

Biological notes and rearing of *Lamprigera* sp.
(Coleoptera: Lampyridae) from West Sumatra

OHBA Nobuyoshi* and SIM Siang Huat**

西スマトラにおけるランプリゲラ属ホタルの1種 (甲虫目: ホタル科) の

生物学的知見と飼育

大場信義*・シム S.H.**

東南アジアから *Lamprigera* 属のホタルは16種知られている。これらのうち *L. boyei* と *L. dorsalis* の2種がスマトラから記録されている。しかしながら、これらのホタルの研究は僅かであり、特に雌成虫の実態が不明であった。我々は1995年3月に西スマトラ島のスカラミにおいて *Lamprigera* の1種の生態・発光行動・生息環境を観察するとともに、雄成虫および幼虫を採集し、室内で飼育をして、蛹・雌成虫の形態を明らかにした。このホタルの外部形態と習性は最も研究が進んでいる *L. tenebrosus* に似ていた。さらに羽化するまでの生育期間を推定した。本種のコミュニケーション・システムは複眼の幅と前胸背板の幅の比率および発光行動の特性から、アキマドボタル *Pyrocoelia rufa* に代表されるPRシステムであると推定された。また室内飼育から雄の幼虫は体長約4 cm以下、雌は4 cm以上であることが確認された。幼虫は採集してから7ヶ月も生存していることから、幼虫期は1年間以上にわたるものと推定された。

There are 16 species of *Lamprigera* firefly in South-east Asia. Two species of *Lamprigera* were recorded from Sumatra. One of them is *L. boyei* and the other is *L. dorsalis* (MCDERMOT, 1966). However, we could not ascertain the species. To date, very few biological studies of *Lamprigera* fireflies have been carried out. Therefore we are unable to identify the specimens from Sumatra. We visited Sukarami Research Institute for food crops at Padang, West Sumatra on 19th March 1995 to study *Lamprigera* sp. which is similar to *L. tenebrosus* in morphology and behavior. We observed the larvae and adult males in the field and reared the larvae in

laboratory. We described on the biological aspects, morphology and the rearing of *Lamprigera* sp. in the field and laboratory. Morphologically, the *Lamprigera* sp. in Sumatra are similar to those of Fraser's Hill, West Malaysia (generally species of fireflies are similar to those found in Fraser's Hill and the forest in Singapore).

Result

Natural habitat

Sukarami Research Institute at Padang, Sumatra is located about 900 m above sea-level and has a cool climate, with the morn-

* Yokosuka City Museum, Yokosuka, 238-0016 横須賀市自然・人文博物館。

** Singapore Zoological Gardens, NS, Singapore シンガポール動物園。

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Fig. 1 Habitat of *Lamprigera* sp. at Sukarami, West Sumatra.

ing temperature of 24°C (80% relative humidity). Although this area is mountainous, the Sukarami Research Institute carried out researches on food crops and paddy cultivation. There are some houses for the staff of the research institute and roads. The fireflies were inhabiting as a whole in this institute yard (Fig. 1), especially the periphery of the banana plantation. There was no other types of snail to be found in the Sukarami Research Institute except for slugs and African snails. Crickets were plentiful.

The terrain where the larvae of *Lamprigera* sp. were found are predominantly of low shrubs and grasses. The larvae were quite easily picked up from the ground at night when they emitted the strong yellowish-light situated at the eighth abdominal segment. The place where the larvae were discovered were at the gardens, road edge, periphery of banana plantation, bunds of the paddy field. We believe that African snails inhabit these places and can be the food of the larvae. The body length of the larvae collected vary from 4 cm to about 8 cm.

Behaviour of the adult

The adult male of the *Lamprigera* sp. was flying and giving out strong continuous light at night. The flight altitude was a few metres and as for flight speed was approximately 5 m/sec. Also, several individual males were emitting continuous light at the

back of the grassland on the road edge. The flight behaviour of the male is typical of male searching for female and this behaviour pattern resembled those of *Pyrocoelia miyako*, *P. attripennis* and *P. rufa* of Japanese species. We tried to collect the adult female, however we could not discover the female, because the habitat was densely covered with shrubs and the female is larviform and cannot fly. Therefore, it is a typical behaviour that the adult male needs to fly over a wide area in search of female. It is considered that the communication system of *Lamprigera* is the PR system similar to *P. rufa* from flight pattern and luminescence.

Morphology

Larva One specimen of the larvae is 59.5 mm in body length and 17.4 mm in width. The body form is flattened (Fig. 2). The Rratio

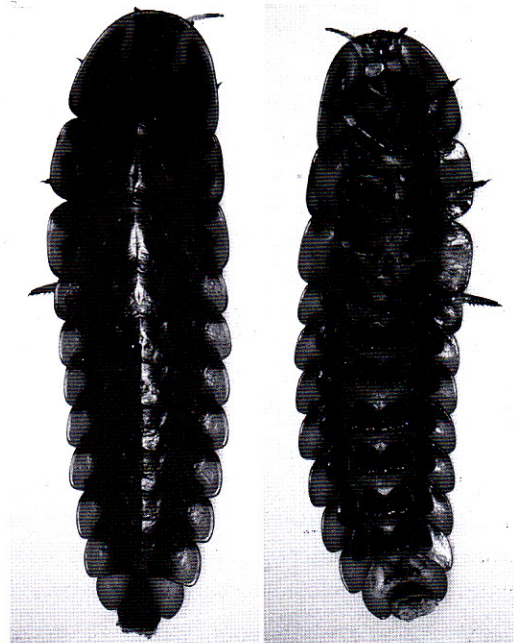


Fig. 2 Larva of *Lamprigera* sp.
Left : dorsal view
Right : ventral view.

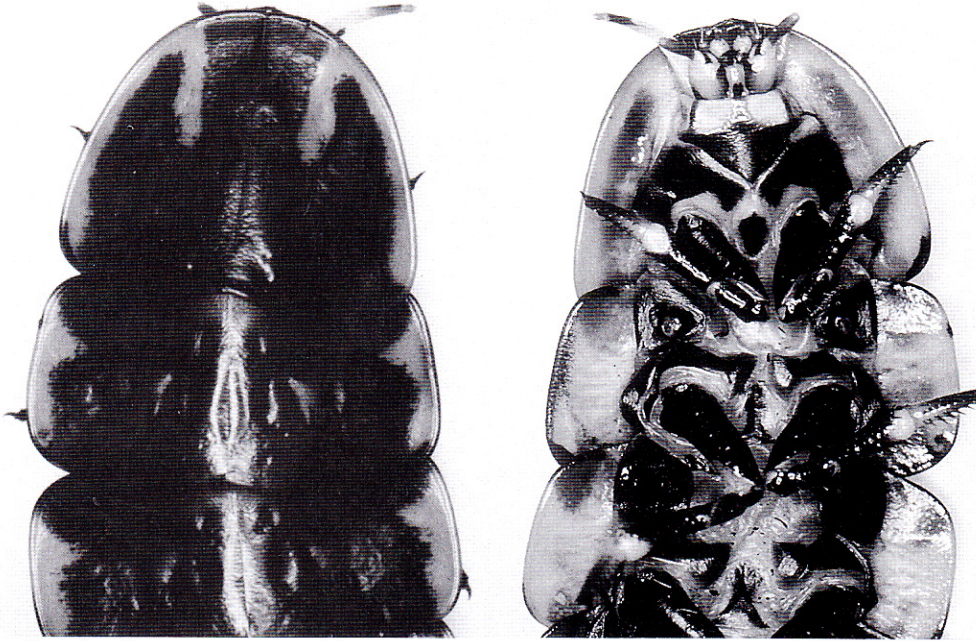


Fig. 3 Thoracic region of *Lamprigera* larva. Left: dorsal view, Right: dosal view.

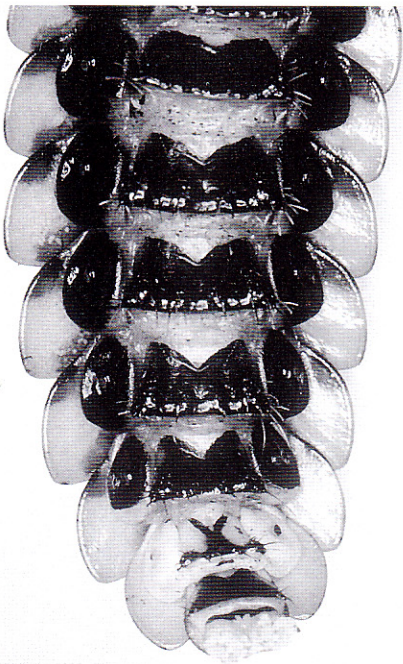


Fig. 4 Ventral view of abdomen of larva of *Lamprigera* sp.

of the width of the body to length is 0.3. The ratio of each hard dorsal plate to the pronotum are 1.0 : 1.18 : 1.23 : 1.13 : 1.13 : 1.09 : 1.06 : 1.01 : 0.94 : 0.81 : 0.58, respectively. The width of the 1st to 9th abdominal segment was gradually narrows. The margin of the dorsal plates are dusky. The pronotum is an half-ellipsoid. There is a pair of small dusky part in the front of the pronotum (Fig. 3). Each sternite and pleurte is black and hard hairs disposed on the sternite (Fig. 4). The head has small antennae with 3 short segments. Head is small, approximately 3.6 mm in width. (Figs. 3, 5) The eye is very small. The legs have 5 segments. A single claw is on the 5th segment of the leg. Length of claw is 0.61 mm, From 3rd to 5th segments of legs are 2.52, 3.22, 2.53 mm in length, respectively. There is a pair of yellowish-white luminous organs that are almost triangle on the pleurtes of 8th abdominal segment (Fig. 4). The pleurtes and luminous organs are yellowish-white. there is a spiracle on the each pleurte (Figs. 3, 4).

Adult male Body form of the male is flattened (Fig. 6), and about 9.8 mm in width and

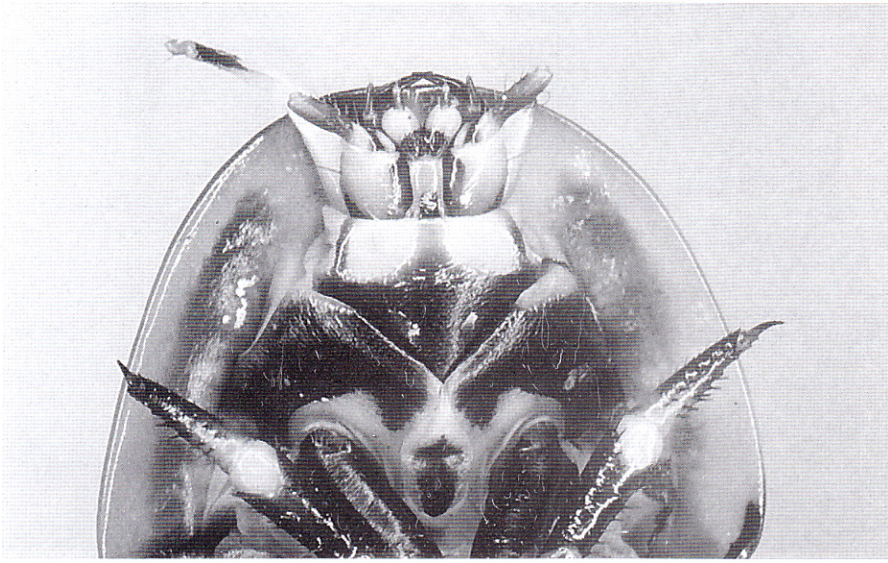


Fig. 5 Ventral view of head of larva of *Lamprigera* sp.

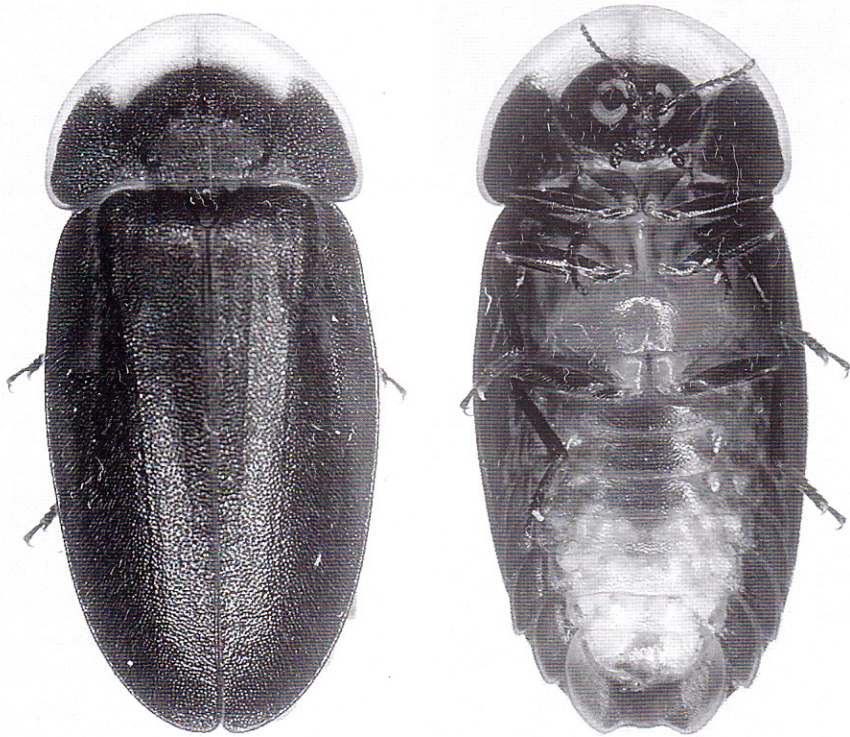


Fig. 6 Adult male of *Lamprigera*. left: dosal view, right: ventral view.

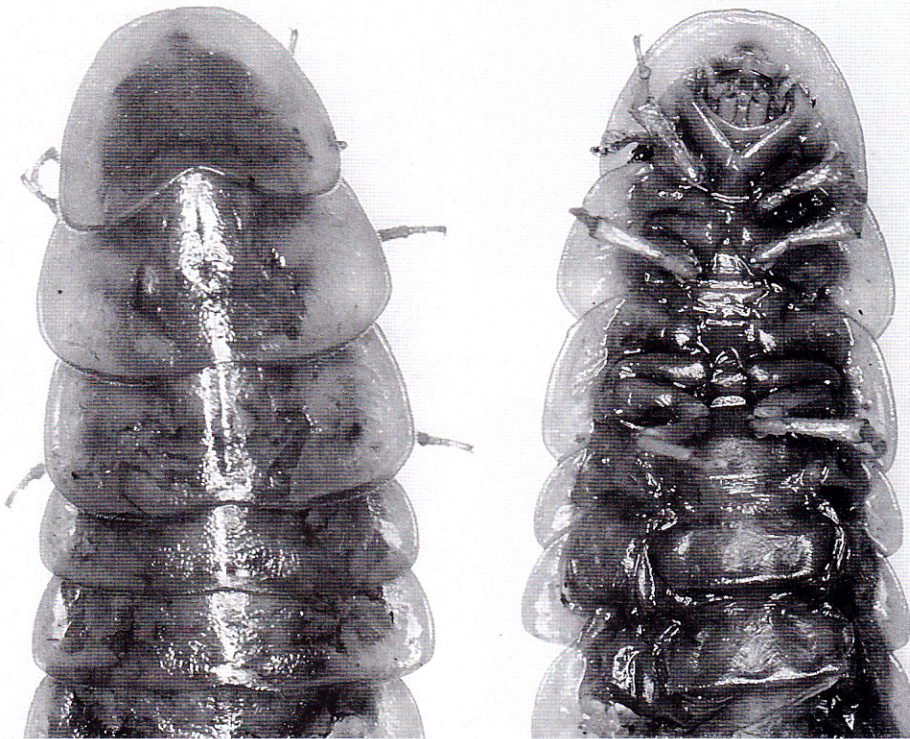


Fig. 7 Adult female of *Lamprigera* sp. left: dosal view, right: ventral view.

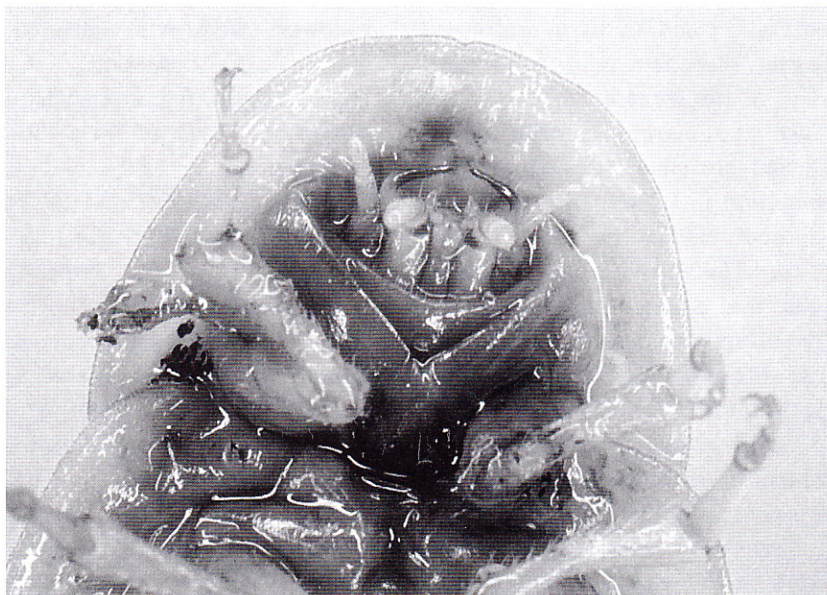


Fig. 8 The head of adult female *Lamprigera* sp.



Fig. 9 Pupa of male *Lamprigera* sp.

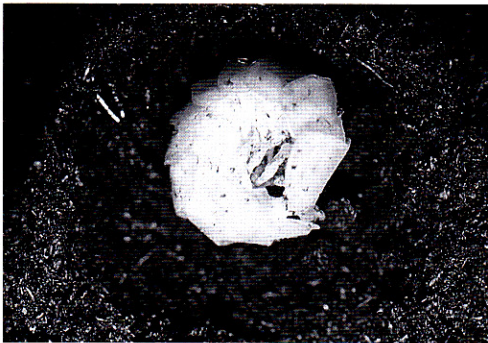


Fig.10 Pupa of female *Lamprigera* sp.

about 24 mm in length. Pronotum is half moon-shaped(Fig. 6) and 8.9 mm in width and 5.9 mm in length. There is a pair of transparent "windows" in the front of the pronotum (Fig. 6), also the margin is transparent. The elytra and scutellum are dark-brown. Width of scutellum is 1.3 mm. The compound eye is black and 2.0 mm in width. Head width is 4.1 mm. The ratios of the width of the compound eye against the width and length of pronotum are approximately 0.44 and 0.27. The ratio against the width of the body to length is 0.45. The width of the 1st to 7th abdominal segments gradually narrows. The ratio of each abdominal segment against the pronotum width are 0.88 : 0.78 : 0.75 : 0.71 : 0.66 : 0.60 : 0.44. Metasternum, coxa and claw are brown. Legs are dark brown. There is a pair of yellowish-white luminous organs that are triangle to oval-

shaped on the 7th abdominal segment (Fig. 6). Width of luminous organ is 1.18 mm. There are three small organs on the 6th abdominal segment that are similar to the luminous organ on the 7th abdominal segment. One of them is rectangular and on the centre of 6th abdominal segment. The 5th and 4th abdominal segments have also similar small organs to that of the 7th abdominal segment (Fig.6). However, we could not determine them as luminous organs. First to 3rd abdominal segments are dark-brown in the center. The antenna is 3.0 mm in length, 0.21 mm in width, 11 segments present. The segments of antenna from 4th to 10th are serrated. The 11th segment is oval. Length of each segment from 5th to 11th is 0.24, 0.17, 0.20, 0.18, 0.19, 0.19, 0.17 mm, respectively. Eyes, legs and elytra are blackish-brown, body brown. By comparing the size of the compound eyes and antennae to the size of the body we can conclude that this firefly is active after dusk.

Adult female Body is about 89 mm in length and 27 mm in width. Body is flattened without wing, larviform, body is soft and the colour is yellowish- white. The body is yellowish- white with white to a little gloss (Figs. 7, 8). Pronotum is half- ellipsed (F ig. 7). Width of pronotum is 9.06 mm. The ratios of the length of 1st to 8th tergite to the pronotum are 1 : 1 : 0.8 : 0.6 : 0.6 : 0.6 : 0.6 : 0.53 : 0.4 : 0.33 : 0.27 and the ratios of width are 1.0 : 1.13 : 1.25 : 1.35 : 1.35 : 1.35 : 1.31 : 1.25 : 1.18 : 1.0 : 0.83, respectively. Head is small, 3.5 mm in width and has small compound eyes, very short antenna with 5 segments. Mandible is curved and the tip is sharp (Fig. 8). The half of length of the mandible from the tip is brown. The ratio of the width of the head against the width of the protonum is 0.38; smaller than the compound eye of the male. Tarsus has 4 segments and claw is forked on the 4th segment(Figs. 7, 8). Length of each segment is 0.2, 0.19, 0.24, and 0.62 mm, respectively.

Egg We observed larvae metamorphosed into females through indoor rearing. Egg is about 3.4 mm in diameter and lemon-yellow in colour. The ratio of the diameter of the egg to the length of the female is 0.08. Dr NAKANO observed female laying eggs.

Rearing

The breeding of *Lamprigera* sp. was unsuccessful, but the following observations were made. *Lamprigera* larvae were kept in a room away from sunlight (30°C ambient temperature) and in air-conditioned room (22°C) in Singapore. Slugs were immediately preyed upon by the larvae. While feeding, the larvae emitted light. It used its lighted tail to flick at interloping larvae. In spite of that, two to three larvae may share the same slug. They also take to dead crickets. One of the larvae reflex bled when handled. The study was hopeful to establish the life-cycle of *Lamprigera* sp. Of the 23 larvae we obtained the sizes vary from 4 to 8 cm in length; a specimen obtained in Fraser's Hill was 9 cm in length. The larvae were fed with crushed water snails; *Pila scutata* and *Thiara* sp. once every 10 days (one snail per larva). The larvae were kept individually in plastic containers measuring 12 cm diameter with 10 cm depth with 6 cm thickness of moist peat moss provided and larvae were noticed to make a depression of 5 cm diameter and remained in C-shaped posture for moulting or undergoing pupation (they did not make subterranean chambers).

In the larval moult the larva became creamy-white and subsequently turned black by four hours. In the male pupa is different from the larva; having eyes and wing (Fig. 9).

The pupation stage of the male larva took 26 days and the pupa coloration changed from yellow to dark colour before becoming a beetle. One of the beetle was 24 mm in length. The male light organs are situated at the seventh abdominal segment in the form of two oval to triangle-shaped light organs.

Male did not emit light when stationary; only emits strong continuously light in flight.

The female pupation took ten days and it has twin-claws on each leg unlike the single claw in its larval stage (Fig. 10). Imago stage of the females remained as larviform but the coloration changed to creamy and later to creamy brown throughout its imago stage. Females became very sensitive to light and more sluggish than when as larvae. The larviform females emitted continuous light. Both male and female were observed to be non-feeding. Male beetle survived for 19 days and the larviform female survived for 18 days. Unfortunately the emergence of the adults did not coincide in time for mating and no egg was recovered.

Conclusion

Morphology and behaviour of *Lamprigera* sp. from Sumatra is described. Based on morphological study and field observation, communication system of this firefly is considered as PR system. It appears that larvae of 4 cm in length tend to become male beetles and the larger larvae are that of females. The larvae survived seven months after the collection. Our extrapolation is that *L.* sp. has a long larval stage, perhaps a year though this could not be proven.

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Reference cited

MCDERMOTT F.A. 1966. Lampyridae. Coleopterorum Catalogues, Paris 9, 149pp. Junk, Gravenhage.