



**Figure 1.** Enlarged photo of an adult female erythrina gall wasp. Actual length of the female is 1.5 mm. The adult male wasp, not shown, measures 1.0 mm.

# Erythrina Gall Wasp

*Quadrastichus erythrinae* Kim

(Hymenoptera: Eulophidae)

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**Introduction.** Samples of gall-damaged leaves and stems of the coral tree, *Erythrina variegata* L., were first collected in Manoa, Oahu, on April 19, 2005, by a University of Hawaii graduate student. The galls were found to have been induced by the larvae of a tiny wasp which was subsequently identified as the erythrina gall wasp (EGW), *Quadrastichus erythrinae* Kim (family Eulophidae) by J. La Salle of the Commonwealth Scientific and Industrial Research Organization (CSIRO) in Australia.

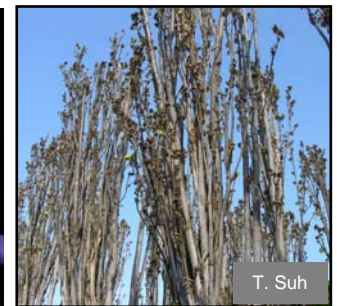
*Erythrina variegata*, with its bright red flowers, is also known as tigers claw, Indian coral tree, and wiliwili-haole. It is a common landscape tree in Hawaii. A tall, columnar form of *E. variegata*, "Tropic Coral," known locally as "tall erythrina" or "tall wiliwili," is also used as a windbreak for soil and water conservation and for planting around farmsteads (Rotar et al. 1986).



**Figure 2.** *Erythrina variegata* leaves exhibiting light gall wasp damage (left) compared with undamaged leaves (right).



**Figure 3.** *Erythrina* petioles and leaflets exhibiting severe gall wasp damage.



**Figure 4.** "Tall erythrina" trees with severe gall wasp damage.

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**Distribution and Hosts.** The erythrina gall wasp was described in 2004 as a new species by Kim et al. (2004) from specimens from Singapore, Mauritius, and Reunion. Since then, it has been reported from Taiwan (Yang et al. 2004), Hong Kong, China, India (J. La Salle, pers. comm.), Thailand (B. Napompeth, pers. comm.), Philippines (pending confirmation by J. La Salle), American Samoa (M. Schmaedick, pers. comm.), Guam (R. Muniappan, pers. comm.), and Okinawa (K. Teramoto, pers. comm.).

Since its discovery on Oahu in April 2005, it spread rapidly to the other islands of Hawaii. In July 2005, gall wasp damage was reported on the Big Island (D. Oishi, pers. comm.), Kauai (C. Kaneshige & E. Garcia, pers. comm.), and Maui (M. Fukada, pers. comm.). In August 2005, it was found on Molokai (R. Joy, pers. comm.). In October 2005, it was observed on Kahoolawe (F. & K. Starr, pers. comm.) and Lanai (S. Joe, pers. comm.). In Hawaii, it affects the coral trees, *Erythrina variegata* L. (including "tall erythrina") a variegated form known as the "sunshine tree"), *E. crista-galli* L., and the native wiliwili, *E. sandwicensis* Degener.

**Figure 5** (right). Erythrina gall wasp larvae within a gall.



**Figure 6** (above). Erythrina gall wasp pupae within a gall.

**Figure 7** (right). Exit holes created by emerging adult erythrina gall wasps.



**Damage.** Like other gall-forming eulophid wasps, eggs are inserted into young leaf and stem tissue. The wasp larvae (Figure 5), which develop within plant tissue, induce the formation of galls in leaflets and petioles (Figure 2). As the infestation progresses, leaves curl and appear deformed while petioles and shoots become swollen (Figure 3). After feeding is complete, larvae pupate within the leaf and stem tissue (Figure 6). After pupation within the galls, adult wasps emerge after cutting exit holes through to the outside (Figure 7). Heavily galled leaves and stems result in a loss of growth and vigor. According to Yang et al. (2004), severe infestations can cause defoliation and death of trees (Figure 4).

**Biology.** Studies conducted by the Hawaii Department of Agriculture (HDOA) indicate a life cycle (egg to adult) of about 20 days. A one-day old female wasp contains about

60 mature eggs in its ovaries. The adult female wasp exhibited a preference for depositing eggs in very young terminal leaves and stems, but not mature leaves. Adult wasps not given any food survived less than three days. Those provided with honey lived more than six days. The sex ratio of emerging wasps in lab-infested plants was seven males to one female. Detailed information on the biology of the gall wasp will be published elsewhere.

**Biological control.** A long-term and environmentally-friendly solution is to import efficient living natural enemies capable of significantly reducing gall wasp infestations. The HDOA's exploratory entomologist spent several months in 2005 and 2007 in areas of Africa searching for living natural enemies of the gall wasp. A team from the University of Hawaii's College of Tropical Agriculture and Human Resources also traveled to Africa to aid in the search. From these two sources, HDOA received a number of different parasitic wasps which have been evaluated in the HDOA Insect Quarantine Facility in Honolulu. Host specificity testing showed that one of these tiny wasps, *Eurytoma erythrinae* Gates and Delvare, was efficient, specific, and would not attack any other insect or plants. After receiving all the necessary approvals, the first release of this wasp was made on November 25, 2008, in a stand of native wiliwili trees in Honolulu. The HDOA will be making additional releases of this beneficial wasp throughout the State.

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## References

- Kim, I.-K., G. Delvare, and J. La Salle. 2004. A new species of *Quadrastichus* (Hymenoptera: Eulophidae): A gall-inducing pest on *Erythrina* spp. (Fabaceae). *J. Hym. Res.* 13(2): 243-249.
- Rotar, P.P., R.J. Joy, and P.R. Weissich. 1986. "Tropic Coral" tall erythrina. *Univ. Haw. CTAHR Res. Ext. Ser.* 072.
- Yang, M.M., G.S. Tung, J. La Salle, and M.L. Wu. 2004. Outbreak of erythrina gall wasp on *Erythrina* spp. (Fabaceae) in Taiwan. *Plant Prot. Bull.* 46:391-396.