regency Maui Resort and Spa, 200 Nohea Drive, Lahaina, Hawaii 96761, shall be responsible and accountable for the restricted article(s) imported, including progeny, from the time of their arrival to their final disposition.

3. The restricted article(s), including progeny, shall be safeguarded at Hyatt Regency Maui Resort and Spa, 200 Nohea Drive, Lahaina, Hawaii 96761, a site inspected and approved by the Plant Quarantine Branch (PQB) prior to importation. Prior to the removal of the restricted article(s) or progeny to another site, a site inspection and approval by the PQB Chief is required.

4. The restricted article(s) shall be maintained by the responsible person, Povi Carisa-Abney, Hyatt Regency Maui Resort and Spa, 200 Nohea Drive, Lahaina, Hawaii 96761, or by trained or certified personnel designated by the permittee.

5. The restricted article(s) shall be imported only through the port of Honolulu, as approved by the Board. Entry into Hawaii through another port is prohibited.

6. The permittee shall provide the HDOA, PQB and Animal Industry Division (AID) with the confirmed arrival date, time, mode of transportation, and any other required information for the arrival of the restricted article(s) at least 48 hours prior to arrival. The permittee shall immediately notify the HDOA, PQB and AID of any changes to this information.

7. Each shipment shall be accompanied by a complete copy of the PQB permit for the restricted article(s) and an invoice, packing list, or other similar PQB approved document listing the scientific and common names of the restricted article(s), the quantity of the restricted article(s), the shipper, and the permittee for the restricted article(s).

8. The restricted article(s) and progeny shall be permanently marked with a unique identification code, or any other markings or identifiers as approved by the PQB Chief.

9. At least four sides of each parcel containing the restricted article(s) shall be clearly labeled with "Live Animals" and "This Parcel May be Opened and Delayed for Agriculture Inspection" in 1/2-inch minimum sized font.

10. Water used to transport the restricted article(s) shall be disinfected with a solution of 50 mg chlorine/L (50 ppm), or other PQB approved treatment for a duration of 30 minutes, then neutralized with sodium thiosulfate, another approved neutralizing agent, or by holding the solution for 48 hours, prior to disposal into an individual wastewater system, municipal sewer system or other PQB approved system.

11. All bedding used to transport the restricted article(s) and fecal material from the restricted article(s) shall be bagged and disposed of directly into the municipal landfill.

12. The restricted article(s) shall comply with all pre-entry animal heath requirements of the AID, Chapter 4-28, Hawaii Administrative Rules, (Ph: (808) 837-8092).

    a. Imported restricted article(s) shall be accompanied by a Poultry and Bird Import Permit and a valid original health certificate issued by a Category II Accredited Veterinarian within ten (10) days prior to importation. The health certificate shall include a declaration indicating the restricted article(s) are free from diseases designated by the HDOA State Veterinarian, free of external parasites and a declaration indicating the restricted article(s) received a negative test for Newcastle disease and avian influenza within fourteen (14) days prior to importation.

b. Prior to importation, restricted article(s) shall be isolated at a veterinary clinic in a mosquito-free/proof enclosure for West Nile Virus under the direct supervision of a Category II Accredited Veterinarian. The isolation shall be a minimum of seven (7) days (168 hours), and the restricted article(s) shall enter the State within thirty-six (36) hours of completion of the isolation.

c. Prior to importation, restricted article(s) shall receive multiple negative Polymerase Chain Reaction diagnostic tests for parasites from at least three blood samples collected several days apart and a prophylactic treatment with chloroquine and primaquine, as approved by the State Veterinarian.

d. Upon arrival at the port of Honolulu, the restricted article(s) shall be issued a permit to ship (form DC-8), by the HDOA State Veterinarian or authorized representative, prior to transport to the approved inspection site, if movement is allowed prior to inspection.

13. The restricted article(s), shall be subject to inspection by the HDOA, PQB, and the AID prior to entering the State. It is the responsibility of the permittee to provide any restraint(s), including chemical restraint(s), deemed necessary by the AID to conduct a proper inspection. The permittee shall be responsible for ensuring an inspection is conducted.

14. The approved site, restricted article(s), including progeny, records, and any other document pertaining to the restricted article(s) and progeny under this permit, may be subject to post-entry inspections by the HDOA, PQB, and the AID. The permittee shall make the site, restricted article(s), including progeny, and records pertaining to the restricted article(s) and progeny available for inspection upon request by a PQB inspector.

15. The permittee shall adhere to the use, facility, equipment, procedures, and safeguards described in the permit application and as approved by the PQB Chief and Board.

16. Effluent from the permittee's system shall be sufficiently treated, as determined by the PQB Chief, to prevent the accidental release of any potential parasites and/or pathogens associated with the restricted article(s), prior to disposal into any individual wastewater system, municipal sewer system or other PQB approved system. Effluent from the permittee's system shall not be discharged to or have a direct connection to the ocean or any other body of water, such as ponds, estuaries, reservoirs, rivers and/or streams.

17. The permittee shall have a biosecurity manual available for review and approval by the PQB, at the time of the initial site inspection and any subsequent post-entry inspection(s), which identifies the practices and procedures to be adhered to by the permittee to minimize or eliminate the risk of theft, escape, or accidental release of the restricted article(s), including the risk of introduction and spread of diseases and pests associated with the restricted article(s) to the environment. The permittee shall adhere to all practices and procedures as stated in this biosecurity manual.

18. The permittee shall immediately notify the PQB Chief verbally and in writing under the following circumstances:

    a. If any escape, theft, release, disease outbreaks, pest emergence and/or mortality involving the restricted article(s) or progeny under this permit occurs. If the restricted article(s) or progeny escape or are found to be free from confinement, the HDOA may confiscate or capture the restricted article(s) or progeny at the expense of the permittee, pursuant to the Hawaii Revised Statutes (HRS), §150A-7(c). The AID shall also be notified of any sign or occurrence of disease.

    b. If any changes to the approved site, facility, and/or procedures regarding the restricted article(s) or progeny occur or are to be made, the permittee shall obtain written approval from the PQB Chief as soon as practicable (if unplanned) or prior to implementation (if planned). Also, the permittee shall submit a written report documenting the specific changes to the PQB Chief.

    c. If a shipment of the restricted article(s) is delivered to the permittee without a PQB "Passed" stamp, tag or label affixed to the article, container, or delivery order that indicates that the shipment has passed inspection and is allowed entry into the State, then the permittee shall not open or tamper with the shipment and shall secure, as evidence, all restricted article(s), shipping container(s), shipping document(s) and packing material(s) for PQB inspection.

    d. If the permittee will no longer import or possess the restricted article(s) or progeny authorized under this permit, then the permittee shall submit a written request to the PQB Chief stating the name and address of the individual to whom the restricted article(s) will be transferred to. If the restricted article(s) or progeny will be transferred within the State, a PQB possession permit shall be obtained by the new owner prior to transfer. Once the transfer is complete, this permit shall be cancelled.

    e. If the restricted article(s) or progeny reproduce, the permittee shall submit a written report to the PQB Chief indicating the number of offspring and

any other information deemed necessary by the PQB Chief.

f. If the restricted article(s) or progeny expires, the permittee shall submit a written report to the PQB Chief that details the circumstances surrounding the death of the restricted article(s) or progeny, the cause of death of the restricted article(s) or progeny, and any other information deemed necessary by the PQB Chief. The permittee shall also submit a necropsy report from a U.S. Department of Agriculture accredited veterinarian within thirty (30) days post-mortem.

19. The permittee shall submit a copy of all valid licenses, permits, certificates or other similar documents required by other agencies for the restricted article(s) to the PQB Chief. The permittee shall immediately notify the PQB Chief in writing when any of the required documents are suspended, revoked, or terminated. This permit may be amended, suspended, or canceled by the PQB Chief upon suspension, revocation, or termination of any license, permit, certificate, or similar documents required for the restricted article(s).

20. It is the responsibility of the permittee to comply with all applicable requirements of municipal, state, or federal law pertaining to the restricted article(s) and progeny.

21. The permittee shall submit a semi-annual report to the PQB Chief in January and July of all restricted articles(s) and progeny imported or possessed. The report shall be in a format approved by the PQB Chief and include the following information for the prior 6-month period:

a. The permit number, quantity, scientific name of each restricted article(s) and progeny;

b. The status of the use and possession of the restricted article(s) and progeny;

c. A summary of any significant changes to the permittee's operation, personnel, and/or procedures; and

d. Any significant events that occurred at the permittee's site.

22. The permittee shall comply with all permit conditions, as amended. Any violation of the permit conditions may result in citation, permit cancelation, and enforcement of any or all of the penalties set forth in HRS §150A-14.

23. The permittee is responsible for costs, charges, or expenses incident to the inspection, treatment, or destruction of the restricted article(s), including progeny, as provided in Act 173, Session Laws of Hawaii 2010, Section 13, including, if

applicable, charges for overtime wages, fixed charges for personnel services, and meals.

24. A canceled permit is invalid and upon written notification from the PQB Chief, all restricted article(s) listed on the permit shall not be imported. In the event of permit cancelation, any restricted article(s) imported under permit, including progeny, may be moved, seized, treated, quarantined, destroyed, or sent out of State at the discretion of the PQB Chief. Any expense or loss in connection therewith shall be borne by the permittee.

25. The permit conditions are subject to cancelation or amendment at any time due to changes in statute or administrative rules restricting or disallowing import of the restricted article(s) or due to Board action disallowing a previously permitted use of the restricted article(s).

26. These permit conditions are subject to amendment by the PQB Chief in the following circumstances:

    a. To require disease screening, quarantine measures, and/or to place restrictions on the intrastate movement of the restricted article(s), as appropriate, based on scientifically validated risks associated with the restricted article(s), as determined by the PQB Chief, to prevent the introduction or spread of disease(s) and/or pests associated with the restricted article(s).

    b. To conform to more recent Board approved permit conditions for the restricted article(s), as necessary to address scientifically validated risks associated with the restricted article(s).

27. The permittee shall agree in advance to defend, indemnify and hold harmless the State of Hawaii, its officers, agents, employees and the Board of Agriculture members for any and all claims against the State of Hawaii, its officers, agents, employees or Board of Agriculture members that may arise from or be attributable to any of the restricted article(s) that are introduced under this permit. This permit condition shall not apply to a permittee that is a federal or State of Hawaii entity or employee, provided that the state or federal employee is a permittee in the employee's official capacity.

28. In case the State of Hawaii shall, without any fault on its part, be made a party to any litigation commenced by or against the permittee in connection with the permit, the permittee shall pay all costs and expenses incurred by or imposed on the State of Hawaii, including attorneys' fees.

STAFF RECOMMENDATION: Based on the recommendations and comments of the Advisory Subcommittee on Land Vertebrates and recommendation to approve by the Advisory Committee on Plants and Animals 7/1, the PQB is recommending the Board approve this request and establish permit conditions for this request.

Respectfully Submitted,

JONATHAN HO
Manager, Plant Quarantine Branch

APPROVED FOR SUBMISSION:

Sharon K. Hurd

SHARON K. HURD
Chairperson, Board of Agriculture

Appendix A

PQ-7 (01/04)

State of Hawaii
Department of Agriculture
PLANT QUARANTINE BRANCH
1849 Auiki Street, Honolulu, HI 96819-3100
Phone: (808) 832-0566, FAX: (808) 832-0584

For Office Use Only

Fee: $_____ Receipt No. _____

☐ Approve Permit No._____ Date: _____

☐ Disapprove ☐ Other _____

Processed by: _____ Date: _____

PERMIT APPLICATION FOR RESTRICTED COMMODITIES INTO HAWAII

Date: *12/7/2023*

In accordance with the provision of Chapter 71 , Hawaii Administrative Rules of the Division of Plant Industry, Department of Agriculture, a permit is requested for the following commodities:

Please type or print clearly.

Quantity	Commodity	Scientific Name
4	African Black-Footed Penguins/ Penguin Eggs	Spheniscus demersus

Name and address of shipper: Metro Richmond Zoo, 8300 Beaver Bridge Road, Moseley, VA 23120

(Mainland or Foreign address)

Approximate date of arrival: TBD. Goal is within 3 months.

Mode of Shipment: ☐ Mail ☑ Air Freight ☐ Boat

Type of Permit:

--- Import
☑ one time only ☐ multi-shipments

--- Intrastate shipment
☑ one time only ☐ multi-shipments

☐ Possession

Object of importation:

☐ Kept caged at all time
☐ Used for propagation
☑ Imported for exhibition
☐ Imported for liberation
☐ Other purposes - specify Povi Carisa-Abney

Please type or print clearly.

Applicant's Name Povi Carisa-Abney

Company Name Hyatt Regency Maui Resort and Spa
(if applicable)

Hawaii Mailing Address 200 Nohea Kai Drive
Lahaina, Hawaii 96761

Telephone number 808-250-1030

Facsimile number 808-667-4717

Fee Amount Enclosed (cash, check or mail order) $ $50

(complete reverse side)

PLEASE COMPLETE THE FOLLOWING INFORMATION (attach extra sheet if necessary)

1. State in detail the reasons for introduction (include use or purpose).

   We have a very successful colony of penguins at the Hyatt Regency Maui for 36 years. Our 3 founding penguins all lived past their expected lifespan and have produced 6 healthy offspring. We have come to a point where our penguins are too closely related to produce offspring of genetic vitality, and our current penguins will begin to age out of their healthiest reproductive years. Our enclosure can support the additional penguins and we feel it is important to contribute to this population of endangered species. We will provide all of our penguins with the best care and welfare possible, and to work with Dept. of Agriculture to help revive a declining species.

2. Person responsible for the organism (include name, address and phone number).

   Povi Carisa-Abney (Wildlife Supervisor at the Hyatt Regency Maui)
   37 Polohina Lane #8, Lahaina HI 96761
   (808) 250-1030
   povi.carisa-abney@hyatt.com
   I have worked with animals for over 30 years and have cared for these penguins over 5 years. I will use my experience with these animals and other experts in the field to provide these penguins with the best care possible.

3. Location(s) where the organism will be kept and used (include address, contact and phone number).

   The penguins will be kept in the penguin habitat located in the center of our lobby at the Hyatt Regency Resort and Spa. 200 Nohea Drive, Lahaina Hawaii 96761. Povi Carisa-Abney (wildlife supervisor) will be contact person and can be reached at 808-250-1030 or by email at povi.carisa-abney@hyatt.com

4. Method of disposition.

   We are looking to acquire penguins to keep our colony going for generations to come. We have no plans to end this project, but should our penguins have to be re-homed, we would ZAA's African Penguin Animal Management Plan program to find a suitable home for them. When a penguin dies, we send the body in for a necropsy to better understand the cause of death, then would dispose of the body through cremation.

5. Give an abstract of the organism with particular reference to potential impact on the environment of Hawaii (include impact to plants, animals and humans).

   a.Spheniscus demersus, African Black-Footed Penguin
   b. The African penguin averages 2 ft. tall and weighs up to 8 lbs. Eggs are laid in pairs and both parents help incubate and feed offspring. After 2-4 years, the chicks will mature and lay their own eggs. Reproductively mature at 4-6, they typically live 10-15 years in the wild but longer in human care. They tolerate extreme temperatures of 40-100 degrees, regulate heat well, and do well in our moderate climate.
   c. Their habitats require shelter, a dry substrate like sand, rock beaches, water and shade.
   d-k. Native range is South Africa, no colonies in Hawaii unlike to establish here or elsewhere due to lack of food (small schooling fish like sardines). Not a threat to local wildlife, through disease or parasites (enclosed area).

****

I request permission to import the articles as listed on the permit application and further, request that the articles be examined by an authorized agent of the Department of Agriculture upon arrival in Hawaii.

I agree that I, as the importer, will be responsible for all costs, charges or expenses incident to the inspection or treatment of the imported articles.

I further agree that damages or losses incident to the inspection or the fumigation, disinfection, quarantine, or destruction of the articles, by an authorized agent of the Department of Agriculture, shall not be the basis of a claim against the department or the inspectors for the damage or loss incurred.

Signature Povi Carisa-Abney **Date** 12/7/2023

(Applicant)

Appendix B

Povi Carisa-Abney
(808) 250-1030
37 Polohina Ave Lahaina, HI 96761
alohapovi@mac.com

Education: Southern Oregon University. Ashland, OR. Bachelor of Science Degree in Psychology. Graduated with Honors.

Certifications:
*Professional Level Member AZA & ZAA
*USCG License- 100 Ton Master Boat Captain
*NAUI Master Scuba Diver
*Red Cross Lifeguarding, CPR and 1st Aid Certifications
*Hyatt Regency and Ritz Carleton Hospitality Training Course
*Pacific Whale Foundation Marine Naturalist Training Courses

Work Experience:

Hyatt Regency- Wildlife Supervisor
*Supervisor. Overseas all aspects of animal welfare, enrichment, records, nutrition, habitat, marketing and wildlife staff training. Leads guest encounters, talks and public feedings animals on property. Care and feeding of penguins, parrots, cranes, flamingos, swans and exotic ducks. My focus is to help our guests create amazing experiences and nurture a love of wildlife.

Ritz-Carlton- Ambassadors of the Environment
*Naturalist Leading ecology focused tours to guests at the Ritz Carleton, including hikes, snorkels, whalewatches and kids programs. My position requires extensive knowledge of Hawaiian history, culture, plants and animals, as well as guest interaction, photography and computer skills.

Ultimate Rafting/Ultimate Whale Watching
*Public Relations/Naturalist As a naturalist I provide interactive talks on humpback whales and other marine species, as well as guide snorkel trips for onboard guests.

Pacific Whale Foundation
*Naturalist/1st Mate/ Cruise Ship Coordinator: Managing boat operations on a 149 passenger boat. Creating Powerpoint presentations and managing guest lecturers on board visiting cruise ships. Providing interactive talks on humpback whales and other marine species, as well as leading snorkel trips to onboard passengers.

Dolphin Research Center
*Animal Care and Training Intern: Assisted trainers in modifying dolphin and sea lion behaviors, as well as serving as a medical back-up for veterinary care. This position allowed me the opportunity to work with the Marine Mammal Stranding Network for the Florida Keys in the rescue and rehabilitation of injured and stranded animals.

References:

Steven Sarro	Ken Keidan	Krystle Alcain
Hyatt Engineering Manager	Hyatt Engineering Supervisor	Hyatt Marketing Manager
808-280-6975	410-456-7574	808-280-8501

PQ-8b
5/87

Attachment 1

Permit No. 11-93-M-7397

Date Nov. 10, 1992

State of Hawaii
DEPARTMENT OF AGRICULTURE
Plant Quarantine Branch
701 Ilalo Street
Honolulu, Hawaii 96813-5524

IMPORT PERMIT

(Valid for one shipment(s) within one year(s) from date)

Permission is hereby granted to introduce the following, in accordance with Chapter 71, Rules of the Division of Plant Industry, Department of Agriculture, and the conditions listed below. *(Each lot must be inspected by a Plant Quarantine Inspector upon arrival before release.)*

Quantity	Commodity	Scientific Name
5	Black-Footed Penguins See attached condition Conditions: Must be certified in accordance with ~~Reg. 11~~ Chap. 19 attached and must be certified as to progeny of captive populations or have been held in captivity for a period of one year immediately prior to importation or have been specifically approved for importation by the board. (NO SUBSTITUTIONS ALLOWED)	Spheniscus demersus

INSTRUCTION To Shipper: One copy of permit to accompany shipment to Hawaii.

Conditions or Object of Importation:

- ☒ To be kept in captivity at all times. (Caged)
- ☐ For propagation
- ☐ Other

Conditions: It is the responsibility of the named importer to personally contact the Federal Government as to their requirements which are contingent to this permit.

Name and Address of Shipper: International Animal Exchange, 130 E. Nine Mile, Ferndale, MI 48220

Name and Address of Importer: Hyatt Regency-Maui, Patricia Lonick, 200 Nohea Kai Dr., Lahaina, HI 96761 Phone: 661-1234

Gary A. Kokubun
CHIEF PLANT INSPECTOR

Yukio Kitagawa
CHAIRPERSON, BOARD OF AGRICULTURE

FOR OFFICIAL USE ONLY

PORT _____ ARRIVAL DATE _____ FLIGHT/SHIP _____

WAYBILL NO. _____ INSPECTION DATE/TIME _____ INSPECTOR _____

REMARKS _____

Conditions applicable to birds imported for Display:

1. Each lot of birds shall be inspected by a State Veterinarian upon arrival and all dead birds shall be returned to the Department of Agriculture for necropsy. The owner shall keep a record of all introduced birds and progenies for the inspection of State officials.

2. The following birds shall be pinioned:

Flamingoes	Ibis
Swans	Geese
Spoonbills	Cranes
Ducks	

   All birds shall be certified by a veterinarian as pinioned and subject to inspection upon arrival by a State Veterinarian.

3. All birds for exhibition out of cages shall be pinioned prior to entry into Hawaii.

4. Birds shall meet all Federal requirements.

5. Inspection of birds may be made at any time by representatives of the Division of Animal Industry, Hawaii Department of Agriculture. Birds shall be dusted with an approved pesticide on entry into the State to prevent the introduction of ectoparasites, or certified by a veterinarian as being ectoparasite-free.

6. Must be enclosed in fenced area.

7. Post entry inspection by Plant Quarantine staff.

8. All progenies must be pinioned and certified by a veterinarian.

Attachment 2

PQ-8b
5/87

Permit No. 12-93-M-7446

Date December 1, 1992

State of Hawaii
DEPARTMENT OF AGRICULTURE
Plant Quarantine Branch
701 Ilalo Street
Honolulu, Hawaii 96813-5524

IMPORT PERMIT

(Valid for One shipment(s) within One year(s) from date)

Permission is hereby granted to introduce the following, in accordance with Chapter 71, Rules of the Division of Plant Industry, Department of Agriculture, and the conditions listed below. *(Each lot must be inspected by a Plant Quarantine Inspector upon arrival before release.)*

Quantity	Commodity	Scientific Name
6	Magellanic penguins	Spheniscus magellanicus

Chap. 19

Conditions: Must be certified in accordance with ~~Reg. 11~~ attached and must be certified as to progeny of captive populations or have been held in captivity for a period of one year immediately prior to importation or have been specifically approved for importation by the board.

Condition: Items on this permit subject to cancellation due to changes in regulations and policy at any time.

(NO SUBSTITUTIONS ALLOWED)

INSTRUCTION To Shipper: One copy of permit to accompany shipment to Hawaii.

Conditions or Object of Importation:

- ☒ To be kept in captivity at all times.
- ☐ For propagation
- ☐ Other

Conditions: It is the responsibility of the named importer to personally contact the Federal Government as to their requirements which are contingent to this permit.

Name and Address of Shipper: International Animal Exchange., 130 East Nine Mile., Ferndale, MI 48220

Name and Address of Importer: Hyatt Regency Maui/Patricia Lonick., 200 Nohea Kai Drive., Lahaina, HI 96761 Phone: 661-1234

Gary A. Kokubun
CHIEF PLANT INSPECTOR

Yukio Kitagawa
CHAIRPERSON, BOARD OF AGRICULTURE

FOR OFFICIAL USE ONLY

PORT _____ ARRIVAL DATE _____ FLIGHT/SHIP _____

WAYBILL NO. _____ INSPECTION DATE/TIME _____ INSPECTOR _____

REMARKS _____

ZOOLOGICAL ASSOCIATION OF AMERICA

Memorandum of Participation

AFRICAN BLACK FOOTED PENGUIN
Spheniscus demersus

The ZAA's Animal Management Program (AMP) for African black-footed penguin includes the following provisions:

Annual conservation donation of $500 to Dyer Island Conservation Trust. Donations will go through ZAA with the donor receiving name recognition.

I hereby acknowledge reading the Memorandum of Participation for the ZAA Animal Management Program described above and agree to abide by its stipulations and requirements.

Name of Institution Hyatt Regency Resort and Spa

Name of Director/CEO Pavi Carisa-Abney

Signature of Director/CEO Pavi Carisa-Abney Date 6-28-23

Note: Institutions that are not accredited by ZAA may apply to participate as a Non-member Affiliate (NMA) and are subject to approval by the AMP Committee.

Name of AMP Committee Chair Kenneth Kaemmerer

Signature of AMP Committee Chair

AMP Committee Approval Date 6-28-2023

CAPTIVE-BRED WILDLIFE REGISTRATION
Permit Number: MAPER3778561
Version Number: 0
Effective: 2023-09-20 **Expires:** 2028-09-19

SUBMIT ANNUAL REPORT VIA YOUR EPERMITS PORTAL, BY EMAIL TO PERMITS@FWS.GOV (REFERENCING THE PERMIT NO. IN SUBJECT LINE), OR BY REGULAR MAIL.

Authorizations and Conditions:

A. Authorized to take for normal husbandry practices; deliver, receive, carry, transport or ship in interstate commerce, for the purpose of enhancement of propagation, any **African penguin** (*Spheniscus demersus*) that is bred in captivity in the United States.

B. General conditions set out in Subpart D of 50 CFR 13, and specific conditions contained in Federal regulations cited above, are hereby made a part of this permit. All activities authorized herein must be carried out in accordance with and for the purposes described in the application submitted. Continued validity, or renewal of this permit is subject to complete and timely compliance with all applicable conditions, including the filing of all required information and reports.

C. The validity of this permit is also conditioned upon strict observance of all applicable foreign, state, local, tribal, or other federal law. **This permit can be photocopied.**

D. Valid for use by permittee named above.

E. Acceptance of this permit serves as evidence that the permittee is registered under 50 CFR 17.21(g), and that the permittee understands and agrees to abide by the Special Conditions for Captive-bred Wildlife Registration as specified by the Division of Management Authority (copy enclosed).

CAPTIVE-BRED WILDLIFE REGISTRATION

Permit Number: MAPER3778561

Version Number: 0

Effective: 2023-09-20 **Expires:** 2028-09-19

Issuing Office:

Department of the Interior

U.S. FISH AND WILDLIFE SERVICE

Division Of Management Authority
5275 Leesburg Pike
Falls Church, Virginia 22041-3803

Emily Mesler

Chief, Branch of Permits

Digitally signed by
Emily Mesler
2023-09-20 15:10:43

Permittee:

Hyatt Regency Resort & Spa
200 Nohea Kai Drive
Lahaina, Hawaii 96761
U.S.A.

Name and Title of Principal Officer:

Kenneth Keldan Director of Engineers

Authority: Statutes and Regulations: 16 U.S.C. 1533 (d), 16 U.S.C. 1539 (a) 50 CFR 17.21 (g)

Location where authorized activity may be conducted:

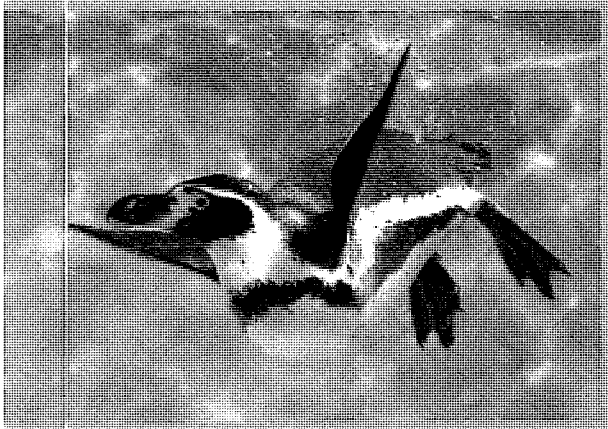
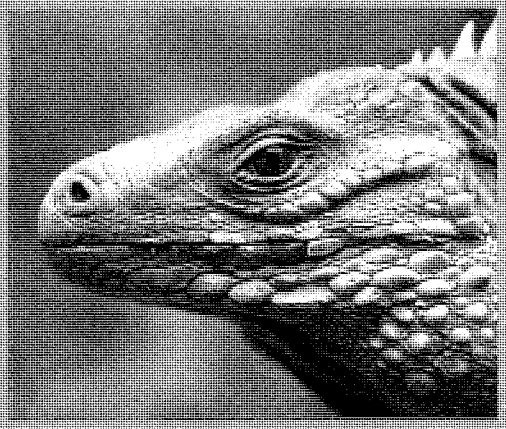
WITHIN THE UNITED STATES

Reporting requirements:

ANNUAL REPORT DUE 3/31.
SEE "SPECIAL CONDITIONS FOR CAPTIVE-BRED WILDLIFE REGISTRATIONS".

ASSOCIATION OF ZOOS & AQUARIUMS

AZA Species Survival Plan®
Program Handbook


Created by the
AZA Animal Population Management Committee
in association with the
AZA Conservation, Management, and Welfare Sciences Department

ASSOCIATION OF ZOOS & AQUARIUMS

Species Survival Plan® Program Handbook

Created by the
AZA Animal Population Management Committee
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ASSOCIATION OF ZOOS & AQUARIUMS

Species Survival Plan® Program Handbook

Published by the Association of Zoos and Aquariums

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Original Completion Date:
March 2011

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Authors and Advisors:
AZA Animal Population Management Committee
AZA Conservation, Management, & Welfare Sciences Department

Table of Contents

Chapter 1. Introduction

Mission Statement

The mission of an ***Association of Zoos and Aquariums (AZA)*** cooperatively managed ***Species Survival Plan® (SSP) Program*** is to manage an *ex situ* species population with the interest and cooperation of AZA-accredited zoos and aquariums, ***Sustainability Partners***, and ***Certified Related Facilities*** (CRFs). An AZA SSP Program is identified through documented demand and potential sustainability within the AZA community; is selected by Taxon Advisory Groups (TAGs) through the RCP process; and develops a Breeding and Transfer Plan that identifies population goals and recommendations to manage a genetically diverse, demographically varied, and biologically sound population. Success is achieved when SSP animals are available to meet Program goals and come from biologically sound populations as a result of a shared commitment to cooperative populations and program management.

Description

SSP Programs are led by knowledgeable individuals who cooperatively work together to maximize genetic diversity, appropriately manage the demographic distribution and long-term sustainability of TAG recommended Animal Programs within AZA member facilities, and collaborate on improving welfare and husbandry for the species. Each SSP Program manages the breeding of a select species or subspecies through a ***Breeding and Transfer Plan*** (BTP). BTPs summarize the current demographic and genetic status of the population, describe the Animal Program's management designation, and recommend breeding pairs/groups and transfers. Breeding and Transfer Plans are designed to maintain a healthy, genetically diverse and demographically stable population for the long-term future and meet member needs.

The AZA and its member facilities recognize that cooperative management is critical to the long-term survival of professionally managed Animal Programs and are fully committed to the goals and cooperative spirit of the SSP Program partnerships. Therefore, all AZA member facilities are required to fully participate in SSPs if they hold the species (see the AZA Policy for Full Participation in the SSP Program and the AZA Animal Management Reconciliation Policy).

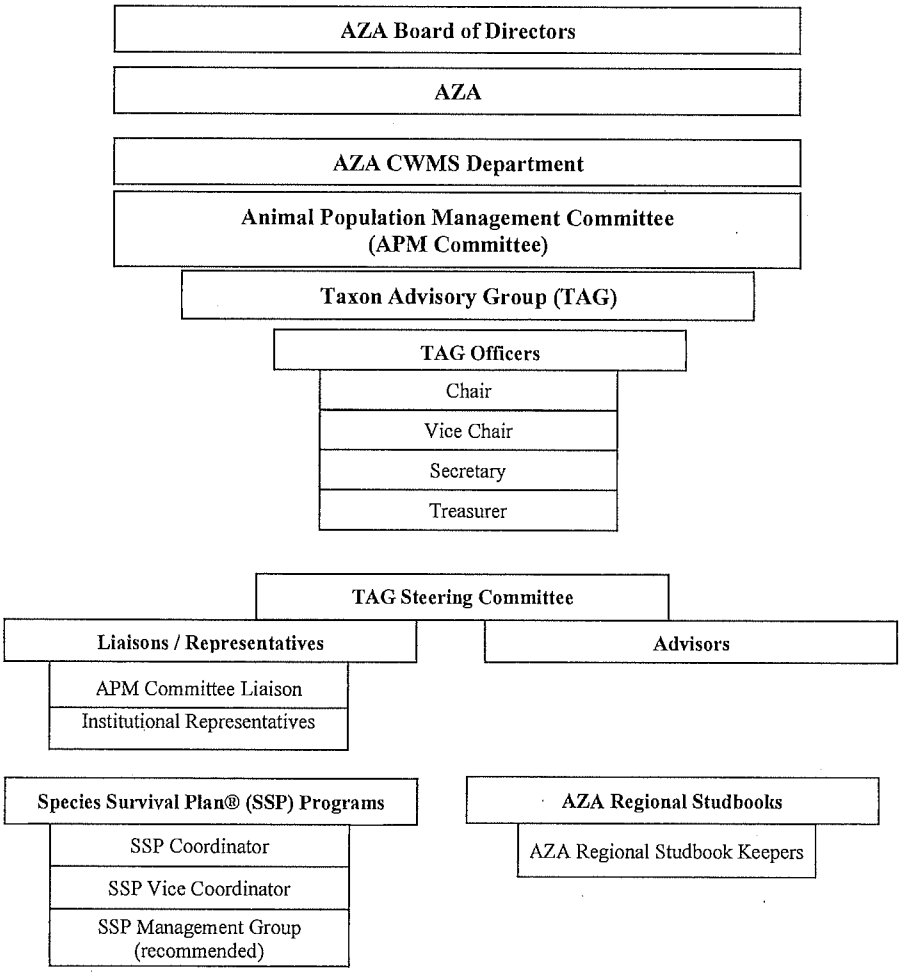
The AZA Animal Programs, along with the ***Animal Population Management Committee (APM Committee)***, must assure that the appropriate ***AZA Board approved policies*** are followed in all aspects of Animal Program management. All AZA member facilities and Animal Programs, regardless of management designation, must adhere to the AZA Policy on Responsible Population Management [formerly the Acquisition and Disposition (A&D)] Policy, the AZA Code of Professional Ethics, and the Sustainability Partner policies. All Board approved policies are found on the AZA website.

AZA Animal Programs

SSPs

There are three types of SSPs: Provisional, Signature, and Secure, which is a subset of Signature. Criteria for SSPs include robust measures of viability and consideration of member interest. The Animal Population Management Committee (APMC) will work closely with Taxon Advisory Groups (TAGs) to determine which type of program best fits each population via the SSP assessment process.

Chapter 2. Organization
Animal Program Overview



SSP Program Structure

All SSP Programs are composed of an ***SSP Coordinator***, ***Vice Coordinator***, a ***Management Group*** (recommended) and Advisors (if preferred) to assure that a significant amount of experience and diversity are represented. Required ***Officer*** positions include the SSP Coordinator, Vice Coordinator, and an AZA Regional ***Studbook Keeper***. The SSP Coordinator or SSP Vice Coordinator may also be the AZA Regional Studbook Keeper; however, this is not a requirement. In some cases, the AZA Regional Studbook Keeper may also act as the ***World Association of Zoos and Aquariums (WAZA) International Studbook Keeper***. The SSP Program may also include a Secretary and, if any financial components are incorporated into the SSP Program, a Treasurer. The SSP Coordinator or Vice Coordinator may fulfill the role of Secretary or Treasure, if necessary. It is not permissible for an SSP Program to have more than one Coordinator (Co-Coordinators) or Vice Coordinator (Co-Vice Coordinators). An SSP Coordinator is not required to be the ***Institutional Representative (IR)*** for their facility.

An SSP Program should include a Management Group if the SSP Program would benefit from the additional structure and administrative support. The Management Group must be composed of, and elected from, the SSP Program's Institutional Representatives (IRs). In addition, each SSP Program may be complimented by Advisors, who are not required to be affiliated with an AZA facility but are able to serve as experts in various fields such as nutrition, behavior, education, veterinary, and field conservation, and may be members of an associated AZA ***Scientific Advisory Group (SAG)***. SSP Programs are encouraged to be creative in composing their Management Groups depending on the specific needs of their species.

Officer Positions

SSP Coordinator

Position Overview

The SSP Coordinator is elected by their TAG's ***Steering Committee*** (if the TAG has a current, approved RCP), or by the APM Committee (if the TAG does not have a current, approved RCP). An SSP Coordinator performs various duties to lead and support the AZA SSP Program. The SSP Coordinator works with IRs, the Vice Coordinator, the AZA Regional Studbook Keeper, the TAG, the APM Committee, and the AZA CMWS Department, as well any associated governmental agencies, to develop, oversee, promote, and support the cooperative animal management, research, husbandry, and educational initiatives of the SSP Program.

Responsibilities include leadership and organization of the SSP Program in building and appropriately managing a sustainable population, and communication of recommendations and guidelines to the appropriate stakeholders. The SSP Coordinator is to regularly complete and distribute an SSP Breeding and Transfer Plan for the managed population.
The SSP Coordinator serves as the primary contact and AZA expert for their species and abides by the duties and responsibilities set forth by the AZA, APM Committee, and the TAG.

Eligibility Requirements

The SSP Coordinator *must*:

- Must be a paid employee at an AZA member facility (AZA-accredited facility, Certified Related Facility, Society Partner, and Conservation Partner). When such individuals change circumstances, they must resign as SSP Coordinator or gain employment at an AZA member facility within 6 months.
    - The term "paid" refers to hourly or salaried. The intent of this requirement is to assure that each Program Leader is fully integrated with their facility, serves a vital and consistent role within the facility that is outside of their role as a Program Leader, and has the facility's full support to serve as a Program Leader. Payment of a minimal amount to a Program Leader who is no longer integrated with their facility outside of their role as Program Leader does not fulfill this eligibility requirement.
- Have an individual AZA membership.
- Be well versed in the biology and behavior of the species covered by the SSP Program.
- Be proficient in utilizing AZA web resources, including the internet, PMCTrack, and have email access.
- Have strong skills in organization, communication, facilitation, conflict resolution, and in establishing and maintaining effective working relationships with diverse groups of individuals.
- Provide a Statement of Commitment included in the SSP Coordinator Application.

Essential Position Functions

Population Planning

- Coordinate development and publication of an SSP BTP with the ***AZA Population Management Center (PMC)*** or a ***PMC Adjunct*** (see "Preparing for a Planning Meeting with the PMC").
- Publish a complete Breeding and Transfer Plan with the PMC or a PMC Adjunct typically every 3 years after initial Breeding and Transfer Plan publication.
- Work with the AZA Regional Studbook Keeper and the PMC or a PMC Adjunct, to publish an SSP Breeding and Transfer Plan as soon as possible after completing a planning session with the PMC or a PMC Adjunct.
- Communicate and collaborate with species managers from other zoo and aquarium regional associations on this SSP Program as needed for ***population sustainability***

Communication

- Communicate any SSP Program updates to the TAG Chair, including
    - Providing relevant information about the SSP
    - Provide updates on goals annually or when requested by the TAG
    - Share any concerns about the SSP Program or participants
- Contribute to the ***SSP Sustainability Report*** and assure that all information in the report is current and complete annually.
    - Work with the TAG Chair to assure that all goals in the SSP Sustainability Report are aligned with the TAG's RCP and TAG Annual Report.

  - Copy the TAG Chair on all proposed changes to the SSP Sustainability Report.
- Elect a Vice Coordinator (See page 18).
- Discuss with TAG leadership and/or IRs whether a management group is warranted/desired.
- If the program is part of a Global Species Management Plan (GSMP), guidelines for master planning and reporting must be followed as outlined in the Resource Manual for Global Species Management Plans:
  - If the GSMP breeding and transfer information is published in place of an SSP Breeding and Transfer Plan it must be published at least every 3 years, unless it is approved for a different time frame due to the species' natural history and/or WAZA accountability.
  - If the GSMP breeding and transfer information is published independently from the SSP Breeding and Transfer Plan, then the BTP must be published at least every 3 years.

Program Oversight

- Review the SSP's IR list on a regular basis, annually at minimum. This list should be used for all SSP communication. Contact ILs for those facilities that do not have a designated IR. IR lists can be downloaded on the SSP's Program page of the Animal Programs Database.
- Assess and address the wants and needs of AZA member facilities. Assure that all SSP Program participants have an opportunity to communicate their wants and needs in the planning process using PMCTrack.
- Assure that all ***Sustainability Partners*** in all SSP Programs have been reviewed and approved by the TAG Chair and the APM Committee ("Sustainability Partner Policy & Application"). Communicate to the AZA CMWS Department any IRs that should be assigned to SSP Programs for Sustainability Partners.
- Extend an invitation to a potential Sustainability Partner if the SSP wishes to include the facility in the Program and the facility is likely to pass the specific criteria in the Sustainability Partner application. Immediately communicate any violations in AZA's SSP Sustainability Partner Policy to the TAG Chair, the APM Committee Vice Chair of Partnerships, the APM Committee Vice Chair of SSPs & Studbooks, and the AZA CMWS Department.
- Respond to surveys and requests for information from the ***AZA Reproductive Management Center (RMC)***, as well as facilitate communication between the RMC and IRs when needed.
- Document issues related to IR or institutional ***accountability*** with respect to commenting on Draft and Final Breeding and Transfer Plans, and completing wants and needs surveys in PMCTrack. In addition, the SSP Coordinator should make the AZA CMWS Department and the APM Committee Chair aware of repeated events of poor IR or institutional accountability.
- Maintain detailed records, including institutional name, contact information, and Species360 mnemonics for each non-AZA member participating in SSP Programs.

- Attempt to reconcile any disagreements surrounding SSP recommendations through effective communication. Program Leaders should utilize their TAG Chairs, other Program Leaders, and the APM Committee to assist if needed. If disagreements cannot be reconciled, the SSP Coordinator must document the issue, communicate with the TAG Chair, and follow the AZA "Animal Management Reconciliation Policy".
- Apply for an AZA SSP Sustainability Award if there has been a significant increase in the SSP population's sustainability.

Administration

- Develop an appropriate Management Group if necessary (Required for Secure SSPs), and oversee the fulfillment of Management Group responsibilities.
    - If the SSP Program no longer requires an existing Management Group, the SSP Coordinator must explain the reasoning with the TAG Chair, and the TAG Steering Committee must approve the removal of the Management Group in its entirety.
- Assure that all Officers and Management Group members update their personal information to the TAG Chair and on the AZA website,
- Take an active role in assisting the TAG with completing the RCP and respond in a timely fashion to all requests from the TAG chair and/or Steering Committee for information and assistance.
- Send copies of all significant SSP Program documents to the AZA CMWS. Department and TAG Chair to be archived and posted to the Animal Programs Database (if applicable).
- Respond to inquiries from the AZA office, APM Committee, TAG chair and steering committee, PMC and RMC in a timely manner.
- Maintain regular contact with and respond in a timely fashion to inquiries/questions/ concerns from SSP Program members.
- Assure that the SSP Program adheres to the "AZA Communications Guidelines".
- Support the AZA Animal Welfare Committee with the development and updating of *Animal Care Manuals (ACMs)*.
- Support the AZA Ambassador Animal Scientific Advisory Group with the development and updating of ***Ambassador Animal Guidelines (AAGs)***.
- Understand that Program Leaders are not responsible for providing engineering advice or letters of endorsement to facilities designing new exhibits for your Animal Program species. Rather, it is the responsibility of those who are developing new exhibit designs to approach a range of AZA member facilities to learn about various specifications or sources regarding the species to be exhibited.

The SSP Coordinator *is encouraged to*:

- Actively advocate and develop sustained interest on the part of member facilities to participate in the SSP Program and build a sustainable population.
- Arrange at least one working SSP Program meeting each year, either in person or electronically through tele- or web-conferencing. If this meeting is in person, the SSP

Program is encouraged to hold the meeting in conjunction with the AZA Annual Conference and/or Mid-Year Meeting. Provide minutes from these meetings to the TAG.

- Create an AZA Network Group for their SSP to facilitate communication and serve as a repository for documents and information.
- Provide routine SSP Program updates to IRs.
- Serve on or as an Advisor to the appropriate TAG and attend relevant meetings.
- Maintain contact with counterparts in other regional zoo and aquarium associations to facilitate inter-regional cooperation, if applicable.
- Engage with the appropriate International Union for the Conservation of Nature (IUCN) Species Survival Commission (SSC) Specialist Group and other relevant organizations, if applicable.
- Delegate responsibilities to the SSP Vice Coordinator and Management Group, as appropriate.
- Complete the AZA Professional Development Courses "Population Management 1 (PM1): Data Management and Processing" and "Population Management 2 (PM2): Data Analysis and Breeding Recommendations."

Vice Coordinator
Position Overview
The Vice Coordinator is a required role for SSP Programs and is elected from the Management Group or IRs through a publicly disclosed process. If no one within the Management Group or the SSP Program's IRs applies for this position, then the SSP Coordinator may appoint an interested party. The SSP will then notify the TAG and AZA CMWS Department.

The Vice Coordinator's specific duties will be outlined by each SSP Program, but the primary role of the SSP Vice Coordinator is to assume leadership of the SSP Program should the SSP Coordinator be unavailable. It is presumed that if, for any reason, the SSP Coordinator must vacate the position, the SSP Vice Coordinator will assume all SSP Coordinator duties until a new SSP Coordinator is elected. Vice Coordinators are not automatically appointed as the SSP Coordinator upon an SSP Coordinator vacancy, they must apply via the SSP Coordinator selection process. Only one official Vice Coordinator may be appointed to the SSP.

Eligibility Requirements
The SSP Vice Coordinator *must*:

- Be a paid employee at an AZA member facility (AZA-accredited facility, Certified Related Facility, Society Partner, and Conservation Partner). When such individuals change circumstances, they must resign as Vice Coordinator or gain employment at an AZA member facility within 6 months.
- Have an individual AZA membership.
- Be well versed in the biology and behavior of the species covered by the SSP Program.

- Uphold SSP business confidentiality.
- Have proficiency in utilizing AZA web resources, including PMCTrack, and the internet, and have email access.
- Have strong skills in organization, communication, facilitation, conflict resolution, and in establishing and maintaining effective working relationships with diverse groups of individuals.
- Provide a "Statement of Individual Commitment".
- Provide a "Statement of Institutional Support" from their employer.

Essential Position Functions

- Assume all Coordinator duties if Coordinator is unavailable, or the Coordinator position is vacant.
- Attend TAG and SSP Program meetings, whenever possible.
- Respond to inquiries from the IRs, TAG, and AZA office in a timely manner.
- Assist the SSP Coordinator in supporting the SSP Program and building a sustainable population.
- Assist the Coordinator with filling the Secretary and Treasurer, or Management Group (if applicable) positions if vacant.

Secretary

Position Overview

If the SSP Program determines that a Secretary is needed to record and manage the SSP Program's details, the Secretary is elected from the IRs through a publicly disclosed, democratic process. The SSP Coordinator or Vice Coordinator may fulfill the role of Secretary, if necessary. In the event that a Secretary cannot be identified from within the Management Group membership, an IR may be appointed Secretary, but will not be allowed to vote as a Management Group member. The Secretary keeps a written record of the SSP Program's elections, votes and formal meetings, and communicates these records, and any programmatic changes to the TAG, the APM Committee, and the AZA CMWS Department.

Eligibility Requirements

The Secretary *must*:

- Be a paid employee at an AZA member facility (AZA-accredited facility, Certified Related Facility, Society Partner, and Conservation Partner). When such individuals change circumstances, they must resign as Secretary or gain employment at an AZA member facility within 6 months.
- Have an individual AZA membership.
- Uphold SSP business confidentiality.
- Have proficiency in word processing and spreadsheet programs, utilizing AZA web resources, and have email access.
- Have strong skills in organization, communication, and in establishing and maintaining effective working relationships with diverse groups of individuals.
- Provide a "Statement of Individual Commitment".
- Provide a "Statement of Institutional Support" from their employer.

Essential Position Functions

- Attend all TAG and SSP Program meetings, when possible.
- Respond to inquiries from the IRs, TAG, and AZA office in a timely manner.
- Post all issues held to a vote within the SSP Program on the SSP's listserv, SSP Network Group, AZA website, etc.
- Distribute all Officer nominee applications to the Management Group, or if there is no Management Group, to the IRs.
- Oversee and mediate all components of issues and elections held to a vote within the SSP Program, including the issue and/or election, the voting record, and the outcome.
- Record and archive the results of all issues held to a vote within the SSP Program and submit them to the SSP Coordinator.
- Record, report, and archive IR responses to SSP related requests.
- Record, archive, and submit minutes from significant SSP Program meetings to the SSP Coordinator.
- Keep all application materials, statements of individual support, etc. on file.
- Communicate all programmatic changes (e.g., Program Leader, Officer, Management Committee member, Advisor, SSP Program designation, etc.) for the SSP Program to the TAG Chair and AZA CMWS Department.

Treasurer

Position Overview

If any financial components are incorporated into the SSP Program, a Treasurer should be elected from the Management Group through a publicly disclosed, democratic process. The SSP Coordinator or Vice Coordinator may fulfill the role of Treasurer, if necessary. In the event that a Treasurer cannot be identified from within the Management Group membership, an IR may be elected Treasurer but will not be allowed to vote as a Management Group member. Treasurers collect, disperse, and archive written records of all financial transactions. Treasurers also coordinate and manage AZA designated fund accounts.

Eligibility Requirements

The Treasurer *must*:

- Be a paid employee at an AZA member facility (AZA-accredited facility, Certified Related Facility, Society Partner, and Conservation Partner). When such individuals change circumstances, they must resign as Treasurer **or** gain employment at an AZA member facility within 6 months.
- Have an individual AZA membership.
- Uphold SSP business confidentiality.
- Have proficiency in word processing and spreadsheet programs, and have email access.
- Have strong skills in organization, communication, and in establishing and maintaining effective working relationships with diverse groups of individuals.
- Provide a "Statement of Individual Commitment".
- Provide a "Statement of Institutional Support" from their employer.

Essential Position Functions

- Apply for and manage the SSP Program's Dedicated Fund in compliance with "AZA's Management Guidelines for AZA Dedicated Funds" if appropriate.
- Respond to inquiries from the TAG and AZA office in a timely manner.
- Attend all TAG and SSP Program meetings, when possible.

Management Group

Overview

An SSP Management Group is composed of the Coordinator, Vice Coordinator, AZA Regional Studbook Keeper, elected members and advisors. The SSP Program may find it useful to create a larger Management Group to assist in sharing the SSP Program's workload and to allow the AZA member facilities greater input into the SSP Program's management. The Management Group serves as the voting body for SSP Program business and all members are integrally involved in the SSP Program appointments, publications, and meetings. Each SSP Program should determine the Management Group's size (suggested ideal is 7 individuals with a maximum of 15 individuals), structure, and administrative responsibilities (e.g., election terms, term limits, duties). Management Group members must be elected from the SSP Program's IRs.

Eligibility Requirements

Members of the Management Group *must*:

- Be a paid employee of their facility
- Uphold TAG business confidentiality.
- Have proficiency in utilizing AZA web resources and the internet, and have email access.
- Have strong skills in organization, communication, facilitation, conflict resolution, and in establishing and maintaining effective working relationships with diverse groups of individuals.

Essential Position Functions

- Contribute to the development of the SSP Breeding and Transfer Plan
- Vote in all elections and issues brought to a vote.
- Attend TAG and SSP Program meetings, whenever possible.
- Inform the SSP Coordinator of any problems or issues within the Management Group.
- Contribute to and review the final draft of the ACM for the species represented by the SSP Program. This includes garnering information regarding ecology, nutrition, reproduction, behavior, etc., and conducting a complete literature review to incorporate the most recent scientific information, and working with the TAG, if applicable, to identify the required external reviewers.
- Provide and update general SSP information for the public pages of the AZA website upon request.
- Respond to inquiries from the IRs, TAG, and AZA office in a timely manner.

Members of the Management Group are *encouraged* to:

- Solicit additional Management Group members to reach the Group's ideal capacity (7-15 individuals).
- Solicit new Management Group members to replace retired Management Group members.
- Implement a Program Leader Training and Mentoring Plan to help new incoming SSP Officers, Studbook Keepers, Management Group members, and IRs become familiar and comfortable with their responsibilities, especially with respect to building sustainable populations.
- Identify, assist, and provide, if appropriate, financial support for ***in situ*** and ***ex situ*** research related to the SSP Program.
- At the request of the TAG, provide expert review of ***Conservation Grants Fund (CGF)*** proposals directed to the SSP Program.

Election Processes

SSP Coordinators are elected by their TAG's Steering Committee (if the TAG has a current, approved RCP) or by the APM Committee (if the TAG does not have a current, approved RCP or lacks a TAG Chair). SSP Officers and Management Group members are elected from the SSP Program's IRs. There are no SSP mandated term limits for SSP Officers or Management Group members. SSP Programs may determine whether to impose term limits on their Management Group members. All facilities are able to participate in the SSP Program through their IRs.

SSP Coordinator vacancies must be announced in the monthly Animal Programs Update and are available on the Current Program Leader Vacancy page if they are not filled after the required 30-day posting.

SSP Coordinator

- Individuals interested in becoming an SSP Coordinator should consult the appropriate TAG Chair. If no TAG Chair exists, or the TAG does not have a current, approved RCP, interested individuals may consult the AZA CMWS Department for advice on becoming an SSP Coordinator.
- Applicants for the position of SSP Coordinator must submit an "SSP Coordinator Application", a "Statement of Individual Commitment" and a "Statement of Institutional Support".
- All SSP Coordinator applications should be submitted directly to the TAG Chair, if the TAG has a current, approved RCP. If the TAG's RCP has not been approved or is not current, or there is no TAG Chair, SSP Coordinator applications should be submitted to the AZA CMWS Department.
- TAG Chair contact information can be found on the TAG's Animal Program page, or on the AZA website.

Officers

- The SSP Coordinator will distribute a call for interest to the SSP Management Group, or to the IRs if there is no Management Group, to obtain a list of nominees for vacant Officer positions (except that of SSP Coordinator and Studbook keeper).
- Nominees for Officer positions must submit a "Statement of Individual Commitment" and a "Statement of Institutional Support" to the SSP Secretary (or the SSP Coordinator if the SSP Program does not have a Secretary) who will distribute the application to the Management Group, or if there is no Management Group, to the IRs.
- Elections, using an open democratic process, will be held if more than one Management Group member, or IR, is interested in the same Officer position.
- The SSP Coordinator will communicate the new appointment decision to the applicant, the rest of the applicant pool, and the AZA CMWS Department.

Management Group Members

- The SSP Coordinator will send a request for Management Group nominees to all of the SSP Program's IRs if the Officers determine that a Management Group is necessary.
- Elections, using an open democratic process, will be held if the number of interested IRs exceeds the number of Management Group positions available.
- The Management Group may fill a vacated position by either holding a new election or appointing the IR who received the highest number of votes among the nominees not selected in the previous election.
- An IL may be involved with the Management Group as a non-voting member if an IR at the same facility is in the Management Group. There may only be one vote per facility.

AZA Regional Studbook Keeper

- Ideally, the SSP Coordinator or SSP Vice Coordinator is also the AZA Regional Studbook Keeper for the SSP Program.
- Individuals interested in becoming an AZA Regional Studbook Keeper should communicate with the TAG Chair, or review published RCPs to determine priority species.
- If the TAG does not have a current, approved RCP, or there is no TAG Chair, interested individuals should consult the AZA CMWS Department for advice on acquiring an AZA Regional Studbook for a taxon of interest.
- All AZA Regional Studbook Keeper applications (See AZA Regional Studbook Keeper Handbook) should be submitted directly to the TAG Chair if the TAG has a current, approved RCP. If the TAG does not have an approved RCP, or there is no TAG Chair, applications should be submitted to the AZA CMWS Department.

Liaisons & Representatives

APM Committee TAG Liaison

Position Overview

The ***APM Committee Liaison*** is a member of the APM Committee who serves as the primary contact between the APM Committee and the Chair of the TAG(s) to which they have been assigned. The TAG should maintain consistent and open communication with their APM Committee Liaison. This will facilitate the Liaison in assisting the TAG during all RCP and accountability processes, and acting as a resource for TAG Program Leaders regarding APM Committee guidelines. The APM Committee Liaison will assist the TAG, and all SSP Programs within its purview, as needed.

Advisors

Position Overview

Advisors, often members of corresponding SAGs, play a critical role in advising, designing, and executing management decisions within AZA Animal Programs. If a member of the Management Group has the appropriate expertise in an advisory area, then they may serve as that Advisor. SSP Programs are encouraged to fill as many Advisor positions as appropriate for their SSP Program in order to implement superlative management initiatives. Advisors do not need to be employed by an AZA member facility. And changes to Advisors must be communicated to the APM Committee and AZA CMWS department through the TAG Annual Report.

Advisors do not vote in elections or on TAG issues unless they also serve as an IR or a member of the SSP Management Group.

Potential Advisor

- Ambassador Animal
- Animal Welfare
- Biomaterials Banking
- Behavior
- Contraception'
- Date and Record Keeping
- Education
- Endocrinology
- Epidemiology
- Field Conservation
- Genetics
- Government Affairs
- Green Practices
- Horticulture
- Husbandry
- Life Support Systems
- Nutrition
- Pathology
- Population Biology
- Public Relations
- Registrar
- Reintroduction
- Research
- Reproduction
- Water Quality
- Welfare
- Veterinary

Position Functions

- Advise the SSP in their efforts to identify, develop and implement Animal Program goals, as applicable.
- Work with the SSP Programs and provide input on the SSP Sustainability Reports.
- Provide content for AZA taxa-related stories of interest related to the Advisor's area of expertise.
- Provide expert advice regarding any topics, research proposals and inquiries related to the Advisor's area of expertise.
- Provide input on relevant Animal Care Manuals and Ambassador Animal Guidelines as requested.
- Uphold SSP Program business confidentiality.
- Assist in the development of education materials related to the Advisor's area of expertise.
- Assist with the development of research projects related to the Advisor's area of expertise.
- Assist the SSP Program and TAG in reviewing taxa-related CGF grant proposals as requested.

The AZA Population Management Center (PMC)

The AZA PMC, hosted by the Lincoln Park Zoo in Chicago, Illinois, was established in 2000 to provide scientific guidance to AZA Program Leaders by conducting demographic and genetic analyses and preparing Breeding and Transfer Plans with SSP and SAFE Programs. The AZA PMC also includes Adjunct Population Biologists based at and supported by various AZA-related facilities. For more information on the PMC, Adjuncts, and its role in AZA Animal Programs see the TAG and AZA Regional Studbook Keeper Handbooks as well as the SAFE Handbook.

AZA PMC Functions

PMC staff provide many services for AZA Animal Programs including:

- Producing Breeding and Transfer Plans (BTPs) with all SSP Programs and those SAFE Programs that are approved to receive this support
- Researching unknown or partially-known pedigrees
- Creating analytical assumptions for AZA Regional Studbooks
- Conducting and/or supporting population biology-related research
- Supporting software development to improve methods of population management
- Advising on data conventions and entering abnormal data
- Troubleshooting problems with population management software (e.g., PopLink, PMx, ZIMS for Studbooks, PMCTrack).
- Maintaining the Survival Statistics database and AZA web page.
- Supporting International Studbook Keepers GSMPs with Conveners based in the AZA region
- Teaching AZA Program Leaders in AZA Population Management I and II courses
- Assisting AZA Regional Studbook Keepers with AZA Regional Studbook publication
- Assisting with SSP Assessments as part of the TAG's RCP process

AZA PMC Animal Program Population Biologists

AZA Animal Program Population Biologists fall into two APM Committee approved categories:

- PMC Population Biologists are employed by and working at the AZA Population Management Center at Lincoln Park Zoo.
- PMC Adjunct Population Biologists are trained by the PMC, have a signed MOU with the PMC and AZA office, and should be paid employees at an AZA member facility (AZA-accredited facility, Certified Related Facility, Society Partner, and Conservation Partner). Most often, Adjuncts are responsible for advising the AZA Animal Programs that have Program Leaders (PLs) based at their supporting facility/facilities. There are a few exceptions to this, which must be discussed with and approved by both the Adjunct's supervisor and AZA PMC Director.

The AZA PMC Director is responsible for assigning and reviewing AZA Animal Program advising assignments for all Population Biologists. These assignments always consider:

a) SSP or SAFE Coordinator's hosting facility and if this is an Adjunct's supporting facility
b) Studbook Keeper's hosting facility and if this is an Adjunct's supporting facility
c) Adjunct existing agreements with their supporting facilities
d) Population Biologist's experience and history with the SSP or SAFE Program and TAG
e) Population Biologist's experience and history with the taxonomic group
f) Population Biologist's experience with any other specific factors for the SSP or SAFE Program (e.g., reintroduction species, conducting molecular genetics research)
g) Population Biologist's time availability within their schedule as well as during the timeframe in which the SSP or SAFE Program needs advising

If a Program Leader wants to change Population Biologists, the Program Leader is encouraged to first have a one-on-one conversation with the Population Biologist and if needed, reach out to the AZA PMC Director for additional discussion. These requests will be carefully considered, mediation used if necessary, and additionally include all the same variables listed above. More information on the PMC can be found on the PMC page of the Lincoln Park Zoo website or the AZA website.

The AZA Reproductive Management Center (RMC)

The mission of the AZA Reproductive Management Center (RMC) is to provide science-based information to AZA facilities on reproductive management to support animal population viability and sustainability. The RMC includes scientists, veterinarians, and animal managers with research and management expertise in wildlife contraception as well as methods for improving reproductive success. The AZA RMC and the EAZA Reproductive Management Group, our European counterpart, jointly manage a Contraception Database which contains over 50,000 records of animals treated with contraception. The RMC uses these data to make taxon- and species-specific contraceptive recommendations and provide advice on the safety, effectiveness, and reversibility of these contraceptive products. AZA institutions can use these recommendations to make informed decisions on how to sustainably manage their animal collections. Contraception is an essential, proven, and humane tool for reproductive management

while still allowing individuals to live in natural social and family groups. It allows managers to maximize available space by preventing births from animals that are not high priorities for breeding or animals that are not currently recommended for breeding, but will be in the future. Contraceptive recommendations are available at the Saint Louis Zoo website.

The RMC also organizes workshops, creates demonstration videos, and carries out research projects on topics related to increasing reproductive success, addressing infertility and mate compatibility, as well as contraception. We carry out Reproductive Viability Analyses (RVAs) that seek to identify what inherent biological and reproductive characteristics of animals in breeding pairs and the pairs themselves correlate with successful reproduction. We also collaborate with SSP Coordinators to carry out a variety of multi-institutional research projects focused on contraceptive efficacy and/or reversibility, reproductive suppression, and reproductive health.

The RMC relies on feedback from the zoo community to improve reproductive management. While safety and efficacy are vital components of a contraceptive suitable for zoo animals, reversibility is the third integral element that has far-reaching consequences for sustainable population management. The RMC's goal is to produce reversibility data for different contraceptives so that managers are well-informed and know what to expect from a particular product. These are often the most challenging data to collect because pregnancies and births can occur years after treatment or at a different facility than the one at which the contraceptive was administered. It is essential that details be reported, not only during treatment to obtain efficacy parameters, but also after treatment is stopped and breeding is desired. The RMC asks that animal managers notify the vet staff or whomever is responsible for updating the contraception website at their institution to let us know when animals are given mate access following contraception and when births occur throughout the year so they can use this information to update to the contraception website. The RMC can be reached by emailing contraception@stlzoo.org.

Sustainability Criteria

SSP Programs operate within three designations: Provisional SSP Programs, Signature SSP Programs, and Secure SSP Programs. An Animal Program's Sustainability Criteria (e.g. population size, number of participating AZA member facilities, and projected gene diversity) directly affect its management designation. These criteria are explained below.

Eligibility Criteria

Populations must meet the initial criteria below to be considered for SSP designation:

1. The majority of the managed population (>50% of individuals) is housed at AZA member facilities.
2. The program is not externally managed, which includes any cooperatively managed program where final approval of breeding, transfers, husbandry, or reintroductions of animals managed in AZA facilities falls to or is made in partnership with an external entity.
3. Breeding exceeds acquisitions from non-AZA sources over the last five years or generation length, whichever is longer.
4. The species is held in at least 15 AZA facilities

If a Program meets the criteria above, the SSP Assessment Worksheet will be completed and evaluated. Programs that do not meet all the criteria above may be considered for Provisional SSP status if there is strong TAG support and evidence of positive future direction. Changes in SSP designation will be considered only during the RCP approval process.

SSP Management Designations

SSPs will fall into one of the following categories:

- Provisional SSP: Populations that have the potential to meet the criteria and be sustainable will be given 5 years to develop goals and make significant progress. If those goals are met, the program will become a Signature SSP. If the goals are not met, the program will be reevaluated for the next RCP cycle.
- Signature SSP: Populations that meet the criteria and will be sustainable for the long term will be designated Signature SSPs.
- Secure SSP: Programs that meet the criteria for Signature SSP may be considered for Secure SSP. These are programs that we are relatively certain will still be present in AZA facilities in 100 years as a robust, viable, healthy, biologically sound population.

Signature SSP Programs

- Include an SSP Coordinator, Vice Coordinator, and Studbook Keeper
- Publish at least one Breeding and Transfer Plan every 3 years with the PMC or designated PMC Adjunct
    - Changes in planning frequency must be discussed with the PMC or designated PMC Adjunct and approved by the TAG chair.
- Publish an Animal Care Manual
- Utilize PMC Track for surveys and fulfillment tracking
- Adhere to Responsible Population Management Policy

- Adhere to Responsible Full Participation Policy
- Adhere to Responsible Sustainability Partner Policy
- Adhere to Animal Management Reconciliation Process Policy

Provisional SSP Programs

- Meet all Signature requirements above
- Develop timeframes and measurable outcomes to meet criteria for Signature SSP

Secure SSP Programs

- Meet all Signature requirements above
- SSP Coordinators must attend Population Management II course
- Form a Secure Species Management Committee (SSMC) that includes the SSP coordinator, the CMWS representative, the relevant APMC TAG liaison, the TAG Chair, plus three elected SSP IRs for a total of seven members.
    - If the studbook keeper and SSP coordinator are not the same person then the studbook keeper should be included as one of the three IR positions.
- Publish a management strategy that includes Full Participation requirements, which may include requirements for facilities, number of animals held, or required roles. These requirements may be included in the ACM or as a separate publication.

Secure SSP Requirements

A Secure SSP is a species we can be reasonably certain will still be present in zoos and aquariums in 100 years in a robust, viable, healthy, biologically sound population. Part of this certainty includes evidence that AZA facilities will continue to dedicate the resources and expertise to maintaining these populations. Requirements will be further developed and announced as early as 2023.

Animals Declared Out of the SSP

Some animals in the SSP population, due to their age, reproductive status, or other demographic, genetic characteristics, institutional needs, or global ex situ population management may be deemed Out of the SSP population and excluded from genetic analyses during population planning.

- The SSP Program must document all decisions to designate an individual animal as Out of the SSP population in the BTP. SSP Coordinators should communicate with facilities housing any animals that are designated to assure mutual understanding.
- In some cases, animals may be sent out of the SSP population to another regional association in order to facilitate global population goals, but individuals should be selected so that any negative impact on the SSP is minimized and both populations are mutually benefited

Government Owned Species
Species whose final approval of breeding, transfers, or husbandry is dictated by an external entity such as a government agency are not eligible to be SSP Programs.

Assessment and Accountability

SSP Programs should regularly assess the status and performance of its Officers, Management Group members, IRs, ILs, and other SSP Program participants within its purview. Accountability guidelines will be updated in 2023.

Management Group Assessment

- SSP Coordinators should regularly communicate with their Officers, Management Group, Advisors, IRs, ILs, and the TAG regarding accountability deadlines, SSP Program management changes, policy guidelines, publications, population planning, etc. The Management Group may remove Management Group members if they do not adequately and/or appropriately perform their duties. The AZA CMWS Department, the APM Committee Vice Chair of TAGs, VC of SSPs, and the TAG Chair are available to provide assistance with SSP Program participant performance issues.
- TAG Chairs with current, approved RCPs have the authority to remove SSP Coordinators and AZA Regional Studbook Keepers who do not fulfill their Animal Program responsibilities. Any such action should be reported to the APM Committee Vice Chair of TAGs and the AZA CMWS Department.

Institutional Assessment

- The SSP Program should assess the status and performance of the facilities participating in its SSP Program.
    - Animal Programs should report any concerns regarding institutional participation to the APM Committee and through the biannual requests during accreditation periods.
- The SSP Program should track IR and IL responses or lack of responses to all information requests, and include this information in an appendix in their Breeding and Transfer Plan
- The "AZA Policy for Full Participation in the SSP Program" is required of all AZA member facilities caring for species designated SSP Programs. TAG Chairs are responsible for arbitrating any full participation issues brought to their attention by their SSP Programs in effort to reach a mutually agreeable resolution.
    - The SSP Coordinator must discuss any potential issues or concerns related to facility participation or communication to the TAG Chair, who will then discuss with the APM Committee Vice Chair of TAGs, Vice Chair of SSPs, and the APM Committee Liaison, and/ or a representative from the AZA CMWS Department. Any concern submitted should include a detailed history of the issues, with specific examples, and a timeline. Any concerns reported will be shared with the Accreditation Commission, the Animal Program Management Committee, and the institution if deemed necessary.
    - If a resolution cannot be obtained through this method, either party or the APM Committee may initiate "AZA's Animal Management Reconciliation Process Policy".

Cooperating with WAZA Recognized Regional Associations

- It is important to cooperate with World Association of Zoos and Aquariums (WAZA) and other regional zoo and aquarium associations (e.g., the European Association of Zoos and Aquaria (EAZA), the Canadian Association of Zoos and Aquariums (CAZA), the Zoo and Aquarium Association (ZAA in Australasia)) as Animal Programs strive toward sustainability.
- SSP Programs must work closely with their TAG as they pursue international relationships with these other regional zoo and aquarium associations.
- For some Animal Program populations, management at the regional level (solely within one regional association, e.g., AZA) may be sufficient to achieve the Animal Program's goals.
- Program Leaders are encouraged to consistently communicate with their regional counterparts as needed, and assure that the TAG's members, APM Committee Liaison, and the AZA CMWS Department are kept informed about such discussions.
- The AZA PMC is available to assist with questions relating to multi-regional population management (e.g., assessing genetic and demographic status of regional populations, discussing potential value of global management, combining databases, selecting animals for transfer between regions).
- The AZA CMWS Department and the TAG's APM Committee Liaison are available to assist Program Leaders in developing these relationships, if necessary.

Global Species Management Plans (GSMPs)

The AZA and other WAZA member regional zoo and aquarium associations have collectively identified addressing the sustainability of animal populations as a top priority. Thus, we seek to maximize the collective impact of our efforts in building the long-term sustainability of wildlife populations by working together in a manner that builds upon, respects, and optimizes existing regional processes and furthers science-based, inter-regional collaboration. For some Animal Programs forming an official WAZA ***Global Species Management Plan (GSMP)*** may be appropriate. The WAZA Committee for Population Management (CPM) is established to advance these relationships and collaborations in professionally managing species in zoos and aquariums globally. One way in which the CPM does this is through coordinating, administering, and overseeing GSMPs. Guidelines and resources for GSMPs can be found in the GSMP Resource Manual.

Sustainable Populations through Responsible Partnerships

AZA Animal Programs focus on select species through cooperative management of small populations at AZA-accredited zoos and aquariums and Certified Related Facilities (CRFs). These facilities undergo a thorough accreditation review process that includes the submission of an extensive application as well as an intensive, on-site inspection by a team of experts to assure the highest standards of animal care and management are met. Additionally, the facilities have access to members-only resources through the AZA Population Management Center, AZA Reproductive Management Center and the AZA office.

AZA Animal Programs can benefit from responsible partnerships with individuals, facilities, or organizations outside of AZA in the form of expertise, space, and other various resources.

Animal Program Roles, Goals, and Essential Actions

Animal Program Role

The SSP may work with the TAG to identify an Animal Program species' role(s) in zoos and aquariums, if desired. Rather than choose from a set list of possible roles, SSPs are encouraged to use narrative to describe the role(s) of the population. For example, "Eld's deer serve a role in AZA of highlighting Asian deer biodiversity, spotlighting zoo-supported conservation efforts, and as a source of animals for reintroduction in the future". These roles are included in the Roles and SMAART goals table for each SSP (see RCP template) and should also be described for each species on its optional species information sheet in the RCP.

Setting Goals for your SSP Program

The TAG will work with the SSP Coordinator to set at least three SMAART goals (see table below and the tutorial on Setting SMAART goals) for each SSP Program within its purview.

A SMAART goal explains a behavior using the following components:

Specific	A SMAART goal identifies a specific action or event that will take place.
Measurable	The description of a SMAART goal will allow you to determine your progress towards completion, and let you know when you are finished.
Achievable	A SMAART goal should be achievable given available resources.
Agreed-upon	A SMAART goal should encourage collaboration and cooperative ownership of plans.
Realistic	A SMAART goal should require you to stretch some beyond your normal routine and regular abilities, but allow for likely success based on your skills, resources, and the time available.
Time	A SMAART goal should state the specific time period in which it will be accomplished.

The TAG and SSP Coordinator will prioritize each Animal Programs' top three goals and include these in the SSP Role and SMAART Goals Table (see RCP template). These goals may also be summarized in paragraph form within the RCP in the species information pages if more space is necessary.

The first and second goals for the populations must relate to efforts to improve or maintain the population's viability and sustainability (e.g., increasing or minimizing the loss of gene diversity, increasing space, solving husbandry challenges through staff training or research). The third goal may focus on additional activities (e.g., creating educational materials, generating funds for field conservation, creating/updating Animal Care Manuals). Goals may NOT include activities that are simply requirements of the program (e.g., updating a studbook, creating a Breeding and Transfer Plan, attending PMI or PM II courses). Goals that do not meet the SMAART format will not be accepted and require revision in the RCP. Note: The Time-bound element of SMAART goals for Provisional SSPs should not exceed 5 years, or one RCP cycle.

Provisional SSP Goals

Provisional SSP goals must focus on the areas of the assessments (genetics, demography, husbandry, and space and interest) to meet Signature SSP status. The SSP Coordinator should work with the TAG and APMC Liaison to develop goals. Timelines for goals should conclude no

later than three months prior to the RCP publication. Timelines beyond the RCP cycle will be considered if warranted by the species life history (i.e. animals with long generation times).

Chapter 4. Breeding and Transfer Plans

Overview

The goal of a Breeding and Transfer Plan is to transparently document and share the collaborative management strategies to maintain a healthy, genetically diverse, and demographically stable *ex situ* population of a particular species among AZA member facilities. In order to assure the production of an effective Breeding and Transfer Plan, the SSP Coordinator must work with the AZA PMC or PMC Adjunct to conduct a planning meeting to discuss and document the current demographic and genetic status of the population, SSP management designation and strategies, and recommend breeding pairs/groups and transfers.

Preparing for the PMC Planning Meeting

Scheduling the PMC Meeting

- All SSPs will be assigned a planning date, at least six weeks in advance of that date.
- The PMC may be able to provide informal assistance for Animal Programs in need of advice outside of scheduled formal planning dates. See "Interim Population Recommendations" below for more information.
- Animal Programs that have not scheduled planning meetings but need population management assistance should contact the PMC Planning Coordinator (PMC@lpzoo.org) to schedule a future planning date. Populations that have never been planned should contact the PMC as soon as possible.
- The SSP Coordinator must notify all people involved (e.g., SSP Vice Coordinator, AZA Regional Studbook Keeper, Management Group members, and IRs) of the planning meeting date and their responsibilities prior to meeting with the PMC.
- All IRs must participate in the planning process, via communicating/responding to emails from the PLs, completing PMCTrack surveys, to increase institutional support and the effectiveness of the Breeding and Transfer Plan. SSP Coordinators are encouraged to reach out to their IRs and invite them to the planning meetings.
- PMC planning meetings may be conducted electronically (conference calls, internet conferencing) or in person (typically at Lincoln Park Zoo, the AZA Annual Conference or the AZA Mid-Year Meeting).

The PMC Planning Meeting

Materials Required Prior to the PMC Planning Meeting

There are five types of materials that the SSP Program must compile and submit to the PMC in preparation for a scheduled planning meeting (See PMC Planning Process Timeline). The PMC will work with the SSP Program to set deadlines by which each of these materials must be received by the PMC so that they can prepare for the planning meeting (for more guidance, visit: http://www.lpzoo.org/population-management-center).

These materials include:

1. An **AZA Regional Studbook database** for the SSP Program species containing all the currently living animals and their ancestors. The PMC Planning Coordinator will run data validation software or will validate the submitted data to assist AZA Regional Studbook Keepers in preparing for the meeting. Studbook Keepers should assess the validation provided by the Planning Coordinator and make updates to the Studbook accordingly. The

PMCTrack Coordinator will use the studbook to validate the SSP Program's AZA IR list to make sure the list of IR contacts for the planning process is accurate, calculate the recommendation outcomes, and populate information in the PMCTrack surveys.

2. APM Committee requires two PMCTrack Surveys as a method to collect a **list of institutional wants and needs** from all current or future holders of that SSP Program's species and better **understand why previous recommendations were not fulfilled.** PMCTrack's standardized surveys collect information on exhibits, holding facilities, breeding capabilities, or social groups, if applicable, and make it easy to summarize specific requests for breeding, holding, placing, or receiving animals. IDs of animals should be included when relevant. See section regarding PMCTrack below for more information. Please note that in rare cases SSP Programs may be able to receive an exemption from using PMCTrack but they must contact the APM Committee prior to beginning the pre-planning process with the PMC.
3. A **list of animals to be excluded** from the potentially breeding population and the reason (e.g., age/post-reproductive, permanent sterilization); this information is collected in PMCTrack's wants/needs survey, but the SSP Coordinator should summarize and organize it.
4. A **list of potential pedigree assumptions** for those animals with unknown parentage (if applicable).

If the SSP Coordinator fails to meet the deadlines mutually agreed upon with the PMC, the PMC may cancel the meeting and reschedule for a time when the SSP Program is better prepared. If deadlines are not met, and the meeting is canceled, the PMC cannot guarantee a new planning date. The PMC will contact the TAG Chair and APM TAG liaison to inform them of the situation. Repeated lack of preparedness may result in an SSP Coordinator's removal from their position by the TAG Steering Committee.

PMCTrack

PMCTrack (https://www.PMCTrack.org) is a web-based resource for SSP Coordinators who are preparing to plan with the PMC. SSP Coordinators automatically receive a log-in to access data specific to their SSP Program and are expected to use the site's Wants/Needs and Outcomes surveys and interim recommendations feature. Instructional videos on how to use these features are available here: https://www.aza.org/online-training-modules.

SSP Coordinators are required to use PMCTrack to:

- See where the SSP Program is in the PMC planning process, as well as viewing information about their program's management history
- Enter interim recommendations in-between planning sessions. Continue to communicate with your facilities and advisor to determine your interim recommendations and then use PMCTrack to formally document them and send the recommendation to the participating parties. If interim recommendations were not input into PMCTrack at the time that they were issued, then remember to enter them into PMCTrack before you confirm that your studbook is up-to-date during the pre-planning period.
- Review the outcomes on dashboard graphs and/or in reports for all recommendations (Breed With, Do Not Breed, Send To, Hold). Outcomes are data on whether previous recommendations occurred as requested in past breeding and transfer plans or were

attempted by facilities; these data can be used to better understand SSP management challenges and evaluate current breeding situations before planning

- Use two standardized surveys to collect pertinent information needed for planning with automated reminder emails to encourage survey participation by IRs. Wants/Needs surveys are sent to all designated Rs for your SSP to gather information about each holding facility's needs for the species. Outcomes surveys are only sent to IRs if a breeding or transfer recommendation is not fulfilled according to the studbook; they solicit reasons about why the recommendation was not completed or how the facility attempted to complete the recommendation.

PMCTrack will help SSP Coordinators prepare for planning with the PMC, communicate with IRs, respond to problems completing plan recommendations, and will help to improve the planning and management processes over time for AZA Animal Programs. SSP Coordinators can log-in to PMCTrack at any time, but will most frequently utilize it when preparing for planning with the PMC.

For more information, contact PMCTrack@lpzoo.org.

Key Elements Produced in the Breeding and Transfer Plan

The PMC will work with the SSP Coordinator, other Animal Program participants, and their RMC Advisor (if necessary), throughout the course of the planning meeting to produce a Draft Breeding and Transfer Plan. This Draft will be AZA branded, structured to meet a standardized format and will include:

- A cover page with essential information such as the species common and scientific names, SSP Coordinator name and contact information, Studbook Keeper name and contact information, picture of the SSP species, date through which the data are current, and name of the PMC Advisor.
- A Table of Contents.
- A list of participating facilities with their corresponding IRs and Species360 mnemonics. This section must identify if the participant is an approved Sustainability Partner.
- A genetic and demographic status summary of the population. Specific items to be included will be determined by the PMC Advisor but should include any assumptions made for the analyses.
- Animal-By-Animal Recommendations. The Breeding and Transfer Plan must include a list of the recommended actions for each individual animal or groups of animals in the population. These recommendations will consider genetic and demographic factors, social, nutritional, behavioral, and medical concerns, practical day-to-day animal management considerations, and the wants and needs of the facilities.
- A general description of the SSP Program, identification of the SSP Program Officers, Management Group members, and Advisors, and a summary of the SSP Program's priorities and activities.

Reviewing the Draft Breeding and Transfer Plan

Upon completion of the draft BTP, the PMC will post it on the AZA Animal Program webpage for 30 days and email the draft to IRs. This process is specifically designed to assure that all facility IRs view, fully comprehend, and provide feedback on the Draft Breeding and Transfer Plan recommendations before they are finalized. The IR must communicate any recommendations affecting their facility's population to their IL and Director, and is required to provide feedback and address questions or concerns about these recommendations to the SSP Coordinator during the comment period. Lack of feedback from an IR will be interpreted as the facility's full acceptance and agreement to the recommendations presented in the Draft Breeding and Transfer Plan.

The following steps are vital to the review process:

- An automated email will be sent to all SSP Program designated IRs to inform them that the Draft Breeding and Transfer Plan is available for review.
- The IRs will have 30 days to provide feedback and address questions or concerns about the recommendations made in the Breeding and Transfer Plan with the SSP Coordinator.
- The SSP Coordinator must respond to IR comments promptly and then address them soon after the 30-day comment period ends.
- The SSP Coordinator may wish to notify the IL if an IR does not respond to the Draft Breeding and Transfer Plan within three weeks after the draft BTP is distributed. If the IR or IL does not respond within the next seven days, the SSP Coordinator may wish to notify the institutional Director.
- SSP Coordinators are responsible for tracking and reporting the response (or lack of response) and feedback provided by the IRs for their Breeding and Transfer Plans.
- If a particular IR is repeatedly unresponsive, the SSP Coordinator should inform the IL of the potential problem. If it is deemed that the IR is not fulfilling their obligations, it is the IL's responsibility to contact the IR and inquire about the status of the delinquent duty. The IL will work with the IR and the SSP Coordinator until responsibilities are met.
- If the IL fails to properly oversee the completion of the SSP Program responsibilities of the IRs at his/her facility, the SSP Coordinator will likely contact the TAG, APM Committee, and the AZA CMWS Department to formally register a complaint.
- Failure to meet these obligations will likely result in the recommendation of removal of the IR by the APM Committee.

Publication of the Final Breeding and Transfer Plan

Upon completion of the Draft Breeding and Transfer Plan 30-day comment period, the SSP Coordinator and PMC Population Biologist will collaborate to address the IRs' feedback and update the BTP accordingly. The PMC will submit the Final Breeding and Transfer Plan to the AZA CMWS Department and email a copy to all IRs. The Final Breeding and Transfer Plan will be posted to the Animal Programs Database for member access. A formal announcement of this publication will be distributed via an automated email that will be sent to all SSP Program designated IRs and in the publication month's Animal Programs Update. SSP Coordinators must assure that the following individuals/entities are notified of Final Breeding and Transfer Plan publication:

- All facilities holding the SSP Program species and participating in the SSP Program
- The SSP Vice Chair

- The AZA Regional Studbook Keeper
- The AZA TAG Chair
- The AZA Conservation, Management, and Welfare Sciences Department
- The United States Fish and Wildlife Service, if applicable.
- The IUCN Specialist Group Chair, if applicable.
- Invested individuals who do not have access to the member's only section of the AZA website (i.e.,
- IUCN specialist group chairs, Program Leaders from other regional zoological associations) of the

Interim Population Recommendations

Although Breeding and Transfer Plans are the official method of recommending and documenting population management actions, many populations will need assistance between plans due to changes in the population or institutional needs. The AZA PMC or a PMC Adjunct can usually provide informal unscheduled assistance to Program Leaders for such interim planning needs.

A MateRx is one tool provided by the PMC, or a PMC Adjunct that Program Leaders can use to assist them when making recommendations for their population between planning meetings.

- A MateRx is a matrix of all potential breeding pairs in a population which integrates four genetic factors to produce a single numeric Mate Suitability Index (MSI) for each male/female pair.
    - The MSI is calculated from considering the potential breeding pairs' mean kinship values, the difference in male and female mean kinship, the inbreeding coefficient of the potential offspring produced, and the amount of unknown pedigree in the potential pair. A MateRx allows users to simplify the decisions about which pairs should be bred by condensing all that we know about the genetics of a pair into a single number.
    - Note that this does not include any demographic, logistic, or other variables that should be considered when recommending breeding.
- Requests for a MateRx can be made to the PMC or PMC Adjunct.
- Materials required for a MateRx include an updated studbook, a list of animals to be excluded from the potentially breeding population, and new information on pedigree assumptions.
- In some cases, a MateRx cannot be produced due to species biology or data quality (e.g., extreme pedigree unknownness). However, even in these cases the PMC highly encourages Programs to contact them for alternative assistance (PMC@lpzoo.org).
- Program Leaders must record all recommendations made between their formal Breeding and Transfer Plans in PMCTrack.

Consulting with the AZA Reproductive Management Center (RMC)

The AZA RMC, hosted by the Saint Louis Zoo, provides information on safety, efficacy and reversibility of contraceptive products to the AZA community to help zoo professionals make informed decisions on how to manage their animal collections. Contraception is an essential, proven, and humane tool for reproductive management while still allowing individuals to live in natural social and family groups. The RMC can also provide advice on reproductive management to promote reproductive success.

- The RMC is an integral part of AZA Animal Program management practices and is fundamental to managed breeding and population sustainability for individuals that are, or have ever been, contracepted.
- To assist AZA's Animal Programs the RMC maintains a database which monitors contraceptive records in one centralized location in order to facilitate meta-analyses and disseminate up-to-date recommendations.
- The SSP Coordinator should communicate with the RMC regarding the animals in their population prior to each formal planning meeting to review and update their status, as necessary.
- The RMC may provide written recommendations to be included in the Breeding and Transfer Plan as an appendix, if needed.
- An Advisor from the RMC may attend or conference into the SSP Program's planning meeting if relevant for the population.
- Communication between the SSP Coordinator and the RMC need not be limited to planning meetings, but can occur throughout the year as questions arise or new data become available.

Chapter 5. SSP Sustainability Reports and Search Portal

A grant awarded to AZA by the Institute for Museum and Library Services (IMLS) allowed AZA to customize their database and merge existing data with new data from Animal Program documents and Program Leaders. The AZA community is now able to identify patterns in population challenges and to strategically address population needs. The SSP Sustainability Reports and Search Portal were launched to the AZA membership in May 2016 and are becoming incorporated into the daily management of AZA SSP Programs. This collection planning tool has profound impacts on TAG recommendations and management decisions, and facilitates action towards increasing SSP population sustainability. The primary sustainability challenges identified by SSP Coordinators and population biologists will help facilitate AZA members in aligning their resources (e.g., space, experience with partnership and imports, multi-species exhibit opportunities, husbandry/research expertise) with the essential actions of SSP Programs. The information gleaned from these reports allows zoo and aquarium staff to take direct action in addressing population sustainability.

SSP Sustainability Reports

The SSP Sustainability Reports are automatically generated, 5-page reports that summarize husbandry practices, exhibit management, species appeal, educational opportunities, multi-species exhibit considerations, species biology, SSP population dynamics, management priorities, challenges to sustainability, and research needs. They also include the major challenges impeding each SSP's population sustainability and the goals and essential actions needed to address them. The report is a compilation of the SSP Coordinator's expertise and the current and projected population summaries from the SSP Breeding and Transfer Plan or PVA. The main areas of the reports are:

Page 1:

- Photos of the species
- Marketing phrase
- Species conservation status, SSP designation, geographic information, and biome
- Exhibit design and management
- Species appeal
- Messaging opportunities

Page 2:

- Multi-species exhibit opportunities
- Non-SSP species that could be substituted by the SSP species
- Species biology
- Offspring housing and reproduction

Page 3:

- Sustainability profile that includes population size, demographics, genetics, and images such as census graphs, age pyramids, and population projections

Page 4:

- Challenges to SSP population sustainability, with identified goals, actions, and needs
- Reproductive technologies available
- Additional research opportunities
- Additional notes on SSP management

Page 5:

- Acquisitions and transfers with information about imports, exports, and reintroductions
- Challenges to acquisitions and transfers
- Disclaimer that includes the date that the report was last updated

SSP Sustainability Reports Search Portal

The SSP Sustainability Reports Search Portal is an online tool for collection planners, Program Leaders, ILs, IRs, research scientists, and other zoo and aquarium staff. The searchable format allows collection planning users to perform searches that identify appropriate species for their collection planning criteria, while also directing resources and attention to managed species. This portal contains 25 search fields, including IUCN status, species appeal, special exhibit considerations, opportunities in multi-species exhibits, messaging opportunities, and research opportunities. The user can select any number of criteria that will return links to the individual SSP Sustainability Reports. The SSP Search Portal can help collection planners at AZA facilities to incorporate SSP species into their institutional collection plan, while facilitating alignment of their specific resources and expertise with SSP needs. SSP Coordinators may use their SSP Sustainability Reports to communicate the challenges impeding population sustainability and encourage the zoos and aquariums participating in the SSP to take an active role in overcoming these challenges. Research scientists can use the "Research Opportunities" field in the Online Portal to align their interests and expertise with critical SSP research needs.

Updating the SSP Sustainability Reports

Quantitative Data

Each month, the quantitative data (e.g., population numbers, gene diversity, participating facilities) from recently finalized SSP Breeding and Transfer Plans is downloaded from PMCTrack and the AZA CMWS staff add that information to the SSP Sustainability Reports.

Qualitative Information

To assure that the SSP Sustainability Reports are as accurate as possible, SSP Coordinators are encouraged, at any time, to submit updates to their qualitative information (e.g., major challenges to their SSP population sustainability, progress in importations) to the AZA CMWS Department (animalprograms@aza.org).

At the very least, SSP Coordinators will be asked to review their reports during each of their SSP planning sessions and send any updates to their information at that time.

TAG Chairs are requested to review all of the SSP Sustainability Reports within their purview at least once per year to make sure that the information is current, accurate, and in line with the TAG's goals. The TAG Chair will be asked if they have conducted their reviews in their TAG Annual Report.

A disclaimer is located on the last page of the SSP Sustainability Reports. A date is included in the disclaimer to show when the report was last updated.

SSP Program Accountability

SSP Coordinators are accountable for submitting a Breeding and Transfer Plan at minimum every 3 years in accordance with the submission date listed on the front cover of the previous publication, in order to meet their SSP Program accountability requirements. If a GSMP breeding and transfer information is also produced, it must be submitted at the time of publication in accordance with WAZA accountability. In addition, SSP Programs should also track IR responses for required SSP Program objectives, including wants and needs data.

There are a few SSP Programs that, due to the species' natural history, may not require or benefit from a traditional Breeding and Transfer Plan every 3 years and could plan less frequently. These SSP Programs will be considered on a case-by-case basis by the AZA CMWS Department, APM Committee, the TAG, and the SSP Program's Population Advisor.

Automated Accountability Emails

Automated deadline reminders are emailed as a courtesy to remind the SSP Coordinators, and other associated parties, of an upcoming Final Breeding and Transfer Plan deadline. Each email includes the appropriate instructions, relevant contact information, and links to the Deadline Information pages on the AZA website. These automated emails are administered as follows:

Prior to reaching the accountability deadline:

- One year prior, and 6 months prior to the deadline - Sent to the:
  - SSP Coordinator
  - TAG Chair
  - AZA CMWS Department.
- One month prior - Sent to the:
  - SSP Coordinator
  - TAG Chair
  - Institutional Liaison
  - APM Committee Chair
  - APM Committee VC of SSPs and Studbooks
  - APM Committee Liaison
  - AZA CMWS Department.

Upon reaching the accountability deadline and after:

- Deadline Reached- Sent to the:
  - SSP Coordinator
  - TAG Chair
  - Institutional Liaison
  - APM Committee Chair
  - APM Committee VC of SSPs and Studbooks
  - APM Committee Liaison
  - AZA CMWS Department.
- Two weeks past - Sent to the:
  - SSP Coordinator
  - TAG Chair
  - Institutional Liaison
  - APM Committee Chair
  - APM Committee VC of SSPs and Studbooks
  - APM Committee Liaison
  - AZA CMWS Department.

Extension Requests

Prior to the accountability deadline date:

- The SSP Coordinator may request an extension to complete their Breeding and Transfer Plan prior to the due date by contacting their TAG Chair, if the TAG has a current, approved RCP.
    - If deemed appropriate, the TAG Chair must contact the AZA CMWS Department with the approved new deadline.
- If the TAG does not have a current, approved RCP, the SSP Coordinator must also contact the APM Committee Vice Chair for SSPs & Studbooks to request an extension.
    - If deemed appropriate, the TAG Chair must contact the APM Committee Vice Chair for SSPs & Studbooks and the AZA CMWS Department with the proposed new deadline.
- The APM Committee Vice Chair will work with the APM Committee to approve/not approve the extension request and communicate the decision to the TAG Chair and SSP Coordinator.

After the accountability deadline has passed:

- If the Breeding and Transfer Plan extension request was not made prior to the Breeding and Transfer Plan deadline but the SSP Coordinator wishes to maintain their position, the IL or Director of the SSP Coordinator's facility must REPLY ALL to the automated accountability deadline email within 2 weeks of the missed deadline to discuss the reason for the missed deadline, and request a new deadline.
- The APM Committee Vice Chair for SSPs & Studbooks will determine if the reason for the missed deadline for the completion of the Breeding and Transfer Plan is valid, and if so, a new deadline will be set. They may discuss the situation with the APM Executive Committee, TAG Liaison or others as needed.
- The Vice Chair and APM Committee may consider previous extension requests, ongoing issues with the Program or SSP Coordinator or other concerns in considering extensions. These issues may further be discussed with the TAG Chair. In some cases, the SSP Coordinator may be asked to resign their role. If the SSP Coordinator is removed, the position vacancy will be advertised on the AZA website and in the ***monthly Animal Programs Update***.

Voting

- All members of the Management Group, if one exists, are required to vote on issues and in elections; votes are determined by majority
- The Secretary will record the votes and submit the voting record to the SSP Coordinator.
- The SSP Coordinator will alert the members of the SSP, the candidates (if applicable), and the TAG of the outcome of all votes.
- Failure to meet these obligations may result in the removal of the Management Group member by the SSP Coordinator or the APM Committee.

Change in Employment or Institutional Status

Change in Facility

SSP Coordinator

- SSP Coordinators who move to a new AZA member facility must confirm that their new facility endorses their continued role as SSP Coordinator and must, within 90 days of departure from their original facility, submit new Statements of Commitment to the TAG Chair.
- If the SSP Coordinator does not wish to maintain the role as SSP Coordinator or their new facility does not endorse the SSP Coordinator to maintain the role, the SSP Coordinator position will be relinquished and the vacancy must be advertised in the monthly Animal Programs Update and posted on the AZA website for a minimum of 30 days.
- All SSP Coordinators must update their new contact information, including facility, phone, fax, and email to the TAG Chair and via the AZA website by logging into their account on "My AZA", as well as update membership information by sending new information to membership@aza.org.
- If the SSP Coordinator takes a permanent position at a non-AZA accredited facility, leaves and/or retires from the Zoo and Aquarium field, they must immediately resign as SSP Coordinator and communicate this to the TAG Chair and AZA CMWS Department via email to animalprograms@aza.org. SSP Coordinators who do not resign under these conditions will be removed by the TAG.

Officers

- Officers moving to a new facility do not automatically become that facility's IR; they must be designated by the new facility's IL.
- If the new facility's current IR is involved in the SSP Program in a voting capacity, the facility must determine which of the two will serve as the IR for, and which will no longer act as a voting member of, the SSP Program to assure each facility has only one voting member.
- The IR required to step down may be appointed as a non-voting Advisor at the SSP Program's discretion.
- Officers who move to a new AZA member facility must, within 90 days of departure from their original facility, submit a new "Statement of Individual Commitment" and "Statement of Institutional Support" to the TAG Chair.
- Officers must update their new contact information, including facility, phone, fax, and email to the TAG Chair and via the AZA website by logging into their account on "My AZA."

Management Group Members

- If a Management Group member transfers to a new facility with an existing IR for the same SSP Program, the facility must determine which of the two will serve as the IR for, and which will no longer act as a voting member of, the SSP Program.
- The Management Group member required to step down may be appointed as a non-voting advisor at the SSP Program's discretion.

IL and IR

- ILs or IRs who transfer to a new facility will no longer serve as the previous facility's representative to the SSP Program. The IL position will revert to the Director, and the IR position will revert to the IL.

Loss of Employment

SSP Coordinator

- If an SSP Coordinator loses their position from an AZA member facility they must communicate this to the TAG Chair and AZA CMWS Department via email to animalprograms@aza.org.
- SSP Coordinators have 6 months to re-gain employment with another AZA member facility before they must surrender their position.
- If an SSP Coordinator is no longer employed at an AZA member facility and fails to communicate with the TAG or the AZA CMWS Department within 1 month, it will be assumed that the SSP Coordinator has abandoned the role in the Animal Program and the TAG may proceed with filling the vacancy before the 6-month grace period is over.
- Departing SSP Coordinators are required to uphold SSP and Animal Program business confidentiality and provide all relevant SSP documents to the TAG Chair and their replacement.
- SSP Coordinators who do not resign under these conditions will be removed by the TAG.

Officers

- If an Officer loses their position from an AZA member facility, they have 6 months to re-gain employment with another AZA member facility before they have to surrender their position within the SSP Program.
- If an Officer is no longer employed at an AZA member facility and fails to communicate with the TAG or the AZA CMWS Department within one month, it will be assumed that the Officer has abandoned the role in the Animal Program and the TAG may proceed with filling the vacancy before the 6-month grace period is over.
- Officers who do not resign under these conditions will be removed by the TAG Chair or, if the TAG does not have a current, approved RCP, the APM Committee.

IL and IR

- If an IL or IR loses their position from an AZA member facility, they will immediately be removed from the SSP Program. The IL position will revert to the Director, and the IR position will revert to the IL.

Member Facility Loss of Accreditation or Certification

SSP Coordinator

- If an SSP Coordinator's facility loses accreditation or certification, they must communicate this to the TAG and AZA CMWS Department via email to animalprograms@aza.org.
- SSP Coordinators have 6 months to re-gain employment with another AZA member facility before they must surrender their position.

- Departing SSP Coordinators are required to uphold SSP and Animal Program business confidentiality and provide all relevant SSP documents to the TAG Chair and their replacement
- SSP Coordinators who do not resign under these conditions will be removed by the TAG.

Officers

- If an Officer's facility loses accreditation or certification, they must communicate this to the TAG Chair.
- If an SSP Officer's facility loses accreditation or certification, the Officer has 6 months to resign from the SSP Program or find employment with another AZA member facility.
- Officers who do not resign from the SSP Program under these conditions will be removed by the TAG Chair or, if the TAG does not have a current, approved RCP, the APM Committee.

Resignation

SSP Coordinator

- SSP Coordinators must provide a written notice of resignation to the TAG Chair (or the APM Committee Vice Chair for SSPs & Studbooks if the TAG does not have a current TAG Chair) and AZA CMWS Department via email to animalprograms@aza.org.
- A planned resignation date may be identified to allow for an election and the mentoring of a new SSP Coordinator. This process must be discussed with the TAG to ensure consistency. Two individuals may not be designated as the SSP Coordinator for a program at the same time.
- Departing SSP Coordinators are required to uphold SSP and Animal Program business confidentiality and provide all relevant SSP documents to the TAG Chair and their replacement.

Officers

- SSP Coordinator must provide a written notice of resignation to the TAG Chair.
- The SSP Vice Coordinator will act as interim SSP Coordinator until a replacement is elected.
- Officers, excluding the SSP Coordinator, must provide a written notice of resignation to the SSP Coordinator.
- Departing Officers should uphold SSP business confidentiality and, when possible, orient and provide all relevant SSP Program documents to their replacement.

Management Group

- SSP Management Group members must provide a written notice of resignation to the SSP Coordinator.
- Departing Management Group members should uphold SSP business confidentiality and, when possible, orient and provide all relevant SSP Program documents to their replacement.

IL and IR

- If an IR resigns, the IL will serve as the default IR for the SSP Program until a new IR is designated.
- If an IL resigns, the Director will serve as the default IL until a new IL is appointed.

Member Removal

Officers

- If an SSP Coordinator is removed by the TAG or the APM Committee, the position must be advertised and the TAG will select a new Coordinator from the pool of applicants if the TAG has an approved RCP. If the TAG does not have a current, approved RCP, the APM Committee will select the new SSP Coordinator.
- The SSP Management Group must vote to remove an Officer (excluding the SSP Coordinator) from the SSP Program.
- The SSP Coordinator will notify the TAG and the APM Committee in writing if an Officer (excluding the SSP Coordinator) is removed from the SSP Program and will include all reasons for, and documentation pertaining to the removal.
- The SSP Management Group will hold a new election to fill the vacant Officer position as soon as possible.

Management Group Members

- The Management Group may choose to remove a Management Group member.
- The SSP Coordinator will notify the TAG and the APM Committee in writing if a Management Group member is removed from the SSP Program and will include all reasons for, and documentation pertaining to, the removal.
- The Management Group may fill the position by either holding a new election or appointing the IR who received the highest number of votes among the nominees who were not selected in the previous election.

IL and IR

- If an IL removes an IR, the IL will serve as the default IR for the SSP Program until a new IR is designated.
- If a Director removes an IL, the Director will serve as the default IL until a new IL is appointed.

AZA Animal Program participants (e.g., Program Leaders, Officers, Steering Committee members,) may be removed at the discretion of the AZA Executive Director. In the rare case that this should occur, the Executive Director and the AZA CMWS Department will work closely with the TAG or SSP Program to document this process.

SSP Officer and Management Group Training

- SSP Coordinators are encouraged to mentor incoming SSP Coordinators, Officers, AZA Regional Studbook Keepers, and Management Group members to help them become familiar and comfortable with their responsibilities as established by the APM Committee in the associated Animal Program Handbooks, especially with respect to building sustainable populations.
- Mentoring and training procedures should include identifying the protocols used to assure data are current and transferred from the outgoing Program Leader to the new incoming Program Leader.
- Effort should be taken to coordinate training for SSP Programs within a TAG so that training can address similar issues across the taxa.

Animal Program Meetings

The APM Committee holds an open meeting for AZA Program Leaders, Officers, ILs, IRs, and other interested parties at each AZA Annual Conference and Mid-Year Meeting. These meetings may include reporting and updates from the APM Committee, the PMC, the RMC, and/or the AZA CMWS Department, as well as an open question and answer session. Minutes from these meetings are disseminated over the AZA network after the meeting.

Program Leader Workshops

- Program Leader workshops may be held at AZA Annual and/or Mid-Year Meetings. These may be organized by the AZA, the APM Committee, or individual Animal Programs.
- These workshops should be advertised in the Animal Programs Update and other appropriate Network Groups and listservs.
- Minutes and reports from these meetings should be AZA branded and disseminated, as appropriate. The AZA CMWS Department is available to assist with document branding, if needed.

Communication

Each SSP Program must develop a means to facilitate communication among its members, as well as distribute appropriate information about the SSP Program and its functions to the general public. The SSP Program may choose to distribute information via reporting sessions at AZA conferences and meetings, through AZA Annual Reports, ***monthly Animal Programs Update***, AZA networks, and AZA Stories. All public communications must be AZA branded and it is recommended that the TAG utilize electronic resources as much as possible in order to engage in green practices.

Meetings

- SSP Coordinators should hold (electronically or in person) at least one open working Animal Program meeting each year,
- If the SSP Program holds additional meetings in a venue outside of these conferences, the SSP Program must communicate the dates and locations of these to its TAG Chair,

- The SSP Coordinator or SSP Vice Coordinator is encouraged to schedule and moderate reporting sessions at AZA Mid-Year and/or Annual Conferences.
- All Officers are encouraged to attend all official SSP Program meetings.
- Minutes must be recorded, archived, disseminated among the SSP Program's IRs, and submitted to the TAG Chair

Position Statements, White Papers and Guidelines

Position Statements

An AZA Position Statement must be approved by the AZA Board of Directors and defines an AZA Committee, SAG, or Animal Program (and therefore the Association's) position on a specific issue. AZA Position Statements most frequently supplement an AZA Board approved policy and are supported by an informational and science-based AZA White Paper. AZA Board approved Policies, Position Statements and White Papers are found here.

Animal Programs Update

The Animal Programs Update is published monthly on the AZA website and includes Animal Program announcements, vacancy advertisements and new publications. The TAG is responsible for submitting programmatic changes for Animal Programs within its purview, including SSP Program appointments and contact information, Animal Program upgrades and downgrades, and taxonomic changes for managed species to the AZA CMWS Department. The SSP Program may also provide TAG-approved announcements and notices to be published in the monthly Animal Programs Update.

The TAG Chair must approve all Program Leader vacancy advertisements and assure that the TAG submits them to the AZA CMWS Department. All Program Leader vacancies must be advertised for 30 days in the Animal Programs Update and on the Current Program Leader Vacancies page before a new Program Leader may be appointed.

AZA Network

The *AZA Network* brings together great ideas, best practices and lessons learned from within the zoo and aquarium community. The diverse community allows for open professional interest groups or closed working groups. Your profile in the Network is where you will manage notifications of activity, allowing you options to receive emails as activity occurs, or in a daily, or weekly digest email. There are many open professional interest groups available, as well as closed Animal Program groups that can be maintained by the Animal Program Leaders themselves. These groups allow members to start discussions, add resources, and share documents.

SSP Programs are encouraged to establish an AZA Network Group for their SSP Program. Membership within Animal Program Network workspaces may be compartmentalized such that some portions may be restricted to the Management Group, while another section may be open to all IRs. All IR updates made in the AZA Animal Program Database will automatically be applied to the workspace membership. The workspace must have a Moderator who will manage subscriptions to closed Management Group workspaces and establish rules for postings. To create a group within the AZA Network, the Program Leader should contact the AZA CMWZ Department.

SSP Highlights
SSP Highlights is a "member view" feature in AZA's *CONNECT* magazine that provides an opportunity to highlight and share efforts SSP Programs have made to increase population sustainability in zoos and aquariums and share their successes with the general AZA membership. This feature provides a way for SSP Programs to share their creative approaches to address population sustainability challenges. Examples include engaging in innovative research, advancing management practices, and developing partnerships to enhance SSP sustainability. SSP Highlights made its debut in the August 2016 issue of *CONNECT*. SSPs are encouraged to submit their draft SSP Highlights to the AZA CMWS Department using the "SSP Highlights Template".

SSP Sustainability Award
The SSP Sustainability Award recognizes initiatives of AZA SSP Programs that have a quantifiable impact on the long-term sustainability of an SSP's managed population. Animal Program Leaders (i.e., TAG Chairs, SSP Coordinators, Studbook Keepers, and Scientific Advisory Group Chairs) may apply for this award that demonstrates how their significant and innovative efforts have resulted in a significant increase in an SSP population's sustainability. Award decisions will be based on the level of effort described that has resulted in significantly improving the SSP population's sustainability, the quantifiable impact that has occurred which demonstrates an increase in the SSP population's sustainability, how any resulting forward actions were made accessible to all appropriate facilities in an effective and timely manner, and how this initiative advances AZA TAG recommendations for that SSP population's sustainability. For more information on deadlines and application materials, visit the AZA website.

Social Media and *CONNECT* articles
AZA manages an AZA Facebook page and a Twitter account that have thousands of followers. To maximize exposure of the TAG's work, snippets of publicly appropriate information (including photos) should be provided for inclusion on the social media resources. To publish information on AZA's Facebook page and Twitter account, the TAG Chair should contact the AZA Digital Media Coordinator. In addition, TAGs may wish to distribute information about their work in an article in *CONNECT* each year. To publish an article in *CONNECT* the TAG Chair should contact the AZA Publications and Brand Director and AZA CMWZ Department.

Chapter 8. Animal Care Manuals

Overview

Animal Care Manuals (ACMs) provide a compilation of animal care and management knowledge that has been gained from recognized species experts based on the current science, practice, and technology of animal management. These manuals compile and organize our understanding of basic requirements, best practices, and animal care recommendations to advance the capacity for excellence in animal care and welfare. These dynamic manuals are considered works in progress, since practices continue to evolve through scientific learning. Once completed, the use of information within each manual should always be in accordance with all local, state, and federal laws and regulations concerning the care of the species specified.

ACMs are composed by TAG and Animal Program representatives, managed by the AZA Animal Welfare Committee, and approved by the AZA CMWS Department. The developmental procedures used to compose each manual follow a specific sequence that includes several review procedures (internal and external) before AZA reviews, and ultimately approves their publication. Because one of the most important outputs of a TAG is to develop and maintain a current ACM, a summary of the primary developmental procedures are described below, however, in addition, a specific ACM template has been composed to ease the process. Please note that this template is geared a bit more toward terrestrial mammal species, however, AZA recognizes that there are many differences between aquatic, terrestrial, and avian species. The ACM template should be adjusted (e.g., edit headers and sub-headers) to match the needs of your species/taxa.

The key processes needed to compose an ACM are listed below; however, the complete set of developmental processes should be used as a guide to produce the final publication.

Chapter 9. Ambassador Animal Guidelines

Overview

Ambassador Animal Guidelines (AAGs) provide a compilation of knowledge provided by recognized animal and education experts based on the current science, practice, and technology of ambassador animal management and presentation. Each AAG assembles basic requirements, best practices, and animal care recommendations to maximize capacity for excellence in animal care and welfare of ambassador species. These guidelines are considered works in progress, since practices continue to evolve through advances in scientific knowledge. Once completed, the use of information within each guideline should always be in accordance with all local, state, and federal laws and regulations concerning the care of the species specified.

While some government laws and regulations may be referenced, these are not all-inclusive nor is this document intended to serve as an evaluation tool for those agencies. The recommendations included are not meant to be exclusive management approaches, diets, medical treatments, or procedures, and may require adaptation to meet the specific needs of individual animals and particular circumstances in each institution.

AAGs are composed by TAG and Animal Program representatives, managed by the AZA Ambassador Animal Scientific Advisory Group, and approved by the AZA CMWS Department. The developmental procedures used to compose each guideline follow a specific sequence that includes several review procedures (internal and external) before AZA reviews and ultimately approves their publication. The key processes needed to compose an AAG are listed below; however, the complete set of developmental processes should be used as a guide to produce the final publication.

Chapter 10. Program Leader Resources

Animal Programs Contact Information

Contact information for groups involved in AZA's Animal Programs can be found here

AZA CMWS Department

Please visit AZA's staff webpage for further information about the CMWS staff. Contact information can be downloaded here.

Animal Population Management Committee

Please visit AZA's Animal Population Management Committee webpage for a current list of committee members and advisors. Contact information and TAG Liaison assignments can be downloaded here.

AZA Taxon Advisory Group Chairs

A current list of TAG Chairs and contact information can be downloaded here.

AZA Population Management Center

Please visit PMC's webpage for further information about the PMC staff. Contact information can be downloaded here.

AZA Small Population Management Advisory Group

Description for the role of Small Population Management Advisory Group TAG Liaisons and current SPMAG TAG Liaison assignments can be downloaded here.

AZA Reproductive Management Center

Please visit RMC's webpage for further information about the RMC staff. Contact information can be downloaded here.

AZA Web Resources

AZA Board Approved Policies
Find the Board Approved Policies and Position Statements here.

Animal Exchange
To access ***Animal Exchange***, the user must be logged in to the AZA website and have Animal Exchange privileges assigned to your individual record in order to use this feature. Never share your log-in information with anyone as you will directly be held responsible for any changes or edits made to secured areas. Once logged in, the Animal Exchange link can be found here.

Animal Programs Database
The Animal Programs Database contains all Animal Program Data, and is separated out into Animal Program pages. There are separate pages for TAGs, SSP Programs, Studbooks and SAGs. Each Animal Program page can be accessed by going through the:

Animal Program Page Search Portal
Find the Animal Program Page Search Portal here.

Each Animal Program page contains the following (*information only available if logged in):

- Program Leaders, Officers, Advisors
- Program Leader, Officers, Advisors contact information*
- Animal Program details (start dates, websites, etc.)
- Animal Program Species
- Related Animal Programs
- Animal Program Documents*
- Animal Program IR list*

SSP Sustainability Reports and Search Portal

Find the SSP Sustainability Reports and Search Portal here.

The SSP Sustainability Reports summarize SSP species' basic care, exhibit design, and population management considerations and priorities. The Search Portal automatically generates these reports which allow collection planners to perform searches that identify appropriate species for their collection planning criteria, while also directing resources and attention to managed species. The SSP Sustainability Reports and Search Portal were designed as a member service for collection planners, Program Leaders, ILs, IRs, research scientists, and other zoo and aquarium staff. Access is available for staff at AZA-accredited facilities and Certified Related Facilities.

Animal Programs Resources
The Animal Programs Resources page contains numerous links, documents and templates aimed to assist Program Leaders. These include:

- Program Leader Handbooks
- Animal Program Applications

- Resource Documents (including templates, guides, and resources related to being a new Program Leader, assessing Sustainability Partners, TAG strategic planning, PVA FAQs, and maintaining Studbooks)
- Contact information for TAGs Chairs, Institutional Liaisons, APM Committee TAG Liaisons, SPMAG TAG Liaisons
- Animal Program ***Sustainability Designations*** (updated quarterly)
- Animal Programs Monthly Update
- Current Program Leader Vacancies
- Illustrative protocols to help Program Leaders navigate the Animal Programs Database

Accountability Information and Instructions
Find the Accountability Information and Instructions here.

PMCTrack
Website: www.pmctrack.org; Email: pmctrack@lpzoo.org

PMCTrack evaluates breeding and transfer recommendations to:

- Determine whether each recommendation occurred based on studbook data
- Collect reasons from Institutional Representatives for recommendations not occurring as planned
- Improve management of AZA's Animal Programs and increase long-term viability of these populations

Population Management Center
Website: http://www.lpzoo.org/population-management-center; Email: pmc@lpzoo.org

Reproductive Management Center
Website: https://www.stlzoo.org/animals/scienceresearch/reproductivemanagementcenter/;
Email: contraception@stlzoo.org

ZIMS for Studbooks
Website: https://zims.species360.org/
Email: support@species360.org
ZIMS for Studbooks is an online database where Studbook Keepers maintain and track their studbook databases.
Resources:

- A Reference Guide to ZIMS for Studbooks for Animal Program Leaders
- Starting a New AZA Studbook in ZIMS for Studbooks
- AZA Guidelines for I. Roles and Access to ZIMS for Studbooks, and II. Sharing Studbook Data
- Working Together in a Shared Studbook Database

Glossary

Accountability- Accountability refers to the processes by which Animal Program participants including Program Leaders, Institutional Representatives (IRs), and Institutional Liaisons (ILs) are responsible for producing and reviewing documents, and communicating among appropriate individuals. Accountability of Animal Programs includes meeting deadlines, requesting extensions if needed, maintaining communication with all individuals, and adhering to the AZA's Full Participation Policy and the Species Survival Plan® Animal Management Reconciliation Policy.

Advisor- An advisor is a non-voting participant of an AZA Animal Program (AP) that provides advice to the AP in their efforts to identify, develop and implement goals related to their species. An advisor may also provide input on Animal Care Manuals and assist with the development of education materials and research projects related to the Advisor's area of expertise.

Animal Care Manuals (ACMs)- Animal Care Manuals (ACMs) are a compilation of animal care and management knowledge that has been gained from recognized species experts, including AZA Taxon Advisory Groups (TAGs), Species Survival Plan® Programs (SSPs), biologists, veterinarians, nutritionists, reproduction physiologists, behaviorists and researchers. Content is based on the current science, practice, and technology of animal management. The manual assembles best practices, animal care recommendations and AZA accreditation standards to maximize capacity for excellence in animal care and welfare and is updated every 5 years. All ACMs are peer reviewed, widely valued, and acclaimed by other regional associations. All TAGs are required to coordinate the publication of ACMs for the taxa within their purview.

Animal Exchange- The Animal Exchange allows representatives from AZA-Accredited Facilities, Certified Related Facilities and Approved Non-Member Participants to list and search for individuals of a species that can be exchanged to meet the goals of their Institutional Collection Plan (ICP) or the Regional Collection Plan (RCP).

Animal Population Management Committee (APM Committee)- The Animal Population Management Committee (APM Committee) works collaboratively with other Committees and is responsible for facilitating the professional and scientific management of the animals cared for in AZA-Accredited zoos and aquariums, Certified Related Facilities, and Approved Non-Member Participants. Committee members serve up to two three-year terms and consist of Directors, Vice Presidents (VPs), curators, and registrars. APM Committee develops, oversees, promotes, evaluates, and supports the cooperative animal management, conservation, sustainability, and scientific initiatives of the AZA.

Animal Population Management Committee (APM Committee) Liaison- Each Taxon Advisory Group (TAG) is assigned one member of the Animal Population Management Committee (APM Committee) who serves as a liaison for that TAG. APM Committee members typically serve as a liaison for 3 TAGs. They communicate with the TAG regularly and serve a crucial advisory role for any policy, procedure, or processes questions the TAG may have, and act as the primary contact and mentor during the TAG's Regional Collection Plan (RCP) developmental and review process.

Animal Programs Database- The AZA Animal Programs Database allows anyone to access general information about AZA's Taxon Advisory Groups (TAGs), Species Survival Plan® (SSP) Programs, Studbooks, the individual species included in these AZA Animal Programs (APs), and view Program Leader, Officer and Advisor contact information. AZA members can log in to the

AZA Animal Programs Database to gain access to more detailed AP information and have the ability to download Institutional Representative (IR) lists and associated final and draft documents.

Animal Program Summary Table- Animal Program Summary Table identifies each AZA Animal Program (AP) (Species Survival Plan® (SSP) Programs and Studbooks) recommended by the TAG for cooperative management. The following information is included for each AP: the date of the last Breeding and Transfer Plan; the current population size, current gene diversity, designation, and target population size; the number of additional spaces needed to achieve the target population size; and the 5-year population trend, conservation status, and top three goals. This table must be updated as APs are analyzed by the Population Management Center (PMC) or PMC Adjunct and is a required component of the TAG Annual Report and the TAG's Regional Collection Plan (RCP).

Association of Zoos and Aquariums (AZA)- Founded in 1924, the Association of Zoos and Aquariums (AZA) is a nonprofit organization dedicated to the advancement of accredited zoos and aquariums in the areas of animal care, wildlife conservation, education and science. AZA is America's leading accrediting organization for zoos and aquariums and accredits only those facilities that have achieved rigorous standards for animal care, education, wildlife conservation and science.

AZA Animal Program- AZA Animal Programs (APs) include Taxon Advisory Groups (TAGs), Species Survival Plan® (SSP) Programs and Studbook Programs. APs are responsible for the extraordinary leadership, development, oversight, promotion, evaluation and support of AZA's cooperative animal management, conservation, and scientific initiatives. Management tools, databases, reference materials, policies, and management plans have been developed to facilitate exceptional AP collaboration within and amongst AZA-accredited facilities.

AZA Brand/Branded The signature for the Association of Zoos & Aquariums is a unique piece of artwork that has been designed specifically for our brand. Consisting of the AZA wordmark and the AZA ampersand symbol, the signature is an extremely valuable asset and the most concise visual representation of our brand.

AZA Board Approved Policies- AZA policies may be drafted by AZA Committees, Scientific Advisory Groups (SAGs), and Animal Programs (APs) in collaboration with their AZA Staff and Board Liaisons but all AZA-related policies must be approved by the AZA Board of Directors before being finalized, published, or distributed. AZA policies may cover topics such as animal management, animal programs, conservation, ethics, health, husbandry and welfare, research and technology, and safety.

AZA Dedicated Funds Account- AZA Committees, Scientific Advisory Groups (SAGs), Taxon Advisory Groups (TAGs), Species Survival Plan® Programs, and SAFE Species Programs who hold and distribute money raised specifically to support projects initiated or coordinated by their group must use an AZA Dedicated Funds to manage all transactions.

AZA Mission- The Association of Zoos & Aquariums (AZA) provides its members the services, high standards and best practices needed to be leaders and innovators in animal care, wildlife conservation and science, conservation education, the guest experience, and community engagement.

AZA Network- The Association of Zoos & Aquariums' online private social networking tool.

AZA Policy for Full Participation- AZA policy stating that all AZA-accredited facilities and Certified Related Facilities having a Green SSP animal in their collection are required to participate in the collaborative SSP planning process (e.g., provide relevant animal data to the AZA Studbook Keeper, assign an Institutional Representative (IR) who will communicate institutional wants and needs to the SSP Coordinator, comment on the draft plan during the 30-day review period, and abide by the recommendations agreed upon in the final plan). All AZA member facilities and Animal Programs (APs), regardless of management designation, must adhere to the AZA Policy on Responsible Population Management, as well as the AZA Code of Professional Ethics.

AZA Strategic Plan- AZA accredited zoos and aquariums will be recognized for leading a compelling wildlife conservation movement. We will achieve this by caring for wildlife and wild places; educating and engaging public, professional and government audiences; serving and increasing membership; and developing a robust and sustainable economic model which empowers AZA to provide superlative member services.

Breeding and Transfer Plans- Breeding and Transfer Plans (BTPs) summarize the current demographic and genetic status of a Species Survival Plan® (SSP) Program, describe the SSP Program management designation, and recommend breeding pairs/groups and transfers. Breeding and Transfer Plans are designed to maintain a healthy, genetically diverse and demographically stable population.

Certified Related Facilities- Organizations holding wildlife that are not commercial entities, and are not open to the public on a regularly scheduled, predictable basis. The facility shall be under the direction of a professional staff trained in animal husbandry, and shall be further defined as having conservation and preservation as part of its mission—a mission that shall have a beneficial, tangible, supportive impact on the zoological and aquarium professions. This includes wildlife ranches, wildlife refuges or rehab centers, research facilities, survival centers, breeding farms, and/or similar organizations.

Conservation Grants Fund (CGF) - Established in 1984, CGF supports the cooperative conservation-related scientific and educational initiatives of AZA and AZA-accredited zoos and aquariums and their collaborators. CGF grants are awarded in six categories: Animal Health, Animal Welfare, Conservation Education, Field Conservation and/or Reintroduction, Management and/or Breeding, Research.

Conservation, Management, and Welfare Sciences (CMWS)- The Conservation, Management, and Welfare Sciences Department (CMWS) of Association of Zoos and Aquariums (AZA) is committed to providing services advancing the initiatives of member institutions related to conservation, animal management, and animal welfare.

Conservation Partner- Organizations that support the vision, mission and goals of zoos and aquariums. Conservation Partners represent AZA-Accredited Facility member societies and associated organizations, professional societies, conservation organizations, universities, some government entities and other non-profits.

Externally Managed Populations- Externally managed populations are any cooperatively managed program where final authority of breeding, transfers, husbandry, or reintroductions of animals managed in AZA facilities falls to an external (i.e. non-AZA) entity. These populations do not qualify for SSP status, but may qualify to become a SAFE Program.

***Ex situ* Conservation**- Preservation of species outside of their native habitat.

Global Species Management Plan (GSMP)- GSMPs are formal, international population management plans among a minimum of two regional zoological associations, and are overseen by WAZA. GSMPs are a valuable partnership when population goals for increasing sustainability cannot be met within a single region. A GSMP provides an opportunity to combine several regional populations, thus improving the genetic and demographic management potential by increasing the population's size, carrying capacity, and other resources.

International Studbook- The World Association of Zoos and Aquariums' (WAZA) Committee of Population Management (CPM) administers and provides oversight to International Studbooks. International Studbooks provide a valuable service to the zoological community by offering the most complete and accurate global data on the *ex situ* population's pedigree and demography, if possible including husbandry and veterinary guidance, and enhancing management of the *ex situ* population through analysis of the International Studbook data.

***In situ* Conservation**- Preservation of natural communities and populations of species in the wild.

Institutional Liaison (IL)- The Institutional Liaison (IL) assures that there is effective communication and participation between the facility and AZA's Animal Programs (APs). The IL designates Institutional Representatives (IRs), keeps the facility's IR list current, and is responsible for updating IR contact information on the AZA website. The IL serves as the default IR for any AP which does not have an IR assigned and is required to respond accordingly. The IL works with Program Leaders and IRs to assure that their facility fully participates in all associated Taxon Advisory Groups (TAGs) and Species Survival Plan® (SSP) Programs, and if necessary, will meet in conflict resolution processes.

Institutional Representative (IR)- The Institutional Representative (IR) is the primary contact between their facility and the Program Leader of the Animal Programs (APs) to which s/he has been designated. The IR is responsible for maintaining open communication between the AP and the facility, communicating to the Program Leader on behalf of the facility, and participating in the AP communications and activities.

Management Group- At a minimum, the Management Group is composed of the Coordinator, Vice Coordinator, and AZA Regional Studbook Keeper. The Management Group serves as the voting body for Species Survival Plan® (SSP) Program business and all members are integrally involved in the SSP Program appointments, publications, and meetings. Management Group members must be elected from the SSP Program's Institutional Representative (IRs).

MateRx- The primary output is a matrix of genetic ratings for every possible breeding pair in a population which allow Program Leaders to quickly discover how the genetic status of animals in their collections compare to the rest of a managed population. Note that this does not include any demographic, logistic, or other variables that should be considered when recommending breeding.

Monthly Animal Programs Update- AZA's Monthly Animal Programs Update contains information about the most recent news pertaining to Animal Programs (APs), Professional Development Courses, workshops, conferences, meetings, funding and award opportunities, new Program Leaders, Program Leader vacancies, new publications, and information regarding Breeding and Transfer Plans.

Officer- Officer positions for an Animal Program (AP) include the Program Leader Taxon Advisory Group (TAG) Vice Chair or Species Survival Plan® (SSP) Program Vice Coordinator, TAG or SSP Secretary, and if any financial components are incorporated into the Animal Program, a TAG or SSP Treasurer. Officers, with the exception of the TAG Chair or SSP Coordinator, are elected from the TAG Steering Committee or SSP Management Group and the Steering Committee/Management Group forms the electorate for that vote.

PMC Adjunct- PMC Adjunct Population Biologists are advisors that are trained by the PMC, have a signed MOU with the PMC and AZA office, and advise AZA Animal Programs from their home institutions. PMC Adjuncts provide many services for AZA Animal Programs including producing Breeding and Transfer Plans, providing informal genetic or demographic advice between plans, investigating unknown or partially-known pedigrees, developing pedigree assumptions and creating analytical studbooks, conducting research and supporting software development to improve methods of population management, and troubleshooting software problems.

PMCTrack- PMCTrack is a web-based database and monitoring system designed to evaluate the outcomes of breeding and transfer recommendations made through the AZA Animal Programs (APs) such as Species Survival Plan® (SSP) Programs. PMCTrack provides the necessary tools and data to understand, monitor, and improve AZA's cooperative population management system. PMCTrack includes survey functionality to request additional information from institutions on the information needed for preparing for SSP Breeding and Transfer Plans (wants/needs, reasons for unfulfilled outcomes).

Population Management Center (PMC)- The AZA Population Management Center (PMC) hosted by the Lincoln Park Zoo in Chicago, Illinois, is responsible for conducting demographic and genetic analyses needed to develop and distribute population management recommendations for all SSP Programs and those SAFE Programs that are approved to receive this support. PMC staff, including Population Biologists, Planning Coordinator, PMCTrack Coordinator, and Research Assistant, also include PMC Adjuncts, which all assist each SSP in the development of their population management plans by making sure the data are accurate, determining the current population status, predicting the future population status, identifying specific breeding and transfer recommendations, and distributing the plan to all participating AZA-accredited institutions. In addition, the PMC contributes valuable information for AZA Sustainability Reports and Regional Collection Plans (RCPs).

Population Sustainability- Success is achieved when SSP-managed animals are available to meet program goals and animals come from biologically sound populations as a result of a shared commitment to cooperative populations and program management.

Population Viability Analysis (PVA)- A PVA is a computer model that projects the likely future status of a population. PVAs are used for evaluating long-term sustainability, setting population goals, and comparing alternative management strategies. Several quantitative parameters are used in a PVA to calculate the extinction risk of a population, forecast the population's future trajectory, and identify key factors impacting the population's future.

Program Leader- Program Leaders include Taxon Advisory Group (TAG) Chairs, Species

Survival Plan® (SSP) Program Coordinators, AZA Regional Studbook Keepers, and Candidate Program Leaders.

Provisional SSP- Populations that have the potential to meet the Animal Programs Sustainability Criteria and be sustainable will be given a defined timeline to improve sustainability and will be reconsidered in the next RCP. If those goals are met, the program will become a Signature SSP. If the goals are not met, they will no longer be an SSP.

Publish- An SSP Breeding and Transfer Plan, AZA Regional Studbook, Population Viability Analysis, MateRx, or a TAG Regional Collection Plan is considered published once the document is posted on that Animal Program's page in the AZA Animal Programs Database.

Regional Collection Plan (RCP)- Taxon Advisory Groups (TAGs) develop Regional Collection Plans (RCPs) to recommend species for cooperative management among the Association of Zoos and Aquariums (AZA) member institutions, determine the sustainability goals for each recommended Animal Program (AP) within its purview, identify objectives relevant to their long-term collection plans, and assure adherence to AZA's animal management and conservation goals.

Reproductive Management Center (RMC)- The AZA Reproductive Management Center (RMC), hosted by the Saint Louis Zoo, is responsible for assessing factors such as contraception type efficacy, reversibility, and safety; an animal's age, reproductive status, behavioral and social needs, and delivery system practicality when recommending appropriate contraception methods for the animals cared for in AZA-accredited institutions.

Scientific Advisory Group (SAG)- Established in 1991, Scientific Advisory Groups (SAGs) help facilitate, support, network and coordinate the relevant research activities of its member institutions. SAGs are made up of experts in a particular field of wildlife science. Members include veterinarians, researchers and zoo- and aquarium-based curators with appropriate scientific training, as well as university, government and other outside scientists with a commitment to sharing their particular expertise.

Secure SSP- Programs that meet the Animal Programs Sustainability Criteria for Signature SSP may be considered for Secure SSP. These are programs that we are relatively certain will still be present in AZA facilities in 100 years as a robust, viable, healthy, biologically sound population.

Signature SSP- Populations that meet the Animal Programs Sustainability Criteria and will be sustainable for the long term will be designated Signature SSPs.

Small Population Management Scientific Advisory Group (SPMAG)- A Scientific Advisory Group (SAG) that provides technical advice pertaining to population management for AZA Animal Programs. SPMAG helps advance the science of applied small population biology and develops tools for use by small population managers.

Species Survival Plan® (SSP) Program- An AZA Survival Plan® Program (SSP) strives to manage a population with the interest and cooperation of AZA-accredited facilities, and is identified through documented demand and potential sustainability within the AZA community defined by the species being held in at least 15 AZA facilities, the majority (>50%) of individual animals of the managed population is housed in AZA member facilities, Breeding exceeds acquisitions from non-AZA sources, and no external entities, government or otherwise, significantly impact how the animals are managed. An SSP is identified by Taxon Advisory Group (TAG)s during the Regional Collection Plan (RCP) process upon review of the SSP Assessment process; and develops a Breeding and Transfer Plan that identifies population goals and

recommendations to manage a genetically diverse, demographically varied, and biologically sound population. Success is achieved when SSP animals are available to meet program goals and come from biologically sound populations as a result of a shared commitment to cooperative populations and program management. All levels of SSPs are subject to AZA's Full Participation and Sustainability Partner Policies.

Species Survival Plan® (SSP) Coordinator- A Species Survival Plan® (SSP) Program Coordinator performs various duties to lead and support the AZA SSP program. The SSP Coordinator works with Institutional Representative (IRs), the AZA Regional Studbook Keeper (if different from the Coordinator), the Taxon Advisory Group (TAG), the Animal Population Management Committee (APM Committee), and the AZA CMWS Department, as well as any associated governmental agencies, to develop, oversee, promote, and support the cooperative animal management, conservation, and research initiatives of the SSP Program. The primary responsibility of the SSP Coordinator is to regularly complete and distribute an SSP Breeding and Transfer Plan for the managed population.

SSP Sustainability Report- An automatically generated 5-page report that summarizes husbandry practices, exhibit management, species appeal, educational opportunities, multi-species exhibit considerations, species biology, SSP population dynamics, management priorities, challenges to sustainability, and research needs. The report is a compilation of the SSP Coordinator's expertise and the current and projected population summaries from the SSP Breeding and Transfer Plan or PVA.

SSP Sustainability Search Portal- An online tool for collection planners, Program Leaders, ILs, IRs, research scientists, and other zoo and aquarium staff. The searchable format allows collection planning users to perform searches that identify appropriate species for their collection planning criteria, while also directing resources and attention to managed species.

Statement of Individual Commitment- A signed statement by the potential new Animal Program (AP) officer to show that the individual is willing and able to meet the commitments and responsibilities of the AP and leading the group in its mission.

Statement of Institutional Support- A signed statement by the potential new Animal Program (AP) officer's facility to show that the facility is willing and able to support this individual in meeting the commitments and responsibilities of the AP and leading the group in its mission.

Steering Committee- The Steering Committee serves as the voting body for Taxon Advisory Group (TAG) business, and all members are integrally involved in TAG decision making, appointments, publications and meetings. The Steering Committee is composed of 5-15 members, including Officers. Each TAG may determine the optimal size and management of its Steering Committee.

Studbooks- An AZA Regional Studbook dynamically documents the pedigree and entire demographic history of each individual in a population of species. These collective histories are known as the population's genetic and demographic identity and are invaluable tools that track and manage each individual cared for in AZA-Accredited Zoos and Aquariums, Certified Related Facilities and by Approved Sustainability Partners as part of a single *ex situ* population.

Studbook Keeper- The AZA Regional Studbook Keeper is responsible for maintaining an accurate record of the histories of all individual animals in an ex situ population. The AZA

Regional Studbook Keeper works directly with the associated Taxon Advisory Group (TAG) and Species Survival Plan® (SSP) Program, all participating AZA member institutions, the Animal Population Management Committee (APM Committee), Population Management Center (PMC) or PMC Adjunct, and the AZA CMWS Department to complete and distribute a timely and accurate AZA Regional Studbook to be used for demographic and genetic analyses relevant to the SSP Program's population management.

Sustainability Designations- An initial Studbook, or a Population Viability Analysis (PVA), Breeding and Transfer Plan, or MateRx determines an Animal Program's (AP's) designation. Sustainability Designations include Secure Species Survival Plan® (SSP) Programs, Signature SSP Programs, and Provisional SSP Programs. This list is updated quarterly on the Association of Zoos and Aquariums (AZA) website.

Sustainability Partners- AZA Animal Population Management Committee (APM Committee) approved wildlife facilities that regularly exchange animals with AZA-accredited facilities and certified related facilities, typically as part of the Species Survival Plan® (SSP) Program Breeding and Transfer Plan or other SSP Program management process.

Target Population Size (TPS)- The desired number of SSP animals to be held across AZA and approved partner facilities over a specific, stated timeframe. This number is determined with consideration for program roles and goals (genetic, demographic, and others), logistical constraints, spatial competition with other TAG-managed species, and other population-specific concerns. Target Population Size is determined by the Taxon Advisory Group (TAG) and published in their Regional Collection Plan (RCP).

Taxon Advisory Group (TAG) Annual Report- Taxon Advisory Group (TAG) Annual Reports update the Animal Population Management Committee (APM Committee) and the Association of Zoos and Aquariums (AZA) CMWS Department on the conservation work of the TAG, and the Animal Programs (APs) within the TAG's purview. TAG Annual Reports provide the Chair an opportunity to document and communicate any potential issues within the TAG's programs, and allow an opportunity for the TAG to submit AP meeting minutes and other materials to AZA on an annual basis. Reports are due to the AZA CMWS Department February 1 of each year.

Taxon Advisory Group (TAG)- Established in 1990, Taxon Advisory Groups (TAGs) examine the conservation and management needs of entire taxa, or groups of related species. TAGs establish priorities for management, research, and conservation. TAGs select appropriate species for AZA conservation and management programs and provide a forum for discussing husbandry, veterinary, ethical, and other issues that apply to entire taxa.

Taxon Advisory Group (TAG) Chair- The primary responsibility of the Taxon Advisory Group (TAG) Chair is to assure the completion and distribution of a Regional Collection Plan (RCP). Additional responsibilities include leadership of the TAG, organization of its members, oversight and consistent communication with all Animal Programs within the TAG's purview (Species Survival Plan® (SSP) Program, AZA Regional Studbooks, and Candidate Programs), the Institutional Liaisons (ILs), Institutional Representatives (IRs), and reporting to the Animal Population Management Committee (APM Committee). The TAG Chair serves as the primary contact and AZA expert for the taxon and abides by the duties and responsibilities defined for the position.

AZA Documents

The documents referenced throughout this handbook can be found at the following AZA webpages:

Board-Approved Policies and Position Statements:

"AZA Animal Management Reconciliation Policy"

"Policy on Full Participation in SSPs"

Population Management Center

"Preparing for a Planning Meeting with the PMC"

Program Leader and Officer Applications

"SSP Coordinator Application"

"SSP Coordinator and Regional Studbook Keeper Application"

"Statements of Commitment and Support for Officers"

Resource Documents

"AZA Animal Programs Chart"

"AZA Guidelines for Roles and Access to ZIMS for Studbooks"

"AZA Guidelines Template"

"AZA Position Statement Template"

"AZA White Paper Template"

"Citation Formats"

"Communications Guidelines"

"Guidelines for Assessing Sustainability Partners in SSP Programs"

"SSP Highlights Template"

"Starting a New AZA Studbook in ZIMS for Studbooks"

"Sustainability Partner Policy & Application"

"Sustainability Partner Policy FAQ"

Citation Formats

Citation of an SSP Breeding and Transfer Plan:
*SSP Coordinator should be the first author, then Studbook Keeper, then the Population Biologist.

SSP Coordinator last name, first initial., Studbook Keeper last name, first initial., and Population Biologist last name, first initial. Year published. Species common name (Scientific name). AZA Species Survival Plan® Designation color Program Population Analysis & Breeding and Transfer Plan. AZA Population Management Center: Chicago, IL.

McAuliffe, J., Ross, S., and Andrews, J. 2017. Chimpanzee (Pan troglodytes). AZA Species Survival Plan® Green Program Population Analysis & Breeding and Transfer Plan. AZA Population Management Center: Chicago, IL.

Citation of a Global Species Management Plan:
GSMP Coordinator last name, first initial. and Population Biologist last name, first initial. Year published. Species common name (Scientific name) WAZA Global Species Management Plan. Institution name: City, State.

Myers, M., Gardner, L., and Lynch, C. 2018. Blue-crowned Laughingthrush (Dryonastes courtoisi). WAZA Global Species Management Plan. Riverbanks Zoo: Columbia, SC.

Citation of an AZA Regional Studbook:
Studbook Keeper last name, first initial. Year published. Species common name (Scientific name) AZA Regional Studbook. Institution name: City, State.

Ross, S. 2015. Chimpanzee (Pan troglodytes) AZA Regional Studbook. Lincoln Park Zoo: Chicago, IL.

Citation of a ZIMS for Studbooks Database:
ZIMS for Studbooks for [Scope/taxonomy]. ([Studbook Keeper last name, first initial], [Currentness date of studbook]). Species360 Zoological Information Management System. Retrieved from http://zims.Species360.org; [annotation to define filters used].

ZIMS for Studbooks for Curl-crested Aracari (Pteroglossus beauharnaesii). (Parotti, F., 14 January, 2019). Species360 Zoological Information Management System. Retrieved from http://zims.Species360.org; filter: AZA.

Citation of a Regional Collection Plan:
TAG Chair last name, first initial. Year published. TAG name Regional Collection Plan. Institution name: City, State.

Holmes, C. 2018. Galliformes TAG Regional Collection Plan. Houston Zoo: Houston, TX.

Citation of a Population Viability Analysis:
(all Last name, First initial) Population Biologist., SSP Coordinator., Studbook Keeper., TAG Chair., and TAG Vice Chair. Year. Species common name (Scientific name) AZA Animal Program Population Viability Analysis Report. Lincoln Park Zoo: Chicago, IL.

Johnson, B., Ray, J., Reinartz, G., Meinelt, A., Stoinski, T., and Fenn, T. 2016. Bonobo (Pan paniscus) AZA Animal Program Population Viability Analysis Report. Lincoln Park Zoo: Chicago, IL.

Citation of an SSP Sustainability Report:
SSP Coordinator last name, first initial. Year published. Species common name (Scientific name) Species Survival Plan® Sustainability Report. Association of Zoos and Aquariums: Silver Spring, MD.

McAuliffe, J. 2017. Chimpanzee (Pan troglodytes) AZA Species Survival Plan® Sustainability Report. Association of Zoos and Aquariums: Silver Spring, MD.

Citation of a Survival Statistic Report:

(all Last name, First initial) SSP Coordinator., SSP Vice Coordinator., Studbook Keeper., Population Biologist. Year. Descriptive Survival Statistics Report for Species common name (Scientific name). Chicago (IL): Lincoln Park Zoo.

Fischer, M., Gray, C., Keele, M., Ray, J., Long, S. 2014. Descriptive Survival Statistics Report for Asian Elephant (Elephas maximus). Chicago (IL): Lincoln Park Zoo.

Citation of PMCTrack:
Faust, L., Theis, M., Long, S., and Shell, S. 2011b. PMCTrack: A Website for Monitoring Breeding and Transfer Recommendations for Zoo Programs. Lincoln Park Zoo, Chicago, IL.<https://www.pmctrack.org> .

Citation of an Animal Care Manual:
AZA (X) Species Survival Plan® (or Taxon Advisory Group). (YEAR). XXX Care Manual. Silver Spring, MD: Association of Zoos and Aquariums.

Citation of an Ambassador Animal Guideline:
AZA Ambassador Animal Scientific Advisory Group, Species Common Name Species Survival Plan® (or Taxon Advisory Group). (YEAR). Species common name Ambassador Animal Guidelines. Silver Spring, MD: Association of Zoos and Aquariums.

ASSOCIATION OF ZOOS & AQUARIUMS

PENGUIN (Spheniscidae) CARE MANUAL

CREATED BY THE
PENGUIN TAXON ADVISORY GROUP
IN ASSOCIATION WITH THE
AZA ANIMAL WELFARE COMMITTEE

Penguin (Spheniscidae) Care Manual

Published by the Association of Zoos and Aquariums in association with the AZA Animal Welfare Committee

Formal Citation:

AZA Penguin Taxon Advisory Group. (2014). Penguin (Spheniscidae) Care Manual. Silver Spring, MD: Association of Zoos and Aquariums.

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Disclaimer: This manual presents a compilation of knowledge provided by recognized animal experts based on the current science, practice, and technology of animal management. The manual assembles basic requirements, best practices, and animal care recommendations to maximize capacity for excellence in animal care and welfare. The manual should be considered a work in progress, since practices continue to evolve through advances in scientific knowledge. The use of information within this manual should be in accordance with all local, state, and federal laws and regulations concerning the care of animals. While some government laws and regulations may be referenced in this manual, these are not all-inclusive nor is this manual intended to serve as an evaluation tool for those agencies. The recommendations included are not meant to be exclusive management approaches, diets, medical treatments, or procedures, and may require adaptation to meet the specific needs of individual animals and particular circumstances in each institution. Commercial entities and media identified are not necessarily endorsed by AZA. The statements presented throughout the body of the manual do not represent AZA standards of care unless specifically identified as such in clearly marked sidebar boxes.

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Introduction

Preamble

AZA accreditation standards, relevant to the topics discussed in this manual, are highlighted in boxes such as this throughout the document (Appendix A).

AZA accreditation standards are continuously being raised or added. Staff from AZA-accredited institutions are required to know and comply with all AZA accreditation standards, including those most recently listed on the AZA website (http://www.aza.org), which might not be included in this manual.

Taxonomic Classification

Table 1. Taxonomic classification for penguins

Classification	Taxonomy	Additional information
Kingdom	Animalia	
Phylum	Chordata	
Class	Aves	
Order	Neognathae	
Suborder	Sphenisciformes	
Family	Spheniscidae	

Genus, Species, and Status

Table 2. Genus, species, and status information for penguins

Genus	Species	Common Name	USA Status	IUCN Status	AZA Status
Aptenodytes	*patagonicus*	King penguin	Not listed	Least Concern	Green SSP
Aptenodytes	*forsteri*	Emperor penguin	Not listed	Least Concern	Red SSP
Eudyptes	*pachyrynchus*	Fiordland penguin	Threatened	Vulnerable	
Eudyptes	*robustus*	Snares penguin		Vulnerable	
Eudyptes	*sclateri*	Erect-crested penguin	Threatened	Endangered	
Eudyptes	*chrysocome*	Southern rockhopper penguin	Threatened	Vulnerable	Green SSP
Eudyptes	*moseleyi*	Northern rockhopper penguin	Not listed	Endangered	Red SSP
Eudyptes	*chrysolophus*	Macaroni penguin	Not listed	Vulnerable	
Eudptyes	*schelegeli*	Royal Penguin	Not listed	Vulnerable	
Eudyptula	*minor*	Little blue penguin	Not listed	Least Concern	Yellow SSP
Pygoscelis	*adeliae*	Adélie penguin	Not listed	Least Concern	Green SSP
Pygoscelis	*antarctica*	Chinstrap penguin	Not listed	Least Concern	Yellow SSP
Pygoscelis	*papua*	Gentoo penguin	Not listed	Least Concern	Green SSP
Megadyptes	*antipodes*	Yellow-eyed penguin	Threatened	Endangered	
Spheniscus	*magellanicus*	Magellanic penguin	Not listed	Near Threatened	Green SSP
Spheniscus	*humboldti*	Humboldt penguin	Threatened	Vulnerable	Green SSP
Spheniscus	*mendiculus*	Galapagos penguin	Endangered	Endangered	
Spheniscus	*demersus*	African penguin*	Endangered	Endangered	Green SSP

*Also known as the black-footed, Cape, and jackass penguin.

General Information

The information contained within this Animal Care Manual (ACM) provides a compilation of animal care and management knowledge that has been gained from recognized species experts, including AZA Taxon Advisory Groups (TAGs), Species Survival Plan® Programs (SSPs), Studbook Programs, biologists, veterinarians, nutritionists, reproduction physiologists, behaviorists and researchers. They are based on the most current science, practices, and technologies used in animal care and management and are valuable resources that enhance animal welfare by providing information about the basic requirements needed and best practices known for caring for *ex situ* penguin populations. This ACM is considered a living document that is updated as new information becomes available and at a minimum of every five years.

Information presented is intended solely for the education and training of zoo and aquarium personnel at AZA-accredited institutions. Recommendations included in the ACM are not exclusive management approaches, diets, medical treatments, or procedures, and may require adaptation to meet the specific needs of individual animals and particular circumstances in each institution. Statements presented

throughout the body of the manuals do not represent specific AZA accreditation standards of care unless specifically identified as such in clearly marked sidebar boxes. AZA-accredited institutions which care for penguins must comply with all relevant local, state, and federal wildlife laws and regulations; AZA accreditation standards that are more stringent than these laws and regulations must be met (AZA Accreditation Standard 1.1.1).

AZA Accreditation Standard

(1.1.1) The institution must comply with all relevant local, state, and federal laws and regulations, including those specific to wildlife. It is understood that, in some cases, AZA accreditation standards are more stringent than existing laws and regulations. In these cases the AZA standard must be met.

The ultimate goal of this ACM is to facilitate excellent penguin management and care, which will ensure superior penguin welfare at AZA-accredited institutions. Ultimately, success in our penguin management and care will allow AZA-accredited institutions to contribute to penguin conservation, and ensure that penguins are in our future for generations to come.

Penguins are flightless, highly specialized marine birds which spend the majority of the year at sea, coming ashore to nest and molt. On land, they are highly social animals, often occurring in large flocks that can number into the tens of thousands. They are dependent on prey items such as fish, crustaceans, and squid. This dependence creates a great vulnerability to pressures from fisheries as well as global climate change, oil spills, marine pollution, human disturbance, hunting, degradation of nesting habitats, and disease. All of these factors have led to the decline of most of the 18 species of penguins.

All species of penguin are found in a wide range of habitats throughout the Southern Hemisphere, from the snow and ice in Antarctica, to temperate rain forests in New Zealand. Breeding, egg-laying, and nest building vary across the species. The largest species of penguins—the Emperor and King penguins—will lay one egg, and instead of building a nest structure, will hold the egg in place on top of their feet. Other species build rock nests or burrows and lay two eggs. Penguins are normally monogamous and will often nest with the same partner for a number of years.

Penguins are long-lived; some individuals will breed at 20 years of age in the wild, and at over 30 years of age in zoos and aquariums. Some species will start nesting at 2 years of age, but others may not breed until they are 5 years old. Most species nest once a year during times of favorable environmental conditions, but for some species the nesting season is variable. A few species will nest twice during the same year.

Due to their adaptation to a marine environment, all penguin species are similar in morphology and physiology. The body is streamlined and the wings are adapted for swimming. Feathers are specialized, improving swimming performance while providing insulation and waterproofing. During molt, penguins lose waterproofing and insulation and should remain on land until molt is complete. This requires penguins to gain weight prior to molt while fasting during molt. (This physiological process has significant implications in an *ex situ* environment, and is addressed in this manual.) Plumage is similar in all species: the dorsal side is darkly colored and the ventral side is white. This coloration provides visual protection from both above and below.

Because of their aquatic adaptations penguins spend significant time in the water. Cold, clean water is essential to their well-being. Penguins will utilize deep pools and pathways that allow for circular swimming. In the wild, penguins will "porpoise," a natural movement behavior that also occurs in zoo and aquarium environments if the aquatic habitat provides adequate space. Despite their aquatic nature, land space is also important for penguins; if provided in a zoological setting, penguins will spend significant time on land. Land areas should to be designed for roosting, nesting, and walking.

Their beaks are specialized and vary in size and shape depending on their prey. In the wild, penguins eat a variety of marine species including fish, squid, and krill. During nesting season, they will forage within a limited area near their nesting location, but they spend the majority of the year at sea. Recent advances in data trackers have allowed researchers to determine important foraging locations. This information has been used to protect important marine systems.

Penguins are not regulated by the US government other than those species listed as endangered or threatened by the Endangered Species Act. Regulations under this act can create challenges in importing or exporting birds to other countries, but do not affect movements within the United States.

Chapter 1. Ambient Environment

1.1 Temperature and Humidity

> **AZA Accreditation Standard**
>
> (1.5.7) The animals must be protected from weather, and any adverse environmental conditions.

The animals must be protected from weather, and any adverse environmental conditions. (AZA Accreditation Standard 1.5.7). Animals not normally exposed to cold weather/water temperatures should be provided heated enclosures/pool water. Likewise, protection from excessive cold weather/water temperatures should be provided to those animals normally living in warmer climates/water temperatures.

Temperature: Penguins are warm-blooded, with average body temperatures ranging from 37.8–38.9 °C (100–102 °F). Penguin species range from the equator to the Antarctic Circle, but are generally found in waters that are relatively cool for the latitude. Temperature regulation is accommodated by both behavioral and physiological adaptations. Apart from behavior and weight, overlapping feathers with downy shafts and a thick layer of blubber provide very effective insulation against the cold. Penguins found in warmer latitudes may face problems with excess heat. These birds generally have thinner layers of blubber than polar species, and also have less dense feathers on the head and flippers. Heat can be lost by ruffling feathers to expose the skin, shading the feet, holding the flippers away from the body, panting, or by remaining in sheltered burrows. Feathers are replaced yearly in a "catastrophic" molt, which generally follows the breeding season.

Air temperature: The following optimum air temperature ranges are recommended for indoor exhibits, and can be used as a guide by northern facilities that seasonally exhibit these species outside.

Table 3. Recommended temperature ranges for penguins

Species	Air temperature range
Emperor	-6 to 0 °C (20 to 32 °F)
Adelie	-6 to 1 °C (20 to 34 °F)
Chinstrap, gentoo	-4.5 to 7 °C (24 to 45 °F)
King, macaroni, rockhopper	0 to 11.5 °C (32 to 52 °F)
Little blue	12 to 22 °C (54 to 72 °F)
African, Magellanic, Humboldt	4.5 to 26.5 °C (40 to 80 °F)

Antarctic and sub-Antarctic penguin species (emperor, Adelie, chinstrap, gentoo, king, macaroni, rockhopper) need to be kept in climate controlled indoor facilities that can maintain the appropriate temperatures. Temperate species (African, Humboldt, Magellanic, little blue) can be successfully housed indoors or outdoors, or in exhibits using a combination of both. The success of an outside exhibit depends chiefly on the ambient temperature and the relative humidity of the area. When housing temperate penguins outdoors in areas where the temperature rises above 26.5 °C (80 °F), provisions should be made to allow the birds a means of heat relief. Sprinklers, misters, shaded areas, and forced-air movements are recommended methods. Chilled water and access to climate controlled areas should be provided. Heat stress problems are not confined to warm southern areas; hot, humid days in the upper mid-east of the United States are warm enough to cause problems. Signs of heat stress include panting, lethargy, and decreased appetite. The penguins may not automatically go into their pool or climate controlled holding areas and may need to be forced into these areas if heat stress becomes apparent. Fans, sprinklers, and misters should also be placed in or around the exhibit and indoor holding areas

Outside exhibits should be constructed so that the birds have shelter from freezing winds in the winter months. When the temperature falls below freezing, all birds should have access to shelter. Open water should be available all winter, and pools should not be allowed to freeze. Penguin species that naturally inhabit temperate climates (e.g., Spheniscid species) may suffer frostbite to the flippers if housed outdoors in cold climates with inadequately heated or accessed shelters.

Water temperature: Acceptable water temperature ranges for penguins housed in zoos and aquariums can be found below.

Table 4. Recommended temperature ranges for penguin pools

Species	Water temperature range
Adélie and emperor	1–7 °C (33–45 °F)
King, gentoo, chinstrap, macaroni, rockhopper	2–13 °C (35–55 °F)
Little blue	12-22 °C (54-72 °F)
African, Magellanic, Humboldt	4–18 °C (40–65 °F)

Some outside exhibits may have ambient temperatures that could rise above 29 °C (84 °F) during the summer months without causing adverse effects to the birds. Chilled water in these situations can assist birds in thermoregulation during these environmental conditions.

Humidity: Penguins do not thrive in humid climates. Warm, humid climates may be conducive to aspergillus infection. In addition, warm wet environments are breeding grounds for mosquitoes and penguins are highly susceptible to malarial infection. Outside exhibits in humid areas with heavy mosquito populations should not be considered for penguin enclosures. A mosquito abatement program should be in place in areas where mosquitoes are present.

In situ populations of penguins may experience a variety of humidity ranges depending on the season and their location (e.g., on the Antarctic continent, the coast of Chile, or the beaches of Australia), however an optimal humidity range has not been scientifically demonstrated. In zoos and aquariums, great care should be taken to ensure that penguins are provided the ability to regulate their own temperatures at all times through their behavior. Systems employed to raise or lower humidity within indoor and outdoor exhibits include air conditioning, dehumidifiers, misters, sprinklers, and fans.

AZA institutions with exhibits which rely on climate control must have critical life-support systems for the animal collection and emergency backup systems available, while all mechanical equipment should be included in a documented preventative maintenance program. Special equipment should be maintained under a maintenance agreement or records should indicate that staff members are trained to conduct specified maintenance (AZA Accreditation Standard 10.2.1).

AZA Accreditation Standard

(10.2.1) Critical life-support systems for the animals, including but not limited to plumbing, heating, cooling, aeration, and filtration, must be equipped with a warning mechanism, and emergency backup systems must be available. All mechanical equipment must be kept in working order and should be under a preventative maintenance program as evidenced through a record-keeping system. Special equipment should be maintained under a maintenance agreement, or a training record should show that staff members are trained for specified maintenance of special equipment.

Climate control: The AZA Penguin TAG recommends that each institution identify the most appropriate climate control systems suitable for their penguin exhibits in order to meet the temperature and humidity recommendations provided above.

Climate control systems can include but are not limited to the following items: HVAC system, heat exchanger, air handling unit, chiller, furnace or boiler system, and the computronics to run the system. All employees should have a general knowledge of the mechanical system to identify any unusual signs that the system may need repair. Daily mechanical/equipment checks should be conducted and information recorded. Any anomalies (e.g., high temperatures, mechanical failures, oil leaks) should be addressed. Critical repairs should be completed as soon as possible. Routine and preventative maintenance on equipment is recommended and all repairs documented.

Backup generators are recommended in the event of a power failure. The type of generator required will be dependent on the needs of the exhibit (e.g., small or portable generator for incubators, or large diesel backup generators for the exhibit). Facilities should have a contingency plan for moving animals in the event of a catastrophic event (e.g., natural disaster, motor failure, wide spread power failure, complete system breakdown). These contingency plans may include moving penguins to alternate housing.

1.2 Light

AZA-accredited zoos and aquariums should give careful consideration to the provision of proper lighting for penguins. For indoor exhibits, special attention should be given to the spectral quality of the light, the light intensity, and the photoperiod. Where feasible, the provision of natural light should be considered. It is recommended that designers plan ahead for the likely potential that more light will be required than what is projected to be needed. The configuration of the exhibit, along with the variation in

exhibit elements and number of birds housed, will influence light absorption and reflectivity within the enclosure and has ultimate impact on the amount of light needed to be delivered inside the exhibit.

Types of lighting that have been used with penguins include skylights, HID lamps (mercury vapor and metal halide), quartz halogen, fluorescent (normal and full-spectrum), incandescent and, most recently, LED. Each type of light installation has unique characteristics and photometrics. For example, HID lamps produce heat and this should be considered when assessing overall exhibit heat load. However, metal halides are a relatively energy-efficient means of providing good quality, high intensity light. Fluorescent lamps are frequently used providing good energy efficiency and spectral output but may not provide sufficient intensity. When evaluating lighting needs, it is recommended to use a variety of bulbs to assure a balanced appearance and appropriate spectral environment. Bulb manufacturers can provide information on color temperature, color rendering index (CRI), and spectral power distribution (the distinct spectrum of light produced by the bulb). It is recommended to consult with other penguin exhibitors before making final decisions about light installations.

Proper maintenance of light fixtures is essential to good quality light. Institutions should make provision for annual replacement of light bulbs because many types of lamps experience a change in their spectral output with use. Skylights or windows through which light passes should be kept clean to maximize light transmittance.

Exposure to a consistent photoperiod is essential to promoting proper breeding and molting cycles. Although penguins have reproduced on a simple turn on/turn off lighting system, some zoos and aquariums report enhanced reproductive success by varying annual day length and light intensity. Lighting schedules should reflect definitive photoperiods to encourage natural molting and breeding cycles. Several zoos and aquariums use lighting schedules that approximate that of the latitudes in which the species exhibited are found. Variations in molt patterns have been correlated with lighting schedules, Penguins are maintained successfully in both northern and southern photoperiod. Birds that are transferred from one cycle to another will usually adapt biologically within three years.

1.3 Water and Air Quality

AZA-accredited institutions must have a regular program of monitoring water quality for aquatic animals and a written record must document long-term water quality results and chemical additions (AZA Accreditation Standard 1.5.9). Monitoring selected water quality parameters provides confirmation of the correct operation of filtration and disinfection of the water supply available for the collection. Additionally, high quality water enhances animal health programs instituted for aquatic collections.

> **AZA Accreditation Standard**
>
> **(1.5.9)** The institution must have a regular program of monitoring water quality for fish, pinnipeds, cetaceans, and other aquatic animals. A written record must be maintained to document long-term water quality results and chemical additions.

Water quality: Both fresh water and salt water can be used in penguin exhibits. The water in a penguin exhibit pool should be clear and of good color with a low bacterial count. (Coliform bacteria levels should not exceed 1,000 MPN (most probable number) per 100 mL of water (Animal Welfare Regulations, 2013). A coliform bacteria count over 1,000 MPN is an indicator of potentially harmful conditions. There are several ways of controlling coliform levels. Water treatment filtration systems include sand, diatomaceous earth, ozone, biological, and ultraviolet light (UV). The addition of a chlorine or bromine system in conjunction with the filtering system also aids in controlling coliform levels. Older exhibits without filtration should maintain a clean supply of constantly running water, with adequate surface water skimming. Skimming capacity is essential for the health of the birds. Oils that build up on the water should be removed in order to maintain healthy feather condition. The number of skimmers should correspond to pool size and configuration. Noxious odors such as ammonia and chlorine that can cause health problems at high concentrations should be carefully monitored.

Performing routine water chemistries assures proper maintenance of water quality for pools. Chemistries should be taken at least once a month but a more frequent schedule is recommended. A record of results should be maintained and reviewed. When collecting water for testing, the sample should be taken from 61–91 cm (2–3 ft.) below the surface in about the same location at each collection. Tests can be performed by various methods such as with a refractometer, spectrophotometer or water quality test stripes such as HACH® AquaChek strip. The tests to be run may include but are not limited to ammonia, nitrite, nitrate, pH, temperature, and specific gravity.

Ammonia (NH_3) should be kept at a level below 0.1 ppm and nitrite (NO_2) levels below 0.5 ppm, although Spotte (1992) lists concentrations 3 ppm as being safe for adult marine fish. Nitrate (NO_3) is the final product in the nitrogen cycle and is safer than nitrite or ammonia. Nitrate readings below 50 ppm are safe for adult marine fish. Nitrate will not react out of the system and is removed only through water changes. The pH for saltwater should range from 8.0 to 8.3 and for fresh water 5.5 to 7.5. Specific gravity for saltwater pools should range from 1.020 to 1.030. Ozone can be utilized for disinfection of penguin water sources. When ozone is used, institutions should develop specific water filtration and disinfection protocols. The following information on the use of ozone has been adapted from approaches used at one institution (see www.zoolex.org). Ozone disinfection can be achieved by using a 10% by-pass flow supplied by a 40 g (1.41 oz.) ozonator through dry air (2 mg/L) that is mixed with filtered water in a vortex mixing chamber with a contact time of two minutes. The oxidation reduction potential (ORP) taken from the mixing chamber can be used to measure and monitor the automation of the ozonator, along with oxidation-reduction probes in the return to pool line. In all cases, a back-up oxidization treatment system should be available (e.g., 1.0 mg/L sodium hypochlorite), and should become operative if the ozonator experiences any mechanical difficulties. If any of the water quality results are above the target levels appropriate, water changes should be performed. Penguin pools require a turnover rate of three to five times the system volume per hour.

Table 5. Recommended water quality parameters

	Temp (°C (°F))	pH	Oxidant (mg/L)	ORP (mVolts)	Turbidity (NTU)	Salinity (0/00)	Coli (/1000mL)	NH3 (mg/L)
Antarctic	42–45 (6–7)	7.2–8.2	0	400–600	<0.20	30–34	<1000	<0.10
Spheniscus	54–57 (12–14)	7.2–8.2	0	275–325	<0.20	30–34	<1000	<0.10

Drainage: Drainage systems for land areas and pool areas should be separate to avoid pool contamination from run-off or exhibit maintenance. Drains, intake valves, and skimmers should be covered so that direct contact by birds is not possible. In filtered systems, care should be taken to provide a large enough bottom drain cover to prevent the possibility of a bird being sucked onto the drain.

Surface drainage should be adequate to allow for quick drying, and all floors should slope to the drain. One of the major reasons to have large exhibits is so penguins can come in and out of the water and dry quickly. Low spots that puddle should be avoided because a constantly wet substrate will eventually cause foot problems in penguins, as well as added staff hours needed for servicing the facility.

Air quality: Penguins as a group are highly susceptible to air-borne fungal infections. For this reason, the air quality in an indoor penguin exhibit should be optimal. Airflow, fresh air exchange, and filter capacity should be researched to provide the cleanest air possible. *Aspergillus fumigatus* spores range in size from 2.5–3 microns with other aspergillus species spores as large as 10 microns. In order to remove these spores from the air, a filter should remove particles in that size range or smaller. If possible sources of aspergillus are external to the exhibit then consideration should be given to reducing fresh air intake and providing a high-quality filter on the incoming air line as well as in the recirculation line. If the possible sources of aspergillus are internal to the exhibit, then a high-quality filter in the recirculating system, a high volume air change per hour, and increased fresh air exchange—as well as identifying and removing the aspergillus source within the exhibit—should be considered. Collection of regular air cultures in the exhibit as well as the air-handling system is a good practice in preventative maintenance. To aid in control of malaria in outdoor exhibits, consideration should be given to installing fans, since mosquitoes avoid persistent air movement.

Air turnover rates in the range of 15 air changes per hour have been recommended for laboratory animals (Lane-Petter, 1976). These parameters may be acceptable for penguins; however, the specific design of an air system needs to balance the tradeoffs between: (1) filter efficiency and airflow or ventilation; and (2) fresh air exchange and temperature regulation capacity. The exhibits of some 1993 AZA Penguin TAG Survey respondent institutions are under positive pressure, which allows air to be forced out instead of into the exhibit when a door is open (Henry, 1993). Doors should be well sealed to prevent air exchanges with outside areas. These rates are acceptable for closed indoor systems.

Daily records of air/water parameters should be recorded to monitor for any changes. If a significant variation in air/water parameters occurs, the penguins' behavior should be carefully monitored for correlations. Immediate steps should be taken to correct problems. Appropriate air monitoring is important for maintaining proper air quality. Air filters, at least 3 microns, are recommended. Filters should be

changed on a regular basis; as often as once a month or more as air quality dictates. Air handlers can be disinfected monthly to reduce the risk of fungal growth. Air testing using agar plates can be conducted every few months to ensure that fungal growth is not occurring. Prior to adding penguins to a new or refurbished exhibit, the air should be monitored for any signs of fungal growth. If spores are grown the area should be cleaned and disinfected, filters changed and another set of air testing should be completed.

1.4 Sound and Vibration

Consideration should be given to controlling sounds and vibrations that can be heard by animals in the care of AZA-accredited zoos and aquariums.

In general, penguins appear adaptable to auditory stimuli within their environments, and can acclimate to new noises and vibrations that are slowly introduced and associated with positive stimuli. However, new sounds and/or sources of vibrations (e.g., generators, water filters, construction noise, concerts, etc.), and activities that may create chronic or acute auditory stressors, should be eliminated or minimized during sensitive animal management periods such as animal introductions, nesting, chick rearing, the arrival of animals in quarantine, and when animals are sick.

Results from formal and informal research into the responses of penguins to sounds and vibrations within zoo and aquarium environments, the welfare issues that may result from this exposure, and methods of minimizing the effect of these stimuli, should be reported to the AZA Penguin TAG and individual species SSP Programs. The AZA Penguin TAG and its SSP programs support research that advances the development of management recommendations and exhibit designs to best meet the needs of penguins in AZA-accredited zoos and aquariums.

Penguin colonies in general can be quite noisy environments (i.e., 90–100 dBA), and penguins seem to adapt to frequent high noise levels (A. Bowles, personal communication). Pending further research, it is recommended that sound levels suitable for humans without hearing protection (i.e., OSHA standards for an 8-hour day) are adequate for penguins.

Chapter 2. Habitat Design and Containment

2.1 Space and Complexity

Careful consideration should be given to exhibit design so that all areas meet the physical, social, behavioral and psychological needs of the species. Penguins should be presented in a manner reflecting modern zoological practices in exhibit design (AZA Accreditation Standard 1.5.1). Penguins must be housed in enclosures and in appropriate groupings which meet their physical, psychological, and social (AZA Accreditation Standard 1.5.2).

AZA Accreditation Standard

(1.5.1) Animals should be presented in a manner reflecting modern zoological practices in exhibit design, balancing animals' functional welfare requirements with aesthetic and educational considerations.

AZA Accreditation Standard

(1.5.2) Animals should be displayed, whenever possible, in exhibits replicating their wild habitat and in numbers sufficient to meet their social and behavioral needs. Display of single specimens should be avoided unless biologically correct for the species involved.

Enclosure space and complexity: Throughout most of the year, the behavior of penguins in zoos and aquariums is fairly predictable, consisting primarily of eating, swimming, and generalized social interaction. Penguins require a multi-faceted exhibit that encompasses enough space for species-appropriate behaviors such as breeding, nesting, and swimming, as well as areas for holding, isolating, and quarantining birds.

Isolation area: Isolation areas should be separate areas for housing birds that need to be isolated for forced pairing, behavioral challenges, parent and hand-rearing of chicks, and non-contagious health problems.

Quarantine area: The quarantine facility for penguins should be a separate facility for accommodating newly acquired birds, or birds that should be separated from the group for health-related reasons. This area should provide separate air and water systems from the main exhibit. A quarantine area can serve as an isolation area if not in use for its intended purpose, or if the isolated birds are treated as quarantine birds whenever quarantine is active. An isolation area without separate air and water systems should not be considered as an appropriate quarantine area.

At the present time, the AZA Penguin TAG adopts minimum guidelines for housing penguins (see Table 6). Additional space should be provided so that penguins are able to perform their full range of species-appropriate behaviors. The same criteria apply to the pool surface area in order to allow sufficient space for the swimming habits of the colony. Penguins within the facility should be able to lie down and turn in a complete circle. The following guidelines are recommended as minimum and only minimum criteria for exhibit and holding standards. These minimum areas do not include land required for nesting for all penguins other than *Aptenodytes*.

Table 6: Minimum space requirements

Species	Land Area	Pool Area	Pool Depth	Pool Volume
King/Emperor				
Exhibit - (per bird for 1st 6 birds)	1.7 m^2 (18 ft^2)	0.8 m^2 (9 ft^2)	1.2 m (4 ft.)	6156 liters (1620 gallons)
Each additional bird	0.8 m^2 (9 ft^2)	0.5 m^2 (5 ft^2)	---	593 liters (156 gallons)
Short-term holding area <6 mo/per bird	0.8 m^2 (9 ft^2)	0.5 m^2 (5 ft^2)	0.9 m (3 ft.)	
All other species (includes program animals)				
Exhibit - (per bird for 1st 6 birds)	0.7 m^2 (8 ft^2)	0.4 m^2 (4 ft^2)	0.9 m (3 ft.)	2052 liters (540 gallons)
Each additional bird	0.4 m^2 (4 ft^2)	0.2 m^2 (2 ft^2)	---	171 liters (45 gallons)
Short-term holding area (per bird)	0.4 m^2 (4 ft^2)	0.3 m^2 (3 ft^2)	0.6 m (2 ft.)	

Enough land mass is needed to accommodate the number of birds housed in the exhibit allowing for territorial disputes, and providing areas for nesting during the breeding season. Penguins also use vertical space and all land space accessible to the birds should be considered usable space. Adequate space will be determined by the particular species and the particular birds and best determined by the animal staff that works with and knows the birds. The amount of land space provided to birds within a breeding colony

of penguins needs to be the size that it takes for individuals to build a nest far enough away from conspecifics that they are out of reach from a neighboring nesting bird's beak. This ensures that neighboring birds do not peck chicks. Larger penguin colonies may benefit from an open area to facilitate individual feeding of supplemented fish.

The AZA Penguin TAG understands that there may be circumstances for short term holding during maintenance of an existing facility or construction of a new exhibit where an institution may find it necessary to house birds in a facility that maintains a healthy and appropriate life support system but may fall outside the square footage recommendations of land or water. The TAG encourages those institutions designing or renovating penguin exhibits to provide enriching and generous land space and as deep of a pool as financially possible to offer the birds an opportunity to perform their natural diving behaviors.

Enclosure design: Penguins are colonial, and the need for visual barriers within enclosures is usually not necessary. Barriers like whalebones, rocks, etc. may be used during breeding seasons between nest sites, and nest boxes or burrows should be 2 m (6.6 ft.) apart. This distance helps to prevent injury of a chick, and does not necessarily keep the birds out of sight from one another. In general, penguins do not seem to be disturbed by visitors, but they should be given an area within their enclosure where they can get away from the public view if they choose.

Hiding places for penguins can include nest boxes, caves, or rock areas that they can duck behind. There should be sufficient hiding places to allow as many opportunities for individual animals (or all individuals) to get out of sight as possible. Penguins should be allowed to move a comfortable flight distance, a minimum of four feet, from the public

Penguins appear to be very adaptable to changes in their physical environment. Changes in the exhibit are enriching to the animals and should be encouraged. Design flexibility can This can include moving rocks around the exhibit, using waves and ice blocks in the pool, and utilizing misting systems. The following list identifies facility design considerations recommended for appropriate and effective care of penguins in AZA-accredited zoos and aquariums:

Observations: Video cameras are an excellent tool to assist in recording events such as breeding, nesting, and chick rearing behavior. Underwater viewing areas for staff and visitor observations are also useful.

Exhibit maintenance: Various land areas where birds can safely get in and out of the water should be provided. Safe entryways and exits should also be provided for keepers and maintenance workers going down into the pool area, and for divers entering and exiting the pool. Walkways and land areas should be safe for keepers to walk on with no trip hazards. Barriers to block birds from the exhibit pool during draining or maintenance should be included within the design of the exhibit.

Enclosure landscaping: The land area should be large enough for various feeding stations to be provided. All areas should be landscaped to minimize bumblefoot by including different levels and different substrates and to encourage natural behaviors. It should also be possible to clean exhibit areas, and good drainage is essential to prevent puddles from accumulating. Care should be taken to ensure that nesting areas are located where the birds feel comfortable and where the public can have at least a partial view.

Miscellaneous: Adding general storage areas for nesting material and behavioral enrichment items near or on exhibit, as well as mixing chambers for adding chemicals to pool water, is helpful for the daily management of the animals.

Enclosure substrates: At this time, there is no single product that meets all of the requirements necessary for optimum penguin substrate. Many institutions use a combination of the following products to provide effective substrate for their birds: Astroturf, concrete, dirt, Dri-Dek®*, fiberglass, grass, Gunite, ice, cat litter, Nomad™* matting, peanut shells, polyurethane*, rocks (river, pea gravel), sand, and sport track surfacing (See Appendix K for product information). Some zoos add soil and vegetation in outdoor exhibits.

Cat litter: Because of its desiccating nature, cat litter has been reported to decrease foot problems and respiratory issues caused by molds. However, caution should be used as cat litter labels now include an OSHA warning relating to the percentage of silica dust contained in the product. Cat litter will also find its

way into the pool drains, as well as the water and filtering systems, where it will clog mechanical equipment, creating additional keeper and maintenance work.

Ground peanut shells: Care should be taken when using ground peanut shell litter products. Although peanut shells do not fall under OSHA regulations, they can serve as a natural media for aspergillus growth. If this product is used, it is recommended that a fungal retardant be added at the manufacturers' level. As a precaution, it is recommended that the product be cultured for fungi before use.

Concrete: Historically, concrete has been used as a substrate for penguin enclosures. It is easy to clean and readily available. Over a period of time, however, the abrasive nature of concrete takes its toll on a penguin's foot, and the result can be pododermatitis or bumblefoot (see Chapter 6, section 6.6). For this reason, concrete or any substrate that remains wet for long periods of time should be avoided altogether. Many accredited zoos and aquariums have found it advantageous to use matting over concrete in selected areas of the exhibit. Some facilities place a protective coating of lacquer over concrete surfaces to reduce abrasiveness and to fill in the small pores where bacterial colonies can become established. Fiberglass and polyurethane have been reported to cause fewer foot problems than plain concrete.

Ice: Ice machines are used in some facilities to create a constant supply of ice, which can be used effectively as substrate. Ice has been used successfully over concrete floors to provide a less abrasive surface for the penguins to stand and walk on. Ice substrate should be used only in exhibits where the temperature is near freezing, as wet ice can contribute to foot problems.

Pebbles: Pebbles and small rocks of various sizes (e.g., 6–15 cm/2.4–5.9 in.) have been used in some exhibits with good success. Adequate drainage is important to ensure that the rocks can be hosed and disinfected regularly.

The AZA Penguin TAG recommends that a variety of materials and textures be provided on which the birds may stand. Plain concrete surfaces should be kept to a minimum, and some type of covering such as ice, matting, or cat litter should be provided. To reduce foot problems, it is recommended to encourage penguins to spend several hours each day swimming, as standing for long periods of time may contribute to foot health problems.

Holding areas: The same careful consideration regarding exhibit size and complexity and its relationship to the penguin's overall well-being should be given to the design and size of all enclosures, including those used in exhibits, holding areas, hospital, and quarantine/isolation (AZA Accreditation Standard 10.3.3). Sufficient shade must be provided by natural or artificial means when sunlight is likely to cause overheating or discomfort to the animals (AZA Accreditation Standard10.3.4).

All penguin exhibits should include an isolation area. There should also be a separate incubation room and/or nursery area away from other bird areas. Holding areas may contain a pool and barriers to separate birds. Adequate lighting, electrical, and temperature monitoring should be included within all indoor and holding areas. Transfer passages between exhibit areas and holding areas so birds do not need to be handled are important for the effective management of the birds.

AZA Accreditation Standard

(10.3.3) All animal enclosures (exhibits, holding areas, hospital, and quarantine/isolation) must be of a size and complexity sufficient to provide for the animal's physical, social, and psychological well-being; and exhibit enclosures must include provisions for the behavioral enrichment of the animals. AZA housing guidelines outlined in the Animal Care Manuals should be followed.

AZA Accreditation Standard

(10.3.4) When sunlight is likely to cause overheating of or discomfort to the animals, sufficient shade (in addition to shelter structures) must be provided by natural or artificial means to allow all animals kept outdoors to protect themselves from direct sunlight.

Enclosure cleaning: Many facilities use wash-downs to clean areas on a periodic basis. These are sprinkler systems that come on for a short duration to prevent accumulation of fecal material. A broad-spectrum disinfectant and fungicide should be used to clean penguin exhibits on a daily basis. Some veterinarians recommend periodic rotation of these products. Care should be taken not to use products that produce strong or toxic fumes.

Enrichment through design:
Penguins are curious animals and appreciate a complex exhibit with multiple layers and textures. Care should be taken in design to create enriching features in the water (jets, vortex, and bubbles) and the dry area. Caves, rock ledges, alcoves, canyons and rock steps are some ways to create an interesting multi-faceted exhibit for the birds. Large rocks can be used for penguins to stand on. Many species also exit the water in one rocket throttle and various large rock perches 0.9–1.8 meters (3–6 feet) above the water are very popular. Ice machines can also be left on during the day and many of the birds enjoy laying and standing in the snow piles. In addition, sprinklers that spray at randomly have also been used successfully and may also contribute to easy cleaning in the exhibit as well. Wave machines provide variation in the water's surface.

2.2 Safety and Containment

Penguins should not be housed in free-ranging environments. Animal exhibits and holding areas in all AZA-accredited institutions must be secured to prevent unintentional animal egress (AZA Accreditation Standard 11.3.1). Exhibit design must be considered carefully to ensure that all areas are secure and particular attention must be given to shift doors, gates, keeper access doors, locking mechanisms and exhibit barrier dimensions and construction.

> **AZA Accreditation Standard**
>
> **(11.3.1)** All animal exhibits and holding areas must be secured to prevent unintentional animal egress.

Containment: For burrowing penguins, containment barriers should be buried at least 0.6 m (2 ft.) into the ground, and they should be angled inwards in an 'L' shape a total of 0.9 m (3 ft.) down.

Predator and pest control: If pests or predators are a problem at an institution, then efforts should be made to protect the colony using appropriate containment barriers and management practices. These pest control methods must be administered so there is no threat to the animals, staff, and public (AZA Accreditation Standard 2.8.1). These methods can include trapping or making the exhibit area predator-proof by using predator-proof barriers such as fences or electrical barriers. Trapping should be used to remove potential predators from the area. Local laws concerning trapping or depredation of native wildlife should be checked prior to predator removal in this manner.

> **AZA Accreditation Standard**
>
> **(2.8.1)** Pest control management programs must be administered in such a manner that the animals, staff, and public are not threatened by the pests, contamination from pests, or the control methods used.

Native gulls (*Larus* spp.) will often raid penguin exhibits for fish, sometimes even taking fish from the beaks of the penguins. Several methods can be employed to discourage gulls, including placing fake predators in the area, playing recorded gull distress calls, placement of gull taxidermy specimens, and placing monofilament line over the exhibit. It is important that these methods be varied as gulls are likely to habituate quickly to a single method. Modifying the penguins' feeding times and method of feeding may reduce the competition from the gulls. Providing fish underwater has been successfully used in some exhibits. It is important to remember that gulls are protected by the U.S. Migratory Bird Treaty Act, and federal permits are required for culling or capture.

On land, depending on geographical location, penguin eggs and chicks may be lost to gulls, dogs, foxes, cats, rats, or small mustelids. Fish should not be left outside overnight to avoid attracting rats. Additionally, if there are other exhibits nearby that attract rats, efforts should be made to keep these areas rodent-free as well. It is critical not to place any poison or traps in areas to which the birds have access.

Public barriers: Exhibits in which the visiting public may have contact with penguins must have a guardrail/barrier that separates the two (AZA Accreditation Standard 11.3.6). Most penguin exhibits are designed so the birds are maintained inside the boundary of the exhibit by acrylic, glass or a moated area with walls. If the exhibit is designed to allow penguins to come into close proximity with visitors, where they could possibly touch the birds, the area should also be constantly monitored by appropriate staff. If the exhibit is an open-air design where the public has potential access to the pool, it is recommended that there be a system in place to monitor for the presence of foreign objects (e.g., regular policing of the area, regularly radiographing the birds, etc.).

> **AZA Accreditation Standard**
>
> **(11.3.6)** Guardrails/barriers must be constructed in all areas where the visiting public could have contact with other than handleable animals.

Exhibits without a solid barrier between penguins and guests: Several penguin species will "pop" out of the water on to land gaining height of as much as six feet. Consideration should be given to this fact, especially for gentoo penguins. It would be appropriate for exhibits with a low barrier between the guest pathway and the penguin pool to add a staff oversight during the day and a night time barrier to prevent birds from jumping out of the exhibit during the night.

Exhibits should be designed so that the birds, and especially the chicks, can easily move in and out of the water from the land mass. This will usually involve some type of ramp system. Sharp materials that birds could hit as they exit the water (walking or porpoising) should be avoided. Acrylic, glass, concrete and rockwork have all proven safe materials within a penguin exhibit.

Selecting the species of penguin for a new exhibit: Prior to committing to and designing a new penguin facility, institutions should consult the AZA Penguin TAG to identify which penguin Species Survival Plan® (SSP) populations have the greatest need for the additional spaces you will be providing. This will ensure that your facility is contributing to increasing the SSP's long-term sustainability. The polar birds will require a much more sophisticated life support system and a climate controlled facility and there should be a considerable cost differential between displaying the sub-Antarctic and the more temperate species who can be housed outside in many climates

Monitoring: Most zoos and aquariums use some type of identification band around each penguin's flippers to maintain records on each bird and on the collection. A color coded system that includes colored cable ties is used by many. Implanted transponder chips are also used by many institutions. Some institutions use a combination of bands and implants to protect against a lost band. Care should be taken to constantly monitor the ID bands to make sure they are sitting properly on the flipper and that the bird's flipper has not swollen prior to molt. Bands are changed regularly as needed and it is good practice in a large colony to use a band on each flipper in case one of the bands falls off.

Education and conservation: Education and Conservation outreach programs are very popular and many zoos allow guests the opportunity to have an up close and personal penguin experience. Penguins may also have a presence in the local and national community. The penguins should be conditioned to be around strangers and trained staff should always accompany the birds and be present when the penguins are in close contact with the guests. Penguins should travel in a kennel and portable display cases can be used at the remote site to safely house the penguins and allow guests a good view of the birds.

Emergency protocols: All emergency safety procedures must be clearly written, provided to appropriate staff and volunteers, and readily available for reference in the event of an actual emergency (AZA Accreditation Standard 11.2.3).

There should be enough crates and nets on site to be able to quickly transport all your birds in case of emergency evacuations. There should be a written evacuation plan that includes alternate locations to hold the animal should your facility have to be evacuated.

Staff training for emergencies must be undertaken and records of such training maintained. Security personnel must be trained to handle all emergencies in full accordance with the policies and procedures of the institution and in some cases, may be in charge of the respective emergency (AZA Accreditation Standard 11.6.2). AZA accredited institutions must also ensure that written protocols define how and when local police or other emergency agencies are contacted and specify response times to emergencies (AZA Accreditation Standard 11.2.7)

In the event of a fire or emergency weather event, a secondary holding area should be available for the penguins. The area should have adequate space and life support and be available quickly in the event of an emergency. It may be advantageous to prepare a contingency plan ahead of time in the event the main and secondary facilities are damaged. Arrangements can be made with other nearby zoological facilities in the case of emergency and a current phone tree of other AZA institutions in your

AZA Accreditation Standard

(11.2.4) All emergency procedures must be written and provided to staff and, where appropriate, to volunteers. Appropriate emergency procedures must be readily available for reference in the event of an actual emergency.

AZA Accreditation Standard

(11.6.2) Security personnel, whether staff of the institution, or a provided and/or contracted service, must be trained to handle all emergencies in full accordance with the policies and procedures of the institution. In some cases, it is recognized that Security personnel may be in charge of the respective emergency (i.e. shooting teams).

AZA Accreditation Standard

(11.2.7) A written protocol should be developed involving local police or other emergency agencies and include response times to emergencies.

area would be helpful to have. Due to the special natural history of the penguins, life support systems should be hooked up to a generator capable of running critical life support for several days in the event of emergency.

Training for emergency holding for penguins should consist of an SOP noting the plan, where the birds can be moved to, agreement with a refrigerated truck rental business and potential arrangements for ice and fish. Emergency drills should be conducted at least once annually for each basic type of emergency to ensure all staff is aware of emergency procedures and to identify potential problematic areas that may require adjustment. These drills should be recorded and evaluated to ensure that procedures are being followed, that staff training is effective and that what is learned is used to correct and/or improve the emergency procedures. Records of these drills should be maintained and improvements in the procedures duly noted whenever such are identified (AZA Accreditation Standard 11.2.5). AZA-accredited institutions must have a communication system that can be quickly accessed in case of an emergency (AZA Accreditation Standard 11.2.6).

Due to the nature of the animal, there is no need to develop an animal attack or escape plan for penguins. In the event of a penguin escape, appropriate zoological staff should be notified to recapture the bird. In the event of a bird bite, the institution should be notified and their health care protocol followed.

AZA Accreditation Standard

(11.2.5) Live-action emergency drills must be conducted at least once annually for each of the four basic types of emergency (fire; weather/environment appropriate to the region; injury to staff or a visitor; animal escape). Four separate drills are required. These drills must be recorded and evaluated to determine that procedures are being followed, that staff training is effective, and that what is learned is used to correct and/or improve the emergency procedures. Records of these drills must be maintained and improvements in the procedures documented whenever such are identified.

AZA Accreditation Standard

(11.2.6) The institution must have a communication system that can be quickly accessed in case of an emergency.

Chapter 3. Transport

3.1 Preparations

Animal transportation must be conducted in a manner that adheres to all laws, is safe, and minimizes risk to the animal(s), employees, and general public (AZA Accreditation Standard 1.5.11). All temporary, seasonal, and traveling live animal exhibits must meet the same accreditation standards as the institution's permanent resident animals (AZA Accreditation Standard 1.5.10). Safe animal transport requires the use of appropriate conveyance and equipment that is in good working order. Animals should be caught up and placed in kennels and transport vehicles with the least amount of stress just prior to transport.

AZA Accreditation Standard

(1.5.11) Animal transportation must be conducted in a manner that is safe, well-planned and coordinated, and minimizes risk to the animal(s), employees, and general public. All applicable local, state, and federal laws must be adhered to.

AZA Accreditation Standard

(1.5.10) Temporary, seasonal and traveling live animal exhibits (regardless of ownership or contractual arrangements) must meet the same accreditation standards as the institution's permanent resident animals.

Transport container/crate: IATA regulations require that the transport container allow a penguin being transported to stand fully erect without touching the roof and sides of the container. IATA regulations can be found at www.iata.org. Penguins can be transported in pet kennels or rigid plastic containers/crates. The proper substrate (e.g., cat litter, rubber matting, Astroturf), depending on the species, should be provided for all crates. It is recommended that the containers be divided so that animals have their own compartment to reduce the threat of injury or over-heating. Bonded pairs, however, can be kept together. A #300 size kennel can hold up to six birds (depending on species).

Transportation containers are typically made of hard white plastic or another safe, water proof non-toxic material, to reduce heat absorption as black crates may get too warm. These containers or crates can be modified for taller species by adding a screened area around the top which will also allow for increased air circulation. Lids should fit the dimensions of the crate and can be bolted on to the crate in all four corners. Figure 1 illustrates these features. Transportation crates should also have slots for the forklift to easily move them from one location to another and lift them up and down off of a vehicle (Figure 2).

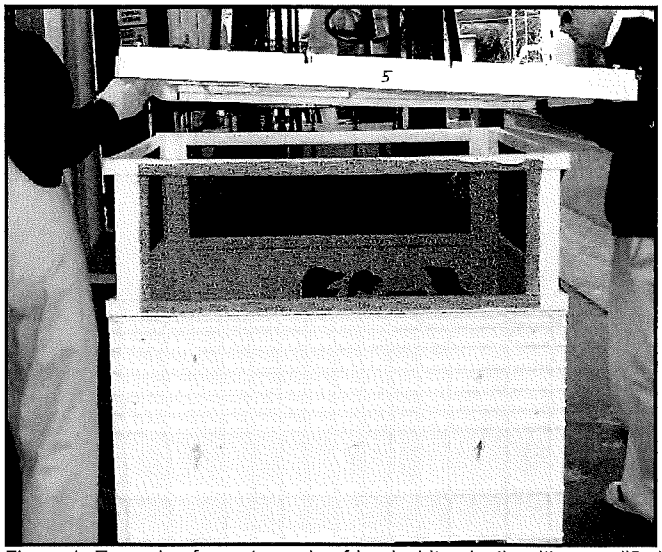

Figure 1. Example of a crate made of hard white plastic with a modified screened area added around the top to increase height and air flow. Photo courtesy of Lauren DuBois

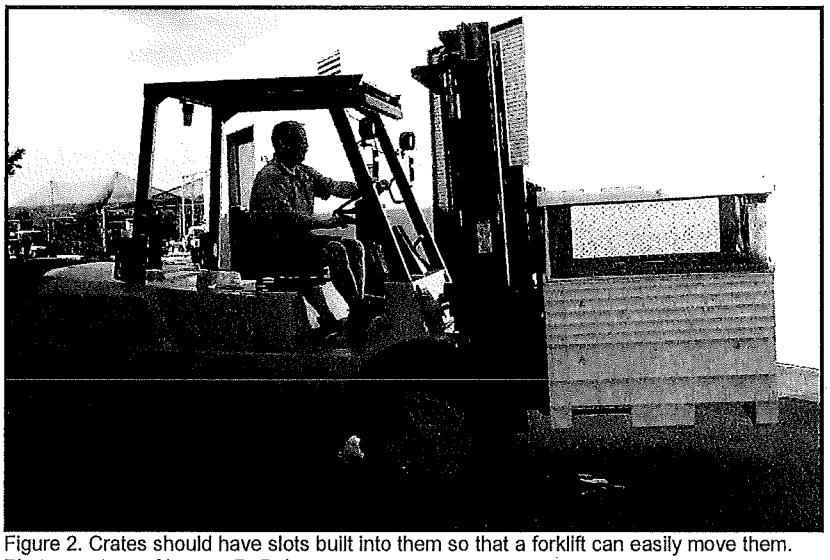

Figure 2. Crates should have slots built into them so that a forklift can easily move them. Photo courtesy of Lauren DuBois

Large crates: Large crates are used on charter flights primarily due to the size and weight. Dimensions of the most commonly used boxes are 1.1 m x 1.2 m x 1.0 m (44 in. x 48 in. x 40 in.). Large crates will hold four medium sized penguins (Gentoos and Macaronis) or five to six small sized penguins (Chinstraps, Adelies, Rockhoppers, etc.). For birds that are aggressive, no more than four small penguins should be placed in a crate. One to three King penguins can be shipped in these large containers.

Small crates: Small crates are typically 1.1 m x 0.7 m x 0.7 m (42 in. x 29 in. x 28 in.) and have been used on commercial flights. They are appropriate for small penguins (Adelie, chinstrap, macaroni, rockhopper), two to three medium sized penguins (gentoo) and one to two King penguins.

Individual pet crates (Sky Kennels): Dimensions of a standard pet crate is 0.7 m x 0.5 m x 0.5 m (27 in. x 21.5 in. x 20 in.). All "windows" and doors of the pet crate should be covered with a breathable and flexible material like bar mat/shelf liner or burlap. Pieces can be cut to fit the exposed areas and attached with cables ties. Doors should be secured with cable ties. Gentoos, Magellanics, Humboldts, Africans, Chinstraps, and Macaronis have been transported in pet crates.

Climate control: Polar species of penguins are susceptible to overheating and special considerations should be taken when these species are placed into transport containers/crates. To ensure that crates (of any size) remain adequately controlled for temperature, they should contain a bottom layer of pre-filled frozen large 0.2 m x 0.04 m x 0.2 m (7 in. x 1.63 in. x 6.75 in.) BlueIce® containers or a layer of frozen water (ice). If using BlueIce®, the best way to prevent slippage is to layer the BlueIce® containers between two industrial rubber floor mats (Figure 3). If using a layer of frozen water, fill crates with 7.6 cm (3 in) of water and freeze them overnight. To prevent slippage, place an industrial rubber floor mat on the ice and add a thin layer of water to the container and re-freeze to allow the mat to freeze to the ice (Figure 4).

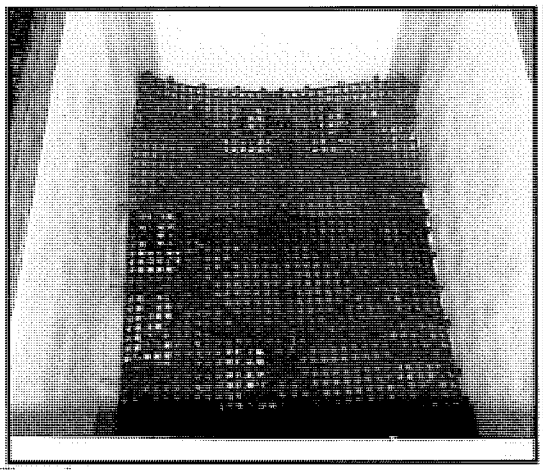

Figure 3.

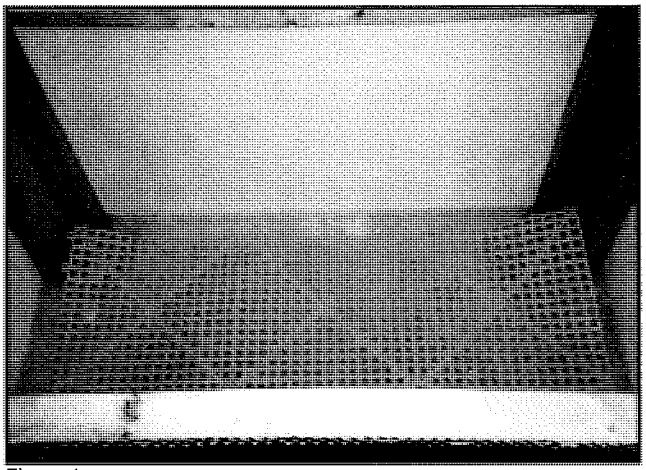

Figure 4.

Figure 3 illustrates how a crate can be temperature controlled by lining the bottom with frozen (size) BlueIce®
Figure 4 illustrates how a crate can be temperature controlled by lining the bottom with a 7.6.cm (3 in.) layer of water that was frozen. Both methods add an industrial rubber floor mat for the birds to stand on to prevent slippage.
Photos courtesy of Lauren DuBois

Transportation plan: A transportation plan should be developed prior to any transports. The plan should identify the point persons and their contact information for both the shipping and receiving institutions and the emergency numbers for the trucking companies, airline contacts, etc. The point person should be responsible for updating their institution regularly on their progress and also notifying the receiving institution of progress and any possible problems and making sure adequate animal checks are being done if applicable. The mode of transportation selected will determine the number of staff needed but there should be at least one experienced penguin person aboard the transport.

Trucking companies generally have contingency plans for truck breakdowns, refrigeration issues or other problems that may occur and these should be detailed in the transportation plan. For a ground transport over 4 hours, also identify institutions having penguin accommodations along the route in case of emergency. The point person should contact these institutions prior to the transport to let them know that they will be in the area and to make sure that they would be able to assist if needed. Transport protocols and contingency plans should be well defined in the transportation plan and discussed with all animal care staff on the transport prior to the trip.

Modes of transportation: Climate control considerations should be taken in all modes of transportation moving polar species of penguins that are susceptible to overheating. If the transportation distance is not too great (e.g., not more than a 10-hour drive), penguins can be transported by being secured into a truck or van (Figure 5). If the ambient temperature is above 4 °C (39.2 °F), it is recommended that a refrigerated truck be used. If the ambient temperature is below 4 °C (39.2 °F), the animals can be transported in an unrefrigerated truck or passenger van. It is recommended that shipping occur during cooler weather 0–21 °C (32–70 °F) and/or during the cooler parts of the day. Ensure that the interior of the truck (van) is cleared of sharp edges and organic debris and that the inside is cleaned, aired out, and disinfected several times over several days prior to transporting penguins.

When the birds are being transported by truck, there should be enough drivers so that they reach their destination in the shortest amount of travel time. Longer truck transports will require several staff members. Contact the Department of Transportation with any questions and keep in mind that when crossing state lines, regulations can differ. However, if the transport is more than a one-day drive, it is recommended that the drivers stop and rest during the evening. This not only gives the drivers needed rest, but allows the penguins time to recover from the continual motion of the transport. Contact the Department of Transportation with questions and for the most updated regulations on driving time vs resting time. Keep in mind that when crossing state lines, regulations can differ

Commercial air transportation can be used for penguins but it is easier for *Spheniscus* (and other non-polar) species because they are more heat-tolerant. Adequate communication with the airlines is essential and it is important to contact the airlines prior to shipping animals to understand their policy for transporting live animals. Staff should communicate the need to move the birds in a timely fashion so that

the time interval to and from the air freight office to the plane can be minimized. If possible, the animals should be transported through the VIP or DASH systems of freight transportation that many airlines have available. The most direct flights should always be used. Accompanying staff should ask the airline if the birds can be loaded onto the plane last, so that they can be the first off-loaded. Prior to loading the birds on to the aircraft, airline personnel will strap the penguin crates down to the" cookie sheets" which then slide into and are fastened onto the bottom of the plane for a secure ride. Airlines will often accommodate special needs of penguins so it is important that these are discussed in advance.

Figure 5. Penguins being transported in crates secured in a refrigerated truck.
Photo courtesy of Lauren DuBois

Figures 6.

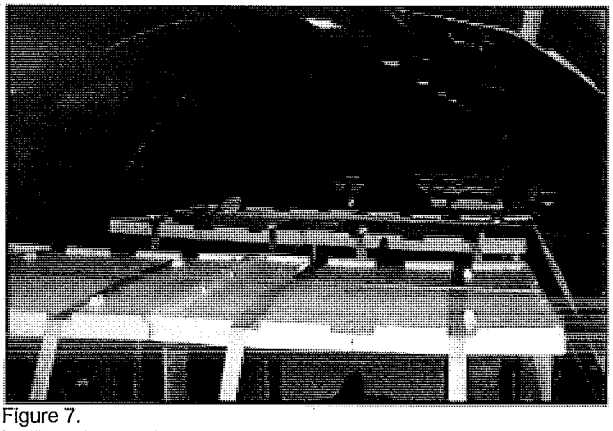

Figure 7.

Figures 6 & 7. Figure 6 illustrates how a crate is secured to "cookie sheet" being loaded on to an aircraft. Figure 7 illustrates how the "cookie sheet" is secured to the aircraft.
Photos courtesy of Lauren DuBois

3.2 Protocols

The equipment should provide for the adequate containment, life support, comfort, temperature control, food/water, and safety of the animal(s).

Equipment: Batteries, extra light for ambient lighting, flashlight, thermometers, tools to repair barriers/kennels, extra cable ties, extra matting, extra ice, water and tubs are important to have on hand during transport. For possible medical conditions towels, plastic bags, spray bottle, paper towels, vet wrap, Quick Stop, silver nitrate sticks, sodium chloride solution, Povidine solution, triple antibiotic ointment, gauze, superglue are also important.

Physical condition: There are certain physical conditions experienced by penguins that can influence the timing of animal shipments. Penguins that are gravid or in any phase of the molt cycle should not be shipped. The timing of molt varies by species. As there is considerable physiological stress associated with molting, the AZA Penguin TAG recommends that birds should not be transported at least six weeks prior to their anticipated molt. Birds may be shipped one to two months after completing molt as long as they have sustained their pre-molt weight for two to four weeks. It is also best to avoid shipping animals just prior to or during the breeding season. The safest time to move penguins is during the cold months of the year as penguins can easily overheat (Boersma, 1991).

Food and water: In the wild, penguins commonly fast for several weeks at a time and drink only every few days. As penguins regularly go through these periods of feast and famine, it is recommended that they be fed well before transport. Once penguins have gained some weight for their trip they can they be fasted for at least eight hours before transport. If the trip lasts more than 48 hours, it is recommended that the birds be fed during transport. It is important that the birds have access to fresh water or clean ice at all times.

Bedding and substrate: For polar penguin species, a suitable substrate is necessary to provide adequate footing for the animals. Smaller rocks (5–10 cm/2–4 in. in diameter) covered with ice provide good footing while allowing drainage of melting ice and fecal materials. It is important to ensure that drains are clear to avoid backup. For non-polar species, the transport container should be bedded with cat litter or rubber matting. Blue ice can be placed below the rubber matting to cool the container.

Temperature, light, and sound: It is necessary that light be provided at all times in the animal transport area. The light source can be the truck light in the refrigerated compartment, or a low wattage bulb that is powered with a 12-volt to 110-volt converter. If accompanying staff will be spending the night in transit, it will be necessary to run an extension cord with a light so that there is lighting throughout the night for the birds.

For truck transportation, a temperature monitor should be installed in the animal area that has a readout in the truck's cabin. This allows the staff traveling with the penguins to constantly monitor the temperature. A backup thermometer should also be placed in the animal area, secured away from the birds in case there is a question of the temperature monitor working properly.

Sub-Antarctic and Adelie penguins: The recommended temperature for truck or plane transport is -5–11.1 °C (22–52 °F). These penguins should be shipped with ice or blue ice in their crates. Air temperature in the plane or truck should not exceed 12.8 °C (55 °F). For short durations (e.g., transport between exhibit and transport vehicle), 23.9 °C (75 °F) is acceptable. If Adelie penguins are housed in exhibits with temperatures below freezing, they should be acclimated to higher temperatures before transport.

Emperor penguins: The recommended transport temperature for emperor penguins is below freezing in the range of -7.2– -1.1 °C (19–30 °F). Emperor penguins overheat easily and should only be exposed to a maximum temperature of 4.4 °C (40 °F) for short durations when the animals are moved between the exhibit and transport vehicle.

Sphensicus: The temperature should be kept between 4.4–15.6 °C (40–60 °F) for air and truck travel involving *Sphensicus* penguins. During short periods of time when the animals are transported between the exhibit and transport vehicles, temperatures should not exceed 23.9 °C (75 °F). *Sphensicus* penguins should be acclimated to cooler or warmer temperatures prior to transport if the receiving institution maintains a different temperature than the sending.

Animal monitoring: The animal area in the back of the refrigerated truck should be separated from the door with a barrier. This will ensure that the animals will not be able to exit when the door is opened. A video camera should be installed in the animal area with a monitor in the cabin, so that the animals can be observed during transport. If a video camera is not available or breaks during transport, staff should check on animals every two to four hours.

Post-transport release: It is important that the environmental conditions in quarantine be similar between the sending and receiving institutions. It is also important, where possible, to have two or more birds quarantined together because of the social needs of the animals. If this is not possible, efforts should be made for quarantined birds to have visual or auditory contact with other penguins. For more information on quarantine, see Chapter 6, section 6.3.

Egg transport: An alternative to transporting live adult birds is to transport eggs and then complete incubation and hand-rearing of the animals at the final destination. One institution has developed techniques for transporting eggs from the wild to their incubation and rearing facilities (Todd, 1987). Eggs have also recently been transported between facilities. A portable incubator that maintains a constant temperature may be used however, for shorter intra-continental flights, a well-insulated cooler with a hot water bottle or hand/feet warmers with a mounted temperature probe can successfully maintain the temperature of the eggs.

The timing of egg transport is important. Eggs should be transported either during the last one-third of their incubation period or before incubation begins (C. Kuehler, personal communication). For species that lay two eggs, it is best to transport the eggs after the second egg is laid, because egg incubation does not begin until the clutch is complete and they can withstand changes in temperatures. Eggs are quite tolerant to periods of neglect throughout the incubation period. The temperature in the cooler or incubator should be maintained at approximately 35.6 °C (96 °F). When the temperature drops below this, additional water should be added to the hot water bottle from a thermos carried for this purpose. If necessary, the airline can usually supply hot water. Upon arrival at the destination, eggs should be placed in an incubator and the procedures and protocols for artificial incubation followed. Safe transport requires the assignment of an adequate number of appropriately trained personnel (by institution or contractor) who are equipped and prepared to handle contingencies and/or emergencies that may occur in the course of transport. Planning and coordination for animal transport requires good communication and planning.

Chapter 4. Social Environment

4.1 Group Structure and Size

Careful consideration should be given to ensure that animal group structures and sizes meet the social, physical, and psychological well-being of those animals and facilitate species-appropriate behaviors. Penguins are highly social, colonially-nesting birds. There is good evidence that reproduction in penguins, as in other colonial waterbirds, is socially facilitated, and that adequate stimulation by conspecifics is essential to successful reproduction in zoo and aquarium conditions (Berger, 1981). Boersma (1991) suggested that small colony sizes in zoo and aquarium populations of penguins might show decreased productivity. A minimal social grouping of three pairs for a single species of penguins was suggested by Gailey-Phipps (1978). The TAG has since revisited this recommendation and as stated in the 2010–2013 Regional Collection Plan TAG Guidelines now recommends that institutions maintain a minimum of 10 penguins in an exhibit. This recommendation supports the importance of the social structure in a penguin colony and allows the birds to select mates and establish a social hierarchy.

Penguins are generally considered to be perennially monogamous, except king and emperor penguins, which are serially monogamous. Mate fidelity in one colony of Adélie penguins housed in a zoological institution has been reported to be 75% over a 13-year period, which is markedly higher than the 51% reported for wild Adélie penguins (Ellis-Joseph, 1992; Ainley et al., 1983). In another case, one pair of wild Magellanic penguins was faithful for 16 years until one of the individuals died (Boersma, 2008). Mate fidelity may be affected by transfer, separation caused by management of illness, or mortality in a zoo or aquarium setting.

In emperor and king penguins, pair bond formation and egg fertility are often positively correlated with competition for new mates (A. Bowles, personal communication). Breeding pairs of Magellanic penguins are more likely to break up after a reproductive failure, compared to situations where breeding pairs have successfully reared a chick (D. Boersma, personal communication). Facilities should be strongly encouraged to build or renovate exhibits to allow any offspring to be housed for up to two years.

Same-sex groups and pairings: Single-sexed groups of penguins can be maintained for management purposes. Having single-sex groups can be an effective management tool for exhibiting birds without any breeding occurring. Same-sex pair bonding does not appear to pose any problems for the health and management of penguins. This phenomenon has been seen in Magellanic, gentoo, little blue, king, northern and southern rockhopper, and African penguins. Pairs of this nature have even been successfully used to raise fostered chicks. Bonds between same-sex individuals have also been successfully split, and the birds have successfully re-paired with individuals from the opposite gender.

Sex ratios: Managers of penguins should strive for fairly balanced sex ratios within their breeding colony. However, a perfect 1:1 ratio is not necessary for harmony within the group. Not all individuals seek out a mate and seem content in the company of conspecifics. Penguin caretakers should be cognizant of each individual's behavior and social interactions. For ideal breeding situations, an even sex ratio and varied age structure among all social groups is best. Over representation of one sex may lead to same sex pairings, while over representation of age classes, especially among older penguins may lead to decreased breeding success.

Multigenerational groups: Individual interactions will be seen among multigenerational groups. Care should be taken to insure that related birds do not breed together. Penguins in general are long-lived, prolific birds. In most colonies where breeding is occurring or younger animals are occasionally brought in, the age structure of the group is suitable for long-term sustainability (i.e., geriatric individuals are replaced by younger birds). Managers who are faced with static collections should consider making changes in order to balance the age structure to avoid loss of the collection through attrition.

Fledging: The age of fledging, or independence from parents, varies among penguin species (see Table 7). Penguins usually achieve their peak weight just prior to fledging.

Table 7. Average age and peak weight at fledging for penguins*

Species	Age at fledging	Approximate peak weight
Emperor	4–6 months	Varies
King	4–8 months	Varies
Adélie	40–60 days	2.5–3 kg (5.5–6.6 lb.)
Chinstrap	55–60 days	3.1–4.2 kg (6.8–9.3 lb.)
Gentoo	70–75 days	6.5–7.5 kg (14.3–16.5 lb.)
Little blue	50–55 days	0.8–0.9 kg (1.8–2 lb.)
Macaroni	60–65 days	3.0–4.1 kg (6.6–9 lb.)
Rockhopper	50–60 days	1.4–1.8 kg (3.1–4 lb.)
Humboldt	70–90 days	3.0–3.6 kg (6.6–7.9 lb.)
African	70–84 days	3.0–3.3 kg (6.6–7.3 lb.)
Magellanic	65–120 days	3.2–4.2 kg (7.1–9.3 lb.)

*Information derived from one zoological institution's unpublished data

4.2 Influence of Others and Conspecifics

Animals cared for by AZA-accredited institutions are often found residing with conspecifics, but may also be found residing with animals of other species.

Mixed-penguin species: Many facilities successfully house and breed several species of penguins in one enclosure, and in some cases mix penguins with other species such as Inca terns (*Larosterna inca*) or blue-eyed cormorants (*Phalacrocorax atriceps*). Concerns for mixed species exhibits include inter-specific compatibility and aggression, differential life support and temperature requirements, differential habitat use and habitat requirements, and avoidance of hybridization. Hybridization among several penguin genera, in particular *Spheniscus* spp. and *Eudyptes* spp., has been documented. It is strongly recommended that *Spheniscus* spp. be housed as single-species populations. One facility has housed northern and southern rockhoppers together for over 25 years without hybridization. Managers contemplating mixed-species exhibits should carefully select desired species.

Aside from a few cases where multi-penguin species exhibition may be problematic, housing several species together can work well if seasonality is maintained. At one zoological institution, king and Gentoo penguins are housed together and utilize the same nesting area. Gentoos nest first, and as their chicks are fledging, the king penguins begin to occupy the rookery and breed. In mixed-species exhibits, sufficient space is needed for each species so that conflict can be avoided. Plenty of nesting areas and feeding stations are needed, with consideration for the natural behaviors of each species. For example, feeding stations for flighted birds housed with penguins can be located off the ground and away from the penguins. Another consideration is the size of the nesting burrow entrances. If little blue penguins are to be held with a larger species of burrow nesting penguins, the nest openings should be smaller to keep the larger birds from exploiting these burrows.

Any time a new species is introduced into an exhibit, it's advisable to section them off to get them accustomed to their "territory" for at least a week before opening them up to the rest of the exhibit. This allows the birds to know where their area is and cuts down on the desire to nest or feed elsewhere once full exhibit access is allowed. Most species of penguins are territorial by nature and having established areas will reduce the need to aggressively defend their "home turf."

Keepers with good observational skills are needed to watch for signs of stress, aggression, and competition in mixed-species exhibits. A plan should be in place to be able to remove problem individuals or make changes to the exhibit, such as changing feeding station areas, adding nesting areas, or adding barriers and dividers between nests if problems arise.

Mixed-species: Appropriate non-penguin species may include waterfowl and shorebird species found also occurring in the penguins' home ranges. Competition for food and nesting resources can be an issue. One species may have to defer to another before gaining access to desired resources. Being alert and responding properly to this will help decrease stress in the colony. Some species within the same exhibit may show preferences for different areas of the exhibit for nesting. For example, one species may prefer flat beach areas versus higher cliff ledges. Make sure to provide ample nesting site possibilities for all exhibited species.

Social groups of penguins used for education: The Penguin TAG recognizes that penguins are valuable additions to education, outreach, and visitor experiences. For institutions that use their birds solely for the purposes of education and outreach, ten is still recommended as the minimum colony size. Acclimating penguins for educational programs can be accomplished by slowly conditioning the birds to being handled in a non-threatening way. Positive reinforcement of calm behavior seems to be most effective. Not all individuals have the demeanor to be involved in education programs. Managers should recognize the signs of intolerance to handling and be prepared to allow these individuals to rejoin their social group.

Imprinting in penguins: During the hand rearing process, penguin chicks can become imprinted on their caregivers. In some cases, this bond is encouraged especially if these individuals are to be used in educational programs. Humans can provide some social stimulation but should not be the only source of social activity for these penguins. All penguins require time with conspecifics in order to develop appropriate behaviors. In some juveniles, aggression towards humans develops. Heavily imprinted African penguins have gone on to select mates and successfully reproduce.

4.3 Introductions and Reintroductions

Managed care for and reproduction of animals housed in AZA-accredited institutions are dynamic processes. Animals born in or moved between and within institutions require introduction and sometimes reintroductions to other animals. It is important that all introductions are conducted in a manner that is safe for all animals and humans involved.

In general, introduction of novel stimuli, including new birds, to a social group of penguins is met with curiosity and investigation. As with all animal introductions, staff should closely monitor both the introduced bird as well as the social group for signs of stress and aggression. The introduction of a new bird or introduction of a group of birds to an exhibit has been approached in several ways:

- Gradual introduction: Use of this technique will depend on exhibit design as well as the temperament of the birds. In gradual introductions, birds are introduced to an exhibit for a few hours at a time, with close monitoring over a several-day period. The time the birds are left in the exhibit is gradually increased until the birds appear to be acclimated. This technique is the most conservative, and most likely to result in successful integration of new birds into an existing social group.
- Group introduction: Most penguin managers feel that it is inadvisable to introduce a single bird into a colony. New birds can be isolated with one or more conspecifics removed from the social group for a period of time. Birds can then be introduced into an exhibit together and monitored by staff.
- "Howdy" cage introduction: Birds are placed in a small enclosure within the exhibit for several hours daily and slowly acclimated to the exhibit and other penguins. Generally, a gradual introduction procedure, as described above, can then be followed.
- Immersion introduction: Birds are placed in the exhibit and regularly monitored by staff.

Hand-reared *Spheniscus* chicks can be introduced into the colony when they are nearly fledged (approximately 80 days). It is best to introduce all species of chicks in a group or in pairs if possible. It is advisable to supervise the interactions of the newly introduced birds during the initial visit to the colony to ensure the chicks' safe movement through exhibit and that aggression from older birds is not an issue.

Chicks can be left unattended after a few days, provided they are able to emerge from the water without trouble, and are not being harassed by other birds. Juveniles tend to congregate together and will fight to establish a hierarchy of their own (Gailey-Phipps, 1978). Chicks should be encouraged to join the other birds at the feeding station rather than be provided with special treatment. It may be a few weeks before they are regularly feeding with the others. Some institutions find it advantageous to use an off-site area to introduce the chicks to members of the colony. A Plexiglas® barrier or screen can also be used for the first introduction within the exhibit. Introduction of hand-reared chicks into exhibits requires close monitoring and is likely to be most successful if a gradual introduction procedure is followed.

Animal separations: In large colonies, removal of individual birds does not seem to have a well-defined effect on social dynamics, except for individuals whose mates have been removed. In these cases, birds may show some signs of lethargy or may repeatedly visit the nest site during breeding season, as if

searching for the bird that has been removed. For example, when moving one bird off exhibit for medical reasons, also move its mate if possible. This seems to decrease stress while off exhibit, helps to maintain the pair bond, and makes for an easier reintroduction to the exhibit. In smaller colonies, removal of a dominant individual may cause a shift in the dominance hierarchy and as equilibrium in the social group is re-established, may lead to a short-term increase in aggressive behavior.

Chapter 5. Nutrition

5.1 Nutritional Requirements

A formal nutrition program is recommended to meet the nutritional and behavioral needs of all penguins (AZA Accreditation Standard 2.6.2). Diets should be developed using the recommendations of nutritionists, the Nutrition Scientific Advisory Group (NAG) feeding guidelines: (http://www.nagonline.net/Feeding%20Guidelines/feeding_guidelines.htm), and veterinarians as well as AZA Taxon Advisory Groups (TAGs), and Species Survival Plan® (SSP) Programs.

> **AZA Accreditation Standard**
>
> **(2.6.2)** The institution should have a written nutrition program that meets the behavioral and nutritional needs of all species, individuals, and colonies/groups in the institution. Animal diets must be of a quality and quantity suitable for each animal's nutritional and psychological needs.

Diet formulation criteria should address the animal's nutritional needs, feeding ecology, as well as individual and natural histories to ensure that species-specific feeding patterns and behaviors are stimulated. Penguins feed almost exclusively on aquatic prey, predominately pelagic schooling fish, crustaceans (often Euphausiidae species) and cephalopods (squid). All species consume more than one type of food, although some smaller-sized, higher-latitude species (e.g., gentoo and chinstrap) rely almost exclusively on Euphausiidae crustaceans (Croxall & Lishman, 1987). Macaroni and Adélie penguins rely heavily on krill, but fish consumption has been reported in some locations (Lishman, 1985). Penguins that live at lower latitudes, such as little blue penguins and the *Spheniscus* spp., tend to rely more heavily on fish than do the high-latitude species (Croxall & Lishman, 1987). The prey fish taken most often are small-bodied, surface-schooling species.

Although qualitative information on feeding habits is available for most penguin species, information on consumed quantities of specific foods is exceedingly rare. Some food intake data are available for little blue, Humboldt, and African penguins, for both non-breeding and breeding seasons (Rand, 1960; Hobday, 1992; Herling et al., 2005). More recent ecological research has focused on the dietary effects on reproductive success (Fonseca et al., 2001; Putz et al., 2001; Clausen & Putz, 2002; Tremblay & Cherel, 2003); the foraging strategies and trophic levels of feeding (Raclot et al., 1998; Forero et al., 2002; Lenanton et al., 2003); and the effect of environmental change on penguin populations (Putz et al., 2001; Gauthier-Clerc et al., 2002; Chiaradia et al., 2003; Boersma, 2008).

Digestive system morphology and physiology: The digestive system of the penguin is relatively simple; it is anatomically and functionally similar to other carnivorous birds. The esophagus is large, expandable, and muscular, allowing for the consumption of large prey items; however, the crop is completely absent, similar to owls (Paster, 1992; Duke, 1997; Olsen et al., 2002). The stomach contains two distinct chambers: the proventriculus and the ventriculus. The proventriculus has two major functions: the secretion of gastric juices for chemical digestion, and the storage of food to feed chicks. The ability to store food for long periods of time is achieved through mechanisms that raise the pH of the gastric juices and regulates stomach temperatures, which disrupts digestive enzymatic activity (Gauthier-Clerc et al., 2002; Olsen et al., 2002; Thouzeau et al., 2004).

The proventriculus empties into the ventriculus (gizzard), which is characterized by a massive muscular wall, often containing grit or small stones (reviewed by Beaune et al., 2009). These stones are believed to aid in digestion and/or be used to regulate buoyancy during foraging; however, the absence of stones in zoo or aquarium penguin exhibits do not appear to affect digestibility (Splettstoesser & Todd, 1999). Small intestines are relatively long, compared with other birds, and correlates positively with body mass (Jackson, 1992). Although limited data exist on the functional features of the ceca in penguins, they are present, but small and vestigial (Clench & Mathias, 1995).

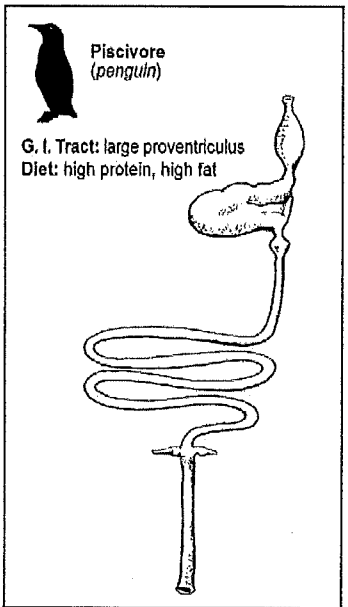

Figure 11. Digestive system of the penguin (adapted from Stevens & Hume (1995) by McClements (2007)).

Nutrient requirements: While many items consumed by various species

of free-living penguins are known, the nutrient content of these items have not been completely characterized. The National Research Council (NRC) has published estimated nutrient requirements of domestic birds and the carnivorous domestic cat (National Resources Council, 1994; 2006). Using these NRC estimates as guidelines, plus data on nutrient composition of free-ranging penguin foods and foods available in zoos and aquariums, target nutrient ranges for penguin diets are proposed in Table 8. Target nutrient ranges encompass needs for growing, reproducing, and maintenance animals.

Vitamin A: Dietary vitamin A requirements for studied avian species are between 1,100–5,600 IU/kg of diet on a DM basis (National Resources Council, 1994). Based on limited data, the vitamin A requirement for cats is between 3,333–7,500 IU/kg of dietary DM (National Resources Council, 2006). It is possible that penguins, as fish-eating birds, have a high tolerance for vitamin A because comparatively high levels occur in their natural diet (Crissey et al., 1998). Whether this infers a high dietary vitamin A requirement has not been established.

Most diets that contain a variety of fish species should contain adequate levels of vitamin A without supplementation. Studies of free-ranging macaroni penguins showed that vitamin A was mobilized from body stores during molt and reproduction (Ghebremeskel et al., 1991; 1992). In zoos and aquariums, serum levels of vitamin A in Humboldt penguins and plasma levels of vitamin A in gentoo and rockhopper penguins vary with diet fed and physiologic conditions, such as molt (Crissey et al., 1998; Monroe, 1993). Dietary levels of 12,000–100,000 IU/kg DM were offered to African and Humboldt penguins in the U.S. with no signs of vitamin A deficiencies or toxicities. Eggs produced by these birds contained vitamin A concentrations of 4.0–7.5 µg/g wet weight (McClements, 2007).

Vitamin E: Vitamin E is destroyed over time in stored marine foods (Bernard & Allen, 1997). It has been proposed that foods for marine animals should be supplemented with 100 IU of vitamin E per kg of diet on a wet basis, or approximately 400 IU/kg DM (Geraci, 1986). In zoos and aquariums, serum levels of vitamin E in Humboldt penguins and plasma levels of vitamin E in Gentoo and rockhopper penguins vary with diet and physiologic conditions, in the same way as serum and plasma vitamin A levels (Crissey et al., 1998; Monroe, 1993). Vitamin E can be purchased in capsules, paste, injectable form, or as a multivitamin designed specifically for piscivorous species, which can be hidden inside the fish and hand-fed to individual penguins.

Although limited data exists on the effect of dietary concentrations of vitamin E on egg composition and hatchability, McClements (2007) showed concentrations between 39–250 IU/kg of natural and commercially available vitamin E resulted in egg yolk concentrations between 180–356 µg/g. Although these data could not be used to determine a minimum requirement for reproductive success, it did appear that these dietary levels resulted in eggs containing sufficient levels of vitamin E for embryonic development. These sufficiency estimates were based on levels observed in eggs collected from reproductively successful free-ranging penguin and piscivorous birds (Surai et al., 2001a; Surai et al., 2001b).

Thiamin: Thiaminases have been identified in mackerel, herring, smelt, and clams with activity sufficient to destroy much of the tissue thiamin during frozen storage (Bernard & Allen, 1997; National Resources Council 1982). It has been proposed that thiamin supplements should be added to marine animal diets, providing 25–30 mg/kg diet on a wet weight basis or approximately 100–120 mg/kg DM (Geraci, 1986). Thiamin can be purchased in tablet, paste, injectable form, or as a multivitamin designed specifically for piscivorous species which can be hidden inside the fish and hand-fed to individual penguins.

Vitamin D, calcium, and phosphorus: Calcium concentrations in whole fish and krill (0.9–6.4% of DM) appear adequate, even for breeding and laying penguins, and calcium supplements should not be required (Bernard & Allen, 1997). Squid, however, are relatively low in calcium (0.1–0.2% of DM) and have an inverse calcium:phosphorus ratio. Some institutions have reported problems (without dietary details) in penguins housed in zoos and aquariums that were ascribed to calcium deficiency during production of multiple clutches, and calcium supplements were used with no apparent ill effect (Ellis & Branch, 1994). However, consideration should be given to the concentrations of calcium, phosphorus, and vitamin D in dietary items (using analyses, if necessary), and to the calcium:phosphorus ratio, as a disproportionate supply of one of these nutrients can adversely influence metabolism of the others, Appropriate UV lighting should be provided as a source of vitamin D if birds are housed indoors.

Sodium: Sodium is an essential nutrient for all animals. It was generally considered by some that the requirement for sodium is a special consideration for the functional development of the nasal glands of marine birds with access only to fresh water (Ellis & Branch, 1994). Some institutions, with both fresh and saltwater environments, supplement penguin diets with salt at approximately 250 mg of NaCl per bird per day, without apparent harm (Ellis & Branch, 1994). However, recent studies with *ex situ* African penguins, housed in a fresh water environment and offered a diet of herring, capelin, and squid, were found to maintain electrolyte balance without additional salt supplementation (Mazzaro et al., 2004). These electrolyte balances have been maintained in the six years since the end of the experimental period (L. M. Mazzaro, personal communication). Gentoo and rockhopper penguins have been maintained in freshwater with no sodium supplementation for eleven years, and king penguins for eight years with no reported ill effects (E. Diebold, personal communication). It is noteworthy that the fish and invertebrates that have been analyzed, whether of marine or freshwater origin, contain sodium concentrations (0.2–5.5% of DM) that are higher than the minimum need of any species for which a requirement has been established (Bernard & Allen, 1997).

Fatty Acids: Fish lipids contain high concentrations of both saturated and unsaturated long chain fatty acids. Henderson & Tocher, (1987) reviewed the major fatty acid fractions of a number of fish species and showed that generally freshwater fish contain considerably higher concentrations of omega-6 (ω-6) fatty acids than fish caught in the marine environment. Generally freshwater fish contain higher concentrations of linoleic (C18:2ω-6) and arachidonic (C20:4ω-6) acids compared to all other marine fish resulting in a 4–14 times reduction in the ω-6 to ω-3 fatty acid ratios (Henderson & Tocher, 1987; Ackman, 1989). Salmonids, such as rainbow trout, are the exception to this generalization, as they contain high concentrations of both ω-6 and ω-3 fatty acids. In contrast, all fish species contain high concentrations of ω-3 fatty acids, including docosahexaenoic acid (DHA; C22:6 ω-3) and eicosapentaenoic acid (EPA) (C20:5 ω-3). Krill and squid are also very good sources of highly unsaturated fatty acids, with squid containing very high levels of DHA (Passi et al., 2002; Ackman & Kean-Howie, 1994).

Based on analytical values for other nutrients in fish and marine invertebrates, it seems unlikely that other deficiencies would appear unless unwise food choices have been made or storage and handling of these foods has been below standards (Crissey, 1998). If a variety of high quality fish are offered, and if they are stored and thawed properly, it is unlikely that supplements, other than of vitamin E and thiamin, will be needed. Adjustments in the amounts of supplement provided should be made in proportion to the mass of food offered.

Chicks: Nutrient requirements for growing chicks have not been defined. Diets that meet the target nutrient ranges should be adequate. During periods of rapid growth, the higher ranges of values for calcium and vitamin D are recommended. Metabolic bone disease has been reported in juvenile Humboldt penguins (Adkesson & Langan, 2007). Long chain polyunsaturated fatty acids are known to impart very important roles in birds, and they are especially apparent in the high concentrations of arachidonic acid and docosahexaenoic acid in the hearts and brains of developing chicks of many species (Noble & Cocchi, 1990; Speake et al., 1998).

Table 8. Target nutrient ranges for adult penguin diets[a] based on requirements of domestic poultry (NRC, 1994); cats (NRC, 2006); and inferences from composition of wild foods (Bernard & Allen, 1997; McClements, 2007) (on a dry matter basis)

Nutrient	Concentration
Gross energy, kcal/g	4.5–6.5
Crude protein, %	45–75
Fat, %	10–40
Vitamin A, IU/g	1.1–7.5
Vitamin D, IU/g	0.2–0.5
Vitamin E, IU/kg	400[b]
Thiamin, mg/kg	100[c]
Calcium, %	0.78–2.5
Phosphorus, %	0.26–0.76
Magnesium, %	0.04–0.07
Potassium, %	0.33–0.5
Sodium, %	0.14–0.17[d]
Iron, mg/kg	60–80
Copper, mg/kg	4–9
Manganese, mg/kg	5–67
Zinc, mg/kg	35–75
Selenium, mg/kg	0.1–0.4

[a] Other nutrients, such as essential fatty acids, essential amino acids, vitamin K, and the other B-complex vitamins are probably required. Nevertheless, there is no evidence that inadequate concentrations are provided by fish and marine invertebrates. Whether or not vitamin C can be synthesized by penguin tissues has not been established. Freshly caught fish contain significant concentrations of this vitamin, and some destruction undoubtedly occurs during storage. However, signs of vitamin C deficiency in the penguin have not been described.

[b] Although this concentration of vitamin E may exceed the minimum requirement, about 400 IU/kg of DM provided by the supplement of 100 IU of vitamin E/kg of fresh fish is recommended to compensate for losses during peroxidation of unsaturated fatty acids.

[c] This concentration of thiamin undoubtedly exceeds the minimum requirement, but about 100–120mg/kg of DM are provided by the supplement of 25–30mg of thiamin/kg of fresh fish to compensate for destruction by thiaminases.

[d] Recent studies with African penguins fed a diet of herring, capelin, and squid, indicate that salt supplementation is not necessary to maintain electrolyte balance (Mazzaro et al., 2004).

Energy requirements: On a yearly cycle, penguin behavior consists of periods of inactivity, such as molting and egg incubation, and periods of increased activity, such as nest building and raising chicks. Some institutions have seen migratory swimming behavior when the birds think that they are "out to sea." The birds' caloric requirements will vary as activity levels fluctuate. Most penguins in zoos and aquariums are given the opportunity to eat until the point of satiation. When the proper environmental conditions are in place, a penguin's food consumption will oscillate with the normal cycles of activity. Nutrient and energy requirements should continue to be met.

Breeding: The appetite of penguins often increases in conjunction with breeding and egg-laying, and distinctive food preferences may be exhibited. Females may increase their weight by as much as 20–25%. It is currently recommended that a variety of whole fish be fed to nesting penguins, in quantities adequate to supply energy and protein needs. It does not appear necessary to provide supplemental fat in the diet. Adélie penguins have been found to feed exclusively on krill when nesting (Nagy & Obst, 1992).

Chick rearing: Energy requirements are considerable for the growth of chicks. King penguin (*Aptenodytes patagonicus*) chicks were estimated, by mass and energy density of stomach contents, to consume an average of 3,646 kJ (871 kcal) of gross energy (GE) per chick per day during a 3-month growth period (Cherel & Ridoux, 1992). The fish consumed contained 22–26 kJ (5.26–6.21 kcal) GE/g, DMB. Free-ranging emperor penguins fed their single chick the equivalent of about 7.5% of adult emperor penguin body mass in a 24-hour period (Robertson et al., 1993). The most important dietary adjustment to make when the parents are rearing chicks in zoos and aquariums is to offer enough fish to the parents so they may adequately feed themselves and their offspring. During chick rearing, parents should be fed *ad libitum* and frequently.

Molting: There are notable alterations in energy intake that are associated with molt (Ghebremeskel et al., 1992). The cues that induce the molting process include changes in ambient temperature, day length, food resource availability (possibly including food nutrient content), and associated hormonal changes (Ghebremeskel et al., 1992). It appears that if fed an adequate diet *ad libitum*, and the environment

accurately mimics seasonal light and temperature changes, most penguins in zoos and aquariums will exhibit a normal annual cycle of food intake, and will molt and reproduce normally (Wilson, 1985; Monroe, 1993). Appetite usually increases during the pre-molt period and decreases during molt. In a study with *ex situ* rockhopper penguins, all birds gained about 23–38% in body mass just prior to molting (Monroe, 1993). Among the penguin species that have been studied, most will fast during incubation and molting. In the wild, mean loss of body mass during molt is as much as 40% in macaroni penguins and 47% in king penguins (Ghebremeskel et al., 1991; Cherel et al., 1994). During molt in zoos and aquariums, losses can be as much as 50% of body mass. After these periods, penguins consume vast quantities of food and deposit considerable body fat and protein (Ghebremeskel et al., 1991).

5.2 Diets

The formulation, preparation, and delivery of all diets must be of a quality and quantity suitable to meet the animal's psychological and behavioral needs (AZA Accreditation Standard 2.6.2). Food should be purchased from reliable, sustainable and well-managed sources. The nutritional analysis of the food should be regularly tested and recorded.

The nutrient composition of fish and marine invertebrates fed to piscivorous animals in zoos and aquariums has been discussed by Bernard & Allen (1997) in the AZA Nutrition Advisory Group Handbook Fact Sheet 005. More recently, McClements (2007) analyzed fish fed to Humboldt and African penguins at ten U.S. zoos. This data encompasses most species of fish utilized for all species of penguin maintained in a zoo or aquarium (see Appendix F). It should be noted that fish nutrient values will vary with species, age, gender, physiologic state, season, and locale of harvest.

The quantity of food provided to penguins in zoos and aquariums to consume per day can be estimated based on their body mass. An average but active adult penguin's daily food consumption on an as-fed basis is approximately 2–3% of body mass for the larger species, such as kings and emperors, and 10–14% for smaller species, such as Humboldts and rockhoppers (Ellis & Branch, 1994). However, the specific quantities consumed depend on the activity level and physiologic state of each individual. In one study, free-ranging king penguins consumed (wet basis) an average of 1.84 kg (4.06 lb.) of food daily (Cherel & Ridoux, 1992). Estimated daily consumption (wet basis) in another study with free-ranging king penguins was an average of 2.32 kg (5.1 lb.). Mean body mass of the king penguins was 11.8 kg (26 lb.), resulting in a calculated daily intake equivalent to as much as 20% of their body mass (Putz & Bost, 1994).

When formulating diets for *ex situ* penguins, flexibility is required to account for variations in food preferences, body mass, activity, physical condition, environment, and behavior, as well as food availability and nutrient content. Vitamin mineral supplementation should be included in the diet where appropriate according to label indications and or recommendations from a qualified nutritionist or veterinarian. Ideally, the items chosen (e.g., high-fat and low-fat fish) and supplements fed should complement each other so that nutrient and energy requirements are met. It should be noted that when examining nutrient data for whole fish and marine invertebrates, the nutrient concentrations can vary among species, among individual lots within a species, among individual fish within a lot, as well as over a period of storage. Thus, published values may or may not reflect the nutrients actually fed to penguins at a specific time. Fish should be routinely sampled and analyzed according to industry standards via commercial laboratory for the determination of macro and micro nutrient concentrations.

Sample diets: Sample diets from institutions housing penguins can be found in Appendix G. The nutrient composition of these diets is presented in Appendix H. Refer to section 7.5 Assisted Rearing or the Penguin Husbandry Manual (Henry & Sirpenski, 2005) for specific diet information regarding hand-rearing of any species.

Food provision: The recommended method of feeding is to hand-feed individual penguins, particularly when offering fish that have been injected with nutrient supplements or in which supplement tablets or capsules have been placed. This ensures that each bird will receive intended nutrients and allows caretakers to monitor food and energy consumption. However, birds conditioned to hand-feeding may develop poor swimming habits, and may spend most of their time standing around on the exhibit surface. To encourage swimming, institutions may opt to pool feed. Individual appetites should still be closely monitored during the feeding. Adult penguins are commonly fed to appetite twice daily, although the number of feedings may be increased during pre-molt and breeding.

Methods of penguin self-feeding can sometimes be used, but keepers should ensure that food items remain cool, clean, and are consumed within a short time after being thawed. In exhibits held at or below 4 °C (39.2 °F), fish may be offered in feeding trays for several hours, as long as birds are neither defecating nor walking in the trays. However, fish should not be left in standing water because of the potential for nutrient loss. Supplemented fish should not be fed in trays because of the potential for under- or over-dosing if individual penguins consume either no or several fish containing supplements. If penguins are fed outdoors in hot, humid, or sunny weather, it is important to feed only the amount that will be consumed immediately or while still iced to avoid microbial proliferation, nutrient loss, and contact by disease-spreading pests.

The size of food items offered to penguins should be appropriate for easy manipulation and swallowing. Purchasing specifications for fish and squid should include size designations so that they can be fed whole. Whole food is accepted most readily, but if it has to be cut because it is too large, all portions should be fed to ensure that the entire supply of nutrients contained in the whole food is consumed. Lengths of fish consumed by free-ranging adult emperor penguins range between 6–12 cm (2.4–4.7 in.), and lengths of squid consumed range from 1.9–28 cm (0.7–11 in.). The largest squid consumed weighed 460 g (1 lb.) (Robertson et al., 1993). Free-ranging adult king penguins consumed prey estimated to be. 7–9 cm (2.8–3.5 in.) long, substantially smaller than the fish commonly fed in zoos and aquariums (Cherel & Ridoux, 1992). The larger average body size and bill dimensions of male penguins may result in consumption of somewhat larger prey than consumed by females. This sex-related difference has been documented in Gentoo penguins, but such differences have not been seen in macaroni, chinstrap, and Adélie penguins (Williams et al., 1992).

Food variability: Among penguin species that have been studied at more than one site or during more than one season, there are suggestions of within species diet variations (Croxall & Lishman, 1987; Cullen et al., 1992). Much of the variation may relate to differences in prey availability, but not all feeding patterns are clear (Croxall & Lishman, 1987; Cullen et al., 1992; Adams & Klages, 1987; Croxall et al., 1988; Clausen & Putz, 2002). Both seasonal and site-based differences in quantities of specific prey items have been reported for most species, including little blue, African, king, and others (Adams & Klages, 1987; Rand, 1960; Montague, 1982; Moore & Wakelin, 1997; Coria et al., 2000; Ainley et al., 2003; Lynnes et al., 2004). African penguins appear to exhibit seasonal variations in food selection that appear unrelated to prey supply. Nevertheless, prey supply appears to be the single largest contributor to seasonal variations and is often associated with reduced reproductive success in free-living species (Clausen & Putz, 2002; Rombola et al., 2003; Lynnes et al., 2004).

Supplies of prey items may shift with major oceanographic events, such as El Niño (Radl & Culik, 1999; Bakun & Broad, 2003; Hays, 1984; 1986). The increased risk of prey disappearance may result from climate change, major disease outbreaks in prey items, and increased competition of human fisheries on prey species (Tonn, 1990; Walther et al., 2002; Perry et al., 2005; Chiaradia et al., 2001; Chiaradia et al., 2003). The impact of fisheries on prey species should not simply be considered a free-living animal issue, especially given that prey items available to zoos and aquariums are a direct result of commercial fisheries. Considerable data exist on both the direct and indirect effects of fisheries on free-living avian species, including penguins (Furness & Tasker, 2000; Tasker et al., 2000; Furness, 2003; Crawford & Shelton, 1978; Shelton et al., 1984; Croll & Tershy, 1998). Therefore, it is recommended that all institutions understand where and how their prey items are being harvested and whether these practices are ecologically sustainable. Data can be found regarding many of the commonly offered species at a number of non-profit and government websites, including the National Oceanic and Atmospheric Administration's FishWatch® initiative and Seafood Watch®. Not all of the fish that are commonly offered to penguins are listed in these two websites, but other countries have similar websites listing many of these other species and their ecological status.

In zoos and aquariums, it is generally accepted that penguins have food preferences. The types and species of prey available for feeding are limited and may be quite different from the variety with which penguins evolved. Even data from free-ranging penguins suggest that the food items most consumed may not be those most preferred, but may be foods that are most available (Hays, 1986; Hobday, 1992; Boersma, 2008). Differences in food choice also may be influenced by physiologic circumstances, such as stage of the reproductive cycle (Boersma, 2008).

A penguin's selection of particular food items may be an expression of food preference, but since penguins in zoos and aquariums lack a historical and long-term association with the dietary items they

are provided, they do not appear to make choices on the basis of nutritional wisdom. Food refusal, on the other hand, may be an indication of spoilage, and if fish are refused, their quality should be checked in addition to normal quality inspections. To avoid dependence on a particular food item, it is prudent to offer a variety of prey species. If a penguin becomes "imprinted" on a specific food item, and if that item becomes unavailable, it may be difficult to coax acceptance of an alternative. In addition, offering a variety of foods will help ensure that the diet provides a complementary and complete nutrient profile.

Food preparation must be performed in accordance with all relevant federal, state, or local laws and/or regulations (AZA Accreditation Standard 2.6.1). Meat processed on site must be processed following all USDA standards. The appropriate hazard analysis and critical control points (HACCP) food safety protocols for the diet ingredients, diet preparation, and diet administration should be established for the taxa or species specified. Diet preparation staff should remain current on food recalls, updates, and regulations per USDA/FDA. Remove food within a maximum of 24 hours of being offered unless state or federal regulations specify otherwise and dispose of per USDA guidelines. Refer to Crissey (1998) for proper assessment, handling and storage of fish.

> **AZA Accreditation Standard**
>
> **(2.6.1)** Animal food preparation and storage must meet all applicable laws and/or regulations.

Typically browse is not offered to penguins. However, any plant species used in the exhibit or for enrichment should be identified with regards to safety by the veterinarians or horticulturalists. If browse plants are used within the animal's diet or for enrichment, all plants must be identified and assessed for safety. The responsibility for approval of plants and oversight of the program should be assigned to at least one qualified individual (AZA Accreditation Standard 2.6.3). The program should identify if the plants have been treated with any chemicals or near any point sources of pollution and if the plants are safe for the penguins. If animals have access to plants in and around their exhibits, there should be a staff member responsible for ensuring that toxic plants are not available.

> **AZA Accreditation Standard**
>
> **(2.6.3)** The institution should assign at least one person to oversee appropriate browse material for the animals.

5.3 Nutritional Evaluations

Taking regular weights is important for monitoring the health of individual animals. The weighing of individuals should be carried out opportunistically. This can be done on a routine basis if exhibit design and bird behavior allows it. The birds should always be weighed when they are handled for other reasons. Individual weight records should be maintained over time and utilized for comparison when a bird appears sick. The use of operant conditioning to train birds to stand on a scale (e.g., scale training) can assist in the daily management of the birds. In most cases, there is no need to limit food intake below *ad libitum* levels unless the penguin is extremely overweight.

Vitamin excesses: Fat-soluble vitamins A, D, E and K accumulate in the body when intakes exceed need, and excessive amounts over extended periods will produce signs of toxicity (Machlin, 1984). It should be noted, however, that there are seasonal differences in the availability of these vitamins for some animal species in the wild, and the accumulation of body stores during comparatively short natural periods of plenty may be critical for health during periods of short supply.

Vitamin A: Chronic vitamin A toxicity typically results from long-term intakes that are 100–1,000 times dietary requirements, although toxic signs have been reported from dietary levels as low as 10 times the requirement in domestic animals (National Resources Council, 1987). Elevated serum levels of vitamin A have been observed in Humboldt penguins fed diets containing 59,800 IU of vitamin A/kg (DMB) for 12 months, but no toxicity signs were seen (Crissey et al., 1998).

Vitamin E: Maximum tolerable levels of dietary vitamin E are quite high, but interference with blood clotting has been reported in pelicans with supplements of vitamin E adding 1,000–2,000 IU/kg of dietary DM (Nichols et al., 1989). Elevated serum levels of vitamin E have been observed in Humboldt penguins fed diets containing 58.6 IU of vitamin E/kg (DMB) for 12 months, but there were no signs of toxicity (Crissey et al., 1998).

Chapter 6. Veterinary Care

6.1 Veterinary Services

Veterinary services are a vital component of excellent animal care practices. A full-time staff veterinarian is recommended. In cases where this is not practical, a consulting/part-time veterinarian must be under contract to make at least twice monthly inspections of the animal collection to respond to emergencies (AZA Accreditation Standard 2.1.1). In some instances, because an institution's size or nature, exceptions may be made to the twice-monthly inspection requirement Veterinary coverage must also be available at all times so that medical needs can be responded to in a timely fashion (AZA Accreditation Standard 2.1.2). The AZA Accreditation Standards recommend that AZA-accredited institutions adopt the guidelines for medical programs developed by the American Association of Zoo Veterinarians (AAZV): http://www.aazv.org/displaycommon.cfm?an=1&subarticlenbr=839.

AZA Accreditation Standard

(2.1.1) A full-time staff veterinarian is recommended. In cases where such is not practical, a consulting/part-time veterinarian must be under written contract to make at least twice monthly inspections of the animals and to respond as soon as possible to any emergencies

AZA Accreditation Standard

(2.1.2) So that indications of disease, injury, or stress may be dealt with promptly, veterinary coverage must be available to the animal collection 24 hours a day, 7 days a week

The current Penguin TAG veterinary advisors can be found at: https://ams.aza.org/eweb/DynamicPage.aspx?Site=AZA&WebKey=8f652949-31be-4387-876f-f49a2d7263b2. Basic information on penguin husbandry, behavior and medicine is available in the current scientific literature, including *Zoo and Wildlife Medicine 3rd edition* (Fowler, 1993), and the 5th editions (Fowler & Miller, 1999). Additional veterinary references can be found in the reference section of this document. There are no penguin-specific training programs in veterinary medicine currently available, although several institutions that house penguins may offer general veterinary medicine internships which include on the job training with penguins.

AZA-accredited institutions must have a clear process for identifying and addressing penguin animal welfare concerns within the institution (AZA Accreditation Standard 1.5.8) and should have an established Institutional Animal Welfare Committee. This process should identify the protocols needed for animal care staff members to communicate animal welfare questions or concerns to their supervisors, their Institutional Animal Welfare Committee or if necessary, the AZA Animal Welfare Committee. Protocols should be in place to document the training of staff about animal welfare issues, identification of any animal welfare issues, coordination and implementation of appropriate responses to these issues, evaluation (and adjustment of these responses if necessary) of the outcome of these responses, and the dissemination of the knowledge gained from these issues.

AZA Accreditation Standard

(2.3.2) Hospital facilities should have radiographic equipment or have access to radiographic services.

AZA Accreditation Standard

(2.5.1) Deceased animals should be necropsied to determine the cause of death. Cadavers must be stored in a dedicated storage area. Disposal after necropsy must be done in accordance with local/federal laws.

Given the wide variety of zoos and aquariums that house penguins, the AZA Penguin TAG cannot provide specific recommendations for the best approaches to take to communicate animal welfare issues effectively within every institution. Some institutions have an animal welfare committee to whom concerns can be relayed. Committee members include both frontline care staff, animal managers, curators as well as staff from other institution departments. Some additionally recruit one or two outside consultants to be members that can voice non-institutional opinions. All animal caretakers that work with penguins should be aware of institutional protocols in place for them to identify, communicate, and hopefully address potential animal welfare issues that are associated with the care and management of these animals.

Protocols for the use and security of drugs used for veterinary purposes must be formally written and available to animal care staff (AZA Accreditation Standard 2.2.1). Protocols should include a list of persons authorized to administer animal drugs, situations in which they are to be utilized, location of animal drugs and those persons with access to them, and emergency procedures in the event of accidental human exposure.

AZA Accreditation Standard

(2.2.1) Written, formal procedures must be available to the animal care staff for the use of animal drugs for veterinary purposes, and appropriate security of the drugs must be provided.

Animal recordkeeping is an important element of animal care and ensures that information about individual animals and their treatment is always available. A designated staff member should be responsible for maintaining animal records and for conveying relevant laws and regulations to the animal care staff (AZA Accreditation Standard 1.4.6). Recordkeeping must be accurate and documented on a daily basis (AZA Accreditation Standard 1.4.7). Complete and up-to-date animal records must be retained in a fireproof container within the institution (AZA Accreditation Standard 1.4.5) as well as be duplicated and stored at a separate location (AZA Accreditation Standard 1.4.4).

> **AZA Accreditation Standard**
>
> **(1.4.6)** A staff member must be designated as being responsible for the institution's animal record-keeping system. That person must be charged with establishing and maintaining the institution's animal records, as well as with keeping all animal care staff members apprised of relevant laws and regulations regarding the institution's animals.

A specific individual should be assigned to handle endangered species permits. For transport across state lines or out of country, contact the receiving state for its requirements regarding health certificates, preshipment tests, and permit numbers.

> **AZA Accreditation Standard**
>
> **(1.4.7)** Animal records must be kept current, and data must be logged daily.

Detailed medical records should be kept regarding an individual's complete medical history. This includes information on all preventive medical care, diagnostic exams, illnesses, injuries, associated treatments, vaccinations, lab reports, abnormal physiology and abnormal behavior. Water quality results should be documented and readily available. Key information for veterinary care should be recorded on a daily basis and include changes in behavior, appetite, diet offered, fecal consistency, reproductive activity, and any overt signs of illness or abnormal health, such as regurgitation/vomiting, bleeding, abnormal swelling, lameness, and respiratory problems, including coughing. It is a critical to follow up with information on response to treatment and procedures, or changes in condition. If medications are being administered, record this information and whether or not delivery of medication was successful. Weights should be documented regularly. Necropsies should be done if at all possible and results maintained as part of the permanent record as a way to monitor the health of the overall collection.

> **AZA Accreditation Standard**
>
> **(1.4.5)** At least one set of the institution's historical animal records must be stored and protected. Those records should include permits, titles, declaration forms, and other pertinent information.

> **AZA Accreditation Standard**
>
> **(1.4.4)** Animal records, whether in electronic or paper form, including health records, must be duplicated and stored in a separate location.

Reproductive recordkeeping: Recordkeeping related to reproductive management should begin at the time of egg laying. Marking the first egg laid is important when calculating expected hatch dates. Egg logs should contain data such as lay date, number of days incubated, sire and dam, sibling identification, and method of rearing. Fertility results should be noted for each egg as well as survivability of chicks. By tracking a pair's reproductive history, trends in success or failure can be identified. One simple method for recording reproductive data for penguins, using large rookery maps, is described by Ellis-Joseph (1990).

Hatch weights and subsequent daily or weekly weights are important to monitor overall growth rate. For hand-reared penguins, many institutions develop records which include first morning weight, weight before and after each feeding, amount of food consumed at each feeding, types of food consumed, vitamins and medications given, and comments on behavior, and. It is useful to record ambient temperature and brooder temperature (if applicable). Chick records should be maintained through fledging. For more information on assisted rearing practices for penguins, see Chapter 7.5.

6.2 Identification Methods

Ensuring that penguins are individually identifiable allows for more better care of each individual. And individual animals should have corresponding ID numbers whenever practical. A system for accurately maintaining animal records must be created if individual identifications are not practical (AZA Accreditation Standard 1.4.3).

> **AZA Accreditation Standard**
>
> **(1.4.3)** Animals must be identifiable, whenever practical, and have corresponding ID numbers. For animals maintained in colonies/groups or other animals not considered readily identifiable, the institution must provide a statement explaining how record keeping is maintained.

To maintain individual records, animals should be banded or marked so individuals can be identified at a distance. In birds, an additional system of permanent identification is recommended in

case the band is lost, and to track birds from one institution to another if banding techniques should change. Cheney (1989) reported that most institutions use flipper bands with good success. In lieu of actual flipper bands, colored cable ties can be placed around the flipper. When using this method, the band should be tightened to the point where a finger can be slipped between the band and the bird's flipper. As bands can continue to tighten after applied, either the fastener should be glued to the band to prevent slippage when in place or monitored to ensure that they do not tighten further and impede circulation to the flipper.

The band should be placed in such a manner that the fastener does not rub against the penguin's flipper or get hooked on protruding objects. Flipper bands should be monitored closely during molt, as the penguins' flippers often swell during this time, potentially restricting circulation. During molt many institutions replace the flipper band with a looser band to accommodate swelling or leave it off during molt if there are other methods if identifying the bird. Regardless of the method of visible individual identification used, the AZA Penguin TAG recommends that transponders also be used with penguins. The AZA Penguin TAG recommends subcutaneous placement of the transponder in the loose skin of the back of the neck, or on top of the head, but Boersma recommends the fleshy part of the foot in the front of the tarsus (D. Boersma, personal communication). Chicks weighing as little as 500 g (1.1 lb.) can be micro chipped if needed. For smaller collections, identification of adults can be made based on spot patterns of the breast feathers based on photographs taken after the molt into adult plumage.

Sexing: DNA sexing from feather, blood, or egg membranes can be done by commercial laboratories and is very reliable. This is the recommended method for sexing penguins (see Appendix I for laboratories). When pulling feathers, be sure to remove them so the root is intact. If commercial labs are not available, penguins can be sexed by cloacal examination. The most reliable use of this technique is constrained to a two-week period following egg laying (Boersma & Davies, 1987). Sladen (1958) indicated that a cloacoscope method for sexing Adélie, Humboldt, and African penguins has been used with some success. The differences between male and female physical characteristics are slight, and extensive training is needed for this method to be used accurately. Although sexing based on morphometrics has been published for some species, this has been shown to be unreliable in managed populations of Humboldt penguins (Wallace et al., 2008) and thus might be expected to be unreliable for other spheniscid species.

AZA member institutions must inventory their penguin population at least annually and document all penguin acquisitions and dispositions (AZA Accreditation Standard 1.4.1). Transaction forms help document that potential recipients or providers of the animals adhere to the AZA Code of Professional Ethics, the AZA Policy on Responsible Population Management: Acquisitions, Transfers and Transitions by Zoos & Aquariums (see Appendix B), and all relevant AZA and member policies, procedures and guidelines. In addition, transaction forms must insist on compliance with the applicable laws and regulations of local, state, federal and international authorities. All animals owned by an AZA institution must be listed on the inventory, including those animals on loan to and from the institution (AZA Accreditation Standard 1.4.2).

AZA Accreditation Standard

(1.4.1) An animal inventory must be compiled at least once a year and include data regarding acquisitions and dispositions at the institution.

AZA Accreditation Standard

(1.4.2) All species owned by the institution must be listed on the inventory, including those animals on loan to and from the institution. In both cases, notations should be made on the inventory.

6.3 Transfer Examination and Diagnostic Testing Recommendations

The transfer of animals between AZA-accredited institutions or certified related facilities as a result of AZA Animal Program recommendations often occurs as part of a concerted effort to preserve these species. These transfers should be done as altruistically as possible and the costs associated with preshipment examination and diagnostic testing should be considered.

Complete preshipment examinations are recommended to ensure that individuals are healthy enough to withstand the stress of shipment, and to screen for disease to prevent spread to another institution. A full physical exam should be conducted, including but not limited to weight, inspection of the feet, oral cavity and eyes, general body and feather condition, and review of medical history, appetite, and behavior.

Minimally, most institutions request blood for a routine CBC and chemistry profile, fecal exam for parasites, and fecal culture for pathogens. Radiographs can be requested provided that the sending institution has access to anesthesia and a radiograph machine, but not all institutions can provide this. Other diagnostic tests might be required by the receiving state/country, and the state/country should be contacted prior to shipment to find out what additional rests and what permits are required. Local, state, or federal regulations that are more stringent than AZA Standards and recommendations have precedence.

6.4 Quarantine

AZA institutions must have holding facilities or procedures for the quarantine of newly arrived animals or for the treatment of sick/injured animals (AZA Accreditation Standard 2.7.1). All quarantine, hospital, and isolation areas should be in compliance with AZA standards/guidelines (AZA Accreditation Standard 2.7.3; Appendix C). Local, state or federal regulations that are more stringent take precedence. All quarantine procedures should be formally written, available to staff working with quarantined animals, and supervised by a veterinarian (AZA Accreditation Standard 2.7.2). If no specific quarantine facility exists, newly acquired animals should be kept separate from the established collection to prohibit physical contact, prevent disease transmission, and avoid aerosol and drainage contamination. If the receiving institution lacks appropriate facilities for quarantine, pre-shipment quarantine at an AZA or American Association for Laboratory Animal Science (AALAS) accredited institution may be applicable.

AZA Accreditation Standard

(2.7.1) The institution must have holding facilities or procedures for the quarantine of newly arrived animals and isolation facilities or procedures for the treatment of sick/injured animals.

AZA Accreditation Standard

(2.7.3) Quarantine, hospital, and isolation areas should be in compliance with standards/guidelines contained within the *Guidelines for Zoo and Aquarium Veterinary Medical Programs and Veterinary Hospitals* developed by the American Association of Zoo Veterinarians (AAZV), which can be obtained at: http://www.aazv.org/associations/6442/files/veterinary_standards_2009_final.docx.

AZA Accreditation Standard

(2.7.2) Written, formal procedures for quarantine must be available and familiar to all staff working with quarantined animals.

Quarantine protocols: Penguins should be quarantined for a minimum of 30 days unless otherwise directed by the staff veterinarian. It may be extended if problems are diagnosed. It can be shortened if examination has shown no problems and it is behaviorally necessary for the well-being of the animals. If additional birds are introduced during the quarantine period, the quarantine should begin again. However, the addition of animals besides birds may not require the re-initiation of the quarantine period. If the new additions do not show signs of infectious disease, the first set of animals may clear quarantine without re-examination.

Separate facilities are recommended to accommodate newly acquired birds, or birds that should be separated from the group for health-related reasons. This area should have air and water systems separate from the main exhibit. It can serve as an isolation area if not in use for quarantine. An area without separate air and water systems should not be considered an appropriate quarantine or isolation area. If possible, two or more birds should be quarantined together because of their social needs. If this is not possible, efforts should be made for quarantined birds to have visual or auditory contact with other penguins. Designated keepers should care only for quarantined animals if possible. If keepers must care for both quarantined and resident animals of the same taxa, they should care for the quarantined animals only after caring for the resident animals. Any equipment or enrichment items used for quarantined animals should be used only with these animals. If this is not possible, then all items should be appropriately disinfected, as designated by the veterinarian supervising quarantine, before being used elsewhere. Standard disinfection with quaternary ammonium or bleach is adequate unless a mycobacterial disease is suspected, in which case ammonium-based products are not suitable. Phenolics can be used but can be corrosive. Enrichment items that are not easily cleaned can be thrown out and replaced if needed (infectious disease diagnosed or suspected).

AZA institutions must have zoonotic disease prevention procedures and training protocols established to minimize the risk of transferable diseases (AZA Accreditation Standard 11.1.2) with all animals, including those newly acquired in quarantine. Although transmission of tuberculosis from penguins to humans

AZA Accreditation Standard

(11.1.2) Training and procedures must be in place regarding zoonotic diseases.

is not of concern, penguins can potentially carry gastrointestinal bacteria that cause disease in people. A separate set of Personal Protective Equipment (PPE) should be worn when handling or cleaning quarantined animals. This includes outerwear such as washable or disposable smocks, aprons, overalls or gowns, surgical masks, gloves and a separate set of boots or shoe covers. Recommended minimum quarantine space, pool, and temperature recommendations are listed in space recommendations (Chapter 2). Non-abrasive flooring or matting should be used, if at all possible.

Quarantine veterinary procedures: During the quarantine period, a complete physical examination and specific diagnostic tests should be conducted for each animal (see Appendix C). Animals should be permanently identified during quarantine if not already, Animals should be evaluated for ectoparasites and gastrointestinal parasites, and treated accordingly. Blood should be collected, analyzed and the sera banked long-term in either a -70 °C (-94 °F) freezer or short-term in -20 °C (-4 °C) freezer (frost-free or self-defrosting freezer should not be used because of the freeze-thaw cycles) for retrospective evaluation. Vaccinations should be updated as appropriate, and if the vaccination history is not known, the animal should be treated as immunologically naive and given the appropriate series of vaccinations. Detailed medical records for each animal should be maintained and kept easily available.

Release from quarantine should be contingent upon normal results from diagnostic testing, and three negative fecal parasite exams and fecal/cloacal cultures that are spaced a minimum of 1 week apart. If at all possible, radiographs should be taken to establish a baseline reference for each individual and to check for evidence of disease, gastrointestinal foreign bodies, or evidence of previous trauma (fractures).

Aspergillus prevention: Aspergillosis is a severe fungal disease and often affects penguins under stress. In addition to receiving anti-fungals prior to shipment (AZA standard 6.3), animals should also receive it for at least two weeks after arrival into quarantine until they are acclimated to their new surroundings.

6.5 Preventive Medicine

AZA-accredited institutions should have an extensive veterinary program that must emphasize disease prevention (AZA Accreditation Standard 2.4.1). The American Association of Zoo Veterinarians (AAZV) has developed an outline of an effective preventative veterinary medicine program that should be implemented to ensure proactive veterinary care for all animals:
(www.aazv.org/associations/6442/files/zoo_aquarium_vet_med_guidelines.pdf).

> **AZA Accreditation Standard**
>
> **(2.4.1)** The veterinary care program must emphasize disease prevention.

Depending on the disease and history of the animals, testing protocols for animals may vary from an initial quarantine test to yearly repetitions of diagnostic tests as determined by the veterinarian. Animals that are taken off zoo/aquarium grounds for any purpose have the potential to be exposed to infectious agents that could spread to the rest of the institution's healthy population. AZA-accredited institutions must have adequate protocols in place to avoid this (AZA Accreditation Standard 1.5.5). To minimize risk, some institutions have separate program animals that used solely for that purpose and that are housed separately from the main collection. If this is not possible, then penguins taken off grounds for any reason, whether for educational programs or diagnostic testing, should not come into contact with other birds or areas where other birds have been, if not adequately disinfected.

> **AZA Accreditation Standard**
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> **(1.5.5)** For animals used in offsite programs and for educational purposes, the institution must have adequate protocols in place to protect the rest of the animals at the institution from exposure to infectious agents.

Routine physical exams: Physical exam frequency for penguins can depend on the situation of the institution. Some institutions will perform medical assessments of the birds more frequently, especially if they are screening regularly for diseases or parasites, or specifically after treatments to assess effectiveness. For smaller flocks, monthly weights are recommended—penguins can be trained to step onto a platform scale to facilitate weighing. Blood samples may be collected from penguins weekly or biweekly in a flock of birds with malaria problems. It is recommended that a physical exam should be performed at least annually, and include blood sampling, weighing, and general health assessments, if staffing and resources permit. If possible, radiographs should be performed on birds where the possibility of ingestion of foreign objects exists. During annual exams, and whenever birds are caught up for other reasons, the opportunity should be taken to weigh the animal, as well as to check the eyes, feet, and mucous membranes for indicators of any health issues. Routine vaccinations are rarely given to

penguins, but in those collections housed outdoors and exposed to mosquitos, vaccination against West Nile Virus and against Eastern or Western encephalitis if the diseases are endemic to a location, may be warranted.

Blood parameters: Each institution should establish its own set of normal blood parameters for every species maintained, preferably on MedARKS or ZIMS software. Outside laboratories or other institutions will often have different normal values. (See Appendix N for normal blood values for various managed species) Data from free-ranging individuals has been published for several species (Wallace et al., 1995; Wallace et al., 1996; Travis et al., 2006; Karesh et al., 1999.). Blood may be collected from the inter-digital, medial tarsometatarsal, flipper, and jugular veins. It appears that more institutions are utilizing the jugular because of the speed and ease of acquisition of large quantities of blood. One institution collects blood from a venous sinus located on the dorsal aspect of the vertebral column at the base of the tail. The amount of blood that may be removed depends on the size of the individual, but generally follows normal avian standards (no more than 1% body weight). Complete blood counts (CBCs) are usually done by hand (using either the eosinophil method or Natt and Herricks method); estimates from a smear are considered less accurate. The Celldyne shows promise in accurately counting white blood cells. Chemistry profiles should include assays for glucose, alanine aminotransferase (ALT), asparginine aminotransferase (AST), calcium, urea, uric acid and bile acids. Increases in cholesterol, calcium, phosphorus, and occasionally alkaline phosphatase are often seen in reproductively active females beginning about a month prior to egg laying and persisting until shortly after the egg(s) is laid (Wallace, unpublished data).

Medical management of molt: Molt is physiologically stressful for penguins. Regeneration of new feathers requires a large amount of energy. Penguins usually molt once a year after the breeding season, but some species (e.g., Galapagos penguins) molt before breeding (Boersma, 1977; 1978). The onset of molt occurs as the days begin to shorten, and is thought to be initiated by a decrease in daylight, especially in the polar species. Some species, such as the African penguins, molt over a longer period of time. African penguins at one zoological institution have molted in every month of the year, but the majority of molts occur between March and August (Bennett, 1991). At another zoological institution, Humboldt penguins have typically molted during August, September, and October, while the rockhoppers and gentoos housed indoors on a Southern hemisphere light cycle typically molt in January to March, and March to April respectively. In Europe, most *Speniscus* species molt in July and August. It is important that institutions are familiar with their normal birds molting times and plan management appropriately.

Prior to molt there is a significant increase in appetite that corresponds with a visible gain in weight. Once penguins begin to molt their appetites decrease dramatically. Some birds refuse food altogether. This corresponds to behavior in the wild, where molting occurs on land and birds do not have access to food, resulting in a fasting period lasting as long as three weeks. For wild African penguins, Cooper (1978) reported a 31% weight gain in pre-molt birds, with a subsequent loss of 41% of their peak body mass during molt. For Humboldt penguins housed at one zoological institution, it is not unusual for them to gain and lose 25% of their body weight.

During molt, the birds lose all their feathers in a short period of time. Bennett (1991) reported that the average molt length is 16.75 days in African penguins. Other penguins have similar molting periods. In zoo and aquarium environments, this large loss of feathers can cause problems for some filtration systems, and it may be necessary to remove birds from the exhibit during this time. If birds are to be moved off-exhibit, it is recommended that they are moved before they drop their feathers. Shed tail shafts have been reported to be ingested by some penguins in the wild, and the ingestion of some feathers by penguins should be considered normal (D. Boersma, personal communication). Another consideration during molt is the potential need to change flipper bands. The swelling that occurs during molt can cause the bands to constrict around the flippers. Bands may need to be removed and replaced with looser bands during molt; birds can then be re-banded after molt is completed. If the band is not removed, it is important that the birds are closely observed to ensure that the bands do not impede circulation.

Sometimes birds will either not go into or not complete their molt. In zoos and aquariums, this condition appears to occur most frequently in chinstrap penguins. Abnormal, inconsistent, or incomplete molts have been noted in various species under different circumstances. Birds from the wild, or those recently acquired from another institution, may skip a molt for the first season at a new location. Molt may also be affected by illness in an individual. Factors that may be linked to molt problems include improper light cycle, improper light intensity (i.e., coverage throughout exhibit), improper light spectrum (UV, type,

spectrum of artificial light), nutrition (i.e., body condition, weight gain, vitamins, and protein components), levels of fatty acids, and humidity.

One zoological park has tried several different methods to stimulate molt including hormonal treatments, increased day length, and natural sunlight, with varying success. The potential role of circulating thyroid and hormone levels in molt problems has also been investigated. Treatment with medroxyprogesterone compounds has been shown to induce or speed up molting, though there is some concern that this is symptomatic relief rather than a true cure. Timing of its use should coincide with the peak portion of the light cycle used in the exhibit (Reidarson et al., 1999). Fatal complications with this treatment have occurred, as has obesity with associated fatty liver syndrome. This treatment, or other types of hormonal therapy, should be used only when environmental factors (e.g., light) have been thoroughly investigated, and when all other changes in husbandry techniques and remedies have failed. There have been cases of arrested molt at varying zoos that have not responded to any treatment, resulting in penguins that are almost devoid of feathers. For these individuals, hypothermia is a concern and management adjustments should be made.

6.6 Capture, Restraint, and Immobilization

The need for capturing, restraining and/or immobilizing penguins for normal or emergency husbandry procedures may be required. All capture equipment must be in good working order and available to authorized and trained animal care staff at all times (AZA Accreditation Standard 2.3.1).

> **AZA Accreditation Standard**
>
> **(2.3.1)** Capture equipment must be in good working order and available to authorized, trained personnel at all times.

Manual restraint: Penguins are hardy animals and can normally tolerate routine handling for nail and beak trimming, banding, and weighing. The individual to be captured should be separated from the colony. There are several different methods for capturing the animal; initial restraint is done by grabbing the back of the head or very high on the neck and lifted from behind. Penguins should not be grabbed by the flippers; several institutions have reported broken flippers during handling. Two people should work together when capturing and restraining king and emperor penguins. The people capturing the birds should wear eye protection to avoid injury from a bird's beak, especially when restraining king penguins. Once the bird has been secured, a black bag can be placed over its head with the beak and nares exposed so the birds can breathe easily. Covering the eyes will immediately calm the bird (D. Boersma, personal communication).

Once captured, there are a variety of restraint techniques for penguins. Non-invasive procedures may necessitate only minimal restraint. However, medical procedures, such as blood collection, which require the bird to be immobile, dictate stronger restraint. One method used successfully involves placing the penguin between the handler's legs so that the flippers are held secure. In this way, the handler's hands are free to restrain and position the head and neck to facilitate procedures such as blood collection and re-banding. With king and emperor penguins, a second person may be needed to avoid injury to the bird and/or handler. Other methods of restraint include using large diameter PVC pipe or traffic cones to hold the bird secure. If a penguin needs to be moved a short distance, it is recommended that the handler carry the bird close to his/her body with the head at their side facing their back. If the bird needs to be moved to a different location, such as the hospital or a different holding area, it can be placed in an appropriate container such as an air kennel or large tub.

Immobilization: Animals should be fasted 18–24 hours prior to anesthesia to prevent regurgitation and aspiration of gastric content. Isoflurane is still the most commonly used gas anesthetic, although many institutions are now successfully using sevoflurane. Induction may be accomplished by use of a facemask or cone with subsequent intubation.

It should be noted that the trachea bifurcates at different levels in some species. Therefore, use of a standard length endotracheal tube may result in unilateral intubation if the clinician is not careful. Because of the extensive pulmonary/air sac system, unilateral intubation does not lead to the severe problems of hypoventilation/hypooxygenation seen in mammals. If the tracheal size diminishes distal to the bifurcation, however, tracheal trauma may occur if an inappropriately sized tube is used. If a clinician is unsure where the trachea bifurcates, radiographs may be helpful as a double trachea may frequently be seen.

Maintenance of anesthesia may be complicated by shallow breathing in the patient, resulting in a chronic excitement phase indicated by swimming like behavior. A smoother plane of anesthesia may be

achieved by assisting ventilation two to three times per minute. Ketamine has also been used, although recovery can be prolonged when compared to isoflurane. One institution recommends ketamine/valium or just ketamine given IM for induction over isoflurane for Little Blue penguins because of the fragile nature of this species and its tendency to traumatize itself during anesthetic induction with isoflurane. Once the ketamine takes effect, anesthesia may be maintained with isoflurane. If cold climate penguin species are immobilized for extended periods, some institutions use ice, ice packs, or other methods to prevent hyperthermia during the immobilization procedure. For minor procedures that just require sedation, or to reduce the stress of handling, birds may be given midazolam intranasally or intramuscularly. Sedation may then be reversed with flumazenil if needed once the procedure is finished.

6.7 Management of Diseases, Disorders, Injuries and/or Isolation

AZA-accredited institutions should have an extensive veterinary program that manages animal diseases, disorders, or injuries and has the ability to isolate these animals in a hospital setting for treatment if necessary. Penguin keepers should be trained for meeting the animal's dietary, husbandry, and enrichment needs, as well as in restraint techniques, and recognizing behavioral indicators animals may display if their health becomes compromised (AZA Accreditation Standard 2.4.2). Protocols should be established for reporting these observations to the veterinary department. Penguin hospital facilities should have radiographic equipment or access to radiographic services (AZA Accreditation Standard 2.3.2), contain appropriate equipment and supplies on hand for treatment of diseases, disorders or injuries, and have staff available that are trained to address health issues, manage short and long term medical treatments and control for zoonotic disease transmission.

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(2.4.2) Keepers should be trained to recognize abnormal behavior and clinical signs of illness and have knowledge of the diets, husbandry (including enrichment items and strategies), and restraint procedures required for the animals under their care. However, keepers should not diagnose illnesses nor prescribe treatment.

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(2.3.2) Hospital facilities should have radiographic equipment or have access to radiographic services.

Aspergillosis: Aspergillosis is one of the most commonly reported illnesses in penguins. It is a fungal infection caused by aspergillus organisms. The organism is ubiquitous in the outdoor environment and is often found in various areas of indoor exhibits. It can exist in low numbers without causing problems if the birds are healthy and well adapted to their exhibit and social group. Disease may occur in stressed or debilitated animals. Stressors that have been associated with the occurrence of aspergillosis include: substandard air quality, poor ventilation, elevated ammonia levels; social incompatibility; introduction to a new social group; inappropriate, prolonged or stressful relocation; introduction of new aspergillus species via new substrate or nesting material; change in location, which may expose birds to new fungal species; and excessive environmental heat or cold. High standards in exhibit air quality are an important consideration in prevention of the disease.

Early clinical signs of Aspergillosis can be subtle, and missed by keepers and veterinarians unfamiliar with the course of this infection in penguins. Signs may include open-mouth breathing, coughing, an inability to vocalize, and mucus may be evident at the glottis (opening to the trachea). Other common signs that are frequently but not always exhibited include inappetance, lethargy, weight loss, isolation, and lying down. These signs are often nonspecific and early diagnosis is difficult. Auscultation of the lungs and air sacs are commonly unremarkable. A complete blood count (CBC) may show an increase in the white blood cell count with a monocytosis, but early in the course of the disease may not show changes. Fungal cultures may be taken of the throat, trachea, or air sacs. Radiographs are helpful in looking for pulmonary or air sac granulomas or general cloudiness to air sac or lung fields. Fluoroscopy, if available, is also useful to detect granulomas. Serologic titers to aspergillus may be helpful, but it is often difficult to differentiate an acute infection from previous exposure. Changes in the plasma (heparinized) protein electrophoretic pattern compatible with chronic inflammation may be present. While there is some variation in the electrophoretic pattern among different penguin species, the inflammatory response elicited by aspergillosis typically results in elevated beta and gamma levels, and a notably depressed albumin : globulin ratio. However, these findings are nonspecific indicators of inflammation, and so can be found with other inflammatory conditions such as malaria, intestinal obstruction, and non-fungal coelomitis. Standard serum or plasma analysis for albumin and globulin values, and hence the ratio between the two, are not accurate in penguins and cannot be used in lieu of electrophoresis as a diagnostic aid.

The method and success of treatment depends on the stage and severity of disease when diagnosed. The veterinarian may often tailor the type of drug used and other therapy modalities. It is important to consult with veterinarians experienced in the treatment of this disease in penguins. Antifungal drugs may be given systemically (oral or intravenous), by nebulization, or intratracheally. Fluids may also be given orally by tube, subcutaneously or intravenously. Force-feeding fish gruel by tube can be used for short-term nutritional support, and any weight loss should be closely monitored. Drugs utilized with some measure of success include (see Appendix J):

- Voriconazole
- Terbenafine
- Itraconazole
- Clotrimazole: (nebulized)
- Amphotericin: (nebulized, intra-tracheal, intravenous)
- Enilconazole: nebulized (very thick, needs dilution)
- Antibacterials (for concurrent bacterial infections)

Commercial formulations of itraconazole should be used. Compounded formulations have been shown to have poorer absorption and may not reach therapeutic levels (Smith et al., 2010). Itraconazole appears to be losing its efficacy in some collections. In those cases where itraconazole is not effective, treatment with voriconazole is recommended, although this drug currently is very expensive and might be cost prohibitive for some institutions.

Treatment is typically long-term, frustrating, and often unsuccessful if begun in the latter stages of disease. Early intervention may yield a better survival rate in aspergillosis cases.

It has been observed that during serious outbreaks, mortality of acutely affected birds follow a "bell-shaped curve", with sporadic deaths initially, a central period of increased deaths followed by another period of sporadic deaths. Loss of acutely affected birds is often followed by another rise in mortalities in birds that have been chronically affected. Prevention of the disease is best. Historically, many major outbreaks of aspergillosis have occurred after major environmental changes. Environmental stressors should be kept to a minimum, especially those involved with social factors (e.g., overcrowding). Prophylactic antifungal drugs, typically oral itraconazole) should be administered when shipping, relocating, or introducing new birds to an exhibit, and it is important not to ship or relocate birds during molt period (including pre- and post-molt periods). Although a fungal vaccination exists, it is not commercially available, and its efficacy is not proven. Maintaining high standards in exhibit air quality is crucial to prevention for species housed indoors. Regular fungal air cultures should be taken from the exhibit area to monitor levels of aspergillus. If it is necessary to shut down the air filtration system in a penguin exhibit, it is recommended to run the system for at least a week after it is restarted to clear the system before putting penguins back into the exhibit. Air cultures and disinfection for aspergillus spp. should be taken at this time. Construction in the surrounding areas may affect the air quality inside the exhibit, and should be carefully monitored. Precautions should be taken prior to the start of any construction.

Malaria: Malaria is a blood parasite carried by mosquitoes and/or biting flies. The causative agent is a *Plasmodium* organism, usually *Plasmodium relictum* or occasionally *P. elongatum.* Most cases of penguin malaria occur in animals that are currently or have historically been housed outside. Although penguins of all ages can be clinically affected, those particularly susceptible include chicks and juvenile birds, naïve adults previously housed indoors, or those that have been transported from areas with low mosquito/malaria problems. Clinical signs for malaria may vary, and range from acute death with no signs, sudden onset of respiratory difficulty with death rapidly following, to lethargy, inappetance, pale mucous membranes (from anemia), and behavioral separation from the group (Graczyk et al., 1995). Signs in more chronic courses are similar to heavy metal toxicity. Diagnostic tests for malaria include a CBC with blood smears (although this test to detect malarial organisms is not very sensitive), postmortem smear of blood, or splenic impression. A serologic test has been validated for black-footed penguins (*Spheniscus demersus*), and may be useful for other sphenscid species, but is not commercially available (Graczyk et al., 1995a; Hoogestyn & Cunningham, 1996). Research is currently underway to try to detect

malarial organisms in blood using PCR techniques, but accurate tests have yet to be developed. In penguins, the mortality rate from malaria infection is high, therefore, regular screening of birds housed outside can be attempted. All birds considered high risk can have blood collected every two weeks, and stained smears of the blood checked for the presence of malaria organisms. Even though it is not a very sensitive test, it may be helpful. Death can often be acute, with malarial protozoa visible only after the onset of severe clinical signs or during necropsy.

Treatment of malaria involves the use of Primaquine with Chloroquine, or if primiquine is not available, mefloquine (Tavernier et al 2005, Willette et al., 2009) can be used. Prophylaxis can be attained using mefloquine, primiquine or using the following drug regimen: A compounded capsule containing 125 mg sulfadiazine, 4 mg Daraprim (pyrimethamine) and 0.4 mg folic acid can be formulated. One capsule should be given orally for 3–5 kg (6.6–11 lb.) penguins every other day throughout the mosquito season. However, as Daraprim is a folic acid inhibitor and is teratogenic (i.e., causes birth defects), it should not be used in laying females. Administration of either prophylactic treatment is risky in parent birds that are feeding chicks, as the parent may regurgitate the medication to a small chick. Institutions may want to discontinue treatment for a week or two while the chick is small, and then restart treatment first in the parent that is less involved in feeding the chick. If using the every other day therapy, treat the parents on alternate days so that the chick does not receive two doses in a day. Doxycycline is used in humans for both malaria treatment and prevention, and should hold promise for treatment in birds, but to date no studies have been published indicating dose or efficacy.

Mosquito control is paramount to reducing exposure to malaria if penguins are housed outdoors. This includes minimizing standing water or removing standing water on a weekly basis, larvicide application to standing water that cannot be routinely removed (including in any drains in the penguins indoor and outdoor enclosures), and minimizing foliage near animal exhibits. Exposure to adult mosquitoes can be reduced by bringing the penguins in during peak mosquito hours (e.g., dusk to dawn), ensuring door sweeps and screens are in good condition, placing screens over intake fans, and providing fans wherever possible to keep the air moving, which may discourage mosquitoes.

Viral encephalitides: There are a number of viruses that can cause encephalitis in birds. Disease spread is typically by the bite of an infected mosquito, and wild birds can act as a reservoir for, and amplify, the virus. There has been some evidence that bird-to-bird transmission may also occur via semen and other infected bodily fluids. Diseases relevant to penguins include eastern equine encephalitis (EEE), western equine encephalitis (WEE), and West Nile fever, caused by the West Nile virus (WNV). Both EEE and WNV have been reported in *Spheniscid* penguins, and these penguins can have high rates of morbidity and mortality in response to these diseases.

West Nile virus: This disease is caused by a flavivirus. West Nile virus was first reported in the United States of America in 1999 after being discovered in a dead crow found on the grounds of the Wildlife Conservation Center (formerly the Bronx Zoo) in New York City. The virus spread rapidly across the US over the course of the next few years, and now has been reported in all 48 contiguous states. Species susceptibility to severe morbidity and mortality varies widely, with Sphensicid penguins being one of the more highly susceptible avian groups. Birds that survive infections with this disease have some latent immunity to reinfection, but it is not known how long this immunity lasts.

Acute death can occur with few premonitory signs, or death may occur within 3–4 days. With supportive care, the course of the disease may be protracted, with death occurring after a couple weeks. Recovery can be prolonged in those animals that do not die, with weakness and decreased appetite lasting for several weeks. When clinical signs are seen, they usually include anorexia, weakness (lying down frequently), and vomiting, with the inability to retain even small amounts of water or oral electrolyte solutions. Bile-stained diarrhea may occur. Dyspnea from excessive mucoid tracheal/pulmonary secretion may also occur, secondary to myocardial involvement. In Humboldt penguins, neurologic abnormalities are not a common sign and tend to occur only in those animals that survive longer before succumbing (R. Wallace, personal communication, 2007).

There is no specific treatment for this disease, and therapy is limited to supportive care. Supplemental fluids given subcutaneously, intravenously, and orally may be necessary for adequate hydration. Antifungal or antibacterial therapy can be given as needed for secondary infections. Oral supplementation of fluids or gruel is not recommended until a penguin's condition has stabilized, or signs begin to resolve, as there is a tendency for these birds to vomit (R. Wallace, personal communication). The oral cavity and glottis should be carefully suctioned if excess mucus is obstructing the airway, and

supplemental oxygen may also be necessary. The zoonotic potential of infected penguins for the keeper staff is unknown. However, virus can be shed in the respiratory secretions, and possibly urates/feces. In addition, horizontal transmission of the virus to humans from other avian species has been documented. Therefore, appropriate protective clothing should be worn when handling or working around infected birds. This should include N-95 masks if there is a chance for inhalation of aerosolized matter (cleaning).

As with malaria, adequate mosquito control is paramount in the prevention of this disease, especially if penguins are housed outdoors. Vaccination is recommended for susceptible species. Currently, there are no commercially available vaccines produced specifically for birds. Two vaccines developed for horses are commercially available (Innovator™ and Recombitek™). Innovator™ is a killed, inactivated vaccine produced by Fort-Dodge. Recommended doses are 1 mL IM given 3–4 weeks apart for three doses, and given to naïve animals prior to mosquito season, followed by annual boosters prior to mosquito season. The efficacy of this vaccine, as measured by serologic titers, differs in different avian species. Recombitek™ is a recombinant canary pox vaccine produced by Merial. There are anecdotal reports of this being used, but efficacy and safety in birds is unknown at this point. Birds known to have had and recovered from the disease are most likely immune, and may not need to be vaccinated, but more information is required to determine the extent of this immunity.

Eastern equine encephalitis (EEE): Eastern equine encephalitis is caused by an alphavirus. The virus was first reported in a group of African penguins (*S. demersus*) housed outdoors at an aquarium (Tuttle et al., 2005). Approximately 60% of the colony had noticeable clinical signs. Common clinical signs include acute anorexia, lethargy, and intermittent vomiting, along with penguins showing antisocial (isolation) behavior. Bile-stained diarrhea may occur. Ataxia can develop after 3–4 days, and with signs progressing to recumbency and seizures in about 25% of affected penguins. Signs in less severely affected penguins began to resolve in 6–9 days, but only after 14 days in more severely affected penguins. Stress-induced secondary infections such as aspergillosis may occur.

Standard complete blood cell count and serum chemistry diagnostic tests show non-specific changes such as an increased white blood cell count with a heterophilia, mild anemia, and a mild increase in glucose and sodium. Serologic testing using a hemagglutin-inhibition test for titers to the EEE virus is performed by the USDA National Veterinary Services Laboratory, and can confirm exposure to the disease. Reference limits for penguins have not been established, although a high titer suggests either exposure or disease, and a rising titer taken 2–4 weeks apart suggests active disease.

As with West Nile infections, there is no specific treatment, and any therapy is limited to supportive care. Supplemental fluids given subcutaneously, intravenously, and orally may be necessary for adequate hydration. Anticonvulsants (diazepam) may be needed to control seizures. Antifungal or antibacterial therapy should be provided as needed for secondary infections. As with WNV and malaria, adequate mosquito control is key for effective prevention of this disease, particularly if penguins are housed outdoors. A killed vaccine against EEE is available for horses and has been used, but the dose required and efficacy for penguins has not been determined.

Chlamydia psittaci: *C. psittaci* is thought to be a pathogen primarily in psittacines and columbiformes. However, *C. psittaci* has caused outbreaks of disease in penguins (F. Dunker, personal communication). Signs include poor appetite, lethargy, and lime-green stools/urates. Bloodwork typically shows an elevated WBC with a heterophilia/lymphopenia with toxic changes. The total protein is elevated with increases in the beta- and gamma-globulins.

Post-mortem lesions seen include splenic and hepatic enlargement, with pulmonary congestion. Necrotizing splenitis, hepatitis, interstitial pneumonia and nephritis may be seen histologically. Gimenez stain shows elementary bodies in affected tissues. The organism can be confirmed using a *C. psittaci* PCR (DNA) probe and tissues, or by culture (Jencek et al., 2006)

Diagnostic tests: The general confusion surrounding the testing methods for *C. psittaci*, and interpretation of test results to determine if a bird's illness is due to an active infection complicates the diagnosis in live birds. Tests are offered by many labs and veterinary diagnostic laboratories. The veterinary clinician is urged to thoroughly investigate the latest diagnostic techniques, and to have a good understanding of what each test result signifies. Some available tests are listed below.

- PCR (DNA) probe of *C. psittaci* (feces, choanal/cloacal swabs, fresh tissue): This test is useful in the diagnosis of infected birds and helps determine shedding, as well as if therapy is working.

- PCR (DNA) probe for *C. psittaci* (blood): False negatives can be seen in birds begin treated with enrofloxacin. This test is of questionable value as known infected birds in one outbreak tested negative.
- Complement fixation (CF) (blood): This test measures IgG antibodies. It is useful to ascertain exposure to chlamydia. However, its value as a diagnostic aid for current infections or as an indicator for cleared infections is still uncertain. It is unknown how long titers remain elevated in affected or recovered penguins.
- Elementary body agglutination (EBA) (blood): This test measures IgM antibodies, indicating current infection. The value of this test in penguins in still unknown.

Treatment:

- Doxycycline is the drug of choice. Either oral doxycycline (Vibramycin) 25–50 mg/kg orally once a day for 45 days (if possible) or parenteral doxycycline (Vibrovenos) 50–75 mg/kg IM once weekly for 6–7 weeks (preferably). Both of these drugs can cause inappetance and possible photophobia.
- Enrofloxacin 15 mg/kg orally once or twice a day. In one outbreak, the Baytril treatment resolved clinical signs but the blood picture did not change. Therefore, it may not be an effective treatment to resolve infection.
- Other supportive care measures such as fluids should be given to ill birds.

C. psittaci is a zoonotic disease, and risk of transmission to the public or animal care staff is real. Public Health officials should be notified if chlamydia infection is confirmed. Affected birds or flocks should be quarantined to protect other collection birds as well as animal keepers. Protective clothing, including N-95 masks, should be worn by persons working with the birds. If birds are kept on display, the area should be hosed with a disinfectant prior to public hours.

Avian pox: Avian pox infection has been observed in both managed and wild penguin populations (Kane et al., 2012). Based on phylogenetic structure of the virus, it was determined that infection was transmitted from wild birds. Transmission is via arthropod vectors or contact of mucosal membranes, broken or abraded skin with infected individuals or their secretions. Pox virus can live a long time in the scabs shed by infected individuals. Infection can be manifested by both the wet and dry forms. There currently is no treatment, and supportive care should be provided while the disease runs its course, usually in 2–3 weeks. Because the virus can survive in the scabs or other dried infected lesions, meticulous disinfection should be performed in any areas where ill animals were housed to prevent infection of other individuals.

Toxoplasmosis: Deaths from toxoplasmosis have occurred in black-footed penguin chicks exposed to cat feces. Signs were primarily neurologic, with death occurring within 24 hours. (Ploeg et al., 2011) At necropsy, peritonitis, pneumonia, hepatomegaly, splenomegaly, and renomegaly were evident. Aside from the direct threat of predation that cats can pose to penguins, toxoplasma oocysts transmitted from infected cat feces can pose a risk; therefore penguin exhibits should be secured to prevent entry by domestic cats.

Pododermatitis (bumblefoot): Penguins, like other birds, may be predisposed to pododermatitis by the following factors: change in normal activity patterns (e.g., decreased swimming, increase in sedentary behaviors), and prolonged standing on hard, abrasive surfaces or surfaces with excessive moisture or fecal contamination. Prevention can be attempted by encouraging penguins to swim on a daily basis. The original lesion may be the result of a bacterial infection from a puncture wound or soft tissue damage caused by pressure necrosis. Once the epithelium is compromised, secondary bacterial invasions may occur, resulting in deep soft tissue infections. If left untreated, severe complications can occur, including mineralized soft tissue, deep granulomas, and osteomyelitis. Examination for pododermatitis should involve an evaluation of the behavior and posture of the penguins. Indicators include:

- Abnormal stance
- Increased lying down
- Abnormal gait (limp)
- Footpad ulceration; scab formation, epithelial thinning, laceration or puncture; drainage; swelling; increased redness; and discomfort on palpation
- Soft tissue mineralization or osteomyelitis seen radiographically

Thermography may be useful both as a diagnostic technique and for monitoring response to therapy. Therapy should be aimed at protecting the foot from further damage, instituting local and systematic treatment of the current lesion, and changing conditions to prevent future occurrences (e.g., improving hygiene and changing to an appropriate substrate or flooring). Treatments that have been used include systemic antibiotics; local antibiotics with or without dimethyl sulfoxide (DMSO); surgical debridement; cryotherapy; and chronic bandaging in conjunction with various salves and ointments (chronic exposure to DMSO within a bandage can cause severe skin irritation) accompanied by intermittent debridement of devitalized tissue.

While there is often initial improvement with many of the techniques listed above, there is a tendency for reoccurrence once therapy is discontinued. Since most treatments involve wrapping the affected feet, it is helpful to provide padding to minimize pressure on the wound site. If the wound site is not surgically closed, the area should be kept moist to encourage granulation. Gauze, GORE-TEX® cast padding, ointment, Vetrap bandaging tape, and waterproof tape or booties made from soft material have all been used (Reidarson et al., 1999a). Booties can be made from old wet suits and Velcro or are commercially available in various sizes. Healing efficiency can also be improved with proper debridement and the use of hydroactive dressings, which may retain moisture better than gauze and ointment. Environmental temperature may affect healing rates. There is some evidence that allowing birds with bandages to swim in salt water during therapy may promote healing, as the saltwater may help in drying out the tissue. Prevention of bumblefoot is a priority, as treatment is typically long-term and frustrating. Prevention should be geared toward encouraging swimming and avoiding hard, rough, wet surfaces that retain contaminated water.

Preen gland infections: Diagnosis is based on the presence of an enlarged, swollen gland containing purulent or caseous material. Early diagnosis and treatment may prevent impaction. The specific etiology of preen gland infections is unknown, but there may be many potential factors, including sedentary birds with decreased swimming patterns, poor plumage, non-preening birds who do not molt regularly, and nutritional deficiencies. Encouraging swimming and making birds stay in the water for longer periods may also reduce this problem, as penguins are more likely to preen when they come out of the water. Once a bird has preen glans problems, they are more susceptible to future episodes. Preen gland infections have not been seen in penguins in the wild (D. Boersma, personal communication)..

Cultures of preen gland fluid have contained numerous bacteria. *Candida* is commonly cultured, even following antifungal therapy. Histologic examination of the gland suggests the possibility of vitamin A deficiency, although supplementation of vitamin A has not resolved the condition. While a limited number of birds may respond to symptomatic therapy, such as flushing the gland or infusing it with a proteolytic enzyme ointment, surgical removal may be needed to avoid eventual rupture and secondary septicemia (MacCoy & Campbell, 1991). It is important to encourage birds, particularly those that are nesting, to swim regularly as a preventative measure. For birds that are nesting, if one of the pair voluntarily leaves the nest to feed, it should be encouraged to swim before returning to the nest. If, for medical reasons, birds are housed without a pool, daily showers can be given to stimulate preening activity.

Pulmonary disease: While aspergillosis is usually the most common disease involving the respiratory system, there are other respiratory problems that are primarily related to bacterial pathogens. In some cases, it is difficult to distinguish between primary or secondary aspergillosis involvement. Upper respiratory diseases also include disease of the sinuses, and dyspnea can occur from plugged nares. Antibiotic therapy should be based on culture and sensitivity results whenever possible.

General bacterial disease; Penguins as with other animals can acquire bacterial infections. Trauma, stress, egg-yolk retention, age, and poor food quality can all predispose an animal to infection with a variety of bacteria, including mycobacteria (Boerner et al., 1994; Fisher et al., 2008). Good husbandry and management help reduce the incidence of bacterial disease.

Renal disease: The diagnosis of severe renal disease by serum chemistries is difficult in penguins. In some cases, the uric acid levels are elevated. However, normal increases in uric acid concentrations that occur after a meal should be differentiated from increases reflecting renal disease. A blood urea nitrogen (BUN) greater than 5 mg/dl may indicate dehydration. Fluid supplementation given orally, subcutaneously, or intravenously may be helpful, although systemic or visceral gout may result in rapid death with very few prior symptoms. On postmortem, there may be bright white flecks of uric acid

deposits in the muscle, air sac, or serosa of organs. Uric acid crystals can be visualized under polarized light. For histologic verification, tissues should be placed in alcohol, since formalin will dissolve the deposits. Articular gout (gout in the joints) occasionally occurs in penguins. Lameness is the primary clinical sign. Nephritis (renal infection) or amyloidosis may be present without clinical signs of gout.

Foreign object ingestion: Penguins are curious animals, and young penguins in particular will investigate small and novel items within their enclosures. When manipulating these objects they may ingest them. Ingestion of foreign objects can cause medical problems and even death (Perpiñan & Curro, 2009). Some of the items that have been reported being ingested include nesting material (e.g., sticks and stones), bristles from brushes used for cleaning (the use of nylon scrub brushes that easily lose their bristles should be avoided), coins, fence clips, lead pellets from dive belt weights, and even molted tail feather shafts. Zinc, lead, and other heavy metal toxicities are always possible when metal objects are ingested. Initial symptoms may mimic malaria. Therefore, radiographs should be performed to detect metallic foreign objects. Some institutions regularly radiograph their penguins to ensure that they are not retaining such items. Some zoos and aquariums use commercial metal scanners on their birds. Although penguins regurgitate easily, foreign objects are not always present in the regurgitated material. These objects frequently remain in the stomach, and do not moved further down the gastrointestinal tract. If attempts to get the penguin to regurgitate are unsuccessful, treatment is usually by endoscopic removal. Penguins have large stomachs. When foreign objects settle in the distal aspect of the stomach, radiographically they often appear to be in the distal intestine near the cloaca. This frequently leads clinicians to believe that the object is about to pass through on its own. But most likely it is still in the stomach. When performing endoscopy for foreign body retrieval, it is necessary to examine all the way to the most distal aspect of the stomach to locate the object.

Nervous system disorders: Incoordination and "stargazing" are occasionally reported as clinical symptoms. Thiamine deficiency has been implicated as a cause when fish quality is compromised (Griner, 1983). Differential diagnoses for non-specific signs of central nervous system involvement should include disease problems seen in other species, including viral or bacterial encephalitis, fungal granuloma, sepsis, nutritional deficiencies, and tumors. Domoic acid poisoning was reported to cause the total loss of a rockhopper penguin collection (Broadbent, 2009). Exposure to the toxin came from eating fish contaminated by the algal toxin. Consideration should be given regarding the source of fish fed to penguins (caught in shallow vs. deep water).

Neoplasia: A variety of neoplasias have been reported in penguin species including adenocarcinomas, melanoma, and lymphoma (Cho et al., 1998; Yonemaru et al., 2004; Rambaud et al., 2003; Ferrell et al., 2006).

Egg-related health issues: Pathology of the reproductive system is uncommon in penguins, although salpingitis, egg binding, and cloacal prolapse have been reported. Treatment for egg binding is similar to that of other avian species. Manual extraction of the egg is preferable. If that is not possible, surgical removal of the egg may be required. Removal of the entire oviduct may be necessary if egg retention leads to oviductal rupture or necrosis. Problem birds should have their calcium level checked periodically. Like other avian species, these birds may benefit from calcium supplementation.

Fluid administration: Fluid may be given to penguins by stomach tube, subcutaneously, intraperitoneally, or intravenously. Intravenous catheters for administration of fluids and therapeutic agents have been successfully placed and maintained in the flipper vein (brachial or medial) of several species of penguin (if the penguin is kept out of water). Penguin bones are not pneumatic and are much denser than those of other species of birds, therefore, intraosseous administration of fluids is quite difficult.

Surgery: Surgery to assess air sacs, reproductive, and gastrointestinal tracts has been successfully performed in a variety of penguin species. It is important to remember to keep Antarctic and sub-Antarctic species cool during surgery. Standard surgical technique may be employed. Intubation, standard patient monitoring (i.e., ECG, oxygen saturation), and fluid administration are generally easy to perform. Birds should be kept out of the water until the skin incision has healed.

Most institutions find that it is easy and less damaging to the patient's skin if the feathers are shaved in preparation for surgery, not plucked. The feather shafts will fall out and normal feathers will grow in

during the next molt. Surgical scrubbing may be gentler and avoid skin trauma. Where feathers are plucked, alcohol may cause excessive damage and impede skin healing.

Blood transfusions: Transfusions may be performed when birds are severely anemic from malaria (blood phase), blood loss, or clotting disorders, and they can stabilize a bird until a diagnosis can be made and treatment initiated. It is indicated when the hematocrit (HCT) or packed cell volume (PCV) drops rapidly into the teens or less and does not stabilize. If the HCT is stable and the cause of the anemia is removed, penguins generally have a good bone marrow response (if not old or debilitated by concurrent disease), and generally respond well to supportive care alone (i.e., fluids, oral or injectable iron supplementation, oxygen and B-vitamins). In birds with malaria with a stable hematocrit in the teens, it has been reported that a transfusion appears to shorten the convalescent time while the treatment with chloroquine/primaquine takes effect.

Blood transfusion procedure: Approximately 1–1.5% of the donor's weight in blood volume can be safely collected (60 mL from a 4–5 kg/8.8–11 lb. bird). Acid citrate dextrose (ACD) solution (available from Metrix Co. Dubuque IA) is used as the anticoagulant at 0.15 mL ACD/ml blood collected. The blood is then collected slowly over 10–15 minutes using a butterfly catheter from the jugular or metatarsal vein while the bird is under anesthesia. IV fluids up to, or equal to the blood volume collected can be given using the same butterfly catheter used to collect blood. The donor bird is given supportive care post-blood collection in the form of subcutaneous fluids (50 mL/kg), B-vitamins (0.5 mL in fluids or IM), and iron dextran (10 mg/kg IM).

Prior to the administration of blood, a partial cross match should be performed on the recipient using the donor blood and recipient bird serum. Absence of hemolysis or agglutination will suggest compatibility. The recipient bird is given dexamethasone sodium phosphate (0.25–1.0 mg/kg IM/IV). The blood is administered through intravenous or intraosseous routes (difficult) using either an IV with either a disposable blood filter or an inline filter, both of which can be attached directly to a 60 mL syringe. It is advisable to administer 60 mL of blood over 45–60 minutes, while constantly rocking the blood in the syringe while monitor the recipient's heart and respiratory rates closely. If either increases, slow or stop the transfusion until parameters have returned to normal, then resume at a slower rate.

With 60 mL of blood (for one 4–5 kg/8.8–11 lb. penguin), one should expect an increase in pre-transfusion HCT by 25–50%. Homologous (same species) transfusions are preferred since the blood cells probably remain in the recipient's circulation longer.

AZA-accredited zoos and aquariums provide superior daily care and husbandry routines, high quality diets, and regular veterinary care to support penguin longevity. In the occurrence of death however, information obtained from necropsies is added to a database of information that assists researchers and veterinarians in zoos and aquariums to enhance the lives of penguin both in their care and in the wild. As stated in Chapter 6.4, necropsies should be conducted on deceased penguin to determine their cause of death, and the subsequent disposal of the body must be done in accordance with local, state, or federal laws (AZA Accreditation Standard 2.5.1). Necropsies should include a detailed external and internal gross morphological examination and representative tissue samples form the body organs should be submitted for histopathologic examination. Many institutions utilize private labs, partner with Universities or have their own in-house pathology department to analyze these samples. The AZA and American Association of Zoo Veterinarians (AAZV) websites should be checked for any AZA Penguin SSP Program approved active research requests that could be filled from a necropsy.

> **AZA Accreditation Standard**
>
> (2.5.1) Deceased animals should be necropsied to determine the cause of death. Cadavers must be stored in a dedicated storage area. Disposal after necropsy must be done in accordance with local/federal laws.

Euthanasia: The AZA Penguin TAG does not have specific recommended protocols for penguin euthanasia within zoos and aquariums. Veterinarians at each institution are encouraged to contact the AZA Penguin TAG veterinary advisors for more specific information or advice on the most effective, safe, and humane approaches to utilize. Each institution housing penguins should have a euthanasia protocol in place, developed by the veterinary team, in case euthanasia becomes necessary in a particular situation. The AZA Animal Welfare Committee also encourages each institution to develop a process to determine when elective euthanasia might be appropriate from a quality of life perspective, taking into account behavioral, health, social, nutritional, and animal caretaker perspectives. Examples of approaches used by institutions are available from the AZA Animal Welfare Committee. If a penguin's

quality of life has diminished to the point where euthanasia is the humane option, anesthesia followed by injection of an approved euthanasia solution (chemical euthanasia) should be performed.

Egg euthanasia: The American Association of Zoo Veterinarians (AAZV) states that the neural tube of avian embryos has developed sufficiently for pain perception by 50% gestation, and so any bird embryos that have reached this stage or beyond should be euthanized using methods appropriate for hatched birds (i.e., chemical euthanasia).

Necropsy: Post-mortem examination is an important component of any comprehensive veterinary medical program. Thorough necropsies include detailed external and internal gross morphological examinations and findings should be documented. Eggs that did not hatch should be opened and checked for fertility and age of embryonic death. Bacterial cultures should be taken of the yolk/albumin or embryo to identify bacterial infection as a cause of embryonic death. Representative tissue samples form the body organs should be submitted for histopathologic examination. Thorough necropsy examination and records will aid assessment of the overall health, and causes of morbidity and mortality in penguin collections. In turn this should lead to better husbandry, management and treatment of the collection. The full Humboldt penguin and egg necropsy protocols can be found in Appendix O. These may be used as a guideline for other penguin species. Further copies and updates may be found at either the AAZV or AZA website under necropsy protocols that can be used as a guideline for other penguin species. Copies of final reports should be sent to the Penguin TAG veterinary pathology advisor and then to the SSP veterinary advisors.

Chapter 7. Reproduction

7.1 Reproductive Physiology and Behavior

It is important to have a comprehensive understanding of the reproductive physiology and behaviors of the animals in our care. This knowledge facilitates all aspects of reproduction, artificial insemination, birthing, rearing, and even contraception efforts that AZA-accredited zoos and aquariums strive to achieve.

The exact age of sexual maturity is difficult to determine for some zoo-housed species. The sex ratio and age distribution of the colony will have an impact on the sexual behavior of the younger penguins. Young males generally will not compete with older males for mates. They will, however, engage in courtship behavior at an early age (1–2 years). The approximate ages of sexual maturity are shown for wild penguins in Table 9.

Table 9. Average age of sexual maturity (*in situ*)

Species	Age at sexual maturity (male / female if available)
Emperor	5 yrs. / 6 yrs.
King	5–7 yrs.
Adélie	3–8 yrs.
Gentoo	2–3 yrs.
Chinstrap	3 yrs.
Macaroni	6 yrs.
Rockhopper	4 yrs. (likely)
African	4 yrs.
Humboldt	3–4 yrs.
Magellanic	4–5 yrs. / 5–6 yrs.
Little Blue	2–3 yrs.

(Williams, 1995; Garcia & Boersma, 2012).

On a yearly cycle, penguins show some predictable changes in sociality related to breeding. Penguins can be seen in large social groups on land during molting and breeding season. They are generally antisocial during molting, although they remain in close proximity. Courtship behaviors can be seen at the beginning of breeding season. The breeding season can be defined in terms of four major phases: courtship, incubation, chick-rearing and fledging. In zoo and aquarium conditions, some behaviors, such as mutual displays, observed during the early phases of the breeding season may be seen year-round, albeit less intensely. In one study, Adélie penguin pairs were observed to occupy their nest sites year-round, even during periods when nesting materials were not available (Ellis-Joseph, 1988). Adélie penguins that pair and lay their eggs earlier in the season were also reported to be significantly more likely to fledge chicks (Ellis-Joseph, 1988; 1992).

The onset of the breeding season, which varies between species, may create a flurry of activity similar to what is reported for wild penguins (Sladen, 1958; Penney, 1968; Ainley et al., 1983). In the wild, the onset of the breeding season takes place when birds return to the colony (*Pygoscelis* spp., *Eudyptes* spp., and *Aptenodytes* spp.) or to the nesting territory (*Spheniscus* spp.). In general, behaviors associated with pairing are observed more intensively 3–4 weeks prior to egg-laying. Depending on the species and exhibit, initiation of courtship can be enhanced by manipulation of artificial lighting (photoperiod, refer also to Chapter 1.2) or introduction of nesting materials.

Aggressive behavior in penguins is most pronounced during courtship and pairing and again once chicks are hatched. Although it is a natural part of the reproductive cycle, staff should monitor aggression closely during the breeding season to ensure that reproduction is not deterred because of excess aggression or competition. Some institutions report mate "stealing" in exhibits with skewed sex ratios. Emperor and king penguins, for example, may require the construction of removable barriers to allow isolation of pairs or individuals, as unpaired birds may attempt to "steal" eggs or chicks from conspecifics that may be incubating or brooding. Some institutions report that penguins attack, and may kill birds that are weak or ill. There is also a need to closely monitor birds that have been isolated and subsequently

returned to the group. Harassment by groups is not common in penguins. Most aggressive exchanges take place between individual birds or pairs (Williams, 1995).

Agonistic displays increase during the breeding season as birds begin to reclaim and defend nest territory, or compete for prime nest locations (Renison et al., 2002; 2003). Overall rates of vocalization and display may increase throughout the exhibit during breeding. It is important to note that injuries from disputes (such as jab wounds in king penguins and corneal abrasions in *Spheniscus, Eudyptes,* and *Pygoscelis* species) may occur more frequently, particularly in multi-species exhibits with a high density of penguins. For Adélie penguins, aggression is lowest during incubation and at highest levels once chicks are hatched (Ellis-Joseph, 1988).

Mating and mate selection: Penguins are usually housed in colonies large enough that birds can select their own mates. Atypical pairing behaviors have been noted in zoos and aquariums. For example, same-sex pairing has been reported for emperor, king, gentoo, Humboldt, Magellanic, and African penguins. One zoological institution reported a male/male pair to which eggs were successfully cross-fostered for two breeding seasons. Other unusual behaviors include: copulations in which the traditionally effective male on top/female on the bottom position is switched; extra-pair copulations; or polyandrous or polygynous trios. In wild Adélie penguins, Muller-Schwarze (1984) described two types of pairing: trial pairing, which is temporary, and true pairing, which results in a clutch and a season-long bond. Such pairings have not been observed in Adélie penguins in zoos and aquariums, possibly because there is no seasonal emigration from the colony and subsequently no advantage to trial pairing. Occasionally, it may be necessary to selectively pair adults when undesirable pair bonding takes place (e.g., sibling, polygynous, polyandrous, same-sex bonds, or non-recommended program pairs). In *Spheniscus* spp., a successful pair bond may be encouraged by isolating the desired pair through egg-laying and incubation. It is desirable to use the male's territory for this isolation.

Approximately 3–4 weeks from onset, courtship and nest building are complete. Copulations, which usually occur at the nest site, may be observed within one week of the onset of the breeding cycle. In *Spheniscus* spp., copulations may be noted frequently during courtship and nest building. Copulations for *Eudyptes* and *Pygoscelis* are generally observed within days of occupation of the rookery. In *Aptenodytes*, particularly emperor penguins, copulation is rarely observed. It is important to note that emperor penguins in zoos and aquariums appear to be much heavier than their wild counterparts, which may hamper copulation and thus adversely affect reproduction.

Hormone tracking: Currently, no hormonal tracking methods are used to assess reproductive condition in penguins. Normal hormonal values have not been established for these taxa. This is an area that may be better understood with future investigation into reproductive technology. All reproductive physiological information can be found in Chapter 7.3.

7.2 Assisted Reproductive Technology

The practical use of artificial insemination (AI) with animals was developed during the early 1900s to replicate desirable livestock characteristics to more progeny. Over the last decade or so, AZA-accredited zoos and aquariums have begun using AI processes more often with many of the animals residing in their care. AZA Studbooks are designed to help manage animal populations by providing detailed genetic and demographic analyses to promote genetic diversity with breeding pair decisions within and between our institutions. While these decisions are based upon sound biological reasoning, the efforts needed to ensure that transports and introductions are done properly to facilitate breeding between the animals are often quite complex, exhaustive, and expensive, and conception is not guaranteed.

AI has become an increasingly popular technology that is being used to meet the needs identified in the AZA Studbooks without having to re-locate animals. Males are trained to voluntarily produce semen samples and females are being trained for voluntary insemination and pregnancy monitoring procedures such as blood and urine hormone measurements and ultrasound evaluations. Techniques used to preserve and freeze semen have been achieved with a variety, but not all, taxa and should be investigated further.

Semen preservation and AI have the potential to enhance natural breeding programs of penguins by reducing or eliminating reproductive problems associated with inbreeding, behavioral compatibility, bird transport, human-imprinting of hand-raised birds and disease transmission. Costs of establishing an assisted reproductive program may initially be greater than relative costs of animal transport, and substantial research on basic reproductive biology is still needed for each penguin species to successfully

apply AI, but such costs would be outweighed in the long-term through benefits resulting from improved genetic and reproductive management.

Artificial insemination has been developed in the Magellanic penguin using fresh, chilled semen. Table 10 outlines the methodologies that have been used in some species in the area of semen collection, characterization, and preservation. Females can be conditioned for insemination using similar training methods described for semen collection, except that females are conditioned to accept manipulation of the cloaca and insertion of a 1 mL syringe and catheter. Alternatively, females can be anesthetized for the artificial insemination procedure (O'Brien, 2013). Candling observations are used to monitor egg fertility status and embryonic development.

Table 10. Assisted reproductive techniques

Assisted reproductive technology	Penguin species	Methodologies	Reference
Semen collection	*Spheniscus magellanicus*	Voluntary semen collection method (n=1 male)	O'Brien et al., 1999
	Eudyptes chrysocome	Voluntary semen collection method (n=6-14 males)	Waldoch et al., 2007, 2012
	Aptenodytes patagonicus	Voluntary semen collection method (n=1 male)	O'Brien & Robeck, 2013
	Spheniscus demersus	Voluntary semen collection Method (number of males not specified)	Unknown
Semen characterization & preservation	*Spheniscus magellanicus*	Short-term chilled storage, long-term cryostorage (n=1 male)	(O'Brien et al., 1999)
	Spheniscus magellanicus	Short-term chilled storage, long-term cryostorage (n=7 males)	2012–2013 unpublished
	Eudyptes chrysocome chrysocome	Semen characterization only (n=14 males)	Waldoch et al., 2007, 2012
	Aptenodytes patagonicus	Short-term chilled storage, long-term cryostorage (directional freezing method)	O'Brien & Robeck, 2013
Artificial insemination	*Spheniscus magellanicus*	Artificial insemination using fresh, chilled semen (n=4 chicks derived from AI, as confirmed by genetic analysis)	O'Brien, 2013

Research into all areas associated with the development of AI using chilled and cryopreserved semen is still required in penguins, in particular, the characterization of female reproductive hormones and temporal relationships of such hormones with physiological events such as ovulation.

7.3 Pregnancy & Egg-laying

It is extremely important to understand the physiological and behavioral changes that occur throughout an animal's pregnancy.

Egg-laying and incubation: Table 11 shows the most commonly reported timing of laying of first clutches for various penguin species in North American facilities. In conjunction with breeding and egg-laying, appetite often increases and distinctive food preferences may be exhibited. Females may increase their weight by as much as 20–25%, and in some cases females may become inappetent 1–2 days before laying. In *Aptenodytes* species, incubation of rocks or ice may indicate that egg-laying is imminent. Gentoos and *Eudypteds* will lie in the nest and dig with their feet. After a frenzied period of nest construction, *Spheniscids* will stop digging and gathering nesting material. Within a month of egg lay females will show changes to blood parameters as outlined in Chapter 6.7: Egg Related Health Issues. Estrogen, progesterone, and prolactin all interact to facilitate brood patch formation in both sexes (Hutchison et al., 1967).

Table 11. Timing of first clutch egg-laying (Henry & Sirpenski, 2005)

Species	Month											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Emperor						A	A	A				
King					N A	N A	N	N		A	A	A
Adélie										A	A	
Gentoo				N						A	A	
Chinstrap				N	N					A		
Macaroni			N	N					A	A		
Rockhopper				N	N				A	A	A	
African	N	N	N	N	N	N	N	N	N	N	N	N
Humboldt	N	N A	N	N	N	N	N	N	N	N	N	N
Magellanic			N	N								
Little Blue								N	N	N		

A = Austral lighting schedule (30° S Latitude–77° S Latitude)
N = Northern Hemisphere or natural lighting conditions

Following a period of ritualized courtship, penguins normally lay 1–2 eggs, depending on the species (refer to Table 12 for clutch size and other egg-laying data). With the exception of emperor and king penguins, both parents take part in nest construction, incubation and chick rearing. For *Pygoscelis* spp., courtship behaviors such as rock presentation and nest building continue throughout egg lay and incubation. On rare occasions, king penguins have laid a replacement clutch when their only egg has been lost early in the term (J. Jozwiak, personal communication). In *Eudyptes* spp., the first laid eggs are much smaller than the second eggs and hatch much later. Table 13 shows expected egg measurements for various species.

Table 12. Egg-laying intervals and incubation data (Henry & Sirpenski, 2005)

Species	Clutch size	Egg lay interval	Mean incubation period	Incubation period range	Pip-to-hatch	Multiple clutches
Emperor	1	-	67 days	64–73 days	48–72 hrs.	No
King	1	-	56 days	53–62 days	48–72 hrs.	No
Adélie	2	3–4 days	36 days	34–42 days	24–48 hrs.	No
Gentoo	2–4	3–5 days	38 days	36–44 days	36–48 hrs.	Yes
Chinstrap	2	3–4 days	37 days	35–39 days	36–48 hrs.	No
Macaroni	2	4–5 days	36 days	36–42 days	24–48 hrs.	No
Rockhopper	2	3–5 days	35 days	32–36 days	24–48 hrs.	No
African	2	3–4 days	38 days	36–42 days	24–48 hrs.	Yes
Humboldt	2	2–4 days	42 days	40–46 days	24–48 hrs.	Yes
Magellanic	2	3–4 days	42 days	38–48 days	24–48 hrs.	Yes
Little Blue	2	1–4 days	36 days	33–37 days	48–56 hrs.	No

Table 13. Egg measurements (includes *ex situ* and *in situ* * laid eggs)

Species	Sample Size	Mean length x width (mm)	Range length (mm)	Range width (mm)	Range weight (g)
Emperor *	10	121 x 82	100–130	78–86	350–502
King	301	106 x 76	90–122	65–82	100–391
Adélie *	72	69 x 53	60–79	42–60	64–119
Chinstrap	52	66 x 52	61–71	48–56	72–113
Gentoo	111	70 x 58	61–78	53–61	93–145
Macaroni "A" egg	25	77 x 52	71–85	46–54	93–136
Macaroni "B" egg	26	78 x 60	75–90	52–61	138–184
Rockhopper "A" egg	50	63 x 49	56–67	41–52	47–88
Rockhopper "B" egg	84	70 x 54	64–80	50–57	83–123
Humboldt *	30	73 x 52	62–85	46–56	-
Magellanic	101	73 x 55	68–82	50–60	94–134
African *	7	65 x 49	62–72	44–60	72–98
	196	65 x 49	59–84	40–70	50–117
Little blue	10		37–40	53–58	36–42

Nest management: It is important to be familiar with the breeding history of a pair during nest establishment and before an egg is produced. Nest sites should be evaluated for prior success or failure, neighboring aggression and level of rookery traffic. Natural barriers such as large rocks or logs can be placed between neighboring nests to discourage intrusion and decrease aggression. An ample supply of nesting materials will decrease resources competition and may help contribute to nesting success. Familiarity with each species natural history can help determine normal versus irregular behavior. Macaroni penguins frequently practice obligate brood reduction and eject their alpha egg from the nest in preparation for the arrival of the beta egg (St. Clair et al., 1995). One zoological institution routinely collects alpha eggs from all pairs of this species at lay for artificial incubation. Any pair with a history of poor incubation, crushing eggs, or ejecting eggs should be evaluated for assisted rearing options.

The health of each parent should be taken into consideration before the onset of egg-laying. Some common antibiotics and malaria preventatives may pose threats to embryonic development, and should be discontinued in advance of egg development. For example, Daraprim (pyrimethamine) is a folic acid inhibitor and is teratogenic (i.e., causes birth defects); Daraprim should not be used in laying females (see Chapter 6.7).

When a female is preparing to lay, she will occupy the nest continuously for a period of 1–2 days while the male stands nearby. It is sensible during this time period to minimize disturbance around the nest and avoid handling of the female. Behavioral changes associated with impending egg lay include, lethargy, dehydration, and a sleepy-eyed appearance. Females may frequently show fluffed contour feathers and sometimes labored respirations. Soon after the egg is produced, the male should provide nest relief, which allows the female to leave the rookery to bathe and feed. The pair should be observed for several days after the clutch is completed to ensure they are sharing incubation duties and performing them adequately. If one parent is left with the sole responsibility of egg care supplemental feedings at the nest can be provided to ensure parental health, or the egg(s) can be removed for assisted rearing or fostering. A decision to supplement any parent at the nest during incubation should include an assessment of the likelihood for adverse impacts on incubation and/or disruption of adjacent pairs on nests.

Gravid females should be monitored for proper egg delivery. Hens who have never laid before are more likely to experience cloacal tearing and associated cloacal bleeding post egg-lay. Depending on rookery cleanliness and individual bird behavior the hen can be placed in the pool for a swim to help clean the vent. Veterinary exam will indicate whether a course of antibiotics is necessary. Females with histories of thin shelled eggs, egg binding, or cloacal prolapse should be watched closely so any difficulties can be addressed early in the process. A bird that has had difficulty with egg lay in the past may be at increased risk to continue the pattern in successive seasons. A female who is showing visible discomfort, seen straining, tail pumping, or has a noticeably distended cloaca for more than 12–18 hours without production of an egg may be experiencing complications and should be examined by a veterinarian.

Complications may include egg binding or an inability to pass an egg that has been broken before or during delivery. If a gravid female has experienced external trauma (e.g., during competition for a mate or a nest site) this could cause an unlaid egg to break in the canal. Thin-shelled eggs may also be broken during delivery due to their fragility. Shell fragments left behind could result in lacerations and fecal matter introduced into the bloodstream might lead to septicemia. Again, veterinary treatment is recommended and may include manually flushing the cloaca to remove the egg fragments. Cloacal prolapse is a serious and life threatening condition that requires immediate veterinary attention. The female should be removed quickly from the rookery to an isolated area with a heat source to await veterinary care (See Chapter 6.7).

Eggs in the nest should be checked visually for damage. Any egg found to have cracks or holes can be repaired. Many zoos have had success repairing eggs with Tegaderm®, or paper towels and white glue. After repair, the egg may be returned to the nest (depending on the extent of the repair) or can be placed in the incubator for careful monitoring for appropriate weight loss and development through incubation. See Chapter 7.5 for details on incubation.

It is recommended that emperor pairs with eggs be separated from the main colony as soon as an egg is detected. One zoological institution utilizes a removable Plexiglas® barrier that physically separates incubating birds within the exhibit without adversely affecting visual and vocal stimuli from the group. Emperors with eggs are slowly walked to the barrier entrance. Initially, pairs are moved inside the barrier together. The female can be released back into the colony as soon as she transfers the egg to the male and begins to pace the enclosed area. Like wild emperors, females do not incubate. In the wild, food

requirements of chicks greater than 40 days of age require both parents to forage simultaneously, leaving chicks alone on the ice to congregate with other chicks in crèches. Crèching is not observed in zoos and aquariums, presumably because of constant food sources, lack of predators, and environmental conditions. In these conditions, emperor penguins continuously brood chicks for approximately 4–6 weeks, and parent-reared chicks fledge at approximately 4–6 months. Huddling for thermoregulation is not generally observed in zoos and aquariums because of constant environmental conditions.

Like emperor penguins, king penguins build no nest, but defend a small nest "territory." For facilities housing king penguins, it is advisable to provide one area suitable for a nesting territory. Although gentoo penguins housed in the same exhibit may attempt to utilize this area for off-season nest-building, king penguins dominate the site during their breeding cycle (S. Branch, personal communication).

Emperor penguins generally eat from keepers' hands without difficulty during incubation. *Pygoscelis* spp., *Eudyptes* spp., and *Spheniscus* spp. penguins can be offered food on the nest as long as it does not cause unnecessary stress for the birds. These species may be aggressive and reluctant to accept food. King penguins may show inappetence at the time of incubation; more commonly, they are too aggressive to eat while on the egg. But keepers familiar with incubation exchanges can locate the bird for feeding when it is off the egg. Some facilities continue to feed the chick-rearing parent the normal morning vitamin fish, and some others prefer to wait until the chick is old enough to take vitamins in their own diet. It is extremely important to remove all dropped fish if parents of smaller species are fed on the nest. The ease with which fish can be removed should be considered when the decision is made to offer food at the nest. If feeding or removal of fish elicits excessive aggression from the parents, an alternative to feeding on the nest should be considered.

If nesting birds are in an off-exhibit area or do not have access to water, it is prudent to give the non-incubating partner the opportunity to swim sometime during the day. Most penguins quickly catch on to this routine and are willing to leave the nesting area for short periods.

7.4 Birthing/Hatching Facilities

As parturition approaches, animal care staff should ensure that the mother is comfortable in the area where the birth will take place, and that this area is "baby-proofed."

Penguins are highly social, colonially-nesting birds. Evidence supports that reproduction in penguins is socially facilitated, and that adequate stimulation by conspecifics is essential for successful reproduction in managed populations (Berger, 1981; Setiawan et al., 2007). Depending on the species, penguins incubate and hatch their eggs either on the nest or in a nest area, and then rear their chicks on or proximal to the nest or nest area. Many institutions provide a nesting area within the main exhibit or provide a designated rookery or nursery in close proximity to, but separate from, the main exhibit space. In either case, provisions for nesting area should be in addition to the recommended land space parameters described in Chapter 2. Some species or individuals may benefit from either a partial or complete separation from the colony due to intra-specific or inter-specific competition and aggression. It may be necessary to partition select nests to prevent aggression or wandering chicks. A partial separation can be achieved by utilizing a barrier such as a Plexiglas® bin, gated and fenced area or a log.

It is important to provide more nesting sites than needed to alleviate competition. The safety and well-being of parents and chicks should always be of the utmost consideration when choosing a nesting area. If the nesting area is located within the exhibit space, areas of high activity, such as proximal to a feeding station, should be avoided. The nesting area should also be located far enough away from pool access to avoid accidental drowning of chicks. Nesting areas should be ventilated well, have good drainage, and be easy to clean, disinfect, and monitor.

It is not recommended to move penguins between facilities during the breeding season. Moving females during egg-formation, laying and post-laying intervals should be avoided due to possible internal egg breakage from handling, and an increased risk of secondary infection from aspergillosis (refer to Transport Protocols, Chapter 3.2). Seasonally, penguins exhibit a great degree of nest site fidelity. With the exception of *Aptenodytes* spp., it is not advisable to relocate a breeding pair once the nest has been established.

Nests and nesting materials: Timing of the addition of nest materials should correlate with other reproductive stimuli that should be approximated to the natural cycle (e.g., artificial lighting and photoperiod), and are generally offered at the onset of breeding season. While nest materials are not necessary for the comfort of the chicks, the collection of nesting material seems to be a strong

component in pair bonding. It is important to provide adequate amounts of suitable nesting material to avoid competition.

Burrows: Nests for penguin species that burrow (*Spheniscus* spp. and *Eudyptula* spp.) can be permanent or seasonal structures, either indoors or outdoors depending on time of egg-laying. Typical burrows for wild *Spheniscus* penguins are fairly wide at the entrance (approximately 40–58 cm [16–23 in.]), narrow slightly, and then widen again in the egg-laying chamber. The dimensions may range from 14–39.9 cm (5.5–5.7 in.) in height by 59.9 cm (23.6 in.) in length (Boersma, 1991). *Ex situ*, burrows can be in the form of natural-excavated scrapes or holes, human-made caves, covers or boxes, or airline kennels (Macha & Sirpenski, 2011; Martir, 2012; Sarro & Kottyan, 2012). When using airline kennels (Vari-Kennel® brand, large, or Sky-Kennel® brand # 300), many facilities recommend removing the door. Some institutions find that using only the top portion of the airline kennel facilitates better monitoring and management due to ease of lifting and moving. Small nest boxes with only enough room so the pair is touching each other when lying down with less than 5.1 cm (2 in.) behind them encourages the penguins to defecate outside the nest which keeps the nest site cleaner than kennels with more room. Burrow nest sites should be at least 1.9 m (6.6 ft.) apart for temperate penguins (Henry & Sirpenski, 2005). The key components to consider are: burrow opening size; adequate air circulation and drainage; ease of cleaning and disinfecting; and adequate number of burrows. *Spheniscus* spp. penguins will utilize almost any nesting option provided. Conservation programs designed to improve *in situ* nesting options have even used 120 L refuse bins, divided in half longitudinally, as artificial burrows (Simeone, 2011).

Artificial burrows may be constructed from wood, providing they are painted or sealed in order to seal out moisture. A burrow of this material should be refurbished or replaced at the conclusion of the breeding season. It may be advisable to consider synthetic wood options such as Trex®, due to the difficulty in adequately sealing and disinfecting wood and for improved durability. All nest boxes should allow the keepers access without unnecessary disruption of the nest. One type of artificial burrow uses 91.4 cm (36 in.) sections of cement pipe, open at both ends. One aquarium uses a similar design made from expanded PVC pipe (45.7 cm [18 in.] long with a 45.7 cm [18 in.] opening) (Macha & Sirpenski, 2011). At another zoological institution, Humboldt penguins are housed in an outdoor exhibit where birds excavate burrows into the natural substrate. Excavation is augmented with a painted plywood tent, box, or fiberglass cover. Most recently a vinyl clad-wire-and-shade-cloth constructed cover has been used successfully (Martir, 2012). In exhibits where birds are allowed to burrow, the soil mixture should be at least 20% clay to prevent nest cave-ins (Beall & Branch, 2005).

Adequate air circulation and drainage are important from the standpoint of humidity and disease control. Proper air circulation is essential in a humid environment; this is especially true if birds are coming from the water and going directly into the nest. Holes or vents can be placed along the sides of the nest box. In exhibits where burrow flooding may occur (due to rain or an overflowing pool) a small drain inside the nest can expedite recovery of the burrow.

The degree of daily maintenance of nest boxes or burrows seems to vary among facilities. Some institutions clean nests daily while others do not clean the nest until the parents abandon it following chick removal. Daily cleaning of nest boxes does not appear to be necessary and may be disruptive. Many institutions remove nest boxes from the exhibit entirely at the close of the breeding cycle. It is recommended that nest boxes be removed for annual disinfection and maintenance (L. Henry, personal communication).

Burrow substrate and nesting material: The substrate used beneath the nesting material should be absorbent, and provide good drainage and ventilation. Nest box substrates that have been safely used include dust-free, non-clumping clay litter, sand or rounded stones (that are too large to swallow) and artificial grass. Materials that have been reported to produce fungal spores (e.g., crushed corncob, peanut shell, potting soil, and shredded newspaper—or bedding made from it) should be avoided. Nesting material might include rounded stones (indoors or outdoors), grasses (e.g., pampas grass), dried heater, and thick leaves like mangrove, evergreens, or dried kelp. Although used successfully by some institutions, managers should be aware of the danger of introducing fungal spores through the use of fresh vegetation as nesting material. When used, it is recommended that vegetation be used outdoors only. Vegetation should be changed frequently if possible. Pencil-sized, dry sticks are an example of a nesting material that should be avoided, as mortality has been reported in adults from eating sticks. Additionally, sticks could be dangerous for young chicks that may be impaled or become trapped under

them. One aquarium uses semi-flexible tubing that is easy to clean and disinfect. The tubing is heated at each end to seal the end closed and to prevent bacteria from getting inside (Macha & Sirpenski, 2011).

Above ground nests: Nests for species that nest above ground (*Pygoscelis* spp. and *Eudyptes* spp.) are built to varying degrees. Wild *Pygoscelis* spp. and *Eudyptes* spp. penguins nest in the open or among vegetation. They commonly make a shallow scrape and utilize small rocks as the primary nest material. Feathers or even vegetation may also be incorporated depending on locale. *Ex situ* nests can consist of depressions built into artificial rockwork, forms made from large rocks or pavers, or rubber tubs. Nests should have good drainage and can be cleaned by carefully using a hose to "flush-out" any debris. This procedure should be discontinued prior to egg-laying, and throughout egg incubation and chick rearing on the nest.

One zoological institution reports that they add beach pebble and river rock to a depth of 10.2–12.7 cm (4–5 in.) on the rookery area to provide an adequate base and a good rock source. Care should be taken to provide rocks large enough to preclude ingestion by chicks. It is unknown whether rock eating is dangerous, since wild penguins are known to eat rocks as well. However, given the need to optimize success in the *ex situ* environment, managers would be well advised to avoid smaller sized rocks.

Aptenodytes spp. do not build nests, but defend a small nest "territory," and therefore, do not require the addition of nesting material. The nesting area should be relatively flat and have good drainage. Substrate used in the nesting area can include Dri-dek® mats or a layer of river rock. For both king and emperor penguins, it may be advantageous to separate incubating and chick-rearing pairs from the colony to avoid aggression and egg or chick stealing by conspecifics. Emperor penguins do not generally occupy a single area for nesting; after an egg is produced it is recommended to move the pair to a separate area to avoid disturbance by conspecifics (L. Henry, personal communication). See Chapter 7.3 for more on nest management.

Assisted hatching: Penguin chicks normally hatch without assistance from the parents. Depending on the species, it takes approximately 12–72 hours for penguin chicks to emerge from the shell (refer to Table 12 in Chapter 7.3). Occasionally, hatching chicks become lethargic or malpositioned within the egg, and may need assistance with hatching. Managers should be familiar with the parental breeding history, the pip-to hatch interval for the species, and the normal appearance of a newly hatched chick. Hatching eggs should be monitored frequently throughout the day. Some general indicators of hatching difficulty (either artificial or parent-incubated eggs) include: an internal or external pip that has failed to progress for 12–15 hours or is well beyond the expected incubation period; the chick has rotated away from the pip site such that the bill is no longer visible at the pip hole; a change in parental behavior (e.g., *Aptenodytes* spp. will lift the brood pouch and bow more frequently); a change in chick sounds coming from the egg (high pitched and frequent suggest stress; too few sounds may indicate lethargy).

Good observations and recordkeeping are essential to determine if intervention is needed. It is recommended that institutions with a penguin breeding program invest in the equipment and training necessary to complete egg-incubation, hatching, hand-rearing and supportive care in the event that intervention is required. Equipment and protocols should be in place prior to the start of the breeding season. For more information on incubator and hatcher recommendations, and incubation and hatching parameters, see Artificial Incubation Protocol in Chapter 7.5.

Once it has been determined that a chick is having hatching difficulty, the egg should be removed from under the parent. When performing an assisted hatch, care should be taken not to introduce bacteria to the chick. Hands should be washed and gloved, and all instruments should be sterilized. The egg should be carefully examined and the problem evaluated before attempting an assisted hatch. A candler can be used to assess the pip site (externally and internally), vascularization, and the position and respiration rate of the chick. A penlight can then be used to look inside of the pip hole for unabsorbed yolk, residual albumen, and for further vessel assessment. In some cases, radiographs may be useful for determining the position of the chick (e.g., when an internal pip has not occurred). If the chick has failed to internally and/or externally pip, a manual internal or external pip may be required.

If an external pip has occurred, forceps can be used to remove small pieces of shell from the pip site. As the pip area becomes further exposed, the membrane should be moistened with warm, sterile water (using a sterile swab) to check for active vessels. If the vessels have receded, the membrane can be peeled back to expose the chick. It is important that the temperature of the egg/chick be monitored during assisted hatching to avoid chilling. Be sure to keep the nares clear of membrane during assistance. Depending on chick vitality and the availability of a hatcher, hatching assistance may be accomplished

over a few hours in a step-wise process. The first goal should be to open the pip hole and create more space for the chick. Assistance over time allows chicks to better absorb their yolk. Some chicks will be able to complete hatching on their own with only minor help. In the case of "sticky chicks" (chicks with a lot of residual albumen) it is best to fully assist the chick to hatch. The chick should then be carefully extracted from the shell, preferably head first. For more information on common problems associated with pipping and hatching eggs, and their solutions, please refer to the Penguin Husbandry Manual (Henry & Sirpenski, 2005).

If a chick is to be parent-reared, it should be carefully assessed for any other problems, and then returned to the nest as soon as possible. Chicks that are "sticky" or have protruding yolk sacs should be considered for hand-rearing. Chicks that are returned for parent-rearing should be closely monitored. In general, a healthy chick will vocalize as it solicits food from the parents. If a problem is suspected or to ensure that the chick is being fed sufficiently, chicks can be carefully removed from the nest, examined, and weighed. Weight gain within the first 5–7 days should be substantial. To check for adequate hydration, pinch the skin (usually on the back of the neck) and assess resilience. The chick is dehydrated if the skin "tents" (stays in the pinched position). The eyes should be moist and the feet plump; the lungs should sound clear. Other ways to determine whether a chick is being adequately fed include checking for the presence of regurgitated fish in the nest, establishing keeper observation times and the use of video cameras.

Staff should be prepared to provide assistance to chicks that are small or malnourished. If a chick appears dehydrated, a supplemental feeding of 2–4 cc of Pedialyte® can be beneficial for sustaining very young chicks until the parents are adequately providing food. Small or dehydrated chicks should be monitored closely for complications.

Weaning/fledging procedure: Penguins raised *ex situ* do not crèche like those raised in the wild. The age of fledging, or independence from parents, varies among penguin species. Penguins usually achieve their peak weight just prior to fledging (refer to Chapter 4 Table 7 for the age of fledging and peak fledging weight for each species). Keeper staff should begin transitioning chicks to hand-feeding at this time. At this stage, parents tend to leave chicks unattended for longer periods. It is good practice to hand-feed chicks when parents are away from the nest to avoid aggression by parents. Once chicks are readily hand-feeding, it may be beneficial to separate chicks from the parents and the main exhibit for controlled introductions. Monitored visits to the social group and colony should then occur. It is best to introduce chicks in pairs or groups if possible. Food consumption, weight and acclimation should be closely monitored during this time and for several weeks post-fledging.

Smaller species of penguins can be given access to water when their abdomen and back are completely molted of down. Larger species may not venture near the water until near completion of the molt. Efforts should be made to ensure that chicks gain experience with entering and exiting the pool prior be being left in the exhibit unattended. Inexperienced chicks should be monitored at all times while swimming and entering or exiting the pool to avoid accidental drowning. For more information on chick removal, weaning and habituation, and introductions see also Partial Rearing in Chapter 7.5 and Chapter 4.3.

7.5 Assisted Rearing

Although mothers may successfully give birth, there are times when they are not able to properly care for their offspring, both in the wild and in *ex situ* populations. Fortunately, animal care staff in AZA-accredited institutions are able to assist with the rearing of these offspring if necessary.

Intervention may be warranted in cases where one or both parents has a health concern, perhaps due to irregular exchange of incubation or brooding bouts; for dropped or abandoned eggs; or where parents are not observed to regularly feed a chick or a chick fails to thrive.

Artificial incubation: Institutions should be familiar with expected incubation behavior for a given species, in order to properly manage eggs on the nest. Many times eggs are removed from a pair based on an assumption of inadequate incubation when, in fact, incubation had not yet begun. Eggs removed from the parents because of improper incubation may be returned to the nest at or before pip for parent rearing if the pair has continued to incubate a dummy egg during the period the egg was in the incubator.

Artificial incubation protocol: It is recommended that institutions undertaking to artificially incubate penguin eggs be familiar with proper hatchery setup, sanitation and maintenance.

Good record keeping is important to egg management. It is recommended that all eggs be documented with a unique egg log identification number and that all eggs laid are recorded along with their outcomes. As eggs come into the incubator, the egg log identification number should be written on the small end of the egg for continuity of identification (see Chapter 6.1: Reproductive Recordkeeping).

A variety of incubators may be suitable for penguin egg incubation. Factors to consider when choosing an incubator include: an automatic-turning mechanism sufficient to accept the larger size and weight of penguin eggs; the ability to maintain a stable temperature and humidity, especially if manual turning is required; and a size sufficient to hold the likely number of eggs to be brought into care. Some types that have been used successfully but are no longer manufactured (though still available) include Petersime Models 1 and 4 and Humidaire models 20 and 50. Other types include Grumbach, Roll-X, Brinsea® and R-Com (Standard Model). Most institutions have reported using Grumbach incubators.

Artificial incubation temperatures reported by 23 institutions vary from 35.2–37.5 °C (95.5–99.5 °F) on the dry bulb and 26.6–30 °C (80–86 °F) on the wet bulb. The most commonly used dry bulb temperature is 35.8 °C (96.5 °F). The wet bulb temperature should range from 27.7–28.8 °C (81–84 °F). Depending on geographic locale and rainfall, this may necessitate more or less frequent additions of water to the incubator reservoir. Type of incubator and the number of eggs being held at one time will affect overall humidity. Monitoring eggs through egg weight loss measurements is well described in the literature, and can assist managers in establishing humidity requirements for their egg incubation (Lomholt, 1976; Anderson-Brown, 1979; Johnson, 1984; and Hoffman, 1987).

Eggs should be set flat, not on end, in the incubator. The majority of institutions that have attempted artificial incubation have reported mechanical turning of the eggs every 1–2 hours. In addition to mechanical turning, some institutions also perform a 180° manual turn of the egg. This practice facilitates a more even development of the vascularization in the egg (Jordan, 1989). For incubators without automatic turning capability, manual turning can be done five or seven times (an uneven number of turns) within a 12-hour day. Eggs should be turned slowly to avoid rupture of developing blood vessels in the egg.

A penguin egg is ready to move to the hatcher following external pip. Turning of the egg is no longer necessary at this time but hatching eggs should be checked 4–5 times per day. Problems have been reported when moving *Pygoscelis* spp. eggs to the hatcher prior to the chipping of the shell by the chick. Some institutions use playback recordings of the colony to stimulate the chick during hatching.

At the time of pip, humidity should be increased by 1–2 °C (2–3 °F) on the wet bulb. This can best be accomplished in a hatcher separate from the incubator. Shell membranes may become dry during hatching. This can be alleviated by adding a small reservoir of warm-water (35.8 °C [95.5 °F]) to the hatcher (away from chick access) to temporarily increase humidity, by rolling a moistened, sterile cotton-tipped applicator over the membrane or by lightly misting the egg. Water for misting should be kept in the hatcher so that the temperature is the same as the hatcher. For more information on common problems associated with pipping/hatching eggs, and their solutions, please refer to the Penguin Husbandry Manual (Henry & Sirpenski, 2005).

Once chicks hatch, they should remain in the hatcher for 12–24 hours to allow for their down to dry before transfer to a chick brooder. Check for yolk sac absorption and closure of the umbilicus (seal). Be extremely careful handling the chick if the yolk is not properly absorbed and/or the umbilical opening is not properly sealed. Swab the umbilicus with a dilute, iodine-based disinfectant (such as Betadine®) or a sterile PDI® Iodine Duo-Swab® Prep and Scrub SwabStick can be rolled gently over the area. For more information on the medical management of neonates, see Chapter 6.5. If two or more chicks are hatching simultaneously in the same hatcher, measures should be taken to separate eggs/chicks in order to maintain individual identification (hatching egg to hatched chick).

Hand-rearing: It is advisable for all institutions managing penguins to gain experience in hand-rearing. A separate hand rearing area is recommended with provision for good air movement, temperature commensurate with the species and reduced humidity.

Important factors to consider before deciding to remove eggs or chicks from the nest should include the age of the pair, their reproductive experience, environmental and social conditions, and the goals of the reproductive program. Prior to undertaking hand-rearing of penguin chicks, managers should consider the time and cost involved in hand-rearing penguins, because this is a labor-intensive undertaking. Staff hours required to tend to the chicks along with the cost of the necessary equipment (brooder, formula, etc.) may have an impact on the decision whether or not to hand-rear chicks.

As with most species, parental rearing is always preferred to hand-rearing. It may be necessary to remove an egg or chick for hand-rearing in the event of the death of a parent or the failure of a chick to thrive in the nest. Sticky chicks (those with residual albumen) or chicks with protruding yolk sacs should be considered for hand-rearing. Success with hand-rearing chicks can be as high as 90% once a well-defined protocol has been established (Cheney, 1990). Hand-rearing may be used to maximize founder representation within a colony, particularly if underrepresented birds do not exhibit successful parental behavior. Hand-rearing can also be used to increase productivity, as some species will often breed again within one season if chicks or eggs are removed. Hand-reared chicks seem to be more tolerant of handling than parent-reared chicks. Depending on the routine husbandry practices of the facility, this may or may not be important. It should also be stressed that penguins are social animals and need to be in the company of conspecifics or congeners, even at a very young age, if they are to develop socially and not imprint. Therefore, if possible, chicks of similar age should be hand-reared together.

Occasionally, when birds are hand-reared, they develop a preference for human companionship over that of conspecifics. Depending on the species, highly imprinted birds may or may not eventually reproduce. Imprinted hand-reared *Pygoscelid* penguins, for example, may not breed. Highly imprinted *Spheniscus* spp. penguins, however, have been reported to breed and may make very good parents. Imprinted birds can be disruptive in penguin colonies, wandering over other birds' nesting territories. Social dysfunction sometimes can be overcome in imprinted birds, especially if they pair with a non-imprinted bird. In general, it is advisable to discourage staff from reinforcing attention from imprinted birds. As with most species, the best strategy is the avoidance of imprinting during rearing.

Introduction of hand-reared chicks into exhibits requires close monitoring and is likely to be most successful if a gradual introduction procedure is followed (see Chapter 4.3). Hand-reared *Spheniscus* chicks can be introduced into the colony when they are nearly fledged (approximately 80 days). It is best to introduce chicks in a group or in pairs if possible. It is advisable to supervise the interactions of the newly introduced birds during the initial visit to the colony. Chicks can be left unattended after a few days provided they are able to emerge from the water without trouble and are not being harassed by other birds. Juveniles tend to congregate together and will fight to establish a hierarchy of their own (Gailey-Phipps, 1978).

Chicks should be encouraged to join the other birds at the feeding station rather than be provided with special treatment. It may be a few weeks before they are regularly feeding with the others. Some institutions find it advantageous to use an off-site area to introduce the chicks to members of the colony. A Plexiglas® barrier can also be used at first introduction in the exhibit. If chicks have not yet lost their entire down, adult birds may attempt to brood fledglings. Emperor penguins in zoos and aquariums, for example, have been observed to compete aggressively to brood newly introduced hand-reared *Pygoscelid* chicks. Once chicks are hatched and have been allowed to dry in the hatcher for 12–24 hours they can be moved to a brooder.

Brooder: Penguin chicks require low humidity and good air circulation, which is best achieved in an open-topped brooder style. Some institutions have successfully used closed baby incubators, or AICU, but managers should be vigilant in order to avoid high humidity and the resultant increased risk for aspergillosis. Brooders should be chosen based on adequate air circulation, ease of cleaning and disinfection, and size and temperature gradient. Brooders can be constructed of a wood alternative (such as Trex®), an ice-chest type plastic cooler or a plastic storage container without a lid; one institution uses a Plexiglas® Acrylic Sheet frame with an open top. Some facilities have successfully used a cooler-type brooder (such as The Original Cooler Brooder); it is important to keep the top open for sufficient air circulation. Typical early brooder dimensions might be 40 cm x 83 cm x 38 cm (12 in. x 33 in. x 15 in.) to accommodate one to four chicks of smaller species (e.g., *Spheniscus* spp., *Pygoscelis* spp., *Eudyptes* spp.) or one to two chicks of larger species (e.g., *Aptenodytes* spp.). Chicks should not be overcrowded. The brooder surfaces may be cleaned and disinfected at least twice per day or more frequently depending on the number of chicks, their age and fecal load. As chicks grow and their needs change, older birds can be housed in a larger area such as in a contained floor area or in an elevated bin.

Substrate: The substrate used my most institutions in the brooder is clean toweling without holes or frays (that might catch a chick's toenails). Some facilities include a non-adhesive and non-slip type of shelf liner (such as Cont-Tact® Grip Ultra Shelf Liner) to provide traction for the chick (on top of the base toweling). Dri-Dek® can also be placed under the toweling to provide a better grip for the chicks' developing legs. Other facilities put a few rocks under the towel to improve the gripping surface. The toweling can be

changed as fecal load dictates. Chicks under 7 days old may tend to wander away from the heat source so a rolled towel can be fashioned to contain the chick(s) in the early brooding period. Older chicks can be moved to an area that provides a substrate for proper foot health such as rocks (similar to that described in 7.1 for nesting), matting (e.g., AstroTurf® roll mat) or Dri-dek®. As chicks approach fledging it may be advantageous to consider providing housing in the exhibit. Chicks can be separated from the colony but still in visual and vocal contact, at a similar temperature and on a similar substrate as their conspecifics, which may facilitate later introductions to the group.

Temperature: The brooder should have a heat source (such as a 250-watt infrared heat lamp). Temperature gradients within the brooder will be increasingly important as the chick grows in its second down toward the end of the guard stage. Gradients allow chicks to find a comfortable temperature within the brooder. Generally, chicks at 1–7 days should be maintained at about 26.7–32.2 °C (80–90 °F); 8–14 day old chicks are usually ready for a slightly reduced temperature of about 21.1–26.7 °C (70–80 °F). These temperatures are dependent on the species and individual chicks' needs. Temperature requirements will change for chicks greater than 14–21 days. Sub-Antarctic and high latitude species will require less or no heat, and may even need reduced temperatures closer to exhibit temperatures. Downy *Spheniscus* chicks may do well at 18.3–21.1 °C (65–70 °F) but should still be monitored for overheating.

A common problem in penguin chick rearing is over- or under-heating chicks. Under-heating is most often seen in chicks less than 14 days old. Under-heated chicks may shiver, huddle against the side of the brooder, have feet and flippers drawn in and/or be cold to the touch. Under-heated chicks are often slow to respond to a feeding stimulus. As chicks get older overheating is a more common concern. Overheating can lead to illness in penguin chicks. Overheating may be indicated by any one or a combination of the following signs and symptoms: chick's posture is spread out, feet and flippers are extended and/or are very warm to the touch, panting, lethargy, dehydration, and disinterest in food. Many of these symptoms are also indicators of illness in a chick. Measures should be taken to discern if under- or overheating is indicated and veterinary intervention should be sought for a chick that does not respond to adjustments in temperature.

Record keeping: Complete records for each chick are extremely important. Records should include the daily morning weight of the chick, the type and volume or weight of the food fed, assessments of the chick's health and vitality including fecal output, temperature adjustments, and any notable milestones such as when eyes open, downing stages, etc. Such records will help monitor proper health and determine if chicks are developing consistent with documented growth rates. Fecal output is an important measure of a chick's response to hand feeding regimes. Feces should be slightly runny and squirt out a good distance during defecation. Color may vary but in general an orange/brown fecal is often reported as normal. Older chicks receiving fish pieces will have a slightly thicker fecal but it will still be quite soft. Feces should not be pasty, dry or pellet-like, excessively green (green is normal in 1–2 day old chicks), black or yellow, or contain blood (orange or red oily spots in the fecal will be normal if krill is part of the diet).

Feeding: Detailed feeding guidelines for penguin chicks (*Spheniscus* spp., *Pygoscelis* spp., *Eudyptes* spp., and *Aptenodytes* spp.) are well described in the Penguin Husbandry Manual (Henry & Sirpenski, 2005). Safe food practices should be followed for fish handling and in the preparation of all diets. Feeding apparatus will include syringes (3 cc, 6 cc, 12 cc, and later 35 cc) sometimes with a short (2.3 cm [1 in.]) portion of a 14-fr catheter tube (such as Kendall Sovereign® Feeding Tube and Urethral Catheter) securely glued to the hub end. A small extension on the syringe can help facilitate the delivery of formula to the chick.

It is important to continue to monitor the absorption of the yolk after the chick is moved to the brooder and feeding begins; slow absorption or a tight distention of the abdomen might be an indicator of a yolk sac infection. Yolk sac infections commonly occur through 14–17 days of age and require a veterinary exam and treatment. The seal should continue to be swabbed once daily (as described above for newly hatched chicks) until the seal is fully closed, usually within a few days following hatching.

In general, young penguin chicks of all species are started on a mixture of fish, krill (if available), water, and vitamins (Penguin Chick Hand Rearing Diet see Appendix L), ground in a blender and fed by syringe five times per day at 3-hour intervals. The very first feeding might be water only in order to determine the vitality of the chick and to introduce it to syringe feeding. Chicks are fed by eliciting a feeding response by extending the first and second fingers in an inverted "V"-shape over the chick's bill,

then wiggling the fingers. The chick should respond by opening its bill and pushing up into the fingers. At this time, the syringe should be placed in the mouth and the formula fed. The amount of food to feed penguin chicks is based on their morning weight. After a few days of initial introduction to feeding, where volumes might be less, chicks can be given a food amount equivalent to 10% of their morning weight at each feeding. It is important not to over-feed penguin chicks.

As the chick grows, fish pieces (usually without skin and bone), and later whole fishes can be introduced. The timing of when to introduce fish, reduce temperature in the brooder, and then later reduce the relative ratio of fish and formula in the diet is all based on weight milestones rather than age. An exception is made for the *Aptenodytes* where fish might be introduced starting at 7–10 days of age. Weight (or age) milestones can serve as a guideline for when to introduce various changes to diet and brooding temperature but hand rearing should always be based on the individual bird's responses. As the smaller species of chicks grow toward about 500 g (18 oz.) the feeding interval should be evaluated and lengthened to 4 hours with feedings reduced to four times per day; the weight milestone here will be different for *Aptenodytes*, This change in feeding interval is in response to the increased amount of food fed per feeding as well as the change in the relative ratio of formula to fish (which is usually 50:50 by this time). Once a maximum of about 30 mL of formula (40 mL for *Aptenodytes*) is being given per feeding, this amount can remain stable with the balance of food making up the feeding coming from fish fillets, fish pieces or whole fishes. In this way, as chicks grow, they are gradually weaned off formula to a whole fish diet. By about 1000 g (35 oz.), most of the smaller species of penguin chicks may start to refuse syringe feeding in favor of fish, need a reduced temperature environment and larger brooder area, and reduce to three feedings per day. As before, timing for this change will be at a different weight target for *Aptenodytes*. As chicks begin to fledge they can be fed consistent with the feeding times they will encounter once they are introduced to the social group.

It is important to note that as chicks (species *Spheniscus* spp., *Pygoscelis* spp., *Eudyptes* spp.) approach 1000–1500 g (35–53 oz.) and beyond they may not eat all the food offered per feeding (i.e., the 10% threshold). At this time, it may be difficult to discern whether the chick is exhibiting normal behavior or whether the behaviors are suggestive of a subclinical illness. Over feeding and overheating are common problems encountered at all stages in penguin rearing, but particularly at this age and stage. *Spheniscus* spp. may also become "head shy" at about 1000 grams (35 ounces) or about 30 days of age, which may be accompanied by a reluctance to give a feeding response. This behavior is normal and roughly correlates to when these chicks would be starting to investigate outside the burrow. However, all chicks exhibiting a reluctance to eat should be assessed for overheating, whether they have been overfed (and/or need a reduction in feeding interval or amount) and monitored for early signs of illness. Dehydration is one good indicator of both overfeeding and overheating. Foul smelling fecal matter should be addressed immediately with a veterinary exam.

Vitamin supplementation: Refer to Chapter 5.1 and the Penguin Husbandry Manual (Henry & Sirpenski, 2005). The preceding is a summary of feeding and rearing procedures. More details are available in the Penguin Husbandry Manual (Henry & Sirpenski, 2005). Penguin managers rearing penguins should consider consulting other institutions with penguin hand-rearing experience before or during the hand rearing process. The preceding is a summary of feeding and rearing procedures. More detailed guidelines for hand-rearing penguins can be found in Appendix M.

Partial rearing: Eggs removed for fostering to another pair can be taken at any point during incubation. Options at this time include placing the egg in an incubator until the target (foster) pair is ready to receive the egg, or transferring the egg immediately to the target pair. The target or surrogate pair should always be incubating an egg or dummy egg prior to replacement with a viable fostered egg.

The fostering of eggs to a surrogate pair for chick rearing is an option used by many facilities to maximize chick survivability and reduce the need for hand rearing. In managing eggs, once viable eggs are identified, one egg from a fertile clutch can be fostered to pairs with infertile eggs. In cases where two chicks could be produced from a pair, this arrangement allows the parents to rear only one chick while a pair that is known to be successful at rearing cares for the second chick. The timing of egg-laying for both pairs should be within two weeks of each other. The eggs of the surrogate pair should be replaced with dummy eggs immediately. The egg(s) to be fostered can be placed under the surrogate pair a few days prior to the expected hatch date or at the time of pipping. Some facilities allow the first egg to hatch successfully before fostering the other egg. Fostering eggs can also be used to give younger or less experienced pairs, or even same sex pairs, an opportunity to rear a chick.

Chicks should be monitored at the nest to assure proper growth and vitality by recording feeding observations. Pairs rearing chicks should be fed frequently and *ad libitum*. It may be advisable to feed smaller, more digestible fishes (such as capelin or silversides) for the first parental feeding of the day so that chicks can be fed quickly. Parents with soliciting chicks have been reported trying to feed chicks too soon after eating larger fishes (such as herring) resulting in large chunks that young chicks cannot accept. Feeding smaller fishes or smaller meals allows for better digestion before it is fed to the chick. Chicks can also be removed from the nest for periodic weights and physical assessments. Chick weights can then be compared with published data for the same age and species to assure adequate growth. It is worth noting that parent-reared chicks should demonstrate a steeper growth rate than that for hand-reared chicks; most available growth rate data will be for hand-reared birds. If a chick requires medical treatment unrelated to parental care, treatments may be accomplished without removing the chick for hand-rearing but instead removing the chick only for needed procedures then returning it to the nest for continued parental care. Some institutions have reported supplementing parents or chicks with vitamins at the nest (see Chapter 5.1 for chicks' nutritional requirements). When chicks are older and able to accept whole fish, they may take fish from hand offered at the nest.

Many facilities remove chicks from parents prior to fledging to habituate the birds to hand feeding. Age at removal varies from 21–50 days depending on the facility and the species. Removing chicks allows for improved monitoring of chicks' growth and development, especially if there are two chicks in a nest, as the second chick may be out-competed by the first chick. Other institutions remove chicks at the end of the guard stage if a pool is nearby and there is concern for chicks' access and welfare. Additionally, chicks weaned in this way are reported to accept routine handling better, are much more relaxed in the colony, and accept hand-feeding better than parent-reared and fledged birds. Chicks removed from parental care can be housed with hand-raised birds of similar age and size. Introduction into the colony follows a similar course as outlined for hand-reared birds' introductions. In rare cases, juveniles may return to the parents or nest area and continue to be fed by one or both of the parents. This does not usually result in adverse outcomes. However, if a parent continues to feed a chick for a prolonged post-fledging time period, a second separation of the chick from the parent should be considered.

7.6 Contraception

Many animals cared for in AZA-accredited institutions breed so successfully that contraception techniques are implemented to ensure that the population remains at a healthy size. The use of invasive contraceptive methods with penguins has not been described. Penguins, as with other birds, provide easy contraception management via the removal of eggs immediately at lay. Dummy eggs may be needed to prevent double-clutching. Should the need arise to cull an egg that has undergone some development, the egg should be refrigerated at 4.4 °C (40 °F) for at least 3 days. This will humanely stop development (Leary, 2013).

Chapter 8. Behavior Management

8.1 Animal Training

Classical and operant conditioning techniques have been used to train animals for over a century. Classical conditioning is a form of associative learning demonstrated by Ivan Pavlov. Classical conditioning involves the presentation of a neutral stimulus that will be conditioned (CS) along with an unconditioned stimulus that evokes an innate, often reflexive, response (US). If the CS and the US are repeatedly paired, eventually the two stimuli become associated and the animal will begin to produce a conditioned behavioral response to the CS.

Operant conditioning uses the consequences of a behavior to modify the occurrence and form of that behavior. Reinforcement and punishment are the core tools of operant conditioning. Positive reinforcement occurs when a behavior is followed by a favorable stimulus to increase the frequency of that behavior. Negative reinforcement occurs when a behavior is followed by the removal of an aversive stimulus to also increase the frequency of that behavior. Positive punishment occurs when a behavior is followed by an aversive stimulus to decrease the frequency of that behavior. Negative punishment occurs when a behavior is followed by the removal of a favorable stimulus also to decrease the frequency of that behavior.

AZA-accredited institutions are expected to utilize reinforcing conditioning techniques to facilitate husbandry procedures and behavioral research investigations. A structured training program that utilizes operant conditioning of natural behaviors, a structured desensitization program to reduce aversive stimuli within the zoo and aquarium environment, and classical conditioning have been effective with penguins. Penguins are relatively easy to condition as they respond well to consistent routines. As a tool for operant conditioning purposes, bridges or markers such as clickers, whistles, and verbal stimuli have all been successfully trained. Food reinforcement is most commonly used, but tactile stimulation, novel objects, and social interaction have also been utilized. Penguins have successfully been scale trained, trained for restraint during physical exams, voluntary blood collection, semen collection, foot exams, shifting and recall. Common recall signals are verbal or mechanical such as a whistle. These behaviors have also been utilized for research purposes.

8.2 Environmental Enrichment

Environmental enrichment, also called behavioral enrichment, refers to the practice of providing a variety of stimuli to the animal's environment, or changing the environment itself to increase physical activity, stimulate cognition, and promote natural behaviors. Stimuli, including natural and artificial objects, scents, and sounds are presented in a safe way for the penguins to interact with. Some suggestions include providing food in a variety of ways (i.e., frozen in ice or in a manner that requires an animal to solve simple puzzles to obtain it), using the presence or scent/sounds of other animals of the same or different species, and incorporating an animal training (husbandry or behavioral research) regime in the daily schedule.

Enrichment programs for penguins should take into account the natural history of the species, individual needs of the animals, and facility constraints. The penguin enrichment plan should include the following elements: goal setting, planning and approval process, implementation, documentation/record-keeping, evaluation, and subsequent program refinement. The penguin enrichment program should ensure that all environmental enrichment devices (EEDs) are "penguin" safe and are presented on a variable schedule to prevent habituation AZA-accredited institutions must have a formal written enrichment program that promotes penguin-appropriate behavioral opportunities (AZA Accreditation Standard 1.6.1).

> **AZA Accreditation Standard**
>
> **(1.6.1)** The institution must have a formal written enrichment and training program that promotes species-appropriate behavioral opportunities.

Penguin enrichment programs should be integrated with veterinary care, nutrition, and animal training programs to maximize the effectiveness and quality of animal care provided. AZA-accredited institutions must have specific staff members assigned to oversee, implement, train, and coordinate interdepartmental enrichment programs (AZA Accreditation Standard 1.6.2).

> **AZA Accreditation Standard**
>
> **(1.6.2)** The institution must have specific staff member(s) or committee assigned for enrichment program oversight, implementation, training, and interdepartmental coordination of enrichment efforts.

Utilizing the natural, individual, and facility information, goals should be set to address either specific behaviors or to provide a stimulating environment. Due to the colonial nature of penguins, enrichment will most often be presented to the entire flock, but can be utilized for individuals as needed. A specific staff person and/or a committee should determine appropriate procedures for setting goals, documentation, and how to determine whether the enrichment is meeting the goals both before and after use. Routine screening of devices for wear as well as determining their "enrichment value" should be conducted on a regular basis. Safety should always be a primary concern and should be in the forefront of any program.

Behavioral enrichment for penguins can easily be achieved by creating a complex water habitat where small fish can hide and survive. Foraging is an important natural behavior and penguins will spend time hunting and capturing these fish, which keeps them swimming and on display. Beyond normal stimuli in a zoo and aquarium environment, such as snow, water, and conspecifics, penguins generally tend to respond with curiosity to novel objects and increase their exploratory behavior. Enrichment does not require elaborate or costly apparatus. One zoological institution reports good success with brightly-colored rubber balls, sprinklers, and also with blocks of frozen fish placed into pools. Having variety in the water by manipulating water currents or using wave machines can stimulate penguins. Sawhorses with securely affixed strips of fabric under which the birds can run is an example of a novel device. Underwater visual barriers may also provide enrichment. Some facilities report good success with the use of different feeding strategies, such as multiple feedings, extended feedings, and scatter feedings.

Enrichment areas should always be built into exhibit rockwork to provide slides, covered areas, burrows, and different sized pathways and land areas. The ability to alter the "furniture" is a benefit. There should be places where it is easy to retrieve devices from the water. By incorporating these types of elements into exhibits natural behaviors such as locomotion, foraging, courtship and breeding are facilitated. Enrichment devices should be provided on a variable schedule. This can be accomplished by varying time of day and duration of presentation. Catalogs and calendars for enrichment initiatives can also be created to allow a variable schedule of enrichment delivery to be developed. It is important to consider sub-aquatic landscape or furbishing in order to promote the surface and underwater activity. This will allow for an increase in natural behaviors that include foraging and exploration. Enrichment devices can be utilized to mitigate stereotypic or aggressive/fearful behaviors as well as facilitate introductions.

Participation in training programs and in behavioral research programs can be enriching as they allow the bird to have differing cognitive stimulations from the normal zoo or aquarium experience. Interaction and mental stimulation are important aspects of training and are essentially enriching. Training reinforcers can include items that the birds find enriching such as novel foods or favorite devices. Training and enrichment can also be utilized to address issues such as veterinary or nutritional needs. Lack of activity can be addressed by enrichment and offering different food choices and presentations can be used to deal with nutritional requirements. Training can make necessary interactions more cooperative and create an environment of choice and control.

As with all taxa, safety is of utmost concern with environmental enrichment devices. Carefully examine all devices for small, ingestible pieces, parts that could easily be broken off, entanglement issues and so on. New devices should always be monitored after presentation to assure that they are safe. Food enrichment should be appropriate for the species and follow the institutional approval process prior to offering. It is also important to be sure that the devices do not cause undue stress on the animals. All devices should be examined on a regular basis to assure that there has been no degradation and if there has been they should be disposed of. An example schedule of penguin enrichment can be found in Appendix P.

Browse: If browse plants are used for enrichment or nesting materials, all plants need to be identified and assessed for safety. The responsibility for approval of plants and oversight of the program should be assigned to at least one qualified individual. The program should identify if the plants have been treated with any chemicals or near any point sources of pollution and if the plants are safe for the species. If animals have access to plants in and around their exhibits, there should be a staff member responsible for ensuring that toxic plants are not available.

8.3 Staff and Animal Interactions

Animal training and environmental enrichment protocols and techniques should be based on interactions that promote safety for all involved. Penguins adapt to humans quickly (Walker et al., 2005; 2006). When

animal caretakers are present within an exhibit with the birds during visitor hours, it is recommended that some interpretation be provided so that the public can learn more about the role of the caretakers, and that their actions are acceptable. Common keeper-penguin activities include feeding, training, handling, herding the birds into the water, and tactile interactions. Interpretation can be achieved through graphics, keeper explanations, volunteers, pool attendants, etc. At a minimum, interpretation efforts should explain what the keeper is doing, and why it is important.

Facilities should be designed to take advantage of training opportunities. Off exhibit holding should be designed to accommodate scales and have sufficient room to allow for training of individuals. This space should have a flat, non-slip surface that is large enough for more than one staff person. Shifts should be large enough to accommodate more than one bird at a time, but easily opened/shut to be able to separate birds. Penguins do not require protected contact, but care should always be used when working in close proximity. They have extremely strong flippers and beaks, and they are capable of causing serious injury. Eye protection may be necessary, depending upon the bird and circumstance.

Program animals: In contact and behind the scenes programs, the keeper has an opportunity to explain more thoroughly the contact that keepers have with the birds. The keeper should explain about the benefits of training, how there are proper ways to handle and desensitize a bird, and that a lot of time is taken to get the birds used to the keepers so they can feel comfortable being handled. Natural history and conservation topics should also be discussed; and it should be made clear that wild birds would not react this way. Finally, the visitors should be told what to expect from their visit, whether they can touch the bird, proper techniques to use, and how the bird might react. See Chapter 9 for additional information on conservation/education program animals.

8.4 Staff Skills and Training

Penguin staff members should be trained in all areas of penguin behavior management. Funding should be provided for AZA continuing education courses, related meetings, conference participation, and other professional opportunities. A reference library appropriate to the size and complexity of the institution should be available to all staff and volunteers to provide them with accurate information on the behavioral needs of the animals with which they work. The following skills are important for all animal caretakers involved in the management of penguins:

- Knowledge of basic husbandry.
- Knowledge of natural history, and the ability to apply this knowledge in the design of effective exhibits.
- Knowledge of exhibit history and collection history.
- General knowledge of life support systems involved with the exhibit.
- Knowledge of incubation and rearing practices.
- General knowledge of morbidities, avian triage, and diseases associated with penguins in zoos and aquariums.
- SCUBA certification, if applicable.
- Ability to lift, shovel, and scrub.
- Ability to safely restrain a penguin.
- Knowledge of operant conditioning techniques prior to training animals.
- General enrichment knowledge that includes an understanding of enrichment that promotes natural behavior, safe enrichment, the importance of varied schedules of enrichment delivery, as well as the ability to recognize that certain types of enrichment can be used for reinforcement.
- Knowledge of in-house policies and procedures, approval processes and safety issues.

Chapter 9. Program Animals

9.1 Program Animal Policy

AZA recognizes many public education and, ultimately, conservation benefits from program animal presentations. AZA's Conservation Education Committee's Program Animal Position Statement (Appendix D) summarizes the value of program animal presentations.

For the purpose of this policy, a program animal is described as an animal presented either within or outside of its normal exhibit or holding area that is intended to have regular proximity to or physical contact with trainers, handlers, the public, or will be part of an ongoing conservation education/outreach program.

Program animal presentations bring a host of responsibilities, including the welfare of the animals involved, the safety of the animal handler and public, and accountability for the take-home, educational messages received by the audience. Therefore, AZA requires all accredited institutions that give program animal presentations to develop an institutional program animal policy that clearly identifies and justifies those species and individuals approved as program animals and details their long-term management plan and educational program objectives.

AZA's accreditation standards require that the conditions and treatment of animals in education programs must meet standards set for the remainder of the animal collection, including species-appropriate shelter, exercise, sound and environmental enrichment, access to veterinary care, nutrition, and other related standards (AZA Accreditation Standard 1.5.4). In addition, providing program animals with options to choose among a variety of conditions within their environment is essential to ensuring effective care, welfare, and management. Some of these requirements can be met outside of the primary exhibit enclosure while the animal is involved in a program or is being transported. For example, housing may be reduced in size compared to a primary enclosure as long as the animal's physical and psychological needs are being met during the program; upon return to the facility the animal should be returned to its species-appropriate housing as described above.

AZA Accreditation Standard

(1.5.4) A written policy on the use of live animals in programs must be on file. Animals in education programs must be maintained and cared for by trained staff, and housing conditions must meet standards set for the remainder of the animals in the institution, including species-appropriate shelter, exercise, social and environmental enrichment, access to veterinary care, nutrition, etc. Since some of these requirements can be met outside of the primary enclosure, for example, enclosures may be reduced in size provided that the animal's physical and psychological needs are being met.

Penguins, in general, can be used as program animals. Program penguins can be held in a colony situation or in separate dedicated housing. Penguins are not a significant zoonotic risk and specific housing or shelter options do not lessen this risk. An animal care program with dedicated clothing and latex gloves will limit disease transfer from penguins to human and other animals in the facility.

The physical needs of penguins as program animals are virtually the same as penguins as exhibit animals. The TAG does suggest colony management of program penguins but that does not mean that off-exhibit holding pens are inadequate. The floor and water requirements are exactly the same and allow for adequate swimming and ambulatory exercise. The TAG recommends that penguins be housed with a minimum of six individuals, which is the same for colonies. Penguins can be trained to enter a "transport crate" to go to educational programming events, although they are also easily placed into these crates manually. Generally, penguins are easy to monitor for medical concerns through animal care staff observations and records keeping, and program animals may more easily allow tactile medical inspection due to their familiarity with people.

Penguin psychological needs are not very extensive. Penguins thrive with other penguins for social interactions but often also engage in social behaviors with their caretakers and visitors. Providing unique or novel enrichment, such as floating balls and/or sinking balls with flag ends, may momentarily enrich a penguin's daily routine but that interest is short-lived. Utilization of laser pointers on a wall or floor has been used with some success as well. Adding live fish to an exhibit may provide interest but there are other considerations with this form of enrichment.

In contact and behind the scenes programs, the keeper has an opportunity to explain more thoroughly the contact that keepers have with the birds. The keeper should explain about the benefits of training, how there are proper ways to handle and desensitize a bird, and that a lot of time is taken to get the birds used to the keepers so they can feel comfortable being handled. Natural history and

conservation topics should also be discussed; and it should be made clear that wild birds would not react this way. Finally, the visitors should be told what to expect from their visit, whether they can touch the bird, proper techniques to use, and how the bird might react.

9.2 Institutional Program Animal Plans

AZA's policy on the presentation of animals is as follows: AZA is dedicated to excellence in animal care and welfare, conservation, education, research, and the presentation of animals in ways that inspire respect for wildlife and nature. AZA's position is that animals should always be presented in adherence to the following core principles:

- Animal and human health, safety, and welfare are never compromised.
- Education and a meaningful conservation message are integral components of the presentation.
- The individual animals involved are consistently maintained in a manner that meets their social, physical, behavioral, and nutritional needs.

> **AZA Accreditation Standard**
>
> **(1.5.3)** If animal demonstrations are a part of the institution's programs, an educational/conservation message must be an integral component.

AZA-accredited institutions that have designated program animals are required to develop their own Institutional Program Animal Policy that articulates and evaluates the program benefits (see Appendix E for recommendations). Program animals should be consistently maintained in a manner that meets their social, physical, behavioral, and nutritional needs. Education and conservation messaging must be an integral component of any program animal demonstration (AZA Accreditation Standard 1.5.3).

Penguins are flagships for numerous conservation messages. The list includes human overpopulation impacts, over-fishing concerns, oil-spills, global warming, pollution, invasive species impacts, and predator-prey dynamics, to name a few. Certain species of penguins lend themselves to different types of educational programming. The *Sphensicid* species (African, Humboldt, and Magellanic) and rockhoppers are commonly used for off-site outreach programs, as they are tolerant of a wide range of temperatures. This does not exclude cold-weather species from outreaches but adds an additional layer to the logistics. For programs that are held on-site, either close to the exhibit/holding pen or in the exhibit, many more of the species may be utilized within the confines of the facility's policies.

Penguins, by nature, are social animals and thrive with interaction with others. Program penguins, and even exhibit animals, often will court and socially interact with their caretakers. The TAG recommends that program penguins be kept in a colony situation although separate accommodations for program birds are acceptable as long as spatial considerations and population numbers are appropriate. Penguin nutrition, daily consumption, and vitamin supplements should be monitored and records kept.

Animal care and education staff should be trained in program animal-specific handling protocols, conservation and education messaging techniques, and public interaction procedures. These staff members should be competent in recognizing stress or discomfort behaviors exhibited by the program animals and be able to address any safety issues that arise. Both exhibit animal and program animal locations require the land and water space formula delineated in this document. Penguins do not pose a large zoonotic risk to the handlers other than occasional bites from beaks and/or impacts from flippers.

The TAG recommends that each institution create their program animal handling policy that conforms to AZA guidelines as well as any local legislation. In general, penguins make good program animals and are usually displayed on a stage, floor or table, with constant monitoring of the handlers. Penguins may try to bite/poke guests, or even handlers, at any time during a program and it are suggested that handlers know the personality of the program birds before utilizing them. Handlers should always be aware of the bird's demeanor and the location of visitors. It is imperative that the penguins be kept away from human faces.

The TAG recommends that the handler of program penguins be aware of visitor interaction at all times. Food and beverage consumption for the handlers should be limited to non-animal areas always. Monitoring of the visitors requires ever-present vigilance. Penguins often poke at people that are within beak-range. Monitoring close approaches of visitors and knowing the personality of the penguin will help ensure a positive interaction for the guests.

Penguin stress, including heat stress and over stimulation, may manifest its presence in a number of ways. Some of the signs of stress are: reduced appetite, abnormally aggressive behavior, agitated attitude, lying down, attempts to get away from the presentation area, and heavy/open mouthed

breathing. If the animal is showing heat stress, check feet for warmth and isolate the bird in a cool dark area or return it as soon as possible to its exhibit or pen. For stress that appears to be from over stimulation, remove the bird from the presentation and kennel it in a quiet area. Later, gauge if the animal will be able to continue with its performance by judging its attitude. Do not continue if the penguin shows continued stress. The animal should be returned it to its exhibit or pen as soon as possible and supervisory staff should be alerted of the situation. Medical staff can also be contacted, if warranted.

The Penguin TAG recommends that when injuries occur to animals, they receive medical attention as soon as possible. The injury may not seem significant but to ensure continued health, seek medical counsel. Before an injury to a visitor or handler occurs, consult your Human Resource Department to determine the proper protocol if an injury should occur. Follow the protocol and contact HR as soon as possible.

Penguins are used in presentations often. The entire program including birds, programs and handlers should be reviewed annually. At this time, handler competency may be evaluated as well as during periodic institutional performance reviews. Any concerns with training performance may be addressed at this time and re-training or additional lessons may be instituted.

Program animals that are taken off zoo or aquarium grounds for any purpose have the potential to be exposed to infectious agents that could spread to the rest of the institution's healthy population. AZA-accredited institutions must have adequate protocols in place to avoid this (AZA Accreditation Standard 1.5.5).

Disease risk is inherent in all environments and it is impossible to eradicate this risk totally. It is best to review each program event and look at potential risks and try to minimize them. The TAG suggests that all outreach events with penguins ensure that only their facility has birds at the event. Additionally, at all events, indoor or outdoor, it is recommended that the program birds have dedicated kennels which will hold the birds any time they are not needed for a presentation and these kennels are kept away from visitors, other animals, and disturbance.

The TAG recommends using hand-washing stations, wipes and/or gels to limit disease transfer and contamination for all staff involved with program animals. All transport kennels should be cleaned thoroughly with facility-approved cleansers and disinfectants to help prevent disease after each use.

The use of chemical sanitation is important for all transport kennels, presentation surfaces and maintenance tools. There are a variety of sanitation chemicals available for proper hygiene. Consult with your animal management team and/or medical staff to identify the best chemical compounds for your situation.

Careful consideration must be given to the design and size of all program animal enclosures, including exhibit, off-exhibit holding, hospital, quarantine, and isolation areas, such that the physical, social, behavioral, and psychological needs of the species are met and species-appropriate behaviors are facilitated (AZA Accreditation Standard 10.3.3; AZA Accreditation Standard 1.5.2).

Similar consideration needs to be given to the means in which an animal will be transported both within the Institution's grounds, and to/from an off-grounds program. Animal transportation must be conducted in a manner that is lawful, safe, well planned, and coordinated, and minimizes risk to the animal(s), employees, and general public (AZA Accreditation Standard 1.5.11).

AZA Accreditation Standard

(1.5.5) For animals used in offsite programs and for educational purposes, the institution must have adequate protocols in place to protect the rest of the animals at the institution from exposure to infectious agents.

AZA Accreditation Standard

(10.3.3) All animal enclosures (exhibits, holding areas, hospital, and quarantine/isolation) must be of a size and complexity sufficient to provide for the animal's physical, social, and psychological well-being; and exhibit enclosures must include provisions for the behavioral enrichment of the animals. AZA housing guidelines outlined in the Animal Care Manuals should be followed.

AZA Accreditation Standard

(1.5.2) All animals must be housed in enclosures and in appropriate groupings which meet their physical, psychological, and social needs. Wherever possible and appropriate, animals should be provided the opportunity to choose among a variety of conditions within their environment. Display of single specimens should be avoided unless biologically correct for the species involved.

AZA Accreditation Standard

(1.5.11) Animal transportation must be conducted in a manner that is safe, well-planned and coordinated, and minimizes risk to the animal(s), employees, and general public. All applicable local, state, and federal laws must be adhered to. Planning and coordination for animal transport requires good communication among all involved parties, plans for a variety of emergencies and contingencies that may arise, and timely execution of the transport. At no time should the animal(s) or people be subjected to unnecessary risk or danger.

There are two basic methods to removing a penguin from an exhibit: train the bird to enter a kennel and then remove the kennel, or manually pick up/restrain the bird where upon it can be placed into an open kennel for transport or walked being hand-held to the desired location. It is not recommended to allow a penguin free-run of a van or other transport vehicle. The penguin will usually walk out of the open kennel once it has arrived at the desired location. When transporting a program bird from one location to the next, it is suggested that the penguin remain in the kennel for the duration of the transport. Crating suggestions are delineated in the above text.

The temperature restrictions for penguins depend upon the species that are being used in programs, the destination of the program and the policy of the institution's animal management team. With weather tolerant species such as African, Humboldt, or Magellanic penguins, extremes in temperature should be avoided. Be cautious having the penguin exposed to temperatures above 26 °C (80 °F) and below 4.4 °C (40 °F). Monitor behavior closely if rising temperatures or direct sunlight exposure is present. If a cold-weather species is to do a program in a situation where it is not climate controlled, please discuss the logistics with your animal management team to discuss the risks. There may be times when the physical environment can be modified to accommodate these species to maintain them is a safe and healthy manner.

As with all program animals, penguins will need breaks from being "on-stage." The TAG suggests a 30-minute on, 10-minute rest schedule for a penguin that is working in a program. The TAG does acknowledge that some programs may run somewhat longer and certain individual penguins can handle a longer "stage performance." Handlers that know their program animals well, how they react to stress, and are able to watch for signs is the key. Many penguins handle travel very well and overnight outreaches are acceptable as long as the animal's basic husbandry needs are addressed and a medical protocol is in place in case of concerns.

9.3 Program Evaluation

AZA-accredited institutions that have Institutional Program Animal Plan are required to evaluate the efficacy of the plan routinely (see Appendix E for recommendations). Education and conservation messaging content retention, animal health and well-being, guest responses, policy effectiveness, and accountability and ramifications of policy violations should be assessed and revised as needed.

The TAG suggests an annual review of all program animal plans. The supervisory staff of the program animals should monitor accountability. Biting issues with visitors, behavioral changes and/or reproductive concerns should be reported to the management in a timely manner. These concerns should be written on accident reporting forms, in daily reports or some other appropriate formal documentation.

The TAG does not mandate any specific disciplinary action in the event of mistakes or violations of policy in a program animal protocol. The TAG will suggest that violations be viewed as serious in nature with re-training, close review of handling privileges, additional supervisory monitoring and probationary implementation as possible actions items. Expectation surveys and other measurement techniques are on the market that may provide insight into the program's effectiveness. There are many facilities that have proven, in-house development/marketing department plans that address measurement and success of programs.

The TAG recommends an annual review of all animal programs as well as the formation and utilization of an Animal Welfare Policy that may address any and all staff concerns in a written and formal method. The TAG suggest that some type of program evaluation form be associated with penguin outreaches. A simple check-off form will often provide valuable information on the effectiveness of the success of a program and give additional insight into how to modify it to include conservation messages, natural history details, and other educational messaging in an engaging, highly palatable form.

Chapter 10. Research

10.1 Research Methods

AZA believes that contemporary animal management, husbandry, veterinary care and conservation practices should be based in science, and that a commitment to both basic and applied, scientific research, is a trademark of the modern zoological park and aquarium. An AZA accredited institution must demonstrate a commitment to scientific research that is in proportion to the size and scope of its facilities, staff and animal collections. AZA accredited institutions have the invaluable opportunity, to conduct or facilitate research both in *in situ* and *ex situ* settings with the goal of maximizing the scientific knowledge of the animals in our care and enhancing the conservation of wild populations. This might be achieved by participating in AZA Penguin TAG sponsored research, conducting original research projects, affiliating with local universities or conservation organizations, and/or employing staff with scientific credentials (AZA Accreditation Standard 5.3).

AZA Accreditation Standard

(5.3) The institution should maximize the generation of scientific knowledge gained from the animals. This might be achieved by participating in AZA TAG/SSP sponsored research when applicable, conducting original research projects, affiliating with local universities, and/or employing staff with scientific credentials.

Research, whether observational, behavioral, physiological, or genetically based, should have a clear scientific purpose with the reasonable expectation that it will increase our understanding of the species being investigated and may provide results which benefit animals in wild populations. Many AZA accredited institutions incorporate superior positive reinforcement training programs into their routine schedules to facilitate sensory, cognitive, and physiological research and these efforts are strongly encouraged by the AZA.

As with all taxa, thorough understanding of natural history, behavior, physiology, and other aspects of organismal biology are critical to providing the highest possible quality of husbandry. Penguins are among the taxa most closely managed on the individual level in AZA bird collections, with a large proportion of animals interacting directly with animal care staff on a daily basis. This makes penguins, as a group, easily accessible for many types of research. Many wild penguin populations have been intensively studied over the past 40 years, and therefore data exists for wild populations. Few avian taxa have such a superb interface of zoo and wild animal population research. As populations decline in the wild, and *ex situ* populations experience concerns surrounding sustainability, research in both managed and wild settings are of increasing and complimentary importance.

AZA-accredited institutions are required to have a clearly written research policy that identifies the types of research being conducted, methods used, staff involved, evaluations of the projects, the animals included, and guidelines for the reporting or publication of any findings (AZA Accreditation Standard 5.2). Institutions must designate a qualified individual to oversee and direct its research program (AZA Accreditation Standard 5.1). If institutions are not able to conduct in-house research investigations, they are strongly encouraged to provide financial, personnel, logistical, and other support for priority research and conservation initiatives identified by Taxon Advisory Groups (TAGs) or Species Survival Plans® (SSP) Programs.

AZA Accreditation Standard

(5.2) The institution must have a written policy that outlines the type of research that it conducts, methods, staff involvement, evaluations, animals to be involved, and guidelines for publication of findings.

AZA Accreditation Standard

(5.1) Research activities must be under the direction of a person qualified to make informed decisions regarding research.

10.2 Future Research

This Animal Care Manual is a dynamic document that will need to be updated as new information is acquired. Knowledge gaps have been identified throughout the manual and are included in this section to promote future research investigations. Any knowledge gained will help maximize AZA accredited institutions' capacity for excellence in animal care and welfare as well as advance conservation initiatives for the species.

Lighting: Artificial lighting in relation to the management of penguins in zoos and aquariums is an area that merits further research. Seasonal variation in light cycle, intensity and spectrum are essential for proper breeding and molting cycles. Some zoos and aquariums have reported enhanced reproductive

success with appropriate changes in day length and light intensity. Variations in molt have also been correlated with lighting schedules.

Diet: The mineral requirements of penguins have not been determined. Research may be helpful to determine if vitamin C can be synthesized by penguin tissues, and whether vitamin C deficiencies are relevant to penguin health. Definitive studies on the water requirements of penguins in zoo and aquariums have also not yet been conducted, and may be beneficial.

Mosquito control: The use of high velocity fans that are strategically placed within outdoor penguin enclosures to generate air currents in the hopes of creating an environment undesirable to mosquitoes warrants further consideration and testing. Further research on the success of this approach and other mosquito abatement research is needed.

West Nile virus: Penguins known to have had and recovered from this disease are believed to have some immunity against the virus, and may not need further vaccination. However, more information is required to determine the extent and duration of this immunity.

Irregular and incomplete molting patterns: Abnormal molting in some penguin species is a fairly common occurrence. Research is needed to determine the extent of the problem and to find ways to prevent and treatment this condition. Several pharmacological agents have been documented to induce molt in penguins with abnormal or arrested molts but further testing is needed.

Pharmacokinetic studies: Antibiotic and antifungal drugs are frequently administered to penguins empirically without actually knowing whether the amount or frequency of administration is adequate to reach and sustain effective levels. Pharmacokinetic studies of commonly used antimicrobial drugs are needed. Studies, even on an opportunistic basis, should be considered in managed penguins, or penguins in rehabilitation centers. Drug metabolism frequently varies among species, therefore these studies should occur across penguin species.

Field research: There are numerous opportunities to conduct or support field studies on species population size, dispersal patterns, migration, fishery use, artificial nest use, changing climate, and other factors that are affecting penguin populations and distribution. The use of geolocators and other technologies have created opportunities for additional areas of research. The Penguin TAG encourages institutions to support field programs and researchers.

The Global Penguin Society (www.globalpenguinsociety.org) is a non-profit conservation and research organization that "is dedicated to the survival and protection of the world's penguin species, fostering integrated ocean conservation through science, management and community education." The Penguin TAG supports the initiatives of GPS and supports its goals.

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References

Ackman, R. G. (1989). Nutritional composition of fats in seafood. *Progress in Food and Nutrition Science*, *13*, 161–241.

Ackman, R. G., & Kean–Howie, J. (1994). Fatty acids in aquaculture: are omega–3 fatty acids always important? In C. Lim, & D. J. Sessa (Eds.), Nutrition and utilization technology in aquaculture. *American Oil Chemists Society Press* (82–103).

Adams, N. J., & Klages, N. T. (1987). Seasonal Variation in the Diet of the King Penguin *Aptenodytes–Patagonicus* at Sub–Antarctic Marion Island. *Journal of Zoology (London)*, *212*(2), 303–324.

Adkesson, M., & Langan, J. (2007). Metabolic bone disease in juvenile Humboldt penguins (*Spheniscus humboldti*): Investigation of ionized calcium, parathyroid hormone, and vitamin D3 as diagnosic parameters. *Journal of Zoo and Wildlife Medicine*, *38*(1), 85–92.

Ainley, D. G., Ballard, G., Barton, K. J., Karl, B. J., Rau, G. H., Ribic, C. A., & Wilson, P. R. (2003). Spatial and temporàl variation of diet within a presumed metapopulation of Adélie Penguins. *Condor*, *105*(1), 95–106.

Ainley, D. G., Leresche, R. E. & Sladen, W. J. (1983). Breeding biology of Adélie penguins. Berkeley, CA: University of California Press.

Anderson-Brown, A. F. and Robbins G. E. S. (2002). The New Incubation Book. Surrey, B.C.: Hancock House Publishers Ltd.

AWR (Animal Welfare Regulations) 2013. Title 9, Chapter 1, Subchapter A, Part 3, Subpart E, Section 3.106, p 107. Retrieved from http://www.gpo.gov/fdsys/pkg/CFR-2013-title9-vol1/pdf/CFR-2013-title9-vol1-chapI.pdf.

Bakun, A., & Broad, K. (2003). Environmental 'loopholes' and fish population dynamics: comparative pattern recognition with focus on El Nino effects in the Pacific. *Fisheries Oceanography*, *12*, 458–473.

Beall, F., & Branch, S. (2005). Housing and Enclosure Requirements. Penguin Husbandry Manual (3rd ed.). American Zoo and Aquarium Association.

Beaune, D., Le Bohec, C., Lucas, F., Gauthier–Clerc, M., & Le Maho, Y. (2009). Stomach stones in king penguin chicks. *Polar Biology*, *32*(4), 593–597.

Berger, J. (1981). A model for the evolution of mixed-species colonies of Ciconiiformes. *The Quarterly Review of Biology*, *56*,143–167.

Bernard, J. B., & Allen, M. E. (1997). Feeding Captive Piscivorous Animals: Nutritional Aspects of Fish as Food. *Nutrition Advisory Group Handbook Fact Sheet 005.* Brookfield, IL: Chicago Zoological Society, Brookfield Zoo,

Bitgood, S., Patterson, D., & Benefield, A. (1986). Understanding your visitors: ten factors that influence visitor behavior. *Annual Proceedings of the American Association of Zoological Parks and Aquariums* (pp. 726–743).

Bitgood, S., Patterson, D., & Benefield, A. (1988). Exhibit design and visitor behavior. *Environment and Behavior*, *20*(4), 474–491.

Boerner, L., Nevis, K. R., Hinckley, L. S., Weber, E. S. & Frasca, Jr., S.I. (2004). Erysipelothrix septicemia in a Little Blue Penguin (*Eudyptula minor*). *Journal of Veterinary Diagnostic Investigation, 16*(2), 145 149.

Boersma, P. D. (1991). Nesting sites of *Spheniscus* penguins. Spheniscus *Penguin Newsletter*, *4*(1), 10–15.

Boersma, P. D. (2008). Penguins as marine sentinels. *Bioscience*, *58*(7), 597–607.

Broadbent, R. (2009) Deaths in rockhopper penguins. *Vet Rec. 164*, 127-128.

Cheney, C. (1990). Spheniscus penguins: an overview of the world captive population. *Spheniscus Penguin Newsletter*, *3*(1), 12–17.

Cherel, Y., & Ridoux, V. (1992). Prey species and nutritive value of food fed during summer to King penguin *Aptenodytes patagonicus* chicks at Possession Island, Crozet Archipelago. *IBIS*, 134, 118–127.

Cherel, Y., Charrassin, J. B., & Challet, E. (1994). Energy and protein requirements for molt in the King penguin, Aptenodytes patagonicus. *American Journal of Physiology*, *266*, R1182–R1188.

Chiaradia, A., Costalunga, A., & Kerry, K. (2003). The diet of little penguins (*Eudyptula minor*) at Phillip Island, Victoria, in the absence of a major prey: pilchard (*Sardinops sagax*). *Emu*, *103*, 43–48.

Chiaradia, A., Dann, P., Renwick, L., & Cullen, M. (2001). The pilchard mortalities effect on little penguins at Phillip Island. *New Zealand Journal of Zoology*, *28*(4), 438–439.

Cho, K. O., Kimura, T., Ochiai, K., & Itakura, C. (1998). Gizzard adenocarcinoma in an aged Humboldt penguin (Spheniscus humboldti). *Avian Pathology 27*, 100–102.

Churchman, D. (1985). How and what do recreational visitors learn at zoos? *Annual Proceedings of the American Association of Zoological Parks and Aquariums* (pp.160–167).

Clausen, A. P., & Putz, K. (2002). Recent trends in diet composition and productivity of gentoo, magellanic and rockhopper penguins in the Falkland Islands. *Aquatic Conservation*, *12*, 51–61.

Clench, M. H., & Mathias, J. R. (1995). The avian cecum: A review. *Wilson Bulletin*, *107*(1), 93–121.

Conway, W. (1995). Wild and zoo animal interactive management and habitat conservation. *Biodiversity and Conservation*, *4*, 573–594.

Coria, N., Libertelli, M., Casaux, R., & Darrieu, C. (2000). Inter–annual variation in the autumn diet of the Gentoo Penguin at Laurie Island, Antarctica. *Waterbirds*, *23*(3), 511–517.

Crawford, R. J. M., & Shelton, P. A. (1978). Pelagic fish and seabird interrelationships off the coasts of South West and South Africa. *Biological Conservation*, *14*(2), 85–109.

Crissey, S. D, McGill, P., & Simeone, A. M. (1998). Influence of dietary vitamins A and E on serum alpha– and gamma–tocopherols, retinol, retinyl palmitate and carotenoid concentrations in Humboldt penguins *Spheniscus humboldti*. Comparitive *Biochemistry and Physiology*, *121*, 333–339.

Crissey, S. D. (1998). Handling Fish Fed to Fish–Eating Animals: A Manual of Standard Operating Procedures. U.S. Dept. Agriculture, Agricultural Research Service, National Agriculture Library, Beltsville, MD.

Croll, D. A., & Tershy, B. R. (1998). Penguins, fur seals, and fishing: Prey requirements and potential competition in the South Shetland Islands, Antarctica. *Polar Biology*, *19*(6), 365–374.

Croxall, J. P., & Lishman, G. S. (1987). Food and feeding ecology of penguins. In J. P. Croxall (Ed.). Seabirds: Feeding Ecology and Role in Marine Ecosystems (pp. 101–133). Cambridge, MA: University of Cambridge Press.

Croxall, J. P., Davis, R. W., & O'Connell, M. J. (1988). Diving Patterns in Relation to Diet of Gentoo and Macaroni Penguins at South Georgia. *The Condor*, *90*(1), 157–167.

Cullen, J. M., Montague, T. L., & Hill, C. (1992). Food of little blue penguins, *Eudyptula minor*, in Victoria: comparison of three localities between 1985 and 1988. *Emu*, *91*, 318–341.

Davison, V. M., McMahon, L., Skinner, T. L., Horton, C. M., & Parks, B. J. (1993). Animals as actors: take 2. Annual Proceedings of the American Association of Zoological Parks and Aquariums (pp. 150–155).

Duke, G. E. (1997). Gastrointestinal physiology and nutrition in wild birds. *Proceedings of the Nutrition Society*, *56*(03), 1049–1056.

Ellis-Joseph, S. (1990). Patterns of incubation behavior in captive-housed Adélie penguins: implications for long-term penguin breeding programs. American Association of Zoological Parks and Aquariums Regional Conference Proceedings, 115–120.

Ellis-Joseph, S. (1992). Painless pairing and nest site data collection: Adélie penguins as a model. Proceedings of the American Association of Zoological Parks and Aquariums Regional Conferences.

Ellis-Joseph, S. A. (1988). Factors contributing to reproductive success in Adélie penguins (*Pygoscelis adeliae*) housed in a controlled environment. Ph.D. Dissertation, University of California, Davis.

Ellis, S., & Branch, S. (Eds.). (1994). Penguin Husbandry Manual (1st ed.). Bethesda, MD: American Zoo and Aquarium Association.

Ferrell, S. T., Marlar, A. B., Garner, M. M., & lung, N. (2006). Intralesional cisplatin chemotherapy and topical cryotherapy for the control of choanal squamous cell carcinoma in an African penguin (*Spheniscus demersus*). *Journal of Zoo Wildlife Medicine, 37*(4), 539 541.

Fisher, K. J., Reavill, D., Weldy, S. H. & Bradway, D. S. (2008). Mycobacterium genavense in a black-footed penguin (*Spheniscus demersus*). *Proceedings: American Association of Zoo Veterinarians* , 211.

Fonseca, V. S., Petry, M. V., & Jost, A. H. (2001). Diet of the Magellanic Penguin on the coast of Rio Grande do Sul, Brazil. *Waterbirds*, *24*, 290–293.

Forero, M. G., Hobson, K. A., Bortolotti, G. R., Donazar, J. A., Bertellotti, M., & Blanco, G. (2002). Food resource utilisation by the Magellanic penguin evaluated through stable–isotope analysis: Segregation by sex and age and influence on offspring quality. *Marine Ecology Progress Series*, *234*, 289–299.

Furness, R. W. (2003). Impacts of fisheries on seabird communities. *Scientia Marina 67*(2), 33–45.

Furness, R. W., & Tasker, M. L. (2000). Seabird–fishery interactions: quantifying the sensitivity of seabirds to reductions in sandeel abundance, and identification of key areas for sensitive seabirds in the North Sea. *Marine Ecology Progress Series, 202*, 253–264.

Gailey-Phipps, J. (1978). Breeding black-footed penguins (*Spheniscus demersus*) at the Baltimore Zoo. *International Zoo Yearbook*, *18*, 28–35.

Garcia-Borboroglu, P. G., & Boersma, P. D. (2012). Humboldt Penguin *Spheniscus humboldti* in Species Fact Sheets. GlobalPenguinSociety.org. November 5, 2012.

Gauthier–Clerc, M., Le Maho, Y., Clerquin, Y., Bost, C. A., & Handrich, Y. (2002). Seabird reproduction in an unpredictable environment: How king penguins provide their young chicks with food. *Marine Ecology Progress Series*, *237*, 291–300.

Geraci, J. R. (1986). Marine mammals (cetacea, pinnipeds, and sirenia): nutrition and nutritional disorders. In M. E. Fowler (Ed.), *Zoo and Wildlife Medicine* (2nd ed.), (760–764). Philadelphia, PA: W.B. Saunders Co.

Ghebremeskel, K., Williams, T. D., Williams, G., Gardner, D. A., Crawford, M. A. (1991). Plasma metabolites in Macaroni penguins *Eudyptes chrysolopus* arriving on land for breeding and molting. Comparative Biochemical Physiology, 99A, 245–250.

Ghebremeskel, K., Williams, T. D., Williams, G., Gardner, D. A., Crawford, M. A. (1992). Dynamics of plasma metabolites in molting Macaroni *Eudyptes chrysolophus* and Gentoo penguins *Pygoscelis papua*. *Comparitive Biochemical Physiology*, 101A, 301–307.

Graczyk, T. K., Cranfield, M. R., & Bicknese, E. J. (1995). Evaluation of serum chemistry values associated with avian malaria infections in African penguins. *Parasitology Research 81*, 316-319.

Graczyk, T. K., Cranfield, M. R., Brossy, J. J., Cockrem, J. F., Jouventin, P., Seddon, P. J., (1995a). Detection of avian malaria infections in wild and captive penguins. *Journal of the Helminthological Society of Washington 62(2)*, 135-141.

Hays, C. (1984). The Humboldt penguin in Peru. *Oryx*, *18*, 92–95.

Hays, C. (1986). Effects of the 1982–83 El Niño on Humboldt penguin colonies in Peru. *Biological Conservation*, 36, 169–180.

Henderson, R. J., & Tocher, D. R. (1987). The lipid composition and biochemistry of freshwater fish. *Progress in Lipid Research*, *26*, 281–347.

Henry, L. (1993). Survey for Penguin Husbandry Practices: Penguin TAG. Unpublished data, 51 survey respondents, AZA Penguin Taxon Advisory Group, North American Region, San Diego, CA.

Henry, L., & Sirpenski, G. (2005). Reproduction. Penguin Husbandry Manual (3rd ed.). American Zoo and Aquarium Association.

Herling, C., Culik, B. M., & Hennicke, J. C. (2005). Diet of the Humboldt penguin (*Spheniscus humboldti*) in northern and southern Chile. *Marine Biology*, *147*, 13–25.

Hines, R. S. & Dickerson, S. (1993). Pseudomembranous enteritis associated with ciprofloxacin and *Clostridium difficile* in a penguin (*Eudyptes chrysolophus*). *Journal of Zoo and Wildlife Medicine, 24* (4), 553-556.

Hobday, D. K. (1992). Abundance and distribution of pilchard and Australian anchovy as prey species for the Little Blue Penguin *Eudyptula minor* at Phillip Island, Victoria. *Emu*, *91*, 342–354.

Hoffman, K. (1987). Egg weight loss during incubation. Animal Keepers Forum 14, 188-190.

Hoogestyn, A. L. & Cunnigham, A. (1996). Development of an indirect immunoflourescent test for the detection of malaria antibodies in penguins (Spenisciformes). *Proceedings: American Association of Zoo Veterinarians*, 584-585.

Hutchison, R. E., Hinde, R. A., & Steel, E. (1967). The effects of estrogen, progesterone and prolactin on brood patch formation in ovariectomized canaries. *Journal of Endocrinology*, *39*, 379–385.

Jackson, S. (1992). Do Seabird Gut Sizes and Mean Retention Times Reflect Adaptation to Diet and Foraging Method? *Physiological Zoology*, *65*(3), 674–697.

Jencek, J. E., Dunker, F. H., Tully, T. N. & Garner, M. M. (2006). An outbreak of *Chlamydophila psittaci* in an outdoor colony of magellanic penguins (*Spheniscus magellanicus*). *Proceedings: American Association of Zoo Veterinarians*,140.

Johnson, R. (1984). Management of artificially incubated bird eggs by weight loss. Annual Proceedings of the American Association of Zoological Parks and Aquariums (pp.199-201)

Johnston, R. J. (1998). Exogenous factors and visitor behavior: a regression analysis of exhibit viewing time. *Environment and Behavior*, *30*(3), 322–347.

Jordan, R. (1989). *Parrot incubation procedures*. Ontario, Canada: Silvio Mattacchione and Co.

Jouventin, P., Barbraud, C. and Rubin, M. (1995). Adoption in the emperor penguin, Aptenodytes forsteri. Animal Behavior 50(4), 1023-1029.

Kane, O. J., Uhart, M. M., & Rago, V., Pereda, A. J., Smith, J. R., Van Buren A., Clark, J. A., & Boersma, P. D. (2012). Avian pox in magellanic penguins (*Spheniscus magellanicus). Journal of Wildlife Diseases. 48*(3), 790-794.

Karesh, W. B., Uhart, M .M., Frere, E., Gandini, P., Braselton, W. E., Puche, H. & Cook R. A. (1999). Health evaluation of free-ranging rockhopper penguins (*Eudyptes chrysocomes*) in Argentina. *Journal of Zoo and Wildlife Medicine. 30* (1), 25-31.

Lane-Petter, W. (1976). The animal house and its equipment. In Universities Federation for Animal Welfare (Eds.), *The UFAW Handbook on the Care of Laboratory Animals (5th ed.)*(pp. 74-94). Edinburgh: Churchill Livingstone.

Leary, S. (2013). AVMA Guidelines for the Euthanasia of Animals: 2013 Edition. Retrieved from https://www.avma.org/kb/policies/documents/euthanasia.pdf.

Lenanton, R. C. J., Valesini, F., Bastow, T. P., Nowara, G. B., Edmonds, J. S., & Connard, M. N. (2003). The use of stable isotope ratios in whitebait otolith carbonate to identify the source of prey for Western Australian penguins. *Journal of Experimental Marine Biology and Ecology*, *291*, 17–27.

Lishman, G. S. (1985). The food and feeding ecology of Adélie penguins, *Pygoscelis adeliae*, and chinstrap penguins, *Pygoscelis antarctica*, at Signy Island, South Orkney Islands. *Journal of Zoology London*, (205A), 245–263.

Lomholt J. P. (1976). Relationship of weight loss to ambient humidity of birds eggs during incubation. Journal of Comparative Physiology 105:2, 189-196.

Lynnes, A. S., Reid, K., & Croxall, J. P. (2004). Diet and reproductive success of Adélie and chinstrap penguins: linking response of predators to prey population dynamics. *Polar Biology*, *27*(9), 544–554.

McaCoy, D. M., & Campbell, T. W. (1991). Excision of impacted and ruptured uropygial glands in three Gentoo penguins (*Pygoscelis papua*). *Proceedings: American Association of Zoo Veterinarians,* 259 260.

Macha, L., & Sirpenski, G. (2011). Two Examples of Artificial Nest Burrows: Mystic Aquarium, Mystic, CT – African Penguin Nests. *Penguin Conservation Newsletter*, *15*(2), 3.

Machlin, L. J. (1984). Handbook of Vitamins: Nutritional, Biochemical and Clinical Aspects. New York, NY: Marcel–Dekker, Inc.

MacMillen, O. (1994). Zoomobile effectiveness: sixth graders learning vertebrate classification. *Annual Proceedings of the American Association of Zoological Parks and Aquariums* (pp. 181–183).

Martir, J. (2012). Improving Magellanic penguin exhibit nesting sites at SeaWorld San Diego. *Penguin Conservation Newsletter*, *16*(2): publication in process.

Mazzaro, L. M., Tuttle, A., Wyatt, J., Goodman, J., Kadyszewski, E., & Dunn, J. L. (2004). Plasma electrolyte concentrations in captive and free–ranging African penguins (*Spheniscus demersus*) maintained with and without dietary salt supplements. *Zoo Biology*, *23*, 397–408

McClements, R. D. (2007). Investigations into the Nutritional Factors Affecting Reproduction of Captive Exotic Birds. PhD dissertation, University of Sydney, Australia.

Monroe, A. (1993). Annual variations in plasma retinol and alpha–tocopherol levels in Gentoo and Rockhopper penguins. *Zoo Biology*, *12*, 453–485.

Montague, T. L. (1982). The food and feeding ecology of the little blue penguin, *Eudyptula minor*, at Phillip Island, Victoria, Australia. M.Sc. Thesis, Monash Univ.162.

Moore, P. J., & Wakelin, M. D. (1997). Diet of the Yellow–eyed Penguin *Megadyptes antipodes*, South Island, New Zealand, 1991–1993. *Marine Ornithology*, *25*(1–2), 17–29.

Morgan, J. M., & Hodgkinson, M. (1999). The motivation and social orientation of visitors attending a contemporary zoological park. *Environment and Behavior*, *31*(2), 227–239.

Muller-Schwarze, D. (1984). The behavior of penguins adapted to ice and tropics. Albany, NY: State University of New York Press.

Nagy, K. A., & Obst, B. S. (1992). Food and energy requirements of Adélie penguins, *Pygoscelis adeliae*, on the Antarctic peninsula. *Physiological Zoology*, 65, 1271–1284.

Nichols, D. K., Wolff, M. J., Phillips, L. G., & Montali, R. J. (1989). Coagulopathy in pink–backed pelicans, Pelecanus refescens, associated with hypervitaminosis E. *Journal of Zoo and Wildlife Medicine*, *20*, 57–61.

Noble, R. D., & Cocchi, M. (1990). Lipid metabolism and the neonatal chicken. *Progress in Lipid Research*, *29*, 107–140.

NRC (National Research Council) (1982). Nutrient Requirements of Mink and Foxes (2nd ed.) (64–65). National Academy of Sciences, Washington, DC: National Academy Press.

NRC (National Research Council) (1987). Vitamin Tolerance of Animals. National Academy of Sciences, Washington, DC: National Academy Press.

NRC (National Research Council) (1994). Nutrient Requirements of Poultry (9th ed.). National Academy of Sciences, Washington, DC: National Academy Press.

NRC (National Research Council) (2006). Nutrient Requirements of Dogs and Cats. National Academy of Sciences, Washington, DC: National Academy Press.

O'Brien, J. K., Oehler, D. A., Malowski S. P. and Roth, T. L. (1999). Semen collection, characterization and cryopreservation in a Magellanic penguin (Spheniscus magellanicus). Zoo Biology 18: 199-214.

O'Brien, J. K. & Robeck, T. R. (2013). Semen characterization and in vitro sperm quality after cryopreservation in the king penguin *(Aptenodytes patagonicus*). Proc. Third International Congress on Controversies in Cryopreservation of Stem Cells, Reproductive Cells, Tissues and Organs. March 21-23, Berlin, Germany, A 12-13.

O'Brien, J. K. (2013). Penguins conceived for the first time following artificial insemination. *Penguin Conservation Newsletter*, 17(2), 3-4.

Olsen, M. R., Myklebust, T., Kaino, V., Elbrønd, & Mathiesen, S. (2002). The gastrointestinal tract of Adélie penguins—morphology and function. *Polar Biology*, *25*(9), 641–649.

Passi, S., Cataudella, S., di Marko, P., de Simone, F., & Rastrelli, L. (2002). Fatty acid composition and antioxidant levels in muscle tissue of different Mediterranean marine species of fish and shellfish. *Journal of Agricultural and Food Chemistry*, *50*, 7314–7322.

Paster, M. B. (1992). A Brief Overview: The Avian Crop. *Journal of the Association of Avian Veterinarians*, *6*(4), 229–230.

Penney, R. L. (1968). Territorial and social behavior in the Adélie penguin. *Antarctic Union*, *12*.

Perpiñan, D. & Curro, T.G. (2009). Gastrointestinal obstruction in penguin chicks. *Journal of Avian Medicine and Surgery 23*(4), 290 293.

Perry, A. L., Low, P. J., Ellis, J. R., & Reynolds, J. D. (2005). Climate Change and Distribution Shifts in Marine Fishes. *Science*, *308*(5730), 1912–1915.

Ploeg, M., Ultee, T., & Kik, M. (2011). Disseminated toxoplasmosis in black-footed penguins (*Spheniscus demersus*), *Avian Diseases.* (55), 701-703.

Povey, K.D. (2002). Close encounters: the benefits of using education program animals. *Annual Proceedings of the Association of Zoos and Aquariums* (pp. 117–121).

Povey, K.D., & Rios, J. (2002). Using interpretive animals to deliver affective messages in zoos. *Journal of Interpretation Research*, *7*, 19–28.

Putz, K., & Bost, C. A. (1994). Feeding behavior of free–ranging king penguins (*Aptenodytes patagonicus*). *Ecology*, *75*, 489–497.

Putz, K., Ingham, R. J., Smith, J. G., Croxall, J. P. (2001). Population trends, breeding success and diet composition of Gentoo (*Pygoscelis papua*), Magellanic (*Spheniscus magellanicus*) and Rockhopper (*Eudyptes chrysocome*) penguins in the Falkland Islands. *Polar Biology*, *24*, 793–807.

Raclot, T., Groscolas, R., & Cherel, Y. (1998). Fatty acid evidence for the importance of myctophid fishes in the diet of king penguins, *Aptenodytes patagonicus*. *Marine Biology (Berlin)*, *132*, 523–533.

Radl, A., & Culik, B. M. (1999). Foraging behaviour and reproductive success in Magellanic penguins (*Spheniscus magellanicus*): A comparative study of two colonies in Southern Chile. *Marine Biology (Berlin)*, *133*(3), 381–393.

Rambaud, Y. F., Flach, E. J., & Freeman, K. P. (2003). Malignant melanoma in a Humboldt penguin (*Spheniscus humboldti*). *Veterinary Record, 153*(7), 217 218.

Rand, R. W. (1960). The biology of guano–producing seabirds. The distribution, abundance, and feeding habits of the Cape penguin, *Spheniscus demersus*, off the southwestern coast of the Cape province. Invest. *Reports Division of Fisheries, South Africa*, *41*, 1–28.

Reidarson, T. H., McBain, J. F., & Denton, D. (1999). The use of medroxyprogesterone acetate to induce molting in Chinstrap penguins (*Pygoscelis antarctica*). *Journal of Zoo and Wildlife Medicine 30*(2), 278-280.

Reidarson, T. H., McBain, J. F., & Burch, L. (1999a). A novel approach to the treatment of bumblefoot in penguins. *Journal of Avian Medicine and Surgery 13* (2), 124-127.

Renison, D., Boersma, P. D., & Martella, M. (2002). Winning and losing: causes for variability in outcome of fights in male Magellanic penguins (*Spheniscus magellanicus*). *Behavioral Ecology*, *13*, 462–466.

Renison, D., Boersma, P. D., & Martella, M. (2003). Fighting in female Magellanic penguins: when, why and who wins? *Wilson Bulletin*, *115*, 58–63.

Robertson, G., Williams, R., Green, K., & Robertson, L. (1993). Diet composition of Emperor penguin chicks *Aptenodytes forsteri* at two Mawson Coast colonies, Antarctica. *Ibis*, *136*, 19–31.

Rombola, E., Marschoff, E., &Coria, N. (2003). Comparative study of the effects of the late pack–ice break–off on chinstrap and Adélie penguins' diet and reproductive success at Laurie Island, South Orkney Islands, Antarctica. *Polar Biology*, *26*(1), 41–48.

Sarro, S. J. & Kottyan, J. (2012). Utilizing Travel Kennels for Penguin Nesting. *Penguin Conservation Newsletter*, *16*(2), publication in process.

Setiawan, A. N., Davis, L. S., Darby, J. T., Lokman, P. M., Young, G., Blackberry, M. A., Cannell, B. L., & Martin, G. B. (2007). *Hormones and Behavior*, *51*, 46–53.

Shelton, P. A., Crawford, R. J. M., Cooper, J., & Brooke, R. K. (1984). Distribution, population size, and conservation of the Jackass penguin (*Spheniscus demersus*). *South African Journal of Marine Science*, (2), 217–257.

Sherwood, K.P., Rallis, S.F., & Stone, J. (1989). Effects of live animals vs. preserved specimens on student learning. *Zoo Biology*, *8*, 99–104.

Simeone, A. (2011). Pajaro Nino Island, Chile – Humboldt Penguin Nests. *Penguin Conservation Newsletter*, *15*(2), 4–5.

Sladen, W. L. (1958). The pygoscelid penguins, parts 1 and 2. Scientific Reports of the Falkland Islands Dependencies Surveys 17. London.

Slifka, K. A., Crissey, S. D., & Goffron, J. (1997). Fish composition: effects of preparation and analytical methods. Proc. AZA Nutrition Advisory Group Second Conference, Ft Worth, TX.

Smith, J. A., Papich, M. G., Russell, G., Mitchell, M. A. (2010). Effects of compounding on pharmacokinetics of itraconazole in black-footed penguins (*Spheniscus demersus*). *Journal of Zoo and Wildlife Medicine*, *41*(3),487–495.

Speake, B., Murray, A. W. B., & Noble, R. (1998). Transport and transformations of yolk lipids during development of the avian embryo. *Progress in Lipid Research*, 37, 1–32.

Splettstoesser, J., & Todd, F. S. (1999). Stomach stones from Emperor Penguin (Aptenodytes forsteri) colonies in the Weddell Sea. *Marine Ornithology*, *27*, 97–100.

Spotte, S. (1992). Captive Seawater Fishes: Science and technology. New York, NY: John Wiley & Sons.

St. Clair, C. C., Waas, J. R., St. Clair, R. C., & Boag, P. T. (1995). Unfit mothers? Maternal infanticide in royal penguins. *Animal Behavior*, *50*, 1177–1185.

Surai, P. F., & Bortolotti, G. R. (2001a). Effects of piscivory on the fatty acid profiles and antioxidants of avian yolk: Studies on eggs of the gannet, skua, pelican and cormorant. *Journal of Zoology (London)*, *255*(3), 305–312.

Surai, P. F., & Speake, B. K. (2001b). Transfer of vitamins E and A from yolk to embryo during development of the king penguin (*Aptenodytes patagonicus*). *Physiological and Biochemical Zoology*, *74*(6), 928–936.

Tasker, M. L., Camphuysen, C. J., Cooper, J., Garthe, S., Montevecchi, W. A., Blaber, S. J. M. (2000). The impacts of fishing on marine birds. *Journal of Marine Science*, *57*(3), 531–547.

Tavernier, P., Sagesse, M., Van Wettere, A. & Redig, P. (2005). Malaria in an eastern screech owl (*Otus asio*). *Avian Diseases 49*, 433-435.

Thouzeau, C., Peters, G., Le Bohec, C., & Le Maho, Y. (2004). Adjustments of gastric pH, motility and temperature during long–term preservation of stomach contents in free–ranging incubating king penguins. *Journal of Experimental Biology*, *207*(15), 2715–2724.

Tonn, W. M. (1990). Climate Change and Fish Communities: A Conceptual Framework. *Transactions of the American Fisheries Society*, *119*(2), 337–352.

Travis, E. K., Vargas, F. H., Merkel, J., Gottdenker, N. Miller, R. E. & Parker, P. G.(2006). Hematology, serum chemistry, and serology of Galápagos penguins (*Spheniscus mendiculus*) in the Galápagos islands, Equador. *Journal of Wildlife Diseases. 42(*(3), 625-632.

Tremblay, Y., & Cherel, Y. (2003). Geographic variation in the foraging behaviour, diet and chick growth of rockhopper penguins. *Marine Ecology Progress Series*, *251*, 279–297.

Tuttle A. D., Andreadis, T. G., Frasca, Jr.,.S., & Dunn, J. (2005). Eastern equine encephalitis in a flock of african penguins maintained at an aquarium. *Journal of the American Veterinary Medical Association 226* (12), 2059 2062.

Waldoch, J., Root, T., Ramer, J., Proudfoot, J. (2007). Semen collection and characterization in rockhopper penguins (Eudyptes chrysocome chrysocome). J Zoo Wildl Med. 38:13-7.

Waldoch, J., Root, T., Dubach, J. M., Proudfoot, J., Ramer, J. (2012). Semen characteristics and artificial insemination in rockhopper penguins (*Eudyptes chrysocome chrysocome*). *Zoo Biology, 31,* 166–180.

Wallace, R. S., Dubach, J. M., Michaels, M. Keuler, N . S., Diebold, E. D., Grzybowski, K., Teare, J. A., Willis, M. (2008). Morphometric determination of gender in adult Humboldt penguins (*Spheniscus humboldti*). *Waterbirds. 31*(3), 448-453.

Wallace, R. S., Teare, J. A., Diebold, E. Michaels, M., Willis, M (1995). Hematology and plasma chemistry values in free-ranging Humboldt penguins (*Spheniscus humboldti*) in Chile. *Zoo Biology 14*, 311-316.

Wallace, R. S., Teare, J. A, Diebold, E., Michaels, M., Willis, M.(1996). Plasma tocopherol, retinol, and carotenoid concentrations in free-ranging Humboldt penguins (*Spheniscus humboldti*) in Chile. *Zoo Biology. 15*, 127-134.

Walther, G. R., Post, E., Convey, P., Menzel, A., Parmesan, A., Beebee, T. J. C., Fromentin, J. M., Hoegh–Guldberg, O., & Bairlein, F. (2002). Ecological responses to recent climate change. *Nature*, *416*, 389–395.

Willette, M., Ponder, J., Cruz-Martinez, L., Arent, L., Bueno Padilla, I., Nicolas de Francisco, O., & Redig, P. (2009). Management of select bacterial and parasitic conditions of raptors. *Veterinary Clinics of North America Exotic Animal Practice 12* (3), 491-517.

Williams, T. D. (1995). *The Penguins.* Oxford, England: Oxford University Press.

Williams, T. D., Briggs, D. R., Croxall, J. P., Naito, Y., & Kato, A. (1992). Diving pattern and performance in relation to foraging ecology in the gentoo penguin, *Pygoscelis papua. Journal of Zoology London*, *227*, 211–230.

Wilson, R. P. (1985). Seasonality in diet and breeding success of the jackass penguin *Spheniscus demersus. Journal of Ornithology*, *126*, 53–62.

Wolf, R. L., & Tymitz, B. L. (1981). Studying visitor perceptions of zoo environments: a naturalistic view. In P. J. S. Olney (Ed.), *International Zoo Yearbook* (pp.49–53). Dorchester: The Zoological Society of London.

Yerke, R., & Burns, A. (1991). Measuring the impact of animal shows on visitor attitudes. Annual Proceedings of the American Association of Zoological Parks and Aquariums (pp. 532–534).

Yerke, R., & Burns, A. (1993). Evaluation of the educational effectiveness of an animal show outreach program for schools. *Annual Proceedings of the American Association of Zoological Parks and Aquariums* (pp. 366–368).

Yonemaru, K., Sakai, H., Asaoka, Y., Yanai, T., Fukushi, H., Watanabe, K. S., & Masegi, T. (2004). Proventricular adenocarcinoma in a Humboldt penguin (*Spheniscus humboldti*) and a great-horned owl (*Bubo virginianus*); identification of origin by mucin histochemistry. *Avian Pathology. 33* (1), 75 79.

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Appendix A: Accreditation Standards by Chapter

The following specific standards of care relevant to penguins are taken from the AZA Accreditation Standards and Related Policies (AZA, 2011) and are referenced fully within the chapters of this animal care manual:

General Information

(1.1.1) The institution must comply with all relevant local, state, and federal laws and regulations, including those specific to wildlife. It is understood that, in some cases, AZA accreditation standards are more stringent than existing laws and regulations. In these cases the AZA standard must be met.

Chapter 1

(1.5.7) The animals must be protected from weather, and any adverse environmental conditions.

(10.2.1) Critical life-support systems for the animals, including but not limited to plumbing, heating, cooling, aeration, and filtration, must be equipped with a warning mechanism, and emergency backup systems must be available. All mechanical equipment must be kept in working order and should be under a preventative maintenance program as evidenced through a recordkeeping system. Special equipment should be maintained under a maintenance agreement, or a training record should show that staff members are trained for specified maintenance of special equipment.

(1.5.9) The institution must have a regular program of monitoring water quality for fish, pinnipeds, cetaceans, and other aquatic animals. A written record must be maintained to document long-term water quality results and chemical additions.

Chapter 2

(1.5.1) Animals should be presented in a manner reflecting modern zoological practices in exhibit design, balancing animals' functional welfare requirements with aesthetic and educational considerations.

(1.5.2) All animals must be housed in enclosures and in appropriate groupings which meet their physical, psychological, and social needs. Wherever possible and appropriate, animals should be provided the opportunity to choose among a variety of conditions within their environment. Display of single animals should be avoided unless biologically correct for the species.

(10.3.3) All animal enclosures (exhibits, holding areas, hospital, and quarantine/isolation) must be of a size and complexity sufficient to provide for the animal's physical, social, and psychological well-being; and exhibit enclosures must include provisions for the behavioral enrichment of the animals. AZA housing guidelines outlined in the Animal Care Manuals should be followed.

(10.3.4) When sunlight is likely to cause overheating of or discomfort to the animals, sufficient shade (in addition to shelter structures) must be provided by natural or artificial means to allow all animals kept outdoors to protect themselves from direct sunlight.

(11.3.3) Special attention must be given to free-ranging animals so that no undue threat is posed to either the institution's animals, the free-ranging animals, or the visiting public. Animals maintained where they will be in contact with the visiting public must be carefully monitored, and treated humanely at all times.

(11.3.1) All animal exhibits and holding areas must be secured to prevent unintentional animal egress.

(2.8.1) Pest control management programs must be administered in such a manner that the animals, staff, and public are not threatened by the pests, contamination from pests, or the control methods used.

(11.3.6) In areas where the public is not intended to have contact with animals, some means of deterring public contact with animals (e.g., guardrails/barriers) must be in place.

(11.2.4) All emergency procedures must be written and provided to staff and, where appropriate, to volunteers. Appropriate emergency procedures must be readily available for reference in the event of an actual emergency.

(11.2.5) Live-action emergency drills must be conducted at least once annually for each of the four basic types of emergency (fire; weather/environment appropriate to the region; injury to staff or a visitor;

animal escape). Four separate drills are required. These drills must be recorded and evaluated to determine that procedures are being followed, that staff training is effective, and that what is learned is used to correct and/or improve the emergency procedures. Records of these drills must be maintained and improvements in the procedures documented whenever such are identified.

(11.6.2) Security personnel, whether staff of the institution, or a provided and/or contracted service, must be trained to handle all emergencies in full accordance with the policies and procedures of the institution. In some cases, it is recognized that Security personnel may be in charge of the respective emergency (i.e. shooting teams).

(11.2.6) The institution must have a communication system that can be quickly accessed in case of an emergency.

(11.2.7) A written protocol should be developed involving local police or other emergency agencies and include response times to emergencies.

(11.5.3) Institutions maintaining potentially dangerous animals (e.g. large carnivores, large reptiles, medium to large primates, large hoofstock, killer whales, sharks, venomous animals, and others, etc.) must have appropriate safety procedures in place to prevent attacks and injuries by these animals. Appropriate response procedures must also be in place to deal with an attack resulting in an injury. These procedures must be practiced routinely per the emergency drill requirements contained in these standards. Whenever injuries result from these incidents, a written account outlining the cause of the incident, how the injury was handled, and a description of any resulting changes to either the safety procedures or the physical facility must be prepared and maintained for five years from the date of the incident.

(11.5.2) All areas housing venomous animals, or animals which pose a serious threat of catastrophic injury and/or death (e.g. large carnivores, large reptiles, medium to large primates, large hoofstock, killer whales, sharks, venomous animals, and others, etc.) must be equipped with appropriate alarm systems, and/or have protocols and procedures in place which will notify staff in the event of a bite injury, attack, or escape from the enclosure. These systems and/or protocols and procedures must be routinely checked to insure proper functionality, and periodic drills must be conducted to insure that appropriate staff members are notified.

(11.5.1) Institutions maintaining venomous animals must have appropriate antivenin readily available, and its location must be known by all staff members working in those areas. An individual must be responsible for inventory, disposal/replacement, and storage of antivenin.

Chapter 3

(1.5.11) Animal transportation must be conducted in a manner that is safe, well-planned and coordinated, and minimizes risk to the animal(s), employees, and general public. All applicable laws and/or regulations must be adhered to. Planning and coordination for animal transport requires good communication among all involved parties, plans for a variety of emergencies and contingencies that may arise, and timely execution of the transport. At no time should the animal(s) or people be subjected to unnecessary risk or danger.

(1.5.10) Temporary, seasonal and traveling live animal exhibits (regardless of ownership or contractual arrangements) must meet the same accreditation standards as the institution's permanent resident animals.

Chapter 5

(2.6.2) The institution should have a written nutrition program that meets the behavioral and nutritional needs of all species, individuals, and colonies/groups in the institution. Animal diets must be of a quality and quantity suitable for each animal's nutritional and psychological needs.

(2.6.1) Animal food preparations must meet all applicable laws and regulations.

(2.6.3) The institution should assign at least one person to oversee appropriate browse material for the collection.

Chapter 6

(2.1.1) A full-time staff veterinarian is recommended. In cases where such is not practical, a consulting/part-time veterinarian must be under written contract to make at least twice monthly inspections of the animals and to respond as soon as possible to any emergencies.

(2.1.2) So that indications of disease, injury, or stress may be dealt with promptly, veterinary coverage must be available to the animal collection 24 hours a day, 7 days a week.

(2.2.1) Written, formal procedures must be available to the animal care staff for the use of animal drugs for veterinary purposes, and appropriate security of the drugs must be provided.

(1.4.6) A staff member must be designated as being responsible for the institution's animal record-keeping system. That person must be charged with establishing and maintaining the institution's animal records, as well as with keeping all animal care staff members apprised of relevant laws and regulations regarding the institution's animals.

(1.4.7) Animal records must be kept current, and data must be logged daily.

(1.4.5) At least one set of the institution's historical animal records must be stored and protected. Those records should include permits, titles, declaration forms, and other pertinent information.

(1.4.4) Animal records, whether in electronic or paper form, including health records, must be duplicated and stored in a separate location.

(1.4.3) Animals must be identifiable, whenever practical, and have corresponding ID numbers. For animals maintained in colonies/groups or other animals not considered readily identifiable, the institution must provide a statement explaining how record keeping is maintained.

(1.4.1) An animal inventory must be compiled at least once a year and include data regarding acquisitions and dispositions at the institution.

(1.4.2) All species owned by the institution must be listed on the inventory, including those animals on loan to and from the institution. In both cases, notations should be made on the inventory.

(2.7.1) The institution must have holding facilities or procedures for the quarantine of newly arrived animals and isolation facilities or procedures for the treatment of sick/injured animals.

(2.7.3) Quarantine, hospital, and isolation areas should be in compliance with standards/guidelines contained within the *Guidelines for Zoo and Aquarium Veterinary Medical Programs and Veterinary Hospitals* developed by the American Association of Zoo Veterinarians (AAZV), which can be obtained at: http://www.aazv.org/associations/6442/files/veterinary_standards_2009_final.docx.

(2.7.2) Written, formal procedures for quarantine must be available and familiar to all staff working with quarantined animals.

(11.1.2) Training and procedures must be in place regarding zoonotic diseases.

(11.1.3) A tuberculin (TB) testing/surveillance program must be established for appropriate staff in order to ensure the health of both the employees and the animals. Each institution must have an employee occupational health and safety program.

(2.5.1) Deceased animals should be necropsied to determine the cause of death. Cadavers must be stored in a dedicated storage area. Disposal after necropsy must be done in accordance with local/federal laws.

(2.4.1) The veterinary care program must emphasize disease prevention.

(1.5.5) For animals used in offsite programs and for educational purposes, the institution must have adequate protocols in place to protect the rest of the animals at the institution from exposure to infectious agents.

(2.3.1) Capture equipment must be in good working order and available to authorized, trained personnel at all times.

(2.4.2) Keepers should be trained to recognize abnormal behavior and clinical signs of illness and have knowledge of the diets, husbandry (including enrichment items and strategies), and restraint procedures required for the animals under their care. However, keepers should not diagnose illnesses nor prescribe treatment.

(2.3.2) Institution facilities should have radiographic equipment or have access to radiographic services.

(1.5.8) The institution must develop a clear process for identifying, communicating, and addressing animal welfare concerns within the institution in a timely manner, and without retribution.

Chapter 8

(1.6.1) The institution must have a formal written enrichment and training program that promotes species-appropriate behavioral opportunities.

(1.6.2) The institution must have specific staff member(s) or committee assigned for enrichment program oversight, implementation, training, and interdepartmental coordination of enrichment efforts.

Chapter 9

(1.5.4) A written policy on the use of live animals in programs must be on file. Animals in education programs must be maintained and cared for by trained staff, and housing conditions must meet standards set for the remainder of the animals in the institution, including species-appropriate shelter, exercise, social and environmental enrichment, access to veterinary care, nutrition, etc. Since some of these requirements can be met outside of the primary enclosure, for example, enclosures may be reduced in size provided that the animal's physical and psychological needs are being met.

(1.5.3) If animal demonstrations are part of the institution's programs, an educational/conservation message must be an integral component.

(1.5.5) For animals used in offsite programs and for educational purposes, the institution must have adequate protocols in place to protect the rest of the animals at the institution from exposure to infectious agents.

(10.3.3) All animal enclosures (exhibits, holding areas, hospital, and quarantine/isolation) must be of a size and complexity sufficient to provide for the animal's physical, social, and psychological well-being; and exhibit enclosures must include provisions for the behavioral enrichment of the animals. AZA housing guidelines outlined in the Animal Care Manuals should b e followed.

(1.5.2) All animals must be housed in enclosures and in appropriate groupings which meet their physical, psychological, and social needs. Wherever possible and appropriate, animals should be provided the opportunity to choose among a variety of conditions within their environment. Display of single animals should be avoided unless biologically correct for the species.

(1.5.11) Animal transportation must be conducted in a manner that is safe, well-planned and coordinated, and minimizes risk to the animal(s), employees, and general public. All applicable laws and/or regulations must be adhered to. Planning and coordination for animal transport requires good communication among all involved parties, plans for a variety of emergencies and contingencies that may arise, and timely execution of the transport. At no time should the animal(s) or people be subjected to unnecessary risk or danger.

Chapter 10

(5.3) The institution should maximize the generation of scientific knowledge gained from the animals. This might be achieved by participating in AZA TAG/SSP sponsored research when applicable, conducting original research projects, affiliating with local universities, and/or employing staff with scientific credentials.

(5.2) Institutions must have a written policy that outlines the type of research that it conducts, methods, staff involvement, evaluations, animals to be involved, and guidelines for publication of findings.

(5.1) Research activities must be under the direction of a person qualified to make informed decisions regarding research.

Appendix B: AZA Policy on Responsible Population Management: Acquisitions, Transfers and Transitions by Zoos & Aquariums

PREAMBLE

The Association of Zoos & Aquariums (AZA) was established, among other reasons, "...to foster continued improvement of the zoological park and aquarium profession through the development and regulation of high standards of ethics, conduct, education and scholarly attainments." The stringent requirements for AZA accreditation and high standards of professional conduct are unmatched by similar organizations and also far surpass the United States Department of Agriculture's Animal and Plant Health Inspection Service's requirements for licensed animal exhibitors. Every AZA member must abide by a Code of Professional Ethics (https://www.aza.org/Ethics/). In order to continue these high standards, AZA-accredited institutions and certified related facilities should make it a priority, when possible, to acquire animals from and transfer them to other AZA member institutions or other regional zoo associations and their members.

AZA-accredited institutions and certified related facilities cannot fulfill their important missions of conservation, education, and science without living animals. Responsible management and the long-term sustainability of living animal populations necessitates that some individuals be acquired and that others be transferred or transitioned at certain times. Furthermore, priority for acquisition and transfer activities should be the long-term sustainability of living animal populations among AZA-accredited and certified related facilities, and between AZA member institutions and non-AZA entities with animal care and welfare standards aligned with AZA. AZA member institutions that acquire animals from the wild, directly or through commercial vendors, should perform due diligence to ensure that zoos/aquariums are not creating a commercial market that promotes the taking of those animals from nature and/or that is detrimental to the survival of species in the wild. Animals should only be solicited and acquired from non-AZA entities that are known to operate legally and conduct their business in a manner that reflects and/or supports the spirit and intent of the AZA Code of Professional Ethics as well as this Policy.

In this Policy "AZA member institutions" refers to AZA-accredited institutions and certified related facilities (zoological parks and aquariums). "AZA members" may refer to either institutions or individuals.

Non – AZA entities includes facilities not accredited or certified by the AZA, facilities in other zoological regions, academic institutions, museums, research facilities, private individuals, etc.

I. INTRODUCTION

The AZA Acquisition, Transfer and Transition Policy was created to help (1) guide and support AZA-accredited and certified related facilities in their animal acquisition and transfer/transition decisions, and (2) make certain that all acquisitions and transfers/transitions are compatible with the Association's stated commitment to save and protect the wonders of the living natural world. This AZA Acquisition, Transfer and Transition Policy applies to individual animals, groups/colonies, and specimens (animal parts, materials, and products). More specifically, the AZA Acquisition, Transfer and Transition Policy provides guidance to AZA members to:

1. assure that the health and welfare of individual animals is considered during acquisition and transfer/transition activities,

Acquisition of animals can occur through breeding (births, hatchings, cloning, and division of marine invertebrates = "fragging"), trade, donation, lease, loan, transfer (inter- and intra-institution), purchase, collection, confiscation, appearing on zoo property, or rescue and/or rehabilitation for release.

Transfer/transition occurs when an animal leaves the institution for any reason. Reasons for transfer or transition may include cooperative population management (genetic, demographic or behavioral management), animal welfare or behavior management reasons (including sexual maturation and individual management needs). Types of transfer include withdrawal through donation, trade, lease, loan, inter- and intra-institution transfers, sale, escape, theft. Types of transition include reintroduction to the wild, humane euthanasia or natural death.

"Dispose/Disposing of" in this document is limited to complete and permanent removal of an individual via incineration, burying or other means of permanent destruction.

2. assure that the health and conservation of populations, species, and ecosystems are carefully considered during acquisition and transfer/transition activities,

3. maintain a proper standard of conduct for AZA members during acquisition and transfer/transition activities, including adherence to all applicable laws and regulations,

4. assure that animals from AZA member institutions and certified related facilities are not transferred to individuals or organizations that lack the appropriate expertise or facilities to care for them [*see taxa specific appendices (in development)*], and

5. support the goals of AZA's cooperatively managed populations and associated Animal Programs [Species Survival Plans® (SSPs), Studbooks, and Taxon Advisory Groups (TAGs)].

Attempts by members to circumvent AZA Animal Programs in the acquisition of animals can be detrimental to the Association and its Animal Programs. Such action may also be detrimental to the species involved and may be a violation of the Association's Code of Professional Ethics.

AZA's scientifically-managed Animal Programs, including SSPs, have successfully bred and reintroduced critically endangered species for the benefit of humankind. To accomplish these critical conservation goals, populations must be managed within "carrying capacity" limits. At times, the number of individual animals in a population exceeds carrying capacity, and while meaning no disrespect for these individual animals, we refer to these individual animals as "extra" within the managed population.

This AZA Acquisition, Transfer and Transition Policy will serve as the default policy for AZA member institutions. Institutions may develop their own Acquisition, Transfer and Transition Policy in order to address specific local concerns. Any institutional policy must incorporate and not conflict with the AZA acquisition and transfer/transition standards.

II. LAWS, AUTHORITY, RECORD-KEEPING, IDENTIFICATION AND DOCUMENTATION

Examples of specimens include animal parts, materials and products including bodily fluids, cell lines, clones, digestive content, DNA, feces, marine invertebrate (coral) fragments ("frags"), germplasm, and tissues

The following must be considered with regard to the acquisition or transfer/transition of all living animals and specimens (their living and non-living parts, materials, and/or products):

1. Any acquisitions, transfers, and transitions must meet the requirements of all applicable local, state, federal and international laws and regulations. Ownership and any applicable chain-of-custody must be documented. If such information does not exist, an explanation must be provided regarding such animals and specimens. Any acquisition of free-ranging animals must be done in accordance with all local, state, federal, and international laws and regulations and must not be detrimental to the long-term viability of the species in the wild.

2. The Director/Chief Executive Officer of the institution must have final authority for all acquisitions and transfers/transitions.

3. Acquisitions or transfers/transitions must be documented through institutional record keeping systems. The ability to identify which animal is being transferred is very important and the method of identifying the animal should be documented. Any existing documentation must accompany all transfers. To standardize institutional animal records data, records guidelines have been developed for certain species (https://www.aza.org/AnimalCare/detail.aspx?id=3150).

Examples of colonial, group-living, or prolific species include and are not limited to certain terrestrial and aquatic invertebrates, fish, sharks/rays, amphibians, reptiles, birds, rodents, bats, big herds, and other mammals,

4. For some colonial, group-living, or prolific species, it may be impossible or highly impractical to identify individual animals when these individuals are maintained in a group. When considered as a group, these species are therefore maintained, acquisitioned, transferred, and transitioned as a group or colony, or as part of a group or colony.

5. If the intended use of specimens is to create live animal(s), their acquisition and transfer should follow the same guidelines. If germplasm is acquired or transferred with the intention of creating live animal(s), ownership of the offspring must be clearly defined in transaction documents (e.g., breeding loan agreements).

   Institutions acquiring, transferring, transitioning or disposing of specimens should consider current and possible future uses as new technologies become available. All specimens from which nuclear DNA could be recovered should be carefully considered as these basic DNA extraction technologies already exist.

6. AZA member institutions must maintain transaction documents (e.g., confirmation forms, breeding agreements) which provide the terms and conditions of animal acquisitions, transfers and loans, including documentation for animal parts, products and materials. These documents should require the potential recipient or provider to adhere to the AZA Acquisition, Transfer and Transition Policy, all relevant AZA and member policies, procedures and guidelines, and the AZA Code of Professional Ethics, and must require compliance with the applicable laws and regulations of local, state, federal, and international authorities.

7. In the case of animals (living or non-living) and their parts, materials, or products (living or non-living) held on loan, the owner's written permission should be obtained prior to any transfer and should be documented in the institutional records.

8. AZA SSP and TAG necropsy and sampling protocols should be accommodated.

9. Some governments maintain ownership of the species found within their borders. It is therefore incumbent on institutions to determine whether animals they are acquiring or transferring are owned by a government entity, foreign or domestic, and act accordingly by reviewing the government ownership policies available on the AZA website. In the case of government owned animals, proposals for and/or notifications of transfers must be sent to the species manager for the government owned species.

> Transaction documents must be signed by the authorized representatives of both parties, and copies must be retained by both parties*. In the case of loans, the owner's permission for appropriate activities should be documented in the institutional records. This document(s) should be completed prior to any transfer. In the case of rescue, confiscation, and evacuation due to natural disasters, it is understood that documents may not be available until after acceptance or shipping. In this case documentation (e.g., a log) must be kept to reconcile the inventory and chain of custody after the event occurs.
>
> *In the case of government owned animals, notification of transfers must be sent to species manager for the government owned species.

III. ACQUISITION REQUIREMENTS

A. General Acquisitions

1. Acquisitions must be consistent with the mission of the institution, as reflected in its Institutional Collection Plan, by addressing its exhibition/education, conservation, and/or scientific goals.

2. Animals (wild, feral, and domestic) may be held temporarily for reasons such as assisting governmental agencies or other institutions, rescue and/or rehabilitation, research, propagation or headstarting for reintroduction, or special exhibits.

> Feral animals are animals that have escaped from domestication or have been abandoned to the wild and have become wild, and the offspring of such animals. Feral animals may be acquired for temporary or permanent reasons.

3. Any receiving institution must have the necessary expertise and resources to support and provide for the professional care and management of the species, so that the physical, psychological, and social needs of individual animals and species are met.

4. If the acquisition involves a species managed by an AZA Animal Program, the institution should communicate with the Animal Program Leader and, in the case of Green SSP Programs, must adhere to the AZA Full Participation Policy (http://www.aza.org/full-participation-in-ssp-program-policy/).

5. AZA member institutions should consult AZA Wildlife Conservation and Management Committee (WCMC)-approved TAG Regional Collection Plans (RCPs), Animal Program Leaders, and AZA Animal Care Manuals (ACMs) when making acquisition decisions.

6. AZA member institutions that work with commercial vendors that acquire animals from the wild, must perform due diligence to assure the vendors' collection of animals is legal. Commercial vendors should have conservation and animal welfare goals similar to those of AZA institutions.

7. AZA member institutions may acquire animals through public donations and other non-AZA entities when it is in the best interest of the animal and/or species.

B. Acquisitions from the Wild

Saving species and wild animal populations for education and wildlife conservation purposes is a unique responsibility of AZA member zoos and aquariums. The AZA recognizes that there are circumstances where acquisitions from the wild are needed in order to maintain healthy, diverse animal populations and to support the objectives of managed species programs, in which case acquisitions from the wild may be a preferable choice to breeding in human care.

Acquiring animals from the wild can result in socioeconomic benefit and environmental protection and therefore the AZA encourages environmentally sustainable/beneficial acquisition from the wild when conservation is a positive outcome.

1. Before acquiring animals from the wild, institutions are encouraged to examine alternative sources including other AZA institutions and other regional zoological associations or other non-AZA entities.

2. When acquiring animals from the wild, both the long-term health and welfare impacts on the wild population as well as on individual animals must be considered. In crisis situations, when the survival of a population is at risk, rescue decisions will be made on a case-by-case basis by the appropriate agency and institution.

3. Institutions should only accept animals from the wild after a risk assessment determines the zoo/aquarium can mitigate any potential adverse impacts on the health, care and maintenance of the permanently housed animals, and the animals being acquired.

> The Lacey Act prohibits the importation, exportation, transportation, sale, receipt, acquisition or purchase of wildlife taken or possessed in violation of any law, treaty or regulation of the United States or any Indian tribal law of wildlife law.
>
> In cases when there is no documentation accompanying an acquisition, the animal(s) may not be transferred across state lines. If the animal was illegally acquired at any time then any movement across state or international borders would be a violation of the Lacey Act.

IV. TRANSFER AND TRANSITION REQUIREMENTS

A. Living Animals

Successful conservation and animal management relies on the cooperation of many entities, both AZA and non-AZA. While preference is given to placing animals with AZA-accredited institutions or certified related facilities, it is important to foster a cooperative culture among those who share AZA's mission of saving species.

> Attempts by members to circumvent AZA Animal Programs in the transfer or transition of animals may be detrimental to the Association and its Animal Programs (unless the animal or animals are deemed extra in the Animal Program population by the Animal Program Coordinator). Such action may be detrimental to the species involved and may be a violation of the Association's Code of Professional Ethics.

1. Any transfer must abide by the Mandatory Standards and General Advisories of the AZA Code of Professional Ethics which indicates that AZA members should assure that all animals in their care are transferred and transitioned in a manner that meets the standards of the Association, and that animals are not transferred or transitioned to those not qualified to care for them properly.

2. If the transfer of animals or their specimens (parts, materials, and products) involves a species managed by an AZA Animal Program, the institution should communicate with that Animal Program Leader and, in the case of Green SSP Programs must adhere to the AZA Full Participation Policy (http://www.aza.org/full-participation-in-ssp-program-policy/).

3. AZA member institutions should consult WCMC-approved TAG Regional Collection Plans, Animal Program Leaders, and Animal Care Manuals when making transfer decisions.

4. Animals acquired as animal feed are not typically accessioned into the collection. There may be occasions, however, when it is appropriate to use accessioned animals that exceed population carrying capacity as feeder animals to support other animals. In some cases, accessioned animals may be transitioned to "feeder animal" status by the local institution as part of their program for long-term sustained population management of the species.

5. In transfers to non-AZA entities, AZA members must perform due diligence and should have documented validation, such as a letter of reference, that the recipient has the expertise and resources required to properly care for and maintain the animals. Supporting documentation must be kept at the AZA member institution.

Examples of documentation include ZIMS records, "Breeding Loan" agreements, chain-of-custody logs, letters of reference, transfer agreements, and transaction documents

6. Domestic animals should be transferred in accordance with locally acceptable farm practices, including auctions, and subject to all relevant laws and regulations.

Examples of domestic animals may include certain camelids, cattle, cats, dogs, ferrets, goats, pigs, reindeer, rodents, sheep, budgerigars, chickens, doves, ducks, geese, pheasants, turkeys, and goldfish or koi.

7. AZA members must not send any non-domestic animal to auction or to any organization or individual that may display or sell the animal at an animal auction. *See certain taxa-specific appendices to this Policy (in development) for information regarding exceptions.*

8. Animals must not be sent to organizations or individuals that allow the hunting of these individual animals; that is, no animal from an AZA institution may be hunted. For purposes of maintaining sustainable zoo and aquarium populations, AZA-accredited institutions and certified related facilities may send animals to non-AZA organizations or individuals. These non-AZA entities (for instance, ranching operations) should follow appropriate ranch management practices and other conservation minded practices to support population sustainability.

9. Every loaning institution must annually monitor and document the conditions of any loaned specimen(s) and the ability of the recipient(s) to provide proper care. If the conditions and care of animals are in violation of the loan agreement, the loaning institution must recall the animal or assure prompt correction of the situation. Furthermore, an institution's loaning policy must not be in conflict with this AZA Acquisition, Transfer and Transition Policy.

10. If living animals are sent to a non-AZA entity for research purposes, it must be a registered research facility by the U.S. Department of Agriculture and accredited by the Association for the Assessment & Accreditation of Laboratory Animal Care, International (AAALAC), if eligible. For international transactions, the receiving facility must be registered by that country's equivalent body having enforcement over animal welfare. In cases where research is conducted, but governmental oversight is not required, institutions should do due diligence to assure the welfare of the animals during the research.

11. Transition: reintroductions and release to the wild. The reintroduction of animals must meet all applicable local, state, and international laws and regulations. Reintroductions may be a part of a recovery program and must be compatible with the IUCN Reintroduction Specialist Group's Reintroduction Guidelines (http://www.iucnssc rsg.org/index.php).

Examples of "Transition" include movements of animals from zoo/aquarium populations to the wild through reintroductions or other legal means, or the transition of an animal from living to dead.

12. Transition: humane euthanasia. Humane euthanasia may be employed for medical reasons to address quality of life issues for animals or to prevent the transmission of disease. AZA also recognizes that humane euthanasia may be employed for managing the demographics, genetics, and diversity of animal populations. Humane euthanasia must be performed in accordance with the established euthanasia policy of the institution and follow the recommendations of current AVMA Guidelines for the Euthanasia of Animals (2013 Edition https://www.avma.org/KB/Policies/Documents/euthanasia.pdf) or the AAZV's Guidelines on the Euthanasia of Non-Domestic Animals.

B. Non-Living Animals and Specimens

AZA members should optimize the use and recovery of animal remains. All transfers must meet the requirements of all applicable laws and regulations.

1. Optimal recovery may include performing a complete necropsy including, if possible, histologic evaluation of tissues which should be a key component of optimal recovery before specimens' use in education/exhibits. AZA SSP and TAG necropsy and sampling protocols should be accommodated. This information should be available to SSP Programs for population management.

It is best practice for modern zoos and aquariums to establish relationships with nearby museums or other biorepositories, so that they can maximize the value of animals when they die (e.g., knowing who to call when they have an animal in necropsy, or specimens for cryopreservation).

Natural history museums that are members of the Natural Science Collections Alliance (NSCA) and frozen biorepositories that are members of the International Society of Biological and Environmental Repositories (ISBER) are potential collaborators that could help zoos find appropriate repositories for biological specimens.

2. The educational use of non-living animals, parts, materials, and products should be maximized, and their use in Animal Program sponsored projects and other scientific projects that provide data for species management and/or conservation must be considered.

3. Non-living animals, if handled properly to protect the health of the recipient animals, may be utilized as feeder animals to support other animals as deemed appropriate by the institution.

4. AZA members should consult with AZA Animal Program Leaders prior to transferring or disposing of remains/samples to determine if existing projects or protocols are in place to optimize use.

When specimens are transferred, the transferring and receiving institutions should agree on data that must be transferred with the specimen(s). Examples of associated documentation include provenance of the animal, original permits, tags and other metadata, life history data for the animal, how and when specimens were collected and conserved, etc.

5. AZA member institutions should develop agreements for the transfer or donation of non-living animals, parts, materials, products, and specimens and associated documentation, to non-AZA entities such as universities and museums. These agreements should be made with entities that have appropriate long term curation/collections capacity and research protocols, or needs for educational programs and/or exhibits.

Appendix C: Recommended Quarantine Procedures

Quarantine facility: A separate quarantine facility, with the ability to accommodate mammals, birds, reptiles, amphibians, and fish should exist. If a specific quarantine facility is not present, then newly acquired animals should be isolated from the established collection in such a manner as to prohibit physical contact, to prevent disease transmission, and to avoid aerosol and drainage contamination.

Such separation should be obligatory for primates, small mammals, birds, and reptiles, and attempted wherever possible with larger mammals such as large ungulates and carnivores, marine mammals, and cetaceans. If the receiving institution lacks appropriate facilities for isolation of large primates, pre-shipment quarantine at an AZA or American Association for Laboratory Animal Science (AALAS) accredited institution may be applied to the receiving institutions protocol. In such a case, shipment must take place in isolation from other primates. More stringent local, state, or federal regulations take precedence over these recommendations.

Quarantine length: Quarantine for all species should be under the supervision of a veterinarian and consist of a minimum of 30 days (unless otherwise directed by the staff veterinarian). Mammals: If during the 30-day quarantine period, additional mammals of the same order are introduced into a designated quarantine area, the 30-day period must begin over again. However, the addition of mammals of a different order to those already in quarantine will not have an adverse impact on the originally quarantined mammals. Birds, Reptiles, Amphibians, or Fish: The 30-day quarantine period must be closed for each of the above Classes. Therefore, the addition of any new birds into a bird quarantine area requires that the 30-day quarantine period begin again on the date of the addition of the new birds. The same applies for reptiles, amphibians, or fish.

Quarantine personnel: A keeper should be designated to care only for quarantined animals or a keeper should attend quarantined animals only after fulfilling responsibilities for resident species. Equipment used to feed and clean animals in quarantine should be used only with these animals. If this is not possible, then equipment must be cleaned with an appropriate disinfectant (as designated by the veterinarian supervising quarantine) before use with post-quarantine animals.

Institutions must take precautions to minimize the risk of exposure of animal care personnel to zoonotic diseases that may be present in newly acquired animals. These precautions should include the use of disinfectant foot baths, wearing of appropriate protective clothing and masks in some cases, and minimizing physical exposure in some species; e.g., primates, by the use of chemical rather than physical restraint. A tuberculin testing/surveillance program must be established for zoo/aquarium employees in order to ensure the health of both the employees and the animal collection.

Quarantine protocol: During this period, certain prophylactic measures should be instituted. Individual fecal samples or representative samples from large numbers of individuals housed in a limited area (e.g., birds of the same species in an aviary or frogs in a terrarium) should be collected at least twice and examined for gastrointestinal parasites. Treatment should be prescribed by the attending veterinarian. Ideally, release from quarantine should be dependent on obtaining two negative fecal results spaced a minimum of two weeks apart either initially or after parasiticide treatment. In addition, all animals should be evaluated for ectoparasites and treated accordingly.

Vaccinations should be updated as appropriate for each species. If the animal arrives without a vaccination history, it should be treated as an immunologically naive animal and given an appropriate series of vaccinations. Whenever possible, blood should be collected and sera banked. Either a 70 °C (-94 °F) frost-free freezer or a 20 °C (-4 °F) freezer that is not frost-free should be available to save sera. Such sera could provide an important resource for retrospective disease evaluation.

The quarantine period also represents an opportunity to, where possible, permanently identify all unmarked animals when anesthetized or restrained (e.g., tattoo, ear notch, ear tag, etc.). Also, whenever animals are restrained or immobilized, a complete physical, including a dental examination, should be performed. Complete medical records should be maintained and available for all animals during the quarantine period. Animals that die during quarantine should have a necropsy performed under the supervision of a veterinarian and representative tissues submitted for histopathologic examination.

Quarantine procedures: Penguins should be quarantine for a minimum of 30 days unless otherwise directed by the staff veterinarian. It may be extended problems are diagnosed. It can be shortened if examination has shown no problems and it is behaviorally necessary for the well-being of the animals.

If additional birds are introduced during the quarantine period, the quarantine must begin again. However, the addition of animals besides birds may not require the re-initiation of the quarantine period. If the new additions do not show signs of infectious disease, the first set of animals may clear quarantine without re-examination

Separate facilities are recommended to accommodate newly acquired birds, or birds that must be separated from the group for health-related reasons. This area should have air and water systems separate from the main exhibit. It can serve as an isolation area if not in use for quarantine. An area without separate air and water systems should not be considered an appropriate quarantine or isolation area .. If possible, two or more birds should be quarantined together because of their social needs.. If this is not possible, efforts should be made for quarantined birds to have visual or auditory contact with other penguins. Designated keepers should care only for quarantined animals if possible. If keepers must care for both quarantined and resident animals of the same taxa, they should care for the quarantined animals only after caring for the resident animals. Any equipment or enrichment items used for quarantined animals should be used only with these animals. If this is not possible, then all items must be appropriately disinfected, as designated by the veterinarian supervising quarantine, before being use elsewhere. Standard disinfection with quaternary ammonium or bleach is adequate unless a mycobacterial disease is suspected, in which case ammonium-based products are not suitable. Phenolics can be used but can be corrosive. Enrichment items that are not easily cleaned can be thrown out and replaced if needed (infectious disease diagnosed or suspected).

AZA institutions must have zoonotic disease prevention procedures and training protocols established to minimize the risk of transferable diseases (AZA Accreditation Standard 11.1.2) with all animals, including those newly acquired in quarantine. Although transmission of tuberculosis from penguins to humans is not of concern, penguins an potentially carry gastrointestinal bacteria that cause disease in people. A separate set of Personal Protective Equipment (PPE) should be worn when handling or cleaning quarantined animals. This includes outerwear such as washable or disposable smocks, aprons, overalls or gowns, surgical masks, gloves and a separate set of boots or shoe covers.

Recommended minimum quarantine space, pool, and temperature recommendations are listed in space recommendations (Chapter 2). Use non-abrasive flooring or matting if at all possible.

Quarantine veterinary procedures: During the quarantine period, a complete physical examination and specific diagnostic tests should be conducted for each animal (see Appendix C). .. Animals should be permanently identified during quarantine if not already, Animals should be evaluated for ectoparasites and gastrointestinal parasites, and treated accordingly. Blood should be collected, analyzed and the sera banked long-term in either a -70 °C freezer or short-term in -20 °C freezer (frost-free or self-defrosting freezer should not be used because of the freeze-thaw cycles) for retrospective evaluation. Vaccinations should be updated as appropriate, and if the vaccination history is not known, the animal should be treated as immunologically naive and given the appropriate series of vaccinations. Detailed medical records for each animal should be maintained and easily available

Release from quarantine should be contingent upon normal results from diagnostic testing, and three negative fecal parasite exams and fecal/cloacal cultures that are spaced a minimum of 1 week apart. If at all possible, radiographs should be taken to establish a baseline reference for each individual and to check for evidence of disease, gastrointestinal foreign bodies, or evidence of previous trauma (fractures).

Aspergillus prevention: Aspergillosis is a severe fungal disease and often affects penguins under stress. In addition to receiving anti-fungals prior to shipment (AZA standard 6.3), animals should also receive it for at least 2 weeks after arrival into quarantine until they are acclimated to their new surroundings.

The following are recommendations and suggestions for appropriate quarantine procedures for penguins:

Penguin (Spheniscidae):

Required:

1. Direct and floatation fecals
2. Vaccinate as appropriate

Strongly recommended:

1. CBC/sera profile
2. Urinalysis
3. Appropriate serology (FIP, FeLV, FIV)
4. Heartworm testing in appropriate species

Appendix D: Program Animal Policy and Position Statement

Program Animal Policy

Originally approved by the AZA Board of Directors—2003
Updated and approved by the Board—July 2008 & June 2011

The Association of Zoos & Aquariums (AZA) recognizes many benefits for public education and, ultimately, for conservation in program animal presentations. AZA's Conservation Education Committee's *Program Animal Position Statement* summarizes the value of program animal presentations (see pages 42–44).

For the purpose of this policy, a Program Animal is defined as "an animal whose role includes handling and/or training by staff or volunteers for interaction with the public and in support of institutional education and conservation goals." Some animals are designated as Program Animals on a full-time basis, while others are designated as such only occasionally. Program Animal-related Accreditation Standards are applicable to all animals during the times that they are designated as Program Animals.

There are three main categories of Program Animal interactions:

1. On Grounds with the Program Animal Inside the Exhibit/Enclosure:
    a. Public access outside the exhibit/enclosure. Public may interact with animals from outside the exhibit/enclosure (e.g., giraffe feeding, touch tanks).
    b. Public access inside the exhibit/enclosure. Public may interact with animals from inside the exhibit/enclosure (e.g., lorikeet feedings, 'swim with' programs, camel/pony rides).
2. On Grounds with the Program Animal Outside the Exhibit/Enclosure:
    a. Minimal handling and training techniques are used to present Program Animals to the public. Public has minimal or no opportunity to directly interact with Program Animals when they are outside the exhibit/enclosure (e.g., raptors on the glove, reptiles held "presentation style").
    b. Moderate handling and training techniques are used to present Program Animals to the public. Public may be in close proximity to, or have direct contact with, Program Animals when they're outside the exhibit/enclosure (e.g., media, fund raising, photo, and/or touch opportunities).
    c. Significant handling and training techniques are used to present Program Animals to the public. Public may have direct contact with Program Animals or simply observe the in-depth presentations when they're outside the exhibit/enclosure (e.g., wildlife education shows).
3. Off Grounds:
    a. Handling and training techniques are used to present Program Animals to the public outside of the zoo/aquarium grounds. Public may have minimal contact or be in close proximity to and have direct contact with Program Animals (e.g., animals transported to schools, media, fund raising events).

These categories assist staff and accreditation inspectors in determining when animals are designated as Program Animals and the periods during which the Program Animal-related Accreditation Standards are applicable. In addition, these Program Animal categories establish a framework for understanding increasing degrees of an animal's involvement in Program Animal activities.

Program animal presentations bring a host of responsibilities, including the safety and welfare of the animals involved, the safety of the animal handler and public, and accountability for the take-home, educational messages received by the audience. Therefore, AZA requires all accredited institutions that make program animal presentations to develop an institutional program animal policy that clearly identifies and justifies those species and individuals approved as program animals and details their long-term management plan and educational program objectives.

AZA's accreditation standards require that education and conservation messages must be an integral component of all program animal presentations. In addition, the accreditation standards require that the

conditions and treatment of animals in education programs must meet standards set for the remainder of the animal collection, including species-appropriate shelter, exercise, appropriate environmental enrichment, access to veterinary care, nutrition, and other related standards. In addition, providing program animals with options to choose among a variety of conditions within their environment is essential to ensuring effective care, welfare, and management. Some of these requirements can be met outside of the primary exhibit enclosure while the animal is involved in a program or is being transported. For example, free-flight birds may receive appropriate exercise during regular programs, reducing the need for additional exercise. However, the institution must ensure that in such cases, the animals participate in programs on a basis sufficient to meet these needs or provide for their needs in their home enclosures; upon return to the facility the animal should be returned to its species-appropriate housing as described above.

Program Animal Position Statement

Last revision 1/28/03
Re-authorized by the Board June 2011

The Conservation Education Committee (CEC) of the Association of Zoos and Aquariums supports the appropriate use of program animals as an important and powerful educational tool that provides a variety of benefits to zoo and aquarium educators seeking to convey cognitive and affective (emotional) messages about conservation, wildlife and animal welfare.
Utilizing these animals allows educators to strongly engage audiences. As discussed below, the use of program animals has been demonstrated to result in lengthened learning periods, increased knowledge acquisition and retention, enhanced environmental attitudes, and the creation of positive perceptions concerning zoo and aquarium animals.

Audience Engagement

Zoos and aquariums are ideal venues for developing emotional ties to wildlife and fostering an appreciation for the natural world. However, developing and delivering effective educational messages in the free-choice learning environments of zoos and aquariums is a difficult task.
Zoo and aquarium educators are constantly challenged to develop methods for engaging and teaching visitors who often view a trip to the zoo as a social or recreational experience (Morgan & Hodgkinson, 1999). The use of program animals can provide the compelling experience necessary to attract and maintain personal connections with visitors of all motivations, thus preparing them for learning and reflection on their own relationships with nature.

Program animals are powerful catalysts for learning for a variety of reasons. They are generally active, easily viewed, and usually presented in close proximity to the public. These factors have proven to contribute to increasing the length of time that people spend watching animals in zoo exhibits (Bitgood, Patterson & Benefield, 1986, 1988; Wolf & Tymitz, 1981).

In addition, the provocative nature of a handled animal likely plays an important role in captivating a visitor. In two studies (Povey, 2002; Povey & Rios, 2001), visitors viewed animals three and four times longer while they were being presented in demonstrations outside of their enclosure with an educator than while they were on exhibit. Clearly, the use of program animals in shows or informal presentations can be effective in lengthening the potential time period for learning and overall impact.

Program animals also provide the opportunity to personalize the learning experience, tailoring the teaching session to what interests the visitors. Traditional graphics offer little opportunity for this level of personalization of information delivery and are frequently not read by visitors (Churchman, 1985; Johnston, 1998). For example, Povey (2001) found that only 25% of visitors to an animal exhibit read the accompanying graphic; whereas, 45% of visitors watching the same animal handled in an educational presentation asked at least one question and some asked as many as seven questions. Having an animal accompany the educator allowed the visitors to make specific inquiries about topics in which they were interested.

Knowledge Acquisition

Improving our visitors' knowledge and understanding regarding wildlife and wildlife conservation is a fundamental goal for many zoo educators using program animals. A growing body of evidence supports the validity of using program animals to enhance delivery of these cognitive messages as well.

- MacMillen (1994) found that the use of live animals in a zoomobile outreach program significantly enhanced cognitive learning in a vertebrate classification unit for sixth grade students.
- Sherwood and his colleagues (1989) compared the use of live horseshoe crabs and sea stars to the use of dried specimens in an aquarium education program and demonstrated that students made the greatest cognitive gains when exposed to programs utilizing the live animals.
- Povey and Rios (2002) noted that in response to an open-ended survey question ("Before I saw this animal, I never realized that . . . "), visitors watching a presentation utilizing a program animal provided 69% cognitive responses (i.e., something they learned) versus 9% made by visitors viewing the same animal in its exhibit (who primarily responded with observations).
- Povey (2002) recorded a marked difference in learning between visitors observing animals on exhibit versus being handled during informal presentations. Visitors to demonstrations utilizing a raven and radiated tortoises were able to answer questions correctly at a rate as much as eleven times higher than visitors to the exhibits.

Enhanced Environmental Attitudes

Program animals have been clearly demonstrated to increase affective learning and attitudinal change.

- Studies by Yerke and Burns (1991), and Davison and her colleagues (1993) evaluated the effect live animal shows had on visitor attitudes. Both found their shows successfully influenced attitudes about conservation and stewardship.
- Yerke and Burns (1993) also evaluated a live bird outreach program presented to Oregon fifth-graders and recorded a significant increase in students' environmental attitudes after the presentations.
- Sherwood and his colleagues (1989) found that students who handled live invertebrates in an education program demonstrated both short and long-term attitudinal changes as compared to those who only had exposure to dried specimens.
- Povey and Rios (2002) examined the role program animals play in helping visitors develop positive feelings about the care and well-being of zoo animals.
- As observed by Wolf and Tymitz (1981), zoo visitors are deeply concerned with the welfare of zoo animals and desire evidence that they receive personalized care.

Conclusion

Creating positive impressions of aquarium and zoo animals, and wildlife in general, is crucial to the fundamental mission of zoological institutions. Although additional research will help us delve further into this area, the existing research supports the conclusion that program animals are an important tool for conveying both cognitive and affective messages regarding animals and the need to conserve wildlife and wild places.

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References

Bitgood, S., Patterson, D., & Benefield, A. (1986). Understanding your visitors: ten factors that influence visitor behavior. *Annual Proceedings of the American Association of Zoological Parks and Aquariums* (pp. 726–743).

Bitgood, S., Patterson, D., & Benefield, A. (1988). Exhibit design and visitor behavior. *Environment and Behavior, 20*(4), 474–491.

Churchman, D. (1985). How and what do recreational visitors learn at zoos? *Annual Proceedings of the American Association of Zoological Parks and Aquariums* (pp.160–167).

Conway, W. (1995). Wild and zoo animal interactive management and habitat conservation. *Biodiversity and Conservation, 4*, 573–594.

Davison, V. M., McMahon, L., Skinner, T. L., Horton, C. M., & Parks, B. J. (1993). Animals as actors: take 2. *Annual Proceedings of the American Association of Zoological Parks and Aquariums* (pp. 150–155).

Johnston, R. J. (1998). Exogenous factors and visitor behavior: a regression analysis of exhibit viewing time. *Environment and Behavior, 30*(3), 322–347.

MacMillen, O. (1994). Zoomobile effectiveness: sixth graders learning vertebrate classification. *Annual Proceedings of the American Association of Zoological Parks and Aquariums* (pp. 181–183).

Morgan, J. M., & Hodgkinson, M. (1999). The motivation and social orientation of visitors attending a contemporary zoological park. *Environment and Behavior, 31*(2), 227–239.

Povey, K. D. (2002). Close encounters: the benefits of using education program animals. *Annual Proceedings of the Association of Zoos and Aquariums* (pp. 117–121).

Povey, K. D., & Rios, J. (2002). Using interpretive animals to deliver affective messages in zoos. *Journal of Interpretation Research, 7*, 19–28.

Sherwood, K. P., Rallis, S. F., & Stone, J. (1989). Effects of live animals vs. preserved specimens on student learning. *Zoo Biology, 8*, 99–104.

Wolf, R. L., & Tymitz, B. L. (1981). Studying visitor perceptions of zoo environments: a naturalistic view. In P. J. S. Olney (Ed.), *International Zoo Yearbook* (pp. 49–53). Dorchester: The Zoological Society of London.

Yerke, R., & Burns, A. (1991). Measuring the impact of animal shows on visitor attitudes. *Annual Proceedings of the American Association of Zoological Parks and Aquariums* (pp. 532–534).

Yerke, R., & Burns, A. (1993). Evaluation of the educational effectiveness of an animal show outreach program for schools. *Annual Proceedings of the American Association of Zoological Parks and Aquariums* (pp. 366–368).

Appendix E: Developing an Institutional Program Animal Policy

Last revision 2003
Re-authorized by the Board, June 2011

Rationale

Membership in AZA requires that an institution meet the AZA Accreditation Standards collectively developed by our professional colleagues. Standards guide all aspects of an institution's operations; however, the accreditation commission has asserted that ensuring that member institutions demonstrate the highest standards of animal care is a top priority. Another fundamental AZA criterion for membership is that education be affirmed as core to an institution's mission. All accredited public institutions are expected to develop a written education plan and to regularly evaluate program effectiveness.

The inclusion of animals (native, exotic, and domestic) in educational presentations, when done correctly, is a powerful tool. CEC's **Program Animal Position Statement** describes the research underpinning the appropriate use of program animals as an important and powerful educational tool that provides a variety of benefits to zoo and aquarium educators seeking to convey cognitive and affective messages about conservation and wildlife.

Ongoing research, such as AZA's Multi-Institutional Research Project (MIRP) and research conducted by individual AZA institutions will help zoo educators to determine whether the use of program animals conveys intended and/or conflicting messages and to modify and improve programs accordingly and to ensure that all program animals have the best possible welfare.

When utilizing program animals our responsibility is to meet both our high standards of animal care and our educational goals. Additionally, as animal management professionals, we must critically address both the species' conservation needs and the welfare of the individual animal. Because "wild creatures differ endlessly," in their forms, needs, behavior, limitations and abilities (Conway, 1995), AZA, through its Animal Welfare Committee, has recently given the responsibility to develop taxon- and species-specific animal welfare standards and guidelines to the Taxon Advisory Groups (TAG) and Species Survival Plan® Program (SSP). Experts within each TAG or SSP, along with their education advisors, are charged with assessing all aspects of the taxons' and/or species' biological and social needs and developing Animal Care Manuals (ACMs) that include specifications concerning their use as program animals.

However, even the most exacting standards cannot address the individual choices faced by each AZA institution. Therefore, each institution is required to develop a program animal policy that articulates and evaluates program benefits. The following recommendations are offered to assist each institution in formulating its own Institutional Program Animal Policy, which incorporates the AZA Program Animal Policy and addresses the following matters.

The Policy Development Process

Within each institution, key stakeholders should be included in the development of that institution's policy, including, but not limited to representatives from:

- The Education Department
- The Animal Husbandry Department
- The Veterinary and Animal Health Department
- The Conservation & Science Department
- The Behavioral Husbandry Department
- Any animal show staff (if in a separate department)
- Departments that frequently request special program animal situations (e.g., special events, development, marketing, zoo or aquarium society, administration)

Additionally, staff from all levels of the organization should be involved in this development (e.g., curators, keepers, education managers, interpreters, volunteer coordinators).
To develop a comprehensive Program Animal Policy, we recommend that the following components be included:

I. Philosophy

In general, the position of the AZA is that the use of animals in up close and personal settings, including animal contact, can be extremely positive and powerful, as long as:

1. The use and setting is appropriate.
2. Animal and human welfare is considered at all times.
3. The animal is used in a respectful, safe manner and in a manner that does not misrepresent or degrade the animal.
4. A meaningful conservation message is an integral component. Read the AZA Board-approved Conservation Messages.
5. Suitable species and individual specimens are used.

Institutional program animal policies should include a philosophical statement addressing the above, and should relate the use of program animals to the institution's overall mission statement.

II. Appropriate Settings

The Program Animal Policy should include a listing of all settings both on and off site, where program animal use is permitted. This will clearly vary among institutions. Each institution's policy should include a comprehensive list of settings specific to that institution. Some institutions may have separate policies for each setting; others may address the various settings within the same policy. Examples of settings include:

1. On-site programming
    a. Informal and non-registrants:
        i. On-grounds programming with animals being brought out (demonstrations, lectures, parties, special events, and media)
        ii. Children's zoos and contact yards
        iii. Behind-the-scenes open houses
        iv. Shows
        v. Touch pools
    b. Formal (registration involved) and controlled settings
        i. School group programs
        i. Summer camps
        ii. Overnights
        iii. Birthday parties
        iv. Animal rides
        v. Public animal feeding programs
    c. Offsite and outreach
        i. PR events (TV, radio)
        ii. Fundraising events
        iii. Field programs involving the public
        iv. School visits
        v. Library visits
        vi. Nursing home visits (therapy)
        vii. Hospital visits
        viii. Senior centers
        ix. Civic group events

In some cases, policies will differ from setting to setting (e.g., on-site and off-site use with media). These settings should be addressed separately, and should reflect specific animal health issues, assessment of distress in these situations, limitations, and restrictions.

III. Compliance with Regulations

All AZA institutions housing mammals are regulated by the USDA's Animal Welfare Act. Other federal regulations, such as the Marine Mammal Protection Act, may apply. Additionally, many states, and some cities, have regulations that apply to animal contact situations. Similarly, all accredited institutions are bound by the AZA Code of Professional Ethics. It is expected that the Institution Program Animal Policy address compliance with appropriate regulations and AZA Accreditation Standards.

IV. Collection Planning

AZA accredited institutions should have a collection planning process in place. Program animals are part of an institution's overall collection and must be included in the overall collection planning process. The AZA Guide to Accreditation contains specific requirements for the institution collection plan. For more information about collection planning in general, please see the Collection Management pages in the Members Only section.

The following recommendations apply to program animals:

1. Listing of approved program animals (to be periodically amended as collection changes). Justification of each species should be based upon criteria such as:
    a. Temperament and suitability for program use
    b. Husbandry requirements
    c. Husbandry expertise
    d. Veterinary issues and concerns
    e. Ease and means of acquisition / disposition according to the AZA code of ethics
    f. Educational value and intended conservation message
    g. Conservation Status
    h. Compliance with TAG and SSP guidelines and policies
2. General guidelines as to how each species (and, where necessary, for each individual) will be presented to the public, and in what settings
3. The collection planning section should reference the institution's acquisition and disposition policies.

V. Conservation Education Message

As noted in the AZA Accreditation Standards, if animal demonstrations are part of an institution's programs, an educational and conservation message must be an integral component. The Program Animal Policy should address the specific messages related to the use of program animals, as well as the need to be cautious about hidden or conflicting messages (e.g., "petting" an animal while stating verbally that it makes a poor pet). This section may include or reference the AZA Conservation Messages.

Although education value and messages should be part of the general collection planning process, this aspect is so critical to the use of program animals that it deserves additional attention. In addition, it is highly recommended to encourage the use of biofacts in addition to or in place of the live animals. Whenever possible, evaluation of the effectiveness of presenting program animals should be built into education programs.

VI. Human Health and Safety

The safety of our staff and the public is one of the greatest concerns in working with program animals. Although extremely valuable as educational and affective experiences, contact with animals poses certain risks to the handler and the public. Therefore, the human health and safety section of the policy should address:

1. Minimization of the possibility of disease transfer from non-human animals to humans, and vice-versa (e.g., hand washing stations, no touch policies, use of hand sanitizer).
2. Safety issues related to handlers' personal attire and behavior (e.g., discourage or prohibit use of long earrings, perfume and cologne, not eating or drinking around animals, smoking, etc.).

AZA's Animal Contact Policy provides guidelines in this area; these guidelines were incorporated into accreditation standards in 1998.

VII. Animal Health and Welfare

Animal health and welfare are the highest priority of AZA accredited institutions. As a result, the Institutional Program Animal Policy should make a strong statement on the importance of animal welfare. The policy should address:

1. General housing, husbandry, and animal health concerns (e.g. that the housing and husbandry for program animals meets or exceeds general AZA standards and that the physical, social and psychological needs of the individual animal, such as adequate rest periods, provision of enrichment, visual cover, contact with conspecifics as appropriate, etc., are accommodated).
2. Where ever possible provide a choice for animal program participation, e.g., retreat areas for touch tanks or contact yards, evaluation of willingness/readiness to participate by handler, etc.)

3. The empowerment of handlers to make decisions related to animal health and welfare; such as withdrawing animals from a situation if safety or health is in danger of being compromised.
4. Requirements for supervision of contact areas and touch tanks by trained staff and volunteers.
5. Frequent evaluation of human / animal interactions to assess safety, health, welfare, etc.
6. Ensure that the level of health care for the program animals is consistent with that of other animals in the collection.
7. Whenever possible have a "cradle to grave" plan for each program animal to ensure that the animal can be taken care of properly when not used as a program animal anymore.
8. If lengthy "down" times in program animal use occur, staff should ensure that animals accustomed to regular human interactions can still maintain such contact and receive the same level of care when not used in programs.

VIII. Taxon Specific Protocols

We encourage institutions to provide taxonomically specific protocols, either at the genus or species level, or the specimen, or individual, level. Some taxon-specific guidelines may affect the use of program animals. To develop these, institutions refer to the Conservation Programs Database.

Taxon and species -specific protocols should address:

1. How to remove the individual animal from and return it to its permanent enclosure, including suggestions for operant conditioning training.
2. How to crate and transport animals.
3. Signs of stress, stress factors, distress and discomfort behaviors.

Situation specific handling protocols (e.g., whether or not animal is allowed to be touched by the public, and how to handle in such situations):

1. Guidelines for disinfecting surfaces, transport carriers, enclosures, etc. using environmentally safe chemicals and cleaners where possible.
2. Animal facts and conservation information.
3. Limitations and restrictions regarding ambient temperatures and or weather conditions.
4. Time limitations (including animal rotation and rest periods, as appropriate, duration of time each animal can participate, and restrictions on travel distances).
5. The number of trained personnel required to ensure the health and welfare of the animals, handlers and public.
6. The level of training and experience required for handling this species
7. Taxon/species-specific guidelines on animal health.
8. The use of hand lotions by program participants that might touch the animals

IX. Logistics: Managing the Program

The Institutional Policy should address a number of logistical issues related to program animals, including:

1. Where and how the program animal collection will be housed, including any quarantine and separation for animals used off-site.
2. Procedures for requesting animals, including the approval process and decision-making process.
3. Accurate documentation and availability of records, including procedures for documenting animal usage, animal behavior, and any other concerns that arise.

X. Staff Training

Thorough training for all handling staff (keepers, educators, and volunteers, and docents) is clearly critical. Staff training is such a large issue that many institutions may have separate training protocols and procedures. Specific training protocols can be included in the Institutional Program Animal Policy or reference can be made that a separate training protocol exists.

It is recommended that the training section of the policy address:

1. Personnel authorized to handle and present animals.
2. Handling protocol during quarantine.

3. The process for training, qualifying and assessing handlers including who is authorized to train handlers.
4. The frequency of required re-training sessions for handlers.
5. Personnel authorized to train animals and training protocols.
6. The process for addressing substandard performance and noncompliance with established procedures.
7. Medical testing and vaccinations required for handlers (e.g., TB testing, tetanus shots, rabies vaccinations, routine fecal cultures, physical exams, etc.).
8. Training content (e.g., taxonomically specific protocols, natural history, relevant conservation education messages, presentation techniques, interpretive techniques, etc.).
9. Protocols to reduce disease transmission (e.g., zoonotic disease transmission, proper hygiene and hand washing requirements, as noted in AZA's Animal Contact Policy).
10. Procedures for reporting injuries to the animals, handling personnel or public.
11. Visitor management (e.g., ensuring visitors interact appropriately with animals, do not eat or drink around the animal, etc.).

XI. Review of Institutional Policies

All policies should be reviewed regularly. Accountability and ramifications of policy violations should be addressed as well (e.g., retraining, revocation of handling privileges, etc.). Institutional policies should address how frequently the Program Animal Policy will be reviewed and revised, and how accountability will be maintained.

XII. TAG and SSP Recommendations

Following development of taxon-specific recommendations from each TAG and SSP, the institution policy should include a statement regarding compliance with these recommendations. If the institution chooses not to follow these specific recommendations, a brief statement providing rationale is recommended.

Appendix F: Nutrient Composition of Fish

	Capelin	Herring	Marine smelt	Freshwater smelt	Rainbow trout	Krill	Squid
Dry Matter (%)	19.9 ± 1.02	27.8 ± 3.51	23.9 ± 4.40	19.3 ± 3.70	27.5 ± 1.80	14.0 ± 6.58	22.9 ± 2.01
Energy (kcal/g)	5.4 ± 0.29	6.0 ± 0.38	5.6 ± 0.73	5.3 ± 0.22	5.9 ± 0.25	4.7 ± 0.79	5.1 ± 0.25
Crude Protein (%)	65.7 ± 5.03	56.6 ± 5.00	62.7 ± 6.40	66.9 ± 5.00	55.2 ± 2.95	54.6 ± 12.18	66.8 ± 2.29
Crude Fat (%)	15.3 ± 4.01	30.6 ± 7.04	19.4 ± 10.3	15.2 ± 4.30	29.6 ± 6.60	25.1 ± 5.66	13.7 ± 7.00
Calcium (%)	1.5 ± 0.23	2.0 ± 0.42	2.9 ± 1.43	2.3 ± 0.96	2.0 ± 0.31	1.6 ± 0.22	0.2 ± 0.15
Phosphorus (%)	1.6 ± 0.20	1.7 ± 0.28	2.4 ± 0.98	1.8 ± 0.61	1.7 ± 0.25	1.5 ± 0.13	1.0 ± 0.38
Magnesium (%)	0.2 ±0.07	0.2 ± 0.04	0.2 ± 0.09	0.1 ± 0.06	0.1 ± 0.02	0.4 ± 0.07	0.2 ± 0.10
Potassium (%)	1.4 ±0.18	1.2 ± 0.16	1.5 ± 0.50	1.1 ± 0.28	1.1 ± 0.16	0.6 ± 0.37	1.3 ± 0.43
Sodium (%)	1.1 ± 0.53	0.8 ± 0.28	0.8 ± 0.46	0.5 ± 0.28	0.4 ± 0.16	1.7 ± 0.64	1.4 ± 0.56
Iron (ppm)	46.5 ±13.65	67.0 ±11.44	57.9 ± 29.97	29.8 ±11.14	50.5 ± 22.4	58.9 ± 22.50	77.7 ± 69.46
Copper (ppm)	2.8 ±1.13	4.3 ± 2.32	4.0 ± 3.55	6.1 ± 2.42	5.4 ±1.46	82.8 ± 28.23	133.5 ± 45.5
Zinc (ppm)	59.2 ±17.4	57.1 ±11.85	109.1 ± 50.94	83.8 ± 24.40	109.3 ± 45.3	63.1 ± 28.23	89.6 ± 22.93
Manganese (ppm)	1.6 ± 0.51	6.01 ± 2.63	6.4 ± 2.93	6.5 ± 1.58	4.2 ± 1.25	3.0 ± 0.06	2.2 ± 0.88
Molybdenum (ppm)	0.6 ± 0.36	0.8 ± 0.19	1.3 ± 0.55	0.7 ± 0.27	0.7 ± 0.13	N/A	1.0 ± 0.34
Vitamin A (IU/g)	29.3 ± 3.50	19.6 ± 4.56	68.3 ± 16.16	44.5 ± 15.12	62.1 ± 22.14	45.3 ± 35.6	45.7 ± 35.46
Vitamin E (IU/g)	17.5 ± 1.45	10.8 ± 1.46	21.5 ± 6.05	44.0 ± 8.08	32.1 ± 6.18	79.3 ± 36.4	79.2 ± 38.4
Total wt FA (g/kg)	14.6 ± 5.13	22.7 ± 8.46	17.8 ± 7.82	14.3 ± 5.49	20.9 ± 7.49	17.8 ± 8.79	12.8 ± 4.28
Saturated (% of FA)	16.9 ± 2.26	23.5 ± 4.17	24.4 ± 2.85	22.4 ± 0.87	24.6 ± 1.4	10.66	22.9 ± 3.21
MUFA (% of FA)	34.8 ± 3.33	37.9 ± 4.49	36.8 ± 6.92	25.8 ± 3.45	31.3 ± 4.2	8.92	19.8 ± 4.40
PUFA (% of FA)	19.8 ± 4.38	18.2 ± 5.94	23.6 ± 6.02	35.9 ± 3.38	29.8 ± 2.25	7.90	40.6 ± 4.81
Total ω-6 (% of FA)	1.4 ± 0.45	1.9 ± 0.47	2.2 ± 0.80	8.3 ± 2.05	7.4 ± 1.49	3.23	2.2 ± 0.19
Total ω-3 (% of FA)	18.4 ± 4.14	16.3 ± 5.55	21.3 ± 5.54	27.6 ± 1.74	22.7 ± 2.67	12.35	38.4 ± 4.78
18: 2 ω-6 (% of FA)	1.0 ± 0.42	1.2 ± 0.31	0.9 ± 0.16	4.5 ± 1.39	6.0 ± 1.13	1.29	0.7 ± 0.14
20: 4 ω-6 (% of FA)	0.4 ± 0.12	0.7 ± 0.37	1.1± 0.56	3.7 ± 0.93	1.2 ± 0.38	1.18	1.5 ± 0.18
18: 3 ω-3 (% of FA)	0.4 ± 0.14	0.9 ± 0.26	0.5 ± 0.32	4.2 ± 1.83	1.3 ± 0.07	0.53	0.5 ± 0.09
20: 5 ω-3 (% of FA)	8.5 ± 1.83	7.4 ± 2.65	7.5 ± 2.69	8.2 ± 1.44	7.2 ± 1.28	5.59	12.5 ± 2.86
22: 6 ω-3 (% of FA)	8.7 ± 2.42	7.2 ± 3.10	9.6± 3.35	11.2 ± 1.80	10.9 ± 0.97	3.62	24.5 ± 2.00

Data from McClements (2007) except krill

Appendix G: Sample Maintenance Diets for Various Penguin Species

Penguin species	King		Rockhopper		Gentoo	Humboldt		African		Magellanic	Little blue	
Institution	A	B	C	B	D	E	F	G	H	A	D	C
Est. Amt/day/bird (g)	800	800	550	600	430	650	650	600	600	625	120	150
Fish type by percentage:												
Capelin	15	50	45	40	32.5	17	77	25	100	100	70	50
Herring	85			15	32.5	11	15	33.5				
Trout		50	15	15		57						20
Krill					17.5						15	
Silversides				10	17.5						15	
Sardines			5	10				16.5				
Squid								25				
Marine Smelt			35	10		15	8					30
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Supplements/bird/day:												
Mazuri Vita-Zu 5TLB1	1 tab									1 tab		
Mazuri Vita-Zu 5M23 (with Vit A)1					1 tab							
Mazuri Vita Zu 5TLC1												
Mazuri Vita Zu 5M25 (with Vit A)1						1 tab		1 tab	1 tab		1 tab	
Thiamin E Paste1		0.8 ml		0.6 ml								
Vitamin E			100 IU 3x/week									100 IU 1x/week
Thiamin			50 mg 3x/week									50 mg 3x/week
CVS Multivit2			0.5 tab 1x/week									0.25 tab 2x/week
CaCO3		1.4 g		1.1 g								
BZ Penguin vit 3							1 tab					

*The AZA Penguin TAG does not endorse any products mentioned.
1PMI Nutrition International. Brentwood, MO 63144
2CVS Corporation. Woonsocket, RI 02895
3Manufactured by Bomac Vets Plus, Inc. Knapp, WI 54749

Appendix H: Nutrient Composition of Sample Diets (Dry Matter Basis)

Species	King		Rockhopper		Gentoo	Humboldt		African		Magellanic	Little Blue	
Institution	A	B	C	B	D	E	F	G	H	A	D	C
Dry Matter (%)	26.70	23.70	22.94	23.85	22.17	25.71	21.42	25.55	19.90	19.90	19.62	22.62
Energy (kcal/g)	22.05	24.30	24.52	23.81	25.72	22.68	25.94	21.99	27.14	27.14	27.59	24.89
Crude Protein (%)	57.97	60.45	62.64	61.67	60.28	58.26	64.10	60.66	65.70	65.70	63.59	62.70
Crude Fat (%)	28.31	22.25	18.88	20.13	22.71	25.52	17.92	20.46	15.30	15.30	17.39	19.31
Calcium (%)	1.93	1.75	2.16	2.16	1.93	2.05	1.69	2.22	1.50	1.50	1.73	2.03
Phosphorus (%)	1.69	1.65	1.93	1.90	1.76	1.79	1.68	1.71	1.60	1.60	1.71	1.86
Magnesium (%)	0.20	0.15	0.19	0.19	0.24	0.14	0.20	0.20	0.20	0.20	0.23	0.18
Potassium (%)	1.23	1.25	1.39	1.36	1.21	1.22	1.38	1.29	1.40	1.40	1.30	1.37
Sodium (%)	0.85	0.75	0.88	0.88	1.06	0.62	1.03	0.97	1.10	1.10	1.15	0.87
Iron (ppm)	61.38	48.50	59.03	68.25	56.28	52.42	50.04	97.19	46.50	46.50	50.01	50.72
Copper (ppm)	4.08	4.10	4.02	3.69	17.50	4.63	3.12	25.12	2.80	2.80	14.98	4.63
Zinc (ppm)	57.42	84.25	85.08	78.16	67.93	95.01	62.88	68.00	59.20	59.20	67.27	84.20
Manganese (ppm)	5.35	2.90	4.04	4.31	4.12	4.29	2.65	4.66	1.60	1.60	2.53	3.75
Mo (ppm)	0.77	0.65	0.88	0.82	0.68	0.78	0.69	0.74	0.60	0.60	0.62	0.87
Vitamin A (IU/g)	20.81	48.59	51.90	40.39	80.10	68.67	37.24	31.44	46.76	30.00	77.47	57.31
Vitamin E (IU/g)	0.60	0.45	0.20	0.44	1.33	0.91	0.47	0.19	0.17	1.02	2.91	0.50
Thiamin (mg/g)	0.54	0.21	0.24	0.21	1.15	0.21	0.18	0.15	0.19	0.92	2.34	0.64
Saturated (g/kg)	50.20	40.25	37.14	39.03	39.37	47.04	32.05	39.38	24.80	24.80	27.58	37.17
MUFA (g/kg)	82.20	59.41	59.60	63.84	64.23	66.02	59.20	63.26	51.06	51.06	49.93	59.12
PUFA (g/kg)	39.98	48.35	41.12	40.93	34.87	52.60	32.61	43.09	29.05	29.05	29.81	41.23
Total ω-6 (g/kg)	4.13	9.81	5.18	4.57	3.77	10.72	2.70	3.29	2.10	2.10	2.81	5.88
Total ω-3 (g/kg)	35.92	38.87	34.98	34.49	32.61	42.19	29.93	35.42	27.00	27.00	28.45	35.42
18: 2 ω-6 (g/kg)	2.52	7.91	3.58	3.09	2.08	8.41	1.70	2.02	1.44	1.44	1.57	4.22
20: 4 ω-6 (g/kg)	1.48	1.70	1.59	1.61	1.43	2.06	0.92	1.78	0.60	0.60	1.02	1.50
18: 3 ω-3 (g/kg)	1.93	1.78	1.11	1.28	1.28	2.09	0.86	1.46	0.51	0.51	0.63	1.16
20: 5 ω-3 (g/kg)	16.45	14.20	14.07	15.13	14.11	14.78	13.77	17.51	12.97	12.97	12.52	13.59
22: 6 ω-3 (g/kg)	16.04	18.58	16.43	16.21	14.39	19.92	13.87	18.15	12.77	12.77	12.88	16.57

Appendix I: Institutions for *Aspergillus* Testing

University of Miami
Division of Comparative Pathology
1550 NW 10th Avenue, Room 105
Miami, Florida 33136
Phone: (305) 243-6927 or 800-596-7390
Fax: (305) 243-5662
Questions: Dr. Carolyn Cray

Elisa tests for both antibodies and galactomannan. Optional protein electrophoresis to aid diagnosis. Call for submission forms and shipping instructions.

Zoologix Inc.: www.zoologix.com
9811 Owensmouth Avenue
Suite 4
Chatsworth CA 91311-3800info@zoologix.com
Phone: (818) 717-8880
Fax: (818) 717-8881

Qualitative real-time PCR test for *Aspergillus fumigatus*. Recommended samples: throat or cloacal swab. Call to confirm specimen acceptability and shipping instructions.

Research Associates Laboratory
14556 Midway Rd.
Dallas, TX 75224
Phone: (972)-960-2221
Fax: (972)-960-1997

DNA-based real-time PCR for detection of *Aspergillus fumigatus* infection. Samples recommended: swab of trachea, air sac granuloma,

Sex Determination

Avian Biotech
1336 Timberlane Road
Tallahassee, FL 32312-1766
Phone: (850) 386-1145 or (800) 514-9672 (Office)
Fax: (850) 386-1146

Zoogen DNA Services
P.O. Box 1157
1046 Olive Drive, Ste. A
Davis, CA 95616
Phone: (530) 750-5757
Toll Free Tel: (800) 995-2473
Fax: (530) 750-5758
Email: zoogenservices@yahoo.com

Loyola Medical Center
2160 South First Avenue
Bldg. #101. RM #2718
Maywood, IL 60153
Phone: (708) 216-2341
Email: jeandubach@gmail.com

Sexing now can be done on feather shafts and eggshell membrane as well as whole blood.

Appendix J: Drugs Commonly Used in Penguin Species

Drug	Use
Terbinafine	Antifungal
Clotrimazole	Antifungal—nebulize
Voriconazole	Antifungal
Itraconazole **	Antifungal
Amoxicillin	Antibacterial
Cephalosporins	Antibacterial (may cause regurgitation in higher doses)
Ivermectin	Parasiticide
Pyrantel pamoate	Parasiticide
Fenbendazole	Parasiticide
Medroxyprogesterone	Molt Induction, suppression of egg-laying
Ibuprofen	Pain reliever (use with care because of renal toxicity)
Meloxicam	Pain relief (use with care because of renal toxicity)
Calcium EDTA	Chelation for heavy metal toxicity
Chloroquine	Malaria treatment
Primaquine	Malaria treatment or prevention
Mefloquine	Malaria treatment or prevention
Daraprim/sulfadiazine	Malaria prevention (compounded formulation)

Pharmocokenetic studies have not been done for most of these drugs in any of the penguin species. Therefore dosage and dosing interval for many of the drugs are empirical. Consult a formulary that includes avian species (Veterinary Drug Handbook by Dr. Donald Plumb, or the Exotic Animal Formulary by Dr. James Carpenter). Some dose and treatment regimens for certain species of penguins may be listed in the references.

** Commercial formulations of itraconazole should be used. Compounded formulations have been shown to have poorer absorption and may not reach therapeutic levels (Smith et al., 2010).

Appendix K: Product Information

1. Dri-Dek®, Kendall Products, 2706 South Horseshoe Drive, Maples, FL 33942 USA. http://www.dri-dek.com
2. Grumbach Incubators, Loher Straße 17, DE-35614 Asslar, Germany. http://www.grumbach-brutgeraete.de/english Lyon Technologies, Inc. is a dealer for supply and repair in North America. www.lyonusa.com
3. Trex® Trex Company, Inc., 160 Exeter Drive, Winchester, VA 22603-8605 USA. http://www.trex.com
4. Roll-X Incubators, Lyon Technologies, Inc., 1690 Brandywine Avenue, Chula Vista, CA 91911 USA. http://www.lyonusa.com
5. Brinsea® Incubators, Brinsea Products Inc., 704 N. Dixie Avenue, Titusville, FL 32796 USA. http://www.brinsea.com
6. R-com Incubators, Autoelex Co., Ltd., 612, Deokam-ri, Juchon-myeon, Grimhae city, Gyeongsangnam-do, Korea. www.autoelex.com (For USA distributor see also Lyon Technologies).
7. Betadine® Solution, Purdue Products L.P., One Stamford Forum, Stamford, CT 06901-3431 USA. http://www.betadine.com
8. PDI® Iodine Duo-Swab® Prep and Scrub SwabStick, PDI, Two Nice-Pak Park, Orangeburg, NY 10954 USA. http://www.pdipdi.com
9. Plexiglas® Acrylic Sheet, Altuglas International, Arkema Inc., 100 PA Route 413, Bristol, PA 190007, USA. www.plexiglas.com
10. The Original Cooler Brooder, Avey Incubator, PO Box 279, Hugo, CO 80821 USA. www.aveyincubator.com
11. AstroTurf roll mat, Grass Tech, S.P.R.L/B.V.B.A, 11, Rue Granbonpre, 1348 Louvain-la-Neuve, Belgium. http://www.astroturfmats.com
12. Con-Tact® Grip Ultra Shelf Liner, Kittrich Corporation, La Mirada, CA. Con-Tact shelf liner is widely available at kitchen and home stores.
13. Kendall Sovereign® Feeding Tube and Urethral Catheter, Tyco Healthcare Group LP, Mansfield, MA 02048 USA. Size 14 Fr (4.7 mm), length 16 in (41 cm). www.tycohealthcare.com
14. Hi-Intensity Egg Candler (Special Zoo Model), Lyon Technologies, Inc., 1690 Brandywine Avenue, Chula Vista, CA 91911 USA. www.lyonusa.com
15. Animal Intensive Care Unit, Lyon Technologies, Inc., 1690 Brandywine Avenue, Chula Vista, CA 91911 USA. www.lyonusa.com
16. Pedialyte®, Abbott Laboratories, 3300 Stelzer Road, Columbus, OH 43219-3034 USA. http://pedialyte.com
17. Mazuri® Vita-Zu Bird Tablet w/o Vitamin A, Land O' Lakes, PO Box 64101, Saint Paul, MN 55164-0101 USA. www.mazuri.com
18. Enfamil® Poly-vi-sol® Infant drops with iron, Mead Johnson Global Headquarters, 2701 Patriot Boulevard, Fourth Floor, Glenview, IL 60026 USA. www.enfamil.com
19. Tegaderm®, Tegaderm Brand Products, 3M Corporate Headquarters, 3M Center, St. Paul, MN 55144-1000 USA.

Appendix L: Penguin Chick Hand-rearing Diet (Formula)

Fish handling and preparation: Fish to be used for the making of Penguin Chick Hand Rearing Diet should be prepared in accordance with safe food handling procedures. Fish should be pulled in a semi-frozen condition straight from the air-thawed fish block. Similar preparation is recommended for krill. This assures the best fish quality for young chicks with naïve immune systems. The goal is to use the least thawed, more frozen fish, from the air-thawed blocks to avoid excessive warming of the food items during preparation. All fish items should be maintained at or below 4.4 °C (40 °F) during preparation.

Full Batch: Average volume pre-strain approximately 1.5 liters

440 g	5–7 in. long whole herring (with head, tail, fins & skin removed)
440 gm	Krill (squeeze water out after defrosting & before measuring)
600 ml	Filtered water
8 each	7.5 grain Brewer's yeast tablets
550 mg	B_1
1 each	5 lb Mazuri® Vita-Zu Bird tab w/o Vitamin A
4 each	10 grain calcium carbonate tablets
1200 IU	Vitamin E
2 cc	Poly-vi-sol® with iron

Blend ingredients thoroughly. Strain through a large colander. Keep refrigerated. Mark with date and time; use within 24 hours.

Prior to feeding, warm the diet using a reservoir of warm water to heat the formula to 35 °C (95 °F) just before feeding; if formula exceeds 37.8 °C (100 °F) during the heating process, discard and do not feed. It is recommended to stir in a pinch of ground B_1 (thiamine) powder to the diet prior to feeding. The powder can be made by grinding 100 mg B_1 tablets; mix one pinch per 30 cc warmed formula.

If a smaller volume of formula is needed within a 24-hour period a half portion can be prepared. Due to the vitamin formulation it is not recommended to make batches smaller than an half batch.

Half Batch: Average volume pre-strain approximately 850 cc

220 gm	5–7 in. whole herring (with head, tail, fins & skin removed)
220 gm	Krill (squeeze water out after defrosting & before measuring)
300 ml	Filtered tap water
4 each	7.5 gr. Brewer's yeast tablets
275 mg	B_1
1 each	2.5 lb Mazuri® Vita-Zu Bird tab w/o Vitamin A
2 each	10 grain calcium carbonate tablets
600 IU	Vitamin E
1 cc	Poly-vi-sol® with iron

Prepare as for Full Batch.

Appendix M: Penguin Chick Hand-rearing Protocols

The guidelines can be used for the Aptenodytes, but modifications must be made for the larger size of these chicks at each stage. The information contained is intended as a guideline only. It is recommended to review this entire document before undertaking to hand rear penguins. Depending on the physical plant, availability of products and materials, and the individual needs of chicks, modifications to these guidelines may be necessary.

Feeding: A note about fish preparation: Before preparing any other fish for the day, fish to be used in preparing the hand-rearing diet or to be used to feed chicks directly should be removed from the air-thawed blocks of fish in a semi-frozen state. Be vigilant for foreign objects often found in frozen fish. The fish should be placed in an appropriate container, topped with ice immediately and stored in the refrigerator. Krill should be prepared in the same way, so that it too is removed straight from the air-thawed block, placed in a separate container and topped with ice. When storing in the refrigerator, do not mix the krill with the fish. If, in the course of feeding during the day, additional food items are needed, it should be pulled from freshly thawing blocks of fish or krill. No fish should be used that has been prepared longer than 12 hours. Such preparation of the fish for use in formula or for feeding assures the best fish quality for young chicks whose guts are more sensitive. The goal is to use fish as freshly thawed as possible to avoid excessive warming of the constituent food items before use in formula or used for direct feeding. Proper fish handling is the foundation of good animal husbandry.

A note about formula storage and preparation: Prepared penguin formula should be stored in the refrigerator until use and will remain fresh for approximately 24 hours from the time it is made. The formula to be fed is heated prior to feeding. The recommended manner of heating formula is by setting the container of formula in hot (not boiling) water until the temperature reaches approximately 35 °C (95 °F). (For very young or finicky chicks, formula may need to be heated to 36.7 °C [98 °F]). Formula should be stirred continually during the heating process to prevent curdling. If curdling occurs, dispose of that formula. Do not boil. Do not reheat. Do not heat in microwave. The unused portion of heated formula should be discarded. When feeding several chicks, the formula container is placed in a warm water bath to maintain temperature for the duration of the feeding bout.

General intake guidelines: Feeding is based on a calculated percentage of the first daily or morning weight of the chick measured before the first feeding (e.g., if chick weighs 100 grams (3.5 oz.), the chick should be fed no more than 10 grams (0.35 oz.) per feeding. Chicks that are 3 days and under are generally fed much less than the calculated 10% because they are still using yolk and learning to eat). Treat chicks individually; the range in amounts listed for the first 3 days is due to the wide range in chicks' weights during this time, depending on species, from 60–120 g (2.1–4.2 oz.).

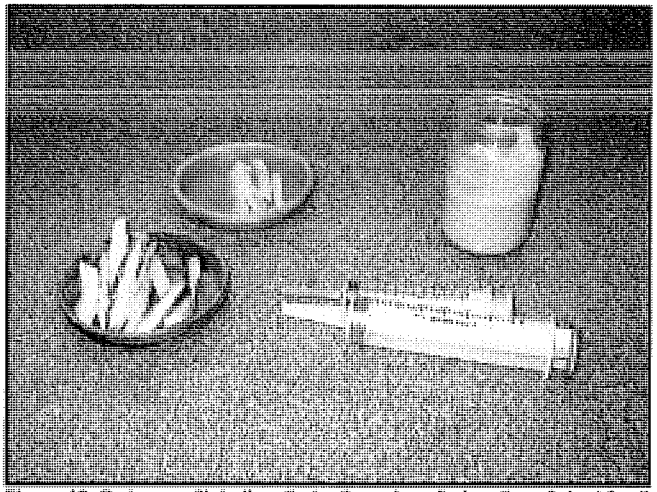

Figure 12. Syringes with both catheter tip and applied portion of short feeding tube along with baby food jar containing formula and dishes with pre-measured fish amounts.
Photo courtesy of Linda Henry.

Initial days of feeding

Day 1: 50:50 formula: water: 1–5 g (cc), but not to exceed the calculated 10% of the first daily weight total intake per feeding. (1 g formula=1 cc formula.) **Note:** Day 1 here is defined as the first day of feeding; this may differ from the chick's age where day 1 equals day of hatch. In these early days, the chick may still be absorbing yolk sac. This is an important factor in judging intake for young chicks—it is wise to be conservative.

Day 2: 75:25 ration of formula to water: 4–8 g (cc) total intake per feeding, not to exceed 10% of chick's first daily weight.

Day 3: Introduce straight formula: 4–10 g (cc) total intake per feeding, not to exceed 10% of chick's first daily weight. (If not well accepted, go back to a 75:25 ratio of formula: to water.)

Day 4 through Day 6: Try 10% of first daily weight total intake per feeding of straight formula - do not exceed. Use 10% of morning weight as a guide for each feeding's total intake. When the chick reaches 7 days of age, but not before reaching 100 g (3.5 oz.) first daily/morning weight, begin evaluating the chick for the ability to accept fish in the diet as described below.

7 days of age until chick achieves 500 grams first daily weight: At or about 7 days of age, but not before 100 g, first daily weight of the chick, evaluate adding fish to the diet. This evaluation should include the following: chick has been tolerating 100% (or full-strength) formula for three days; hydration is good; chick is bright, active and alert; fecal output is normal for chick's age; chick is thermoregulating appropriately for its age. Fish is most often introduced using herring filets cut into 2.5–3.8 cm (1–1.5 in.) x 0.6 cm (0.25 in.) pieces. Dip the fish or fish pieces in warm water just prior to feeding—this hydrates fish, warms it a little, and makes it easier for the chick to swallow. Gentoos usually begin fish at slightly greater than 100 g morning weight (approximately 110–115 g [3.9–4.1 oz.] morning weight) due to their larger hatch weights. Their first day on fish should not be any earlier than 7 days of age. Humboldts may also begin fish at greater than 100 g morning weight (between 100–200 g [3.5–7.1 oz.] first daily weight) because Humboldt penguins often have a longer readiness period to accept fish.

The guidelines for the amount of fish to be fed are as follows:

- **7 days of age:** Evaluate for fish introduction. If ready, give 3 g (0.1 oz.) fish once a day (SID) for the first day at the second feeding; fish is given in combination with formula to equal, but not exceed, 10% of the first daily weight.
- **2nd day on fish**: 3–5 g (0.1–0.2 oz.) maximum fish given twice a day (BID)—at second and fourth feedings—in combination with formula to equal, but not exceed, 10% of first daily weight
- **3rd day on fish**: 3–5 g (0.1–0.2 oz.) maximum fish given every other feeding in combination with formula to equal, but not exceed, 10% of first daily weight.
- **4th day on fish**: 3–5 g (0.1–0.2 oz.) maximum fish given every feeding in combination with formula to equal, but not exceed, 10% of first daily weight.
- **5th day on fish**: 5–7 g (0.2–0.25 oz.) maximum fish given every feeding in combination with formula to equal, but not exceed, 10% of first daily weight.
- **6th day on fish**: 7–10 g (0.25–0.35 oz.) maximum fish given every feeding in combination with formula to equal, but not exceed, 10% of first daily weight.

After 6 days of transitioning fish into the diet, fish amounts can be determined using the first daily weight as a guide:

- **300 g (10.5 oz.):** 10–15 g (0.35–0.5 oz.) fish every feeding maximum with formula to equal, but not exceed, 10% of first daily weight.
- **400 g (14 oz.):** Fish is 50% of total intake every feeding maximum in proportion with formula, not to exceed 10% of morning weight per feeding. Consider adding vitamin supplements at this time. **Note:** Heating formula to the full 35 °C (95 °F) becomes less critical as chick is consuming a higher percentage of cold fish. 32 °C (90 °F) is an acceptable formula temperature at this time.
- **500 g (18 oz.):** Decrease the number of feedings to 4 per day (QID), every 4 hours, at approximately 500 g (18 oz.) first morning weight. Let the chick's appetite guide you.

After the chick reaches approximately 600 g (21 oz.) or greater, and has been doing well on a 50:50 fish to formula diet ratio, then the feeding schedule may be altered to increase the percentage of fish in the diet.

Maintain the formula amount given at 30 cc, and then adding fish to make the feeding intake total equal to 10% of first daily weight. Water may be given as needed. The size of fish given can usually be increased at this time to include cut up herring and capelin chunks, including entrails. Fish size can progress gradually to whole capelin as chicks are able to accept it; herring is a dense-fleshed fish and may be difficult for younger birds to digest when given whole so use herring chunks a little longer before offering whole herring fish. Maintain formula at 30 cc of formula per feeding so that a natural transition occurs from formula to fish. As the chick grows the percentage of fish in the diet, relative to formula, will increase with increasing daily weights.

When chick is 1000 g (35 oz.) or greater at the first morning weight: Chicks may start to "wean" themselves from formula by refusing to feed from a syringe. Formula may be reduced to 15 cc four times per day. Formula is eventually reduced to 30 cc once a day and given at the first feeding when chick is most hungry. Formula will eventually be eliminated from the diet altogether. Fish fed to chicks that are not receiving formula should be dipped in water or hydrated by injecting water into the fish just prior to feeding. If this is not enough to hydrate chicks, an electrolyte replacement solution should be used.

Although chicks may be on four feedings per day, they may not eat the full amount of fish offered at each of those feedings, especially the fourth feeding of the day. Feeders should be thinking in terms of the total daily intake for each individual chick and whether chicks are maintaining proper weight gains. Be vigilant for early signs of illness or overheating at this time, which also will adversely affect a chick's appetite.

An additional reduction of numbers of feedings per day may also be indicated at around 1500 g (53 oz.). Chicks that are not hungry at the second feeding for several days are probably ready for three feedings per day, given about every 6 hours.

When chicks go to three times a day (TID) feedings monitor weight gains; birds may be reaching their asymptotic weight at this time. Chicks should still be eager to eat at each feeding. As chicks start to moult, they may not eat the full amount offered. Once chicks have completed moult and have reached a good, stable weight, fish may be fed on "demand" (or on the same schedule as the other birds in the primary penguin exhibit).

Note: As chicks progress through various feeding stages, they will respond differently. Sometimes chicks will not eat all food items offered at all feedings. Never force a chick to eat. Evaluate each chick individually and then determine the cause for inappetence. Information contained in the Chapters 6 Veterinary Care and 7 Reproduction have details on assessing chick health and vitality relative to hand rearing regimes.

There are typically two stages at which many chicks become finicky, at 500 g (18 oz.) for a day or two, and at 1,000 g (35 oz.) for several days (this often corresponds to head-shyness in *Spheniscus* at 30 days of age). Chicks may refuse food at one feeding or not eat full amounts at each feeding. Check for overheating. Evaluate the environment. If low appetite continues for more than one or two feedings, a veterinary exam should be scheduled. The chick may be ill. Once chicks molt into juvenile plumage and fledge they can be introduced to the primary colony. After birds are stable and well-integrated into the colony, vitamin supplementation can be consistent with adult maintenance vitamins.

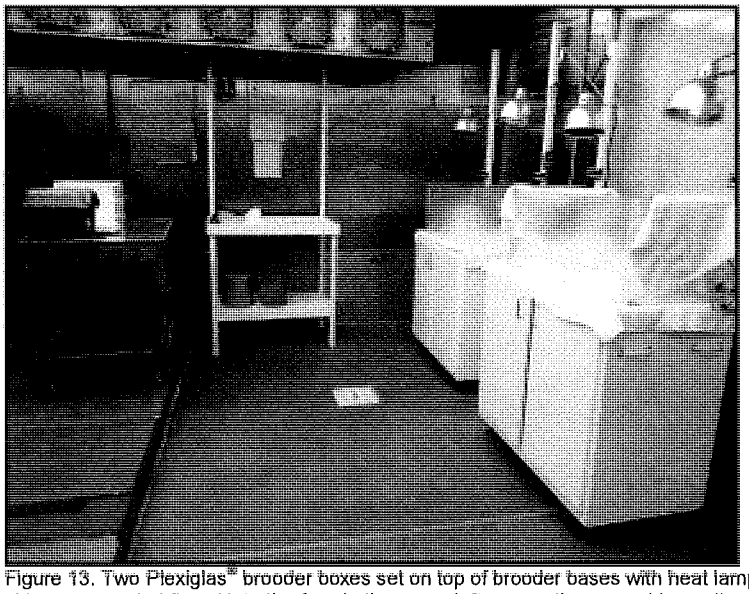

Figure 13. Two Plexiglas® brooder boxes set on top of brooder bases with heat lamps secured. Towels are draped over one or both sides to control airflow. Note the fans in the upper left corner; these provide cooling and good air movement. It is important that the room be cooled to offset the production of heat by the heat lamps. Lighting is provided by dimmable full-spectrum 40W fluorescent light bulbs. Photoperiod during the neonatal period is set to match exhibit parameters.
Photo courtesy of Linda Henry.

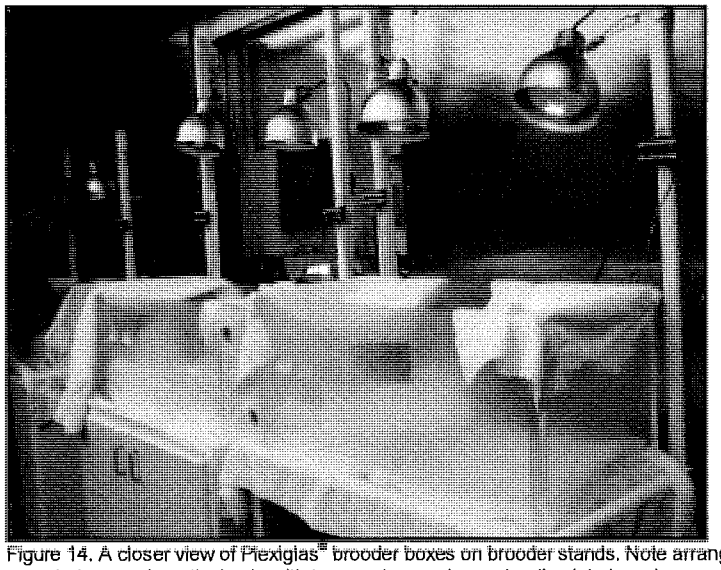

Figure 14. A closer view of Plexiglas® brooder boxes on brooder stands. Note arrangement of toweling inside. Digital readouts are mounted on each vertical pole with temperature probes extending into brooders.
Photo courtesy of Linda Henry

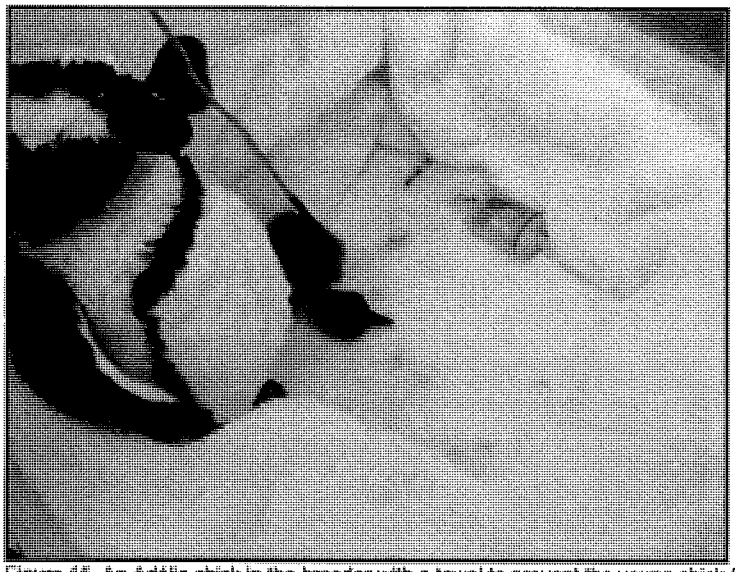

Figure 15. An Adélie chick in the brooder with a towel to prevent the young chick from wandering away from the heat source. A temperature probe and an Onset HOBO® temperature data logger have been placed in the brooder to record temperature variations. Photo courtesy of Linda Henry.

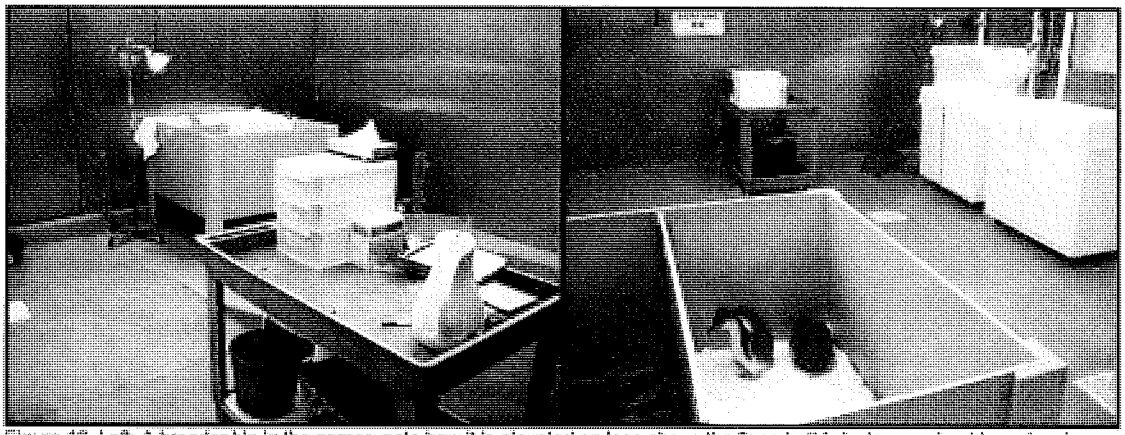

Figure 16. Left: A brooder bin in the corner; note how it is elevated on legs above the floor. In this instance a heat lamp has been provided on a portable stand; such provision of heat may be needed for some chicks during the initial transition to the bin following the end of the guard stage. Right: Gentoo chicks in one side of the divided bin with toweling over the rock substrate.
Photos courtesy of Linda Henry.

Penguin hand-rearing vitamin regimen: Recommended for small species (*Spheniscus magellanicus, S. humboldti, Pygoscelis adeliae, P. papua, P. antarctica, Eudyptes chrysolophus.*)

Early Vitamins: Provided in three ways in the formula: Poly-vi-sol® infant multi-vitamin, oral B-Comp, and oral B-1 tablets. See as follows:

- Just prior to feeding formula, stir in one pinch of ground 100 mg. B-1 and one pinch of ground B-Complex (B-50) per 100 cc formula prepared. Do this starting with the introduction of full strength formula until chick is 400 gm. at the first daily weight.
- 25 mg B-1 BID and 1/8 of a B-comp –BID beginning at 400 g first daily weight (or when the amount of fish fed is equal to or greater than the amount of formula fed) until 1000 g first daily weight.
- Poly-vi-sol® infant multivitamin drops (without iron) starting at 4 days of age through 1000 g first daily weight as outlined:

4 days of age:

250 g/ 8.8 oz. (a.m. weight):	0.10 cc Poly-vi-sol® drops SID
251–500 g /8.8–18 oz. (a.m. weight):	0.15 cc Poly-vi-sol® drops SID
501–750 g/ 18–26 oz. (a.m. weight):	0.20 cc Poly-vi-sol® drops SID
751–1000 g/ 26–35 oz. (a.m. weight):	0.25 cc Poly-vi-sol® drops SID

First daily weight = 1000 g (or when chick receives BID formula)

AM	1/2 children's multi-vitamin 1/8 tablet 10 grain Calcium carbonate 50 mg. B-1
PM	100 I.U. Vitamin E EOD 25 mg. B-Complex (1/2 tablet B-50) 1/8 tablet 10 grain Calcium carbonate

First daily weight = 2000 g (or greater)

AM	1 children's multi-vitamin 1/8 tablet 10 grain Calcium carbonate 50 mg. B-1
PM	100 I.U. Vitamin E EOD 25 mg. B-Complex (1/2 tablet B-50) 1/8 tablet 10 grain Calcium carbonate

Vitamins may be inserted into the gills of the fish before feeding, or fed to the chicks with a feeding response followed by the fish fillets if no whole fish is being fed.

Children's poly-vitamin drops: One zoological institution has used Enfamil® Poly-vi-sol® Infant Drops

Vitamin	Amount per 1 mL
Vitamin A	1500 IU
Vitamin C	35 mg
Vitamin D	400 IU
Vitamin E	5 IU
Vitamin B_1	0.5 mg
Vitamin B_2	0.6
Niacin	8 mg
Vitamin B_6	0.4 mg
Vitamin B_{12}	2 mcg

Children's poly-vitamin drops with iron: One zoological institution has used Enfamil® Poly-vi-sol Infant Drops with Iron

Vitamin	Amount per 1 mL
Vitamin A	1500 IU
Vitamin C	35 mg
Vitamin D (cholicalciferol)	400 IU
Vitamin E (d-alpha-tocopheryl succinate)	5 IU
Thiamin (as thiamin HCl)	0.5 mg
Niacin (as niacinamide)	8 mg
Vitamin B_6 (as pyridoxine HCl)	0.4
Iron (as ferrous sulfate)	10 mg

Children's Multi-vitamin: One zoological institution uses My First Flintstones™

Vitamin	Amount per tablet
Vitamin A	1998 IU
Vitamin C	60 mg
Vitamin D (D_3)	400 IU
Vitamin E	15 IU

Thiamin (B_1)	1.05 mg
Riboflavin (B_2)	1.2 mg
Niacin	10 mg
B_6	1.05 mg
Folic Acid	300 mcg
Vitamin B_{12}	4.5 mcg
Sodium	10 mg

Contents of Mazuri® Vita-Zu Bird Tablet w/o Vitamin A

	Each ½ lb. tablet (5TLC) supplies:	Each 5 lb. tablet (5TLB) supplies:
Vitamin A, I.U.	0	0
Vitamin E, I.U.	26	130
Vitamin C, mg	28	140
Thiamin Mononitrate, mg	23	117
Riboflavin, mg	1.7	8.6
Pyridoxine	1.7	8.6
Pantothenic Acid, mg	1.71	8.54
Biotin, mcg	0.0	0.1
Folic Acid, mg	0.06	0.29
Magnesium, mg	0.1	0.3

Juvenile Penguin Vitamin Supplementation Schedule
Begin supplementation at completion of first molt until 4 months post fledge

Gentoo, Humboldt, Magellanic:
1 each 2.5 lb. Mazuri Tab without Vitamin A once daily
½ each 50 mg B-complex once daily
100 IU Vitamin E twice weekly

Macaroni, chinstrap, Adélie:
2 each ½ lb. Mazuri Tab without Vitamin A once daily
½ each 50 mg B-complex once daily
100 IU Vitamin E twice weekly

Mazuri® Vita-Zu Bird Tablet w/o Vitamin A — www.mazuri.com
(See table above for contents)

My First Flintstones — www.bayercare.com
(See table above for contents)

Enfamil® Poly-vi-sol® Infant drops — www.enfamil.com
(See table above for contents)

Onset HOBO®
Pendant temp/light datalogger — www.onsetcomp.com/products/data-loggers/ua-002-64

Appendix N: ISIS Physiological Blood Values

International Species Information System
12101 Johnny Cake Ridge Road
Apple Valley, MN 55124 USA.
www.isis.org

Blue Penguin (*Eudyptula minor*)

Samples contributed by 8 institutions.

Sample Selection Criteria:

- No selection by gender
- All ages combined
- Animal was classified as healthy at the time of sample collection
- Sample was not deteriorated

Physiological Reference Intervals for Eudyptula minor

Test	Units	Reference Interval	Mean	Median	Low Sample[a]	High Sample[b]	Sample Size[c]	Animals[d]
White Blood Cell Count	*10^3 cells/µL	2.93 - 34.60	13.39	12.00	1.98	39.40	220	138
Red Blood Cell Count	*10^6 cells/µL	1.19 - 3.05	2.06	2.05	1.00	3.80	125	102
Hemoglobin	g/dL	*	17.2	18.1	9.3	23.9	30	28
Hematocrit	%	29.4 - 57.8	44.3	44.5	24.0	64.0	209	130
MCV	fL	123.0 - 362.3	222.1	214.2	98.6	437.5	125	102
Heterophils	*10^3 cells/µL	0.55 - 19.83	6.74	5.59	0.03	24.80	219	137
Lymphocytes	*10^3 cells/µL	1.02 - 16.19	5.65	4.60	0.53	20.00	219	138
Monocytes	cells/µL	48 - 2095	579	385	30	2340	162	115
Eosinophils	cells/µL	0 - 460	210	181	30	700	80	60
Basophils	cells/µL	0 - 1014	407	339	20	1600	112	82
Glucose	mg/dL	51 - 328	205	209	1	405	212	120
Uric Acid	mg/dL	0.6 - 38.4	12.5	8.2	0.2	44.7	222	124
Calcium	mg/dL	8.4 - 13.2	10.3	10.3	6.9	14.3	145	70
Phosphorus	mg/dL	1.3 - 11.0	4.2	3.5	1.1	12.0	123	53
Ca/Phos ratio		0.0 - 6.0	3.2	2.9	0.8	8.6	117	50
Sodium	mEq/L	142 - 163	152	153	136	168	89	31
Potassium	mEq/L	1.6 - 6.2	4.0	3.9	1.8	7.1	98	39
Na/K ratio		13.1 - 66.7	42.0	39.9	22.3	87.8	88	31
Total Protein	g/dL	3.9 - 8.2	5.6	5.5	3.0	8.9	186	101
Albumin	g/dL	1.1 - 3.4	2.1	2.1	0.6	3.8	133	57
Globulin	g/dL	0.5 - 6.8	3.4	3.3	0.0	7.6	128	54

Alkaline Phosphatase	IU/L	0 - 500	255	229	47	584	40	18
Lactate Dehydrogenase	IU/L	0 - 1002	417	323	20	1553	67	36
Aspartate Aminotransferase	IU/L	110 - 587	262	228	50	690	233	132
Creatine Kinase	IU/L	28 - 874	255	189	0	1096	221	124
Amylase	IU/L	0 - 8466	2879	2850	1	6420	51	30
Cholesterol	mg/dL	102 - 384	242	243	66	470	89	43

[a] Lowest sample value used to calculate the reference interval.
[b] Highest sample value used to calculate the reference interval.
[c] Number of samples used to calculate the reference interval.
[d] Number of different individuals contributing to the reference interval.
* Sample size is insufficient to produce a valid reference interval.

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Chinstrap Penguin (*Pygoscelis antarcticus*)

Samples contributed by 2 institutions.

Sample Selection Criteria:

- No selection by gender
- All ages combined
- Animal was classified as healthy at the time of sample collection
- Sample was not deteriorated

Physiological Reference Intervals for Pygoscelis antarcticus

Test	Units	Reference Interval	Mean	Median	Low Sample[a]	High Sample[b]	Sample Size[c]	Animals[d]
White Blood Cell Count	*10^3 cells/µL	0.00 - 16.22	8.24	7.62	2.30	23.40	52	21
Hematocrit	%	36.3 - 54.0	44.6	45.1	32.0	51.0	52	20
Heterophils	*10^3 cells/µL	0.00 - 10.50	4.82	4.30	1.30	16.40	52	21
Lymphocytes	*10^3 cells/µL	0.00 - 5.80	2.76	2.27	0.52	7.26	51	21
Monocytes	cells/µL	*	514	522	23	1596	33	9
Glucose	mg/dL	*	255	261	168	346	33	19
Creatinine	mg/dL	*	0.2	0.2	0.0	0.3	32	19
Uric Acid	mg/dL	*	10.9	8.4	3.5	28.1	32	19
Calcium	mg/dL	*	10.4	10.3	9.0	11.8	32	18
Phosphorus	mg/dL	*	3.8	3.5	1.6	6.9	30	19
Sodium	mEq/L	*	154	156	136	165	30	19
Chloride	mEq/L	*	108	110	92	117	30	19
Total Protein	g/dL	*	4.7	4.8	3.4	5.7	33	19
Albumin	g/dL	*	1.8	1.8	1.2	2.3	31	19
Globulin	g/dL	*	2.9	2.9	2.0	3.6	32	19
Alkaline Phosphatase	IU/L	*	202	110	30	749	30	19
Aspartate Aminotransferase	IU/L	*	185	173	90	363	32	19
Alanine Aminotransferase	IU/L	*	118	96	18	369	30	19
Creatine Kinase	IU/L	*	337	272	4	934	32	19
Cholesterol	mg/dL	*	324	320	167	547	33	19

[a] Lowest sample value used to calculate the reference interval.
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al_Ameõêcan_uniIs__201'j CD.h&l"ÿ?n

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Gentoo Penguin (*Pygoscelis papua*)

Samples contributed by 12 institutions.

Sample Selection Criteria:

- No selection by gender.
- All ages combined
- Animal was classified as healthy at the time of sample collection
- Sample was not deteriorated

Physiological Reference Intervals for Pygoscelis papua

Test	Units	Reference Interval	Mean	Median	Low Sample[a]	High Sample[b]	Sample Size[c]	Animals[d]
White Blood Cell Count	*10^3 cells/µL	3.63 - 22.38	11.36	10.68	1.60	28.00	372	131
Red Blood Cell Count	*10^6 cells/µL	1.34 - 3.21	2.30	2.28	1.50	3.25	54	30
Hemoglobin	g/dL	4.9 - 30.7	15.1	17.8	2.0	22.4	48	33
Hematocrit	%	36.3 - 57.7	48.4	48.7	31.0	63.0	400	134
MCV	fL	148.3 - 308.5	227.8	228.4	150.2	306.3	48	27
MCHC	g/dL	27.0 - 45.4	36.8	36.2	23.3	49.9	41	29
Heterophils	*10^3 cells/µL	2.41 - 16.31	7.49	6.98	1.15	20.00	370	130
Lymphocytes	*10^3 cells/µL	0.61 - 9.36	3.33	2.74	0.17	11.00	371	130
Monocytes	cells/µL	60 - 1378	413	299	47	1620	284	107
Eosinophils	cells/µL	0 - 528	235	193	41	740	95	67
Basophils	cells/µL	0 - 295	144	121	35	440	91	57
Glucose	mg/dL	147 - 298	234	237	108	344	361	125
Blood Urea Nitrogen	mg/dL	0 - 7	4	4	1	9	54	39
Creatinine	mg/dL	0.0 - 0.6	0.2	0.2	0.0	1.0	52	46
Uric Acid	mg/dL	2.3 - 20.4	7.8	6.1	1.4	24.7	351	123
Calcium	mg/dL	7.8 - 12.4	10.2	10.2	6.7	13.9	351	128
Phosphorus	mg/dL	1.3 - 8.0	3.9	3.8	0.4	9.7	298	106
Ca/Phos ratio		1.2 - 5.5	2.9	2.7	0.6	6.6	292	106
Sodium	mEq/L	145 - 164	155	155	138	169	291	99
Potassium	mEq/L	1.4 - 6.8	3.2	3.1	1.0	8.1	276	98
Na/K ratio		20.9 - 112.8	55.3	49.6	16.6	147.3	277	97
Chloride	mEq/L	101 - 123	111	112	98	120	58	43
Total Protein	g/dL	3.8 - 7.0	5.4	5.3	2.6	7.9	314	127
Albumin	g/dL	1.4 - 3.7	2.4	2.3	0.6	5.2	345	123

Globulin	g/dL	0.6 - 4.6	2.7	2.9	0.2	5.6	344	123
Alkaline Phosphatase	IU/L	0 - 378	119	102	0	454	192	58
Lactate Dehydrogenase	IU/L	153 - 963	453	420	23	1248	206	56
Aspartate Aminotransferase	IU/L	67 - 590	248	225	2	706	372	133
Alanine Aminotransferase	IU/L	*	94	92	5	210	36	32
Creatine Kinase	IU/L	81 - 742	279	232	4	861	266	99
Amylase	IU/L	148 - 1302	702	716	0	1529	158	34
Cholesterol	mg/dL	232 - 417	326	326	195	451	218	68

[a] Lowest sample value used to calculate the reference interval.
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Humboldt Penguin (*Spheniscus humboldti*)

Samples contributed by 21 institutions.

Sample Selection Criteria:

- No selection by gender
- All ages combined
- Animal was classified as healthy at the time of sample collection
- Sample was not deteriorated

Physiological Reference Intervals for Spheniscus humboldti

Test	Units	Reference Interval	Mean	Median	Low Sample[a]	High Sample[b]	Sample Size[c]	Animals[d]
White Blood Cell Count	*10^3 cells/µL	6.16 - 49.88	23.53	21.99	1.37	74.50	2191	468
Red Blood Cell Count	*10^6 cells/µL	1.27 - 3.16	2.16	2.12	0.67	4.20	448	167
Hemoglobin	g/dL	9.5 - 21.5	15.8	15.9	5.0	24.0	889	234
Hematocrit	%	28.9 - 60.0	47.8	49.0	18.0	79.0	2589	503
MCV	fL	135.3 - 342.5	226.1	225.1	57.8	389.3	444	167
MCH	pg	52.3 - 114.8	79.8	79.7	20.6	146.5	328	112
MCHC	g/dL	26.3 - 45.8	33.2	32.7	16.3	50.3	884	233
Heterophils	*10^3 cells/µL	3.33 - 30.22	14.03	13.26	1.05	42.40	2183	468
Lymphocytes	*10^3 cells/µL	1.17 - 21.47	7.56	6.09	0.14	28.10	2176	467
Monocytes	cells/µL	103 - 4200	1210	859	32	5550	1709	435
Eosinophils	cells/µL	84 - 1495	457	348	22	1785	964	335
Basophils	cells/µL	99 - 1786	602	468	22	2387	1330	371
Glucose	mg/dL	154 - 326	236	235	69	406	2276	424
Blood Urea Nitrogen	mg/dL	1 - 7	4	4	1	8	1078	240
Creatinine	mg/dL	0.1 - 0.9	0.4	0.4	0.0	1.8	1028	183
Uric Acid	mg/dL	2.3 - 22.0	8.0	6.4	0.8	24.6	2473	462
Calcium	mg/dL	8.7 - 12.8	10.4	10.3	6.9	14.3	2183	437
Phosphorus	mg/dL	1.2 - 8.0	3.4	3.1	0.0	9.9	2171	409
Ca/Phos ratio		1.3 - 7.8	3.7	3.4	0.4	10.1	2156	406
Sodium	mEq/L	140 - 164	152	152	128	176	2204	420
Potassium	mEq/L	2.1 - 6.1	3.8	3.7	0.5	8.2	2142	412
Na/K ratio		23.7 - 74.1	43.1	41.0	4.2	95.0	2149	413
Chloride	mEq/L	100 - 124	113	114	89	136	1781	349

Total Protein	g/dL	3.7 - 6.9	5.2	5.2	2.1	8.4	2274	425
Albumin	g/dL	1.0 - 2.7	1.8	1.7	0.0	3.5	2109	411
Globulin	g/dL	0.6 - 5.3	3.4	3.5	0.3	6.6	2080	405
Alkaline Phosphatase	IU/L	36 - 387	137	112	3	447	1580	271
Lactate Dehydrogenase	IU/L	79 - 654	248	204	40	786	1171	210
Aspartate Aminotransferase	IU/L	83 - 435	209	192	4	571	2454	466
Alanine Aminotransferase	IU/L	11 - 105	42	37	0	137	1431	250
Creatine Kinase	IU/L	56 - 849	272	206	0	1065	1617	427
Gamma-glutamyltransferase	IU/L	0 - 18	7	7	0	26	516	184
Amylase	IU/L	718 - 3288	1665	1545	2	4502	401	190
Lipase	IU/L	0 - 50	23	19	2	64	80	67
Total Bilirubin	mg/dL	0.0 - 1.6	0.4	0.3	0.0	1.8	1264	235
Direct Bilirubin	mg/dL	0.0 - 0.1	0.0	0.0	0.0	0.1	384	27
Indirect Bilirubin	mg/dL	0.0 - 2.2	0.6	0.4	0.0	2.5	387	27
Cholesterol	mg/dL	131 - 380	244	240	13	493	1679	337
Triglyceride	mg/dL	20 - 138	56	49	13	158	671	189
Bicarbonate	mEq/L	17.9 - 34.3	26.2	26.1	15.9	39.0	69	55
Magnesium	mg/dL	1.46 - 3.23	2.42	2.34	1.80	3.89	48	40
Iron	µg/dL	32 - 258	148	145	40	277	69	18
Carbon Dioxide	mEq/L	15.6 - 39.0	27.7	28.0	11.0	48.4	417	120

[a] Lowest sample value used to calculate the reference interval.
[b] Highest sample value used to calculate the reference interval.
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[d] Number of different individuals contributing to the reference interval.

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Jackass Penguin (*Spheniscus demersus*)

Samples contributed by 37 institutions.

Sample Selection Criteria:

- No selection by gender.
- All ages combined
- Animal was classified as healthy at the time of sample collection
- Sample was not deteriorated

Physiological Reference Intervals for Spheniscus demersus

Test	Units	Reference Interval	Mean	Median	Low Sample[a]	High Sample[b]	Sample Size[c]	Animals[d]
White Blood Cell Count	*10^3 cells/µL	4.11 - 39.01	15.34	13.53	0.17	50.40	2105	626
Red Blood Cell Count	*10^6 cells/µL	0.97 - 3.30	1.83	1.77	0.16	3.68	1130	467
Hemoglobin	g/dL	4.7 - 19.9	12.5	12.7	1.3	27.5	1066	429
Hematocrit	%	27.6 - 57.2	45.1	46.0	14.0	70.0	2884	788
MCV	fL	97.8 - 356.4	238.0	245.4	26.2	457.1	1153	469
MCH	pg	17.7 - 125.9	67.7	64.0	5.4	195.2	985	396
MCHC	g/dL	15.1 - 43.2	29.1	29.9	3.5	63.3	1048	423
Heterophils	*10^3 cells/µL	1.77 - 21.50	8.48	7.51	0.02	28.70	2084	625
Lymphocytes	*10^3 cells/µL	0.64 - 16.78	5.32	4.04	0.07	22.20	2078	623
Monocytes	cells/µL	78 - 2099	599	435	23	2550	1593	548
Eosinophils	cells/µL	73 - 1508	428	289	25	1894	989	386
Basophils	cells/µL	59 - 1080	369	287	30	1428	894	401
Glucose	mg/dL	137 - 290	220	220	91	349	2320	736
Blood Urea Nitrogen	mg/dL	2 - 10	4	4	1	11	536	251
Creatinine	mg/dL	0.2 - 1.1	0.5	0.4	0.0	1.5	377	182
Uric Acid	mg/dL	2.3 - 23.0	8.7	7.2	0.0	27.4	2384	726
Calcium	mg/dL	8.5 - 13.4	10.5	10.4	6.4	15.0	2267	732
Phosphorus	mg/dL	1.1 - 8.2	3.6	3.3	0.0	11.1	2033	664
Ca/Phos ratio		1.3 - 7.7	3.5	3.2	0.0	10.2	1980	646
Sodium	mEq/L	142 - 168	155	155	129	180	1880	637
Potassium	mEq/L	2.7 - 7.5	4.5	4.3	1.2	8.9	1827	617
Na/K ratio		16.7 - 55.5	35.9	35.6	2.8	74.8	1850	627
Chloride	mEq/L	103 - 129	116	116	88	141	1304	461
Total Protein	g/dL	3.7 - 7.3	5.3	5.3	1.7	9.3	2378	736
Albumin	g/dL	1.0 - 3.2	1.8	1.8	0.0	3.9	2241	699
Globulin	g/dL	0.6 - 5.1	3.2	3.3	0.0	7.0	2118	685
Fibrinogen	mg/dL	*	1	1	0	1	36	14

Alkaline Phosphatase	IU/L	22 - 459	141	100	0	550	1315	461
Lactate Dehydrogenase	IU/L	80 - 1908	581	436	30	2581	995	364
Aspartate Aminotransferase	IU/L	58 - 378	164	146	2	489	2413	748
Alanine Aminotransferase	IU/L	21 - 268	101	88	2	353	646	300
Creatine Kinase	IU/L	77 - 1052	362	290	0	1296	2065	668
Gamma-glutamyltransferase	IU/L	0 - 10	3	2	0	13	358	168
Amylase	IU/L	1247 - 6866	3277	2793	3	7987	609	206
Total Bilirubin	mg/dL	0.1 - 0.8	0.2	0.2	0.0	1.0	340	189
Cholesterol	mg/dL	153 - 437	273	267	24	536	1722	560
Triglyceride	mg/dL	44 - 269	128	126	39	350	133	92
Bicarbonate	mEq/L	13.8 - 32.5	23.1	23.1	10.0	34.0	86	54
Carbon Dioxide	mEq/L	15.6 - 34.0	25.0	25.5	10.0	36.0	207	62
Body Temperature	F	*	100.4	101.3	94.3	104.0	35	32

[a] Lowest sample value used to calculate the reference interval.
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King Penguin (*Aptenodytes patagonicus*)

Samples contributed by 11 institutions.

Sample Selection Criteria:

- No selection by gender
- All ages combined
- Animal was classified as healthy at the time of sample collection
- Sample was not deteriorated

Physiological Reference Intervals for Aptenodytes patagonicus

Test	Units	Reference Interval	Mean	Median	Low Sample[a]	High Sample[b]	Sample Size[c]	Animals[d]
White Blood Cell Count	*10^3 cells/µL	2.89 - 22.49	9.40	8.50	0.80	29.80	167	65
Red Blood Cell Count	*10^6 cells/µL	*	2.04	1.88	0.76	3.25	38	14
Hemoglobin	g/dL	12.5 - 20.9	16.2	16.7	10.0	19.6	57	22
Hematocrit	%	33.0 - 58.5	47.2	48.1	23.0	62.0	193	68
MCV	fL	*	237.9	242.1	144.6	310.0	37	13
MCHC	g/dL	29.7 - 38.5	34.2	34.1	30.0	40.5	55	20
Heterophils	*10^3 cells/µL	0.95 - 9.74	4.19	3.90	0.48	11.10	165	64
Lymphocytes	*10^3 cells/µL	0.55 - 11.37	3.69	3.01	0.22	14.20	164	65
Monocytes	cells/µL	56 - 1527	473	354	38	1856	128	56
Eosinophils	cells/µL	0 - 453	202	155	27	670	71	38
Basophils	cells/µL	0 - 1672	699	552	60	2415	118	50
Glucose	mg/dL	147 - 321	233	230	101	369	191	76
Blood Urea Nitrogen	mg/dL	2 - 6	4	4	2	6	50	25
Creatinine	mg/dL	0.0 - 0.7	0.4	0.4	0.1	0.8	44	19
Uric Acid	mg/dL	2.6 - 23.2	10.0	9.0	1.6	28.0	191	77
Calcium	mg/dL	8.1 - 12.4	10.3	10.3	6.4	14.0	176	75
Phosphorus	mg/dL	1.6 - 8.5	3.9	3.6	0.1	9.7	178	73
Ca/Phos ratio		1.2 - 6.3	3.0	2.8	0.2	7.4	169	72
Sodium	mEq/L	141 - 170	155	155	131	172	133	59
Potassium	mEq/L	1.4 - 6.8	3.4	3.2	0.7	7.5	129	59
Na/K ratio		19.3 - 103.1	50.8	47.9	3.8	108.0	126	58
Chloride	mEq/L	99 - 127	113	113	88	131	102	49
Total Protein	g/dL	2.5 - 6.9	5.1	5.1	1.9	8.0	164	72
Albumin	g/dL	1.0 - 3.3	2.0	1.9	0.0	4.3	151	72
Globulin	g/dL	0.5 - 4.9	2.9	3.1	0.2	5.9	142	69
Alkaline Phosphatase	IU/L	0 - 224	119	106	35	304	90	40
Lactate Dehydrogenase	IU/L	0 - 550	235	166	54	789	85	51

Aspartate Aminotransferase	IU/L	91 - 366	202	191	54	419	190	77
Alanine Aminotransferase	IU/L	1 - 121	64	61	13	149	69	38
Creatine Kinase	IU/L	66 - 891	312	272	4	968	132	66
Total Bilirubin	mg/dL	0.0 - 0.7	0.2	0.1	0.0	1.2	42	19
Cholesterol	mg/dL	134 - 513	318	317	46	573	120	59

[a] Lowest sample value used to calculate the reference interval.
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Macaroni Penguin (*Eudyptes chrysolophus*)

Samples contributed by 3 institutions.

Sample Selection Criteria:

- No selection by gender
- All ages combined
- Animal was classified as healthy at the time of sample collection
- Sample was not deteriorated

Physiological Reference Intervals for Eudyptes chrysolophus

Test	Units	Reference Interval	Mean	Median	Low Sample[a]	High Sample[b]	Sample Size[c]	Animals[d]
White Blood Cell Count	*10^3 cells/µL	3.16 – 19.54	8.70	7.88	1.38	24.00	178	41
Red Blood Cell Count	*10^6 cells/µL	1.73 – 3.50	2.66	2.62	1.67	4.30	98	18
Hemoglobin	g/dL	13.3 – 20.9	17.0	17.1	10.5	20.0	69	14
Hematocrit	%	31.6 – 60.4	49.3	49.8	25.0	64.0	214	45
MCV	fL	123.7 – 275.2	196.0	199.4	63.0	290.0	99	18
MCH	pg	44.6 – 88.5	65.9	66.6	19.6	90.9	68	14
MCHC	g/dL	24.6 – 38.1	31.6	31.4	25.9	39.2	70	14
Heterophils	*10^3 cells/µL	1.30 – 9.70	4.09	3.61	1.04	12.20	177	41
Lymphocytes	*10^3 cells/µL	0.50 – 12.45	4.14	3.61	0.21	15.20	178	41
Monocytes	cells/µL	0 – 904	331	238	28	1511	79	32
Eosinophils	cells/µL	0 – 624	244	181	28	990	82	29
Basophils	cells/µL	0 – 543	253	218	32	815	103	26
Glucose	mg/dL	146 – 276	215	218	75	318	196	46
Uric Acid	mg/dL	2.2 – 27.2	10.2	8.1	1.7	30.7	185	44
Calcium	mg/dL	7.7 – 13.5	10.0	9.9	6.9	14.2	192	46
Phosphorus	mg/dL	0.0 – 5.9	3.1	2.8	0.7	7.8	114	45
Ca/Phos ratio		0.0 – 8.2	4.1	3.6	1.2	13.0	113	45
Sodium	mEq/L	142 – 165	154	154	133	168	109	39
Potassium	mEq/L	2.1 – 5.6	4.0	3.9	1.9	6.4	107	39
Na/K ratio		21.0 – 57.3	40.1	39.2	15.6	70.9	107	38
Chloride	mEq/L	101 – 128	115	114	94	134	84	37
Total Protein	g/dL	3.4 – 7.0	4.9	4.8	2.0	7.6	185	43
Albumin	g/dL	1.3 – 4.3	2.6	2.6	1.1	4.6	132	35

Globulin	g/dL	0.2 – 3.8	1.4	0.9	0.2	5.3	127	34
Alkaline Phosphatase	IU/L	4 – 201	107	103	24	205	42	30
Lactate Dehydrogenase	IU/L	0 – 391	204	188	62	548	49	29
Aspartate Aminotransferase	IU/L	126 – 401	247	243	52	471	192	45
Alanine Aminotransferase	IU/L	*	47	43	14	131	38	27
Creatine Kinase	IU/L	72 – 730	242	193	63	813	121	42
Cholesterol	mg/dL	176 – 438	309	307	142	476	98	39
Bicarbonate	mEq/L	*	25.8	26.0	17.0	35.0	31	27

[a] Lowest sample value used to calculate the reference interval.
[b] Highest sample value used to calculate the reference interval.
[c] Number of samples used to calculate the reference interval.
[d] Number of different individuals contributing to the reference interval.

* Sample size is insufficient to produce a valid reference interval.

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Suggested citation format:
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Magellanic Penguin (*Spheniscus magellanicus*)

Samples contributed by 12 institutions.

(Citation Format)

Sample Selection Criteria:

- No selection by gender
- All ages combined
- Animal was classified as healthy at the time of sample collection
- Sample was not deteriorated

Physiological Reference Intervals for Spheniscus magellanicus

Test	Units	Reference Interval	Mean	Median	Low Sample[a]	High Sample[b]	Sample Size[c]	Animals[d]
White Blood Cell Count	*10^3 cells/µL	4.79 - 37.51	15.07	13.20	2.30	44.60	908	238
Red Blood Cell Count	*10^6 cells/µL	0.87 - 3.41	1.97	1.98	0.51	4.67	412	142
Hemoglobin	g/dL	10.7 - 21.8	16.1	16.2	8.0	24.3	107	77
Hematocrit	%	27.7 - 58.9	45.6	46.8	15.0	75.0	955	243
MCV	fL	117.8 - 441.1	241.7	231.0	10.0	536.4	399	140
MCH	pg	36.2 - 106.5	75.5	71.3	40.7	114.0	86	63
MCHC	g/dL	25.1 - 41.3	33.5	33.2	19.4	48.3	106	77
Heterophils	*10^3 cells/µL	1.70 - 20.05	7.42	6.27	0.03	26.20	891	237
Lymphocytes	*10^3 cells/µL	1.04 - 18.12	6.31	5.07	0.06	23.70	897	238
Monocytes	cells/µL	66 - 1673	478	342	26	2045	454	185
Eosinophils	cells/µL	63 - 1306	384	277	40	1560	392	172
Basophils	cells/µL	64 - 696	261	208	30	915	391	172
Glucose	mg/dL	149 - 283	215	215	87	342	791	240
Blood Urea Nitrogen	mg/dL	0 - 9	5	3	1	12	61	44
Creatinine	mg/dL	0.0 - 0.7	0.3	0.2	0.0	0.9	77	50
Uric Acid	mg/dL	1.9 - 26.1	9.6	7.3	0.6	35.8	818	239
Calcium	mg/dL	8.6 - 12.0	10.2	10.2	7.1	13.6	753	237
Phosphorus	mg/dL	1.1 - 8.7	3.8	3.4	0.4	10.5	585	205
Ca/Phos ratio		1.1 - 8.2	3.3	2.9	0.0	9.4	555	200
Sodium	mEq/L	141 - 165	153	153	132	170	360	161
Potassium	mEq/L	2.1 - 8.5	4.4	4.2	1.7	10.4	366	163
Na/K ratio		18.9 - 75.3	39.0	36.5	10.3	92.2	359	163
Chloride	mEq/L	94 - 126	109	109	85	137	162	102
Total Protein	g/dL	3.7 - 8.4	5.8	5.7	2.3	10.6	916	239

Albumin	g/dL	0.3 - 3.7	1.9	1.8	0.0	4.2	619	209
Globulin	g/dL	0.1 - 5.9	3.1	3.4	0.0	7.6	626	208
Alkaline Phosphatase	IU/L	29 - 388	140	116	2	475	191	88
Lactate Dehydrogenase	IU/L	65 - 1033	375	288	1	1406	295	152
Aspartate Aminotransferase	IU/L	59 - 538	206	176	21	628	767	239
Alanine Aminotransferase	IU/L	0 - 191	78	63	0	312	71	48
Creatine Kinase	IU/L	56 - 1121	336	250	0	1315	658	222
Amylase	IU/L	558 - 7001	3838	4022	87	7426	187	71
Total Bilirubin	mg/dL	*	0.4	0.3	0.1	1.4	35	29
Cholesterol	mg/dL	165 - 463	300	299	66	580	458	198

[a] Lowest sample value used to calculate the reference interval.
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[d] Number of different individuals contributing to the reference interval.

* Sample size is insufficient to produce a valid reference interval.

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Southern Rockhopper Penguin (*Eudyptes chrysocome*)

Samples contributed by 14 institutions.

Sample Selection Criteria:

- No selection by gender
- All ages combined
- Animal was classified as healthy at the time of sample collection
- Sample was not deteriorated

Physiological Reference Intervals for Eudyptes chrysocome

Test	Units	Reference Interval	Mean	Median	Low Sample[a]	High Sample[b]	Sample Size[c]	Animals[d]
White Blood Cell Count	*10^3 cells/µL	2.45 - 19.51	8.30	7.44	1.40	24.20	513	150
Red Blood Cell Count	*10^6 cells/µL	*	2.11	2.10	1.43	3.13	33	22
Hemoglobin	g/dL	*	18.4	17.9	11.9	26.4	38	26
Hematocrit	%	33.1 - 59.9	48.7	49.6	25.0	68.0	553	157
MCV	fL	*	223.3	226.5	129.6	293.7	33	22
MCHC	g/dL	*	38.8	36.2	31.6	50.6	38	26
Heterophils	*10^3 cells/µL	1.07 - 9.65	4.14	3.60	0.02	14.20	512	149
Lymphocytes	*10^3 cells/µL	0.39 - 8.49	3.01	2.47	0.05	11.00	495	147
Monocytes	cells/µL	45 - 959	315	240	16	1275	431	137
Eosinophils	cells/µL	44 - 1378	378	272	20	1629	217	99
Basophils	cells/µL	35 - 952	295	229	24	1278	286	114
Glucose	mg/dL	167 - 319	239	238	126	361	500	152
Blood Urea Nitrogen	mg/dL	1 - 6	3	3	1	9	111	57
Creatinine	mg/dL	0.0 - 0.9	0.4	0.3	0.1	1.3	91	51
Uric Acid	mg/dL	2.5 - 24.0	9.3	7.5	1.5	33.0	472	149
Calcium	mg/dL	7.8 - 11.7	9.7	9.7	6.7	12.5	479	152
Phosphorus	mg/dL	0.4 - 6.8	2.5	2.2	0.0	8.5	443	148
Ca/Phos ratio		1.3 - 14.9	5.3	4.3	0.8	17.3	425	144
Sodium	mEq/L	141 - 163	153	153	135	171	419	136
Potassium	mEq/L	2.0 - 7.1	4.0	3.8	1.0	8.4	388	134
Na/K ratio		20.9 - 76.4	41.4	39.6	14.6	91.8	387	134
Chloride	mEq/L	106 - 122	115	115	102	124	149	85
Total Protein	g/dL	3.1 - 6.0	4.4	4.4	1.8	6.8	390	150
Albumin	g/dL	1.1 - 3.2	1.9	1.7	0.3	4.1	437	144
Globulin	g/dL	1.0 - 4.1	2.6	2.7	0.3	5.3	432	142
Alkaline Phosphatase	IU/L	1 - 289	94	76	0	337	298	88
Lactate Dehydrogenase	IU/L	48 - 368	164	149	24	410	279	81
Aspartate Aminotransferase	IU/L	123 - 445	255	245	32	533	456	149

Alanine Aminotransferase	IU/L	0 - 101	48	40	10	149	103	56
Creatine Kinase	IU/L	91 - 1145	385	302	54	1338	329	117
Gamma-glutamyltransferase	IU/L	0 - 9	3	3	0	12	48	27
Amylase	IU/L	1392 - 8877	5001	5135	1483	7962	108	28
Total Bilirubin	mg/dL	0.0 - 0.4	0.1	0.1	0.0	0.9	58	37
Cholesterol	mg/dL	194 - 497	325	321	133	621	305	96
Carbon Dioxide	mEq/L	15.7 - 41.0	29.1	28.3	13.0	52.5	110	46

[a] Lowest sample value used to calculate the reference interval.
[b] Highest sample value used to calculate the reference interval.
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[d] Number of different individuals contributing to the reference interval.
* Sample size is insufficient to produce a valid reference interval.

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Clinical Pathology Records Report: ISIS/In-House Reference Values (2002)
Milwaukee County Zoo
Scientific name: *Eudyptes pachyrhynchus*
Common Name: Fiordland penguin

ISIS Values

		Mean	S.D.	Min.	Max.	(N)
WBC	*10^3/UL	9.440 +	3.319	5.720	12.10	(3)
RBC	*10^6/UL	2.13 +	0.48	1.70	2.65	(3)
HCT	%	47.0 +	5.6	41.0	52.0	(3)
MCV	fL	223.8 +	24.2	196.2	241.2	(3)
HETEROPHILS	*10^3/UL	3.607 +	3.540	0.970	7.630	(3)
LYMPHOCYTES	*10^3/UL	5.307 +	2.169	3.990	7.810	(3)
MONOCYTES	*10^3/UL	0.323 +	0.100	0.210	0.400	(3)
EOSINOPHILS	*10^3/UL	0.220 +	0.141	0.120	0.320	(2)
BASOPHILS	*10^3/UL	0.230 +	0.000	0.230	0.230	(1)
GLUCOSE	MG/DL	188 +	4	185	191	(2)
CREAT.	MG/DL	1.2 +	0.8	0.7	1.8	(2)
URIC ACID	MG/DL	26.0 +	10.1	11.1	32.9	(4)
AST (SGOT)	IU/L	715 +	212	476	980	(4)
CPK	IU/L	721 +	218	459	985	(4)

Clinical Pathology Records Report: ISIS/In-House Reference Values (2002)
Milwaukee County Zoo
Scientific name: *Pygoscelis adeliae*
Common Name: Adelie penguin

ISIS Values

		Mean	S.D.	Min.	Max.	(N)
WBC	*10^3/UL	9.186 +	2.265	5.400	11.80	(7)
RBC	*10^6/UL	3.00 +	0.97	2.31	3.68	(2)
HGB	GM/DL	16.4 +	1.5	14.3	17.4	(4)
HCT	%	49.4 +	4.4	42.0	54.0	(7)
MCHC	uug	35.1 +	1.2	34.0	36.9	(4)
MCV	fL	184.6 +	57.3	144.0	225.1	(2)
HETEROPHILS	*10^3/UL	5.301 +	1.972	2.970	8.900	(7)
LYMPHOCYTES	*10^3/UL	3.316 +	2.038	0.740	5.430	(7)
MONOCYTES	*10^3/UL	0.327 +	0.336	0.074	0.708	(3)
EOSINOPHILS	*10^3/UL	0.255 +	0.170	0.054	0.472	(6)
BASOPHILS	*10^3/UL	0.245 +	0.159	0.074	0.472	(6)
GLUCOSE	MG/DL	284 +	46	215	353	(7)
BUN	MG/DL	3 +	0	3	3	(5)
CREAT.	MG/DL	0.3 +	0.1	0.2	0.5	(6)
URIC ACID	MG/DL	8.6 +	6.3	2.5	18.7	(7)
CA	MG/DL	10.9 +	0.8	10.0	12.5	(7)
PHOS	MG/DL	2.6 +	0.6	1.7	3.1	(4)
NA	MEQ/L	153 +	5	146	161	(7)
K	MEQ/L	2.9 +	0.6	2.2	3.8	(7)
CL	MEQ/L	114 +	3	110	117	(7)
CHOL	MG/DL	304 +	65	256	415	(5)
T.PROT. (C)	GM/DL	4.9 +	0.5	4.0	5.6	(7)
ALBUMIN (C)	GM/DL	2.1 +	0.3	1.7	2.6	(7)
GLOBULIN (C)	GM/DL	2.7 +	0.3	2.2	3.0	(7)
AST (SGOT)	IU/L	155 +	56	95	234	(7)
ALT (SGPT)	IU/L	25 +	15	7	45	(5)
T. BILI.	MG/DL	0.3 +	0.1	0.2	0.4	(5)
ALK.PHOS.	IU/L	64 +	27	26	96	(5)
LDH	IU/L	415 +	277	139	940	(6)
CPK	IU/L	147 +	151	43	371	(4)
ALPHA-1 GLOB	GM/DL	0.3 +	0.0	0.3	0.3	(1)
ALPHA-2 GLOB	GM/DL	0.4 +	0.0	0.4	0.4	(1)
BETA GLOB.	GM/DL	0.5 +	0.0	0.5	0.5	(1)
CO2	MMOL/L	21.0 +	0.0	21.0	21.0	(1)

Appendix O: AZA Recommended Penguin Egg, Chick & Adult Bird Necropsy Protocols

Egg Necropsy:

1. Refrigerate the egg if there will be a delay before necropsy. Do not freeze eggs or embryos unless the primary goal is virus isolation or bacterial culture, rather than histologic evaluation.
2. Weigh and measure the egg as soon as possible after the embryo is confirmed dead.
    a. Record weight in grams.
    b. Measure length and greatest diameter of egg in centimeters.
3. Describe egg shell characteristics (abnormal shape, shell thickness, presence of cracks, degree of fecal staining, external calcium deposits, etc.).
4. Open the egg by carefully removing the shell overlying the aircell. This can be accomplished with a pair of sharp-blunt scissors, or by gently cracking the shell and removing fragments with forceps.
    a. Examine the aircell membrane for integrity, thickenings, hemorrhages, etc.
5. For small (early stage) embryos, obtain separate swabs of yolk and albumen for culture and cytology. Skip to step 7 for larger embryos.
    a. Peel back the aircell membrane and insert a swab to obtain the albumen culture. Note: if the fluid is watery, it is likely allantoic fluid rather than albumen.
    b. The egg contents may have to be dumped out in order to obtain the yolk cultures.
    c. A second swab of yolk (not a culture swab) may then be taken and rolled onto three microscope slides. The smears should be as thin as possible. NOTE: Avoid vigorous swabbing of the internal aspect of the yolk sac; hematopoietic cells which reside there may be dislodged and give a false impression that there is inflammation in the yolk sac. Recommended stains include Wright-Giemsa (or Diff-Quik) and gram. Save the third slide for additional stains, if needed.
6. For larger (late stage) embryos, remove enough egg shell to expose the embryo. Note the position of the head relative to other body parts, and in relation to the aircell. The normal position for embryos ready to pip is head under the right wing, with the tip of the beak pointing up toward the aircell.
    a. If the yolk sac is still external (has not retracted into the body cavity), and is accessible, puncture the wall with a sterile scalpel and obtain a culture. If the yolk sac is inaccessible, skip to step 8.
    b. Obtain a second swab of yolk for cytology as described above.
    c. Save the yolk sac (in formalin) for histopathology
    d. Record the color and consistency (relative thickness or viscosity) of the yolk.
7. Remove the embryo and membranes from the shell by gently dumping the contents into a clean shallow container.
    a. If swabs of yolk for culture and cytology have not yet been collected, obtain them now (as described under step 6). Record the color and consistency (relative thickness or viscosity) of the yolk.
    b. Weigh the embryo with and without the yolk sac (if external).
    c. Measure the length of the embryo and if possible estimate the stage of development using The Normal Stages of The Chick as a guideline.
    d. Note any external abnormalities, such as musculoskeletal deformities, abnormal skin color, skin hemorrhages, edema, dryness, residual albumen, etc. If possible photograph any abnormalities.
    e. Record the degree of internalization (retraction) of the yolk sac.
    f. Examine the pipping muscle at the back of the neck for edema or hemorrhages.
    g. Note the contents of the mouth, nares, and gizzard.
8. Small embryos along with yolk sac and fetal membranes may be immersed whole in formalin. The volume of formalin should be at least ten times the total volume of the tissues.
9. If the embryo is large enough, conduct a mini-necropsy, retaining representative samples of all organs and tissues for histopathology.

a. Open the coelomic cavity by making a ventral midline incision with a scalpel or scissors, being careful to avoid tearing the yolk sac if it is internalized. Proceed with yolk sac cultures and cytology as described under steps 6 and 7 above.
b. Save the yolk sac (in formalin) for histopathology along with the embryo and membranes. The volume of formalin should be at least ten times the total volume of the tissues.

10. Send a copy of the final pathology report and a recut set of H&E stained slides to Dr. Judy St. Leger, SeaWorld San Diego, 500 SeaWorld Drive, San Diego, CA 92109-7904. Ph: 619-222-6363.

Chick and Adult Necropsy:

1. Refrigerate the body if there will be a delay before necropsy. Do not freeze the body unless the primary goal is virus isolation or bacterial culture, rather than histologic evaluation.
2. Record all relevant historical information as indicated on the necropsy form.
3. Weigh the bird as soon as possible after death.

EXTERNAL EXAMINATION:

4. For chicks, note condition of the umbilicus or seal, particularly whether it dry and completely closed.
5. Note any musculoskeletal abnormalities, ectoparasites, evidence of trauma, proliferative skin lesions, etc.
6. Examine the feet carefully for evidence of pododermatitis (bumblefoot).
7. Examine body orifices for patency, exudates, fecal staining around cloaca, etc.
8. Make an evaluation of nutritional condition based on fat stores and relative muscle mass.

INTERNAL EXAMINATION:

9. Make a ventral midline skin incision from the mandible to the cloaca with a sharp scalpel or scissors, being careful to avoid rupturing the yolk sac in young birds.
    a. If the yolk sac ruptures, immediately obtain a yolk culture as the yolk spills out and prepare smears for cytology.
    b. Note the size of the yolk sac and, if sufficient yolk remains, obtain separate swabs for culture and cytology.
10. Remove the keel to expose the thoracic organs.
    a. Note any accumulations of fluid or exudate in the body cavity and obtain a swab for bacterial and/or fungal culture if appropriate.
11. Obtain blood for smears and bacterial culture by direct heart puncture using a 1 to 3 cc syringe with a 20 to 22 gauge needle.
    a. Prepare at least two blood smears for hemoparasite screening (only a few drops of blood are needed).
    b. If enough blood was obtained, bacterial cultures should be submitted on young birds to rule out septicemia.
    c. If no blood can be obtained from the heart by syringe, smears can be prepared by dabbing the cut surface of the lung or liver onto two or three microscope slides.
12. Collect the thyroids (with parathyroids), thymus, and spleen for histopathology.
    a. Determine gender by examining the gonads prior to removal.
13. Remove the internal organs and examine each systematically.
    a. Obtain samples for histopathology using the tissue list below as a guide. Save samples of all lesions.
    b. Note especially the quantity and nature of the ingesta throughout the GI tract.
    c. The bursa of Fabricius lies dorsal to the cloaca, close to the cloacal orifice (vent). Make sure the bursa does not remain attached to the body when the GI tract is removed.

<u>Tissue Checklist</u>

All of the following tissues may be placed together in a single container of 10% neutral buffered formalin. THE VOLUME OF FORMALIN SHOULD BE 10 TIMES THE VOLUME OF ALL TISSUES COLLECTED. The tissues should be no thicker than 0.5cm to ensure proper fixation.

- Skin Muscle (pectoral and thigh)

- Sciatic nerve (with thigh muscle)
- Tongue
- Esophagus
- Crop
- Proventriculus
- Gizzard
- Duodenum
- Jejunum
- Ileum
- Cecum
- Colon
- Cloaca with Bursa of Fabricius
- Liver with gallbladder
- Pancreas
- Spleen
- Kidney with Gonad
- Oviduct
- Adrenal (with kidney)
- Thyroid and Parathyroid Thymus
- Trachea
- Lung
- Heart
- Aorta
- Pituitary
- Eye
- Brain
- Femoral Bone Marrow

FREEZE PORTIONS OF THE FOLLOWING IF POSSIBLE FOR FURTHER TESTING:

- Liver
- Spleen
- Lung
- Brain
- Heart
- Skeletal Muscle

Freeze each tissue separately by wrapping in foil and placing in separate plastic bags (at least 10 grams of each tissue if large enough. These tissues can be valuable for ancillary diagnostics. They may be discarded after a definitive diagnosis is established, but if possible, should be saved for future research purposes.

Send a copy of the pathology report and a recut set of H&E slides to Dr. Judy St. Leger, Pathology Department SeaWorld San Diego, 500 SeaWorld Dr. San Diego CA 92109-7904. Ph:619-222-6363.

Appendix P: Sample Enrichment Schedules for Penguins

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			1	2	3	4
			Sprinkler / mister	Keeper play in habitat	Relocate pm pans	Ice cubes throughout habitat
			W	K	FH	T
5	6	7	8	9	10	11
Puzzle ball w/fish & ice cubes	Guests in habitat	Relocate pm pans	Wading area on east side w/sunken fish	Keeper's choice of toy w/interaction	Boomer ball	Radio or penguin sounds CD
T, FD	G	FH	W, FD	TK	T	A
12	13	14	15	16	17	18
Keeper play in habitat	Bubbles	Ice cubes on west & north sides	Sprinkler on east side	Relocate pm pans	Keeper's choice of toy w/interaction	Ice cubes throughout habitat (iphone)
K	V	T	W	FH	TK	T
19	20	21	22	23	24	25
"Keeper play" outside habitat	Radio or penguin sounds CD	Relocate pm pans	Wading area on east side w/boomer ball	Ice cubes throughout habitat	Multiple boomer balls, interact with for 10 minutes	Keeper's choice of toy w/interaction
V	A	FH	W	T	TK	TK
26	27	28	29	30	31	
Puzzle ball w/fish & ice cubes	Bubbles	Keeper play in habitat	Sprinkler / mister	Relocate pm pans	Ice cubes throughout habitat	
T, FD	V	K	W	FH	T	

Week of:	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	Traffic cones, car mats, painting	Fish from heaven, seasonings, kelp with fish	Hula hoop chain, jingle bells	Mandatory swim, pool float	Showers, pool noodles, small colored plates	Mirror-in exhibit or at underwater viewing, jumbo tennis balls	Balloon freezes, open house encounter room
	Mandatory swim, hanging ball from feed hook	Water sprinkler, dog toys, kazoos	Bubbles, cauldrons, puzzle mats	Turtle pool &/or top, kayak	Trash can lids, baby bath, xylophone	Hose pieces, ice sculpture, baby mobile	Kelp, flashlight in exhibit or at underwater viewing
	Ice treats, bells, frisbees	Boogie board, roll ball at underwater viewing	Smiley toy, open house HR and HP	Tv at UWV, fish inside octoballs	Water feed from heaven, mandatory swim, buoys	Snow cones, chalk drawings, painting	Tent, boogie board, extracts
	Color-changing ball, yoga mats	Mandatory swim, penguin soccer	Big red ball, wind chimes, large ice floe	Music, water feed from side door of exhibit	Kiddie pool, small balls, small colored mats	Water sprinkler, fire hose pieces	Ice alone or with fish/fish juice/extracts
	Bubbles, plastic box toys, plastic bowling pins	Pinwheels, window clings, piano mat	Wheelbarrow with ice and fish/juice/extract, beans in a can interactive	Yellow surf board, in water fountain/light show	Hula hoops, singing and dancing penguin	Ice alone or with fish/fish juice/extracts, mega blocks towers or loose	Towels & mandatory swim

Julia J. Chambers

480 Kenolio Rd Apt. 30-101 I Kihei, HI 96753 I (631)-901-6658 | Chambersjj21@gmail.com

Summary of Qualifications:

- Natural take charge leader
- Detail oriented
- Interpersonal relationship with co-workers and customers
- Multi-tasking in a fast-paced environment
- Office skills including data entry, answering phone, understanding of excel, word, outlook, etc
- Ability to comprehend and maintain policies and procedures
- Exemplary problem-solving skills with the ability to identify problems and implement corrective action
- Personality attributes include friendly and engaging, responsible, patience, adaptable to a variety of situations

Work Experience:

Hyatt Regency Maui & Spa- *Wildlife Attendant* May 2022- Currently

- Oversee a variety of exotic avian species including African penguins, parrots, swans, flamingoes, African crowned cranes and ducks
- Sanitized and maintained a healthy environment for African Penguins; including positive enrichment, daily cleanings in habitat and providing nutritional needs in their diet
- Conducting educational programs for local youth groups about the significance of the African Penguins
- Daily tasks include feeding, watering, cleaning, and monitoring the wellbeing of all animals.

Wailea Beach Villas – *Concierge, Wailea HI* December 2020- January 2022

- Arrange booking and reservations on behalf of guests prior to arrival as well as guest in house
- Assisted with Bellmen duties, Recreation tasks and Front desk check ins
- Provide exceptional customer service addressing all guests needs
- Ability to prioritize and handle task within a stressful environment

Andaz Maui at Wailea Resort – *Concierge, Wailea, HI* April 2018- July 2020

- Answered questions inquires through email, on the phone or in person
- Coordinate travel arrangements for guest prior to their arrival to the resort as well as in-house guest
- Direct guest to resort amenities, including laundry, fitness facility, pool desk, on site restaurants
- Received

Maui Humane Society – *Humane Enforcement Officer,* Puunene, HI July 2017 – September 2018

- Conduct investigation and enforcement of State and County laws pertaining to animal control and animal cruelty
- Issue citations for violations of animal control and animal cruelty laws
- Educate animal owners on the proper care and treatment of their animals
- Performed office duties including answering phones for dispatch and data entry
- Applied problem solving skills to deescalate stressful situations

Maui Humane Society – *Animal Care Attendant,* Puunene, HI November 2016- July2017

- Maintain a clean and sanitized living environment for all the animals.
- Provide adequate food, water and exercise for the animals as part of my daily routine.
- Ability to work within a team, assisting various departments within the shelter with shared duties.

Quail Run Kennel- *Kennel Employee Student;* Medford, NY May 2014- August 2016

- General kennel maintenance, oversaw 70-85 different breeds of dogs at a time.
- Bathing and assisted with feeding.
- Performed financial transactions upon release of clients pets

Education:

Becker College, Worcester, MA
Bachelor of Science in Criminal Justice, May 2016
Associate of Science in Animal Care, May 2015
The American University of Rome, Rome, Italy
Study Abroad, Summer 2011

Allison Strassburg

734-929-7358 | strassb2@msu.edu

Education

Michigan State University College of Natural Science | East Lansing, MI
Bachelor of Science in Zoology with a concentration of Animal Behavior and Neurobiology, May 2020

Experience

- Hyatt Regency Maui- Wildlife Caretaker
  - Held paid position from March 2023- Current
  - Daily care for the birds: feeding, cleaning, handling, performing routine health checks and maintenance, and enriching their minds
  - Penguin feeding presentations and Q&As for the guests and the public
  - Wildlife tours offered 3 days weekly to the guests and the public: providing natural history backgrounds and disposition descriptions for the parrots, penguins, and waterfowl in the gardens
  - Wildlife University- a program for children staying at the resort, educating them about animal husbandry through nutrition and diet planning, enrichment projects, natural history talks, etc.
  - Future planning for the growth of the programs
    - Expanding our penguin program- in depth diet, enrichment, medical and habitat research
    - Brainstorming a new habitat for flamingos
    - Designing a coral nursery
    - Looking into new, more natural, perches in lobby
- Central & West Maui Animal Clinics- Vet Tech Assistant
  - Held position from October 2022- March 2023
  - Providing compassionate care to animals, keeping patients clean, dry, and comfortable.
  - Alerts the veterinarian(s) to changes in patients' condition.
  - Recognizing patients with contagious disease and follows relevant procedures.
  - Providing safe and effective patient restraint.
  - Medicating patients.
  - Using proper safety techniques and positioning for radiological procedures.
  - Recovering patients from anesthesia.
  - Setting up and assisting with procedures, such as IV catheterization and other common treatments.
  - Assisting with lab tests as needed.
  - Completing medical records accurately and efficiently.
  - Stocking & cleaning the hospital
  - Utilizing in-house inventory control procedures to ensure items are stocked appropriately.
  - Demonstrating ability to accurately manage and record detailed information in medical records and other data-management systems.
  - Completing assigned tasks in the time allotted without direct supervision.
  - Showing empathy toward clients and treat animals with respect and compassion.
  - Working energetically for entire shift, sometimes exceeding 10 hours per day.

- Wildlife Rescue & Rehabilitation- Rehab Apprenticeship
    - Held from March 1st-May 26th
    - Feeding, restraining & medicating, and caring for native Texas wildlife of all ages including raccoons, opossums, squirrels, deer, songbirds, waterfowl, land fowl, and egrets and other shorebirds
        - Feeding types: Tube, syringe, bottle, and hand feeding
        - Medication administration types: oral, SubQs, IM injections, ophthalmic and topicals
    - Assessing behaviors, making diets, enclosure cleanings, and check-ups for patients
    - Body condition checks
    - Medicating all patients
    - Releasing animals
    - 10-14 hours shifts
        - Total hours worked 582hrs
- Bird Center of Michigan (*name change)- Rehab Assistant
    - Same experience as previous employment, overseeing and working alongside interns
    - In addition, experienced in songbird & waterfowl euthanasia
    - Held paid position from June-September 2022
- *Bird Center of Washtenaw County Internship- Songbird Rehabilitation Clinic
    - Held paid position from May-December 2020: Supervisor position overseeing first year interns and volunteers
    - Held paid position from May-August 2019
    - Provided daily care for patients:
        - Feeding- gavage, tweezer, syringe
        - Administering medications
        - Enclosure maintenance
        - Monitoring symptoms and behavior
        - Diagnoses upon intake and in-care
        - Aiding in physical therapy and enrichment
        - Following parasite fecal checks, procedures, and diagnoses
    - Reception work:
        - Data input, daily logs, and updates for staff
        - Answering phone calls, provided resources & support for the pubic
- Campanario Biological Station- Volunteer
    - Held position from Mid-April- Mid-October 2021, Osa Peninsula in Costa Rica
        - Observed avian, mammalian, reptilian, and amphibian animal behaviors on a daily basis
        - Learned the components of the ecosystems in which jungle and marine wildlife thrive [understanding what individual species need in terms of environment and nutrition]
        - Seasonal trail maintenance- sign making, raking, checking for accuracies
        - Learned cultivation and harvesting techniques of native fruits and vegetables
        - Grew in my understanding of the interactions between the ocean and the jungle

        - General housekeeping: cooking for small tour groups and cleaning the kitchen, lab, bathrooms, and bunkhouse areas for large students groups
- Monteverde Butterfly Gardens- Intern
    - Held position from June- end of July 2021
        - Learned native plant, insect, and arachnid species of Costa Rica
        - Managed captive arthropod species' enclosures
        - Gave garden and arthropod enclosures tours: teaching about the native species and helping tourists understand insect myths and facts
- Holekamp Laboratory at MSU (Hyena Lab)
    - Held student position from November 2019 to March 2020
    - Held paid position from May 2020-April 2021: IBIO Student Research Assistant aiding in data entry
        - Data analysis of field work observations from the past two decades
        - Data entry for a graduate student's hyena diet ecology project
- Howell Nature Center Internship 2.0- Animal Husbandry, Education Zoo
    - Held position from September 2020-April 2021
    - Weekly volunteering in the education zoo
    - Mentoring new interns and aiding in the wildlife clinic when needed
- Howell Nature Center Internship- Animal Husbandry, Education Zoo
    - Held position from May-August 2018
        - Daily diet prep and delivery for residents
        - Design and installation of new exhibit features
        - Monitoring and documenting animal health daily
        - Interaction and handling of animals
        - Raptor restraint for semiannual physicals
        - Raptor handling of education birds
        - Enclosure maintenance and landscaping
- Whole Foods Market- Part-Time Cashier
    - Held paid position from October 2020-April 2021
        - Cashier-providing customers with a clean, safe, and welcoming experience

Volunteering

- Elephant Sanctuary in Tennessee
    - Participated in a volunteer day, helped with sanctuary maintenance and preparing elephant enrichment, July 2018
- Humane Society of Huron Valley - Volunteer Cat Comforter
    - Held position from 2017-2018
        - Trained in animal behavior recognition
        - Comforting stressed cats, watching for illness, managing supplies

Professional Education and Training

- CPR & First Aid Certified
- Above & Beyond Staff Award at WRR
- Background in captive and clinic animal care
- Knowledge of natural history for Michigan's native mammals, birds, & reptiles
- Trained at HSHV, HNC, & the Bird Center in behavior recognition
- Trained in bird specimen prep for the MSU Museum
- Certification from the San Diego Zoo Global Academy

Skills & Abilities

- Critical thinking and conflict resolution
- Can work independently or in a group setting
- Able to work in fast paced environment with efficiency
- Driven to complete tasks to the best of my ability
- Proficient in Microsoft Access and Excel
- Time Management & Organization
- Background in data analysis
- Servant Leadership Style
- Physically Active
- Detail-oriented

Affiliations

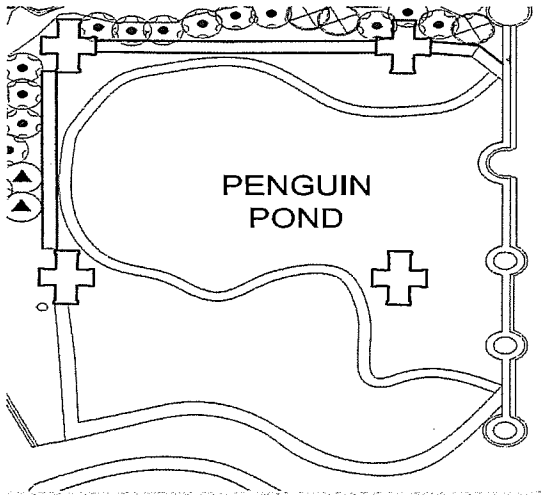
- Association of Zoos and Aquariums Membership (2019-2020)
- MSU Women's Ultimate Frisbee (August 2017-March 2020)

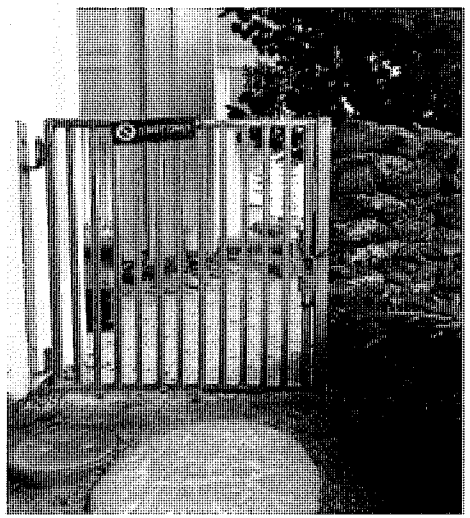
Attachment 9

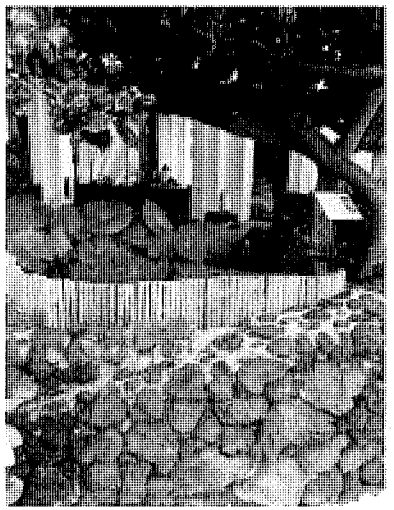
Attachment 10

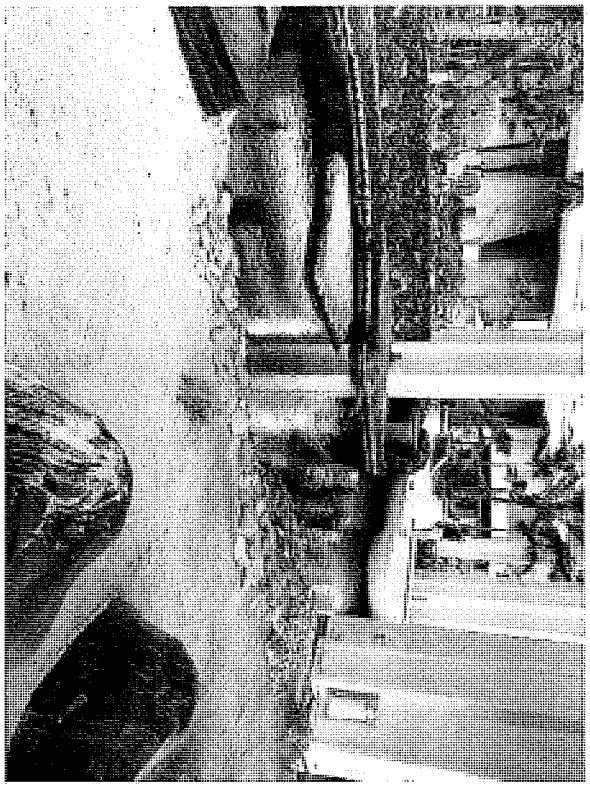
Penguin Habitat

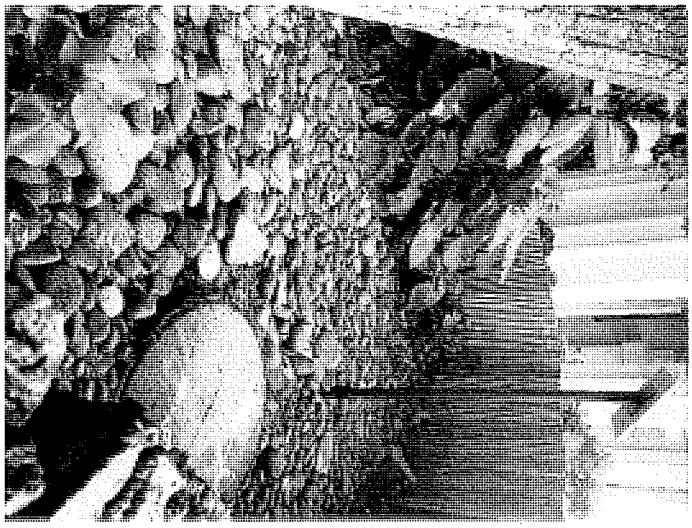
(37x44' or 1624 sq ft total enclosure area. Blueprint view, Balcony View, Employee Gate, Salto Locks, Bamboo Fence and Various Viewpoints

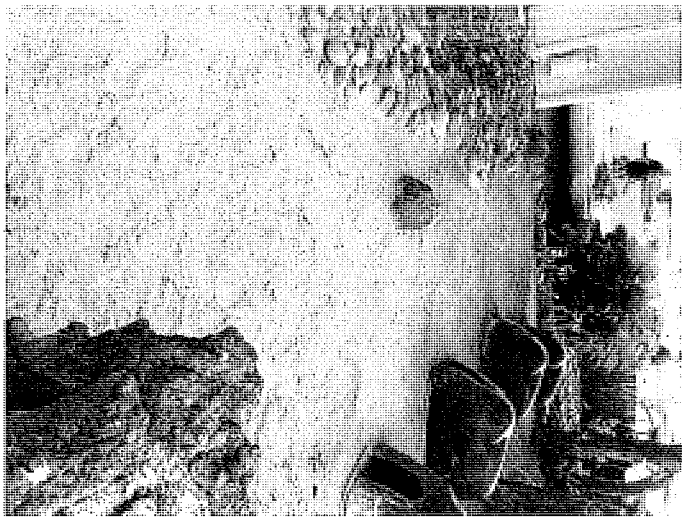








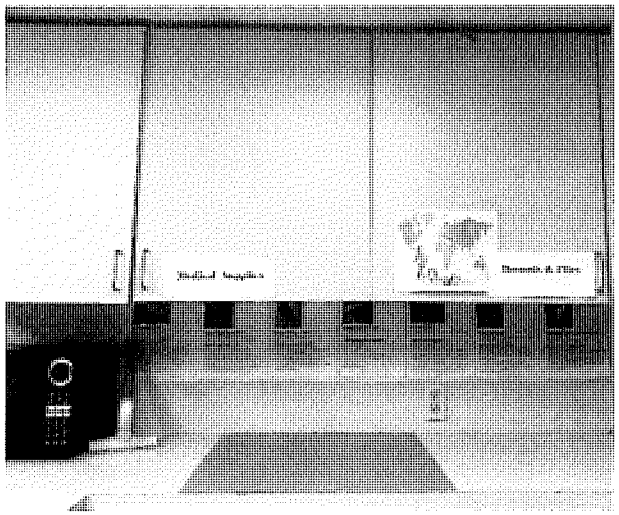


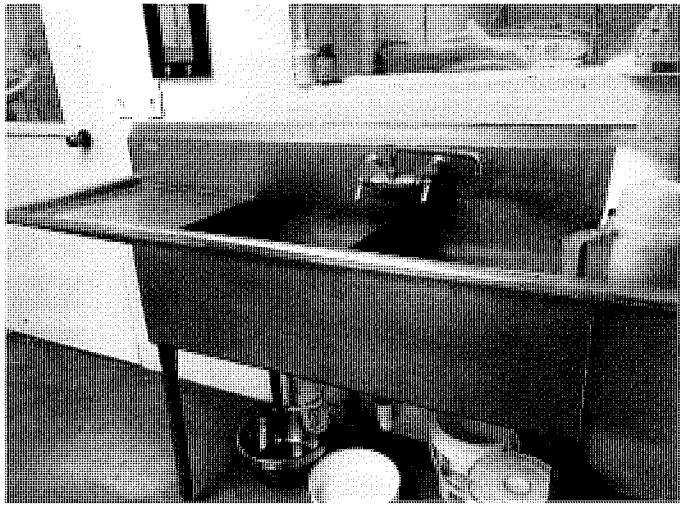


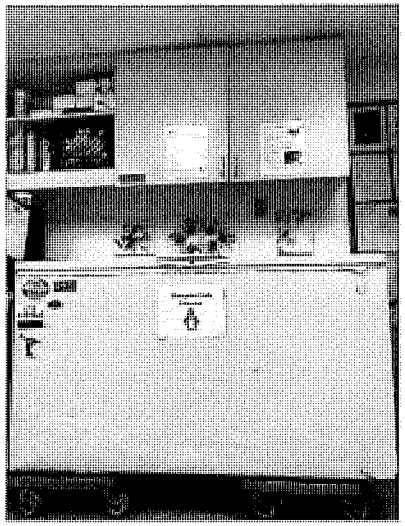
Attachment 10

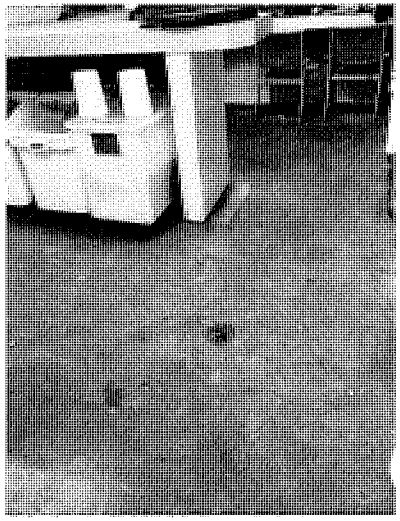
Quarantine Room

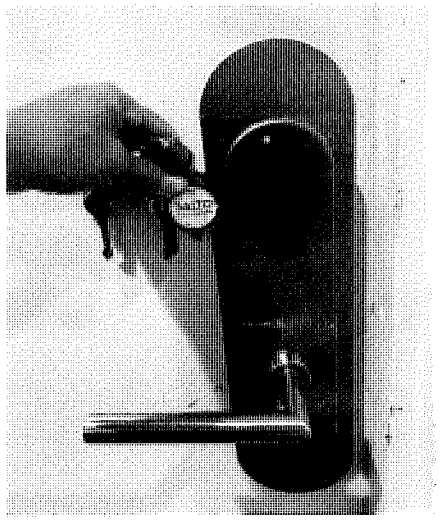
(12.5x17ft. space with Salto Locks, Medical Supplies, Bird Record, Sink, Penguin Fish Freezer, Floor Drain and Salto Locks)











Attachment 11
Pages: (1-8)

Hyatt Regency Maui Biosecurity Manual

HYATT
REGENCY
MAUI RESORT & SPA

INTRODUCTION

Biosecurity is the set of precautions taken to minimize the risk of introducing an infectious disease into an animal (or human) population.

The Hyatt Maui has identified the following priorities:

- Keep all birds safe
- Keep all birds healthy
- Keep Hyatt staff and visitors safe and healthy
- Keep facility open and running if an infectious disease outbreak occurs within, or near animal habitats
- Assist USDA, US Fish and Wildlife, ZAA and AZA in acquiring and managing exotic species.

Hyatt Biosecurity includes but is not limited to:

- Appropriately constructed and maintained facilities
- Management of stray and pest species
- Management of drainage and waste products
- Good hygiene and work practices
- A preventative medicine program
- Appropriate quarantine of newly arrived and sick animals and
- Veterinary diagnosis and treatment of sick animals.

Bird Safety and Security

Overall Property and Emergency Protocol:

1.) Hyatt Maui has over 150 Avigilon security cameras installed across the lobby and around the property. Hyatt security team patrols the lobby 18 times a day. Hyatt security, engineering, housekeeping and front desk personnel are on duty 24 hours a day to help monitor, and are the first line of defense.
2.) In the event of an emergency, the Wildlife Supervisor (WS) will be available by phone 24 hours a day. Security would call WS to assess situation.
3.) WS would then make additional calls if needed (to veterinarian, US Dept. of Agriculture, Maui Police Department) to assist in or report an emergency.

Enclosures:

All enclosures are constructed and maintained to keep birds safe and to prevent escape, prevent unauthorized access, ensure safety and to minimize the introduction or spread of disease. Enclosures to be inspected by USDA every two years. Hyatt will follow AZA standards for habitats whenever possible.

1.) Penguins. Penguin Habitat is enclosed with 3-foot lava rock wall and locked gate. Perimeter inside habitat is routinely monitored to be cleared of rocks/vegetation that would allow access over the rock wall. Signs are posted to inform guests about our rules regarding trespassing/harassment of penguins.
2.) African Cranes. Walls are constructed high enough to prevent escape with locking gates. Birds are pinioned following the guidelines set by USDA to prevent escape.
3.) Parrots. Parrots kept inside individual cages inside a locked bird room and flight feathers are trimmed to prevent escape. Signs are posted to inform guests about our rules against feeding, harassment and handling of birds.
4.) Flamingos, Swans and Ducks. Inside security-monitored garden setting. Exotic species pinioned following the guidelines set by USDA to prevent escape. Signs posted explaining rules interacting with our birds.
5.) Quarantine Areas established in case of new animals or illness/injury to existing animals to meet standards set by AZA and Department of Agriculture. Safe carriers are available if animal needs to be transported to vet.

Infectious Disease Prevention and Protocol:

Hyatt's Wildlife Team will lead the management of disease prevention with collaboration of other Hyatt Departments (Water Features, Landscaping, Engineering, and Recreation). Wildlife Staff will continue to conduct on site risk management assessments and stay current of all new protocols. These are the following priorities set by the department:

1.) Prevent the introduction of infectious disease and contaminants to other animals
   a. Most of our birds are not in contact with other species and stay to their confined habitats. There is little interaction with wild species of birds. Handlers wash hands between all encounters. Office, bird room and quarantine area are sterilized daily or between animal encounters.
   b. All new animals will be acquired, quarantined and reported following USDA and AZA standards.
   c. With the onset of Covid 19, all guest/bird encounters are currently suspended, and all interactions with birds are handled exclusively by wildlife staff, who are all vaccinated.
   d. No wild birds will be rehabilitated on our property to prevent exposure and spread of disease to birds in our care.

2.) Prevent the spread of disease from an infected area to an uninfected area on property
   a. Maintain appropriate levels of cleanliness/hygiene for the species with the aim of minimizing biosecurity risk. This includes all enclosures, equipment, feeding dishes, water sources and substrate. Hyatt wildlife team will follow all hygiene and water cleanliness standards set by AZA.
   b. Water Features team will test, monitor and treat penguin pond daily (closed water system) and report to Wildlife Staff any abnormality.
   c. Water Features team will test, monitor and treats garden waterways (separate closed water system) and report to Wildlife Staff any abnormality.
   d. Waste disposal
      i. Waste from penguin and parrots will be collected and sealed in plastic garbage bags and disposed in trash. Penguin pond chemical levels will be monitored and treated daily.
      ii. Waste from garden birds will be sprayed down and water systems monitored and treated daily by Landscaping and Water Features teams.
   e. Water Features and Landscaping teams will monitor penguins and garden birds for any signs of illness or injuries, then calls wildlife team if needed. If disease is suspected, WS will call vet. Should vet need additional assistance, they will call AZA Species Coordinator or ZAA Animal Management Program Coordinator. Wildlife staff will follow all recommended protocols to treat birds.
   f. All animals exposed will be quarantined and habitat sanitized to AZA standards. All cases of infection or death will be reported.
   g. All habitats will be designed and maintained to reduce access to pest species, and any stagnant water will be removed daily.
   h. Animals will stay within their specific zones to minimize the introduction or spread of disease.

3.) Prevent the spread of infectious disease from Hyatt animals to animals outside Hyatt
   a. Wildlife Staff will follow all recommended protocols of vet. Should animal die of infectious disease, animal will be stored, shipped and disposed of professionally after necropsy to prevent spread of disease through burial or water exposure.
   b. Most animal water systems at the Hyatt are considered "closed system" and should not affect animals outside of our property. Any contamination of outside water sources will be reported to Department of Agriculture immediately.

4.) Prevent the spread of infectious disease from animals to humans or humans to animals
   a. Handlers will stay home when sick whenever possible
   b. Handlers will wash hands between encounters, multiple handwashing/sanitizing station located inside Hyatt.
   c. Handlers will wear proper PPE when working with animals
   d. Handlers will have a stocked first aid kit for both birds and staff members. Staff members will treat injuries immediately and cover to prevent spread disease.
   e. Handlers will prepare and serve bird food following AZA standards, and will monitor human handled objects that birds encounter throughout the day. Dry feed, fresh fruits and vegetables will be stored properly to prevent spoilage, pests, bacteria or mold from contaminating food.
   f. All staff, outside contractors and guests (over the age of 5) have Covid testing protocol in place at the Hyatt through Security Office/Front Desk Office.
   g. All guest interactive programs have been suspended during Covid to prevent illness from spreading. Guests are encouraged to wash hands once interactive programs begin again.
   h. All handlers are currently wearing face masks to prevent the spread of Covid and other diseases while working with animals, guests and other staff.
   i. Wildlife staff should have working knowledge of zoonotic disease spread between animals and humans, risk factors, prevention and treatment.

5.) Other preventative measures:
   a. Preventative medicine, supplements and proper nutrition to ensure health of birds.
   b. Daily inspection of habitats for signs of illness or risk of illness
   c. Isolation and treatment of sick animals
   d. Veterinary investigation of illness and death in collection animals
   e. Control of wild, stray and pest animals in a partnership with EcoLab
   f. Hygiene procedures for staff and visitors, especially if in contact with other animals.
   g. Appropriately constructed and maintained facilities
   h. Controlling drainage and waste disposal in partnership with Landscaping and Water Features team.
   i. Ensuring food, water, equipment or work practices do not introduce or spread pests or disease
   j. Proper Record Keeping
   k. Ongoing Staff Training

Animal Health and Preventative Medicine

1.) Hyatt will contract an experienced exotic veterinarian to work with animals. Current vet is Dr. Paul McCurty, who is available 24 hours/7 days a week.
2.) Hyatt wildlife staff and vet have outside resources available through ZAA and AZA to assist with the diagnosis and treatment of animals.

3.) Wildlife Staff has strong working relationship with ZAA and AZA as resource for health, nutrition, breeding, behavior, illness and other animal-related issues.
4.) WS has working relationship with Department of Agriculture, US Fish and Wildlife, and Maui County to make sure Hyatt is compliant in all areas, including reporting.

Quarantine

1.) Hyatt has established 2 quarantine areas (indoor and outdoor) on property to comply with AZA and US Dept. of Agriculture Standards.
2.) Quarantine areas are constructed to minimize the introduction or spread of disease from:
    a. Newly arrived animals
    b. Sick/injured animals
        i. Any animal exposed to sickness will immediately move into quarantine area and biosecurity measures will increase.
        ii. Any animal leaving quarantine will only do so with the permission of vet, or Department of Agriculture (in case of new animal). Monitoring and testing will continue with all impacted animals.
        iii. All diagnostic samples (feces, blood, urine) should be assessed and managed for biosecurity risk. Any animal that dies while in quarantine will be given necropsy and considered a high biosecurity risk until cleared by vet. If necropsy cannot be performed immediately, care will be taken to preserve body (in separate freezer) until necropsy can be performed by qualified vet or specialist.
        iv. Any unexplained/unexpected death will be considered a high biosecurity risk and reported to Department of Agriculture.
        v. Any death that constitutes a high biosecurity risk will be immediately reported to Department of Agriculture and other relevant authorities. Any death of animals under permit and/or listed in Department of Agriculture's inventory list will also be immediately reported to relevant authorities.
        vi. Deceased animals will disposed of following recommended procedures that minimize biosecurity risk and minimize opportunity for scavenging (cremation at vet's office preferred).
        vii. Any materials used to collect, store or transport carcasses should be disinfected or disposed of.
        viii. Complete medical records will be maintained during quarantine.
3.) All animals in quarantine will undergo examination, monitoring, and testing/treatment (if needed) under recommendations given by vet, ZAA, AZA and/or Department of Agriculture, then documented and reported as needed.
4.) All wildlife staff will be trained to recognize signs of illness in birds and biosecurity risks and report findings immediately. Advanced care will be given by or under supervision/recommendation of qualified personnel.
5.) Each animal in quarantine should be assessed for biosecurity risk and biosecurity management procedure should be put into place. Access to quarantined animals will be limited.
    a. Wildlife staff will take all advised precautions moving between quarantined animals and healthy animals (hand washing, PPE's changing footwear/clothing, disinfection, etc.)

b. Equipment used to treat quarantined animals will be dedicated to this area only, disinfected between uses.

6.) Quarantine area will be sterilized as recommended per case, and cleaning procedures followed to prevent cross-contamination.
7.) Wild birds will not be rehabilitated on Hyatt property to prevent the introduction or spread of disease.
8.) NO ANIMAL LIVING AT THE HYATT WILL BE RELEASED INTO THE WILD.

Management of Pest Species

1.) Hyatt will work with EcoLab in the management of pest species to minimize the introduction or spread of disease.
2.) All food storage containers are designed to minimize access to pests.
3.) Countertop and floors will be cleaned daily to minimize attraction of pests.
4.) Rubbish and excess food will be disposed of daily to lessen the attraction of pests.
5.) Material that harbor pest species will be disposed of regularly.
6.) Safe and effective pest control (traps- no poison) are monitored by EcoLab throughout the Hyatt and Garden area.
7.) Any stray/wild animals are to be kept away from our collection of birds to minimize the introduction or spread of disease. Maui Humane Society may need to be called to assist.
8.) Wild birds are not to be brought into bird room to minimize the introduction or spread of disease.

Food Storage

1.) All dry food will be kept in sealed storage containers, in climate controlled room to prevent pests, spoilage or introductions of mold/bacteria
2.) All produce and mealworms will be kept refrigerated, and fish for penguins kept frozen in appliance with visible temperature gauges to prevent pests, spoilage or introductions of mold/bacteria.
3.) Serving dishes and water bowls will be cleaned daily to prevent access of pests or disease, maintain hygiene and prevent stagnation of water.
4.) All food will be ordered through reputable food suppliers approved by Hyatt's purchasing department. All food will be inspected before adding to our bird room and again before serving.
5.) All food will be prepared in a manner to minimize or prevent contamination.

Record Keeping

1.) Written records of birds' diets will be maintained by Wildlife Staff. All food and water quality guidelines will meet/exceed standards set by AZA.
2.) Record keeping to document all necessary information essential for good biosecurity practices. Records to include individual animals or group identification, date and place

of birth, medical history of individual, including preventive medicine program, breeding history and husbandry practices.

i. Upon death the following should be documented: date, location, species, clinical signs/circumstance/syndrome noted, test performed/results, diagnosis and response.
ii. Additional records should be kept for any animal posing a biosecurity risk.

Ongoing Staff Training

1.) Ensure all staff are aware of biosecurity significance
2.) Ensure all staff understand major routes for disease and how to control contamination.
3.) Ensure all staff have understanding how to minimize risk of disease and pathogen movement.
4.) All staff should have access to Hyatt Biosecurity Manual

Attachment 12
Slides: (1-17)

USDA Permit Request for African Pelagics

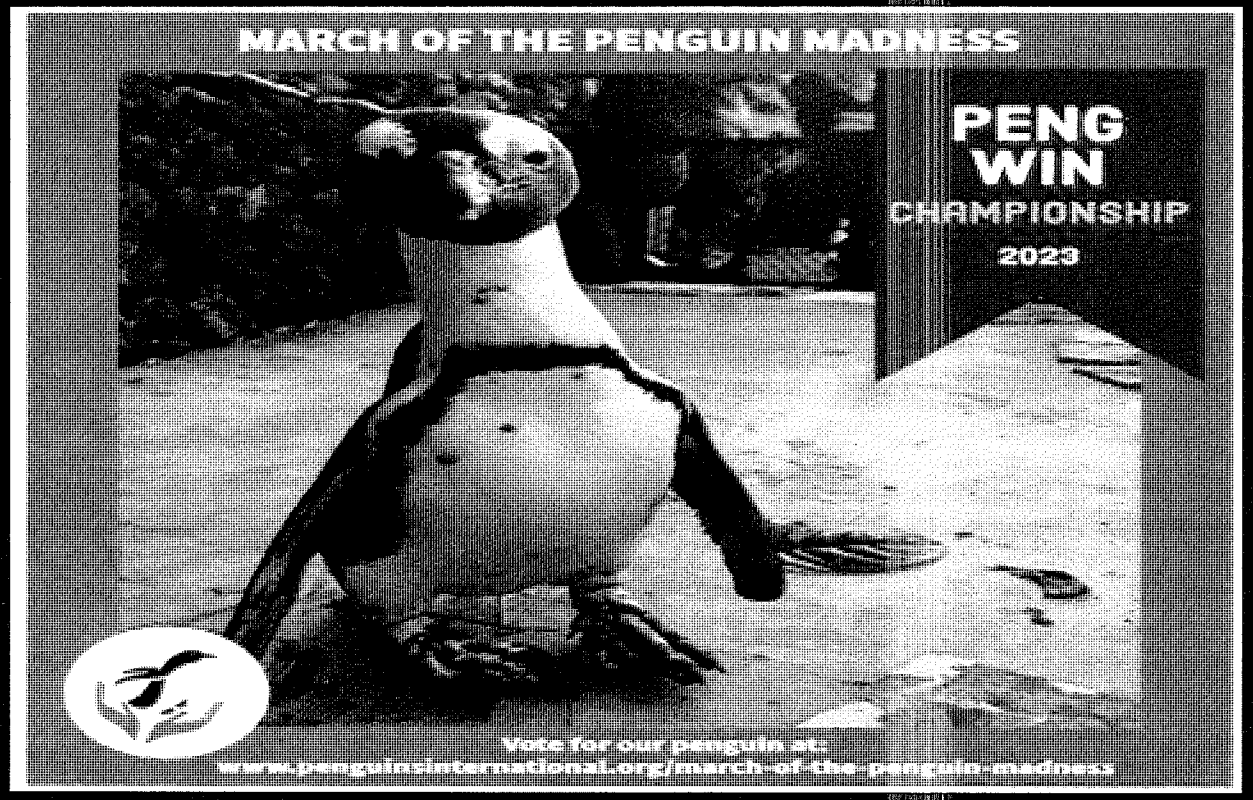
Hyatt Regency Maui


No Zoos in Maui

School Groups

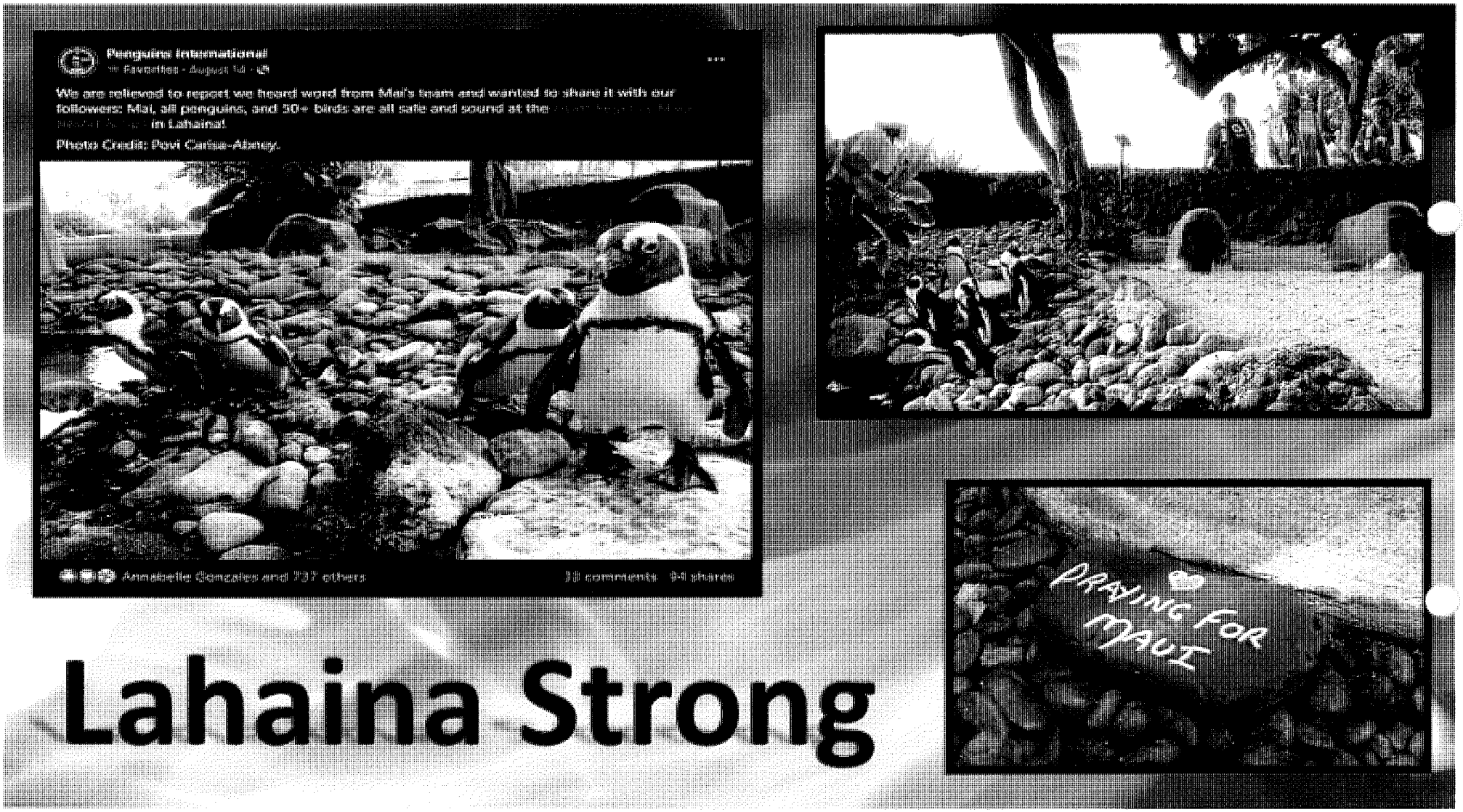
Community Events

COMMUNITY



SUPPORT

Over 25,000 votes from around the world


Penguins International
Favorites · August 14 ·
We are relieved to report we heard word from Mai's team and wanted to share it with our followers: Mai, all penguins, and 30+ birds are all safe and sound at the
in Lahaina!
Photo Credit: Puvi Carisa-Aberay.
Annabelle Gonzales and 737 others
31 comments 941 shares
PRAYING FOR MAUI
Lahaina Strong

Animal Welfare and Compliance

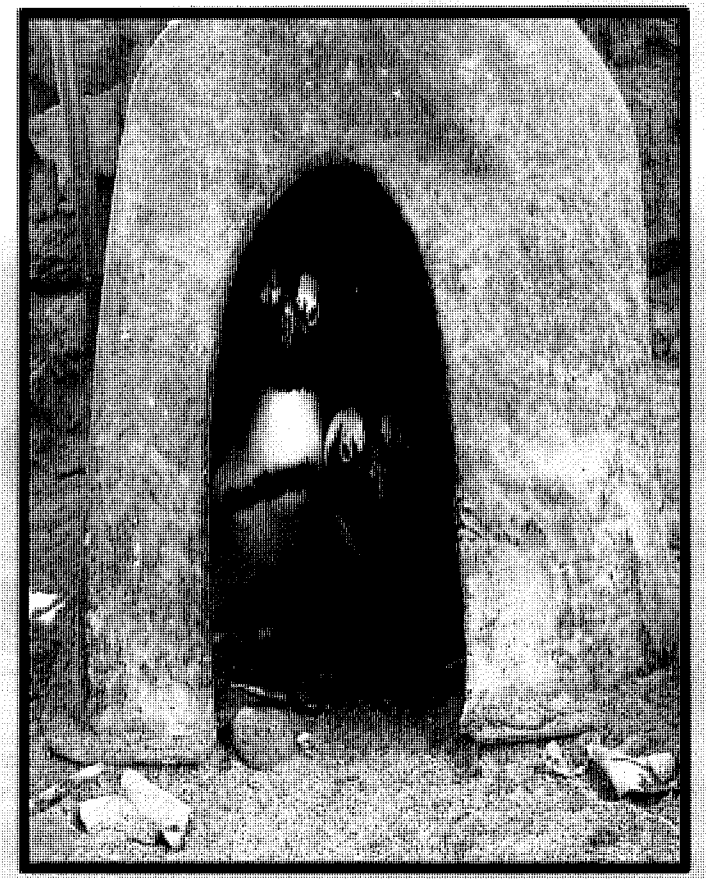
Animal Welfare is our top priority. Our facility has passed all inspections and goes beyond protocols to ensure our animals are given the best lives possible.

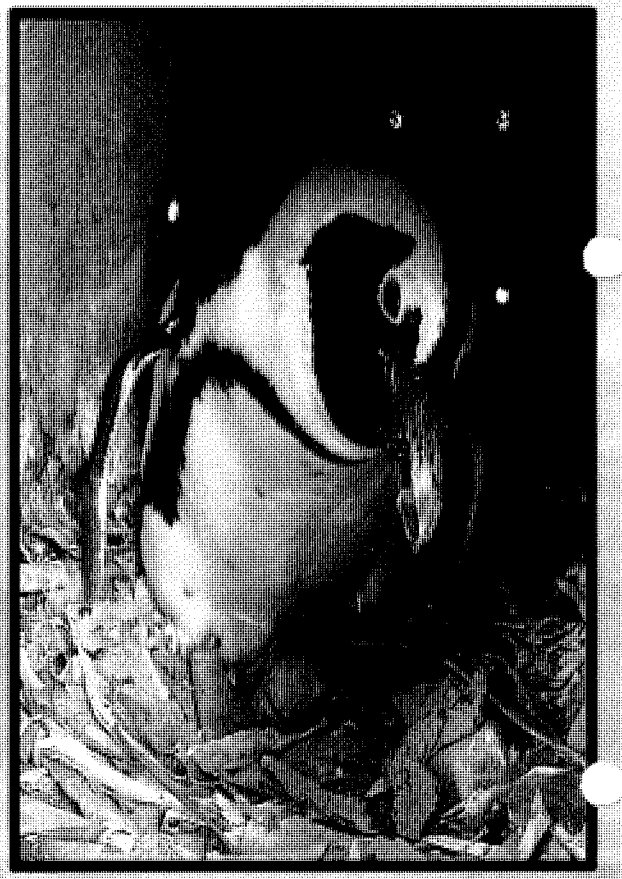
We have an outstanding track record in our 40 year history working with animals.

Our goal is to be transparent and fully compliant. We respect the regulations in place to keep Hawaii safe and hold ourselves accountable to follow all rules in place.

We follow all AZA and ZAA penguin care protocols, have an excellent veterinary staff and provide top quality nutrition, medical care, enrichment and habitat needs.

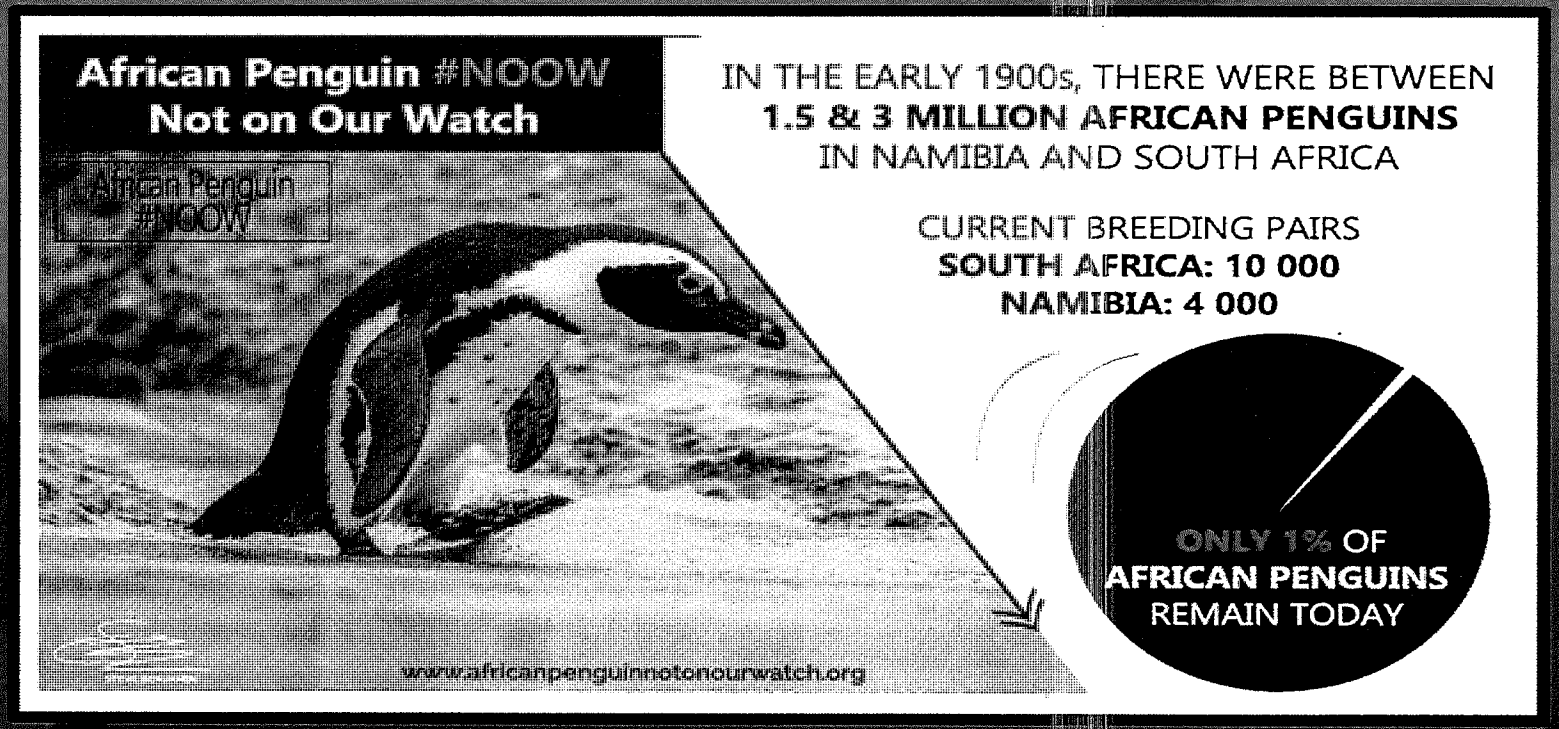
Our staff continues to work with other facilities and animal experts to improve our skills and penguin care practices. Ultimately the best things we can do for our penguins is to give them the advised group size to meet social fulfillment and ensure genetic diversity.





No Successful Hatchings in over 14 Years

Every Penguin Counts



African Penguins Could be Functionally Extinct by 2035

Affiliations- It takes a village to save a species

SANCCOB
Southern African Foundation for the Conservation of Coastal Birds
Getting our birds back on their feet

ZAA
ZOOLOGICAL ASSOCIATION OF AMERICA

METRO RICHMOND ZOO

Penguins International
Protecting penguins, protecting the planet

African Penguin #NOOW

Smithsonian
National Zoological Park

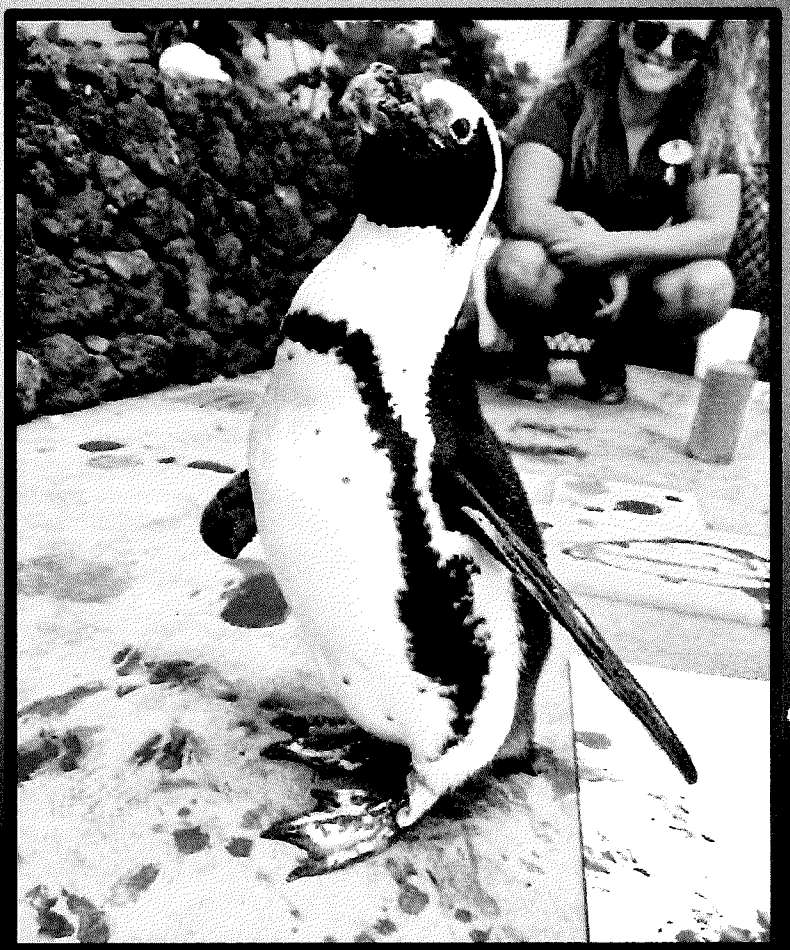
SAN FRANCISCO ZOO

U.S. FISH & WILDLIFE SERVICE

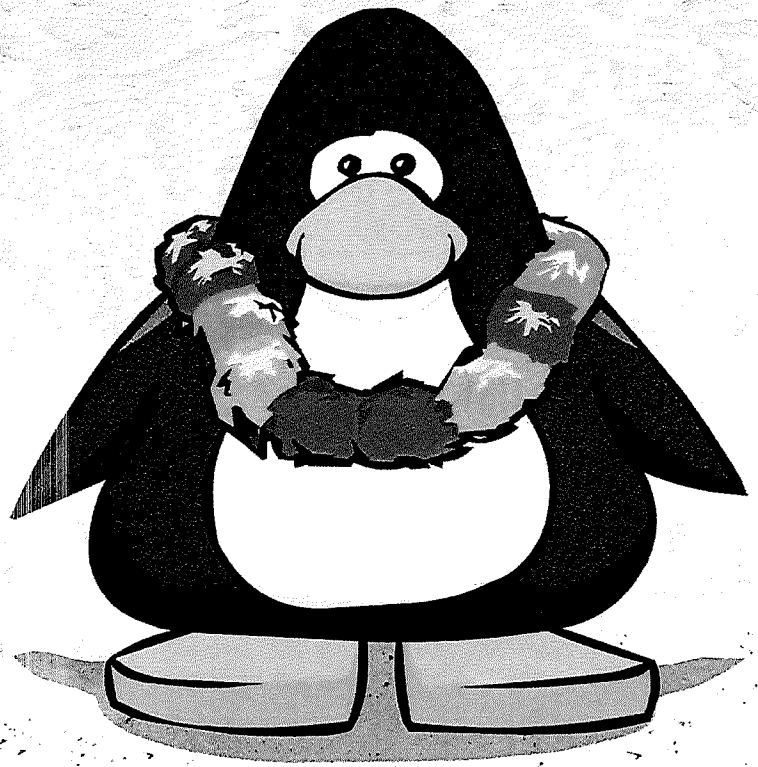
Dyer Island Conservation Trust

ASSOCIATION OF ZOOS & AQUARIUMS

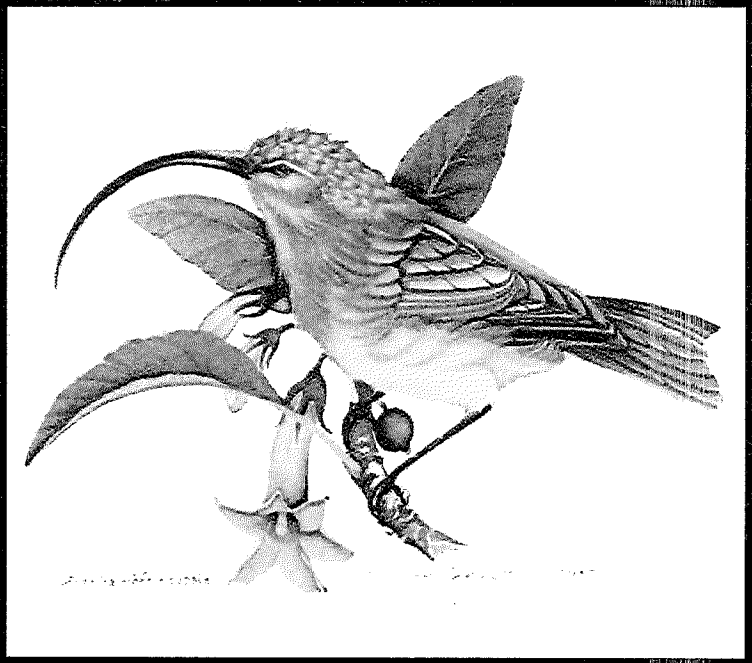
GEORGIA AQUARIUM



Penguins in Hawaii?



Hawaii- A Melting Pot of Culture and Diversity



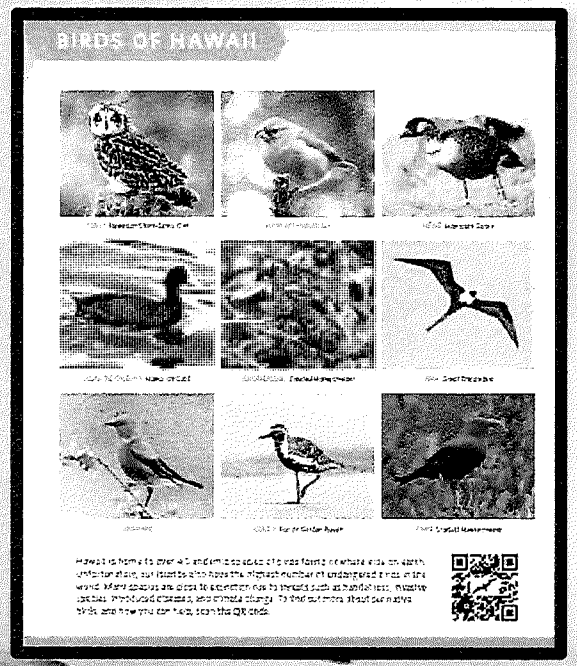
Extinction is Forever

Hawaii has a history of respecting birds of all species

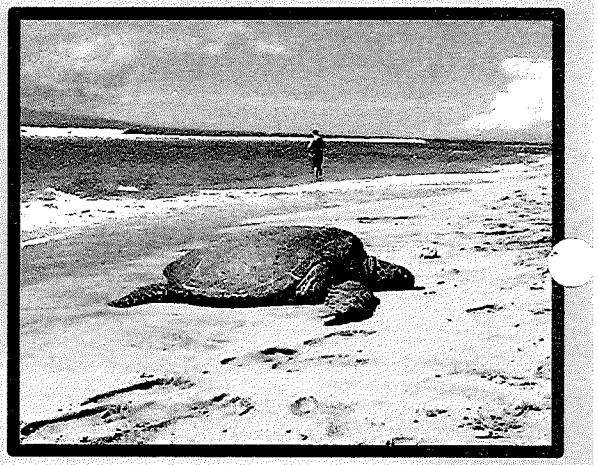
David Kalakaua (1836-1891) made royal lands available to the people of Hawaii on which the Honolulu zoo was founded. Royal subsidies were used to display the King's private bird collection. The purpose of displaying exotic animals was to create a place of refuge and wonder for his people and visitors alike.

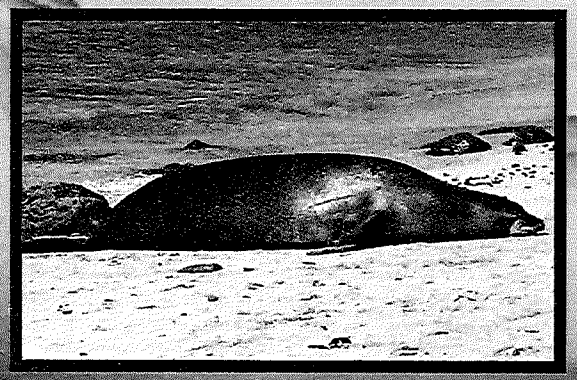
Featherwork in Hawaii has roots that date back 1,500 years. Hawaiians illustrated their reverence for birds by holding feathers as a symbol of royalty, power, and respect.

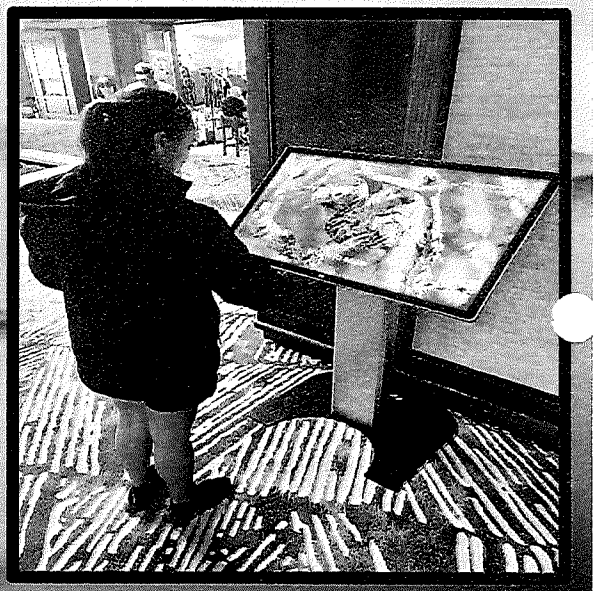
Local Partners

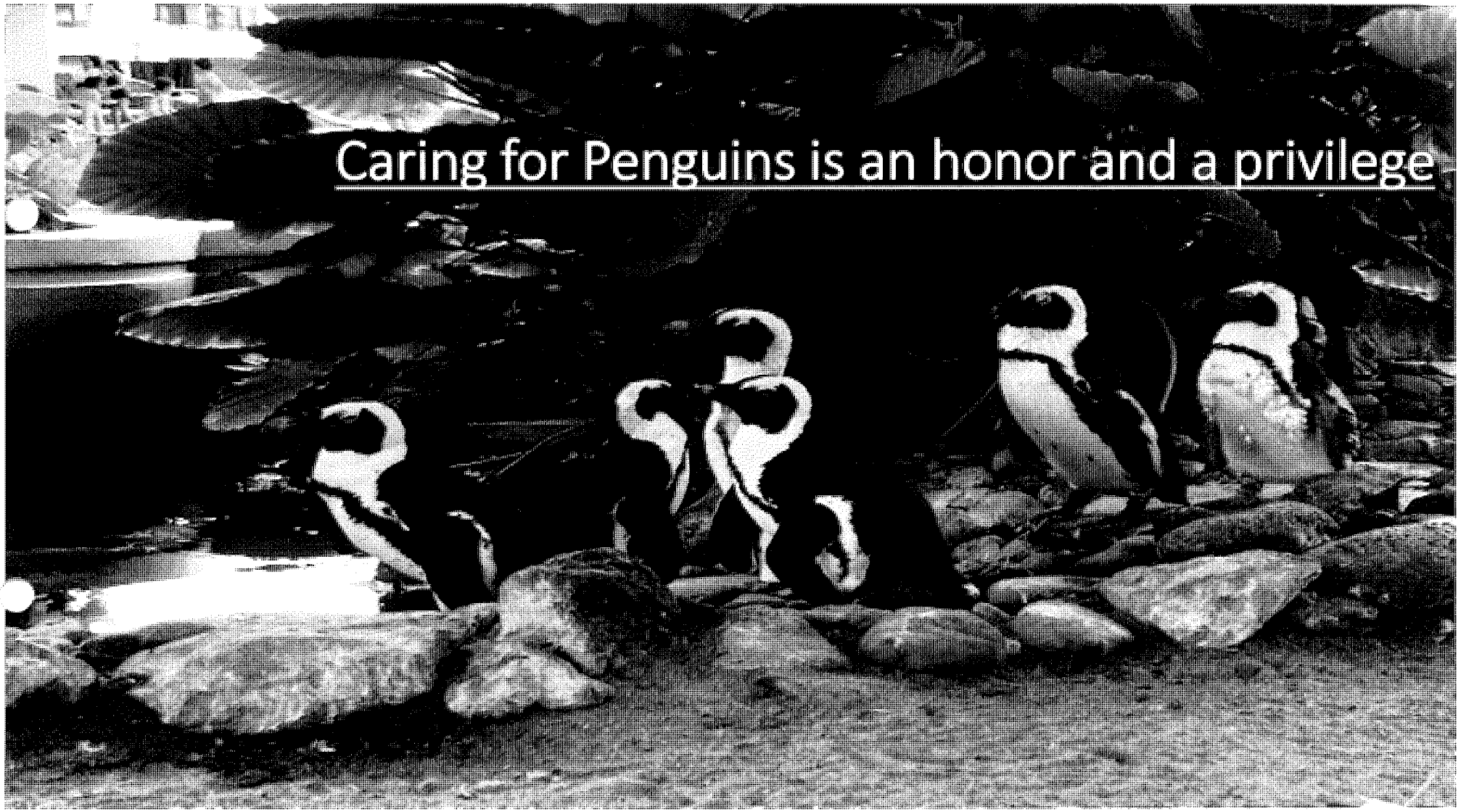


MAUI nauka
NATURE-BASED TOURISM



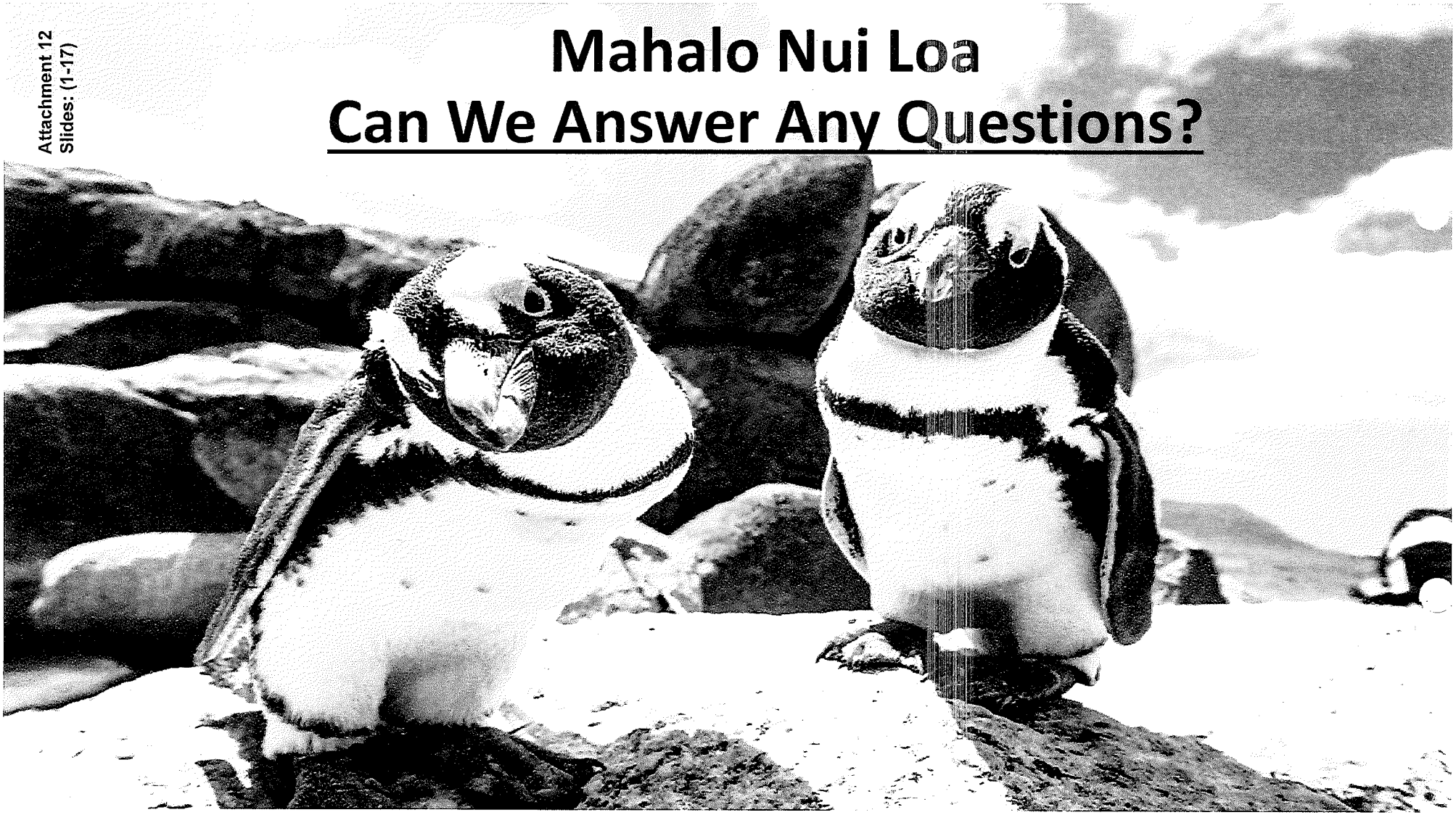





Caring for Penguins is an honor and a privilege

Attachment 12
Slides: (1-17)

Mahalo Nui Loa
Can We Answer Any Questions?



Attachment 13

29 November 2023

To Whom it May Concern:

I am writing this statement in order to facilitate, if possible, the acquisition of additional African penguins (*Spheniscus demersus*) for the Hyatt Maui Spa and Resort in Lahaina, HI. I was asked by the Hyatt administration to visit their penguin colony in fall 2023 and develop recommendations to help them improve their program. I was happy to do so as I have 30 years' experience working with this species.

The Hyatt Maui colony has 6 African penguins in an exhibit that has a large pool and a land area where nest boxes had been installed. The wildlife team that cares for the penguins as well as a number of other taxa of birds is dedicated, experienced, and not shy about asking questions that will improve their husbandry. The nutrition that the birds receive is first rate, including the fish for the penguins. The staff provide educational messaging to the guests and local population of Lahaina about penguins, wildlife, and conservation.

Penguins are a social species and the minimum number of penguins recommended by the Association of Zoos and Aquarium's (AZA) Penguin Care Manual is 10 individuals. I feel that this space could actually hold up to 16 penguins although more metrics would need to be done to confirm this.

I have maintained my communication with the wildlife staff at the Hyatt Maui and they are quite engaged in not only breeding their flock, but also doing what is best for the penguins which means increasing the colony size. I fully support this plan and hope that they are able to succeed acquiring the proper permits and paperwork to allow this to happen.

I am open to answering any questions that you might have so feel free to contact me.

Respectfully,

Steven J. Sarro

African Penguin Species Survival Plan Coordinator
(peebs1025@comcast.net)
443-695-1390

Attachment 14

To Whom It May Concern,

The talented staff at the Hyatt have been incredibly generous by providing wonderful opportunities for our preschool-6th grade students since 2013. We are a project-based, arts-integrated school that prioritizes experiential learning, so having the opportunity to bring students to learn about their birds has been a tremendous gift to our learning community. Teachers of our Preschool-6th grade students have developed units of study around these field trips which include but are not limited to; neuroscience, world geography, migration, and birds.

At our most recent field trip on October 26, 2022, we brought a group of 4th-6th graders to enjoy a wildlife tour of the swans, parrots, flamingos, and ducks, but also to observe a penguin paint. Students were amazed to learn about the specific personality traits of each penguin, this experience inspired students to dive deeper into their neuroscience unit and do some research on art and the brain. We are so grateful for these opportunities, we deeply respect Povi and her team for welcoming groups of local keiki in to learn from them the incredible environment they have created.

Mahalo,
Melita Charan
Head of School
melita@rootsmaui.org

ROOTS SCHOOL
CELEBRATING 15 YEARS
2006 - 2021

www.rootsmaui.org

Main Office: 808-250-7988
Mailing Address:
PO Box 975
Haiku, HI 96708

Roots School is located on Haiku Road in Haiku Town.

United States Department of Agriculture
Animal and Plant Health Inspection Service

JLEE
INS-0001064294

Inspection Report

Hyatt Regency Maui Resort
200 Nohea Drive
Lahaina, HI 96761

Customer ID: **6021981**
Certificate:
Site: 001
Hyatt Regency Maui Resort

Type: PRE-LICENSE INSPECTION
Date: 11-JUL-2024

No non-compliant items were identified during this Pre-License inspection.

This is the 1st Pre-License Inspection for a Class "C" license. The inspection and exit briefing were conducted with the applicant. The applicant is ready to be licensed under the AWA.

A copy of your license will be sent to you without any additional action on your part. If you have not received your license within 30 days, please contact the USDA at 970-494-7478.

Prepared By: JEFFREY LEE
USDA, APHIS, Animal Care
Date: 13-JUL-2024

Title: VETERINARY MEDICAL OFFICER

Received by Title: Facility Representative
Date: 13-JUL-2024

United States Department of Agriculture
Animal and Plant Health Inspection Service

Customer: 6021981
Inspection Date: 11-Jul-2024

Species Inspected

Cust No	Cert No	Site	Site Name	Inspection
6021981		001	Hyatt Regency Maui Resort	11-JUL-2024

Count	Scientific Name	Common Name
000001	*Amazona oratrix*	YELLOW-HEADED PARROT / YELLOW-HEADED AMAZON / DOUBLE YELLOW-HEADED AMAZON
000002	*Alisterus scapularis*	AUSTRALIAN KING-PARROT
000001	*Cacatua alba*	WHITE COCKATOO / UMBRELLA COCKATOO
000002	*Psittacus erithacus*	CONGO AFRICAN GREY PARROT / GRAY PARROT
000001	*Ara militaris*	MILITARY MACAW
000001	*Radjah radjah*	RADJAH SHELDUCK
000002	*Anas platyrhynchos*	MALLARD
000002	*Nymphicus hollandicus*	COCKATIEL
000007	*Cygnus olor*	MUTE SWAN
000001	*Aix galericulata*	MANDARIN DUCK
000003	*Balearica pavonina*	BLACK CROWNED-CRANE
000001	*Cygnus atratus*	BLACK SWAN
000011	*Anas platyrhynchos domesticus*	DOMESTIC DUCK INCLUDING ALL DOMESTIC BREEDS
000005	*Spheniscus demersus*	AFRICAN PENGUIN / CAPE PENGUIN
000008	*Cairina moschata*	MUSCOVY DUCK
000048	**Total**	

USDA

United States Department of Agriculture

Animal and Plant Health Inspection Service

Animal Care

Fort Collins Office
2150 Centre Avenue
Building B, 3W11
Fort Collins, CO 80526
Phone: 970-494-7478

RE: NEW LICENSE APPROVAL
Certificate Number: 95-C-0057
Renewal Date: July 18, 2027

July 18, 2024
Customer ID Number: 6021981

Hyatt Regency Maui Resort
200 Nohea Drive
Lahaina, HI 96761

Dear Licensee:

We are pleased to inform you that you have met the licensing requirements under the Animal Welfare Act (AWA). Accordingly, we are enclosing a copy of your approved application (APHIS Form 7003A), along with the official license certificate, which is suitable for display.

Please note the license expiration date; each year, you are required to submit your license renewal application and renewal fees on or before the expiration date. The appropriate forms and instructions will be sent to you at least 6 weeks prior to the expiration date -- this will serve as the sole reminder that your license is nearing expiration.

In addition to maintaining your facility and animals in accordance with the AWA regulations and standards, you must keep current, accurate records -- including a written program of veterinary care. You must also notify this office by certified mail of any change of name, address, management, or substantial control or ownership of your business within 10 days of the change.

We appreciate your efforts in complying with the Animal Welfare Act. Contact this office at 970-494-7478 if you have any questions regarding this letter or the Animal Welfare Act.

Sincerely,

Roxanne I Mullaney

Dr. Roxanne Mullaney D.V.M.
Deputy Administrator
USDA, APHIS, Animal Care

cc:
JEFFREY LEE

Enclosures

USDA

Expiration Date: 07-18-2027

United States Department of Agriculture

Marketing and Regulatory Programs

Animal and Plant Health Inspection Service

Animal Care

This is to certify that
Hyatt Regency Maui Resort

is a licensed Class C - Exhibitor
under the

Animal Welfare Act

(7 U.S.C. 2131 et seq.)

Certificate No. 95-C-0057

Customer No. 6021981

Maximum Number Of Animals Authorized: **100**

Authorized Dangerous Animal Group(s): **None**

Deputy Administrator

HYATT AVIAN DISEASE OUTBREAK PLAN

MAJOR DISEASES OF CONCERN FOR SUCH AN OUTBREAK:

Highly Pathogenic Avian Influenza *(HPAI)* & *Virulent* Newcastle Disease *(VND)*

PLAN AT THE HYATT REGENCY MAUI:

- Reinforce and/or increase biosecurity
    - USDA-APHIS approved disinfectants for control of avian diseases
        - Foot baths with bleach 1:100 dilution, Virkon S 2%
        - Foot baths should be changed at minimum daily, especially when bleach is used as it inactivates when in contact with organic material. When footbath is visibly dirty, needs to be changed immediately.
        - Shoe sides and soles need to be cleaned/scrubbed before dipping in footbaths
        - Disinfect public floor space in Tropical aviary daily with Oxivir TB 1:8 dilution (Avian influenza only) or Virkon Aquatic (approved for use for amphibians, which are also housed in the aviary)
    - Exhibit specific foot wear is the best practice
        - **Shoe covers are an alternative**
    - Wash hands
    - Wear clean clothes
    - Minimize contact with collection birds, limit foot traffic and visitors to bird areas
    - No shared fomites, e.g. tools, feeding bowls
    - Discontinue movement of birds in and out of collection and around the zoo, except to move to indoor housing
- Monitoring for ill wild birds
- Minimize commingling of collection birds with wild birds
- Establish trigger points for increasing response
- Carefully review disease location maps and biosecurity practices at origin location of new acquisitions
- Relationships with CDFA and USDA:AHPHS. Bolded names are initial primary contacts.
    - ***Jessica Ann Miura,*** *Acting Land Vertebrate Specialist, Hawai'i Department of Agriculture Plant Quarantine Branch, Ph: 808-832-0566, HDOA.PQLVS <hdoa.pqlvs@hawaii.gov>*
    - ***Jeffrey A. Lee, DVM,*** *Veterinary Medical Officer (VMO), USDA/APHIS/Animal Care, (415) 606-0362, jeffrey.a.lee@usda.gov*

Goals: Protect animals from being an infected premise (IP)

- If Zoo becomes an IP, contain outbreak within the zoo, treat animals, prevent potential zoonotic infection

Known susceptible species on property

- Waterfowl (ducks, swans)
- Penguins
- Cranes
- Parrots

Wild birds that may visit property

- Psittacines
- Seabirds
- Egrets & Plovers
- Owls
- Chickens
- Waterfowl (ducks, coots)

Clinical signs of HPAI & VND

- Sudden death with no changes in clinical signs (any species)
- Neurological or abnormal behavior (likely gulls, ducks, and other species)
- Swelling of the head and GI signs (Galliformes)

Avian disease entry points into the Hyatt

- Wild birds
- Humans – staff and visitors
- Food - poultry products, transport trucks, cricket carriers (egg crate), hay
- Fomites – delivery trucks, contractors, bicycles, clothing, shoes
- Vendors

Avian disease dissemination concerns

- Staff
- Visitors
- Food
- Wildlife

Trigger points

- Outbreak reported
  - Initial response
- Outer Islands > 50 miles from Zoo
  - Standard response
- Maui < 50 miles but > 10 miles
  - Elevated response
- Lahaina < 10 miles, or on property
  - Extreme response

Disinfectants for enclosures, perching, enrichment items (everything but foot baths)

- Approved USDA-APHIS and National Veterinary Services Laboratory disinfectants include Virkon S (1-2% solutions) and bleach (diluted 1oz/gallon) for all housing areas, animal equipment, and vehicles. Virkon Aquatic contains the same ingredients as Virkon S without dyes and perfumes and safe around amphibians and aquatic exhibits. Oxivir TB is only approved for use with Avian Influenza outbreaks.
- Disinfectants must be used properly according to label instructions with consideration for contact times on different materials. General use to be 1% solution with 15-minute contact time for non-porous materials, 2% solution with 15-minute contact time for porous materials (e.g. perches).

Hyatt communication:

- Povi Carisa-Abney- Wildlife Supervisor
- Ken Keiden- Director of Engineering
- Leadership Committee Hyatt Regency Maui
- Security Team
- Purchasing
- Sales & Marketing

INITIAL RESPONSE: Disease outbreak within US

Animal:

- Evaluate risk of exposure for any incoming bird species and request testing prior to departure from sending institution if warranted. If bird is already in transit and from a known geographical disease location, quarantine indoors and test.

Facilities/equipment:

- Confirm bird meat and eggs only from National Poultry Improvement Plan (NPIP) farms or internal sourcing

STANDARD RESPONSE: Outer Islands> 50 miles from Hyatt

Initial response steps plus the following:

Contact USDA & CDFA primary contacts.

Facilities/equipment:

- Review the areas that should be closed to the public as an avian disease comes in closer range.
- Foot baths at all exhibits with bleach 1:100 dilution or Virkon S 2% solution. Maintain appropriately (*change when debris present, refill daily for bleach or every 7 days for Virkon if solution is not dirty*). Oxivir TB can be used for Avian Influenza outbreaks only.
- *Start using* exhibit specific feed bowls & tools
- *Confirm* bird meat and eggs only from National Poultry Improvement Plan (NPIP) farms

- Inventory current feeder poultry stock on zoo grounds
- Browse and perches cleaned with Virkon S 2%, bleach (1oz/gallon) or Oxivir TB (Avian influenza only) prior to distribution to susceptible species. Contact time should be at least 15 minutes. Rinse prior to placing in exhibits.
- Confirm that uniform service can clean uniforms on disinfection cycle. Identify on-site laundry facilities for staff use that does not cross contaminate avian areas.
- Check on how current construction projects may impact movement of collection birds into holding spaces.

Staff/volunteers

- Vet(s) maintain contact with local, state and federal authorities
    - Brief senior staff and curators to upgraded status
- Refresher to all staff/volunteers about disease of concern, *include a copy of this plan in the email.*
- Confirm annual employee & volunteer zoonotic disease and biosecurity training completed
- Animal staff and volunteers
    - Inform supervisors of species of animals with which they have contact outside of work.
    - All with potential exposure to susceptible species outside the zoo will be required to change into zoo specific clothing at the zoo. Personal clothes must be stored separately from zoo specific clothing.
    - All who work with susceptible species in the Zoo will be required to change into their dedicated work clothes. Personal clothes must be stored away from enclosure areas.
    - **Dedicated zoo work shoes to remain on grounds for anyone in contact with susceptible species.**
    - Staff and volunteers who own outdoor birds or work in bird rehabilitation centers must change into zoo clothes and footwear when arriving at the zoo and out of zoo clothes and footwear when going home (protects zoo birds and personal birds). This is for anyone working with susceptible species, their enclosures, and food.
    - Zoo clothes laundered on site or cleaned by uniform service only. If these are not an option, then transporting them between home and work should be in plastic bags if staff does not have any contact with at risk species outside of work.

Animals

Collection animals

- Evaluate risk of exposure for any incoming bird species and request testing prior to departure from sending institution if warranted. If bird is already in transit, test.
    - All quarantine of avian species to be completed in indoor spaces only.

    - Routine quarantine for birds entering collection into inside rooms, especially if transiting through geographical areas of concern. Recommend a temporary hold on acquisitions.
    - Routine health evaluations and preventative medicine
    - Routine necropsy
    - Escaped and recaptured animals may be quarantined and tested as needed
- Native and feral wildlife
    - Handled by designated personnel wearing PPE (gloves, clothing cover or dedicated clothing, dedicated footwear or plastic shoe covers).
        - Will need to change dedicated clothing and disinfect footwear prior to returning to susceptible species areas.
    - For sick birds, deliver to vet in a crate or cardboard box. Deliver deceased birds to vet in a double plastic bag sprayed with disinfectant. Inform supervisor bird has been delivered.
    - Minimize wild waterfowl population, particularly near susceptible species.

Vendors

- Feed suppliers (especially those in contact with poultry or poultry products) food storage area and distribution sites regularly reviewed

Visitors

- Normal Service Animal Policy. If service animal is a bird, will need to have discussion of this policy and risk to our collection with owner.

ELEVATED RESPONSE: Maui < 50 miles but > 10 miles from Hyatt

Standard response steps plus the following:

- Communication with CDFA and USDA (see list at top of document)

Facilities/equipment

- Identify and partition zoo into quarantine areas (similar to individual poultry farms)
    - Food delivered to specific exhibit or quarantine area only
- Tours of susceptible species will be discontinued
- Clean all food containers with soap & water, then Virkon S 1-2% solution, bleach (1oz/gallon) or Oxivir TB (for avian influenza only). Contact time with disinfectant should be a minimum of 15 minutes. Cover all food containers with tarps if need to be stored outside.
- Feed sources scrutinized for possible contamination from wild birds
- Transport cages cleaned thoroughly between uses with use of Virkon S 1-2% solution, bleach (1oz/gallon) or Oxivir TB (for avian influenza only). Contact time with disinfectant should be a minimum of 15 minutes.
- Equip all quarantine areas with susceptible species with PPE (gloves, dedicated clothing, dedicated foot wear or plastic foot covers)
- All tools and feeding bowls for susceptible species to be disinfected daily with either Virkon S 2% or bleach (1oz/gallon) for 15 minutes.

Staff/volunteers

- Employee and volunteer briefing (e-mail), include copy of this protocol with the email.
- Vet department
    - When visiting bird strings
        - Coveralls or change of clothes
        - Shoe covers or boots
- Review employee contact with off-site animals, including livestock, rehab facilities, especially if they are working with susceptible species or their enclosures.
- Highly discourage working in/visiting wildlife rehab facilities caring for susceptible species.
- Highly discourage visiting outside facilities with susceptible species.

Collection animals

- Parrots (high risk due to collection species)
    - Close aviary to public
- Oriental Gardens/Lily & Simon/Cranes (medium to high risk depending on wild duck visitors)
    - Limited hours in outside exhibit.
    - Overnight in night house
    - Footbath + dedicated boots or shoe covers used in exhibit.
    - Swans move off the pond to covered enclosures
    - House in indoor mews or outdoor aviaries with covered tops
    - Use duck exclusion feeders to limit potential source of food for wild birds
- Penguin Habitat (low risk of fly over, medium risk depending on AI strain)
    - Footbath/covers used before entering and leaving island.

Native or feral wildlife

- Monitor native birds.

Visitors

- Signage updated.

Vendors and outside contractors

- *Per CDFA, biggest potential transmission from contaminated shoes. Options are shoe covers, stay in vehicle for duration of visit, change shoes, proper use of foot bath.*

EXTREME: Lahaina ≤ 10 miles (control zone) or at Hyatt Property (Infected Premise)
Response <u>in addition</u> to the initial, standard and elevated responses

Connect with USDA & CDFA contacts. Follow their guidance to help maintain integrity of collection to degree possible with the infectious disease risk.

Facilities

- Discontinue tours. *Footbath or booties use for all garden guests.*
- Quarantine each avian exhibit. Other non-bird staff excluded from bird areas as possible, strictly enforce foot bath and PPE use for maintenance staff needing access.
- Trash to be moved outside of buildings by keeper staff for pick up and disposal.
- Food Prep:
    - Mandatory use of foot baths in and out of area.
    - May need to restrict access for all non-wildlife staff into the Bird Room.
    - May need to close doors, windows, and cover all food containers in/out of center to prevent passerine contamination (if confirmed route of transmission)
- USDA and CDFA likely to be involved, definitely if Infected Premise.

Staff/volunteers

- Brief senior staff and curators to upgraded status, include this protocol with email and reminder video of proper PPE donning (gloves, boot covers, coveralls)
- Employee and volunteer briefing (e-mail)
- Those working with susceptible species required to wear PPE (gloves, dedicated clothing, dedicated footwear or plastic shoe covers)
- Those working with infected species required to wear PPE (gloves, dedicated outer clothing, dedicated footwear or plastic shoe covers)

Animals

- Continual assessment based of location of disease for open area aviaries, penguins and waterfowl.
- Avoid cross contamination during transport, e.g. food deliveries and animal deliveries
- Transport deceased birds to vet in double bags sprayed with disinfectant. Transport sick birds in crate or cardboard box to vet. Personnel to wear PPE (gloves, dedicated clothing, dedicated footwear or plastic shoe covers). Personnel will need to change clothes and disinfect footwear before returning to susceptible species areas.
    - Cardboard box to be incinerated. Crates to be disinfected.
- Positive collection animals will be quarantined and treated only by designated personnel wearing proper PPE (gloves, dedicated clothing, dedicated footwear or plastic shoe covers).
    - Protocols will be worked out with USDA or CDFA.

Visitors

- Signage confirmed for closed exhibits and updated with potential zoonotic risk if present. Follow USDA and CDFA recommendations.

END OF DISEASE RESPONSE: To be coordinated with USDA & CDFA.

State of Hawai'i
Department of Agriculture
Plant Industry Division
Plant Quarantine Branch
Honolulu, Hawai'i

January 28, 2025

Board of Agriculture
Honolulu, Hawai'i

Subject: Subject: (1) Request for Review of the Petition From Andrea Kawabata, University of Hawai'i (UH) College of Tropical Agriculture and Human Resources (CTAHR), to Initiate Administrative Rule Making and Rule Amendment to Chapter 4-72, Hawaii Administrative Rules (HAR), to Designate the Islands of Kaua'i, Moloka'i, and Lāna'i as Coffee Berry Borer (CBB), *Hypothenemus hampei*, infested areas.

I. Background:

On December 19, 2024, the Office of the Chairperson received a petition from Ms. Andrea Kawabata, UH CTAHR Extension Agent for Coffee and Orchard Crops, requesting that the Board of Agriculture (Board) amend §4-72-12, HAR, Restrictions on coffee, to expand the CBB infested areas to include the islands of Kaua'i, Moloka'i, and Lāna'i. The Board has already designated, Hawai'i Island, O'ahu, and Maui as CBB infested areas. Ms. Kawabata's Petition is included as Attachment A. Ms. Kawabata's Petition seeks to amend chapter 4-72, HAR, to manage the existing requirement of a one-year quarantine of coffee plants from a CBB infested area to non-infested areas in the state, and would help to create equity among coffee producers, facilitate the movement of coffee materials from CTAHR, Hawaii Agricultural Research Center, U.S. Department of Agriculture, etc. throughout the state, maintain quarantine regulations protecting Hawai'i's coffee industry, and support industry efforts with long-term management of coffee leaf rust (CLR).

Ms. Kawabata's Petition for rule amendment is brought under the Board's Rules of Practice and Procedure, chapter 4-1, HAR, which allows rulemaking to be initiated by petition of an interested person or agency upon Board approval. (§4-1-23, HAR, et seq.) Section 4-1-23(c), HAR, requires that within 30 days after filing such a petition, the Board must either deny the Petition or initiate rulemaking proceedings. Denial of a petition does not prevent the Board from acting on the petition's subject matter on the Board's own motion at a later time. (§4-1-24, HAR). A procedural denial was issued on

C22

January 14, 2025, as the Board was not able to approve or deny the petition within the 30-day timeframe. The procedural denial letter is included as Attachment B.

To be considered by the Board, a Petition for rule adoption or amendment under §4-1-23(b), HAR, must contain certain substantive items, specifically: (1) a draft of the substance of the proposed rule or amendment or designation of the rule provisions to be repealed; (2) a statement of the petitioner's interest in the subject matter; and (3) a statement of the reasons in support of the proposed rule, amendment, or repeal. Ms. Kawabata's Petition appears to conform to these procedural prerequisites for Board consideration.

Should the Board ultimately act favorably on this Petition, the proposed amendments to the rules would occur after Advisory Committee on Plants and Animals review then following Chapter 91, Hawaii Revised Statutes, rulemaking procedures, which include the public hearing process, Board adoption, and Governor's approval or; via the expedited amendment procedure through a Board Order, which involves an abbreviated process that is available in certain circumstances.

II. Summary of Proposed Amendments to Chapter 4-71, HAR

While Ms. Kawabata's Petition does not specify specific language that she would like to see changed in§ 4-72-12, HAR, the Plant Quarantine Branch (PQB) has drafted the following changes to §4-72-12(e), HAR, in Ramseyer format which the PQB believes would effectuate Ms. Kawabata's request as indicated in her petition.

e) The island[s] of Hawaii[, Oahu, Maui, Lanai, and Molokai are] ~~is~~ designated as ~~a~~ coffee berry borer infested area[s], notwithstanding ongoing control projects on the island[s], and other islands in the State are designated as coffee berry borer restricted areas. The designated coffee berry borer infested area may be expanded by board action as provided in §4-72-4.5.

PQB NOTES: While Ms. Kawabata's petition does not seek to include O'ahu and Maui, these islands were included in the proposed amendments to §4-72-12(e) because those islands were previously designated as CBB infested areas via Board actions taken in February 2015 and March 2017 respectively, but were never included into 4-72-12, HAR.

III. Analysis

The PQB does not dispute the information provided in Ms. Kawabata's petition and understands that the distribution of CLR-resistant varieties of coffee plants is part of managing the effects that CLR has on coffee yields.

Quarantine restrictions beyond general inspection requirements are designed to manage the spread and subsequent widespread establishment of pests. Should the Board designate the islands of Kaua'i, Moloka'i, and Lāna'i as infested areas, the changes to §4-72-12 would essentially make the entire regulation and additional requirements of permitting and enhanced mitigation measures unnecessary as Kaho'olawe and Ni'ihau do not have commercial coffee plantations and every other island in the state would be considered as infested with CBB.

It should be noted that the mere presence or absence of a pest on an island does not automatically qualify the island as infested. While the Department has indicated CBB's presence on Kaua'i, Moloka'i, and Lāna'i, without more comprehensive surveys, designating these entire islands as infested may be premature. As a result, the PQB believes that additional surveys should be conducted prior to designating these islands as infested. Furthermore, if these islands all have widespread CBB-infestations, the coffee industry should consider submitting another petition repealing the entire rule as the rule, permitting structure, and mitigations are all designed to prevent the spread of CBB. Restrictions were also put in place via permitting to manage movement of regulated coffee material between infested areas to prevent cross contamination due to the nature of interisland shipping. Deeming all islands as infested would make the additional restrictions not necessary.

Repeal of the rule would not prevent the PQB from inspections and certification of live coffee plants moving interisland. Additionally, during the course of inspection, should any pest be found, the coffee plants would need to be subjected to a treatment that eradicates the pest before the plants could be transported. Coffee plants grown in soil from Hawai'i Island would still be prohibited unless tested to be free of rapid ōhi'a death prior to movement, as the soil restriction is in another section of 4-72, HAR.

As the repeal of 4-72-12, HAR would take some time, the Board could alternatively designate Kaua'i, Moloka'i, and Lāna'i as infested pursuant to §4-72-4.5 Designation of infested areas; expansion. This would be the quickest way to enable the movement of CLR-resistant coffee plants while the processing of the repeal is being processed.

IV. Staff Recommendation

The PQB recommends that the Board deny this request to initiate rulemaking as there is not enough current survey information provided regarding how widespread CBB infestations are on Kaua'i, Moloka'i, and Lāna'i, nor was the information provided by the petitioner reviewed by the appropriate Advisory Subcommittee and Advisory Committee on Plant and Animals, prior to the Board's final decision making, as is standard procedure.

However, should the Board desire to further review this request as presented by the petitioner, or via the suggestions provided by the PQB in section III, the Board can direct PQB staff to work with the petitioner to complete the full advisory review and the request can be brought before the Board at a later date, for a complete review and decision making, or direct PQB staff to pursue quarantine expansion via §4-72-4.5, while industry petitions for a repeal of the rule.

Respectfully Submitted,

Jonathan Ho
Manager, Plant Quarantine Branch

APPROVED FOR SUBMISSION:

Sharon Hurd
Chairperson, Board of Agriculture

December 19, 2024

Board of Agriculture
State of Hawaii
1428 S. King Street
Honolulu, HI 96814-2512

Re: Petition to expand designated Coffee Berry Borer-infested areas to include Kaua'i, Lāna'i, and Moloka'i under Hawaii Administrative Rules 4-72-12

Dear Chairperson and Board,

My name is Andrea Kawabata. I am a resident of Hawai'i and employee of the University of Hawai'i at Manoa's College of Tropical Agriculture and Human Resilience (UH-CTAHR). I have over 13 years of experience as an Extension Agent providing education and outreach to Hawai'i's coffee and orchard crops industries via UH-CTAHR's Cooperative Extension Service. Over the years, I have conducted hundreds of farm visits with the state's coffee growers and as a result, am acutely aware of the presence of Coffee Berry Borer (*Hypothenemus hampei*) or CBB and Coffee Leaf Rust (*Hemileia vastatrix*) or CLR on commercial farms in Hawai'i. I am also knowledgeable about their management as my Extension program disseminates science-based educational materials and technologies to coffee producers.

With this letter, I am requesting that the Board of Agriculture consider the amendment of the Hawai'i Administrative Rules (HAR) § 4-72 to expand the islands determined to be infested by CBB to include Kaua'i, Moloka'i, and Lāna'i.

CLR, considered the most devastating disease of coffee in the world, was found on Maui in 2020, and quickly spread to all islands. On November 20, 2020, interim rule 20-1 took effect which prohibited the intrastate movement of coffee plants (*Coffea arabica*, *C. canephora* and other *Coffea* spp. including hybrids and varietals) and plant parts such as green beans, fruits, leaves, stems, twigs, cuttings, wood, logs, and mulch or greenwaste, used coffee-related packing materials such as coffee bags, and any previously-used equipment used to harvest, transport, or process coffee plants or plant parts, from the Island of Maui, Hawai'i Island, or any other island confirmed with CLR except by permit issued by the Hawaii Department of Agriculture (HDOA). On March 23, 2021, the Board of Agriculture expanded the coffee quarantine to O'ahu and Lāna'i and on July 20, 2021, the HDOA announced that CLR was found on Kaua'i and Moloka'i, thereby declaring CLR's presence on all major Hawaiian Islands. As a result, there is no prohibition on the interisland movement of coffee trees due to CLR.

With the arrival of CLR to Hawai'i, research on CLR-resistant plants is being conducted at the Hawai'i Agricultural Research Center (HARC), USDA-Agricultural Research Service (USDA-ARS), UH-CTAHR Kona Research Station, and at farms. Research (Diniz et. al, 2012) shows that (re)planting with CLR-resistant trees is the most effective long-term strategy for combatting rust. UH-CTAHR's Kona Research Station and my Extension program is currently distributing CLR-resistant trees to industry and in the future, CLR-resistant trees may also be distributed via USDA-ARS, HARC, and industry producers. CLR-resistant trees are important to the industry

for maintaining and potentially improving plant health, yield, and coffee quality, reducing tree losses and replanting costs, reducing pesticide use and their potential hazards to human health and the environment, and for improving the sustainability of farm operations. CLR-resistant plants will need to be transported interisland but that will be severely hampered by an unnecessary quarantine for CBB.

CBB, the world's most important insect pest of coffee, was discovered in Kona, Hawai'i in 2010. This beetle has since spread to neighboring islands. On March 14, 2017, the Board of Agriculture voted in favor of expanding the designated CBB-infested areas to encompass the islands of Hawai'i, O'ahu, and Maui under HAR § 4-72-12, (Restrictions on coffee). Confirmation by the HDOA of CBB infestation on Kaua'i, Lāna'i, and Moloka'i was publicly announced on September 10, 2020, September 15, 2020, and March 9, 2022, respectively. To date, these islands have not been included under HAR § 4-72-12 as infested by CBB, and this presents a major roadblock for growers interested in receiving CLR-resistant trees from neighboring islands.

Under current HAR rules, there is no restriction on coffee movement due to CLR, but coffee trees must undergo a one-year quarantine in a state-run facility if transported from a CBB-infested island (Hawai'i, Maui, or O'ahu) to a "non-infested island" (Kaua'i, Moloka'i, or Lāna'i). Again, CBB is on all islands, so this petition seeks to correct that. All coffee plants are otherwise subject to inspection and approved mitigation and decontamination measures specified by an intra-island PQ-7 permit approved by HDOA's Plant Quarantine Branch (PQB).

For example, coffee trees transported from Kona to Maui (CBB-infested to a CBB-infested island) must follow the procedures below:

1. A permit must be issued to the person receiving the plants prior to shipping.
2. Plants shall be free any coffee seeds or cherries.
3. Pots, growing media, etc. shall be free of any coffee seeds or cherries.
4. Growing media shall be free of any soil.
5. Plants must be free of all pests (arthropods, invertebrates, diseases, etc.).
6. Plants must undergo PQB-approved treatments for coffee berry borer and coffee leaf rust, adhering to all label and reentry interval requirements. Witnessing treatment by PQB will not be required.
7. Plants must be inspected and passed by HDOA PQB prior to transport to another island. The shipper must contact PQB office ahead of time to coordinate inspection dates and times.
8. Plants shall be shipped in sealed boxes or containers to prevent infestation by coffee berry borer or coffee leaf rust.

After adhering to these procedures, NO QUARANTINE is required when transporting coffee trees from a CBB-infested to CBB-infested island.

Whereas, for example, coffee trees transported from Kona to Kaua'i (CBB-infested to a "non-CBB infested" island) must follow the procedures above AND A ONE-YEAR QUARANTINE IS REQUIRED upon receipt by the permittee. Should this proposed amendment be passed, an approved permit, mitigation and decontamination measures, and inspection would still be necessary prior to transport, but a quarantine would not be required by the receiving party.

This proposed amendment to include Kaua'i, Lāna'i, and Moloka'i as CBB-infested islands under HAR § 4-72-12 will not eliminate, repeal, or replace the need for permit, and any requirements for decontamination, mitigation, or inspection, but would instead 1) create equity among coffee producers, 2) facilitate the transport of coffee materials throughout the state, 3) uphold quarantine regulations to protect Hawai'i's coffee industry, and 4) support industry's efforts with long-term management of CLR.

I humbly ask that the Board consider this request. If there are any questions or concerns, please feel free to contact me at 808-322-4892 or andreak@hawaii.edu.

Sincerely,

Andrea Kawabata
UH-CTAHR Extension Agent for Coffee and Orchard Crops
79-7381 Mamalahoa Highway
Kealakekua, HI 96750

Literature cited:

Diniz, I., Talhinhas, P., Azinheira, H.G. *et al.* (2012). Cellular and molecular analyses of coffee resistance to *Hemileia vastatrix* and nonhost resistance to *Uromyces vignae* in the resistance-donor genotype HDT832/2. *Eur. J. Plant Pathol.* 133, 141–157. https://doi.org/10.1007/s10658-011-9925-9.

UNIVERSITY of HAWAI'I SYSTEM

ATTACHMENT A

Andrea Kawabata <andreak@hawaii.edu>

Coffee Rules Amendment - Letter to Board of Agriculture

HCA Events Chair <events@hawaiicoffeeassoc.org> Fri, Nov 22, 2024 at 9:13 PM
To: Andrea Kawabata <andreak@hawaii.edu>
Cc: Bill Dwyer <bdwyer@konamountaincoffee.com>, "HCA President (Bill Dwyer)" <president@hawaiicoffeeassoc.org>

Andrea,

I have forwarded your letter to the HCA board and majority responded with full support. Thank you for taking on this effort and let us know if there is anything else we can help with.

Have a lovely weekend!

Alla Kostenko
Secretary
Hawaii Coffee Association

[illegible]
[illegible]
<Board of Agriculture Letter 111624.pdf>

ATTACHMENT A

November 25, 2024

Andrea Kawabata
UH-CTAHR Extension Agent for Coffee and Orchard Crops
79-7381 Mamalahoa Highway
Kealakekua, HI 96750

Re: Support for petition to expand CBB Quarantine

Aloha Andrea,

I hope this letter finds you well. I am writing on behalf of the Kona Coffee Farmers Association (KCFA) to inform you that our Board recently met to discuss your letter to the Hawaii Board of Agriculture regarding the petition to expand designated Coffee Berry Borer-infested areas to include Kaua'i, Lāna'i, and Moloka'i under Hawaii Administrative Rules 4-72-12.

The draft letter you sent was circulated among the Board members and thoroughly discussed. I am pleased to inform you that the Board unanimously agreed with the intent of your letter and voted to support it.

The KCFA Board and our president are available to answer any questions you may have concerning our standing on this matter. We appreciate your efforts and dedication to addressing the Coffee Berry Borer issue and look forward to continued collaboration.

Thank you for your attention to this important matter.

Mahalo nui loa,

Mark Petersen

Mark Petersen, President
Kona Coffee Farmers Association

ATTACHMENT A

December 13, 2024

Andrea Kawabata

UH-CTAHR Extension Agent for Coffee and Orchard Crops

79-7381 Mamalahoa Highway

Kealakekua, HI 96750

Re: Support for petition to expand CBB Quarantine

Aloha Andrea,

I am writing on behalf of the Maui Coffee Association (MCA) to provide support for your letter to the Hawaii Board of Agriculture regarding the petition to expand designated Coffee Berry Borer-infested areas to include Kaua'i, Lāna'i, and Moloka'i under Hawaii Administrative Rules 4-72-12.

We appreciate your efforts and dedication to addressing the Coffee Berry Borer issue and transport of coffee-related materials.

Thank you for your attention to this important matter and please let us know if you have any questions.

Sincerely,

Gerry Ross, President

Maui Coffee Association

PO Box 1089, Kula, HI 96790

808-868-1175

lavaboy458@gmail.com

ATTACHMENT A

HAWAII AGRICULTURE RESEARCH CENTER

94-340 Kunia road, Waipahu, Hawaii 96797
TELEPHONE: (808) 621-1350 FAX: (808) 621-1359
http://www.harc-hspa.com

November 19, 2024

Board of Agriculture
State of Hawaii
1428 S. King Street
Honolulu, HI 96814-2512

Re: Petition to expand designated Coffee Berry Borer-infested areas to include Kaua'i, Lāna'i, and Moloka'i under Hawaii Administrative Rules 4-72-12

Dear Chairperson and Board,

With this letter, I am requesting that the Board of Agriculture consider the amendment of the Hawai'i Administrative Rules (HAR) § 4-72 to expand the islands determined to be infested by coffee berry borer (CBB) to include Kaua'i, Moloka'i, and Lāna'i.

My name is Ming-Li Wang. I am a resident of Oahu and employee of the Hawaii Agriculture Research Center (HARC). I have over 32 years of experience as a plant molecular biologist working on projects related to Hawaii agriculture. In 2020, I took over the coffee programs at HARC with focus on germplasm transfer to USDA ARS Pacific Basin Agricultural Research Center (PBARC) and breeding coffee leaf rust (CLR)-resistance into Hawaiian elite commercial cultivars. The field tests of the CLR-resistant coffee seedlings will be conducted on four different farms on four different islands. Timely exchanges of coffee plant materials between islands are essential for the success for Hawaii coffee industry to battle CLR.

I understand currently there is no prohibition on the interisland movement of coffee trees due to CLR. I also understand the importance of preventing the spread of CBB. However, CBB infestation on Kaua'i, Moloka'i, and Lāna'i has been confirmed by Hawaii Department of Agriculture (HDOA) in 2020 and 2022. To date, these islands have not been included under HAR § 4-72-12 as infested by CBB, and this presents a major roadblock for growers interested in receiving CLR-resistant trees from neighboring islands. The rule that required one-year quarantine at a state-run facility will significantly delay the progress of CLR-resistance breeding on Kaua'i.

This proposed amendment to include Kaua'i, Lāna'i, and Moloka'i as CBB-infested islands under HAR § 4-72-12 will not eliminate, repeal, or replace the need for permit, and any requirements for decontamination, mitigation, or inspection, but would instead 1) create equity among coffee producers, 2) facilitate the transport of coffee materials throughout the state, 3) uphold quarantine

regulations to protect Hawai'i's coffee industry, and 4) support industry's efforts with long-term management of CLR.

I really appreciate HDOA's effort for keeping CLR out of Hawaii for more than a century. But now I humbly ask that the Board to consider the request of expanding CBB infestation designation. If there are any questions or concerns, please feel free to contact me at the phone number and email listed below.

Sincerely,

Ming-Li Wang, Ph.D.
Hawaii Agriculture Research Center
Lab Manager/Plant Molecular Biologist/Biosafety Officer
Address: 94-340 Kunia Road, Waipahu, HI 96797
Phone: 808-621-1389
Fax: 808-621-1399
email: mwang@harc-hspa.com

JOSH GREEN, M.D.
Governor

SYLVIA LUKE
Lt. Governor

ATTACHMENT B

SHARON HURD
Chairperson, Board of Agriculture

DEAN MATSUKAWA
Deputy to the Chairperson

State of Hawai'i
DEPARTMENT OF AGRICULTURE
KA 'OIHANA MAHI'AI
1428 South King Street
Honolulu, Hawai'i 96814-2512
Phone: (808) 973-9600 FAX: (808) 973-9613

January 14, 2025

Ms. Andrea Kawabata
79-7381 Mamalahoa Highway
Kealakekua, HI 96750

Subject: Procedural Denial of Petition to the Board of Agriculture to designate the islands of Kaua'i, Moloka'i, and Lāna'i as coffee berry borer infested areas.

Dear Ms. Kawabata,

Thank you for your petition requesting the Board of Agriculture (Board) to enact a rule amendment to Chapter 4-72, Hawaii Administrative Rules (HAR), to designate the islands of Kaua'i, Moloka'i, and Lāna'i as coffee berry borer infested areas to: create equity among coffee producers; facilitate the transport of coffee materials throughout the state, uphold quarantine regulations to protect Hawai'i's coffee industry, and support the coffee industry's efforts with long-term management of coffee leaf rust.

Pursuant to §4-1-23(c), HAR, the Board is required to either deny a petition or initiate rulemaking proceedings within 30 days after filing of a petition for rulemaking. Due to a scheduling conflict, the Board is unable to have a meeting within the 30-day timeframe and this letter serves as a procedural denial of your petition to satisfy the requirement above. Please note §4-1-24, HAR does not prevent the Board from acting on its own motion upon any matter disclosed in a denied petition. The Board will be considering your petition at its next meeting, tentatively set for January 28, 2025.

Should you have questions regarding this matter, please contact Mr. Jonathan Ho, Plant Quarantine Branch Manager at 808-832-0566 or jonathan.k.ho@hawaii.gov.

Sincerely,

Sharon Hurd

Sharon Hurd, Chairperson
Board of Agriculture

Island Fresh