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SHORT COMMUNICATION

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THE FIRST REPORT OF TWO THREAD-LEGGED ASSASSIN BUGS (HEMIPTERA: REDUVIIDAE: EMESINAE) FROM INDIA

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Abstract: Two Emesinae bugs, namely *Stenolemus crassirostris* Stål, 1871, and *Gardena brevicollis* Stål, 1871, are being reported for the first time from India. Both are widespread species but have never been recorded from India.

Keywords: Emesinae, *Gardena*, India, Reduviidae, *Stenolemus*, thread-legged bugs.

While surveying Heteroptera from 2016–2017, two assassin bugs of the subfamily Emesinae were recently collected in Sharadwadi, Shirur Taluka, Pune District (Maharashtra State). Of these two species, one 7mm long, hairy bug was identified as *Stenolemus crassirostris* Stål, 1871 (Image 1A) while the other slender, 13mm long, bug was identified as *Gardena fasciata* Distant, 1909 (now junior synonym of *Gardena brevicollis* Stål, 1871) (Image 1B). Both these bugs were identified using Distant (1904, 1910) and were confirmed using keys by Wygodzinsky (1966) as well.

Since none of these two bugs are previously known to be in Indian territory, this becomes the first record of these two species. The only published checklist of Reduviidae for India by Ambrose (2006) does not include these species. Stål originally described these

species from the Philippines (Stål 1871) and are also known from Ceylon (now Sri Lanka), as mentioned by Distant, cited above. Since useful descriptions of both these species are available, we are only providing many photographs of diagnostic characters with brief comments. We agree with Ang et al. (2013) who stated that “ (taxonomic) descriptions should become more data-rich by presenting a large amount of images and illustrations to cover as much morphology as possible”.

Original descriptions for both the species, as given by Stål (1871), were checked. Detailed generic characters as well as important diagnostic characters of each species have been given by various workers (Distant 1904, 1909, 1910; Wygodzinsky 1956, 1966; Ishikawa 2005, Rédei & Tsai 2010), along with line drawings, and so those are not given again. For various synonyms of *Gardena brevicollis* see Wygodzinsky (1966) and Maldonado-Capriles (1990); *Stenolemus crassirostris* has no synonym.

MATERIALS AND METHODS

Material studied: One male *Stenolemus crassirostris* (coll. B. Sarode 03.vi.2017), found in an old, unused house with many spider webs and subsequently one

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Image 1 A–B. *Stenolemus* and *Gardena*
A - live *Stenolemus crassirostris*; B - live *Gardena brevicollis*.

female was collected in a grass patch (coll. B. Sarode 12.xi.2017).

One male *Gardena brevicollis* was collected when it was attracted to light (coll. B. Sarode, 27.vi.2017); while one male was found dead in a spider web in Daund, Pune (coll. P. Pansare, 25.xi.2017).

The collected bugs were preserved in 70% alcohol and dried for observation using standard entomological methods. Properly mounted insects were studied and photographed under Leica SMZ6 stereozoom with attached Cannon PowerShot S50. Several images were taken at different focus and stacked to get final image using Combine ZM freeware. The images were processed and cleaned using Photoshop CS5. For preparation of male genitalia the whole insect was briefly warmed in 10% KOH for 15–20 minutes and the pygophore was detached using fine forceps. The dissected insects were subsequently treated with dilute acetic acid and washed in 70% alcohol before dry mounting again. The dried specimens are maintained at the Department of Zoology, Modern College. Detached pygophore was boiled in



Image 2 A–H. *Stenolemus crassirostris*
A - dorsal habitus of male (scale = 5mm); B - head and pronotum;
C - ventral view showing forewing extending beyond abdominal tip; D & E - dorsal and ventral colouration and details of fore leg; F - forewing; G - fore leg details; H - mid and hind leg colouration.

10% KOH for 2 minutes, cooled and boiled again for 2–3 minutes in fresh 10% KOH. This pygophore was then stored overnight in 5% KOH before further dissection.

During dissection parameres and proctiger were first removed and then the phallus was carefully removed. The phallus was further cleared from the muscles using fine forceps, stained briefly in dilute Methylene Blue and Eosin. In case of *Gardena*, the endosoma was also everted. Permanent slides of phallus and parameres were prepared by standard methods. For phallus and parameres the photographs were prepared on microscope using an attachment for camera.

Genus: *Stenolemus* Signoret, 1857
***Stenolemus crassirostris* Stål, 1871**

Genus *Stenolemus* is a species rich genus spread over all major zoogeographical areas and can be diagnosed on the basis of characters like: pedunculate pronotum, with distinct subglobular anterior lobe, narrow peduncle and posterior, usually bell shaped, lobe possessing a pair of discal projections and lateral carinae; incrassate labial

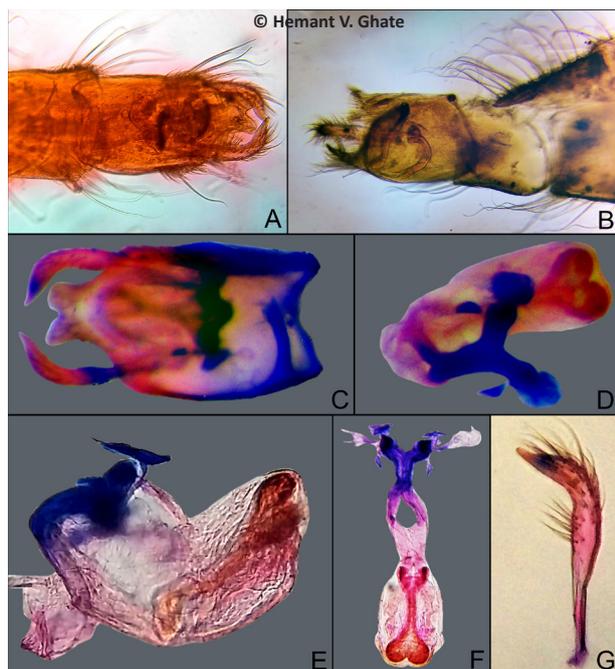


Image 3 A–G. *Stenolemus crassirostris*
A & B - dorsal and lateral view of pygophore; C - pygophore after removal of the proctiger; D–F - phallus in dorsal, lateral and flat view; G - paramere.

segments; scuteller and metanotal spines; relatively broad forewings that pass beyond abdominal tip, often with inner emargination at apex and with discal and basal cells; fore tarsus two-segmented.

Diagnostic characters for the species *Stenolemus crassirostris* such as: hairy body, general coloration (Image 2A), petiole of pronotum distinctly shorter than anterior lobe, pronotal posterior lobe with a pair of widely rounded tubercles (Image 2B), forewing extending much beyond abdominal tip (Image 2C) and presence of typical dark brown spots on forewing (Image 2F), foreleg coloration and spines (Image 2D,E), close up of foreleg spines (Image 2G), mid and hind legs with long setae of uniform density and with dark annuli, lacking dense tufts of dark hairs (Image 2H), etc., are shown here. These characters and structure of the phallus, as illustrated by Cai & Xiong (1996), are matching with the images given here. The colour pattern on forewing, seen in our specimen, is also similar to that shown by Distant (1904), as is evident from the photo of a live specimen and full dorsal view presented here.

The Pygophore of this species is very small, less than 1mm long, oblong oval and with long setae, parameres and preceding segments also have long setae. Parameres are moderately long, apically curved, as seen in situ (Image 3A,C). Phallus is clearly seen, even in undissected pygophore, in this lateral view

due to KOH treatment (Image 3B). Posterior border of pygophore has a plate like process which is broadly bilobed, and seen clearly in dorsal view of pygophore, after removal of the proctiger (Image 3C). Phallus in dorsal view (Image 3D), lateral view (Image 3E) and in full flat view (Image 3F), as well as parameres (Image 3G) are also very similar to that shown by Cai & Xiong (1996) for *S. crassirostris*, confirming identity of our specimen.

All measurements given below are in mm. Male and female measurements are separated as male / female.

Total length from head to tip of forewing: 7.5/7.0.

Total length of head - 0.75/0.70, antecular part - 0.18/0.12, postocular part - 0.25/0.20, head breadth at the level of eyes - 0.65/0.65, interocular distance - 0.30/0.30; antenna: length of I segment of antenna - 2.62/2.72, length of II segment - -/2.12, length of III segment - -/0.37, length of IV segment - -/0.95; labium: total length of labium - 0.96/0.90, length of I visible segment of labium - 0.40/0.37, length of II segment - 0.25/0.22, length of III segment - 0.31/0.31; pronotum length dorsally - 1.64/1.52, (fore lobe - 0.52/0.37, petiole - 0.25/0.17, hind lobe - 0.65/1.0), pronotum breadth at humeral angles - 1.0/1.0; abdomen length - 2.75/1.25; length of hemelytra - 5.5/5.5; fore leg, (lengths): coxae - 0.62/0.75, femur - 2.07/2.07, tibia - 1.62/1.62, tarsus with claw - 0.27/0.30; mid leg, (lengths): coxae - 0.25/0.37, femur - 3.50/3.75, tibia - 5.0/4.50, tarsus with claw - 0.25/0.32; hind leg, (lengths): coxae - 0.38/0.37, femur - 5.37/6.12, tibia - 7.62/7.25, tarsus with claw - 0.30/0.32. Male phallus: total length of phallus (everted and flattened as shown in figure) - 0.62; paramere - 0.35.

Genus: *Gardena* Dohrn, 1860.

***Gardena brevicollis* Stål, 1871**

The genus *Gardena* can be identified by characters such as: the first visible labial segment much shorter than second visible segment; mesonotum as well as and metanotum without any spines; anteroventral series of fore femur composed only of fine, spine like setae; fore wings with a single large discal cell, etc.

The species *Gardena brevicollis* can be identified on the basis of body size; pronotal coloration and length (Image 4A,B), shape of head, neck and labial segments (Image 4C,D) and presence of deep transverse notch between anterior and posterior lobes of pronotum (Image 4E). Close up photos of head, pronotum and prosternum, along with coloration of coxae and trochanters of mid-hind legs (Image 5A,B,C) indicate similarity with what was described as *Gardena fasciata*



Image 4 A-E. *Gardena brevicollis*
A & B - dorsal and ventral habitus (scale = 5mm); C & D - head dorsal and ventral view, E - head and thorax in lateral view.

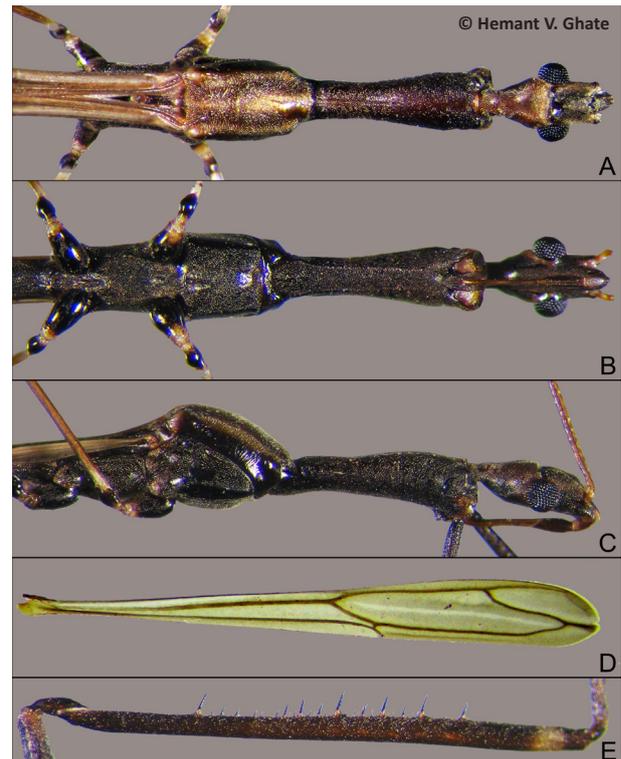


Image 5 A-E. *Gardena brevicollis*.
A-C - dorsal, ventral and lateral view of head and thorax respectively; D - forewing, E - fore femur details.

by Distant referred above. Forewing image shows details of venation, (Image 5D) and spineless nature of the basal 1/4th length of fore femur is shown in (Image 5E), both matching with the illustrations given for this species by Wygodzinsky (1956).

Note dorsally nearly flat head as well as relative proportion of head with entire pronotum, large eyes, transverse sulcus between eyes and slightly swollen second visible segment of labium, distinct notch between anterior and posterior lobes of pronotum (Image 5C) and somewhat shining body. Also visible is sub apical ochraceous annulation on fore femur in (Image 5E).

In this species the last tergite is subtriangular, slightly obliquely raised above abdomen and just overlapping distal tip of pygophore (Image 6A,C), barely showing parameres from dorsal side. Pygophore is longer than broad, ventrally very convex (Image 6B,C) and dorsally flat, considerably sclerotized and opaque, even after KOH treatment (Image 6D). Pygophore has distinct, vertical, spiny process at posterosuperior tip that is clearly visible after removal of parameres (see inset of Image 6E). Parameres are long, slender in basal half, slightly clavate and very setose in distal half (Image 6F). Phallus is shown here in fully everted position showing short and stout articulatory apparatus, as mentioned by Wygodzinsky cited above (Image 6G). This is also a

species rich, cosmopolitan genus with about 50 species known from all zoogeographical regions.

Gardena brevicollis measurements, given below, are in mm.

Total length 12.8, one male. Head length 1.25, anteocular dorsally visible part 0.50, postocular dorsally visible part 0.57, head breadth between eye 0.42, head breadth at eye 0.85; antenna: length of I segment of antenna 6.4, length of II segment 6, length of III segment 0.32, length of IV segment 1.76; labium: total length of labium 1.32, length of I segment of labium 0.25, length of II segment 0.375, length of III segment 0.70; length of anterior lobe of pronotum 1.62; length of posterior lobe of pronotum 1.37; breadth at anterior angle of pronotum 0.50; breadth at humeral angles 0.87; abdomen: total length of abdomen 8.4, maximum breadth of abdomen 0.87; wing: forewing length 7.6; fore leg, (lengths): coxae 2.4, femur 4.0, tibia 2.24, tarsus with claw 0.40; mid leg, (lengths): coxae 0.50, femur 10.88, tibia 15.2, tarsus with claw 0.40; hind, (lengths): coxae 0.50, femur 8.4, tibia 10.4, tarsus with claw 0.40; pygophore: length of pygophore 0.75, height at base 0.50, breadth dorsally 0.42; pygophoral spine height 0.12; phallus- total length of phallus (everted and flattened as shown in figure)

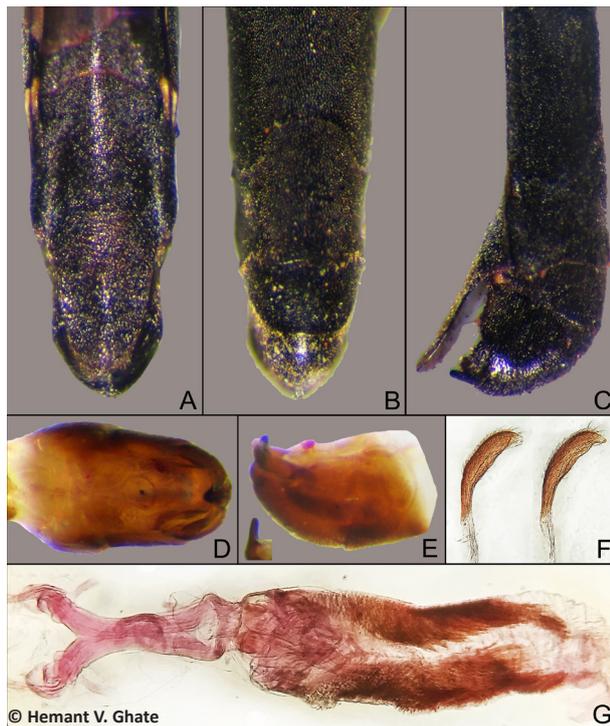


Image 6 A–G. *Gardena brevicollis*.

A–C - dorsal, ventral and lateral view of abdomen respectively; D - dorsal view of pygophore; E - lateral view of pygophore; Inset showing pygophoral tip after removal of parameres; F - parameres; G - everted phallus.

1.31, paramere length 0.43.

DISCUSSION

Stenolemus crassirostris was originally described briefly by Stål (1871). Distant (1904) later reported this species from Ceylon (now Sri Lanka) and also gave a slightly extended description and habitus drawing; Cai & Xiong (1996) subsequently redescribed in more details and provided measurements and additional diagrams including those of parameres and phallus for the first time, based on specimens from China. Recently Rédei & Tsai (2010) reported this species from Taiwan, gave diagnostic features and stated the distribution to be: 'Philippines, Sri Lanka, China and Taiwan'. A report also states presence of this species in northern Sumatra (Arnold 1991).

Until now only four species of *Stenolemus* were known from India: *Stenolemus atkinsoni* Distant, 1903; *Stenolemus greeni* Distant, 1903; *Stenolemus hirtipes* Distant, 1919 and *Stenolemus susainathani* Wygodzinsky, 1966 (see Ambrose 2006) and a fifth was added to this list, as *Stenolemus annulatus* Mukherjee, Ambrose, Hassan & Biswas, 2015 (Mukherjee et al. 2015). *Stenolemus crassirostris* thus becomes the sixth

species under this genus in India.

S. crassirostris differs from other Indian species in having the shortest 'petiole' of pronotum and in not possessing tufts of black hairs on dark annuli of mid and hind legs; besides the pattern of coloration on forewing of *S. annulatus*, *S. susainathani* and *S. greeni* is entirely different. *S. hirtipes* is 11mm long and has 'longly pilose' mid and hind legs as per original description (Distant 1911); *S. greeni* is about 10mm. Keys for already known species of Indian *Stenolemus* were provided by Mukherjee et al. (2015)

Gardena brevicollis is a very widely distributed species in the oriental region and also occurs in Australian region, in some parts of Russia, Korea and Japan (Wygodzinsky 1966, Ishikawa 2005, Rédei & Tsai 2010). *Gardena* specimen was initially identified as *Gardena fasciata* Distant, 1909, because the characters were matching with the original description, and subsequent redescription, with habitus drawing (Distant 1909, 1910). McAtee & Malloch (1926) also gave brief comments on colouration of *Gardena brevicollis*. Wygodzinsky (1966), in a monograph on world Emesinae, synonymized *Gardena fasciata* with *Gardena brevicollis* and stated: "nothing in Distant's description and figure of his *fasciata* distinguishes it from *brevicollis*". The color pattern of the thorax, as described by Distant, is typical of well- preserved specimens of *brevicollis*". Earlier, Wygodzinsky (1956) had also synonymized *Gardena australis* Horvath, 1902 with *Gardena brevicollis*; these two papers by Wygodzinsky give illustrations of important diagnostic characters of *Gardena brevicollis* (such as fore femur and its spine, pygophore and phallus) and those were useful in confirming the identity of species.

Recently Ishikawa (2005) studied the species of the genus *Gardena* found in Japan, including *Gardena brevicollis*; in the same paper Ishikawa described a new species as *Gardena albiannulata* Ishikawa, 2005 from Japan. Based on its description and illustrations given by Ishikawa (2005), we feel that it is also very similar to *Gardena fasciata* Distant and hence likely to be a synonym of *Gardena brevicollis*. Dr. Ishikawa (in personal communication with H.V. Ghate, August 2017), has also expressed this possibility; however, re-examination of additional specimens (from India and Japan) may be necessary for deciding the status of *Gardena albiannulata*. Rédei & Tsai (2010) also reported *Gardena brevicollis* as well as *Gardena albiannulata* from Taiwan. It should be noted that *Gardena brevicollis* is widespread and also a variable species with respect to coloration and for this reason *Gardena australis* Horvath and *Gardena fasciata* Distant have been synonymised

with *Gardena brevicollis* (see Wygodzinsky 1966).

Recently an apterous form of *Gardena melinarthrum* Dohrn, 1859 was reported from Jalpaiguri District, West Bengal (Mukherjee & Saha 2017) but this paper is illustrated with images (of male and female) that do not show any structural details. On the basis of size alone (reported length for male 10mm and female 15mm) we feel that this material must be re-examined because, as per the key and description of *melinarthrum* group of Wygodzinsky (1966), *Gardena melinarthrum* is “medium to large (18.5 to 25 mm), winged or apterous” insect; so it is likely that Mukherjee and Saha’s species is something else. The only other species said to be present in India is *Gardena muscicapa* (Bergroth, 1906) as mentioned in the checklist of Ambrose (2006); however, there are no further reports or good photographs / illustrations of this species from India. *Gardena bicolor* Distant, 1903, described from Burma (=Myanmar), and so likely to be present in India, has been treated as a possible synonym of *Gardena melinarthrum* (see: Wygodzinsky 1966). Most species of Emesinae found in India are poorly studied and need well-illustrated redescrptions so that those can be identified unambiguously. One such redescription of an apterous emesine bug, *Ploiaria anak*, has recently been completed (Pansare et al. 2018) and a few more will be presented in due course.

The presence of the two Emesinae reported here, namely *Stenolemus crassirostris* and *Gardena brevicollis*, in India is not surprising because many insects are common to India and Sri Lanka. What is surprising is that these have never been reported from India so far. A recent report of another emesine bug *Myiophanes greeni* Distant, 1903 from Maharashtra (Kulkarni & Ghate 2016), indicates that emesine bugs originally described on the basis of specimens from Ceylon are also likely to be present in India. According to Wygodzinsky (1966) *Gardena* and *Stenolemus* are two of the four genera that are cosmopolitan with ‘species in each of the six traditional zoogeographical region’. Thus, In spite of delicate appearance and small size, many emesines are widespread.

It is well known that many species of *Stenolemus* are found in and around spider webs and some actually feed on spiders, as has been described by other workers (Wygodzinsky 1966; Wignall & Taylor 2010; Soley et al. 2011). It would be interesting to study the biology of this and other species of *Stenolemus* in India.

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Correction

Corrigendum - Butterfly host plant Monograph, P. 11701

Miscellaneous

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