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## **FRESHWATER PRAWNS (CRUSTACEA DECAPODA: NATANTIA) FROM SUBTERRANEAN WATERS OF THE GUNUNG SEWU AREA, CENTRAL JAVA, INDONESIA**

by

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Key words: Crustacea Decapoda; Natantia; *Macrobrachium*; description; Java.

*Macrobrachium poeti* spec. nov. is described from subterranean waters of the Gunung Sewu karst area, central Java, Indonesia. The species probably is closest related to *M. pilimanus* (De Man, 1879).

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The peculiar cone karst area of Gunung Sewu (= Goenoeng Sewoe, = Duizendgebergte, = Thousand mountains), near the south coast of Central Java, has always intrigued those who visited or studied the region. Franz Junghuhn, who travelled in the area in 1836, gave a glowing description of it in his monumental work "Java, zijne gedaante, zijn plantentooi en inwendige bouw" (1853, vol. 1, pp. 275, 343, pls. 1 and 11) and provided two charming coloured illustrations. Junghuhn gave most attention to the geology and flora of the area. Also in the numerous later publications dealing with the area, the geology was extensively discussed while relatively little attention was directed to the zoology.

The subterranean aquatic fauna of this karst region, as far as I can find, was first dealt with by Edward Jacobson, who visited several caves in the area in February-March 1911. In a popular article, Jacobson (1912 (15 March): 513–516) described his experiences in collecting animal life from subterranean waters in Gunung Sewu. He obtained among other things a species of fish, crabs and prawns. The cave crabs were later examined by Ihle (1912 (15 November): 177–182, pl. 9) and proved to represent two species. The first, of

which four specimens were collected, was *Parathelphusa convexa* De Man, 1879, a common epigeic species of Javanese fresh water. The second species proved to be new and was described by Ihle under the name *Sesarma jacobsoni*: at present it is known as *Sesarmoides jacobsoni* (Ihle, 1912). This second species, judging by its long and slender legs and pale colour, very likely is a true troglobiont. It has been mentioned several times in cave literature, but since 1912 no new material has been reported upon, be it that the "small white crabs" reported by Waltham et al. (1983: 90) from underground water of Gunung Sewu, could very well belong to this species. Jacobson took his crabs in two caves: both species occurred in Gua Jomblang (recorded by Jacobson and Ihle, respectively, as Goewa Djoemblang and Guwâ Djumblang) near the village of Bedojo in the subdistrict of the same name. *Sesarmoides jacobsoni* was furthermore obtained from Gua Ngingrong (= Guwâ Ningrong of Ihle's report) in the Mulo (= Mulâ) subdistrict.

As to prawns, Jacobson (1912: 513) reported the capture of "een grote garnalensoort" (a large species of prawn), without indicating the exact caves within the Gunung Sewu area where he obtained the material. At present this prawn material is in the Zoological Museum of Amsterdam. It consists of one lot of seven specimens (including five ovigerous females) of *Macrobrachium lar* (Fabricius, 1798) from a freshwater stream within the above-mentioned Gua Ngingrong in the Mulo subdistrict, and one lot of seven specimens of *Macrobrachium pilimanus* (De Man, 1879) from a stream in Gua Nggremeng (= Guwâ Gremeng). This *Macrobrachium* material has been reported upon by Holthuis (1950: 181 (*M. lar*) and 217 (*M. pilimanus*)). So far as I know, no other Decapod material from Gunung Sewu has been mentioned in the literature.

In 1982 the Gunung Sewu Cave Survey, a joint British-Indonesian undertaking sponsored by the British Royal Geographical Society and financed by the Overseas Development Administration of London and the Ministry of Public Works of the Government of Indonesia, explored and mapped the caves of the area. An extensive illustrated report on this survey was published by Waltham et al. (1983: 55–96, text-figs. 1–30, 3 pls.); the nomenclature and numbering of the caves adopted in Waltham's report is also used in the present paper. The Survey collected a few subterranean prawns, which proved to belong to an undescribed species, which now is treated below.

In their report Waltham et al. (1983: 90) mentioned that "some caves contained large white crayfish". As no crayfishes do exist in Java, it is most likely that the species observed is a large *Macrobrachium*, probably a species different from the one described here. It would be of great interest if material of this animal could be obtained for study.

In 1983 new prawn material was collected in the Gunung Sewu area by Mr. R. Willis, and like the 1982 material was placed at my disposal. These specimens proved to belong to the new species and are included in the present report.

Acknowledgements. — I want to express by gratitude to Mr. Philip Chapman, Museum and Art Gallery, Bristol, and Mr. Graham S. Proudlove, University of Manchester, for placing this material at my disposal and for providing me with very useful information about habitat, localities, etc. of the species and also about the expedition that obtained them.

The material is deposited in the collection of the Rijksmuseum van Natuurlijke Historie, Leiden (RMNH).

### **Macrobrachium poeti spec. nov.**

“*White shrimps*” — Waltham et al., 1983: 90.

Luwang Jurangjero (Gunung Sewu Luwang register no. 8, grid 668115; see Waltham et al., 1983: 93), ca. 100 m below the entrance, August 1983, leg. R. Willis. — ♂ holotype (from the main stream), 1 ♀ paratype (from a static canal), (RMNH Crust. D no. 35796).

Luwang Tong Pocot (Gunung Sewu Luwang register no. 51, grid 631101; see Waltham et al., 1983: 77, 93), percolation-fed pool with mud floor, 5 August 1982, leg. Andrew Eavis. — 1 ♀ paratype (RMNH Crust. D no. 35794).

Gua Sodong, east of kampong Baran, near Mudal (Gunung Sewu Luwang register no. 133, grid 762112; see Waltham et al., 1983: 81, 95), 23 August 1982, leg. Tim Atkinson. — 1 damaged ♀ paratype (RMNH Crust. D no. 35795).

Description. — The rostrum is rather short, it fails to reach the end of the scaphocerite, but overreaches the antennular peduncle. It is straight and has the dorsal margin rather evenly provided with teeth. There are 9 to 13 dorsal teeth, 4 or 5 of which are placed behind the orbit in the anterior 1/4 of the carapace; only in the smallest specimen (cl. 11 mm) there are only 2 of the dorsal teeth behind the orbit. The upper margin is almost straight or slightly convex. The lower margin is distinctly convex and bears a single tooth (in three of the four specimens; in the fourth, the ♀ from Gua Sodong, the rostrum is broken).

The antennal spine is sharp and slender, it continues posteriorly as a ridge; it is placed slightly below the lower orbital angle. The hepatic spine lies distinctly behind and below the antennal spine. The two spines are not placed in a single line. The carapace is smooth, also in the anterolateral region of the largest, male, specimen. In the middle the carapace is somewhat swollen and the posterior margin is sharply delimited.

The abdomen is smooth. The pleura of the first four somites are broadly

rounded, that of the fifth is triangular with a rounded top. The sixth somite is 1.5 times as long as the fifth. The posterolateral angle of the sixth somite is broadly triangular and sharply pointed; the process overlapping the lateral basal part of the telson is also triangular and sharply pointed, but with a small, blunt lobe on the lower margin.

The telson is 1.5 times as long as the 6th somite. The two pairs of dorsal spines are placed, respectively, slightly behind the middle and at about  $3/4$  of the length of the telson. The tip of the telson is either sharply pointed and triangular (in juveniles), or more bluntly produced (in larger specimens); it is overreached by the inner pair of posterior spines, the outer pair is about half or less than half as long as the inner. Numerous hairs are implanted on the posterior margin.

The eyes are small and reach only slightly beyond the middle of the basal segment of the antennular peduncle. They have a reduced cornea, which is distinctly shorter and narrower than the eyestalk. In the preserved specimens the colour of the cornea is pale bluish grey. A distinct small ocellus is present.

The basal segment of the antennular peduncle has the stylocerite sharply pointed, reaching to about the middle of the segment; the anterolateral tooth is very strong and reaches far beyond the rounded anterior margin of the segment.

The scaphocerite reaches somewhat beyond the rostrum. It is 2.5 times as long as wide. The outer margin is almost straight and ends in a strong tooth, which fails to reach the end of the lamella.

The third maxilliped is slender and reaches with the last segment beyond the antennal peduncle. The last segment is about  $3/4$  as long as the penultimate and slightly more than half as long as the antepenultimate.

The first leg is very slender and reaches with the chela (in the small specimens) or with up to  $1/3$  of the carpus (in the larger) beyond the scaphocerite. The fingers are about as long as the palm and very slender. The carpus is about 1.7 times as long as the chela and distinctly longer than the merus.

Of the 4 specimens, the largest and the smallest have only a single second pereiopod. In the two other specimens both second pereiopods are present; here they are perfectly similar in shape and size, and resemble the second pereiopods of the other specimens. The possibility remains, however, that in still larger specimens the second legs will prove to be asymmetrical. In all specimens the second pereiopod reaches with the chela beyond the scaphocerite. In the largest specimen the fingers are  $4/3$  as long as the palm, their tips are sharp and are crossing. The cutting edge shows in its proximal part several small teeth of equal size. It seems quite possible that our largest specimen is not quite fullgrown and that in fully adult males the entire edge may be denti-

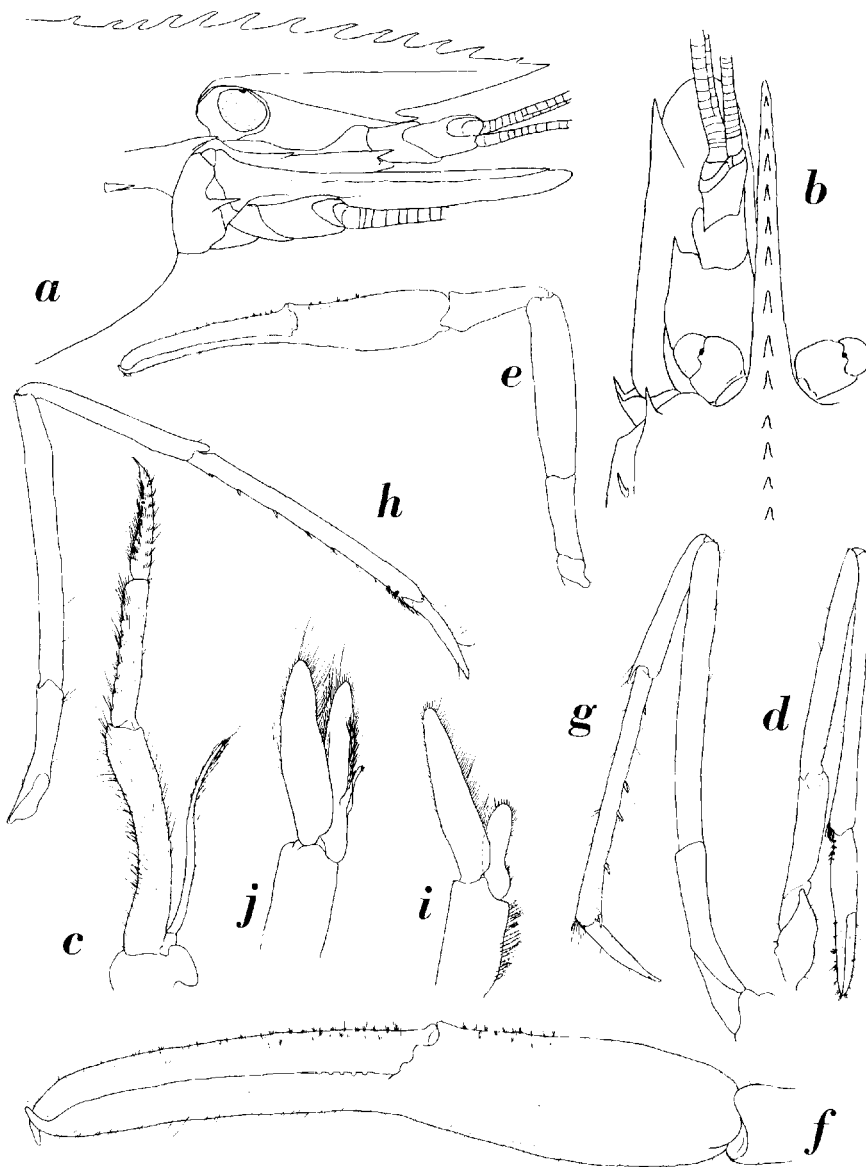


Fig. 1. *Macrobrachium poeti* new species, male holotype. a, anterior part of body, in lateral view; b, anterior part of carapace, eyes, antennula, and antenna, in dorsal view; c, third maxilliped; d, first pereiopod; e, second pereiopod; f, chela of second pereiopod; g, fourth pereiopod; h, fifth pereiopod; i, first pleopod; j, second pleopod. a-d, f-j,  $\times 6$ ; e,  $\times 3$ .

culated. The palm is smooth and shining and shows no spinules; it is slightly swollen and some tufts of short, soft hairs are visible in the upper part of palm and fingers, but there is no dense pubescence at all. A few simple hairs are scattered over palm and fingers. Like the chela, the other segments of the cheliped are smooth and shining, without any spinules. The carpus measures about  $1/3$  of the length of the chela; it widens distally, but remains there narrower than the palm. The merus is about half as long as the chela and longer than the ischium. There is no pubescence, apart from a few scattered, simple hairs, on any of the segments.

The following legs are very slender and reach with the dactylus, or part of it, beyond the scaphocerite. The propodus of the third leg is three times as long as the dactylus and bears several spinules on the posterior margin. The carpus measures about  $3/5$  of the length of the propodus. The merus is distinctly longer than the propodus and about twice as long as the ischium. The fourth leg resembles the third. The fifth leg shows some transverse rows of short hairs in the distal part of the lower margin of the propodus. The carpus is relatively longer than in the previous leg, measuring  $2/3$  of the length of the propodus. Otherwise the fifth leg is very similar to the fourth.

The first pleopod of the male has the endopod oval with the inner margin concave, the outer convex. The second pleopod has the appendix masculina slender and about twice as long as the appendix interna; it is provided with numerous rather short and stiff hairs. The uropods are of the usual shape.

Size. — The largest male from Luwang Jurangjero has a carapace length (including the rostrum) of 21 mm. Two of the non-ovigerous females have the carapace 11 and 16 mm long. In the damaged female from Gua Sodong the rostrum is broken; its carapace length (exclusive of the rostrum) is 7 mm. No ovigerous females are present.

Colour. — Waltham et al. (1983: 90) mentioned the present species as "white shrimps" that were commonly seen during the Gunung Sewu Cave Survey. The preserved specimens are of the normal pale opaque colour and have the cornea of the eyes pale bluish grey.

Affinities. — The species probably is closest to *Macrobrachium pilimanus* (De Man, 1879), a species frequently encountered in epigeal fresh water of Java, Sumatra, Borneo and the Malay Peninsula. *M. poeti* differs from *M. pilimanus* in the higher rostrum with only a single ventral tooth, in the carapace and second legs showing no spinules, not even in large males, in the reduction of the eyes and their corneae, in the more slender legs, and in the chela of the second legs not showing a dense pubescence. The carpus of the second leg is even more slender and narrow than in *M. pilimanus leptodactylus* (De Man).

*Macrobrachium pilimanus*, although best known as an epigeal species, has

several times been reported from subterranean waters. Re-examination of the specimens collected in Gua Ngremeng, Gunung Sewu (mentioned in the introduction of the present paper), reported upon by Holthuis (1950: 217), showed these to be typical *M. pilimanus* with robust pubescent chelipeds and well developed eyes. Also the specimens from stalactitic caves near Panumbangan, W. Java (November 1915, leg. S. Leefmans) and from Bua Cave near Sidjungjung, W. Sumatra (March 1914, leg. E. Jacobson), reported upon by Holthuis (1950: 215), proved to be true *M. pilimanus*.

Habitat. — In their account of the caves of Gunung Sewu, Waltham et al. (1983) gave a register of all the caves with a number and grid reference for each; some are more extensively treated in the text and often provided with a map. The caves in which *Macrobrachium poeti* were found are the following:

Luwang Jurangjero, 8°S 111°E (Waltham et al., no. 8, grid ref. 668115), depth ca. 100 m below the entrance. This "is a shaft system located at the end of an impressive and overgrown dry valley which takes substantial water in the wet season. A series of pitches drop steeply down to a large (8 × 4 m at the least) passage with a sizeable population of bats. This passage closes down rapidly into a static canal with a wet season flood level 1 m above the existing water level. Beyond this, and over a gravel sill, is the Kali Bribin stream, about 1.4 cubic metres. Bats roost in the main stream way. The water in the canal is fairly organic from flood debris. The shrimps came from the canal (small one [= ♀ paratype]) and the main stream (others [= holotype])" (Mr. R. Willis in litt.).

Luwang Tong Pocot (Waltham et al., no. 51, grid ref. 631101). "Length 900 m. Depth 142 m. The roomy entrance shaft soon narrows into a fossil rift, so that the only way on is in a small youthful overflow passage. This has a succession of nine short drops, interspersed with an interesting swim and a pair of thought-provoking squeezes, before opening out into a horizontal gallery. This contains a series of long pools, and has plenty of length though unfortunately a general shortage of standing height. A pair of waterfalls provide interest near to the halfway point to the terminal sump." (Waltham et al., 1983: 77, 93, fig. 25). The shrimps were found in a percolation-fed pool with a mud floor.

Gua Sodong near Mudal (Waltham et al., no. 133, grid ref. 762112). "Length 4290 m. Depth 46 m. A fine dendritic stream cave system with three major branches, Sodong is the longest known cave in Sewu. Its entrance is normally crowded with villagers who use the water from an inlet just inside. The main flow leaves the passage and is thought to go via Luwang Sapen to the Northern Tributary. Heavily polluted overflow fills pools in the passage beyond, and these constitute a very serious health hazard. Once the pools are

traversed the cave becomes progressively more pleasant, as a high tunnel provides easy walking broken by two short handline pitches and long canals, with one area of decorated chambers. The Main Stream Passage is mostly a high canyon, with a sizeable stream along its whole length of nearly two kilometres. The water emerges from the top sump, flows through a succession of pools, small cascades and waist-deep canals, and eventually feeds into the terminal sump from where it has been dye traced to the Pracimantoro spring two kilometres away and on almost the same level" (Waltham et al., 1983: 81, 95, fig. 29, pl. 2 fig. 4, pl. 3 fig. 7).

The caves mentioned in the introduction of the present paper were listed and/or described and figured by Waltham et al. as follows: Gua Jomblang (no. 169, on p. 95, see also fig. 30), Gua Ngingrong (no. 170, on pp. 63, 95, fig. 9), Gua Nggremeng (no. 243, on p. 96, see also fig. 30).

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