

## Scientific Note

# A new native host for *Erythrina* gall wasp *Quadrastichus erythrinae* Kim, 2004 (Hymenoptera: Eulophidae) in the oceanic archipelago of Fernando de Noronha, Brazil

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**Abstract.** We record for the first time the *Erythrina* gall wasp *Quadrastichus erythrinae* Kim, 2004 (Hymenoptera: Eulophidae) attacking the mulungu plant, *Erythrina velutina* Willd. (Fabaceae), a new native host in the oceanic archipelago of Fernando de Noronha, Brazil.

**Keywords:** Chalcidoidea, Mulungu, Neotropical Region, Oceanic Island.

The *Erythrina* gall wasp (EGW) *Quadrastichus erythrinae* Kim, 2004, (Hymenoptera: Eulophidae) is a gall-inducing wasp described in 2004 based on adults reared from galls on *Erythrina* spp. (Fabaceae) collected at Mauritius, Réunion and Singapore (Kim et al. 2004). *Erythrina* spp. are popularized as “coral trees” in foreign countries and, are called “mulungu” in Brazil.

Chronologically, the species is distributed by Réunion (2000), Seychelles (2002), Mauritius (2003), Singapore (2003), Taiwan (2003), Thailand (2004), India (2005), China (2005), Japan (2005), Malaysia (2005), Hawaii - USA (2005), Florida - USA (2006), Guam - USA (2006), Samoa (2006), Sri Lanka (2006), Vietnam (2007), Philippines (2010), French Polynesia (2010), Martinique (2012), Guadeloupe (2012), Puerto Rico (2012), Brazil (2013), Mexico (2017) and Panama (2018) (Lin et al. 2021).

*Quadrastichus erythrinae* can induce galls on the leaves, petioles, twigs, and buds of several species of coral trees. Severe EGW infestations can cause curling of young buds, defoliation, and even death of afflicted trees (Yang et al. 2004; Heu et al. 2008). Its impact in Hawaii has been particularly devastating, where it is destroying and threatening with extinction *Erythrina sandwicensis* O. Deg., an endemic species (Gramling 2005).

So far, the EGW hosts are: *Erythrina variegata* L., *E. fusca* Lour., *E. corallodendron* L., *E. cristagalli* L., *E. abyssinica* Lam., *E. berteriana* Urban, *E. sandwicensis* and *E. herbacea* L. (Lin et al. 2021). It is known that there are reports of 13 species of *Erythrina* occurring in Brazil (Martins 2022a). Ridley (1890) described *Erythrina aurantiaca*, endemic to archipelago of Fernando de Noronha, and for several years, this species was treated as endemic to this island. Recently, Martins & Tozzi (2018), based on the analysis of the type's specimens, synonymized *E. aurantiaca* with *Erythrina velutina* Willd., and this if the first record of EGW to this plant species.

The oceanic archipelago of Fernando de Noronha, state of Pernambuco, Brazil, is a federal conservation area located 360 km east of the Brazilian coast. The archipelago is entirely volcanic in origin and has never been connected to the continent. The total land area is 18.4 km<sup>2</sup>, including 16.9 km<sup>2</sup> on the main island of Fernando de Noronha (Lopes & Ulbrich 2015).

The entomofauna of this archipelago has been recorded and currently includes 454 species distributed in 21 orders (Rafael et al. 2020) and recent studies have advanced the knowledge of

Hymenoptera species (Fernandes et al. 2021a; 2021b; Mahlmann et al. 2022; Martins 2022b).

Thus, the purpose of this work was to identify the insects that are causing damage to *Erythrina velutina* based on material collected on the archipelago.

The specimens collected during this study were deposited in the following institutions: INPA, Instituto Nacional de Pesquisas da Amazônia, Manaus, Amazonas, Brazil (M. L. Oliveira, curator); CZMA, Coleção Zoológica do Maranhão, Caxias, Maranhão, Brazil (F. Limeira-de-Oliveira, curator); MNRJ, Museu Nacional, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil (F. Vivallo, curator); MPEG, Museu Paraense Emílio Goeldi, Belém, Pará, Brazil (O. T. Silveira, curator) and MZUSP, Museu de Zoologia da Universidade de São Paulo, São Paulo, Brazil (C. R. F. Brandão, curator).

The studied specimens were identified based on the original description (Kim et al. 2004). Morphological observations were carried out using a Leica MZ 12.5 stereomicroscope under fluorescent light source. Photographs were taken using a Leica M165C stereomicroscope with a DFC420 digital camera and Leica Application Suite V3.4.1 (Version 2009). Series of partially focused digital images were stacked using the Helicon Focus software (Version 6.7) to produce final images with enhanced quality.

New records are indicated with an asterisk (\*), and the new host record with two (\*\*).

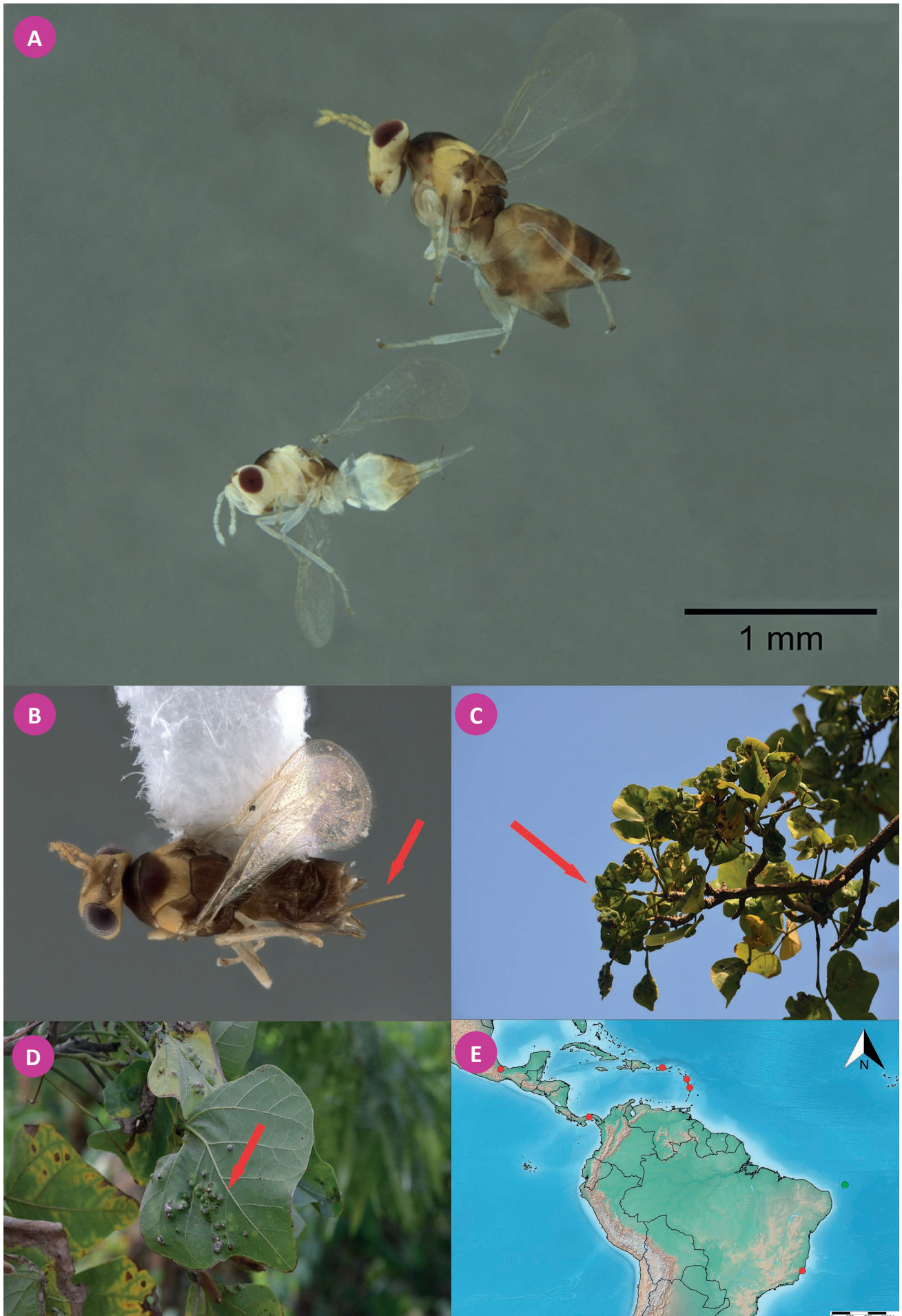
The map was prepared using the free software SimpleMappr ([www.simplemappr.net](http://www.simplemappr.net)) (Shorthouse 2010).

### *Quadrastichus erythrinae* Kim, 2004

(Fig. 1A, B and E)

**Diagnosis.** According to Kim et al. (2004) this species is distinct from all other *Quadrastichus* Girault, 1913 on the basis of the long hypopygium. Furthermore, females of *Q. erythrinae* are characterized by a dark brown color with yellow markings (Fig. 1A, top; Fig. 1B) and, in contrast, the males are pale colored with brown markings (Fig. 1A, bottom).

**Material examined.** 575 females and 496 males. BRAZIL, Pernambuco, Fernando de Noronha, Boldró, 3°51'30"S - 32°25'50"W, 1-9.vi.2019, varredura [sweeping], J.A. Rafael, F. Limeira-de-Oliveira, D.M.M. Mendes, 3 females and 3 males (INPA); *idem*, except Capim-Açu, Arn. Luz [light trap], 3 females (INPA); *idem*, except Caracas, 1 female



**Figure 1.** A) Female (top) and male (bottom) of *Quadrastichus erythrinae*; B) Female of *Q. erythrinae*, ovipositor= red arrow; C) Buds of *Erythrina velutina* with galls induced by of *Q. erythrinae*; D) Leaves of *E. velutina* with galls induced by of *Q. erythrinae*; E) Distribution map in Neotropical Region; red circles= previous records, green circle= new record.



(INPA); *idem*, except Sueste, Mangue, Arm. Luz [light trap], 2 females (INPA); *idem*, except Trilha Atalaia, 1 female (INPA); *idem*, except Trilha Sancho, 5 females and 307 males (INPA); *idem*, 20 males (CZMA); *idem*, 20 males (MNRJ); *idem*, 20 males (MPEG); *idem*, 20 males (MZUSP); *idem*, except Trilha Sancho, Arm. Luz [light trap], 6 females and 3 males (INPA); *idem*, except Trilha Sancho, YPT, 11 females and 5 males (INPA); *idem*, except Trilha Sancho, Malaise, 354 females (INPA); *idem*, 20 females (CZMA); *idem*, 20 females (MNRJ); *idem*, 20 females (MPEG); *idem*, 20 females (MZUSP); *idem*, except Trilha Sancho, Shannon, 10 females (INPA); *idem*, except Trilha Sancho, Window trap, 99 females and 98 males (INPA).

**Hosts.** *Erythrina variegata*, *E. fusca*, *E. corallodendron*, *E. cristagalli*, *E. abyssinica*, *E. berteriana*, *E. sandwicensis*, *E. herbacea* and *Erythrina velutina* Willd.\*\*.

**Damage.** Attacks were observed *in loco* on buds (Fig. 1C) and leaves (Fig. 1D) of several plants on the island, mainly in the Cacimba do Padre, Sancho, Baía dos Porcos and Capim-Açu. In addition, there were severe attacks in the interior of the island, as in Bairro dos Três Paus. Additionally, several specimens of EGW were created directly from these galls, however, the specimens deteriorated during the drying process (collapsed) and were not included in the material examined.

**Distribution in Neotropical Region.** Brazil (Espírito Santo and archipelago of Fernando de Noronha\*), Guadeloupe, Martinique, Mexico, Panama and Puerto Rico (Fig. 1E).

Despite its rapid expansion into the Neotropical Region since 2004 the presence of *Q. erythrinae* was only detected in 2013, when it spread across Martinique and Guadeloupe (Etienne & Dumbardon-Martial 2013), Puerto Rico (Jenkins et al. 2014), Brazil (Culik et al. 2014), Mexico (Palacios-Torres et al. 2017) and Panama (Medianero & Zachrisson 2019). In South America, the first record of EGW was in Vitória (Espírito Santo, Brazil) attacking *Erythrina variegata* plants (Culik et al. 2014). However, since then, no other record of EGW has been made in the country (Costa & Pikart 2022).

It is uncertain if this species was brought to Fernando de Noronha by humans or whether it was a natural dispersal. However, there has been active trade between the mainland and Fernando de Noronha over the years, which has most likely facilitated the transport of infected ornamental plants to the island. Another hypothesis is the possibility that *Q. erythrinae* have migrated naturally to the island. Alves et al. (2019) verified the presence of species of Hemiptera, Lepidoptera and Odonata attracted by light in a boat on the open ocean about 390 km off the coast of Brazil. Since that the archipelago of Fernando de Noronha is situated around 360 km off the Brazilian coast, this possibility cannot be completely excluded.

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## Author's Contributions

JAR and DRRF designed the study; JAR conducted the fieldwork and collected the samples; DRRF identified the specimens; KSD and KGL sorted the material on laboratory; DOC collected and photographed part of material; DRRF, KSD, KDL, DOC and JAR wrote the manuscript.

## Conflicts of Interest Statement

The authors declare that they have no conflict of interest.

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