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Study of Genus *Neoperla* (Plecoptera: Perlidae)  
from the Philippines

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Študija genusa *Neoperla* (Plecoptera: Perlidae)  
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## STUDY OF GENUS *NEOPERLA* (PLECOPTERA: PERLIDAE) FROM THE PHILIPPINES

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UDK 595.735(529)(045)=20 *Neoperla*

**ABSTRACT** — The Philippines have a distinct fauna of shared or closely related species of *Neoperla*. Some species from the same locality and not only from different islands reveal great variability.

Based on the study of types of all previously named taxa (several lectotypes designated) the following species are recognized, described, illustrated and identified in the key (adults only): *N. recta* BANKS (= *N. incerta* KLAPÁLEK; new synonymy; = *N. visayana* BANKS, new synonymy); *N. pseudorecta* spec., nov.; *N. zwicki* spec. nov.; *N. nishidai* spec. nov.; *N. hermosa* BANKS; *N. pallescens* BANKS; *N. obliqua* BANKS; (= *N. apoana* BANKS, new synonymy); *N. jewetti* spec. nov.; *N. pallicornis* BANKS; *N. atripennis* BANKS; *N. oculata* BANKS; *N. wagneri* spec. nov.; *N. nigra* spec. nov.; *N. philippina* spec. nov.; *N. spec.* ZWICK; *N. flinti* spec. nov.; *N. dentata* spec. nov.; *N. agusani* spec. nov. Unassociated females of 9 species are given provisional letter designations.

**IZVLEČEK** — ŠTUDIJA GENUSA *NEOPERLA* (PLECOPTERA: PERLIDAE)  
S FILIPINOV — Filipinsko otočje naseljuje svojska favna dokaj sorodnih vrst rodu *Neoperla*. Nekatere vrste precej varirajo tudi na isti lokaliteti in ne samo na različnih otokih.

Na osnovi študija tipov vseh predhodno imenovanih taksonov, smo opisali, ilustrirali in generirali ključ (le za adultne štadije) za naslednje vrste: *N. recta* BANKS (= *N. incerta* KLAPÁLEK, n. syn; = *N. visayana* BANKS, n. syn.); *N. pseudorecta* spec. nov.; *N. zwicki* spec. nov.; *N. nishidai* spec. nov.; *N. hermosa* BANKS; *N. pallescens* BANKS; *N. obliqua* BANKS; (= *N. apoana* BANKS, n. syn.); *N. jewetti* spec. nov.; *N. pallicornis* BANKS; *N. atripennis* BANKS; *N. oculata* BANKS; *N. wagneri* spec. nov.; *N. nigra* spec. nov.; *N. philippina* spec. nov.; *N. spec.* ZWICK; *N. flinti* spec. nov.; *N. dentata* spec. nov.; *N. agusani* spec. nov. Samice 9 vrst za katere ne poznamo odgovarjajočih samcev smo začasno označili le s črkami.

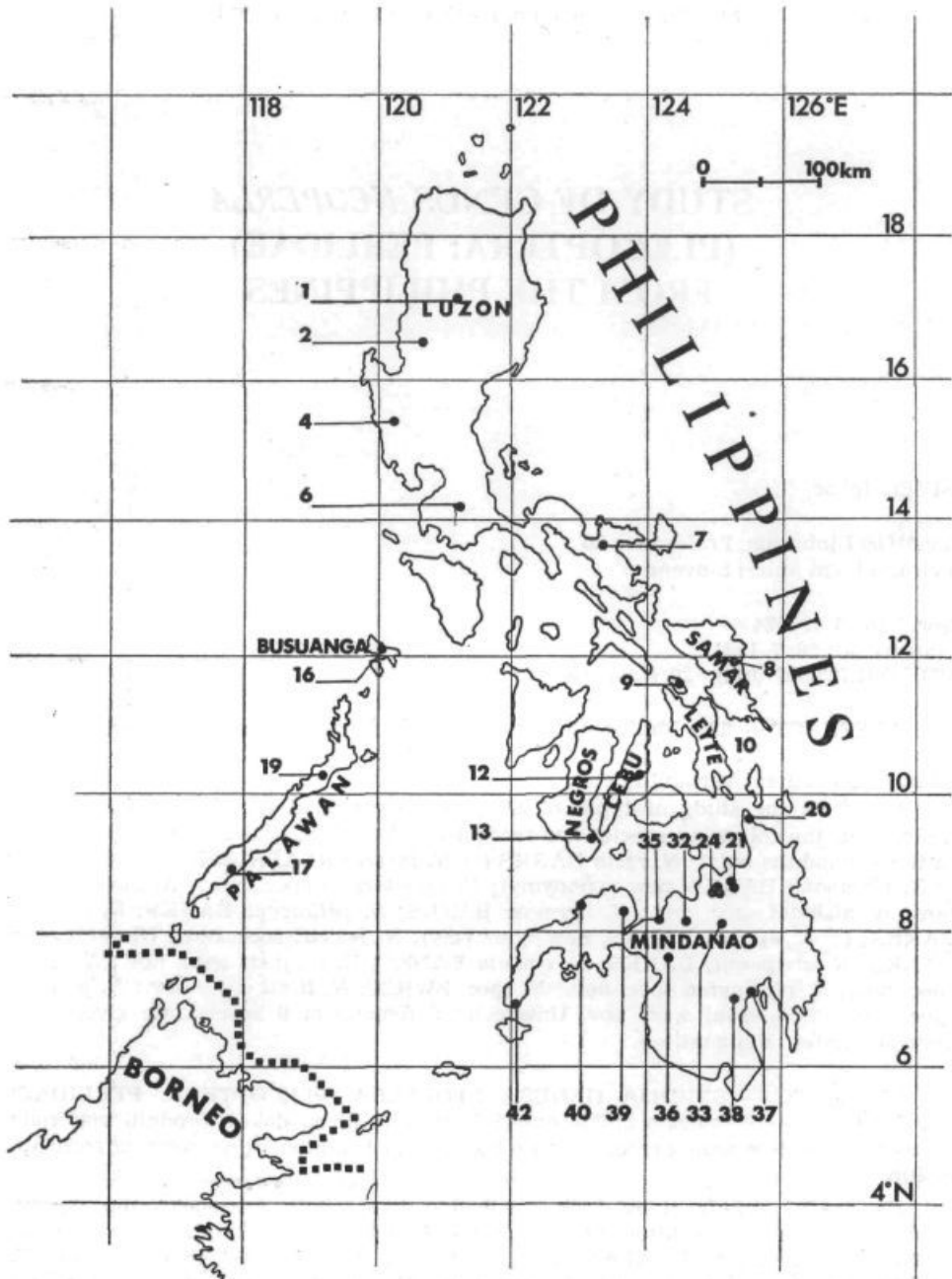


Fig. 1. Approximate location of several collecting sites of reference on the Philippines (scale length is 100 km)

### Introduction

Several intensive studies of the large genus *Neoperla* from the Oriental region were done in recent years by ZWICK (1982, 1983 a, b) and STARK (1983). The study of a fairly large material collection from different museums based on detailed penis armature, vaginal sclerites and egg chorion, as well as that of types of all described species from the Philippines has enabled me to present a reasonably complete synopsis. However, some species, especially the extremely polymorphic ones, are insufficiently known as yet (conspecificity of males and females) and remain unnamed, additional and better material of several others that have been named would be desirable. Progressing habitat destruction could be a reason for old records only of some species.

As shown for Jawa, Sumatra and Borneo, many more species actually exist than have been named so far and expected in this region (ILLIES, 1966). In lack of sufficient material, additional and detailed ecological data in most cases conspecificity of sexes is still a matter of more or less circumstantial evidence. In this respect I follow Zwick's policy (ZWICK, 1983 a) in not naming species in the female sex only.

The fact that on the Philippines only the *montivaga* group occurs with relatively polymorphic species belonging to fewer subgroups than the Bornean ones suggests that the *Neoperla* species spread from Borneo to the Philippines and not in the opposite way (ZWICK, 1983 a b). Faunal connections with the neighbouring Borneo are minimal and only one species occurs in both regions. So far there have been established no faunal connections with Sumatra, Java and the Malay Peninsula. Extreme poorness or an almost complete lack of Oriental Perlidae in New Guinea is not greatly in support of Gressitt's idea of a closer entomofaunistic connection between New Guinea and the Philippines (GRESSITT, 1982) in an enlarged Wallacea. Further studies of Taiwan and especially Chinese *Neoperlina* will show eventual similarities to northern East Asian mainland fauna.

As in ZWICK (1983 a) a preliminar arrangement of species into groups and even more provisional subgroups with species complexes has also been adopted in the present study.

Within the *montivaga* group of the genus *Neoperla* in the Philippines, all species but one are representatives of the *recta* subgroup comprising *recta*, *oculata* and *variegata* species complexes. The position of *N. agusani* spec. nov. within the *montivaga* group remains uncertain.

### Material and Methods

Specimens of all primary types and several additional ones were borrowed from the museums listed below.

Most specimens were collected at light. There is, however, very little additional label information about the circumstances under which specimens were collected, especially in old material. This enables a proper association of males and females. Most specimens were pinned and had to be relaxed in a moist chamber for about an hour. Abdomens of males were detached and treated with a cold maceration technique recommended by ZWICK (1983 a), which gives the best results in eversion of inner penial sac desirable for identification of males. Females were first soaked in water so that eggs could be removed; they were usually cleared in hot KOH afterwards.

Genitalia have been stored in glycerol in microvials or mounted in Canada balsam on transparent cellulose foil. As a rule, the genitalia preparations have been attached to the specimen pin.

The complete label information is contained in the lists of the material below. Characters typical of the group to which a given species belongs are not repeated in the descriptions of individual species unless requiring some comment or specifications. Abbreviations used in descriptions are: HT — hemitergite(s) 10; S — sternite(s); T — tergite(s).

For easier orientation the more frequently listed localities and points of reference are shown on the map in Fig. 1.

In the lists of material examined, the following abbreviations have been used to identify depositories: BPBM: Bernice P. Bishop Museum, Honolulu; LFS: Limnologische Flusstation Schlitz des Max-Planck-Instituts für Limnologie, Schlitz; MCZ: Museum of Comparative Zoology, Cambridge, Mass.; NMW: Naturhistorisches Museum, Wien; USNM: United States National Museum, Washington, D. C.; ZMH: Zoologisches Institut und Museum der Universität, Hamburg.

#### List of collecting sites:

##### LUZON island

- 1 Ifugao province: Jacmal Bunhian, 24 km E Mayoyao, 800—1000 m /16.49 N/121.13 E/
- 2 Benguet: Baguio /16.25 N/120.36 E/
- 3 Nueva Vizcaya: Imugin
- 4 Zambales /15.30 N/120.30 E/
- 5 Rizal: Mt. Montalban, Wa-wa Dam, 150—200 m
- 6 Laguna: Mt. Maquiling (Makiling) /14.08 N/121.11 E/  
Los Baños
- 7 Camarines Sur: Mt. Isarog, Pili, 600—800 m /13.33 N/123.16 E/
- 8 SAMAR
- 9 BILIRAN
- LEYTE
- 10 Burauen /10.59 N/124.53 E/
- 11 Tigbao  
CEBU
- 12 Camp 7, 25 km W Cebu City /10.00 N/123.00 E/  
NEGROS
- 13 Dumaguete /9.18 N/123.18 E/
- 14 Cuernos Mts.
- 15 L. Balinsasayao

- 16 BUSUANGA  
PALAWAN
- 17 Mainit, 11 km NW Brooke's Point /8.46 N/117.50 E/  
18 Macagua, 12 km SW Brooke's Pt.  
19 Litso, Amoyan ck., 57 km N Puerto Princessa, 10 m /10.00 N/118.45 E/  
MINDANAO
- 20 Surigao del Norte: Surigao /9.48 N/125.30 E/  
21 Agusan: Esperanza, Bagugan, Matibog Creek /8.42 N/125.36 E/  
22 Agusan: S. Francisco, 10 km SE /8.29 N/125.55 E/  
23 Agusan: Los Arcos  
24 Misamis Oriental: Mt. Balatukan, 15 km SW of Gingoog, 1000—2000 m /8.50 N/  
125.07 E/  
25 Misamis Oriental: Mt. Pomalihi, 21 km W Gingoog City, 800—1000 m  
26 Misamis Oriental: Mt. Empagatao, 1050—1200 m  
27 Misamis Oriental: Minalwang, 1050 m  
28 Misamis Oriental: Minubanan, 1050—1200 m  
29 Misamis Oriental: Dinawihan Gingoog, 26 km E of Gingoog City, 100—300 m  
30 Misamis Oriental: Balason  
31 Misamis Oriental: Mt. Kibungd, 10 km SE Gingoog, 700—800 m  
32 Bukidnon: Mt. Katanglad, 1480 m /8.15 N/124.45 E/  
33 Bukidnon: Malaybalay Alanib, 910 m /8.09 N/125.05 E/  
34 Bukidnon: Tangcolan  
35 Lanao del Norte: Kolambungan /8.07 N/123.54 E/  
36 Lanao del Sur: Butig Mts. 4—6 km NE of Butig, 900 m /7.30 N/124.15 E/  
37 Davao del Norte: Davao /7.04 N/125.30 E/  
38 Davao del Norte: Mt. Apo, Galog Riv. /6.57 N/125.16 E/  
39 Misamis Occidental: Mt. Malindang /8.15 N/123.40 E/  
40 Zamboanga del Norte: Manucan, 25 km S, 500 m /8.31 N/123.06 E/  
41 Zamboanga del Norte: Gundawan, 1260—1350 m  
42 Zamboanga del Sur: Zamboanga /6.54 N/122.05 E/  
43 Zamboanga del Sur: 24 km NW of Milbuk, nr. Lebak, 450—900 m  
44 Dansalan

#### Checklist of *Neoperla* species

- I. The montivaga group
- I.1. The recta subgroup
- I.1.1. The recta species complex
- Neoperla recta* BANKS  
= *Neoperla incerta* KLAPÁLEK  
= *Neoperla viscayana* BANKS  
*Neoperla pseudorecta* spec. nov.  
*Neoperla zwicki* spec. nov.  
*Neoperla nishidai* spec. nov.  
*Neoperla* spec. PH A  
*Neoperla* spec. PH B  
*Neoperla* spec. PH C  
*Neoperla* spec. PH D
- I.1.2. The oculata species complex
- Neoperla obliqua* BANKS  
= *Neoperla apoana* BANKS

*Neoperla jewetti* spec. nov.  
*Neoperla* spec. PH E  
*Neoperla hermosa* BANKS  
*Neoperla pallescens* BANKS  
*Neoperla pallicornis* BANKS  
*Neoperla* spec. PH F  
*Neoperla* spec. PH G  
*Neoperla atripennis* BANKS  
*Neoperla oculata* BANKS  
*Neoperla wagneri* spec. nov.  
*Neoperla nigra* spec. nov.  
*Neoperla* spec. ZWICK  
*Neoperla philippina* spec. nov.  
*Neoperla flinti* spec. nov.  
*Neoperla* spec. PH H

I.1.3. The variegata species complex

*Neoperla dentata* spec. nov.

I.2. Species incertae sedis

*Neoperla agusani* spec. nov.

**Key to the species of *Neoperla* known from the Philippines**

For successful identification comparisons to figures and original descriptions should be used together with this key. HT: male hemitergite 10; S: sternite; T: tergite.

(Key to genera of oriental Perlinae see in ZWICK, 1983 a)

1	Males . . . . .	2
—	Females . . . . .	18
2	Two pointed processes on T7 and T8 . . . . .	3
—	Only one process, on T7 . . . . .	6
3	T7 with large median hump on its anterior part. Penis tubular, single subterminal ventral outgrowth and two pairs of spiny protrusions near the middle . . . . .	<i>N. zwicki</i>
—	Anterior part of T7 normal . . . . .	4
4	Everted penis strongly bent ventrally, only one pair of lateral outgrowth . . . . .	<i>N. nishidai</i>
—	Everted penis with several ventral and lateral outgrowth . . . . .	5
5	Everted penis with distinct subterminal dorsal spiny outgrowth (of a different length) . . . . .	<i>N. recta</i>
—	Dorsal outgrowth of everted sac not present . . . . .	<i>N. pseudorecta</i>
6	Process on T7 forked, slightly bilobed . . . . .	<i>N. philippina</i>
—	Process on T7 pointed, not bilobed . . . . .	7
7	Everted penis without distinct or long outgrowth. Subterminal strong hooks in the form of rosette with a row of spines in front and behind . . . . .	<i>N. dentata</i>
—	Everted penis at least with a single longer outgrowth, usually more . . . . .	8



- 8 Everted sac with simple outgrowth only subterminally . . . . . 9
- Everted sac with several outgrowths also in the middle and at the base . . . . . 12
- 9 Single subterminal ventral process more or less covered with spines . . . . . 10
- Short paired subterminal ventral outgrowths covered with spines. Dorsal side with a blunt hump below apex covered with strong hooks . . . . . *N. wagneri*
- 10 Everted penis tubular, a single subterminal ventral outgrowth only . . . . . 11
- A pair of subterminal small ventral outgrowths, apex of sac plump covered with strong spines, tapering to tip . . . . . *N. spec.*
- 11 Single ventral process only, middle size dark brown coloured species . . . . . *N. atripennis*
- Strong spines at apex long and slender, not triangular, a dorsal band of stronger spines near the middle . . . . . *N. agusani*
- 12 Penis with a long finger shaped ventral process outside inverted penis . . . . . 13
- Inverted penis tube without process . . . . . 14
- 13 Middle size species, distinct oval pale spot on fore wings, two pairs of outgrowths at the base of everted sac . . . . . *N. hermosa*
- Large species. Three pairs of smaller dorsolateral outgrowths . . . . . *N. jewetti*
- 14 Everted sac of penis with at least one ventral outgrowth . . . . . 15
- Ventral side of sac without outgrowth, two pairs of dorsolateral outgrowths and one pair of lateral outgrowths at base . . . . . *N. obliqua*
- 15 Single ventral outgrowth . . . . . 16
- Two ventral outgrowths, a pair of subterminal lateroventral outgrowths, and a pair of dorsolateral outgrowths . . . . . *N. oculata*
- 16 More than one pair of dorsolateral outgrowths . . . . . 17
- One pair of bare dorsolateral outgrowths. Apex plump with a short ventral process parallel to base. Larger dark brown to black species . . . . . *N. nigra*
- 17 Three pairs of dorsolateral processes. Pronotum with distinct pale lateral margins . . . . . *N. pallescens*
- Two pairs of dorsolateral processes . . . . . *N. flinti*
- 18\* Vagina sac shaped, strongly folded, receptacle with a central attachment. Egg without collar and anchor . . . . . 19
- Attachment of receptacle anteriorly in front of sclerites, collar present . . . . . 23
- 19 S 8 forms a strong projecting parabolic lobe, chorion with finer punctation in the middle than at polar sides . . . . . *N. recta*
- S 8 normal, or with a projecting lobe, punctation uniform . . . . . 20
- 20 Eggs more or less oval, fine punctate . . . . . 21
- Eggs nearly spherical with very rough punctation arranged in polygons . . . . . *N. nishidai*
- 21 S 8 with a projecting parabolic lobe, chorion uniformly fine punctate. Punctation grouped in polygones separated by narrow bare ribs . . . . . *N. spec. PH B*
- S 8 normal or only slightly projecting . . . . . 22
- 22 Chorion fine punctate, lid with reticular structure formed by narrow bare ribs . . . . . *N. spec. PH A*

\* For *N. spec. PH D*, egg is not known, therefore this species is not included in the key.

— Chorion much wider at equator, fine punctate, no reticular structure . . . . .	<i>N. spec.</i> PH C	
23 No external modification of genitalia . . . . .		24
— Bilobed strongly sclerotized subgenital plate, vagina with a strong sclerotized central part . . . . .	<i>N. dentata</i>	
24 Eggs striated . . . . .		25
— Eggs not striated . . . . .		26
25 Sulci of chorion narrow with two rows of punctations only . . . . .	<i>N. flinti</i>	
— Sulci of chorion wider, more than two rows (4—5) of punctations . . . . .	<i>N. spec.</i> PH H	
26 Apical plate of egg normal, more or less flat . . . . .		27
— Apical plate of egg deeply invaginated . . . . .	<i>N. atripennis</i>	
27 Chorion fine punctate either with or without reticular structure . . . . .		29
— Chorion rough punctate . . . . .		28
28 Uniform, strong punctation in more or less regular lines . . . . .	<i>N. obliqua</i>	
— Strong punctation in polygones separated by narrow bare ribs, more irregular at collar . . . . .	<i>N. spec.</i> PH G	
29 Single or double row of bare polygones at lead . . . . .		30
— Chorion fine punctate without bare polygones . . . . .		31
30 Single row of bare polygones, both poles with reticular structure formed by narrow bare ribs . . . . .	<i>N. pallicornis</i>	
— Double row of bare polygones, lid without reticular structure . . . . .	<i>N. spec.</i> PH F	
31 Chorion uniformly fine punctate without any reticular structure . . . . .	<i>N. spec.</i> PH E	
— Chorion uniformly fine punctate, reticular structure at both poles . . . . .		32
32 Fore wings with distinct pale spot, reticular structure at lid not very strong . . . . .	<i>N. hermosa</i>	
— No spot at fore wings, lateral sides of pronotum distinctly pale, reticular structure at lid stronger* than in <i>N. hermosa</i> . . . . .	<i>N. pallescens</i>	

### Taxonomy

#### I. The *montivaga* — group

The short parallel ventrobasal and the longer triangular dorsal sclerite of the otherwise soft penis are diagnostic (for details see original group definition, ZWICK, 1983a).

#### I.1. The *recta* — subgroup

The subgroups and species complexes subdivisions as proposed by ZWICK (1983b) is adopted.

\* Separation by egg structure and vagina only very difficult or nearly impossible, comparison of males necessary.

## I.1.1. The recta species complex

Males have a pointed processes on tergites 7 and 8. Various lobes of everted sac and armature. Vagina sac-shaped, very extensible, strongly folded around and in front of the central attachment of receptacle. Eggs without collar and anchor, differently punctate.

***Neoperla recta* BANKS (Figs. 2a-g).**

- 1913 *Neoperla recta* BANKS, Proc. ent. Soc. Washington, 15: 172; fig. 10.  
 1920 *Neoperla viscayana* BANKS, Bull. Mus. Comp. Zool., 64: 321; new synonymy.  
 1921 *Neoperla incerta* KLAPÁLEK, Ann. Soc. Ent. Belg., 61: 321; new synonymy.  
 1923 *Neoperla incerta* — KLAPÁLEK, Coll. Zool. Selys Longchamps, 42: 158; fig. 34.  
 1958 *Neoperla recta* — JEWETT, Fieldiana Zoology, 42 (6): 85.

Material studied: ♀ lectotype, LUZON: Los Baños (BAKER; MCZ type 11887; lectotype here designated); ♀ holotype of *N. incerta* KLAPÁLEK, MINDANAO (SEMPER; NMW); ♂ holotype of *N. viscayana* BANKS, LUZON: N. Viscaya, Imugin (BAKER; MCZ). Additional material: LUZON: 9 ♂♂, 1 ♀, Los Baños (various dates and collectors; MCZ, USNM; 1 ♂, no. 425 BANKS det. *Ochthopetina luteola* BUR.); 12 ♂♂, 9 ♀♀, Mt. Makiling (BAKER; MCZ, USNM); 1 ♂, Mt. Makiling, 22. VIII. 1925 (M. PROTACIA; MCZ); 3 ♀♀, N. Viscaya, Imugin (BAKER; USNM, MCZ); 2 ♂♂, Benguet, Baguio (BAKER; MCZ); 5 ♂♂, 6 ♀♀, Camarines Sur, Mt. Isarog, Pili (different dates and elevations) (H. M. TORREVILLAS; BPBM); 1 ♂, Zambales, XII. 1917 (BOETTGER; coll. Ulmer, ZMH); 3 ♂♂, Mt. Montalban, Rizal, Wa-wa Dam, 150—200 m, 2. III., 6. III., 18. III. 1965 (L. M. & H. M. TORREVILLAS; BPBM); NEGROS: 1 ♂, 3 ♀♀, Dumaguete (C. T. BRUES; MCZ); 4 ♂♂, Negros Or., L. Balinasasayao, 1.—7. X. 1959, light trap (L. QUATE & C. YOSHIMOTO; BPBM).

Middle-sized ochre to brownish coloured species. Wings of males 12,5 to 14,5 mm, of females 16—17 mm long. Fairly large ocelli with dark rings one diameter apart in males and 1,5 in females. Area between ocelli and in front of these (except M-line) may be brownish (specimens from Negros, both males and females with a distinct head pattern). Antennae dark brown to black except the scape.

♂: T7 with a large median triangular sclerite ending in a knob like the spiny process on its prosterior end. T like median sclerite of T8 strongly raised as a little hook covered with spines on its upper concave side. Usual paramedian swellings of T9 weakly expressed with only a few spines in some specimens. Hemitergites normal, anterior processes short and plump bent near the middle.

Everted sac in general shape with three ventral and two dorsal single outgrowths and a pair of subterminal lateral protrusions. However, shape, length and armature can vary greatly in different specimens either from a different or even the same locality. Three more distinct types of this variation are recognised as seen in Fig. 2.

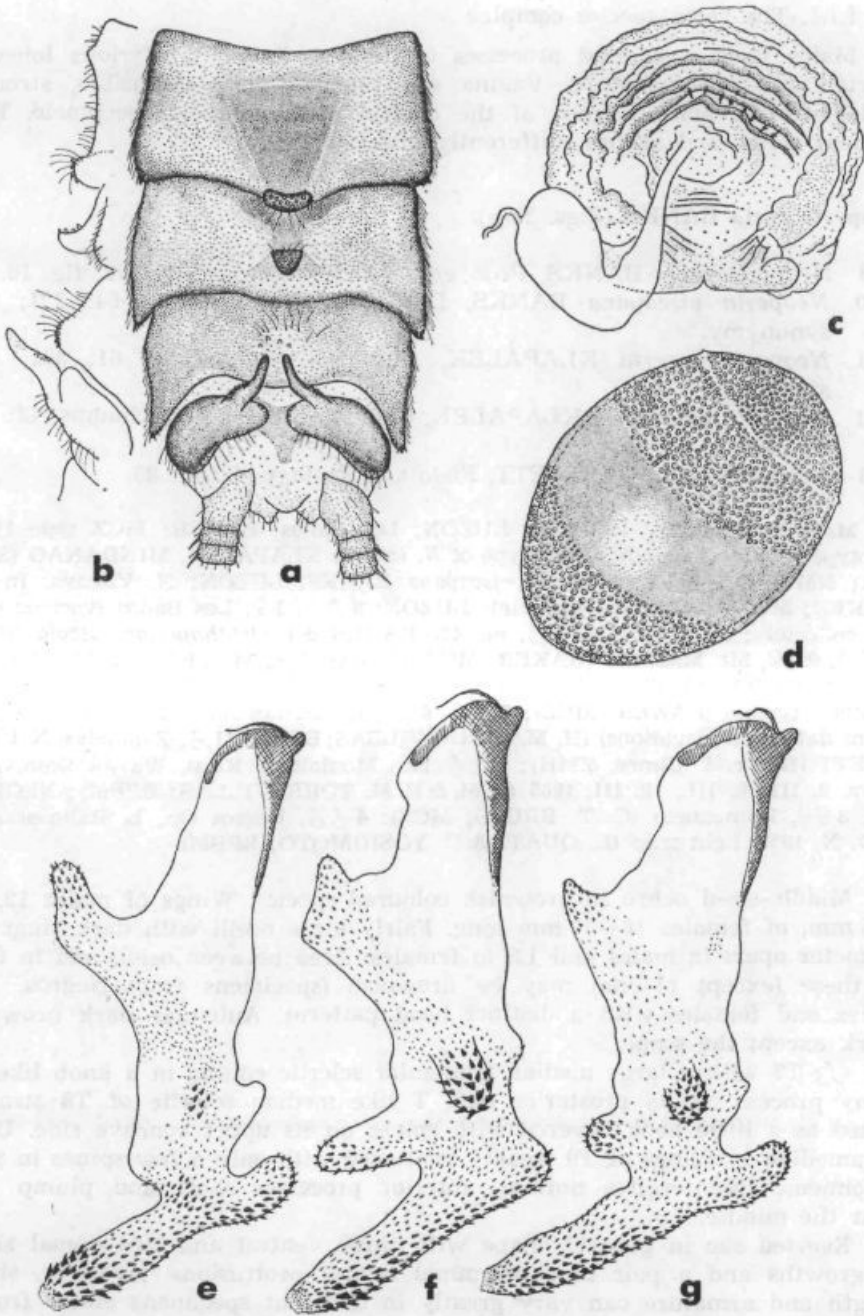


Fig. 2. *Neoperla recta* BANKS: Abdominal tip of ♂ (a, b), vagina (c), egg (d), everted penis from Imugin (e), Mt. Makiling (f), Negros (g).

♀: S8 forms a strongly projecting parabolic lobe. Vagina sac-shaped with few wide concentric folds around and in front of the attachment of the receptacle. These central folds are slightly sclerotized and anteriorly narrower (degree of sclerotization is variable at different specimens — stronger in specimens from Negros). Marginal parts of the vagina soft, irregularly folded and wrinkled, evidently very extensible. Posterior margin of the large central fold straight and flat with median invagination. Irregular sclerotized spots occur usually on the upper part amidst the central folds.

Egg regularly oval, size  $0.33 \times 0.25$  mm. Collar and anchor absent. Chorion with very fine punctation in the median third and rougher punctation on the polar sides (slightly variable in different specimens). Lád with a clearly visible smooth narrow suture. Micropyles along sharp upper lines of different punctations.

Notes: In his original description of *N. recta* BANKS mentions also a male, however, only a type of females was available. *N. viscayana* was described from female and this type of specimen, too, was not available. Male specimen of the same species (?) (from the same locality, not specifically mentioned in the original description) is labeled as a type of *N. viscayana*, which could not be excluded according to original description.

The amazing variability of closely similar male specimens makes the distinction of taxa in this complex quite difficult, further and more detailed study might prove either extreme polymorphism or presence of several very closely related species.

From material presently available sexes appear to be conspecific because they frequently occur together; general shape, pattern and colouration are similar.

### *Neoperla pseudorecta* spec. nov. (Figs. 3a-c).

Material studied: ♂ holotype, CEBU: Camp 7, 25 km W Cebu City, 400 m, 21.—29. IX. 1965 (D. DAVIS; USNM). Additional paratypes: NEGROS: 2 ♂♂, Cuernos Mts. (BAKER; USNM); 1 ♂, Cuernos Mts. (BAKER; MCZ; labeled as *recta*); 1 ♂, Dumaguete (C. T. BRUES; MCZ); LUZON: 1 ♂, Mt. Makiling (BAKER; USNM, 24207); 1 ♂, Mt. Makiling (BAKER; MCZ, 24207, labeled as *recta*); 1 ♂, Los Baños, 15. XI. 1931 (ISABELA MONGE; MCZ); Additional material: BUSUANGA: 4 km N of San Nicolas, 1 ♂, 21. V. 1962, (light trap); 1 ♂, 25. V. 1962 (H. HOLTSMANN; BPBM).

Middle-sized uniformly ochre coloured species. Wings 12 mm long. Ocelli large, about one diameter apart. Some specimens with an oval dark spot between ocelli and a triangular one in front of M line. Pronotum sharp-angled in front, strongly narrowed behind.

♂: External genitalia and general shape of penis similar to *N. recta*. Everted sac tubular to plump, slightly curved ventrally with a larger proximal and a smaller distal ventral outgrowth and a pair of lateral bulbs covered with strong spines. Ventrobasal process covered only with a few spinules at top. Strong triangular hooks around the apex of sac, more or less extending dorsally.

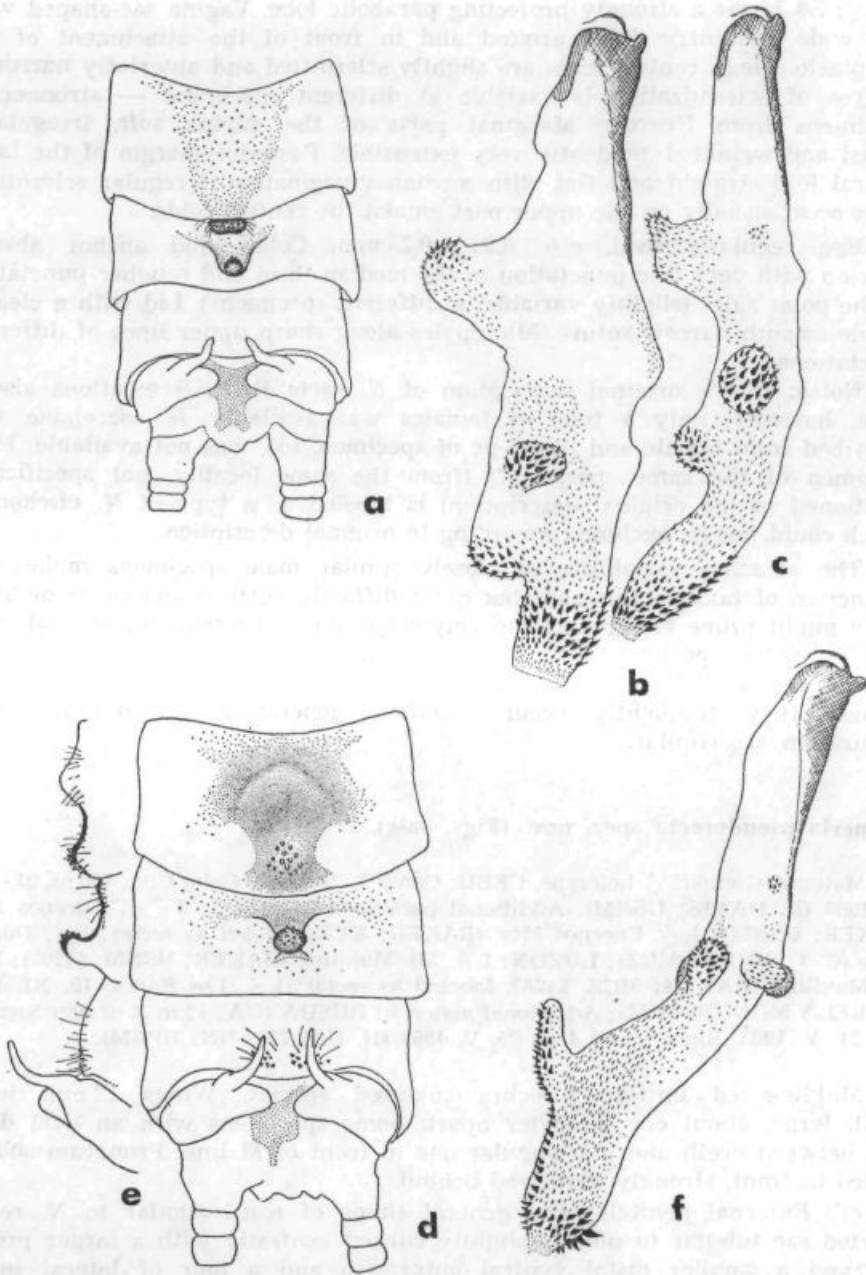


Fig. 3. *Neoperla pseudorecta* spec. nov.: Abdominal tip of ♂ (a), everted penis: from Cebu (c), Busuanga Island (b); *Neoperla zwicki* spec. nov.: Abdominal tip of ♂ (d, e), everted penis (f).

♀: Not known.

Notes: This species is very closely related to *N. recta*. Some specimens have been misidentified and labeled as *recta* by BANKS. Specimens from Negros are darker with a distinct head pattern. There is also some variability in the shape of the everted sac. Specimens from Busuanga island are different to some extent, but still of the same general type (see Fig. 3b, c).

***Neoperla zwicki* spec. nov. (Figs. 3d-f).**

Material studied: ♂ holotype, MINDANAO: Agusan, Esperanza, Bagugan, Mati-bog creek, 7. XI. 1959 (light trap) (C. M. YOSHIMOTO; BPBM); Additional material-paratypes: MINDANAO: Misamis Or., Mt. Balatukan, 10 km SW of Gingoog, 1000—2000 m, 1 ♂, 27.—30. IV. 1960; 1 ♂, 1.—5. V. 1960 (H. TORREVILLAS; BPBM); LUZON: 1 ♂, Los Baños, 8. I. 1917 (C. R. PAULICAN; MCZ; determined by P. ZWICK, 1979 as *N.? oculata* BANKS); 1 ♂, Los Baños, 3. I. 1932 (M. PLUROD; MCZ); 1 ♂, Los Baños, 12. XI. 1929 (E. VILLANUEVO; MCZ); SAMAR: 1 ♂ (BAKER; MCZ, 21073, labeled as *recta*).

Middle-sized uniformly ochre coloured species. Wings 11—12 mm long. Ocelli fairly large, two diameters apart. Pronotum slightly wider than long, narrowed behind.

♂: T7 with two median bulb-shaped projections, partly sclerotized. Lower projection with a patch of spinule. T8 with a prominent upwardly curved process with spinules on its tip. Dorsal side of the process partly sclerotized. T9 with the usual median depression and paramedian swellings with setae and spinules. HT normal, anterior processes long, gently curved, wider at the base. Sternites and cerci simple. Penis long, moderately slender. Everted sac narrow, tubular, with two pairs of spiny spherical protrusions near the middlength. Apical armature of strong spines is ventrally extended with a narrow strip to a subterminal lateral finger-shaped outgrowth. Ventral side of this process covered with fine spinules only. The rest of the sac covered with minute asperities and fine spinules. Small patch of spinules on paired lateral inconspicuous swellings.

♀: Not known.

Notes: In the general shape of genital segments belongs to *recta* species complex, with processes on T7 and T8, however, the shape of penis sac shows no affinities to other species of this group.

***Neoperla nishidai* spec. nov. (Figs. 4a-d).**

Material studied: ♂ holotype, BUSUANGA ISLAND: 4 km N San Nicolas, 24. V. 1962 (light trap) (H. HOLTSMANN; BPBM); 1 ♂ paratype, same locality, 20. V. 1962; 1 ♂, paratype, same locality, 27. V. 1962 (H. HOLTSMANN; BPBM). Additional material: PALAWAN: 1 ♂, Macagua R., 12 km SW Brooke's Pt., 20. XII. 1965; 1 ♀, Mainit, 11 km NW Brooke's Point, 18. XI. 1965 (D. R. DAVIS; USNM).

Middle-sized brownish to brown coloured species (females slightly darker). Wings of males 13 mm, of females 17 mm long. Head brown, wider

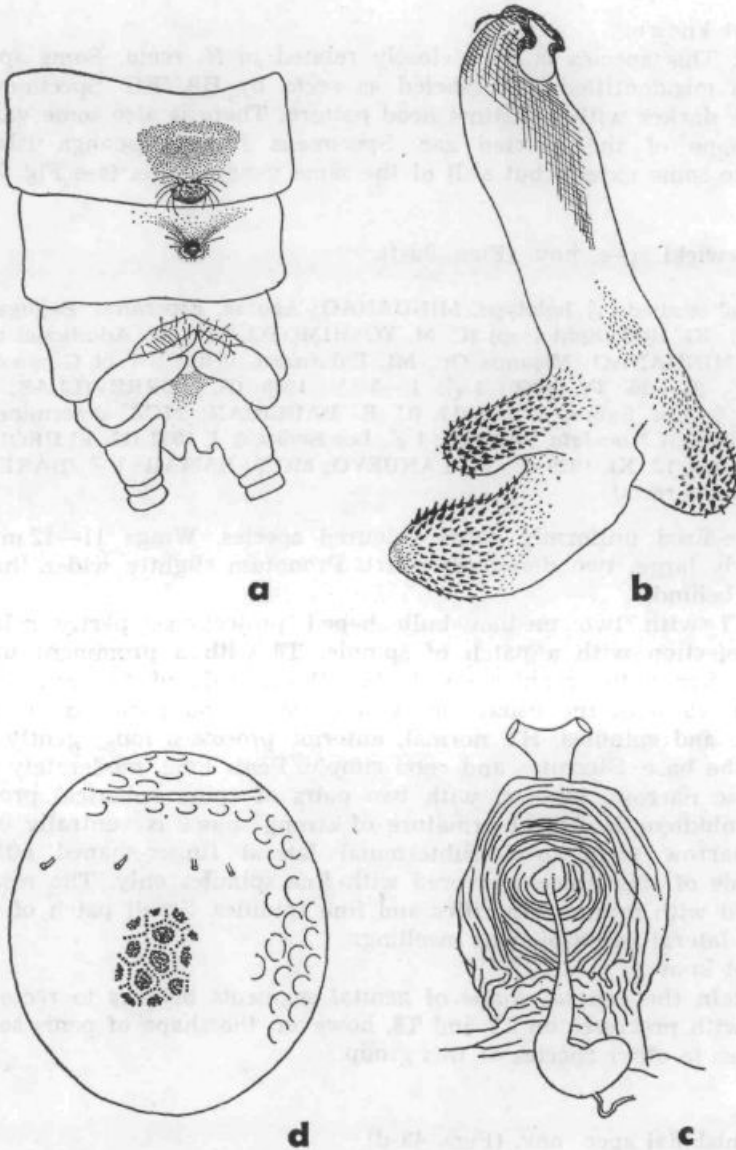


Fig. 4. *Neoperla nishidai* spec. nov.: Abdominal tip of ♂ (a), everted penis (b), vagina (c) egg (d).

than pronotum, tentorial calluses and M line appear as pale marks. Ocelli smaller in females, about two diameters apart. Distal part of femora and proximal part of tibiae darkened.

♂: Genital segments with the same projections as *N. recta*. Projection of T7 with dense long hairs on its upper side. Anterior process of HT massive



and plump from the lateral view, sinuously inverted. Everted penis bent nearly rectangular to ventral side, with three large finger-shaped lobes. The median one covered with strong spines ventrally and bare dorsally. Lateral outgrowths are covered with spines dorsally and bare ventrally.

♀: Subgenital plate slightly bilobed. Internal genitalia transparent unsclerotized, strongly folded with a central attachment of receptacle.

Eggs almost spherical, size  $0,34 \times 0,30$  mm. Collar and anchor absent. Chorion roughly punctate in slight depressions. Punctures grouped in polygons separated by wide rib-like smooth strips with a central single line of finer punctures. Micropyles normal.

Notes: No close relatives within the subgroup species complex. The specimen from Palawan is slightly larger (14 mm long fore wings) with small differences in the longer and slender everted penis. General colouration is also different from that of the type specimens. The head, antennae, palpi and pronotum are distinctly darker than the rest of the body.

In all probability conspecific with female from Palawan. General colouration and head pattern are identical in both specimens from Palawan.

#### *Neoperla* spec. PH A (Figs. 5 a, b).

Material studied: BUSUANGA ISLAND: 4 km N San Nicolas, 1 ♀, 23. V. 1962, 1 ♀, 30. V. 1962, (light trap) (H. HOLTSMANN; BPBM).

Ochre brownish coloured wings 12 mm long. Eyes large, ocelli moderately large, close together, with dark rings. Dark marks also in front of M line. Pronotum wider than long, sharp-angled narrowed behind.

♀: No external modifications. Vagina transparent, unsclerotized, with concentric folds around and in front of the receptacle attachment. Irregular sclerotized spots occur circularly around the central part, amidst the soft folds.

Eggs size  $0.31 \times 0.24$  mm, oval, slightly conical below, collar and anchor absent. Chorion of uniform thickness with fine punctation. Lid with punctate polygonal meshes.

Notes: The species is not formally named because the male is unknown and conspecificity with *N. pseudorecta* from the same locality is not completely excluded.

#### *Neoperla* spec. PH B (Figs. 5c, d).

Material studied: NEGROS: 1 ♀, Cuernos Mts. (BAKER; MCZ, 21075, labeled as *recta*); 1 ♀ Cuernos Mts. (BAKER; USNM, 21075, labeled as *recta* by BANKS); LUZON: 1 ♀, Los Baños, 19. XI. 1930 (E. CODO; MCZ); 2 ♀♀, Los Baños, 29. X. 1916 (F. B. PADOLINA; MCZ; determined by P. ZWICK, 1979 as *N.? recta* BANKS); 1 ♀, Mt. Montalban, Rizal, Wa-wa Dam, 150—200 m, 26. II. 1965, (light trap) (H. M. TORREVILLAS; BPBM).

Middle-sized ochre to brownish coloured species. Wings 15 mm long. Antennae distinctly darker, except the first segment in the specimen from

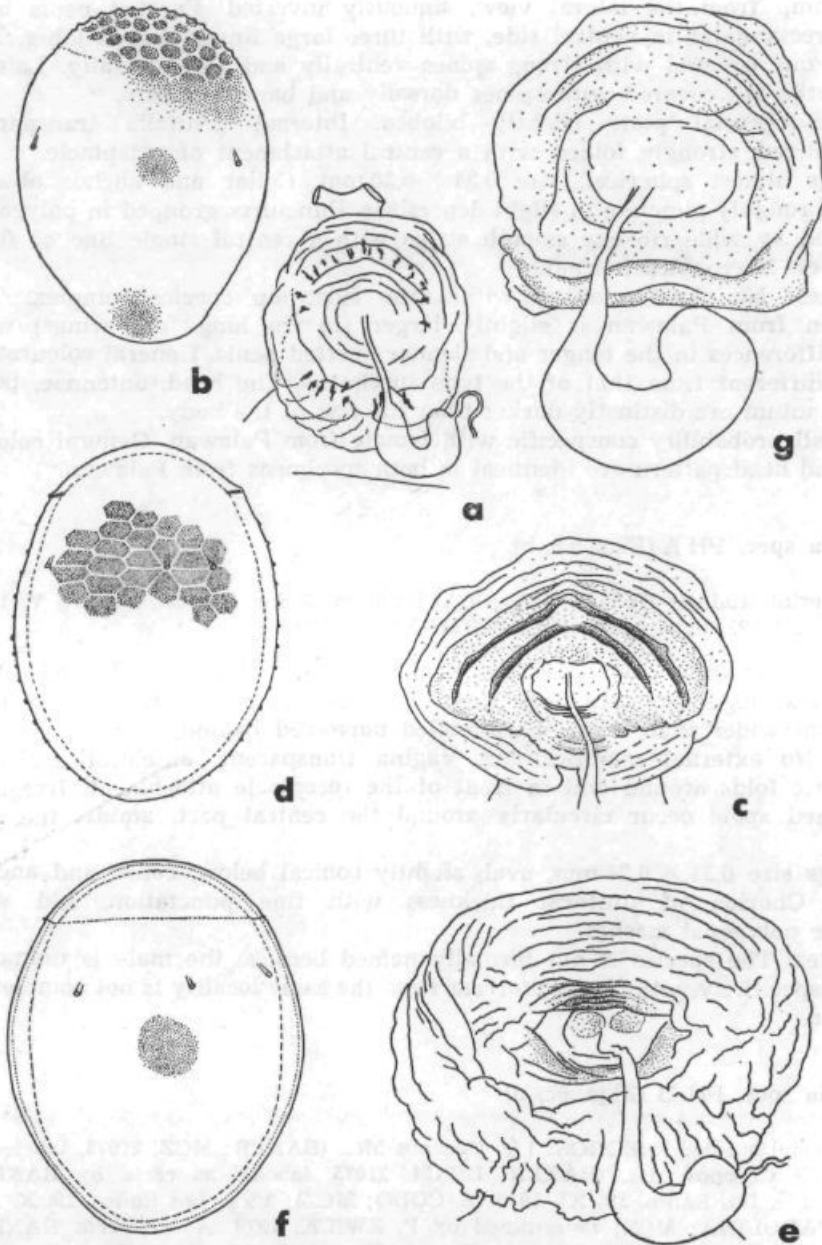


Fig. 5: Vaginas and eggs: a, b: *N. spec.* PH A; c, d: *N. spec.* PH B; e, f: *N. spec.* PH C; g: vagina of *N. spec.* PH D.

Mt. Montalban (others more or less damaged). Head pale, dark spot in front of M line. Specimens from Negros dark spot also between ocelli, in others only dark ringed. Ocelli of a moderate size, about one diameter apart. Pronotum laterally paler, slightly narrowed behind.

♀: S8 forms a strong projecting parabolic lobe. Vagina large, transparent and unsclerotized. Specimens from Los Baños with a few distinct wide semicircular (horse shoe) folds around and in front of the attachment of the receptacle. These large regular folds sclerotized, smaller ones soft.

Eggs regularly oval, size  $0.34 \times 0.25$  mm, collar and anchor absent. Chorion very fine punctate, punctures grouped in polygons separated by narrow smooth ribs. Micropyles below the lid are in the centre of the surrounding polygons.

Notes: The species is not formally named because the male is unknown and conspecificity with the other species known from male only is not completely excluded. In the shape of subgenital plate and vagina very similar to *N. recta*, however, eggs are completely different. Additional material and more detailed studies of male complex within *N. recta* could prove the presence of more species with extremely minute differences.

#### *Neoperla* spec. PH C (Figs. 5e, f).

Material studied: LUZON: Ifugao province, 1 ♀, Jacmal Bunhian, 24 km E Mayoyao, 800—1000 m, 7.—8. IV. 1967 (H. M. TORREVILLAS; BPBM).

Middle-sized dull ochre to brownish coloured. Wings 18 mm long. Antennae darker except the first segment. Head pale, oval spot between and around ocelli and centre of frontoclypeus in front of M line dark brown.

♀: Posterior end of S8 not so strongly projecting as in *N. recta*. Vagina large and transparent. Only some of the central folds around and in front of the attachment of the receptacle are slightly sclerotized.

Eggs regularly oval, size  $0.35 \times 0.28$  mm, collar and anchor absent. Chorion much thinner at the poles than near the equator of the egg, very finely punctate. Micropyles normal.

Notes: The species is not formally named because the male is not known and conspecificity with the other species known from male only is not completely excluded.

#### *Neoperla* spec. PH D (Fig. 5g).

Material studied: PALAWAN: 1 ♀, Brooke's Pt., Macagua, 75 m, 27.—31. III. 1962 (M. THOMPSON; BPBM); 1 ♀, Brooke's Pt., Macagua, 75 m, 7. IV. 1962 (H. HOLT-MANN; BPBM).

Small pale ochre coloured species. Wings 8 mm long. Ocelli about one diameter apart, dark ringed. Rings wider on the inner sides of ocelli.

♀: No external modifications. Only a few slightly sclerotized circular folds around and in front of the attachment of the receptacle. Posterior end of sclerotized folds flat, straight and parallel to the segment border with a small notch in the middle.

Eggs: Only one not fully developed egg was available. Its shape seems to be more or less oval, collar and anchor absent. Chorion very finely punctate.

Notes: This species is one of the smallest from the Philippines. In all probability it is not conspecific with any other species known from male only, however in lack of fully developed eggs and insufficient material it is not formally named.

### 1.1.2. The oculata species complex

#### *Neoperla obliqua* BANKS (Figs. 6a-d).

- 1913 *Neoperla obliqua* BANKS, Proc. Ent. Soc. Washington, 15:172; pl. 8, fig. 12.  
 1937 *Neoperla apoana* BANKS, Philipp. J. Sci., 63 (2):136, new synonymy.  
 1958 *Neoperla obliqua* — JEWETT, Fieldiana, Zoology, 42 (6):83—84 (part).  
 1982 *Neoperla apoana* — ZWICK, Aquatic Insects, 4 (1):20.

Material studied: LUZON: 1 ♀ holotype, Mt. Makiling (BAKER; MCZ, Type 11888; slide with eggs from ♀ holotype, LFS); Additional material: 4 ♀♀, Mt. Makiling (BAKER; MCZ); 6 ♀♀, Los Baños (various dates and collectors; MCZ); 1 ♀, Mt. Makiling (no. 24211, JEWETT det: *obliqua*); 1 ♀, Mt. Makiling, Laguna, V-27-30 (A. DUYAG, JEWETT det: *obliqua*; all USNM); MINDANAO: 1 ♀, holotype of *N. apoana*, Mt. Apo, Galog riv., 6000 ft., 18. X. (C. F. CLAGG; MCZ type 22102); 9 ♀♀, paratypes of *N. apoana*, same locality (MCZ paratype 22102; one paratype USNM no. 53223); 3 ♀♀ same locality (MCZ; labeled as *apoana*); 2 ♀♀, Mainit, Mt. Apo, 1215 m, 12. XI. 1965 (D. DAVIS; USNM); 1 ♂, 2 ♀♀, Bukidnon prov., Tangcolan (BAKER; USNM, one ♀ no. 14857, second ♀ no. 14857, JEWETT det: *obliqua*); 1 ♀, Surigao (BAKER; USNM); 1 ♀, Tambulan, 18. VI. 1915 (MCZ); 1 ♂, 10 ♀♀, Misamis Or., Minalwang, 1050 m, 24. III.—4. IV. 1961, at light (H. TORREVILLAS; BPBM); 2 ♀♀, Misamis Or., Minubanan, 1050—1200 m, 5.—9. IV. 1961, at light (H. TORREVILLAS; BPBM); 1 ♂, 1 ♀, Misamis Or., Mt. Empagatao, 1050—1200 m, 19.—30. IV. 1961 (H. TORREVILLAS; BPBM); 1 ♂, Agusan, Esperanza, Bagugan, Matibog Creek, 7. XI. 1959, light trap; 1 ♂, Esperanza, 4.—11. XI. 1959 (C. M. YOSHIMOTO; BPBM); 1 ♂, Misamis Or., Mt. Balatukan, 15 km SW of Gingoog, 1000—2000 m, 1.—5. V. 1960, at light (H. TORREVILLAS; BPBM); 1 ♂, Mis. Or., Mt. Pomalihi, 21 km W Gingoog City, 800—1000 m, 10. X. 1965 light trap (H. M. TORREVILLAS; BPBM); 1 ♂, Zamboanga del Norte, Gundawan, 1260—1350 m, 12. VII. 1958, light trap (H. E. MILLIRON; BPBM); 1 ♂, Z. del Sur, 24 km NW of Milbuk, nr. Lebak, 450—900 m, 6.—7. VIII. 1958 (H. E. MILLIRON; BPBM).

Middle-sized to large ochre coloured species. Wings of males 12—17 mm, of females 15—23 mm long. Head more or less embrowned, darker in front of M line in some specimens. Antennae basally brown, paler beyond. Pronotum brownish, often slightly paler laterally. Ocelli of moderate size, one diameter

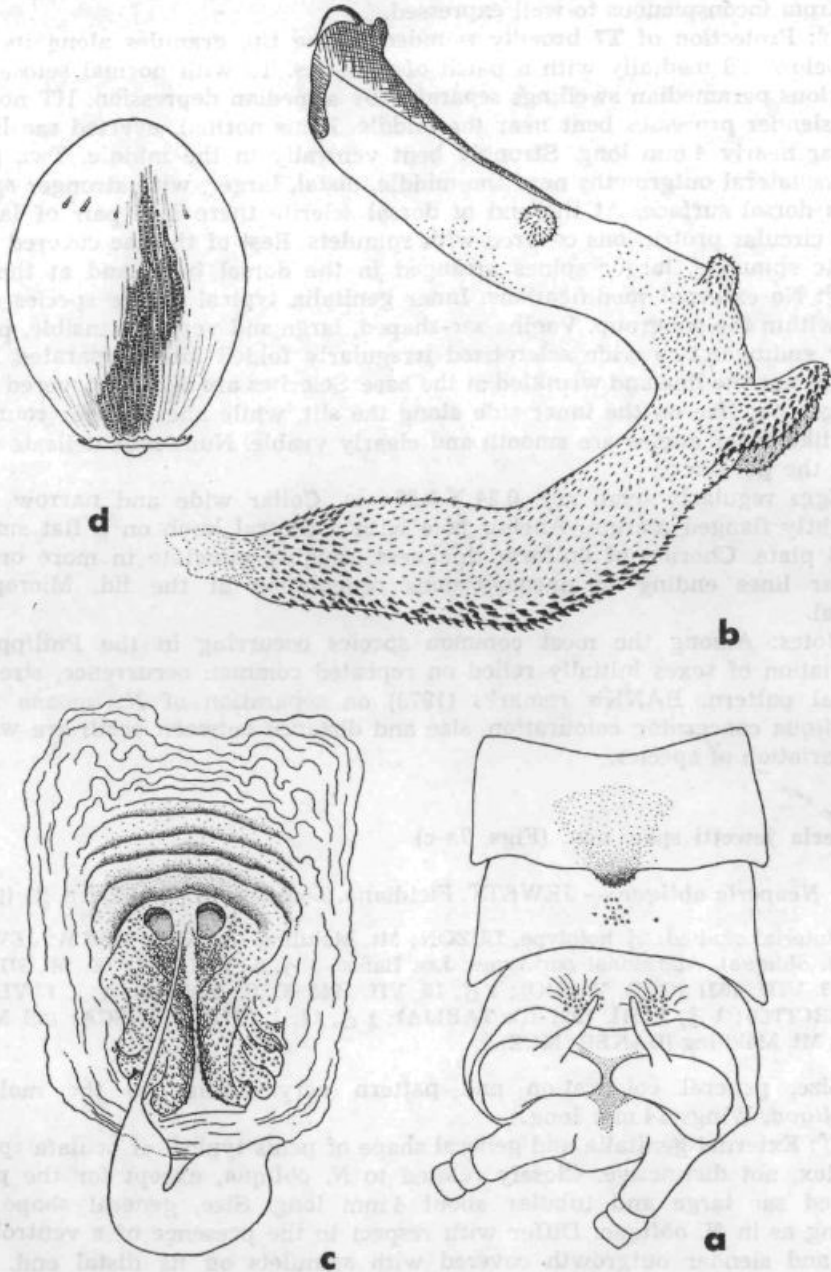


Fig. 6. *Neoperla obliqua* BANKS: Abdominal tip of ♂ (a), everted penis (b), vagina (c), egg (d).

apart in males and 1,5 to two diameters apart in females. Ocellar rings variable from inconspicuous to well expressed.

♂: Projection of T7 broadly rounded at the tip, granules along its side and below. T8 medially with a patch of granules. T9 with normal setose and granulous paramedian swellings separated by a median depression. HT normal with slender processes bent near the middle. Penis normal, everted sac large, tubular nearly 4 mm long. Strongly bent ventrally in the middle. Two pairs of dorsolateral outgrowths near the middle, distal, larger, with stronger spines on its dorsal surface. At the end of dorsal sclerite there is a pair of lateral small circular protrusions covered with spinulets. Rest of the sac covered with minute spinulets, larger spines arranged in the dorsal band and at the tip.

♀: No external modifications. Inner genitalia typical of the species complex within the subgroup. Vagina sac-shaped, large and very expansible, posteriorly ending in two wide sclerotized irregularly folded lobes separated by a straight narrow line and wrinkled at the base. Sclerites are densely covered with stronger papillae on the inner side along the slit, while the anterior rounded, knob-like inner angles are smooth and clearly visible. Numerous delicate folds along the periphery.

Eggs regularly oval, size  $0.34 \times 0.25$  mm. Collar wide and narrow with a slightly flanged margin. Anchor pole with a central knob on a flat smooth apical plate. Chorion of uniform thickness, roughly punctate in more or less regular lines ending in unobvious reticulation at the lid. Micropyles normal.

Notes: Among the most common species occurring in the Philippines. Association of sexes initially relied on repeated common occurrence, size and general pattern. BANK's remarks (1973) on separation of *N. apoana* from *N. obliqua* concerning colouration, size and distance between ocelli are within the variation of species.

#### *Neoperla jewetti* spec. nov. (Figs. 7a-c).

1958 *Neoperla abliqua* — JEWETT, Fieldiana, Zoology, 42 (6) : 84, fig. 21 (part).

Material studied: ♂ holotype, LUZON: Mt. Makiling (BAKER; USNM; JEWETT det: *N. obliqua*), Additional paratypes: Los Baños, 1 ♂, 6. VIII. 1923 (E. M. SIBAL); 1 ♂, 23. VIII. 1931 (G. B. VIADO); 1 ♂, 15. VII. 1915 (C. S. BANKS); 1 ♂, 1. VI. 1914 (E. JERCITO); 1 ♂, 1. III. 1931 (D. TABIJA); 1 ♂, 11. I. 1977 (T. NISCA) (all MCZ); 3 ♂ ♂, Mt. Makiling (BAKER; MCZ).

Size, general colouration and pattern very similar to the male of *N. obliqua*. Wings 14 mm long.

♂: External genitalia and general shape of penis typical of oculata species complex, not distinctive. Closely related to *N. obliqua*, except for the penis. Everted sac large and tubular about 4 mm long. Size, general shape and curving as in *N. obliqua*. Differ with respect to the presence of a ventrobasal long and slender outgrowth covered with spinulets on its distal end. This process is on the outer penis tube recognisable also in uneverted penis. Among three pairs of dorsolateral short spiny protrusions, contrary to

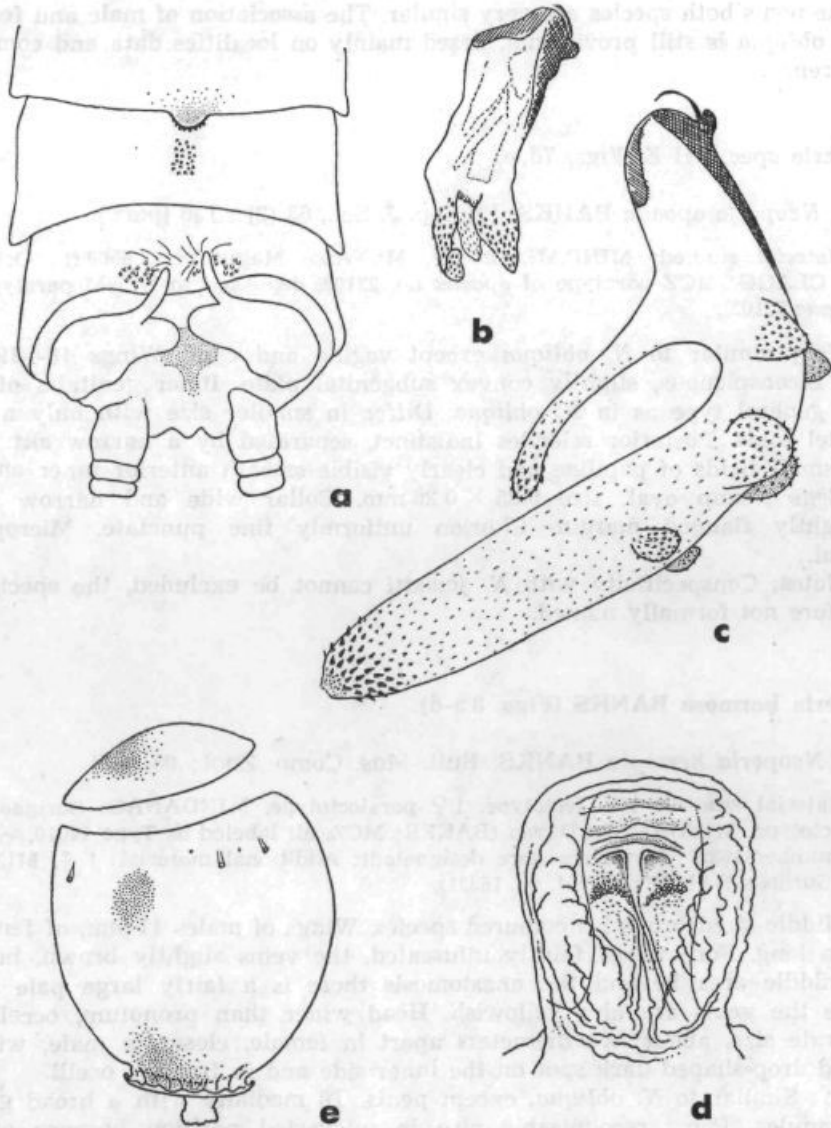


Fig. 7: *Neoperla jewetti* spec. nov.: Abdominal tip of ♂ (a), contracted and everted penis (b, c); *Neoperla* spec. PH E: vagina (d), egg (e).

*N. obliqua*, the smallest are distal and the largest proximal. Rest of the everted sac covered with fine spinulets except for the stronger spines near the tip.

♀: Not known.

Notes: JEWETT (1958) determined males of *N. obliqua* that had never been described or mentioned earlier either by him or by BANKS, however, except

for the penis both species are very similar. The association of male and female in *N. obliqua* is still provisional, based mainly on localities data and common occurrence.

**Neoperla spec. PH E** (Figs. 7d, e).

1937 *Neoperla apoana* BANKS, Philipp. J. Sci., 63 (2) : 136 (part.).

Material studied: MINDANAO: 1 ♀, Mt. Apo, Mainit riv., 6500 ft., Oct. 20. (C. F. CLAGG; MCZ paratype of *apoana* no. 22102, deposited in USNM paratype of *apoana* 22102).

Very similar to *N. obliqua* except vagina and eggs. Wings 18—19 mm long. Inconspicuous, slightly convex subgenital plate. Inner genitalia of the same general type as in *N. obliqua*. Differ in smaller size with only a few parallel folds. Posterior sclerites indistinct, separated by a narrow slit with only small fields of papillae and clearly visible smooth anterior inner angles.

Eggs plump oval, size  $0.35 \times 0.26$  mm. Collar wide and narrow with a slightly flanged margin. Chorion uniformly fine punctate. Micropyles normal.

Notes: Conspecificity with *N. jewetti* cannot be excluded, the species is therefore not formally named.

**Neoperla hermosa** BANKS (Figs. 8 a-d).

1924 *Neoperla hermosa* BANKS, Bull. Mus. Comp. Zool., 65 : 427.

Material studied: 1 ♂ lectotype, 1 ♀ paralectotype, MINDANAO: Surigao; 1 ♀ paralectotype, MINDANAO: Davao (BAKER; MCZ, all labeled as Type 14810, ♂ also with number 16321; lectotypes here designated); Additional material: 1 ♂, MINDANAO: Surigao (BAKER; USNM, no. 16321).

Middle-sized brownish coloured species. Wings of males 11 mm, of females 13 mm long. Fore wings faintly infuscated, the veins slightly brown, but in the middle area beyond the anastomosis there is a fairly large pale spot, where the veins are also yellowish. Head wider than pronotum, ocelli of moderate size, about two diameters apart in female, closer in male, with a curved drop-shaped dark spot on the inner side and in front of ocelli.

♂: Similar to *N. obliqua*, except penis. T8 medially with a broad group of granules. Penis recognisable also in uneverted position because of its ventrobasal long and slender outgrowth with stronger spinules on its distal part. Everted sac rectangularly bent, directed ventrally with a single long and slender ventrobasal outgrowth and two pairs of lateral spiny protrusions of a different size near the curving of penial tube. Distal half of everted sac long and straight with minute spinules and strong spines around the tip.

♀: No external modifications. Inner genitalia typical of *oculata* species complex, very similar to *N. obliqua*. Slightly differ only in the shape of smooth rounded pocket-shaped inner angles of central sclerites.



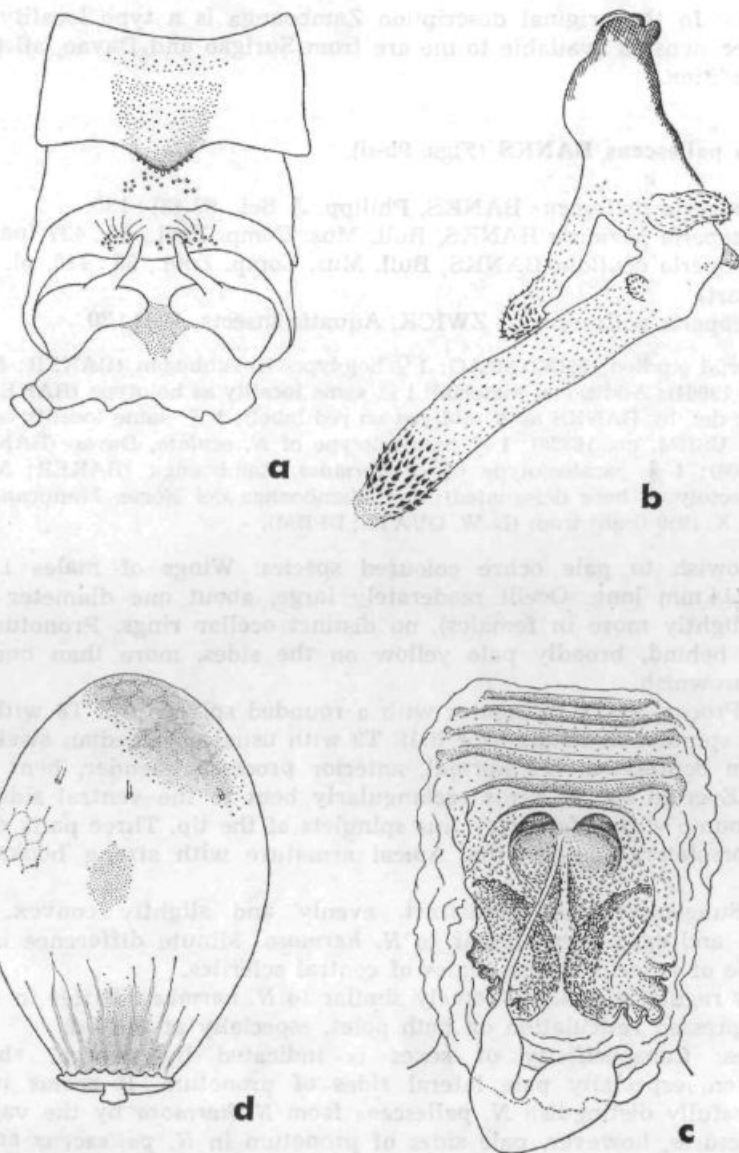


Fig. 8: *Neoperla hermosa* BANKS: Abdominal tip of ♂ (a), everted penis (b), vagina (c), egg (d).

Eggs oval, size  $0.40 \times 0.27$  mm. Collar narrow and inconspicuous with a slightly flanged margin. Anchor pole with a fairly large central knob on the apical plate. Indistinct reticulation expressed on both poles. Chorion of uniform thickness with fine punctation. Micropyles normal.

Notes: In the original description Zamboanga is a type locality as well. Type specimens as available to me are from Surigao and Davao, all in a very poor condition.

***Neoperla pallescens* BANKS** (Figs. 9a-d).

- 1937 *Neoperla pallescens* BANKS, Philipp. J. Sci., 63 (2) : 135.  
 1924 *Neoperla hermosa* BANKS, Bull. Mus. Comp. Zool., 65 : 427 (part).  
 1924 *Neoperla oculata* BANKS, Bull. Mus. Comp. Zool., 65 : 428, pl. 2, fig. 16 (part).  
 1982 *Neoperla pallescens* — ZWICK, Aquatic Insects, 4 (1) : 20.

Material studied: MINDANAO: 1 ♀ holotype, Kolambugan (BAKER; MCZ Type 22101, no. 13694); Additional material: 1 ♀, same locality as holotype (BAKER; USNM, no. 13694; det. by BANKS as *N. obliqua* on red label); 1 ♂, same locality as holotype (BAKER; USNM, no. 16320); 1 ♂ paralectotype of *N. oculata*, Davao (BAKER; MCZ Type 14808); 1 ♂ paralectotype of *N. hermosa*, Zamboanga (BAKER; MCZ Type 14810); (lectotypes here designated); 1 ♂, Zamboanga del Norte, Manucan, 25 km S, 500 m, 18. X. 1959 (light trap) (L. W. QUATE; BPBM).

Yellowish to pale ochre coloured species. Wings of males 11 mm, of females 14 mm long. Ocelli moderately large, about one diameter apart in males (slightly more in females), no distinct ocellar rings. Pronotum widely rounded behind, broadly pale yellow on the sides, more than one half of middle brownish.

♂: Process of T7 triangular with a rounded spinose tip. T8 with a small patch of spinules in its anterior half. T9 with usual paramedian swellings and a median depression. HT normal, anterior processes slender, bent near the middle. Everted sac of penis rectangularly bent to the ventral side. Conical ventral hump with a few very fine spinulets at the tip. Three pairs of smaller spiny dorsolateral outgrowths. Apical armature with strong hooks, smaller at tip.

♀: Subgenital plate indistinct, evenly and slightly convex. Internal genitalia and eggs very similar to *N. hermosa*. Minute difference is only in the shape of anterior inner angles of central sclerites.

Eggs regularly oval, extremely similar to *N. hermosa*. Differ in a slightly more expressed reticulation on both poles, especially at the lid.

Notes: Conspecificity of sexes is indicated by general shape and colouration, especially pale lateral sides of pronotum. It seems impossible to successfully distinguish *N. pallescens* from *N. hermosa* by the vaginal and egg structures, however, pale sides of pronotum in *N. pallescens* and a pale spot on the fore wings of *N. hermosa* as well as structures of extended penises separate them distinctly.

***Neoperla pallicornis* BANKS** (Figs. 10a, b).

- 1937 *Neoperla pallicornis* BANKS, Philipp. J. Sci., 63 (2) : 137.  
 1982 *Neoperla pallicornis* — ZWICK, Aquatic Insects, 4 (1) : 20.

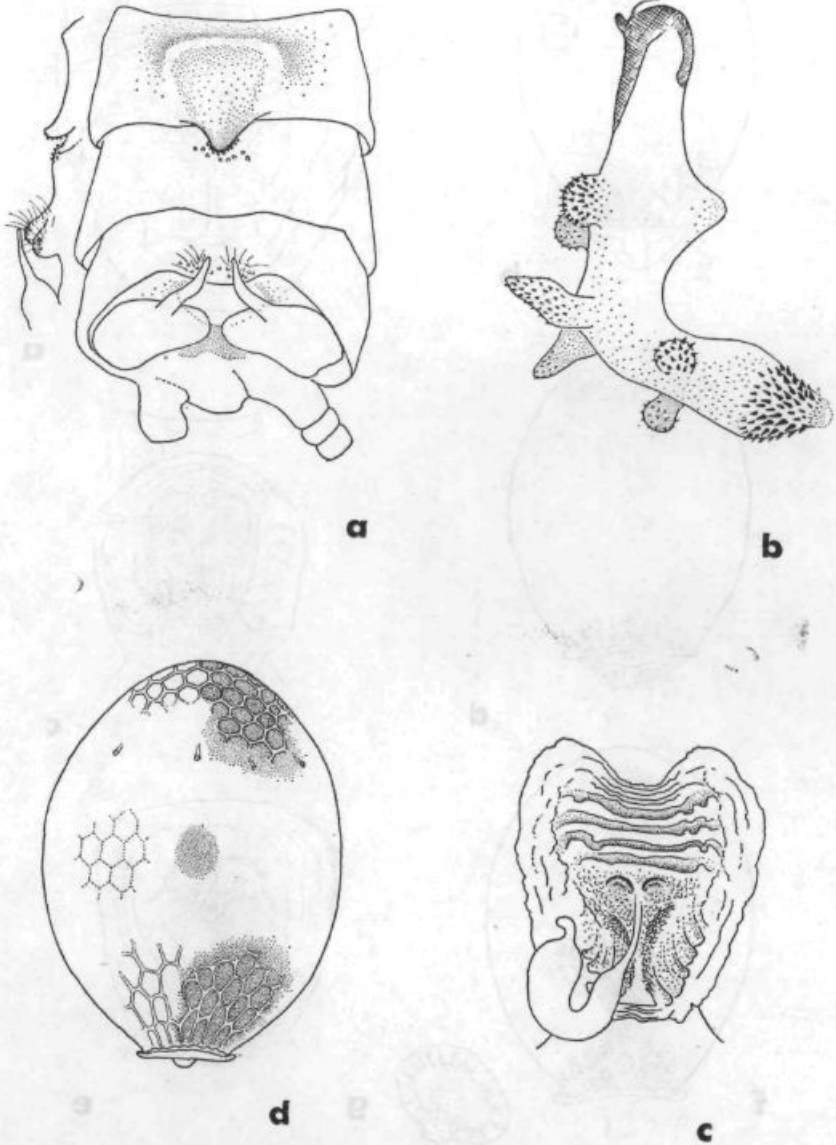


Fig. 9: *Neoperla pallescens* BANKS: Abdominal tip of ♂ (a), everted penis (b), vagina (c), egg (d).

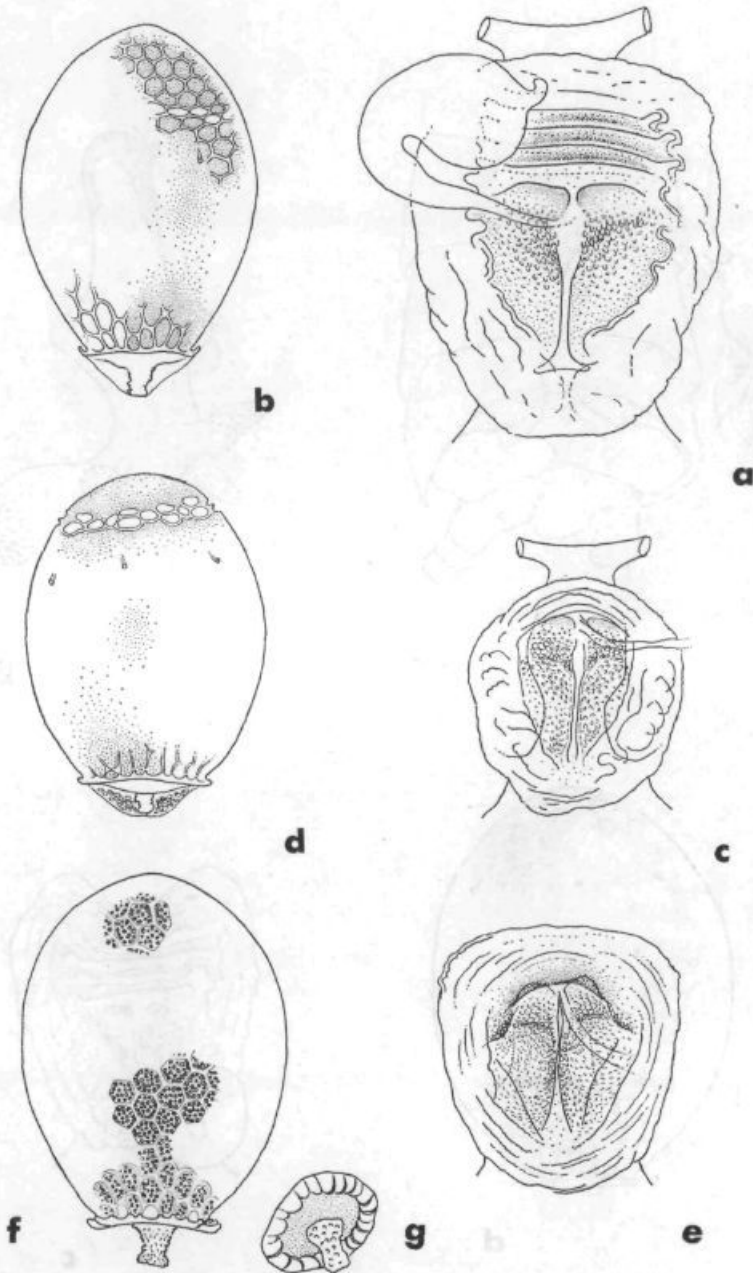


Fig. 10: *Neoperla pallicornis* BANKS: Vagina (a), egg (b); *N. spec. PH F*: Vagina (c), egg (d); *N. spec. PH G*: Vagina (e), egg (f, g).

Material studied: ♀ holotype, LUZON: Mt. Makiling (BAKER; MCZ Type 22104); 1 ♀ paratype, same locality (BAKER; MCZ Paratype 22104); Additional material: LUZON: 1 ♀, Los Baños, 3. II. 1925 (F. FOSECA; MCZ); 1 ♀, LEYTE: Burauen, 9. V. 1915 (BOETTGER; Coll. Ulmer, Eing. Nr. 6—63; ZMH); 1 ♀, SAMAR (BAKER; MCZ, det. ZWICK, 1979 as *N. oculata*); 1 ♀, LUZON: Mt. Montalban, Rizal, Wa-wa Dam, 150—200 m, 5. III. 1965 (H. M. TORREVILLAS; BPBM).

Pale ochre coloured. Wings 13 mm long. Head pale, ocelli of moderate size, 1—1.5 diameter apart, ocellar rings narrow except holotype.

♀: No external modifications. Vagina of the same general type with only a few regular folds in its upper part. Sclerites below, with larger smooth anterior inner angles, separated by a straight narrow line. Upper part of sclerites covered with stronger papillae, the rest only with a weak hexagonal mesh-like structure.

Eggs oval, size  $0.39 \times 0.25$  mm. Collar wide and narrow with a slightly flanged margin. Anchor pole convex with a large central knob on the smooth apical plate. A few elongate meshes formed by minute bare ribs at the collar and well expressed polygonal ones on the lid. Chorion of uniform thickness with fine irregular punctation except for a ring of bare polygons in the upper part above normal micropyles.

Notes: The species is redescribed with respect to a female holotype, however, the validity of this species remains uncertain. Male is unknown and conspecificity with other species known by male only is not completely excluded. Further studies could prove association to one of the males as already known. In his original description BANKS (1937) mentions two females only, however, four specimens are type labeled. 1 male (paratype) which he briefly discusses as to probable conspecificity belongs to *N. oculata*. Type series contain also misidentified specimen of female PH H.

#### *Neoperla* spec. PH F (Figs. 10 c, d).

Material studied: CEBU: 3 ♀♀, Camp 7, 25 km W Cebu City, 21.—29. IX. 1965, 400 m (D. DAVIS; USNM); MINDANAO: 1 ♀, Surigao (BAKER; MCZ); 1 ♀ Bukidnon prov., Tangcolan (BAKER; MCZ); Dansalan, 1 ♀, 12. II. 1915, 1 ♀, 23. II. 1915 (MCZ); Misamis Or., Dinawihan Gingoog, 26 km E of Gingoog City, 100—300 m, 1 ♀, 31. VII. 1965, 1 ♀, 15. VII. 1965, Malaise Trap (H. M. TORREVILLAS; BPBM); 1 ♀, Bukidnin, Malaybalay Alanib, 910 m, 25. X. 1959 (L. W. QUATE; BPBM); 1 ♀, Momungan, 10. VII. 1915 (BOETTGER; coll. Ulmer, ZMH).

Middle-sized ochre coloured species. Wings 13—14 mm long. Head pale, except for an indistinct spot in front of M line. Antennae, palpi and pronotum darker. Ocelli of moderate size, dark ringed, about one diameter apart.

♀: No external modifications. Internal structure practically identical with *N. pallicornis*.

Eggs plump oval, size  $0.36 \times 0.25$  mm. In general shape closely related to *N. pallicornis*. Reticular structure near the collar indistinct and absent at the lid. Chorion of uniform thickness, fine punctate, except a double row of bare polygons.

Notes: The species is not named because male is not known and conspecificity with other species known from male only cannot be excluded.

**Neoperla spec. PH G (Figs. 10e-g).**

Material studied: 1 ♀, MINDANAO, Surigao (BAKER; no. 16329; BANKS det. as *N. oculata* on red label).

Middle-sized, darker brown coloured species. Wings 12 mm long. Pronotum, antennae, palpi and legs darker than the head. Dark brown spot in front of M line. Ocelli of moderate size, one diameter apart, without ocellar rings.

♀: No external modifications. Vagina of the same type as in *N. pallicornis*. Upper part with one sclerotized transverse fold only.

Eggs plump oval, size  $0.37 \times 0.25$  mm. Collar present as a circular re-bent fold surrounding anchor pole with a fairly large nipple. Chorion roughly punctate. Regular polygonal punctures separated by narrow smooth ribs. Meshes are more irregular near the collar, some of the cells are smooth with ribs entering into the curved fold-like collar.

Notes: Two dark coloured species known from males only are both larger, with a different general shape and head pattern. It might prove to belong to the species with presently unknown males.

**Neoperla atripennis BANKS (Figs. 11a-d).**

1924 *Neoperla (Javanita) atripennis* BANKS, Bull. Mus. Comp. Zool., 65 : 428; Pl. 2, Fig. 21.

1958 *Neoperla atripennis* — JEWETT, Fieldiana Zool., 42 : 82; Fig. 20.

Material studied: ♂ lectotype, MINDANAO: Surigao (BAKER; no. 16324, MCZ Type 14807); 2 ♀♀ paralectotypes, same locality (BAKER; MCZ Type 14807); 1 ♀ paralectotype, MINDANAO: Bukidnon, Tangcolan (BAKER; MCZ Type 14807) (lectotypes here designated);

Additional material: MINDANAO: 3 ♂♂, 1 ♀, Surigao (BAKER; USNM); 2 ♂♂, Tomkulan, 15. and 18. VI. 1915 (BOETTGER; Coll. Ulmer, ZMH); 1 ♂, Misamis Or., Balason, 4.—5. IV. 1960 (W. TORREVILLAS; BPBM); 1 ♀, Agusan, Esperanza Bagugan, Matibog Creek, 7. XI. 1959, light trap (C. M. YOSHIMOTO; BPBM); 1 ♀, Misamis Occ., Mt. Malindang, 19. X. 1959 (C. M. YOSHIMOTO; BPBM); 1 ♀, Zamboanga del Norte, Manucan, 11 km SSE, 250 m, 13. X. 1959 (L. W. QUATE; BPBM); LEYTE: 1 ♂, Tigbao, 19. VIII. 1957 (BPBM).

Middle-sized darker brown coloured species. Wings of males 11 mm, of females 13 mm long. Antennae, palpi and pronotum dark brown. Head paler more laterally. Ocelli small, about two diameters apart, slightly more in females. Ocellar rings indistinct. Pronotum wider than long, strongly narrowed behind. Legs dark brown, bases of femora pale. Wings brown, venation dark brown.

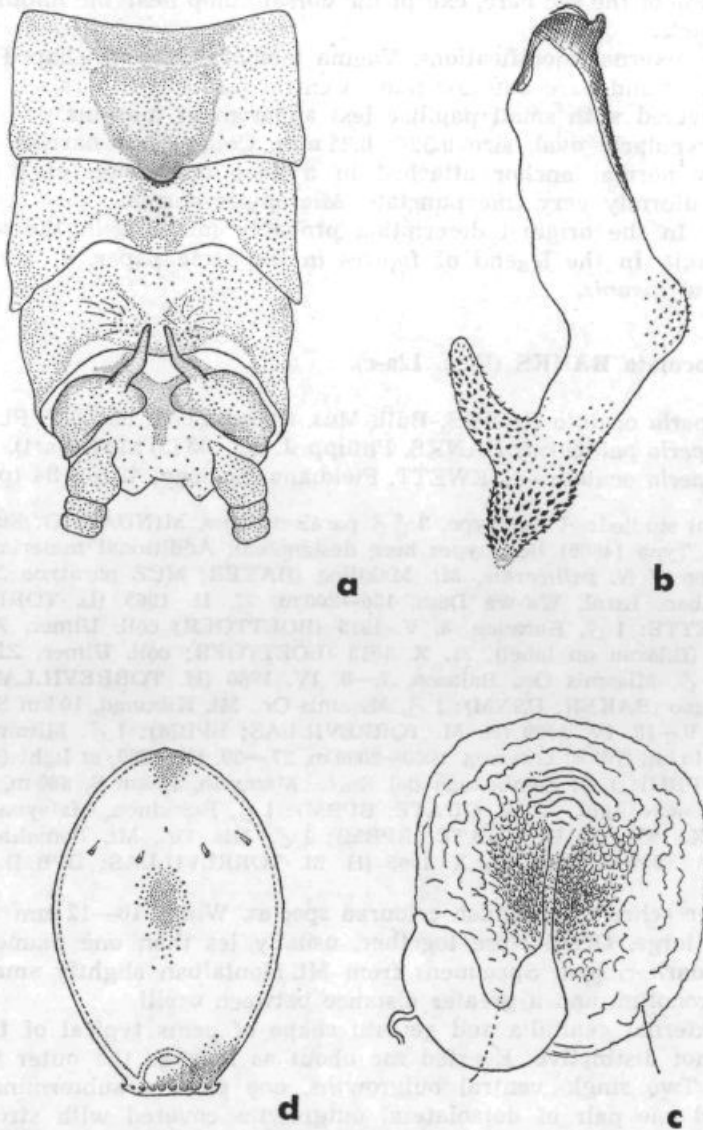


Fig. 11: *Neoperla atripennis* BANKS: Abdominal tip of ♂ (a), everted penis (b), vagina (c), egg (d).

♂: External genitalia and general shape of penis typical of the species complex. Everted sac simple, tubular bent ventrally. Single ventral subterminal finger-shaped spiny process of a variable length in different specimens. Stronger spines are to be observed also around the tip.

The base of the sac bare, except the dorsal hump near the middle, covered with spinulets.

♀: No external modifications. Vagina membranous, sac-shaped with few short parallel and bare anterior folds. Central part slightly raised in a cone, densely covered with small papillae less apparent at margins.

Eggs regularly oval, size  $0.32 \times 0.22$  mm. Collar as a narrow bare ring. Apparently normal anchor attached in a deep depression of the chorion. Chorion uniformly very fine punctate. Micropyles normal.

Notes: In the original description probably misprint in the spelling of *N. atropennis*. In the legend of figures in the same paper, as well as type labels, *N. atripennis*.

### *Neoperla oculata* BANKS (Figs. 12a-c).

1924 *Neoperla oculata* BANKS, Bull. Mus. Comp. Zool., 65 : 428, Pl. 2, fig. 16.

1937 *Neoperla pallicornis* BANKS, Philipp. J. Sci., 63 (2) : 137 (part).

1958 *Neoperla oculata* — JEWETT, Fieldiana, Zoology, 42 (6) : 84 (part).

Material studied: ♂ lectotype, 3 ♂ ♂ paralectotypes, MINDANAO: Surigao (BAKER; MCZ Type 14808) (lectotypes here designated). Additional material: LUZON: 1 ♂ paratype of *N. pallicornis*, Mt. Makiling (BAKER; MCZ paratype 22104); 1 ♂, Mt. Montalban, Rizal, Wa-wa Dam, 150—200 m, 27. II. 1965 (L. TORREVILLAS; BPBM); LEYTE: 1 ♂, Burauen, 3. V. 1915 (BOETTGER; coll. Ulmer, ZMH); 1 ♂, BILIRAN? (Bilaran on label), 21. X. 1915 (BOETTGER; coll. Ulmer, ZMH); MIN: DANAŌ: 1 ♂, Misamis Or., Balason, 7.—8. IV. 1960 (H. TORREVILLAS; BPBM); 3 ♂ ♂, Surigao (BAKER; USNM); 1 ♂, Misamis Or., Mt. Kibungd, 10 km SE Gingoog, 700—800 m, 9.—18. IV. 1960 (H. M. TORREVILLAS; BPBM); 1 ♂, Misamis Or., Mt. Balatukan, 15 km SW of Gingoog, 1000—2000 m, 27.—30. IV. 1960, at light (H. TORREVILLAS; BPBM); 1 ♂, Zamboanga del Norte, Manucan, 15 km S, 680 m, 14.—15. X. 1959, at kerosene light (L. W. QUATE; BPBM); 1 ♂, Bukidnon, Malaybalay Alanib, 910 m, 25. X. 1959 (L. W. QUATE; BPBM); 1 ♂, Mis. Or., Mt. Pomalihi 21 km W Gingoog City, 800—1000 m, 17. X. 1965 (H. M. TORREVILLAS; BPBM).

Smaller ochre to brownish coloured species. Wings 10—12 mm long. Eyes and ocelli large. Ocelli close together, usually less than one diameter apart, distinctly dark ringed. Specimens from Mt. Montalban slightly smaller, with a wider pronotum and a greater distance between ocelli.

♂: External genitalia and general shape of penis typical of the species complex, not distinctive. Everted sac about as long as the outer tube, bent ventrally. Two single ventral outgrowths, one pair of subterminal ventrolateral and one pair of dorsolateral outgrowths covered with strong hooks. The rest of the sac covered with very fine spicules. Specimens from Luzon slightly differ in the size and armature of ventral outgrowths, the presence of a subterminal small dorsoventral field of stronger spines and in the lack of paired lateral humps near the middle (see Fig. 12c).

♀: Not known.

Notes: An apparently quite variable species. Type series of *N. oculata* include also misidentified male specimen of *N. pallescens* from Davao. The paratype male of *N. pallicornis* is misidentified and belongs to *N. oculata*.



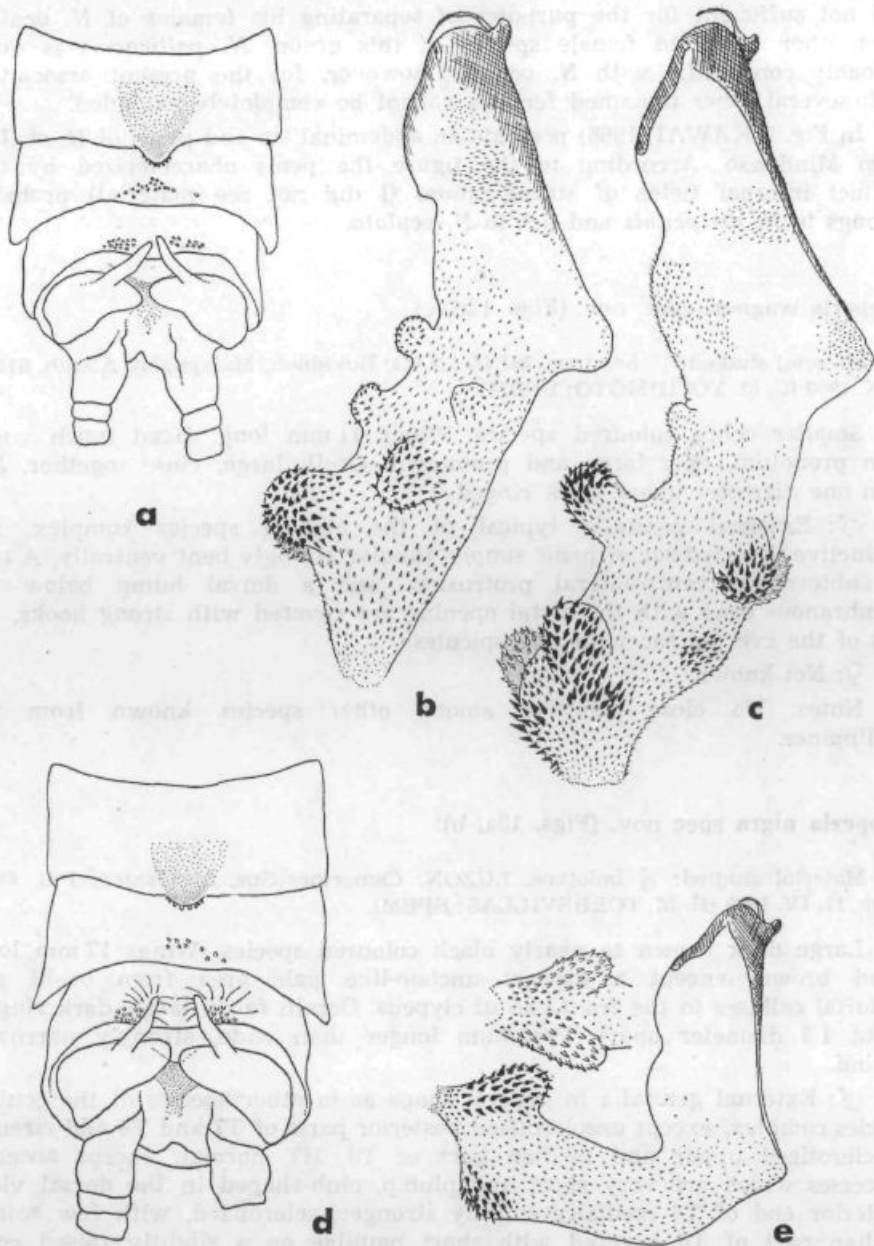


Fig. 12: *Neoperla oculata* BANKS: Abdominal tip of ♂ (a), everted penis: typical form (b), variation from Rizal (c); *Neoperla wagneri* spec. nov.: Abdominal tip of ♂ (d), everted penis (e).

JEWETT's characters of *N. oculata* females (JEWETT, 1958) are very dubious and not sufficient for the purposes of separating his females of *N. oculata* from other unnamed female species of this group. *N. pallicornis* is quite probably conspecific with *N. oculata*, however, for the present association with several other unnamed females cannot be completely excluded.

In Fig. 9 KAWAI (1968) presents an abdominal tip and penis of *N. oculata* from Mindanao. According to the figure the penis characterized by two distinct internal fields of strong spines (I did not see material) probably belongs to *N. atripennis* and not to *N. oculata*.

***Neoperla wagneri* spec. nov.** (Figs. 12d, e).

Material studied: ♂ holotype, MINDANAO: Bukidnon, Malaybalay Alanib, 910 m, 25. X. 1959 (C. M. YOSHIMOTO; BPBM).

Smaller ochre coloured species. Wings 11 mm long. Head much wider than pronotum, eyes large and prominent. Ocelli large, close together, less than one diameter apart, dark ringed.

♂: External genitalia typical of the *oculata* species complex, not distinctive. Everted sac of penis simple, tubular strongly bent ventrally. A pair of subterminal ventrolateral protrusions and a dorsal hump below the membranous cone with the distal opening are covered with strong hooks, the rest of the everted sac with fine spicules.

♀: Not known.

Notes: No close relatives among other species known from the Philippines.

***Neoperla nigra* spec. nov.** (Figs. 13a, b).

Material studied: ♂ holotype, LUZON: Camarines Sur, Mt. Isarog, Pili, 600—800 m, 11. IV. 1965 (H. M. TORREVILLAS; BPBM).

Large dark brown to nearly black coloured species. Wings 17 mm long. Head brown, except a distinct anchor-like pale area from ocelli and tentorial calluses to the front end of clypeus. Ocelli fairly large, dark ringed, about 1.5 diameter apart. Pronotum longer than wide, strongly narrowed behind.

♂: External genitalia in general shape as in other species of the *oculata* species complex, except unsclerotized posterior parts of T7 and T8 and circular unsclerotized upper and median part of T9. HT normal, except anterior processes which are very short and plump, club-shaped in the dorsal view. Posterior end of T6 medially slightly stronger, sclerotized, with few spines. Median part of T8 covered with short papillae on a slightly raised cone. Penis small. Everted sac short and plump, with a pair of bare dorsolateral large protrusions and a single dorsal outgrowth near the end of the dorsal sclerite, covered with fine spicules. Most of the plump and slightly conical

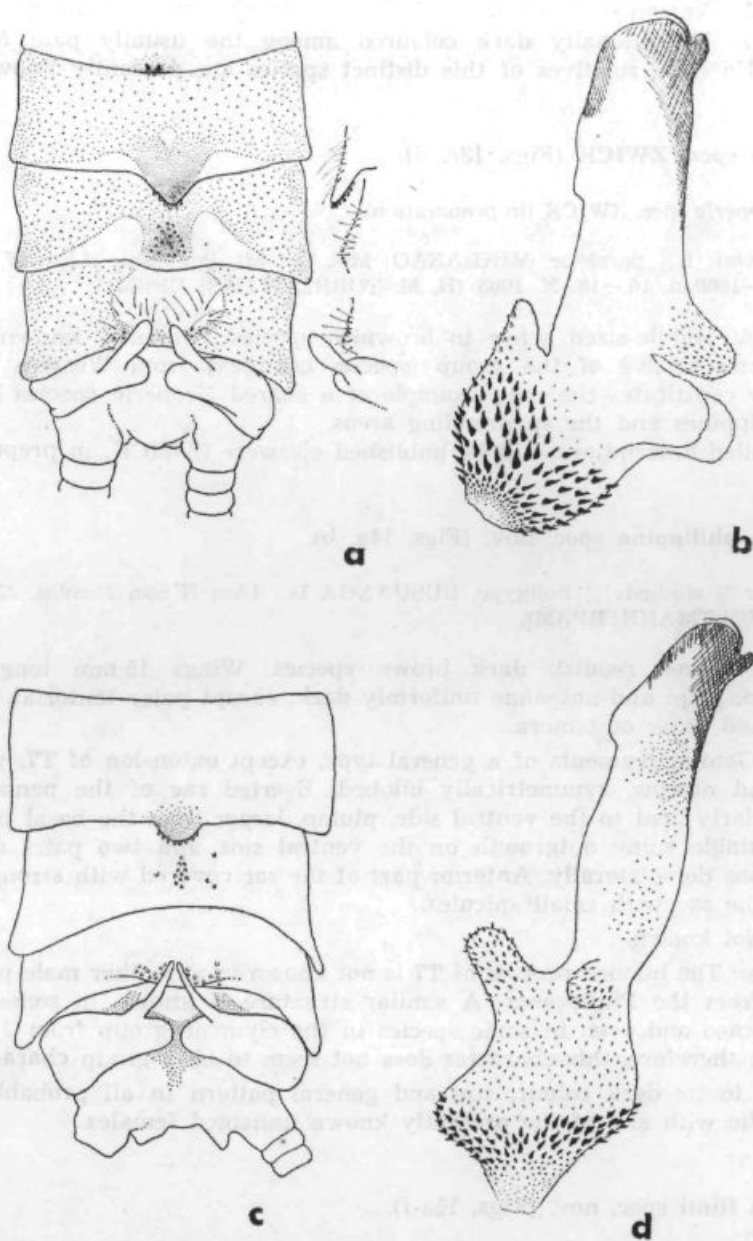


Fig. 13: *Neoperla nigra* spec. nov.: Abdominal tip of ♂ (a), everted penis (b); *Neoperla* spec. ZWICK: Abdominal tip of ♂ (c), everted penis (d).

anterior part of the sac covered with strong hooks, ventrally projecting backwards, parallelly to the base of the penis.

♀: Not known.

Notes: Exceptionally dark coloured among the usually pale *Neoperla* species. No close relatives of this distinct species are presently known.

***Neoperla spec.* ZWICK** (Figs. 13c, d).

1983 *Neoperla spec.* ZWICK (in preparation)

Material: 1 ♂ paratype, MINDANAO: Mis. Or., Mt. Pomalihi, 21 km W Gingoog City, 800—1000 m, 16.—18. X. 1965 (H. M. TORREVILLAS; BPBM).

Notes: Middle-sized ochre to brownish species. Presently known as the only representative of the group (species complex) from Western Borneo. Presently constitutes the only example of a shared *Neoperla* species between the Philippines and the surrounding areas.

Detailed descriptions will be published elsewhere (ZWICK, in preparation).

***Neoperla philippina* spec. nov.** (Figs. 14a, b).

Material studied: ♂ holotype, BUSUANGA Is.: 4 km N San Nicolas, 23.—24. V. 1962 (H. HOLTSMANN; BPBM).

Middle-sized reddish dark brown species. Wings 15 mm long. Head, pronotum, palpi and antennae uniformly dark, except paler tentorial calluses, M line and bases of femora.

♂: Genital segments of a general type, except extension of T7, which is small and narrow, symmetrically bilobed. Everted sac of the penis nearly rectangularly bent to the ventral side, plump, larger than the basal part. Sac with a single spiny outgrowth on the ventral side and two pairs of spiny protrusions dorsolaterally. Anterior part of the sac covered with strong hooks, rest of the sac with small spicules.

♀: Not known.

Notes: The bilobed process of T7 is not known in any other male presently known from the Philippines. A similar structure is known in some species from Borneo and even in some species in the clymene group from Java and Sumatra, therefore, this character does not seem to be a group characteristic.

Due to its dark colour, size and general pattern in all probability not conspecific with any of the presently known unnamed females.

***Neoperla flinti* spec. nov.** (Figs. 15a-f).

1937 *Neoperla apoana* BANKS, Philipp. J. Sci., 63 (2) : 136 (part).

1958 *Neoperla oculata* — JEWETT, Fieldiana, Zoology, 42 (6) : 84 (part).

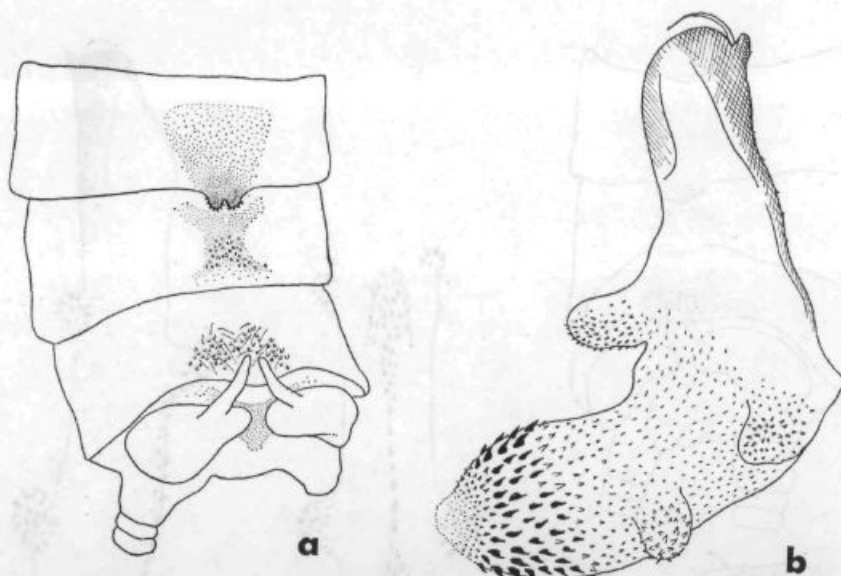


Fig. 14: *Neoperla philippina* spec. nov.: Abdominal tip of ♂ (a), everted penis (b).

Material studied: ♂ holotype, MINDANAO: Baclayan, Mt. Apo, 1650 m, 13.—15. XI. 1965 (D. DAVIS; USNM); 2 ♀♀ paratypes, MINDANAO: Mt. Apo, Galog Riv., 6000 ft., 18. X. and 23. X. (C. F. CLAGG; MCZ paratype of *N. apoana*, no 22102, misidentified); 1 ♀ paratype, MINDANAO: Lanao, Butig Mts. 4—6 km NE of Butig, 900 m, 19.—21. VI. 1958, in jungle (H. E. MILLIRON; BPBM); 2 ♀♀ paratypes, MINDANAO: Bukidnon, Mt. Katanglad, 1480 m, 27.—31. X. 1959 (L. W. QUATE; BPBM); 3 ♀♀ paratypes, MINDANAO: Misamis Or., Minalwang, 1050 m, 24. III.—IV. 1961, at light (H. TORREVILLAS; BPBM); 1 ♀ paratype, LUZON: Mt. Makiling BAKER; USNM, JEWETT det. 1956: *N. obliqua* BANKS).

Large ochre brownish coloured species. Wings of males 18 mm, of female 19—22 mm long. Fore wings infusate along venation, more distinct at anastomosis. Ocelli large, dark ringed, about one diameter apart. Pronotum slightly sculptured, narrowed behind. Tibiae darker at the base.

♂: Generally similar to other males of the *oculata* species complex, except the penis. Everted sac long and tubular, with two pairs of dorsolateral spiny outgrowths and a single ventral protrusion covered with stronger spines. Subterminal ring of strong hooks is ventrally extended to the spiny process in a single line of strong hooks. The rest of the sac covered with minute spicules.

♀: No external modifications. Vagina sac-shaped, membranous, with many peripheral folds, most of them transparent and hard to see. Central part as a slightly raised cone, densely covered with scaly sclerotizations ending in fine spicules. Irregular sclerotized spots occur around the central part amidst the soft folds.

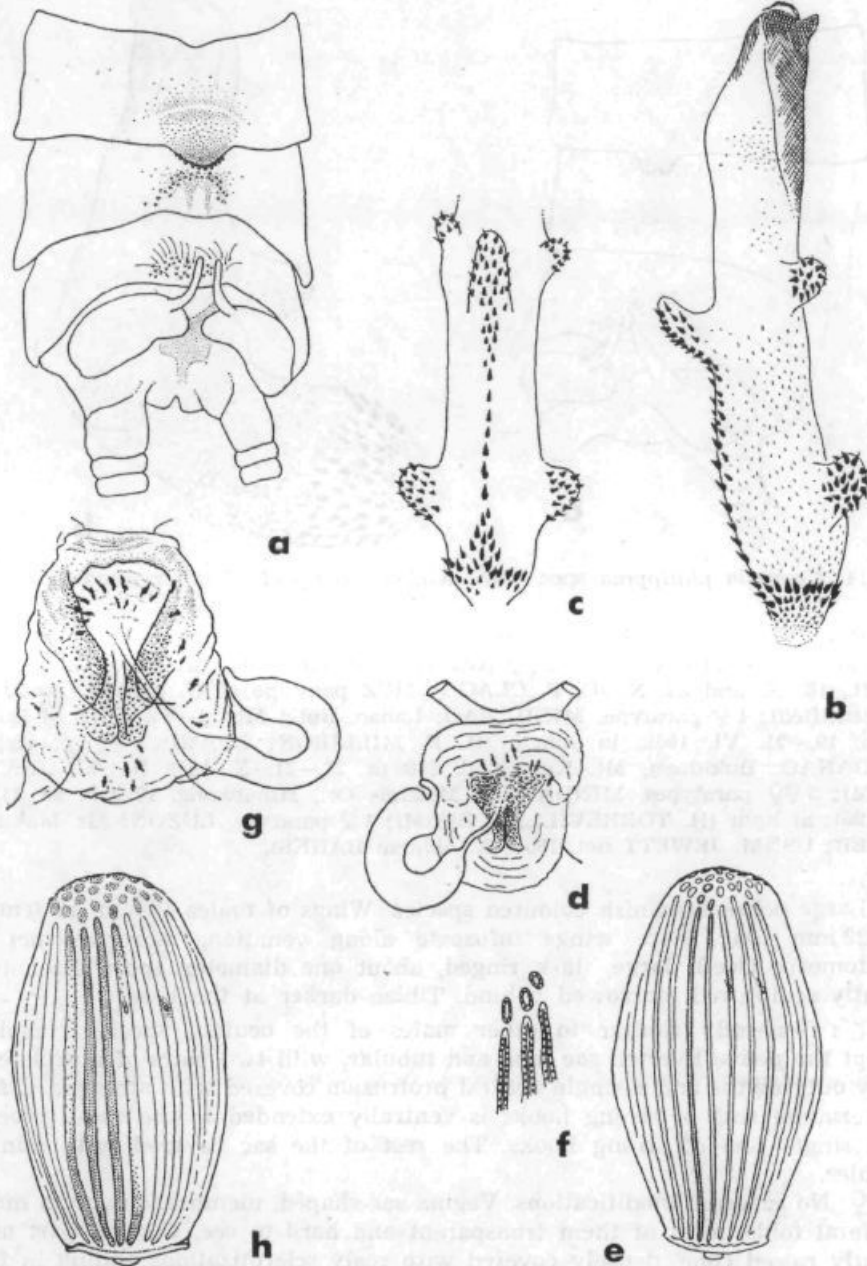


Fig. 15: *Neoperla flinti* spec. nov.: Abdominal tip of ♂ (a), everted penis (b, c), vagina (d), egg (e, f); *N. spec. PH H*: Vagina (g), egg (h).

Eggs oval approximately 0.36 mm long. Collar only as a narrow seam around the flat anchor pole with a small central knob on the smooth apical plate. Approx. 10 straight, smooth wide ribs visible in side view, sulci between these narrow, with two lines of fine punctation. Micropyles singly in sulci, closer to the reticulate lid.

Notes: Misidentified in past due to general similarity, size and common occurrence with *N. obliqua*. However, it is easy to distinguish *N. flinti* from all other Philippine species by a distinct pattern on fore wings. This pattern was used for association of sexes.

### *Neoperla* spec. PH H (Figs. 15g, h)

1937 *Neoperla pallicornis* BANKS, Philipp. J. Sci., 63 (2) : 137 (part).

Material studied: 1 ♀, LUZON: Mt. Makiling (BAKER; MCZ paratype 22104 of *N. pallicornis* misidentified by BANKS); 1 ♀, same data (BAKER; MCZ) 1 ♀, LUZON: Los Baños, 19.—20. IX. 1959, light trap (L. QUATE & C. YOSHIMOTO; BPBM); 1 ♀, MINDANAO: Agusan, S. Francisco 10 km SE, 12. XI. 1959 (L. W. QUATE; BPBM).

Middle-sized ochre coloured species. Wings 13—14 mm long. Ocelli of moderate size, dark ringed, about two diameters apart. Distal part of femora and proximal part of tibiae slightly darkened.

♀: No external modifications. Vagina and egg very similar to *N. flinti*. A slight difference is in a more elongate and less regular oval egg with a flat lid, a wider collar and wider sulci with several lines of punctation and not only two as in *N. flinti*.

Notes: The present species is very closely related to *N. flinti*, however, much smaller size, different general shape and colouration, especially the lack of wing pattern, as well as different eggs distinctly separate these two species.

### I.1.3. The variegata species complex\*

#### *Neoperla dentata* spec. nov. (Figs. 16a-h).

Material studied: ♂ holotype, BUSUANGA Is.: 4 km N San Nicolas, 28. V. 1962 (M. THOMPSON; BPBM); 1 ♀ paratype, same locality, 24. V. 1962 (H. HOLTSMANN; BPBM); PALAWAN: 2 ♂♂, 1 ♀ paratypes, Litso, Amoyan Ck 57 km N Puerto Princessa, 10. XII. 1965, 10 m (D. DAVIS; USNM); 1 ♂, 1 ♀ paratypes, Macagua R. 12 km SW Brooke's Pt., 20. XII. 1965 (D. R. DAVIS; USNM).

Small pale ochre coloured species. Wings of males 10 mm, of females 11—13 mm long. Ocelli fairly large, slightly more than one diameter apart,

\* See detail description of the variegata species complex in ZWICK, 1983 b.

nearly two diameters apart in specimens from Palawan. Wings pale with darker venation.

♂: External genitalia and general shape of penis not different from other representatives of the *oculata* species complex. Everted sac long, tubular and straight except the apical part which is bent dorsally and tapering. A pair of dorsolateral humps are covered with stronger spinules. The subterminal ventral hump bears a large hooks arranged in a rosette continuing in a single ventral line of strong hooks decreasing toward the middle of the everted penis. Ventral side of tapering apex with a line of smaller long and slender spines in front of the rosette. The rest of the everted sac covered with minute spicules.

♀: S8 projecting in a short, slightly sclerotized bilobed subgenital plate. Vagina soft and membranous with a large and strong sclerotized central part of complicated structure as seen in Fig. 16f.

Eggs regularly oval, size  $0.35 \times 0.22$  mm. Well developed collar with re-bent fine screen covering the base of the egg. Sclerotized central knob on the apical plate is inside the collar. Chorion covered with narrow straight ribs forming a reticular structure at the lid. Regular lines of fine punctation are observed laterally, and a more or less irregular stonger punctation in the middle of wide sulci separated by smaller ribs. Micropyles simple in the middle of sulci.

Notes: Association of sexes initially relied on repeated common occurrence, identical general shape and colouration. General shape of penis and arrangement of major spines somewhat resemble the species of the *variegata* species complex from Borneo (ZWICK, 1983b). Similarity can also be established in the shape of the vagina, but eggs are completely different and do not fit into the general description of the *variegata* species complex proposed by ZWICK. Presently the only representative of this species complex in the Philippines.

## I.2. Species incertae sedis

### *Neoperla agusani* spec. nov. (Figs. 16i, j).

Material studied: ♂ holotype, MINDANAO: Agusan, Los Acros, 20.—21. X. 1959, light trap (L. QUATE & C. YOSHIMOTO; BPBM); 1 ♂ paratype, MINDANAO: Surigao (BAKER; no. 16328; USNM).

Middle-sized brownish coloured species. Wings 11—11.5 mm long. Eyes and ocelli large. Ocelli distinctly dark ringed, more than one diameter apart. Pronotum wider than long, slightly narrowed behind.

♂: T7 with triangular sclerite ending in a blunt lappet beset with spicules. Circular patch of spicules on a slightly raised cone in the middle of a distinct median sclerite of T8. T9 with usual paramedian swellings. HT normal, anterior processes long, bent near middle, distally parallel. Everted



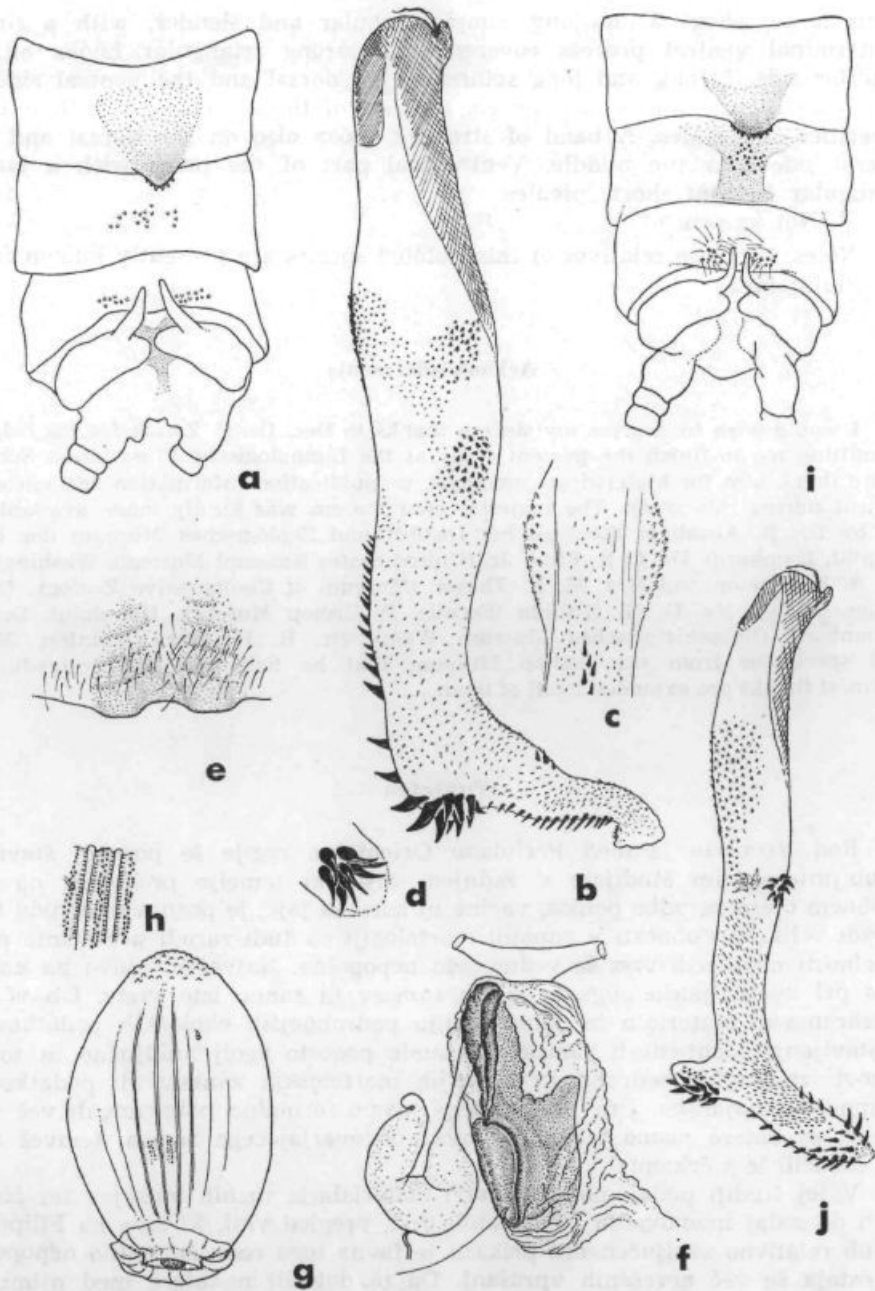


Fig. 16: *Neoperla dentata* spec. nov.: Abdominal tip of ♂ (a), everted penis (b, c, d), female subgenital plate (e), vagina (f), egg (g, h); *Neoperla agusani* spec. nov.: Abdominal tip of ♂ (i), everted penis (j).

penis large, about 3 mm long, simple, tubular and slender, with a single subterminal ventral process covered with strong triangular hooks on its anterior side. Strong and long spines on the dorsal and the ventral side of the apex, shorter spines in between, the rest of the sac covered with minute asperities and scales. A band of stronger hooks also on the dorsal and the lateral side near the middle. Ventrobasal part of the penis with a larger triangular field of short spicules.

♀: Not known.

Notes: No close relatives of this isolated species are presently known from the Philippines.

#### Acknowledgements

I would wish to express my sincere thanks to Doc. Dr. P. Zwick for his help in permitting me to finish the present study at the Limnologische Flusstation Schlitz. I also thank him for his critical comments, prepublication information and encouragement during this study. The material used therein was kindly made available to me by Dr. R. Abraham (Zoologisches Institut und Zoologisches Museum der Universität, Hamburg), Dr. O. S. Flint, Jr. (United States National Museum, Washington), Dr. A. F. Newton and Mrs. M. K. Thayer (Museum of Comparative Zoology, Cambridge, Mass.), Mr. G. N. Nishida (Bernice P. Bishop Museum, Honolulu), Dr. A. Kaltenbach (Naturhistorisches Museum Wien), Dr. B. P. Stark (Clinton, Mass. sent specimens from the Bishop Museum that he had initially received). My warmest thanks are extended to all of them.

#### Povzetek

Rod *Neoperla* je med Perlidami Orientalne regije še posebej številen, kljub intenzivnim študijam v zadnjem času, ki temelje predvsem na podrobnem opisu zgradbe penisa, vagine in horiona jajc, je poznavanje rodu tudi zaradi velike podobnosti v zunanji morfologiji pa tudi zaradi precejšnje polimorfnosti nekaterih vrst še vedno zelo nepopolno. Največje težave pa nastopijo pri ugotavljanju odgovarjajočih samcev in samic iste vrste. Ob včasih preskromnem materialu in pomanjkanju podrobnejših ekoloških podatkov je ugotavljanje identičnosti samcev in samic pogosto zgolj naključno in to na osnovi izrazitejših podrobnosti zunanjih morfoloških znakov ali podatkov o skupnem nahajališču. Prav zaradi tega nismo formalno poimenovali več vrst samic, za katere nismo mogli ugotoviti odgovarjajočega samca, temveč smo jih označili le s črkami.

V tej študiji podajamo, na osnovi materiala iz raznih muzejev ter študij vseh do sedaj imenovanih in opisanih vrst, pregled vrst, ki žive na Filipinih. Kljub relativno zaključenemu prikazu je favna tega rodu še vedno nepopolna in ostaja še več nerešenih vprašanj. Da bi določili nekatere med njimi, bi potrebovali obsežnejši in boljše ohranjen material. Zaradi vse obsežnejše polucije in poseganja v naravno okolje so nekatere vrste mogoče že celo izumrle, če lahko to sklepamo na osnovi podatkov in muzejskega materiala.

Rod *Neoperla* je prav tako kot na Javi, Sumatri in Borneu tudi na Filipinih številčnejši kot so prvotno pričakovali za to področje (ILLIES, 1966). Čeprav so nekatere vrste zelo polimorfne, je raznolikost vrst precej skromnejša, iz česar lahko sklepamo, da je naselitvena pot tekla iz Bornea na Filipine in ne v obratni smeri. Pri sistematskem razvrščanju izredno obsežnega rodu *Neoperla* smo uporabili začasno klasifikacijo v grupe, podgrupe in komplekse vrst (ZWICK, 1983a, b).

Skoraj ves material, ki smo si ga izposodili v različnih muzejih, je bil suh, sprepariran na entomoloških iglah. Delo s takšnim materialom je dosti bolj zamudno in zapleteno kot s svežim in v alkoholu fiksiranim materialom, saj je determinacija po suhem materialu nemogoča.

Pri študiju moških spolnih organov in predvsem penisa smo uporabili hladno maceracijsko tehniko po ZWICK-u, 1983a, ki daje najboljše rezultate, saj je za natančno determinacijo potrebno popolno izvihanje membranskega dela penisa, ki ima značilno nameščene močnejše hitinaste kavlje in zobce. Samice smo najprej navlažili, da smo odstranili jajca in šele potem tretirali genitalne segmente z vročim KOH.

Genitalije in jajca smo shranili v glicerinu v miniaturnih mikroeprevetkah z gumijastim zamaškom ali pa smo jih vklopili v Kanada balzam na celuloidnih ploščicah, oboje pa smo praviloma pritrdili na iglo skupaj z osebkom.

Za boljše razumevanje razprostranjenosti vrst podajamo orientacijski zemljevid Filipinskega otočja (Slika 1.) z označenimi najpomembnejšimi nahajališči.

Določevalni ključ zajema tako imenovane vrste kot tudi neimenovane samice, začasno označene le s črkami (le za adultne štadije). Najpomembnejši znaki so na osnovi zgradbe genitalnega aparata in le izjemoma so kot dopolnilo upoštevani tudi zunanji morfološki znaki, na osnovi katerih so narejeni nekateri stari ključi, čeprav je zunanja podobnost v celotnem rodu *Neoperla* izredno velika in povsem neustrezna za uspešno ločevanje na nivoju vrste.

Vsi predstavniki filipinskega rodu *Neoperla* spadajo v grupo montivaga. Le položaj vrste *Neoperla agusani* spec. nov. je v okviru montivaga grupe trenutno nejasen. Vse ostale vrste spadajo v podgrupo *recta* s tremi kompleksi vrst: *recta* kompleks vrst, *oculata* kompleks vrst in *variegata* kompleks vrst.

*Neoperla dentata* spec. nov. je edini predstavnik *variegata* kompleksa vrst, ki ima več predstavnikov na Borneu. Vrsta s Filipinov ima zelo podobno zgradbo penisa kot vrsta z Bornea, ne ustreza pa povsem opisu kompleksa vrst (ZWICK, 1983b), zlasti pri strukturi jajc.

Predstavniki *recta* kompleksa vrst ni na Borneu, Javi in Sumatri, nastopajo pa na Formozi, Japonski in južni Kitajski.

*Neoperla recta* BANKS je ena najpogostejših in najbolj variabilnih vrst (zlasti samci), mogoče predstavlja celo kompleks več zelo sorodnih vrst. *Neoperla viscayana* BANKS in *Neoperla incerta* KLAPÁLEK sta nova sinonima vrste *N. recta* BANKS.

*Neoperla pseudorecta* spec. nov., *Neoperla zwicki* spec. nov. in *Neoperla nishidai* spec. nov. so novo opisane vrste in do sedaj za to območje niso bile

poznane. Z *Neoperla* spec. PH A, *N. spec. PH B*, *N. spec. PH C* in *N. spec. PH D* smo označili različne vrste samic, za katere ne vemo, če spadajo h kateremu od že imenovanih vrst, pri katerih poznamo le samca, ali pa so še dodatne nove vrste, za katere samcev še ne poznamo.

*Oculata* kompleks vrst je najštevilneje zastopan na Filipinih, več ozko sorodnih vrst pa najdemo tudi na Borneu, medtem ko je *Neoperla spec. ZWICK* edina vrsta, ki poleg Filipinov naseljuje tudi Borneo.

*Neoperla obliqua* BANKS je tudi ena pogostejših vrst. Pri študiju tipske serije smo ugotovili prisotnost več različnih vrst. *Neoperla apoana* BANKS je nov sinonim za vrsto *N. obliqua* BANKS. *Neoperla jewetti* spec. nov. je ozko sorodna vrsta, ki se od prejšnje jasno loči po zgradbi genitalnih organov. *Neoperla spec. PH E* je mogoče samica vrste *N. jewetti*, vendar to trenutno ni mogoče ugotoviti.

*Neoperla hermosa* BANKS in *Neoperla pallescens* BANKS sta prav tako zelo sorodni vrsti, pri katerih do sedaj ni bil poznan samec vrste *N. pallescens* BANKS.

*Neoperla pallicornis* BANKS je opisana po samici, vendar skoraj gotovo spada k eni od že imenovanih vrst, znanih le po samcu, čeprav tega trenutno ne moremo točno ugotoviti. Po vsej verjetnosti je samica vrste *N. oculata* BANKS.

*Neoperla spec. PH F* in *Neoperla spec. PH G* sta neimenovani samici. Za vrsti *Neoperla atripennis* BANKS in *Neoperla oculata* BANKS podajamo prav tako podrobnejše opise.

*Neoperla wagneri* spec. nov., *Neoperla nigra* spec. nov., *Neoperla philippina* spec. nov. in *Neoperla flinti* spec. nov. so novo opisane vrste. Nekatere med njimi so temno obravnane, kar je razmeroma neobičajno za sicer svetlo rumenkasto okrasto obarvane vrste rodu *Neoperla*.

*Neoperla spec. PH H* je zelo sorodna vrsti *Neoperla flinti* spec. nov., saj se ločita le v podrobnostih strukture horiona jajc.

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