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On an extant species of the genus *Neocyprideis* APOSTOLESCU from Java (Indonesia), with the description of the appendages (Crustacea, Ostracoda)

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Abstract

In newly acquired marine material from Java (Indonesia) living specimens of a species of the genus *Neocyprideis* APOSTOLESCU were recovered for the first time. The male and female appendages are described and figured. Comparison of the morphology of the copulatory appendage, with other members of the subfamily, shows that the genus *Neocyprideis* takes a somewhat unexpected position in the Cytherideidinae. The affinities with other genera and the taxonomic uncertainties in the subfamily are discussed.

Key-words: Ostracoda, taxonomy, Indonesia.

Introduction

The genus *Neocyprideis* APOSTOLESCU, 1956 occurs since the Upper Cenomanian (GERRY & ROSENFELD, 1973, COLIN *et al.*, 1990), but it really started to diversify during the Palaeogene. It was believed that the genus *Neocyprideis* had no recent representatives. The discovery, however, of valves of *Cyprideis* sp. (= *Neocyprideis*) by CARBONEL *et al.* (1985) in the delta of the river Mahakam in Indonesia, of *Neocyprideis* sp. by MONTENEGRO *et al.* (2004) in the Mae Khlong river mouth in Thailand, and of living specimens of *Neocyprideis agilis* in mud flat sediments from Java (present paper) shows that there is at least one extant species of this ancient genus. The newly acquired material from Java made it possible to describe and figure the male and female appendages of a *Neocyprideis* species. The species was identified as *N. agilis* (GUAN, 1978), originally described from Miocene and Pliocene deposits in China, because of the striking similarities of this species with the material from Java.

Taxonomic account

Superfamily Cytheroidea Baird, 1850
Family Cytherideidae Sars, 1925
Subfamily Cytherideidinae Sars, 1925

Genus *Neocyprideis* APOSTOLESCU, 1956
Type species: *Cyprideis (Neocyprideis) durocortoriensis* APOSTOLESCU 1956 (by original designation).

Neocyprideis agilis (GUAN, 1978)
(Pl. 1, figs 1-9, Pl. 2, figs 1-6, Pl. 3, figs 1-15)

SYNONYMY

1978 *Cytheridea agilis* – GUAN, Paleontological Atlas of Central and South China, 4 : 239-240, figs 12-14.
1985 *Cyprideis* sp. – CARBONEL, HOIBIAN & MOYES, Zone deltaïque de la Mahakam, pl. 3, figs 1-2.
2004 *Neocyprideis* sp. 1 – MONTENEGRO, PUGLIESE & SCIUTO, Mae Khlong river mouth, pl. 2, fig. 1.

MATERIAL

Two males, two females and one juvenile with valves stored dry and soft parts preserved in glycerine preparations (O.C 2905-2909) and three empty carapaces (O.C. 2910-2912).

LOCALITY

Java, Surabaya, Pantai Kenjeran, mud flat, leg.: F. FIERS, 27 November 1986 (station 86-95).

DESCRIPTION

Large, slightly transparant valves (Pl. 1, figs 1, 2; Pl. 3, figs 1-6). Dorsal margin strongly convex, with distinct posterior cardinal angle, particularly in the left valve; anterior margin broadly rounded, posterior margin obliquely rounded; ventral margin straight in the right valve, and slightly convex in the left valve. Left valves markedly larger than right ones (Pl. 3, figs 5, 6). Valve surface with widely spaced shallow pits, mostly in the central region. Male carapace (Pl. 3, figs. 11, 12) with convex lateral margins, rather blunt extremities and largest width situated in the middle. In female carapaces (Pl. 3, fig. 10) the largest width is situtated behind the middle. Anterior, posterior and ventral margin set with striped lamellar chitinous selvage [comparable with a homologous structure in *Cyprideis pacifica* HARTMANN, 1957, *Haplocytheridea setipunctata* (BRADY, 1869) and *Bishopina vangoethemi* WOUTERS, 1981]. This lamellar structure is clearly visible on Pl. 3, figs 7 and 8. Left valve overlapping right one in ventral view (Pl. 3, fig. 12). Anterior and posterior vestibulum absent. Marginal pore canals simple and

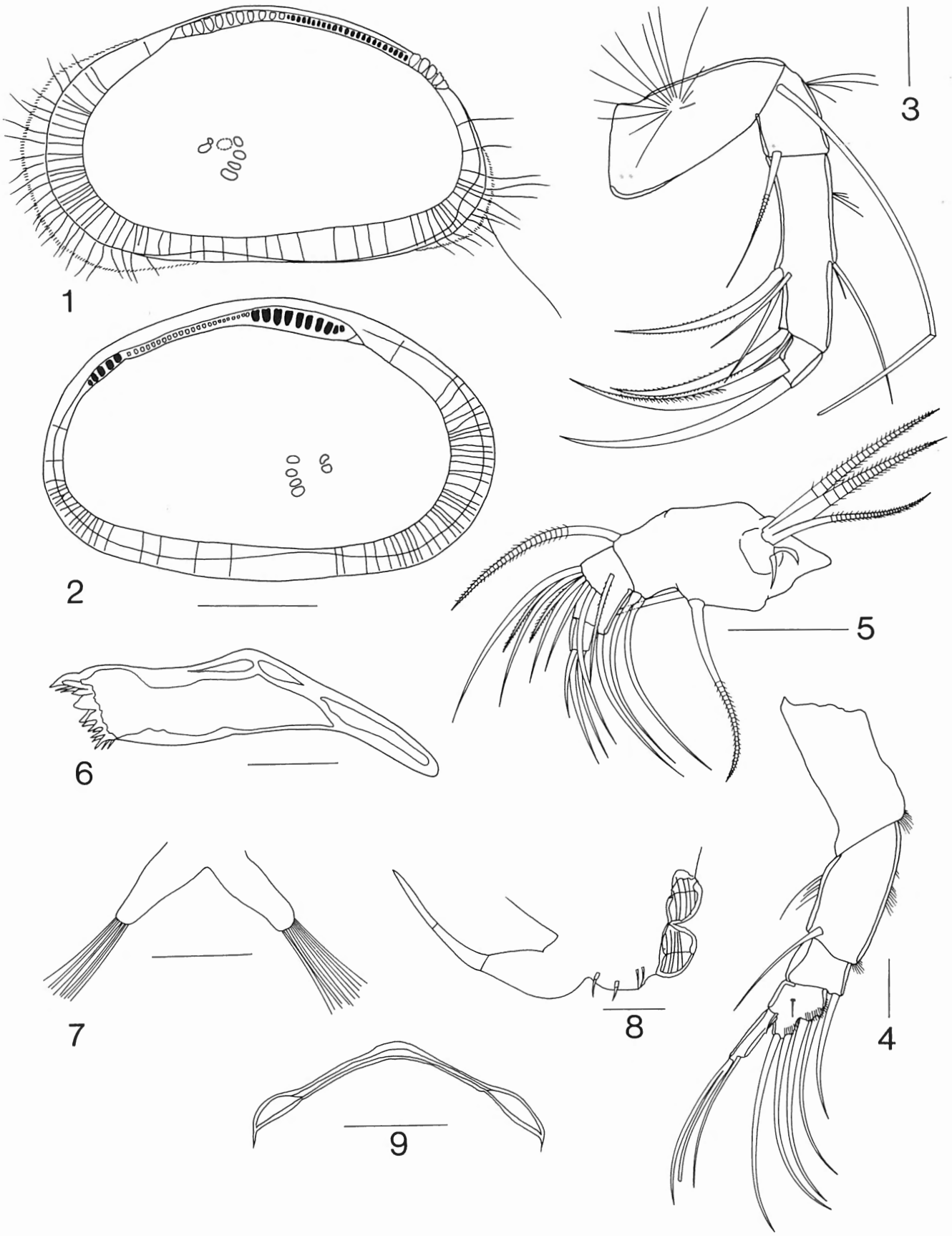

Plate 1. *Neocyprideis agilis* (GUAN, 1978), Pantai Kenjeran, Surabaya, Java. Fig. 1. Right valve male, internal view (O.C. 2907). Fig. 2. Left valve, male, internal view (O.C. 2907). Fig. 3. Antenna, male (O.C. 2907). Fig. Antennula, female (O.C. 2906). 5. Mandible, palp, male (O.C. 2907). Fig. 6. Mandible, coxa, male (O.C. 2907). Fig. 7. Brush-like organ, male (O.C. 2905). Fig. 8. Abdominal extremity, female (O.C. 2906). Fig. 9. Hypostome fork, male (O.C. 2907). Scales: figs 1-2: 200 µm; figs 3-9: 50 µm.

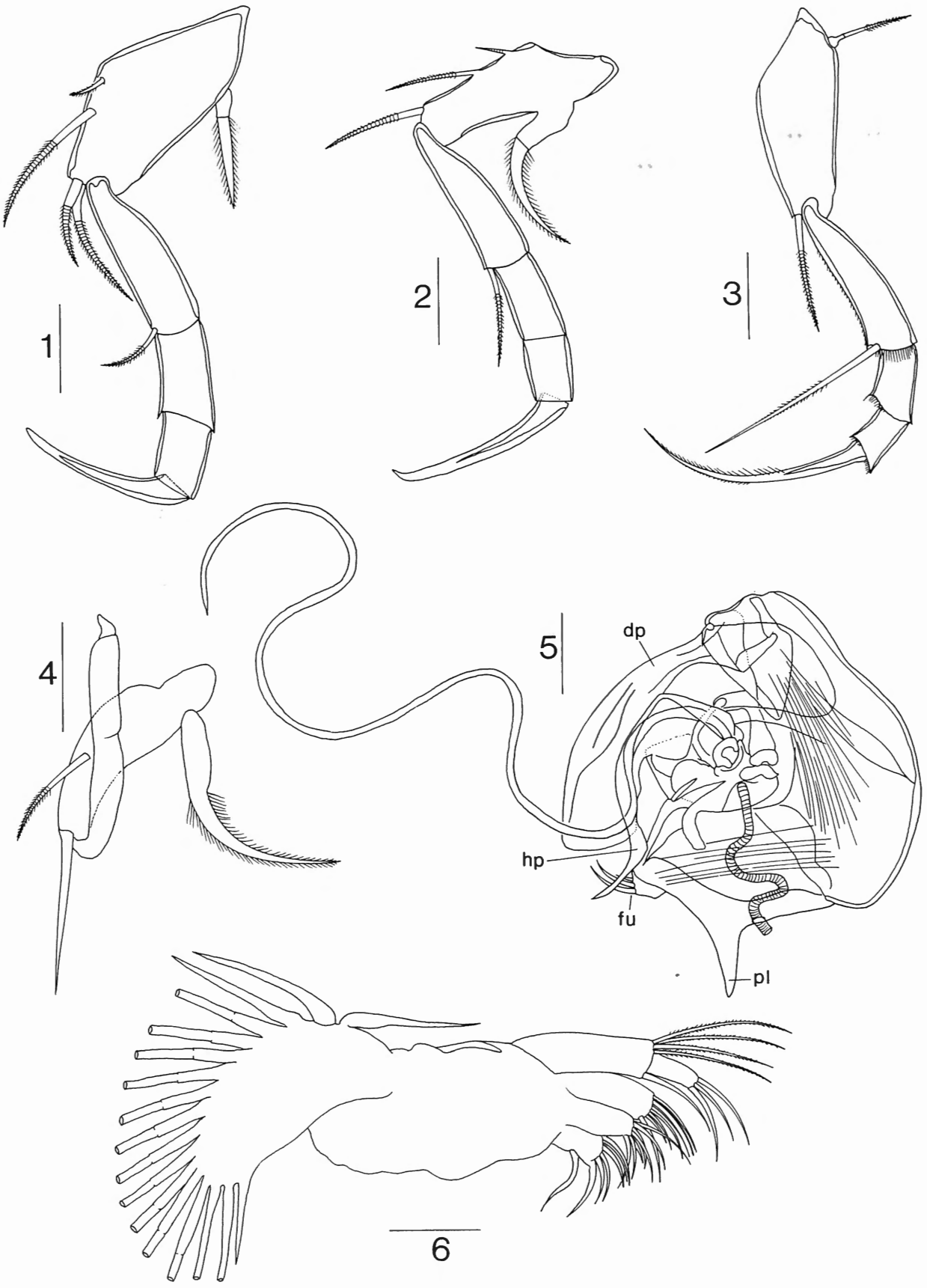

Plate 2. *Neocyprideis agilis* (GUAN, 1978), Pantai Kenjeran, Surabaya, Java. Fig. 1. First leg, male (O.C. 2905). fig. 2. Left second leg, male (O.C. 2905). Fig. 3. Third leg, male (O.C. 2905). Fig. 4. Right second leg, male (O.C. 2905). Fig. 5. Hemipenis, male (O.C. 2907). Fig. 6. Maxillule, male (O.C. 2905). Scales: figs 1-6: 50 µm.

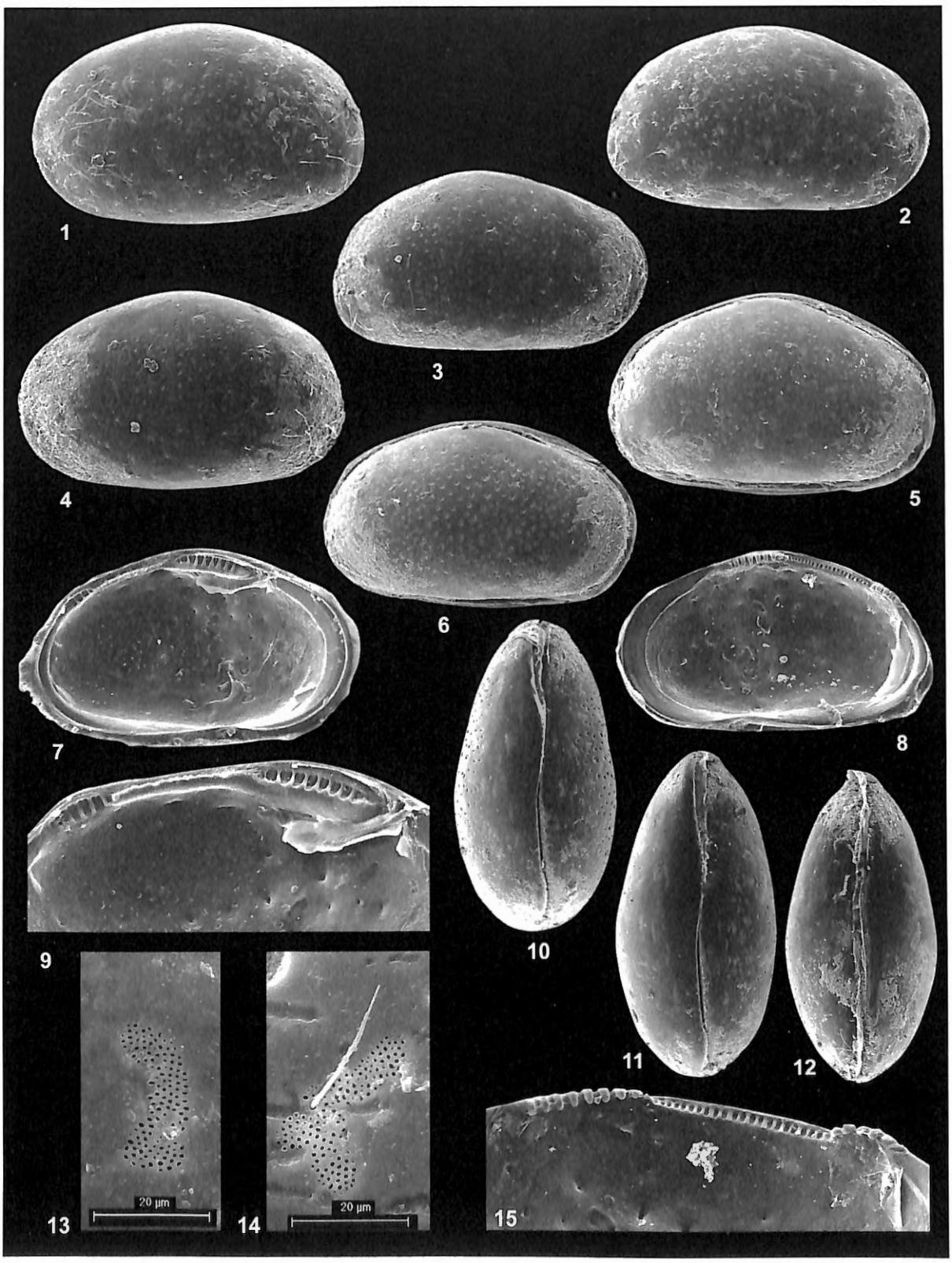

Plate 3. *Neocyprideis agilis* (GUAN, 1978), Pantai Kenjeran, Surabaya, Java. Fig. 1. Left valve, male, x 70 (O.C.2905). Fig. 2. Right valve, male, x 70 (O.C. 2905). Fig. 3. Right valve, female, x 70 (O.C. 2906). Fig. 4. Left valve, female, x 70 (O.C. 2906). Fig. 5. Carapace, right valve view, female, x 70 (O.C. 2912). Fig. 6. Carapace, right valve view, male, x 70 (O.C. 2910). Fig. 7. Left valve, internal view, male, x 70 (O.C. 2907). Fig. 8. Right valve, internal view, male, x 70 (O.C. 2907). Fig. 9. Left valve, hinge, male, x 112 (O.C. 2907). Fig. 10. Carapace, dorsal view, female, x 70 (O.C. 2912). Fig. 12. Carapace, dorsal view, male, x 70 (O.C. 2910). Fig. 12. Carapace, ventral view, male, x 70 (O.C. 2911). Fig. 13. "Oblong" sieve pore, female right valve (O.C. 2906). Fig. 14. "Irregular" sieve pore, female right valve (O.C. 2906). Fig. 15. Right valve, hinge, male, x 145 (O.C. 2907).

straight; 32 to 34 anterior and 15 posterior marginal pore canals. Muscle scar pattern consisting of a row of four small, more or less oval, adductor scars, a small fulcral point and one elongate frontal scar. Hinge antimerodont, consisting, in the right valve, of a positive anterior, a negative median and a positive posterior element. Hinge of right valve (Pl. 1, fig. 1; Pl. 3, figs 8, 15): anterior element with 9 dorso-ventrally elongated toothlets; median element a long groove with 21 small sockets; posterior element much shorter, with 5 toothlets. Hinge of left valve complementary (Pl. 1, fig. 2, Pl. 3, figs.7, 9). Numerous "oblong" (Pl. 3, fig. 13) and "irregular" (Pl. 3, fig. 14) sieve pores (terminology used by ROSENFELD & VESPER, 1977).

Antennule (Pl. 1, fig. 4) five-segmented; first and second segment elongate; antero-distal seta of second segment short, reaching to the end of the fourth segment; third and fourth segment short, with long curved claw-like setae; fifth segment long and slender with a long slender claw, and a long aesthetasc, fused at the base with a seta. Medial seta of fourth segment very short.
Antenna (Pl. 1, fig; 1) four-segmented; two-segmented exopodite, of the same length in both sexes; terminal segment subquadrate,with two stout claws.
Mandibular palp three-segmented, median segment indistinctly sutured; epipodite with three long and two very short setae; for setation, see Pl. 1, fig. 5. Coxa stout, with numerous teeth (Pl. 1, fig. 6).
Maxillulla (Pl. 2, fig; 6) with two-segmented palp; four distal setae of first segment of palp feathered; all other setae and claws smooth; branchial plate with 16 normal setae and 1 reflexed seta.
First leg (Pl. 2, fig. 1) not dimorphic in the male; four-segmentend, with strong blunt terminal claw. Segments and terminal claw of female first leg (not figured) more slender than in males.
Second leg strongly dimorphic in the male: left leg (Pl. 2, fig. 1) as in the female, with weakly curved terminal claw; right leg (Pl. 2, fig. 4) strongly reduced and weakly sclerotized; terminal segments small and delicate; probably three-segmented, but sutures indistinct.
Third leg (Pl. 2, fig. 3) not dimorphic, slender, with long and very slender weakly curved serrate terminal claw.
Hypostome fork: see Pl. 1, fig. 9.
Brush-like organ (Pl. 1, fig. 7) with a simple shaft, distally set with hairs of approximately the same length as shaft.
Hemipenis (Pl. 2, fig. 5) large and complex; narrow triangular proximal lobe (pl on figure); distal extremity rounded to slightly sinuous; large distally inserted and postero-ventrally oriented, movable, elongate and slightly curved plate-like process (dp on figure); large curved, medially inserted hook-like process (hp on figure); very long coiled copulatory tube; furcae small (fu on figure).
Abdominal extremity in the female (Pl. 1, fig. 8) a crescent-shaped process with two sutures; furcae very small.
Measurements
Length: 0.76-0.82 mm, height: 0.45-0.51 mm.

Discussion

In their phylogenetic analysis BABINOT & COLIN (1976) and COLIN & CARBONEL (1990) suggest that *Neocyprideis* is only distantly related to *Cyprideis*. This hypothesis was rejected by TITTERON *et al.* (2001) who regarded *Neocyprideis* as a sibling (or even possible ancestral) genus of *Cyprideis*. The morphology of the copulatory appendage of the here described *Neocyprideis* species, however, is markedly different from other known *Cyprideis* species. When the copulatory appendages of extant *Cyprideis* species are compared (see e.g. SANDBERG, 1964, SANDBERG & PLUSQUELLEC, 1974, WOUTERS, 2002, 2003), and those of related genera in Lake Tanganyika (WOUTERS & MARTENS, 1992, 1994, 1999, 2000, 2001), it becomes evident that they all share a very comparable morphological pattern consisting of a lozenge-shaped basal part with transverse musculature, a large distal shield, a long and narrow distal lobe, a copulatory lobe and a copulatory process. Even species of other genera of the Cytherideidinae, such as *Sarsicytheridea* ATHERSUCH, 1982, *Cytheridea* BOSQUET, 1952 (see SCHORNIKOV, 1969) and *Haplocytheridea* STEPHENSON, 1936 (see KEYSER, 1977) exhibit a copulatory appendage morphology comparable to that of *Cyprideis*. Almost none of the higher mentioned features can be seen in *Neocyprideis* where the copulatory appendage has a completely different morphology, without the lozenge-shaped basal part, distal shield and copulatory process, but with a large triangular proximal lobe, a large distally inserted and postero-ventrally oriented, movable, elongate and slightly curved plate-like process and a medially inserted hook-like process (the latter may be homologous to the copulatory lobe). This striking morphological difference is a strong argument in favour of the hypothesis of BABINOT & COLIN (1976) and COLIN & CARBONEL (1990) that *Neocyprideis* is only distantly related to *Cyprideis*. There seems to be at least one other species with a somewhat unusual copulatory appendage, namely *Clithrocytheridea chiloeensis* Hartmann, 1965, but the appendage is incomplete, and therefore inconclusive.

Whether *Neocyprideis* is a senior synonym of *Miocyprideis* KOLLMANN, 1960 and of *Bishopina* BONADUCE *et al.*, 1978 remains a matter of debate. VAN MORKHOVEN (1973) already argued that the diagnostic features mentioned by KOLLMANN (1960) to discriminate between the two genera are not distinctive and that on such grounds *Miocyprideis* would seem to deserve perhaps only subgeneric status within *Neocyprideis*. BABINOT & COLIN (1976) and COLIN & CARBONEL (1990) distinguish between both genera, and consider them to belong to the *Neocyprideis-Miocyprideis* lineage, in opposition to the *Sarlatina-Cyprideis* lineage, both descending from the genus *Fabanella* in the Upper Cretaceous. According to these authors, the genus *Miocyprideis* is characterized by a quadrangular shape, with strong ventral overlap of the left valve over the right, conspicuous anterior and posterior marginal denticles, smooth or finely pitted valves and crenulate hinge elements; the central element has about half the length of the anterior one; the posterior elements are less crenulate than the anterior. The study by KEEN (1990) on four stratigraphically arranged *Neocyprideis* spe-

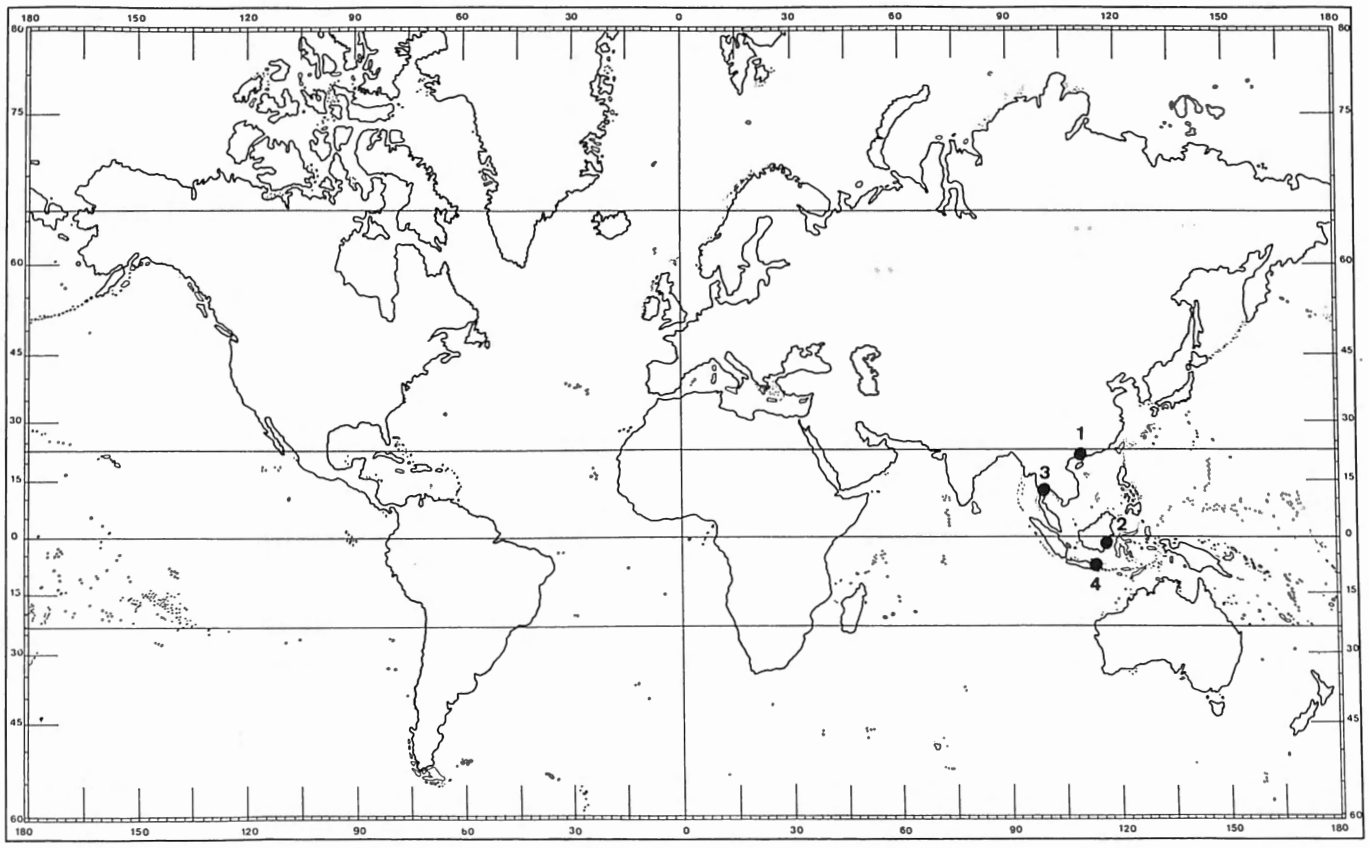

Fig. 1. Distribution of *Neocyprideis agilis* (GUAN, 1978). 1. Yingli, Haikang County, China, Pliocene (GUAN, 1978). 2. Delta of the river Mahakam, Kalimantan, Indonesia (CARBONEL, HOIBIAN & MOYES, 1985). Mae Khlong river mouth, Thailand (MONTENEGRO, PUGLIESE & SCIUTO, 2004). 4. Pentai Kenjeran, Surabaya, Java (this paper).

cies illustrates that some of the features do show a progressive change through time. KEEN (1990, p. 222-224): "The number of anterior radial pore canals clearly increases from an average of 13 in the late Palaeocene to 21 in the Oligocene and the relative proportion of the anterior and median hinge elements also shows a gradual change with a reduction in the relative length of the median element and a concomitant increase in the length of the median element". VAN MORKHOVEN (1963) already noticed that the number of marginal pore canals would seem to increase in forms of successively younger strata. On the basis of the number of toothlets of the median bar of the hinge. MALZ & IKEYA (1986) infer that *Miocyprideis* and *Bishopina* are related, but different genera. In an earlier paper WOUTERS (1981) already considered them as two separate genera. Given the wide variability of diagnostic features, TITTERTON *et al.* (2001) conclude that *Miocyprideis* and *Bishopina* are to be considered junior synonyms of *Neocyprideis*, and that the diagnosis of *Neocyprideis*, therefore, should be expanded to accommodate those species assigned to *Miocyprideis* and *Bishopina*. The persistence of these conflicting hypotheses is rather confusing. The morphology of the valves seems to be insufficient to unequivocally discriminate between the genera under consideration. Comparison of the appendages, and more precisely of the copulatory appendage, could bring valuable supplementary information to solve this problem. Although several recent species of *Miocyprideis* and *Bishopina* are known, the copulatory appendages remain to be described and figured. The female appendages of *Bishopina* have already been described by WOUTERS (1981), but they do not offer distinctive features to discriminate between genera. If, in the future, male specimens of *Bishopina* and *Miocyprideis* were to be discovered, then comparison of the morphology of the copulatory appendage could shed some light on the relationships between the genera. In the meantime it is hoped that the description of the valves and appendages of an extant *Neocyprideis* species is a step in that direction.

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