

A new host record of an eulophine parasitoid of the genus *Elasmus* (Hymenoptera: Eulophidae) from Karnataka, India

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ABSTRACT: This study describes a new host record of an eulophine parasitoid of the genus *Elasmus* (Hymenoptera: Eulophidae) from Karnataka that was reared from the larva of Banana skipper, *Erionota torus* (Lepidoptera: Hesperidae). The banana skipper or banana leaf-roller or red eye skipper, *Erionota torus* is a common banana pest in Southeast Asia. The larva causes considerable damage to foliage of banana by rolling the leaf while feeding on it. *Elasmus brevicornis* Gahan (Chalcidoidea: Eulophidae: Eulophinae) is redescribed and illustrated. Previously *E. brevicornis* has been reported from various lepidopteran pests including *Erionota thrax* L. although it is reported first time from *E. torus*. This offers new perspectives for the use of this parasitic wasp in biological control programmes against this destructive pest.

Key words: Chalcidoidea, Eulophidae, Eulophinae, *Elasmus brevicornis*, *Erionota torus*, Hesperidae

Erionota torus Evans is a common banana pest described by Evans in 1941 and the earlier geographical distribution records show that this skipper was originally reported from Southeast Asia, ranging from Sikkim to south China, Burma, Malaya and Vietnam. In India, it is historically known from the Himalaya east and southeast ward, and currently broke out in South India (Raju *et al.*, 2015). The larva causes considerable damage to foliage of banana by rolling the leaf while feeding and causing mean defoliation of about 60 per cent, leading to yield loss of about 20 per cent (Okolle *et al.*, 2010). It is quite often being confused with *E. thrax*. These two species can be distinguished only by the wing variations (straight outer margin and acute apex of the forewing in *E. thrax*, and the more convex outer margin and rounded apex of the forewing in *E. torus*) and differences in male genitalia (Evans 1949, Raju *et al.*, 2015). The species of the genus *Elasmus* are primary parasitoids of the larvae and prepupae of various Lepidoptera, though few species occur as hyperparasitoids of cocooned prepupae of Braconidae and Ichneumonidae (Verma and Hayat, 1986, Coote, 1997). The genus contains over 254 species worldwide and 54 species from India (Noyes 2012, Kazmi and kumar, 2015). Mani and Saraswat (1972) described 15 species of Indian *Elasmus* as new (3 species based on males). Husain and Kudeshia (1984) described four species from India (Husain *et al.*, 1984). Verma and Hayat (1986) reviewed the literature on the genus, and catalogued the species from India and the adjacent countries (Rao *et al.*, 1985). Ferriere (1929) described two species as new and recorded *E. brevicornis* Gahan from India (Ferriere *et al.*, 1929).

Erionota torus has moved down Southward and has been

recorded in South Indian states leading to outbreaks mainly in Karnataka and Kerala (Jayanthi *et al.*, 2015). The objectives of this study were to identify the collected Hymenopteran parasitoids of *Erionota torus* (Lepidoptera: Hesperidae). Hymenopteran parasitoids particularly are very important as biological control agents of various agricultural pests and are thus responsible for sustainable agriculture.

MATERIALS AND METHODS

The taxonomic study was carried out in the Insect Biosystematics and Insect-pest Management Laboratory, Department of Zoology, KU SSJ Campus, Almora, Uttarakhand. The rearing material was collected from the banana plantation from Shivamogga, Karnataka. The banana leaf rolls made by larvae of banana skipper were then kept in the rearing jar covered with muslin clothes and examined daily for the emergence of hymenopteran parasites. The emerged parasitoids were then killed by ethyl acetate and kept into a glass vials containing 70% alcohol. Specimens were mounted on slide and illustrated as prescribed by Noyes (1982). The specimens were then examined under Olympus Magnus MSZ-TR (Binocular Stereo Microscope) and various photographs, drawings were made by Olympus Trinocular Research Microscope Model- CX-31-TR with drawing tube attachment.

RESULTS AND DISCUSSION

Elasmus brevicornis Gahan

1922. *Elasmus brevicornis* Gahan, 50, Female, Indonesia, Java, Buitenzorg (USNM).

Description of species***Elasmus brevicornis* Gahan****Diagnosis.**

Female: Body length about 1.95 mm; body colour black; head black, ocelli dull reddish and eyes dull reddish, antennae light brown except pedicel pale brown; thorax black, pronotum black, non iridescent; wings hyaline with pale brown venation; fore leg coxa black, trochanter yellowish, femur yellowish except basal part blackish, tibia yellowish, tarsal segment yellowish; mid leg coxa black, trochanter yellowish, femur black except apical tip yellowish, tibia yellowish, tarsal segment yellowish; hind leg coxa black, trochanter yellowish, femur black, tibia and tarsus yellowish in colour; overall gaster dark brown except apices of I and II gastral tergites honey yellow, more than half portion of its own gastral length honey yellow except its apical segments dark brown laterally and ventrally.

Head (Fig.1): Wider than long in frontal aspect (0.40:0.35), head punctured by hairs sparsely at frontal view, head scrobal grooves present placed parallel to each

other and touching to toruli; fronto vertex wide; ocelli arranged in obtuse angled triangle; POL 1.7X as long as OOL (0.07 : 0.12); compound eyes bulged, large and smooth, eyes orbit round; antennal toruli situated at the lower level of eyes margin, prominence between antennal toruli less than the width of frons between eyes (0.04: 0.235), malar space smooth and longer than eye width (0.095 : 0.08); mandible having 7 teeth (Fig. 3); lower margin of clypeus bilobed.

Antennae (Fig.2): 8 segmented excluding 2 anelli, antennae with trichoidal sensilla, apical tip of antenna without spicula, antennal formula 1,1,2,3,3; scape cylindrical slightly 3.4X as long as wide (0.12:0.035), scape setose apex not reaching to mid ocelli; pedicel more than 1.4X as long as wide (0.05:0.035); funicle 3 segmented, FS1 to FS3 not gradually increasing in length, FS1 1.3X as long as wide (0.058 :0.045), FS2 1.1X as wide as long (0.045:0.0425), FS3 quadrate in shape and a trifle as long as wide (0.044:0.043), club 3 segmented, more than 1.5X as long as wide (0.11: 0.07), a trifle more than preceding two funicle segments combined.

Thorax (Fig.4): Pronotum bearing hairs at posterior margin ; mesoscutum wider than long (0.34:0.30); mesoscutum having fine setigerous punctures, notuli incomplete and shallow reaching half of the mesoscutum; axilla not advanced; scutellum slightly convex, shallow reticulation (shown at 400 X magnification) and shorter than mesoscutum, subequal in length and width (0.17: 0.17) without median longitudinal grooves and with 2 pairs of setae situated; dorsellum smooth; propodeum without median carina and without paraspicular carina, propodeal spiracles rounded, large and well separated from the anterior margin of propodium by a space less than half of its own diameter, spiracle rim fully exposed.

Fore wings (Fig.5): Wedge in shape, more than 3.3X as long as wide (1.2:0.36), slight more than 1 time longer than hind wing length, densely setose; SMV shorter (0.215) and MV (0.66); PMV short, PMV more than 1.8X longer than SV (0.0375:0.02, Fig. 6); marginal fringe short spaced by a distance less than $\frac{1}{2}$ of the length of fringe; isolated subcubital vein of setae.

Hind wings (Fig.7): more than 4.6X as long as wide (1.15:0.25) with blunt apex; vein length (0.71) more than $\frac{1}{2}$ of the length of wing.

Fore Legs (Fig.8): Coxa 11.8X as long as wide (0.18 : 0.10), almost 2.5X times longer than fore trochanter; femur more than 3.5X as long as wide (0.25:0.07), equal to tibia in length (0.25:0.25); Tibia slightly longer than length of fore tarsus (0.25:0.23), TS1 shorter than next two tarsal segments (0.08 :0.10), TS1 2X longer than tibial

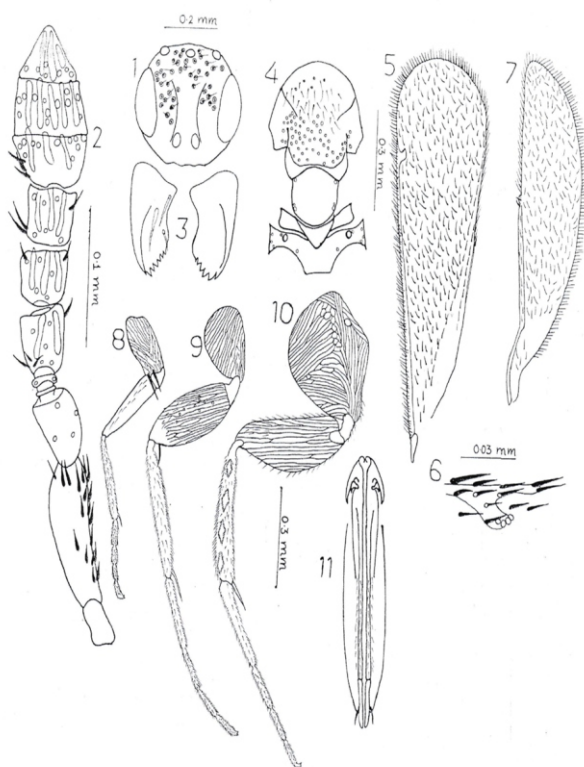


Plate A: Fig 1-11: 1. Head frontal view; 2. Antenna; 3. Mandible; 4. Thorax in dorsal view; 5. Forewing; 6. Post marginal vein and stigma vein; 7. Hind wing; 8. Foreleg; 9. Mid leg; 10. Hind leg; 11. Female genitalia;

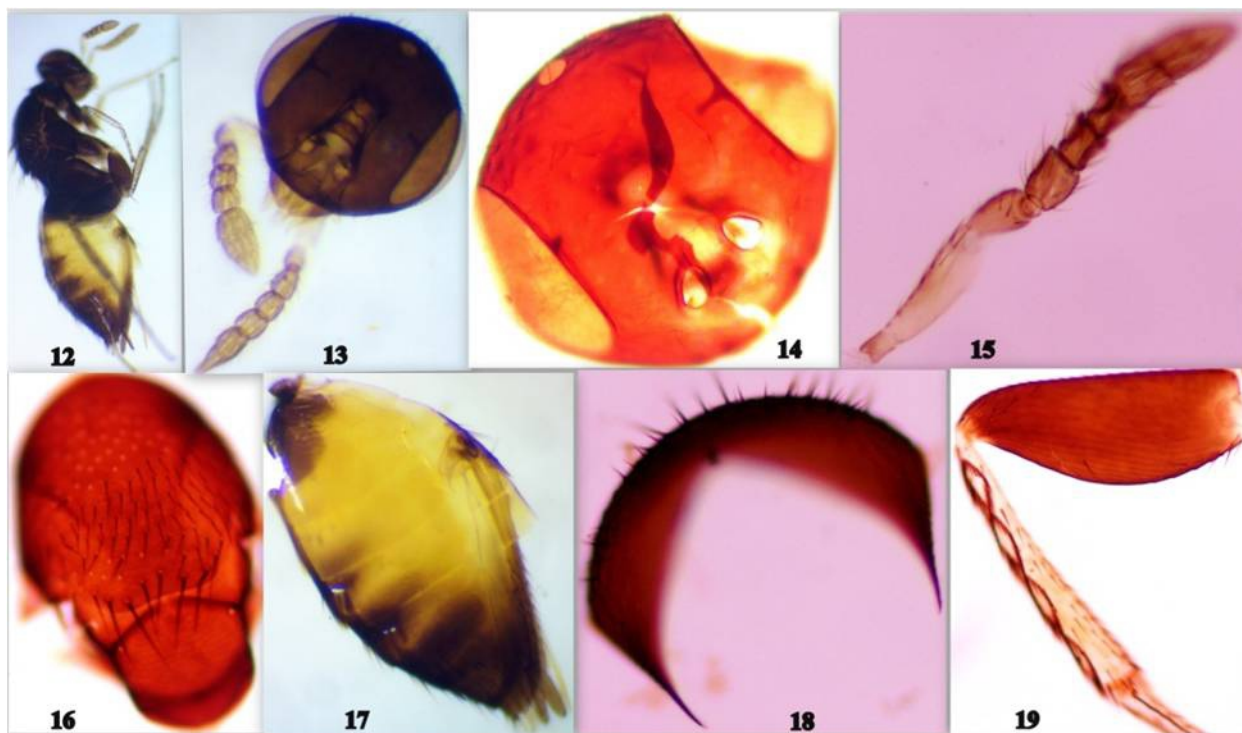


Plate A: Fig1-19: 12. Female habitus; 13. Head dorsal view (before dissecting); 14. Head dorsal view (after dissecting); 15. Antenna; 16. Thorax; 17. Gaster (lateral view); 18. Pronotum; 19. Hind leg

spur length, tarsus pale yellow except TS4 black.

Mid Legs (Fig.9): Coxa more than 1.5X long as wide (0.23:0.15), almost 2.3X longer than mid trochanter (0.33:0.14); femur 2.3X as long as wide (0.33:0.14), more than half of the tibia in length; mid tarsus longer than length of tibia (0.520:0.425), TS1 slightly shorter than next two tarsal segments (0.21: 0.23), TS1 1.9X longer than mid tibial spur length, tarsus pale yellow except TS4; mid tibial spur slightly longer than hind tibial spur and much longer than fore tibial spur.

Hind Legs (Fig. 10): Hind coxa 1.4X as long as wide (0.4 : 0.3), almost 4X longer than hind trochanter; femur 2.4X as long as wide (0.39: 0.16), more than half to tibia in length; hind tarsus longer than length of tibia (0.52: 0.43), TS1 slightly longer than next two tarsal segments (0.29 : 0.25), TS1 slightly less than 2.8X longer than tibial spur length, tarsus yellowish, hind tarsus having 4 diamond shaped lozenges.

Gaster (Fig.12): Large, gaster surface smooth, sparsely setose, petiolate, petiole small in size; metasoma longer than mesosoma; ovipositor sheaths slightly exerted; first valvifer semicircular with sharp free end (Fig.11); anterior margin of basal part of second valvifer long and much curved, thirdvalvulae movably articulate with second

valvifer, 5.5X as long as wide (0.105 : 0.019), 6.2X shorter than the length of second valvifers (0.66); outer plates of ovipositor subequal in length with second valvifers, hypopygium reaching to more than $\frac{1}{2}$ Length of gaster.

Male: Male is somewhat similar to female except, the branched antenna with 4 funicular segments and the colour of whole body is dark black.

Host: *Biloba subsecivella*; *Cnaphalocrosis medinalis*; *Diaphania indica*; *Hapalia machaeralis* on *Tectona grandis*; *Lamprosema indicata*; *Lygropia quarteranalis* defoliating *Helictares isora*; *Marasama suspicalis*; *Nausinoe geometralis*. Braconid, *Apanteles machaeralis*. (*Erionata thrax* in Java; *Psara stultalis* and *Sylepta derogata* Fabricius in Malaysia) (Verma *et al.*, 2002, Noyes 2003).

Distribution: India (Kerala, Karnataka, Tamil Nadu, Andhra Pradesh, Goa, Maharashtra, Delhi, Madhya Pradesh, Orissa, Punjab, Rajasthan, Uttarakhand, Uttar Pradesh, West Bengal, Chattisgarh), Indonesia, Malaysia.

Material Examined: @&, India, reared on larva of *Erionata torus*, collected through rearing of host from Shivamogga, Karnataka, Dec. 2017, Hym. Eulo. Nr. 01 (Sandeep Kumar).

Remarks: *E. brevicornis* is very closely related to *E. philippinensis* Ashmead (Ashmead, 1904). However *Elasmus* species are readily distinguished by their enlarged discus-like hind coxae, and hind tibia with diamond shaped pattern.

CONCLUSION

This is the new host record of *Elasmus brevicornis* parasitizing on banana skipper *Erionota torus* on banana from Karnataka. *Elasmus brevicornis* Gahan (Chalcidoidea: Eulophidae: Eulophinae) is redescribed and illustrated. The species of *E. brevicornis* Gahan were collected by the rearing of banana skipper, *Erionota torus* (Lepidoptera: Hesperidae). Previously *E. brevicornis* has been reported from various lepidopteran pests including *Erionota thrax* L. although it is reported first time from *E. torus*. Literature revealed those studies on *Erionota torus* and its natural enemies on banana has been not studied by earlier in detail in southern Karnataka (Kalleshwara swamy *et al.*, 2016). The insect pest if not managed at the right time using integrated practices may lead to serious damage to banana cultivation. This species is emerged from the larva of Banana skipper *Erionota torus*. Larvae of most species of the genus *Elasmus* are ectoparasitoids of some species of Lepidoptera, so they play a vital role in biological control programmes. This study provides a better understanding of *E. torus* and its newly recorded natural enemy *E. brevicornis*. This offers new perspectives for the use of this parasitic wasp in biological control programmes against Banana skipper.

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