



## SOME DETAILS ON THE BIOLOGY OF LEAF BEETLE *SASTROIDES BESUCHETI* MEDVEDEV OCCURRING ON WILD NUTMEG

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### ABSTRACT

**This study provides some preliminary details on the biology of the leaf beetle *Sastroides besucheti* Medvedev (Coleoptera: Chrysomelidae: Galerucinae) occurring on wild nutmeg *Myristica malabarica* Lam. with damage symptoms. Banana (cv. Jnalipoovan) as a host observed now for the adults is also explained.**

**Key words:** Chrysomelidae, leaf beetle, new record, outbreak, *Sastroides besucheti*, wild nutmeg, *Myristica malabarica*, banana, *Myristica fragrans*, Idukki district, biology

Genus *Myristica* belonging to the primitive family Myristicaceae (Order: Magnoliales) is a pantropical tree group that includes 172 species (Plants of the World Online, 2021). Among the *Myristica* spp., *Myristica fragrans* Houtt and *M. malabarica* Lam. are commercially important; the former as an introduced crop exploited fully for its commercial products viz., nutmeg and mace (Thangaselvabai et al., 2011), *Myristica malabarica* is an economically important native tree spice endemic to Southern Western Ghats from Konkan southward (Jose and Chandrasekhara Pillai, 2016), and famous for its large yellow arils.

Commonly known as Malabar nutmeg, rampatri, Bombay mace or kaatuhjathi (Chelladurai and Ramalingam, 2017), *M. malabarica* is one of the characteristic species in *Myristica* swamps, and its fruits are extensively exploited for its aril locally (Jose and Chandrasekhara Pillai, 2016). It is a large perennial tree (15-25 m tall) found in evergreen forests up to 800 m in the swamp and lowland forest habitats in the Western Ghats (Chelladurai and Ramalingam, 2017), most frequently in evergreen and semi-evergreen forests (Nagaraju et al., 2013). This tree has large greyish black trunks, with flowering and fruiting season being from February through August (Chelladurai and Ramalingam, 2017). This tree is economically important for its wild nutmeg and mace, used for both medicinal and industrial purposes. It is also used as a hardy rootstock for grafting the commercial nutmeg i.e *M. fragrans* (Mathew and Joseph, 1982). It is traditionally used for its anti-

ulcer, sedatives hypnotics, antimicrobial, nematicidal and anti-inflammatory properties (Chelladurai and Ramalingam, 2017).

There are scant reports on pests of *M. malabarica*. But 19 species of insects are known to infest its congener *M. fragrans* in Asia and the Pacific (Reddy, 1977). Of these, nine insect species have been recorded as pests in India, most of which are bugs (Prathapan and Balan, 2016). Prathapan and Balan (2016) reported *Sastroides besucheti* Medvedev as a pest of *M. fragrans* from Idukki district of Kerala. It was observed that the eggs are laid in the soil and the larva is a soil dweller that feeds on the roots, as being common with members of Galerucinae. Not much work has been done on this sporadic pest of *Myristica* other than its description based on 15 specimens collected (on 4<sup>th</sup> November, 1972) at Periyar in Idukki District, India, by Medvedev (1999) and its record as a pest of *M. fragrans* (Prathapan and Balan, 2016).

The present study was carried out in the Idukki district to explore the outbreaks of gregarious beetles on wild nutmeg and banana, based on the information shared by the local Agriculture Department. The dearth of information on the pests of wild *Myristica* spp. along with the inclusion of wild nutmeg *M. malabarica* in the IUCN Red List (IUCN, 2000), and the occurrence of the adult beetle on banana, led to urgent surveys. The observations made during these surveys and the occurrence of *S. besucheti* are explained herein along with preliminary observations on its biology.

## MATERIALS AND METHODS

During June-July 2021, outbreaks of leaf beetles were observed infesting wild nutmeg and banana in Kamakshy (9.82°N, 77.0274°E) and on wild nutmeg in Chinnakanal (10.04°N, 77.18°E) Panchayats of Idukki District, Kerala. Repeated surveys were carried out and infested areas were scouted to evaluate the infestation, nature of damage, feeding preference, oviposition, eggs and other lifestages focused on *S. besucheti*. Observations on the habitus were made with a Canon EOS 700D camera with a 100 mm macrolens or with OPPO mobile camera with the macrolens option enabled.

Under laboratory conditions, its biology was observed. Fresh twigs of wild nutmeg from the field on which egg masses, grubs and adults found were collected. These were placed in large containers lined with thick layer of moist filter paper at the bottom to maintain humidity and freshness of the leaves. To ensure freshness, the cut end of twigs were wrapped with moist cotton. Adult beetles which were flying around the wild nutmeg branches were collected, using insect net, transferred into large containers lined with moist filter paper, tagged and brought to the Entomology laboratory, Banana Research Station, Kannara, Thrissur, Kerala. A portion of these specimens were preserved in 70% ethanol as voucher specimens.

Egg masses found under the leaves were kept along with the leaf portion in transparent, circular, insect breeding dishes with net on top (90x 40 mm) and lined with thick layer of moist filter paper to record the egg period. Only freshly laid egg masses, confirmed by the greenness of scrapped foliage from the areas near the oviposition sites, which were covered by female beetles were used. For rearing grubs and adults, transparent plastic containers of 25 x 23 and 40 x 22 cm size were used, respectively, which were again lined with moist filter paper. For the final instar grubs, soil was provided to facilitate pupation. To ensure supply of fresh leaves, wild nutmeg seedlings were procured and maintained. Different lifestages of the beetle collected were also reared in insect cages provided with wild nutmeg plants as food. The containers and cages were maintained at 25± 2°C and 70-80% RH. The various lifestages were observed in samples of ca. 20 adults, 10 egg masses, and 20 grubs and pupae each.

## RESULTS AND DISCUSSION

The leaf beetles collected from the field were identified as *Sastroides besucheti* Medvedev (Coleoptera:

Chrysomelidae: Galerucinae). Adult beetles measured 7-9 mm long, with pale yellow body and bluish black eyes. The antenna consisted of eleven antennomeres with apical ones slightly dark and elytra clothed with short, golden setae. Females were slightly larger than males (Fig. 1).

A total of 34 wild nutmeg trees (32 no. in a 15 acre farmers' plot and 2 no. in nearby 8 acres farmers' plot) of 30 years old were found affected by *S. besucheti* in Kamakshy Panchayat; whereas around 8 trees were affected in Chinnakanal Panchayat. These plots were mixed plantations of wild nutmeg, nutmeg, jackfruit, mango, garcinia, clove, cardamom, black pepper etc. along with some other large trees retained for shade. Large number of adult beetles were found to feed on wild nutmeg (*M. malabarica*) causing severe damage to foliage. They were found in groups of 7-18/ leaf and fed on both sides by scrapping the green matter, especially the abaxial side, leaving distinctive scars (Fig. 2). These scars initially gave a burning appearance to the foliage (Fig. 3), which later dried off and fell to the ground near the trees. Heavy feeding by the adults also lead to total drying up of young branches and trees appeared dried up (Fig. 4). During the initial surveys, with examination of the affected foliage, the presence of eggs and grubs were confirmed, but no pupae was observed. Adults when disturbed flew around the branches and after a few minutes settled down. Vegetation other than wild nutmeg in farmers' plantations were observed for feeding. Only on the leaves of banana (cv. Jnalipooan), few beetles (3-5) were found feeding. These plants were around 4 m away from the base of a very large wild nutmeg tree which harboured maximum number of beetles. These adults were observed scrapping banana leaves leaving white window pane patches (Fig. 5). These banana plants (12 no.) when searched for the presence of grubs did not yield any.

Large numbers of mating pairs of the beetle were often observed in the field (Fig. 6). Females sometimes resort to feeding while mating. Eggs are laid in masses on the abaxial surface near the midrib of leaves. In *M. malabarica*, these egg masses were covered with the green matter scrapped from the leaf as could be seen near the oviposition sites (Fig. 7). Egg masses consisted of 18-23 eggs. Eggs were oval, yellowish orange and measured 1 mm. Few females were seen laying eggs singly on banana leaves and covering it with excreta (Fig. 8).

First instar grubs were gregarious, 1-2 mm long, with yellowish body, serrated body margins and sparse hairs



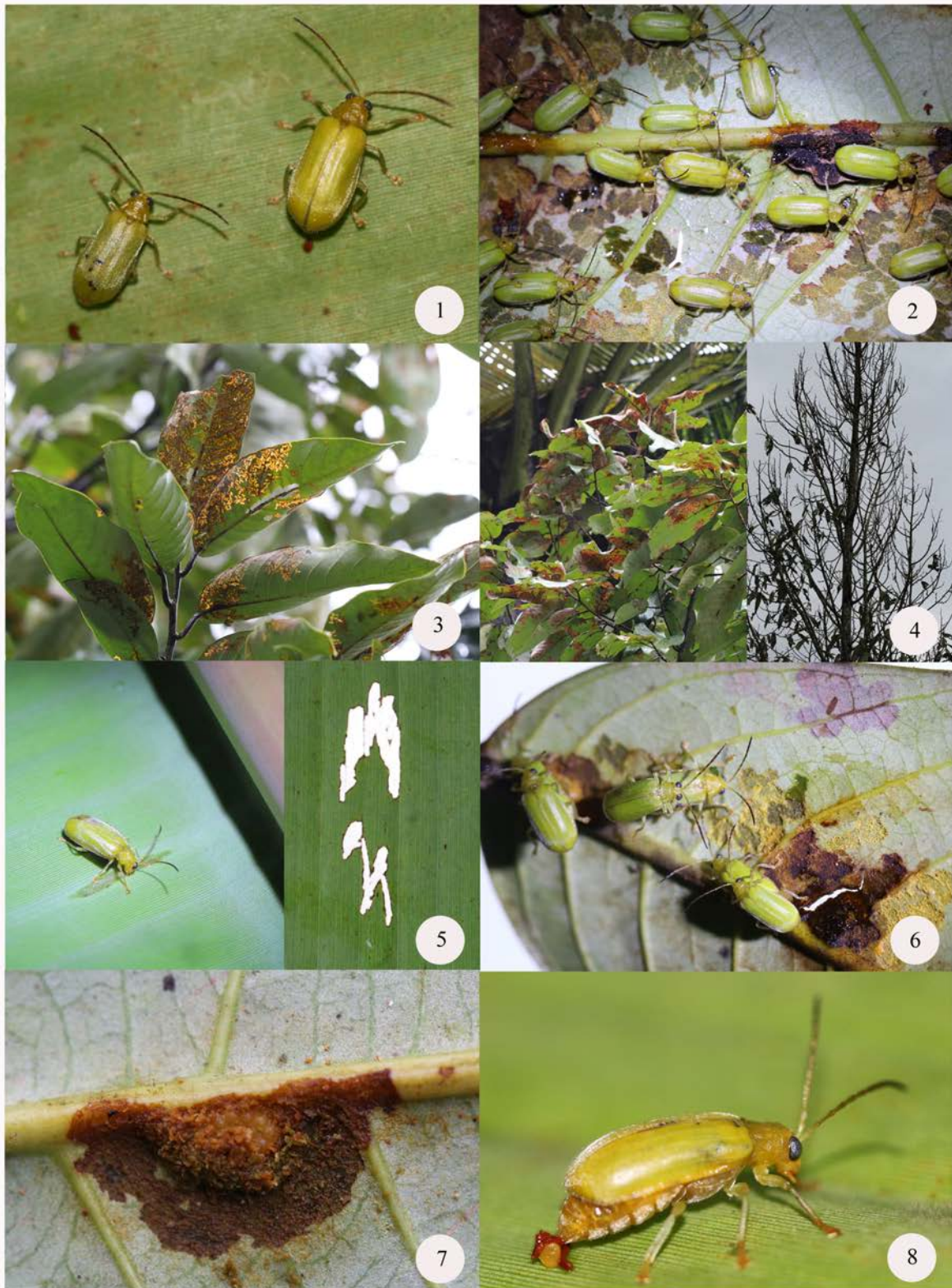


Fig. 1-8. *Sastroides besucheti*: 1. A pair of adults; 2. adults on wild nutmeg; 3-4. Damage symptoms on wild nutmeg; 5. on banana; 6. mating pairs; 7. eggs mass on abaxial side of leaf; 8. Egg laying in banana.



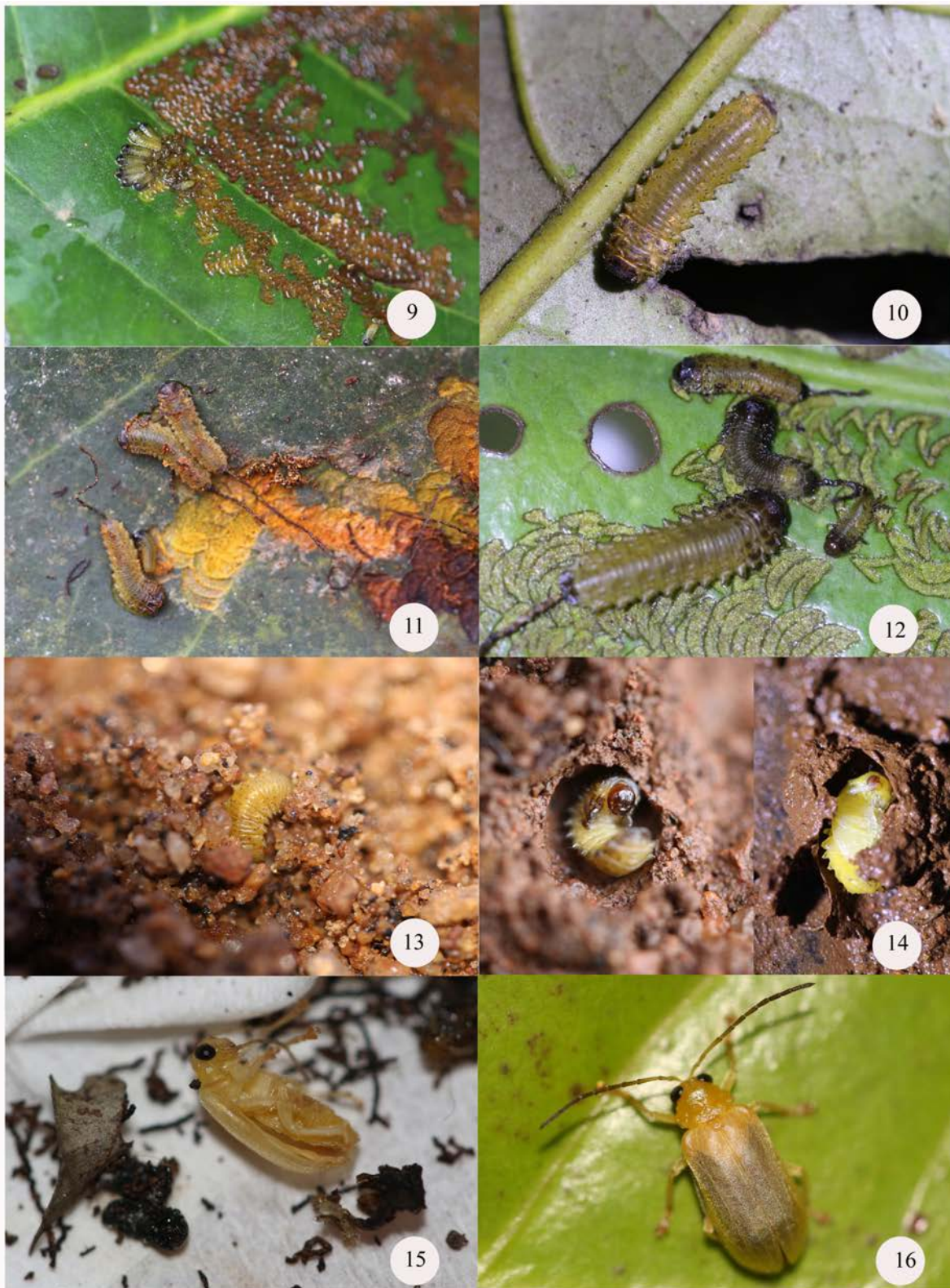


Fig. 9-16. *Sastroides besucheti* larvae, pupae, newly emerged adults: 9. First instar; 10. Final instar on wild nutmeg; 11. Excretal threads produced by grubs; 12. Characteristic zigzag feeding patterns; 13. Tunnelling in soil by the last instar; 14. Pupation chamber and pupae; 15. Adult emergence; 16. Newly emerged adult.

distributed all over (Fig. 9). The grubs feed voraciously and scrap the leaf surface. Final instar grubs are >1 cm long and are dark greenish yellow (Fig. 10). Grub stages have plump body with wrinkles and black head capsule. These grubs have only thoracic legs, with a sticky peg like structure in the last abdominal segment. The grubs produced copious amount of excreta while feeding, which were retained as long strings (Fig. 11); these are many times as long as the grub, perhaps as a defence mechanism. The feeding grubs made characteristic zigzag patterns on the leaves (Fig. 12). Presence of all lifestages (except pupae), including 1<sup>st</sup> and final instar grubs simultaneously points to the likelihood of overlapping generations. It was observed that ready to pupate final instar grubs migrated to the base of the trees. Also, some grubs were noticed to fall to the ground to reach the soil under the tree canopy for pupation. The grubs excavated 1-3 cm top soil under the host tree canopy in the field to enter pupal stage in an earth chamber or under a fallen leaf and turned into an exarate pupa. At the end of the pupal period, translucent yellow adults emerged out, which became active after sometime.

Life history of *S. besucheti* on wild nutmeg (*M. malabarica*) was observed with 20 adults, 10 egg masses, and 20 grubs and pupae each in the laboratory ( $25 \pm 2^\circ\text{C}$  and 70-80% RH). Some details observed are based on the reared individuals (Fig.13-16). Adult longevity lasts  $13.8 \pm 0.58$  (7-16) days; egg stage for  $6.8 \pm 0.23$  (6-9) days on moistened leaves; larval stage lasts for  $18.1 \pm 0.37$  (16-21) days and there were four instars; pupal stage lasted for  $7.6 \pm 0.4$  (6-11) days.

Association of beetles, especially chrysomelids with *Myristicaceae* is mostly known as assisting pollination referred to as cantharophily (Armstrong and Irvine, 1989; Bernhardt, 2000). There are very few records among Myristicaceae (e.g., genera *Viola* and *Knema*) as host plants of leaf beetles. *Sceloenopla lutena* Staines and *S. nigropicta* Staines (Cassidinae: Hispini) (Staines, 2011) and *Laselva triplehorni* Furth (Galerucinae: Alticini) (Furth, 2007) are known with *Viola koschnyi* as their host plant. *Notosacantha calligera* Spaeth (Cassidinae: Cassidini) is observed with *Knema* sp. as its host (Borowiec et al., 2013).

The genus *Sastroides* was described by Jacoby (1884) from Sumatra with *Sastroides bimaculata* Jacoby as its type species. Records of *Sastroides* from India and neighbouring countries include: *Sastroides nigriceps* Kimoto (North India), *Sastroides parvula* Jacoby (Myanmar)-Kimoto, 2004; *Sastroides dohertyi*

(Sri Lanka, Myanmar); *Sastroides rugicollis* Kimoto (Sri Lanka)-Kimoto, 2003; and *Sastroides besucheti* Medvedev (Kerala, India)-Medvedev, 1999.

*Sastroides besucheti* seems to prefer *Myristica* sp. (Myristicaceae) as food plant as evident from the present study. Earlier record only shows *M. fragrans* as its adult host. The present study documents *M. malabarica*, as its larval and adult food. This study also describes its outbreak after a gap of five years in the Idukki district with *M. malabarica* as its most preferred host for both grubs and adults. Banana (*Musa* spp.) as a probable alternate host at least in the adult stage has also been brought out. The biology evaluated under laboratory conditions confirm that eggs are laid on leaves, larval stages are spent on the foliage, and pupation takes place in soil. These results are significant, considering the economic importance of *M. malabarica* and its threatened status.

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