

STONEFLIES (Plecoptera) FROM THE RYUKYU ISLANDS IN THE BISHOP MUSEUM, HONOLULU

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Abstract: The new plecopterans *Neopeltoperla ishigakiensis*, *Amphinemura okinawaensis*, *Rhopalopsale longicerca* and *Gibosia linguambita* are described from the Ryukyu Islands.

Through the kindness of Prof. Dr J. Illies, I was afforded the opportunity to examine material from the Ryukyu Is. in the collections of the Bishop Museum, Hawaii. The material consists of 13 species in 7 genera belonging to Peltoperlidae, Nemouridae, Leuctridae and Perlidae. Some of the species appear to be new. The material was collected by C. M. Yoshimoto and J. C. Harrell of the Bishop Museum during the Scientific Cooperation Program of the United States and Japan². Some of the species are widely distributed elsewhere in Japan.

Hitherto, the only reports in the stonefly fauna of the Ryukyu Is. are those of Uéno (1938) and Kawai (1964). The species found are listed below. In the majority of cases this is the first record of occurrence of these species in the Ryukyu Is. All type material is deposited in Bishop Museum, Hawaii.

I wish to express my sincere thanks to Prof. Dr Joachim Illies, of the Limnologische Flußstation des Max-Planck Instituts für Limnologie for his kindness in placing this interesting material at my disposal. It is a pleasure to acknowledge Dr W. D. Williams, for his kind help in reading and correcting my manuscript.

PELTOPERLIDAE

Neopeltoperla ishigakiensis Kawai, new species Fig. 1 A-E.

♂. Small hairy brown stonefly. Distal segments of abdomen much darker. Head brown with a large chocolate brown marking on dorsum. Pronotum brown, both lateral margins chocolate brown. Abdomen brown with a chocolate brown band on frontal margin of each segment. Cerci pale brown, first segment darker than remaining ones.

Head rounded, bent a little downwards and a little retracted under front of prothorax, nearly as wide as pronotum. Compound eye very large, black and hairy, situated on dorsolateral side of head and projected laterally. With 2 ocelli distinct, large, brownish orange, distance between them about 2× as far as between ocellus and inner margin of compound eye. Antenna broken off, but at least nearly as long as body length.

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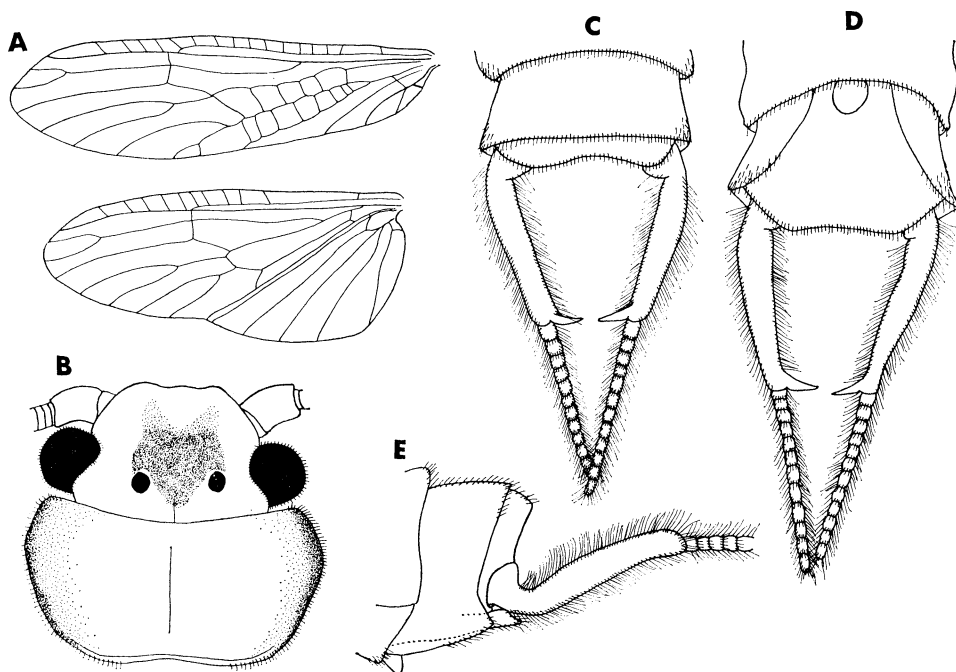


Fig. 1. *Neopeltoperla ishigakiensis* n. sp: A, wings; B, head and prothorax-- C, ♂ terminal segments of abdomen, dorsal; D, the same, ventral; E, the same, lateral view.

Pronotum nearly quadrate with rounded corners, wider than long, nearly $2\times$ as wide as long; frontal margin wider than hind margin; with many minute chocolate brown hairs on pronotal margins. Wings subhyaline, veins brown. Venation not different from those of Banks' description (1940) and Hitchcock's figures (1964) of the genus. Legs slender, brown, covered with distinct chocolate brown hairs and without markings; each femur somewhat flattened; each tibia long and slender; 1st and 2nd tarsal segments nearly equal and very short, 3rd the longest, $2.5\times$ as long as I+II.

Abdomen short, somewhat tapering posteriorly and depressed. Abdominal segments without peculiar structures through tergites I—IX inclusive; each segment covered with brown hairs. Last tergite with rounded hind margin which is a little concave at middle. Ninth sternite produced into a large subgenital plate with rounded hind margin and with a small button-like hairy ventral lobe on frontal margin. Cerci of ♂ short, 2.8 mm, composed of 13 joints, covered with fine white hairs; 1st segment the longest, nearly as long as remaining ones, with a sharp spur on inside of distal end and without a row of setae inside; remaining ones normal.

Body length 7 mm; length of fore wing 10 mm, and of hind wing 9 mm.

♀. Unknown.

Holotype. ♂ (BISHOP 7630), Karayama, Ishigaki I., 13. III. 1964, Yoshimoto & Harrell.

Remarks: This new species closely resembles *Neopeltoperla chiangi* (Banks), but differs in the shape of a spur on the 1st cercal segment. The spur of *N. chiangi* bears several

teeth on its tip but such teeth are not present in the present species.

NEMOURIDAE

Amphinemura longispina Okamoto

SPECIMENS EXAMINED: ♂, Yona, Okinawa I., 24-25.III.1964, Yoshimoto & Harrell; 1 ♂, Mt Omoto-dake, Ishigaki I. 16.III.1964, Yoshimoto & Harrell; 1 ♂, Ushiku-Mori, 425 m, Iriomote I., 9.III.1964, Harrell.

Amphinemura okinawaensis Kawai, new species Fig. 2 A-D.

♂. Small brown stonefly without markings. Head rounded, wider than prothorax, antennae long and slender, brown but with distal segments dark brown; with 3 distinct ocelli, anterior smaller than posterior two; without markings and spots on head. Pronotum quadrate, nearly as long as wide, all angles not rounded, dorsum somewhat arched and a little rugose, both lateral margins straight. A pair of vestiges of gill filaments present on ventral side of prothorax near frontal margin. Legs long and slender, pale brown and covered with fine brown hairs, 3rd tarsal segment darker than other segments. Wings hyaline, veins yellowish brown without smoked area; venation typical for genus.

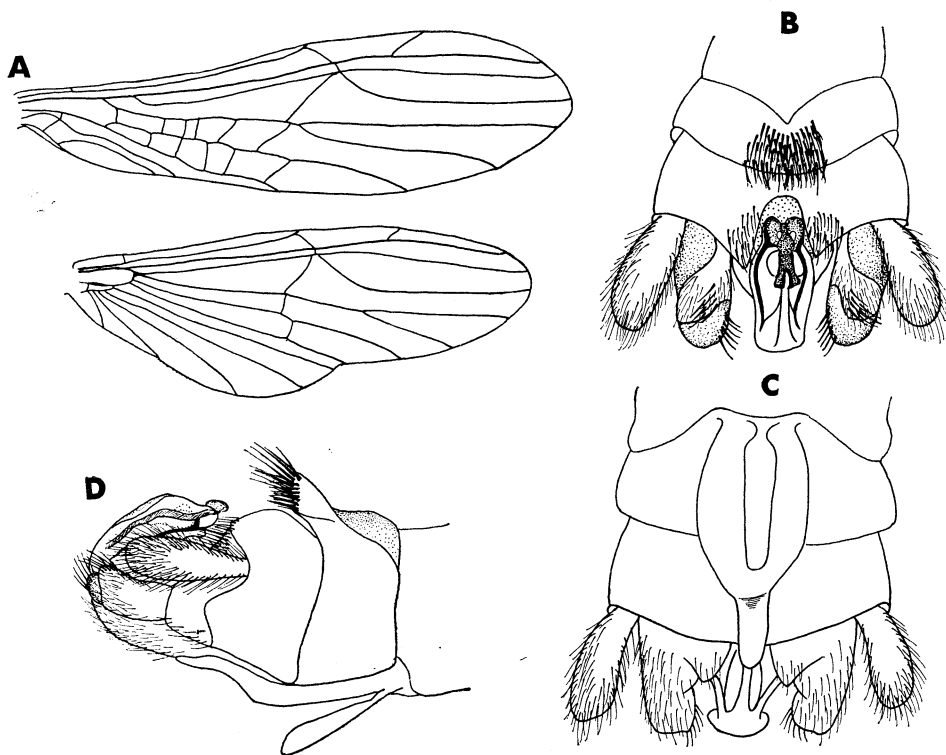


Fig. 2. *Amphinemura okinawaensis* n. sp.: A, wings; B, ♂ terminal segments of abdomen, dorsal; C, the same, ventral; D, the same, lateral view.

Abdomen cylindrical, 1st to 7th segments membraneous, the remaining heavily sclerotized. Eighth tergite produced upwards and a little backwards into a broad knob at apex, with a group of bristles at middle of hind margin. Hind margin of 9th tergite broadly cleft and with a group of bristles on both sides of the cleft. Subanal lobe divided into 2 lobes, of which inner lobe broad and small with blunt tip and outer one heavily modified, produced backwards and a little upwards, dorsal 1/2 sclerotized and lower 1/2 membraneous which is a little longer than dorsal 1/2; 2 rows of 7 bristles present on dorsal 1/2 and a row of 6 bristles present on lower 1/2. Cerci blunt and hairy. Supra-anal process large and long, bipartite, heavily sclerotized, recurved on 9th tergite. Subgenital plate longer than wide, extending backwards and a little recurved upwards; ventral lobe longer than 1/2 of subgenital plate, extending a little beyond hind margin of 9th sternite, and elongate spatula-shaped.

Body length 5 mm; length of fore wing 6 mm, and of hind wing 5 mm.

♀. Unknown.

Holotype ♂ (BISHOP 7631) Yona, Okinawa I., 24-25.III.1964, Yoshimoto & Harrell.

Remarks: This species is closely related to the Chinese species, *Amphinemura licenti* (Wu), but differs in its shape of the supra-anal process and by having a group of bristles on the hind margin of the 9th tergite.

***Amphinemura flavostigma* Okamoto**

SPECIMEN EXAMINED: 1 ♂, Karayama, Ishigaki I., 14.III.1964, Yoshimoto & Harrell.

***Amphinemura* sp.**

SPECIMEN EXAMINED: 1 ♀, Yona, Okinawa I., 24-25.III.1964, Yoshimoto & Harrell.

***Nemoura* sp.**

SPECIMEN EXAMINED: 1 ♀, Shirahama, Ushiku-Mori, Iriomote I., 9.III.1964, Harrell.

LEUCTRIDAE

***Rhopalopsole subnigra* Okamoto**

SPECIMENS EXAMINED: 2 ♂♂, Yona, Okinawa I., 24-25.III.1964, Yoshimoto & Harrell.

***Rhopalopsole amamiensis* Kawai**

SPECIMEN EXAMINED: 1 ♀, Yona, Okinawa I., 24-25.III.1964, Yoshimoto & Harrell.

***Rhopalopsole longicerca* Kawai, new species** Fig. 3 A-E.

♂. Small brown stonefly. Head wider than prothorax, slightly dark brown without spots and markings; with 3 ocelli, anterior one smaller than posterior two, distance between posterior ocelli 3× distance between these and inner margin of compound eye; epicranial suture indistinct; dorsal callosities rounded and situated in front of posterior ocelli.

Pronotum brown, subquadrate, wider than long at frontal margin and nearly as long as wide at hind margin; anterior corner rounded, posterior corner not rounded and with many irregular chocolate brown spots on dorsum. Prosternal structure not different from that of genus. Prothoracic presternum completely separated from basisternum. Prothoracic basisternum Y-shaped. Prothoracic furcasternum small, oblong and completely fused with end of basisternum. Wings

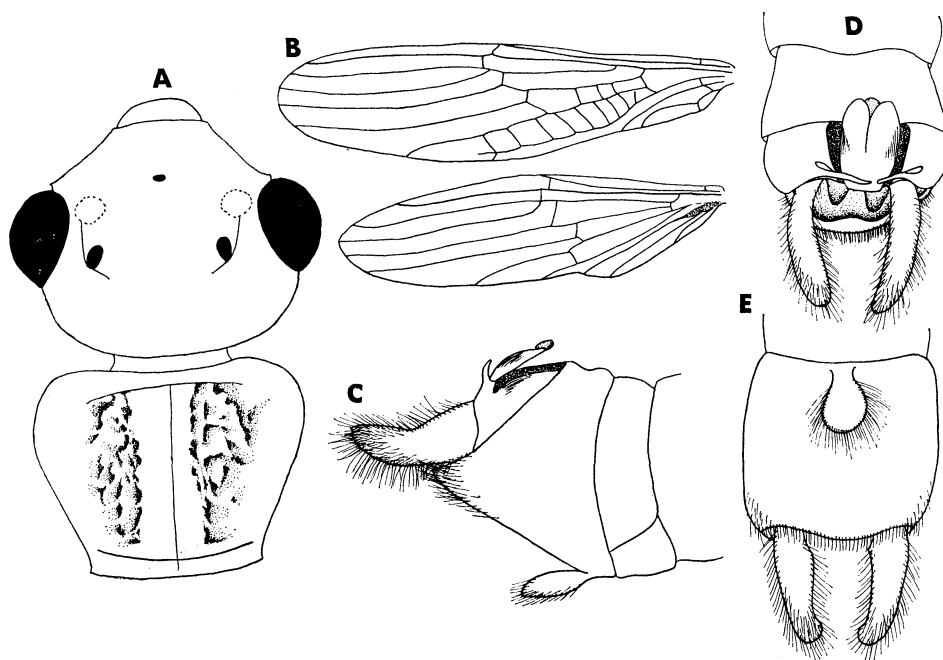


Fig. 3. *Rhopalopssole longicerca* n. sp.: A, head and prothorax; B, wings; C, ♂ terminal segments of abdomen, lateral; D, the same, dorsal; E, the same, ventral view.

subhyaline, veins brown, rolled around the abdomen at rest. Venation typical to genus; cross vein *m-cu* of hind wing joins upper branch of Cu_1 near base and situated on inner part of situation of cross-vein *r-m*. Legs long and slender, brown, covered with fine hairs; tibia and tarsal joints of each leg darker.

Abdomen cylindrical, membranous, but last 2 segments heavily sclerotized. Dorsal side of 9th tergite without peculiar structure, but ventral side forming a very large subgenital plate produced backwards and obliquely upwards covering 10th segment; a small rounded hairy ventral lobe situated on anterior margin of subgenital plate. Tenth tergite small and lying on posterior projection of 9th sternite. Middle of 10th tergite strongly sclerotized, dark brown; both lateral sides of 10th tergite produced into a slender chitinous process directed inwards and a little recurved upwards, pointed at tip. Subanal lobe membranous, projected posteriorly, a little beyond tip of abdomen. Supraanal process small, heavily sclerotized, dark brown, flattened, recurved upwards. Cerci 1-segmented, not modified, comparatively large, directed backwards and a little obliquely upwards at distal 1/2, covered with white fine hairs.

Body length 5 mm; length of fore wing 8.5 mm and of hind wing 4.5 mm.

♀. Unknown.

Holotype ♂ (BISHOP 7632), Karayama, Ishigaki I., 14.III.1964, Yoshimoto & Harrell.

Remarks: This new species closely resembles *Rhopalopssole dentata* Klapálek but is easily distinguishable from the latter by the shape of the subgenital plate and the size of the process on the 10th tergite.

Rhopalopsole sp.

SPECIMEN EXAMINED: 1, Yona, Okinawa I., 24-25.III.1964, Yoshimoto & Harrell.

It could not be identified to species or sex, because the abdominal segments are broken off.

PERLIDAE

Kiotina riukiensis Uéno Fig. 4 A-C.

SPECIMENS EXAMINED: 2 ♂♂, 1 ♀, Yona, Okinawa I., 24-25.III.1964, Yoshimoto & Harrell.

The original description of this species was based on a single ♀ and a nymph by Uéno (1938) from Bennoki of Okinawa Island. No description of the ♂ has been given until now. The species is known to be distributed in the Ryukyu Is. and Yakushima I. which lies S of Kyushu.

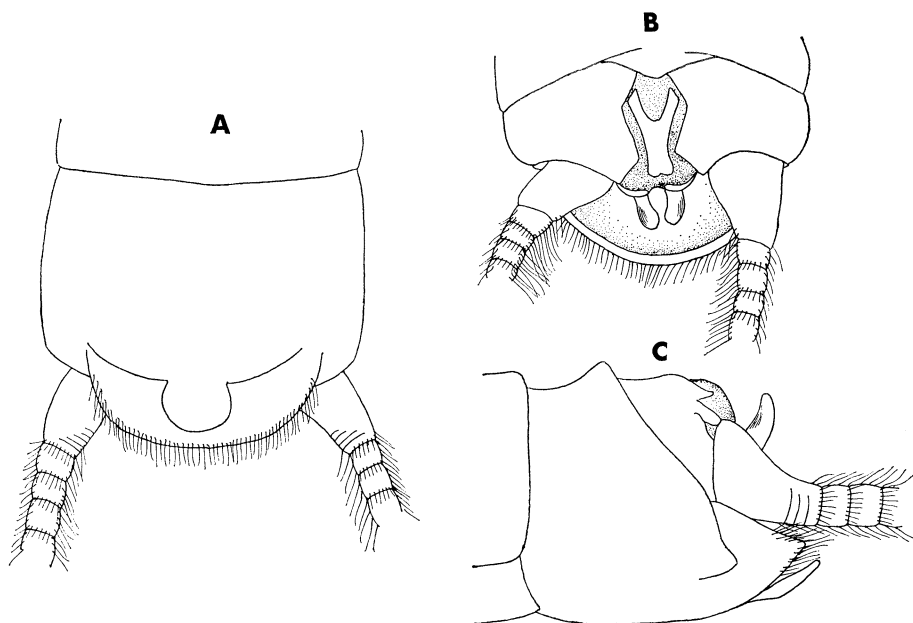


Fig. 4. *Kiotina riukiensis* Uéno: A, ♂ terminal segments of abdomen, ventral; B, the same, dorsal; C, the same, lateral view.

♂. Similar to the ♀ in general morphological features, but a little smaller than the ♀.

Hind margin of 9th tergite a little projected backwards at middle, both sides of projection rise a little upwards. Tenth tergite broadly cleft with a small Y-shaped chitin plate; genital hook directed backwards and upwards with blunt tip. Subgenital plate very large and with rounded hind margin which extends backwards with a baton-like hammer at middle near hind margin.

***Neoperla geniculata* Pictet**

SPECIMENS EXAMINED: 5 ♂♂, 2 ♀♀, Yona, Okinawa I., 24-25.III.1964, Yoshimoto & Harrell; 1 ♀, Ushiku-Mori, 425 m, Iriomote, 11.III.1964, Harrell.

***Gibosia linguambita* Kawai, new species**

Fig. 5 A-E.

♂. Medium-sized stonefly. General color yellowish with brown markings on head and pronotum. Head yellowish with a large brown marking on dorsum and a brown hexagonal marking situated before M-line which is yellow, both sides of occipital part somewhat brownish.

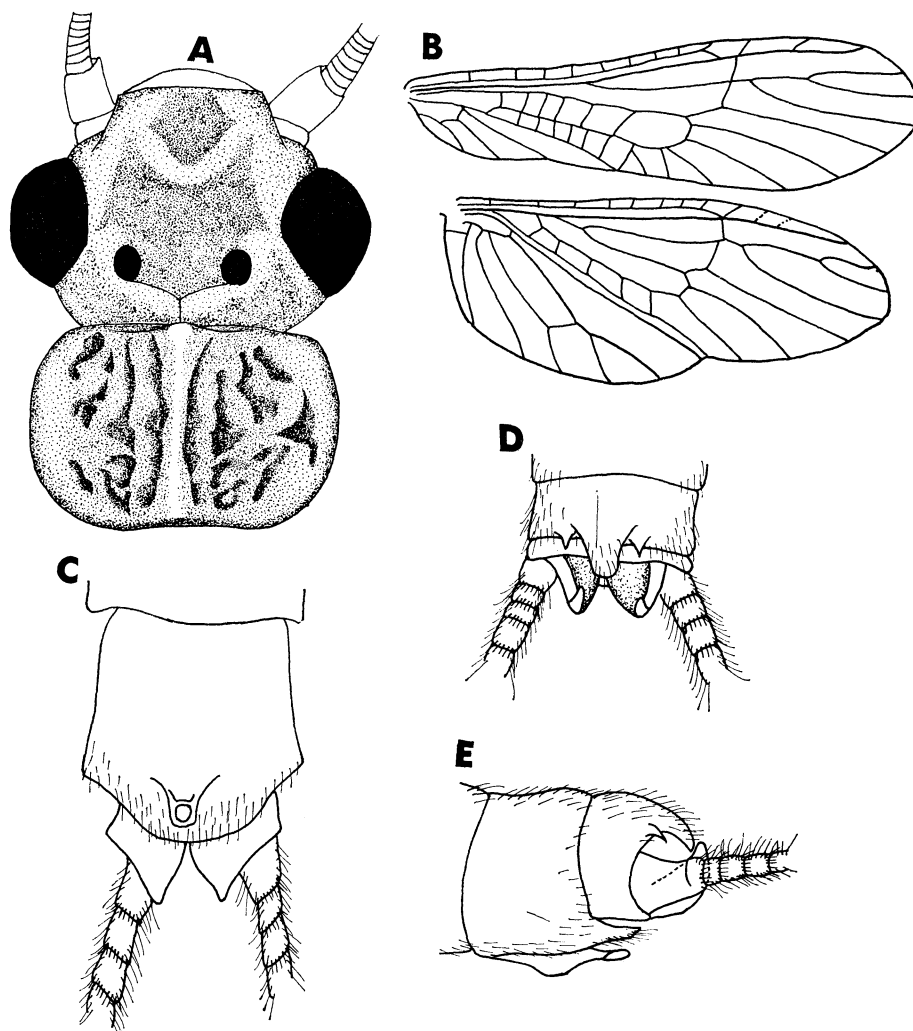


Fig. 5. *Gibosia linguambita* n. sp.: A, head and prothorax; B, wings; C, ♂ terminal segments of abdomen, ventral; D, the same, dorsal; E, the same, lateral view.

Antenna yellowish brown in proximal and chocolate brown in distal parts. Prothorax with a narrow pale brown median longitudinal stripe, both sides of stripe brown with many irregular chocolate-brown markings, pronotal margins with a narrow chocolate-brown band. Meso- and metanotum yellowish brown; hind margin of each notum with a narrow brown U-marking. Legs pale brown, but 3rd tarsus of each leg more dark. Abdomen yellowish, the last 2 segments a little darker. Cerci uniformly brown.

Head rounded, a little wider than prothorax; with 2 ocelli, distance between them nearly 2× as far as between 1 ocellus and inner margin of compound eye, and situated nearly on a line with posterior margin of compound eye. Antenna long and slender, nearly as long as body, composed of 40 segments.

Pronotum quadrangular, slightly wider than long, with rounded corners; dorsum somewhat arched and rugose. Legs long and slender. Wings hyaline, veins brown; venation typical to genus.

Abdomen cylindrical without peculiar structures on dorsal sides. Hind margin of 10th tergite produced directed backwards and a little downwards into a small tongue-shaped hairy chitinous plate at middle, and produced backwards into a pair of small brown processes with sharply pointed tips. Ninth sternite forming a large subgenital plate with a small brown hammer at middle of rounded hind margin.

Body length 9.5 mm; length of fore wing 10 mm, and of hind wing 8 mm.

♀. Unknown.

Holotype ♂ (Висноф 7633), Yona, Okinawa I., 24.III.1964, C. M. Yoshimoto & J. C. Harrell. Paratopotypes: 2 ♂♂, same data as holotype.

Remarks: This species closely resembles *Gibosia tobei* Okamoto, but differs in having the middle of hind margin of the 10th abdomen projecting backwards with a small chitinous plate; it is not projecting backwards in *G. tobei*.

LITERATURE CITED

- Banks, N.** 1940. Report on certain group of neuropteroid insects from Szechwan, China. *Proc. U. S. Nat. Mus.* **88**: 173-220.
- Hitchcock, S. W.** 1962. Notes on Banks' species of Peltoperlidae (Plecoptera). *Bull. Brook. Ent. Soc.* **77**: 80-83.
- Illies, J.** 1966. Katalog der rezenten Plecoptera. *Tierreich* **82**: 1-632.
- Jewett, Jr., S. T.** 1958. Stoneflies from the Philippines (Plecoptera). *Field. Zool.* **42**: 77-87.
- Kawai, T.** 1958. Studies on the Holognathous stoneflies of Japan IV. Description of a new species of the genus *Microperla* (Peltoperlidae). *Kontyu* **26**: 138-41.
1964. Stonefly and mayfly nymphs from the caves of Okinoerabu, one of the Ryukyu Islands. *Mushi* **38**: 19-24.
1967. Plecoptera (Insecta). *Fauna Jap.* 1-211.
- Klapálek, Fr.** 1923. Plécoptères, II. Fam. Perlidae. *Coll. Zool. Selys Longchamps.* **4**: 1-193.
- Kohno, M.** 1945. My observation of the genus *Nogiperla* and genus *Peltoperla* with description of new genus *Neopeltoperia* (order Plecoptera). *Ins. World* **49** (571): 1-13.
1946. Corrigenda of my paper "My observation of the genus *Nogiperla* and the genus *Peltoperla* with description of new genus *Neopeltoperla* (order Plecoptera)". *Ins. World* **30** (574): 11-14.
- Okamoto, H.** 1912. Erster Beitrag zur Kenntnis der japanischen Plecopteren. *Trans. Sapporo Nat. Hist. Soc.* **4**: 105-70.

1922. Zweiter Beitrag zur Kenntnis der japanischen Plecopteren. *Bull. Agr. Exp. Sta. Chosen* **1**: 1-46.
- Uéno, M.** 1938. Stoneflies and mayflies collected in Okinawa, Ryukyu Islands. *Trans. Biogeogr. Soc. Jap.* **3**: 92-99.
- Wu, C. F.** 1938. Plecoptera Sinensium. 1-225.