



Research Article

Redescription of a predatory stink bug, *Amyotea malabarica* (Fabricius, 1775) (Hemiptera: Pentatomidae: Asopinae)

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ABSTRACT: The genus *Amyotea* Ellenrieder, 1862 (Hemiptera: Pentatomidae: Asopinae), along with the species *Amyotea malabarica* (Fabricius, 1775) is redescribed. The male and female genitalia of the same is described and illustrated. A slightly modified procedure for the dissection of male genitalia is also given.

KEY WORDS: *Amyotea* Ellenrieder, male genitalia, female genitalia, eggs, variability

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INTRODUCTION

Amyotea Ellenrieder, 1862 is a predaceous stink bug belonging to the subfamily Asopinae. The monophyly of Asopinae was confirmed by Gapon and Konstantinov (2006) based on examination of various types of aedeagal structure of different representatives of this taxon. Asopinae are represented by eight genera in south India (Salini and Viraktamath, 2015) and 16 genera in India (Atkinson, 1888; Distant, 1902, 1908 and 1918; Chatterjee, 1934; Thomas, 1994; Kaur *et al.*, 2012). Thomas (1994) gave a taxonomic synopsis of old world genera of Asopinae. Eight species are known for the genus *Amyotea* from the world (Rider, 2016). Of these, *Amyotea malabarica* (Fabricius) is the only species known to occur in India. Azim and Shafee (1982) described a new species *Asopus rufus*, which was later synonymized with *A. malabarica* by Thomas (1994). Ahmad and Rana (1992) redescribed *A. malabarica* from Bihar, India and illustrated only the female genitalia. Rider and Zheng (2002) gave distributional records and synonymy notes for *A. malabarica* in their checklist of Chinese Pentatomidae. Zhao *et al.* (2011) dealt with the genus *Amyotea* from China with description of a new species *A. lata* and gave distribution of *A. malabarica* within China.

The Asopinae are easily diagnosed by their incrassate labium, especially the first segment of labium is markedly thickened and free, base of labium attached directly to the apex of head; bucculae form a labial groove, not reaching the posterior margin of head; labium generally extending

beyond the midcoxae, but not surpassing base of venter; anterior tibiae with short, acute spine on the lower surface (De Clercq, 2000). Like other members of the subfamily Asopinae, the members of the genus *Amyotea* are brilliantly coloured and often collected with difficulty as single or a few individuals. Though the species was found to feed on larvae of soft bodied insects like Lepidoptera, their prey are not well known.

The species *A. malabarica* is a bright red coloured bug with black spots. Even though the species is generally distributed all over India, a detailed description and notes on colour variation for this species is lacking for the region. An illustration of the male and female genitalia is also lacking except a partial illustration by Datta *et al.* (1985). The present paper aims at redescribing the species *A. malabarica* with emphasis on the male and female genitalia.

MATERIAL AND METHODS

Photographs were made using Leica DFC 420 camera mounted on a Leica M205A stereozoom microscope and by using the software Automontage® (LAS). Photographs were edited using Adobe Photoshop CS (Version 8.0). The procedure to dissect male genitalia as detailed by Ahmad (1986) was followed. But the procedure was slightly improvised as follows. The whole specimen (after removing the labels) with pins in inserted position was boiled for 3–5 minutes and transferred to distilled water for the dissection of male genitalia. After removing the insect pin, the genital

capsule was detached by gently pressing the posterior part of abdomen on ventral side. The specimen, after removing the genial capsule, was repinned and kept for drying with the labels inserted. The proctiger of the genital capsule was removed carefully using needles and fine forceps without damaging the genitalia parts and placed in 5–10 ml of distilled water with one pellet of Potassium Hydroxide (KOH). The genital capsule was then boiled for digestion for 5–7 minutes. The detachment of proctiger will facilitate the natural inflation of endosoma. The digested genial capsule was placed in plain distilled water with 1–2 drops of absolute alcohol in a cavity block for dissection. The genital capsule was placed in such a way that the caudal opening directed upwards. The right paramere (practically left paramere of insect) was detached from the dorsal side of genital capsule by using fine forceps and blunt needles. The phallus was detached carefully from the genital capsule by using a needle with bent apex, inserted through the caudal opening. The female genitalia was dissected after boiling the whole abdomen in hot water for about 10–15 minutes with 10% Potassium Hydroxide (KOH). The internal contents were cleared after thoroughly washing it in distilled water for 2–3 times and with the help of fine forceps, the terminalia and spermatheca were detached from abdominal sternites.

All measurements are given in millimetres and presented as median, with minimum and maximum values given in parenthesis. The following dimensions were measured: Body length (from apex of mandibular plates to apex of membrane or apex of tergite VIII, dorsal view), head length (from apex of mandibular plates to anterior margin of pronotum, anterodorsal view), head width (width of head including compound eyes, anterodorsal view), interocular width (between inner margins of compound eyes, anterodorsal view), length of each antennal segment, length of each labial segment, pronotum length (medially, from anterior to posterior margin of pronotum, anterodorsal view), pronotum width (maximum width between humeri, anterodorsal view), scutellum length (medially from base to apex, dorsal view) and scutellum width (maximum width at base between basal angles of scutellum, dorsal view). Morphological terms used for male and female genitalia follow Tsai *et al.* (2011). Basic terms are followed from Schuh and Slater (1995) and Tsai *et al.* (2011) and terms associated with external scent efferent system follow Kment & Vilimová, 2010.

Specimens studied for this research work are deposited in the following museum.

National Bureau of Agricultural Insect Resources

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RESULTS AND DISCUSSION

Taxonomy

Amyotea Ellenrieder, 1862

Asopus Burmeister, 1834: 292–293; *Amyotea* Ellenrieder, 1862: 137. (Synonymized by Stål, 1870).

Type species: *Amyotea dystercooides* Ellenrieder, 1862 (= *Cimex malabaricus* Fabricius, 1775), by subsequent designation (Schouteden, 1907).

Redescription. Structure. Head slightly inclined downwards, distinctly wider than long. Mandibular plates straight, together wider than distance between ocelli, apex of each rounded, as long as clypeus (Fig. 7); lateral margins of mandibular plates slightly sinuate in front of compound eyes; clypeus not narrowing (opened anteriorly) anteriorly; dorsal surface of head more or less flattened. Compound eyes moderately large, rounded, protruding out of the head outline in most of their width. Postgenae behind eyes, not surpassing eyes laterally. Ocelli situated just before the posterior margin of head submedially. Antenniferous tubercles small, sessile, pointed apically, hardly visible from above. Antennae five segmented, slender. Antennal segment I shortest and segment II longest, segment III second shortest and segments IV and V subequal; antennal segment I cylindrical and stoutest; segments II to V slender and cylindrical. Bacculae reduced and confined mainly to base of first labial segment; labial segment I stoutest and passing anterior prosternal margin (Fig. 9); apex of labium reaching between hindcoxae.

Pronotum. Anterior pronotal margin deeply concave; anterolateral angles rectangular, unarmed; anterolateral margins slightly concave especially towards humeral angles, not smooth, not reflexed, with indistinct serrations. Humeri slightly angulate, not sharp rather rounded; posreolateral margin obliquely straight; posterior margin straight. Pronotal disc more or less flat with slight transverse impression medially.

Scutellum triangular, longer than wide at base, lateral margins slightly convex in frenal portion, incised at 1/3rd from apex; apex of scutellum rounded; scutellum distinctly shorter than anterodistal angles of corium. Disc of scutellum more or less flat.

Hemelytra. Clavus narrowly triangular, uniformly and coarsely punctate, extending beyond frena. Corium gradually widening towards distal end; anterodistal an-

gles rounded apically, much surpassing apex of scutellum. Membrane translucent, widely rounded apically, extending much beyond apex of abdomen. Membrane with 9-11 simple, parallel veins, without reticulate venation.

Thoracic pleuron and sternum. Forecoxae located away from mid and hind coxae, mid and hind coxae closely placed; mesosternum with narrow, median longitudinal carina. Peritreme modified into peritremal disc (Fig. 8); evaporatorium not distinctly delineated, metathoracic spiracle not distinct.

Legs. Fore femora as long as mid femora but shorter than hindfemora; foretibiae as long as midtibiae but shorter than hindtibiae. Femora unarmed. All tibiae with segment II shortest, segment I subequal to combined length of segment II and III; all tarsal segments regularly rounded, not grooved.

Pregenital abdomen broadly semiovate. Connexivum narrow and sometimes exposed; antero lateral angles and posterolateral angles of sternites rounded or slightly an-

gulate, lacking tooth. Abdominal sternites slightly convex medially, neither grooved nor keeled. Sternites III (basal abdominal sternite) neither spinose nor depresses medially. Spiracle on sternite II covered by metapleuron. A pair of trichobothria placed posteriad to spiracle on each sternite III-VII. Sternite VIII (Fig. 12) in male short, roughly trapezoidal and partially covering the genital capsule ventrally from proximal end.

Genitalia. Genital capsule of male roughly quadrangular; dorsal rim broadly concave with narrow median emargination.; ventral rim slightly wavy with slight concavity medially. Paramere small, roughly sickle-shaped Phallosome with two halves due to transverse constriction; a pair of membranous conjunctival processes; processes of aedeagus sclerotized; aedeagus erect, short and tubular. Female genitalia with valvifers VII subquadrate; valvifers IX fused to single quadrate plate; laterotergite IX finger-like, laterotergite VIII medially fused. Ring sclerites absent. Spermatheca with balloon-like median dilation; apical receptacle large orbicular, without any finger-like processes.



Figs. 1-4. Dorsal habitus of *Amyotea malabarica* (Fabricius) showing the variability of black spots on pronotum and scutellum and hemelytra with or without black colouration.

***Amyotea malabarica* (Fabricius, 1775)**

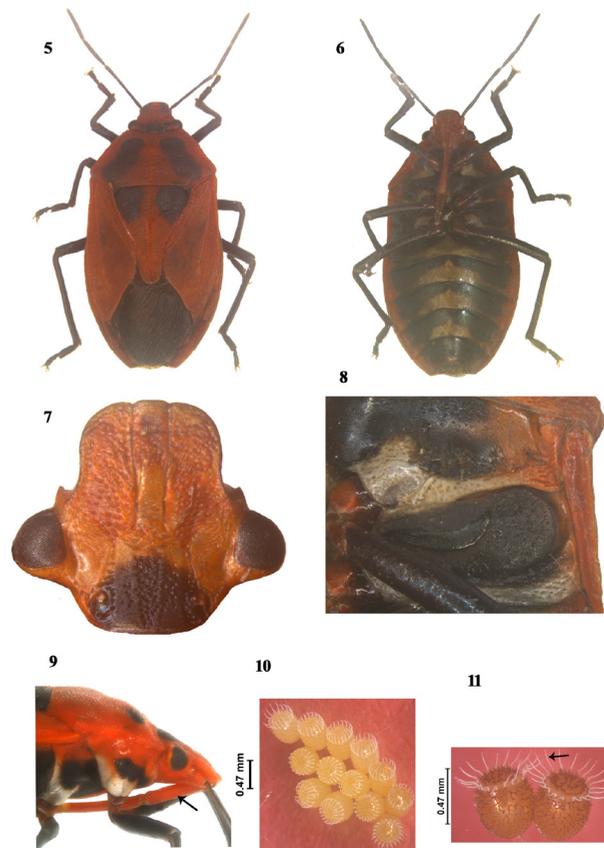
(Figs 5-6)

Cimex malabarica Fabricius, 1775: 718; *Cimex mactans* Fabricius, 1781: 366; *Cimex oculatus* Fabricius, 1798: 535 (homonym); *Lygaeus malabaricus* Fabricius, 1794: 151; *Lygaeus mactans* Fabricius, 1794: 161; *Lygaeus argus* Fabricius, 1803: 217 (new name for *oculatus*); *Asopus argus* Burmeister, 1834: 293; *Pentatoma mactans* Westwood, 1842: 25; *Asopus mactans* Dallas, 1851: 107; *Amyotea dystercoides* Ellenrieder, 1862: 137; *Amyotea nigripes* Ellenrieder, 1862: 138; *Asopus nigripes* Vollenhoven, 1868: 12; *Asopus malabricus* Stål, 1870: 56; *Asopus malabraica* var. *rubrocinctus* Breddin, 1899: 166; *Asopus malabraica* var. *rubrocincta* Schouteden, 1907: 54; *Asopus malabraica* var. *nigripes* Hsiao et al., 1977: 88; *Asopus rufus* Azim and Shafee, 1982: 361.

Material Examined. INDIA: Karnataka: 1♀, Hoskote, 22.i.2009, N 13° 05.321' E 077°49.687', Yeshwanth,

H. M.; 1♀, Kolar, 10.ix.2009, Mallesh; 2♂, Basavanehalli, Magadi, 28.i.2010, N13°02 E77°18, Mahendra, R, ex maize; 1♀, Basavanehalli, Magadi, 28.i.2010, N13°02 E77°18, Umesh Kumar, S, ex Maize; 1♀, Savanadurga, 23.vii.2010, Mallesh; 1♀, Devanahalli, 15.xii.2010, N13°16E77°38, Umeshkumar, S.; 1♂, Basavenahalli, 27.i.2011, N13° 02E77°18, Mahendra, R; 1♂, Basavenahalli, 27.i.2011, Meenakshi, J.; 2♀, Kenchanakuppe, Bidadi, 24.ii.2011, N 12°48 E77°22, Meenakshi, J, ex maize; 1♀, Tumukulahalli, Chikkaballpur, 26.iii.2011, N13°23 E77°43, Meenakshi, J, ex Maize; 1♂, Shimoga, 17.v.2011, Harish, ex light; 1♀, Hebbal, 10.viii.2012, Salini, S.; 1♀, Hebbal, 19.xii.2012, Salini, S; 1♀ (without label); 1♀, Hebbal, 05.i.2013, Salini, S. ; 1♂, Bangalore, Attur, 28.i.2013, Salini, S.; 1♀, Attur, Yelahanka, 13.i.2014, Salini, S; 1♀, Bagalur, 18.xii.2015, Lalitha; Tamil Nadu: 1♂, Hosur, 11.xi.2015, Salini, S.

Redescription. *Colouration.* Body above bright red with black spots of variable size (Fig. 5) as follows: dor-



Figs. 5-11. *Amyotea malabarica* (Fabricius). 5, Habitus (dorsal); 6, Habitus (ventral); 7, Head (dorsal); 8, External scent efferent system; 9, Head and Pronotum (lateral)—arrow showing thickened first labial segment; 10, Freshly laid eggs; 11, one day old eggs—arrow showing the white hair-like structures demarcating operculum.

sal disc of head with oval, transverse elongate spot posteriorly behind compound eyes, black; one transverse, elongate black spot borne by each pronotal cicatrices; disc of scutellum with two large, roughly round spot at each basal angles, black. Antennal segments black except segment I red. Head underside including labium red except apex of labium (segment III and IV) pale. Thoracic and abdominal sternites (except red circumference) with alternate bands of black and white (Fig. 6). Legs red as a whole or black with red coxae.

Integument and vestiture. Body uniformly covered with dense and fine punctae dorso-ventrally. All punctae concolourous to body colouration.

Structure. See the generic redescription.

Male genitalia (Figs 12–20). Genital capsule (Fig. 14) short, roughly quadrangular with posterior aperture slightly shifted towards dorsal side of genital capsule. Proctiger (Fig. 13) black, sclerotized proximally with median longitudinal suture. Caudal angles broadly rounded. Dorsal rim (Fig. 14) broadly concave with narrow median emargination; infoldings of dorsal rim with lateral depressions on either side of median emargination. Ventral rim (Fig. 15) slightly wavy with slight concavity medially. Paramere (Figs. 16–17) small, roughly sickle-shaped, distal end broadly expanded and rounded. Phallosome of phallus with median transverse constriction, dividing phallosome into two nearly equal halves (Fig. 18); phallosome slightly sclerotized; a pair of membranous conjunctival processes with apex sclerotized and pointed (Figs 19–20). Processes of aedeagus sclerotized, fused subapically and longer than aedeagus (Fig. 20). Aedeagus erect, short and tubular (Fig. 19).

Female genitalia (Figs 21–22). Valvifers VII subquadrate (Fig. 21) with posterior margin incised towards inner posterior angles, valvifers IX fused to single quadrate plate with posterior margin concave; laterotergite IX finger-like, reaching apex of abdomen, laterotergite VIII posteriorly encompassing laterotergite IX and segment X and medially fused. Ring sclerites absent. Spermatheca (Fig. 22) with proximal spermathecal duct longer than distal spermathecal duct, median dilation balloon-like; distal invagination of spermathecal duct (=spermathecal rod) narrow, cylindrical; intermediate part of spermatheca (=spermathecal pump) short, only single flange visible; apical receptacle large orbicular, without any finger-like processes.

Measurements (in mm). Males (n=5); median (minimum–maximum). Body length 11.16 (10.78–12.20); length

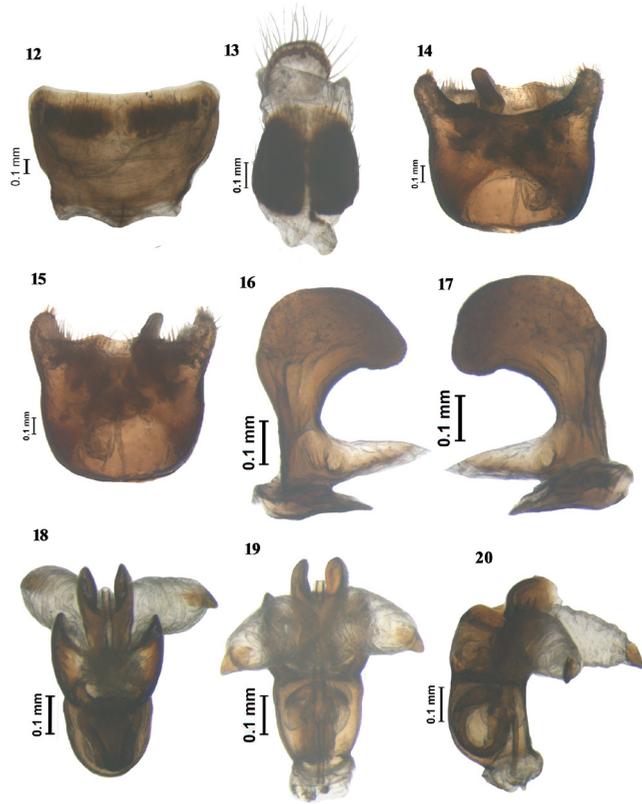
of head 1.73 (1.66–1.84), width across eyes 2.17 (2.14–2.24), interocular distance 1.37 (1.32–1.44), lengths of antennal segments (I) 0.36 (0.32–0.39): (II) 1.72 (1.56–1.89): (III) 0.81 (0.73–0.92): (IV) 1.47 (1.45–1.51): (V) 1.44 (1.25–1.62); lengths of labial segments (I) 1.52 (1.40–1.68): (II) 1.76 (1.65–1.85): (III) 0.84 (0.77–0.97): (IV) 0.43 (0.39–0.50); median length of pronotum 2.36 (2.27–2.61); humeral width 5.07 (4.75–5.57); length of scutellum 3.94 (3.72–4.32); basal width of scutellum 3.22 (3.22–3.59).

Females (n=5); median (minimum–maximum). Body length 12.81 (11.70–14.41); length of head 1.95 (1.81–2.11), width across eyes 2.39 (2.24–2.59), interocular distance 1.51 (1.43–1.70), lengths of antennal segments (I) 0.38 (0.37–0.39): (II) 1.98 (1.78–2.47): (III) 0.91 (0.81–0.98): (IV) 1.53 (1.42–1.68): (V) 1.50 (1.38–1.59); lengths of labial segments (I) 1.70 (1.41–1.87): (II) 1.96 (1.79–2.19): (III) 0.94 (0.82–1.04): (IV) 0.46 (0.43–0.53); median length of pronotum 2.78 (2.53–2.89); humeral width 5.90 (5.59–6.52); length of scutellum 4.71 (4.42–5.16); basal width of scutellum 3.70 (3.44–4.26).

Variability (Figs. 1–4). The specimens examined differ in the body measurements; variability also associated with shape of black spots on head, pronotum and scutellum apart from hemelytra. Disc of head sometimes with two additional longitudinal black marks at apex of each mandibular plates. The black spots borne by pronotal cicatrices sometimes enlarged and extended posteriorly covering most of the posterior pronotal disc dorsally, but well separated medially with red region. Black spots at basal angles of scutellum extending posteriorly and reaching to region where frena ends in a few specimens. Apart from the usual reddish hemelytra, sometimes whole of corium and adjacent posterior longitudinal half of embolium, black.

Bionomics. Freshly laid eggs (Fig. 10) are yellowish and after a day turns to orange brown (Fig. 11). Eggs are oval shaped, whole surface covered with numerous small spine-like projections. The operculum/lid is demarcated by a row of elongate and white hair-like structure at anterior region of egg (Fig. 11). Length of egg (1.16 mm) and width of egg (0.90 mm). Egg period was observed to be 10–11 days. Remaining stages unknown.

Distribution. Distribution within India is given by Salini and Viraktamath (2015). Attur, Bagalur, Chikkaballapur, Devanahalli, Hoskote, Kolar, Magadi, Savanadurga, Shimoga are the additional locations within Karnataka, from where the localized specimens are obtained for the present work.



Figs. 12-20. *Amyotea malabarica* (Fabricius)- male genitalia. 12, sternite VIII of male; 13, Proctiger (dorsal); 14, Genital capsule (dorsal); 15, Genital capsule (ventral); 16, Paramere (dorsolateral); 17, paramere (ventrolateral); 18, Phallus (dorsal); 19, Phallus (ventral); 20, phallus (lateral).



Figs. 21-20. *Amyotea malabarica* (Fabricius)-female genitalia. 21, Termina; 22, Spermatheca.

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