



Research Article

First record of family Xenasteiidae (Diptera: Brachycera: Cyclorrhapha) from India in association with *Aleurodicus rugioperculatus* Martin (Hemiptera: Aleyrodidae) with cautionary notes on associated parasitoids

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ABSTRACT: First ever record of family Xenasteiidae (Diptera: Brachycera: Cyclorrhapha) from mainland India is provided. Most of the previous records of this family are from coastal sites, as they have usually been found on islands in the Indian and Pacific Oceans. For the first time biology and life stages of *Xenasteia* are illustrated. *Xenasteia* members were found associated with an exotic rugose spiraling whitefly (RSW) colony of *Aleurodicus rugioperculatus* Martin (Hemiptera: Aleyrodidae) in the coastal areas of Karnataka in southern India, however no direct obligate association could be diagnosed. Also for the first time *Ooencyrtus* sp. (Hymenoptera: Encyrtidae) was recorded from the genus *Xenasteia* as its solitary parasitoid. Worldwide, this is the first ever report of parasitism associated with any member of this little-known family Xenasteiidae.

KEY WORDS: India, new record, Xenasteiidae

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INTRODUCTION

In an interesting and strange sighting of an exotic rugose spiraling whitefly (RSW) colony of *Aleurodicus rugioperculatus* Martin (Hemiptera: Aleyrodidae) from the coastal areas of Karnataka in southern India, a pristine association of RSW along with members of genus *Xenasteia* Hardy, belonging to the little-known family Xenasteiidae (Diptera: Brachycera: Cyclorrhapha), were discovered. This is the first ever record of family Xenasteiidae from mainland India. Most of the previous records of this family (10 species) are from coastal sites, as they have usually been found

On islands in the Indian and Pacific Oceans (Hawaiian Islands: Oahu; Marshall Islands: Bikini; Marianas: Guam, Saipan and Anatahan; Society Islands: Tahiti; Tuamotu Islands: Mangareva; Western Caroline Islands—Palau Islands: Angaur, Peleliu and Koror, Yap; Ryukyu Islands: Okinawa; Malaya: Pangkor Island, Perak and Indian Ocean: Aldabra, Mahe, Seychelles and Diego Garcia (Hardy, 1980).

The recent invasive pest rugose spiraling whitefly was found infesting coconut, banana, custard apple, mango, sapota, guava and several ornamental plants in Karnataka, Tamil Nadu, Andhra Pradesh and Kera-

la in India (Selvaraj *et al.*, 2016; Sundararaj and Selvaraj, 2017; Selvaraj *et al.*, 2017). On the lookout for the spread of this invasive pest various host plants were targeted. Interestingly, a plant of *Calophyllum inophyllum* L. (Calophyllaceae) commonly known as Indian laurel, severely infested with RSW was noticed. The infested leaves were found supporting few members of *Xenasteia*. In the present study for the first-time biology and life stages of *Xenasteia* are illustrated and the

details of first ever record of family Xenasteiidae from Indian mainland is provided.

MATERIALS AND METHODS

During the surveys undertaken in the first and last week of April, 2017 in and around the Malpe beach, Udupi, Karnataka, which is an important port and fishing harbor on the Karnataka coast, a plant of



Fig. 1. *Calophyllum inophyllum* L. A, Host plant in habitus view. B & C, Leaves infested with *Aleurodicus rugioperculatus* and *Xenasteia* sp.

C. inophyllum severely infested with RSW was noticed (Fig. 1A). On a much closer observation some debris aggregates were noticed on few leaves (Fig. 1B–C). The infested material was brought to the ICAR- National Bureau of Agricultural Insect Resources, Bengaluru laboratory for further observations. Images were taken with a Leica M 205 A stereozoom microscope with Leica DC 420 inbuilt camera using automontage soft-

ware (version 3.8). The images of host were taken with Sony DSLR-A100 Camera. The material examined was deposited at the ICAR-NBAIR insect repository.

Genus *Xenasteia* Hardy

Figs 2A–C

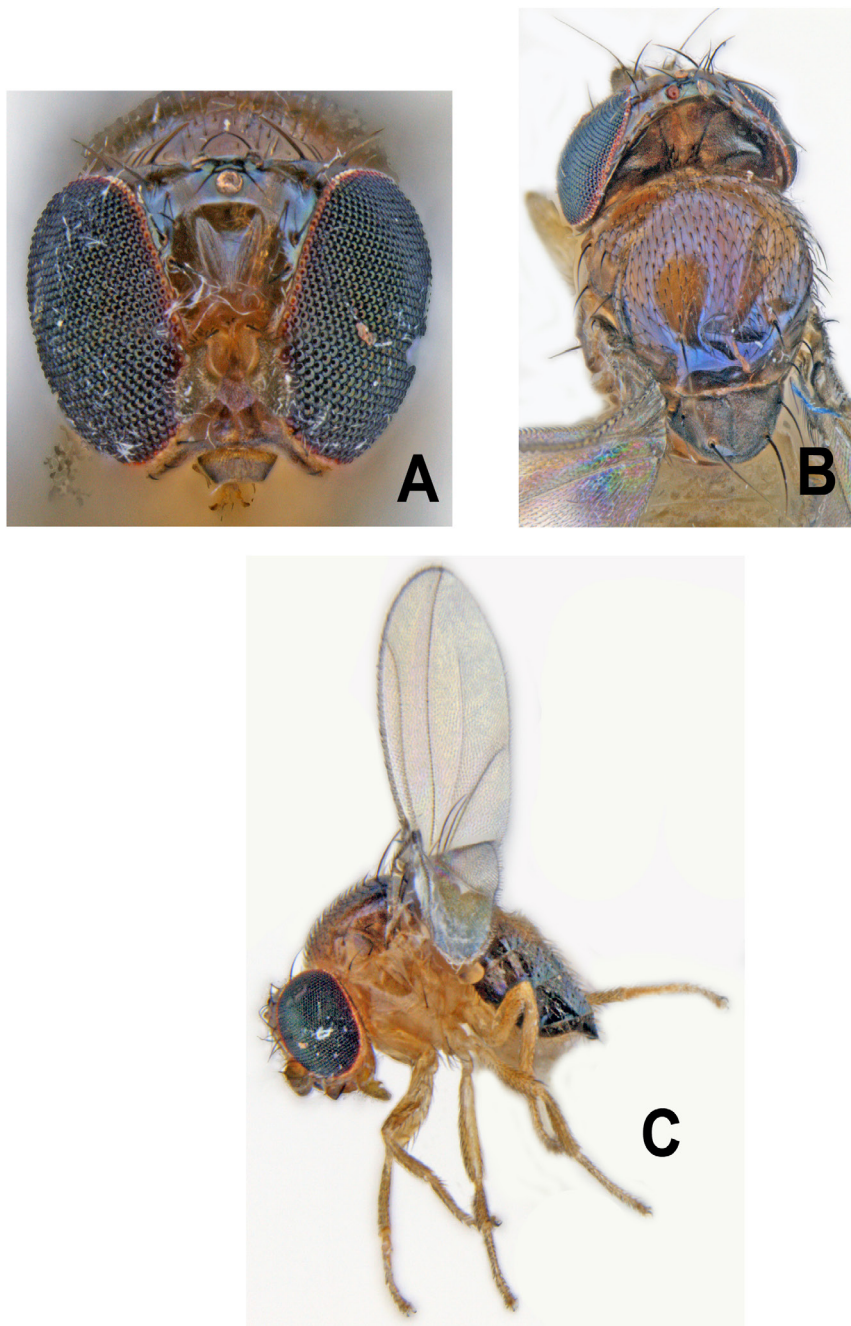


Fig. 2. *Xenasteia* sp. A. Head in frontal view, B. Head & mesosoma in dorsal view, C. Adult in habitus.

Diagnosis. Follows Hardy (1980).

Specimens examined: 5 males and females, INDIA, Karnataka, Udupi, Malpe beach, 6–8/iv/17 and 28–29/iv/17, 13.3555° N, 74.7044° E, on host *Calophyllum inophyllum* L. (Calophyllaceae), coll. K. Selvaraj, code - NBAIR/Dip/Xen/8417, 28417 (NBAIR).

Distribution: India, Karnataka: Udupi.

Biology (Figs 3A–E). The eggs of *Xenasteia* are white in colour, oval in shape with elongated streaks and slightly tilted to one side at apical end, and measure 500 μ m long. They were laid loose on the leaf surface. On an average two females when mated with a single male laid 25 eggs when fed with 50% honey after an incubation period of two days. Eggs hatched in 3–4 days after oviposition. The larvae are sluggish with a coat of debris and remnants of egg case on its

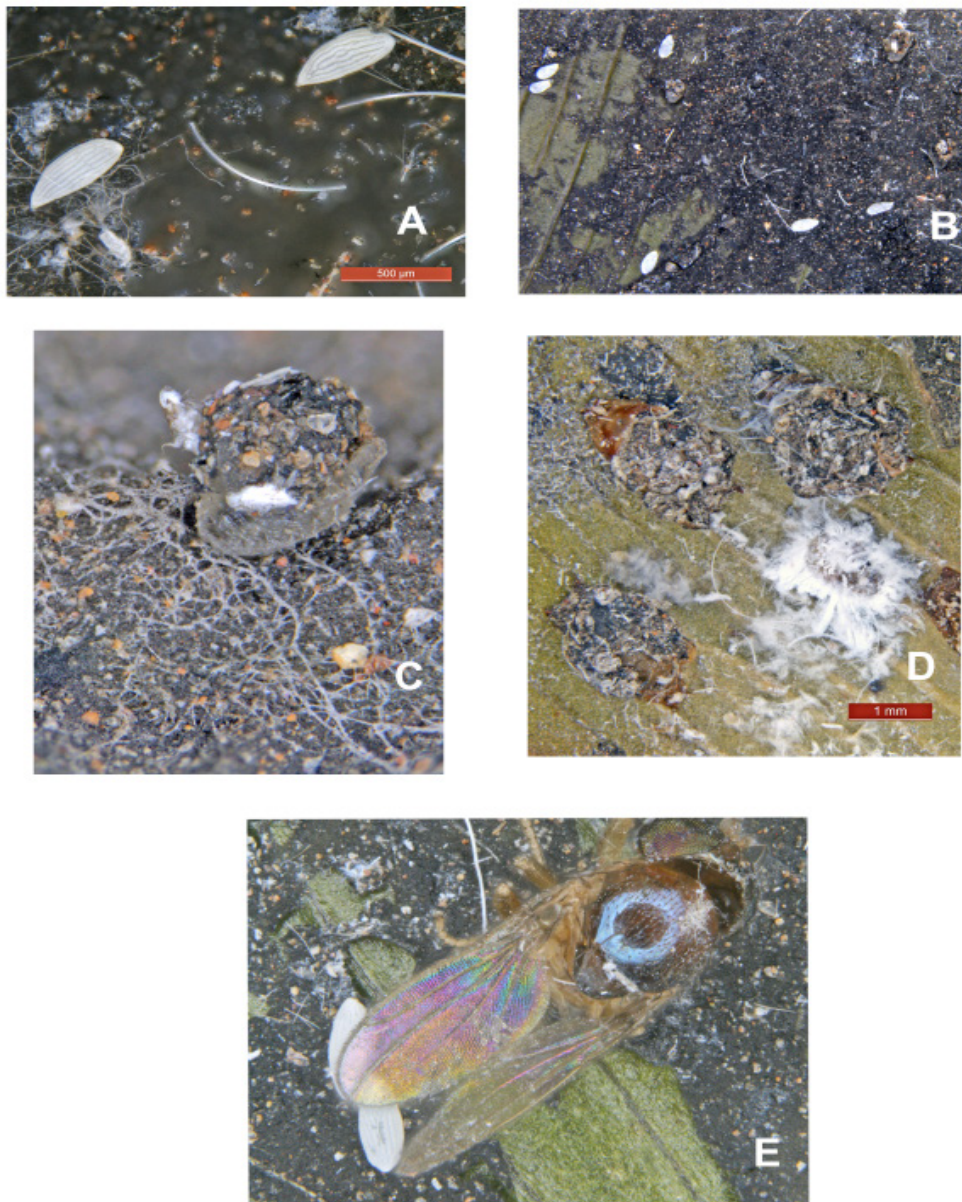


Fig. 3. Life stages of *Xenasteia* sp. A & B. Eggs, C. Larva feeding on fungal hyphae & sooty mould, D. Pupae, E. Adult fly.

dorsal surface, presumably for protection/camouflage. Larvae were observed feeding on sooty mould/fungal hyphae. Larval duration ranged from 9–10 days. The pupal stage lasts about 9–10 days. The average

life span from oviposition to adult emergence is 25 ± 2 days. The adult fly survived for one and a half month on 50% honey diet.

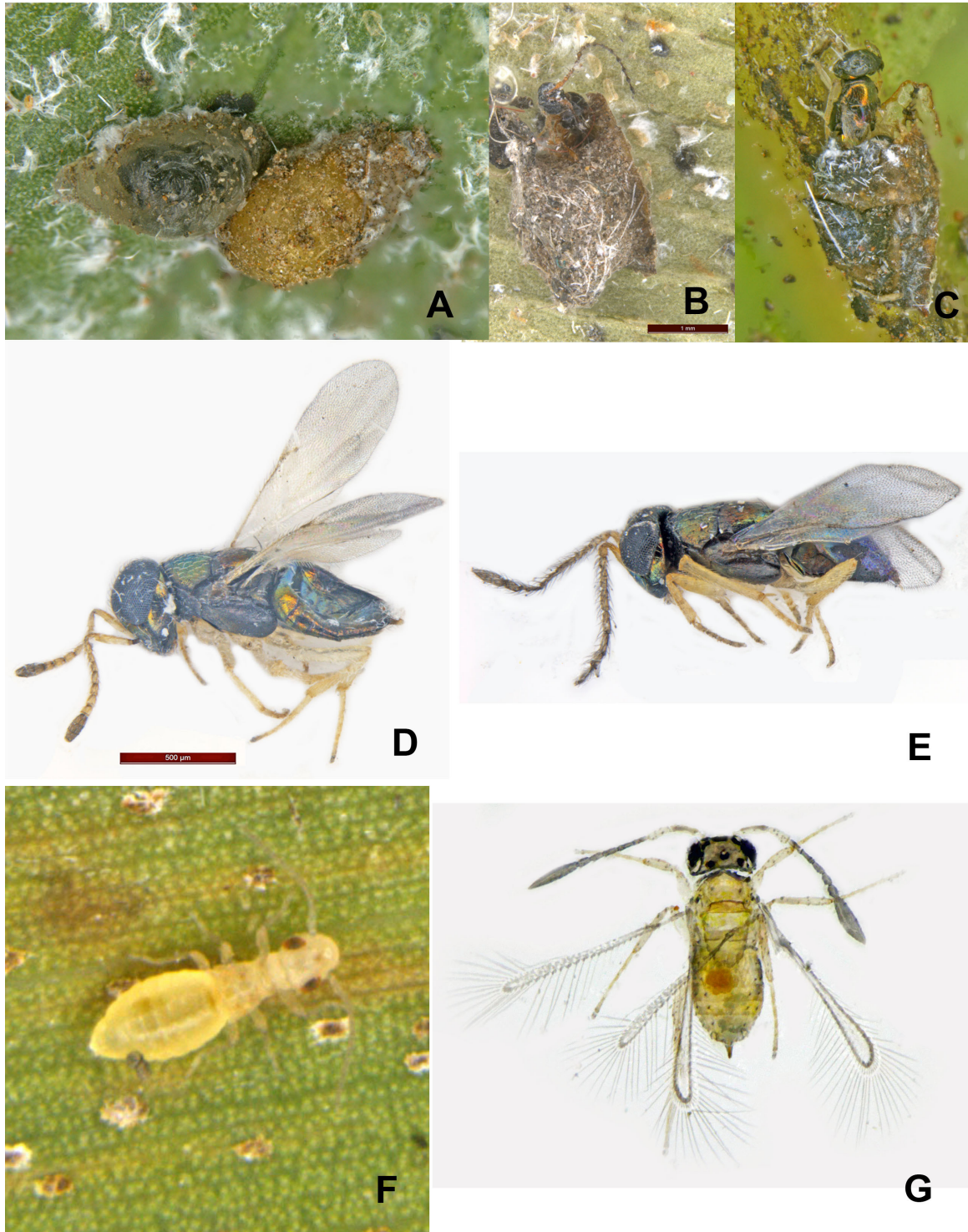


Fig. 4. A. *Xenasteia* puparia, B. male *Ooencyrtus* sp. emerging from pupa, C. Female *Ooencyrtus* sp. emerging from pupa, D. Female *Ooencyrtus* sp. E. Male *Ooencyrtus* sp. F. Psocid, G. *Alaptus* sp.

Host: The host plant *Calophyllum inophyllum* L. (Calophyllaceae) is native from East Africa, southern coastal India to Malaysia and Australia.

Comments: *Xenasteia* larvae develop on the naturally occurring organic debris deposited on the beaches (Papp, 1998). In our study, the rugose spiralling whitefly colony provided congenial environment for the development of *Xenasteia* on the leaves of *C. inophyllum* due to the sooty mould formed because of the honey dew secretion by the whitefly colony. The elevated humidity on the beach side was an added advantage for the development of *Xenasteia*.

Cautionary notes on parasitoids found in RSW niche

So, far only two species of parasitic wasps have been found to be directly associated with RSW in India- *Encarsia guadeloupae* Viggiani and *E. dispersa* Polaszek (Hymenoptera: Aphelinidae) (Poorani & Thanigairaj, 2017 and Selvaraj *et al.*, 2017).

In the present study, the parasitized puparia of *Xenasteia* were isolated carefully from the RSW colony to avoid confusion (Fig. 4A). For the first time *Ooencyrtus* sp. (Hymenoptera: Encyrtidae) (Fig. 4B,C) was recovered from the genus *Xenasteia* as its solitary parasitoid. A single wasp individual emerged from each parasitized pupa (Fig. 4D,E). Worldwide, this is the first ever report of parasitism associated with any member of this little-known family Xenasteiidae.

Also, *Alaptus* (Hymenoptera: Mymaridae) (Fig. 4G) was found emerging from the container with host leaves containing RSW colony and few members of Coccoidea. Since psocids were also recovered (Fig. 4F) hence it is presumed that there were Psocoptera eggs hidden somewhere on the host leaves. For the genus *Alaptus*, all the reliable records are from Psocoptera

(pers. comm. John Huber).

A word of caution is given to the researchers working on this pest to carefully examine the RSW colony as many other hosts share the same niche hence the parasitoids emerging need not necessarily be from RSW.

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REFERENCES

- Hardy DE. 1980. Xenasteiidae, a new family of Schizophora (Diptera) from the Pacific and Indian Oceans. *Proc Hawaii Entomol Soc.* **23**: 205–225.
- Papp L. 1998. Family Xenasteiidae. In: Papp L, Darvas B (Eds.). *Contributions to a Manual of Palaearctic Diptera*. Volume 3: Higher Brachycera. Budapest, Science Herald, 305–308 pp. ISBN 978-963-04-8836-5.
- Poorani J, Thanigairaj R. 2017. First report of *Encarsia dispersa* Polaszek (Hymenoptera: Aphelinidae) as a parasitoid of rugose spiralling whitefly, *Aleurodicus rugioeperculatus* Martin (Hemiptera: Aleyrodidae), a recent invasive pest in India, with notes on its predators. *J Biol Control* **31**(1): 1–4. Crossref.
- Selvaraj K, Sundararaj R, Venkatesan T, Ballal C R, Jalali SK, Gupta A, Mridula HK. 2017. Potential natural enemies of the invasive rugose spiralling whitefly, *Aleurodicus rugioeperculatus* Martin in India. *J Biol Control* **30** (4): 236–239. Crossref
- Selvaraj K, Gupta A, Venkatesan T, Jalali SK, Sundararaj R, Ballal CR. 2017. First record of invasive rugose

spiraling whitefly *Aleurodicus rugioperculatus* Martin (Hemiptera: Aleyrodidae) along with parasitoids in Karnataka. *J Biol Control* **31**(2): 74–78. Crossref.

Sundararaj R, Selvaraj K. 2017. Invasion of rugose spiraling whitefly, *Aleurodicus rugioperculatus* Martin (Hemiptera: Aleyrodidae): a potential threat to coconut in India. *Phytoparasitica* **45**:71–74. Crossref.