

A new genus of the family Pontocyprididae (Crustacea, Ostracoda) from the Indian and Pacific Oceans, with the description of two new species

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Abstract

A new pontocypridid genus, *Peripontocypris* gen. nov. and two new species are described from the Maldive Islands, Papua New Guinea and from Easter Island. The new genus has a remarkable set of characters, which are unknown in other members of the family: six adductor muscle scars, a Y-shaped Zenker's organ and a large furca. Some other characters of the valves and the soft parts are reminiscent of different pontocypridid genera, and suggest a mosaic type of evolution. The affinities of *Peripontocypris* with other genera, and its taxonomic position are discussed.

Key-words: Ostracoda, marine fauna, taxonomy, new genus, Indo-Pacific.

Resumé

Un nouveau genre, *Peripontocypris* gen. nov. et deux nouvelles espèces de la famille des Pontocyprididae sont décrits des îles Maldives, de la Papouasie Nouvelle-Guinée et de l'île de Pâques. Le nouveau genre se distingue par un ensemble remarquable de caractères qui sont absents chez d'autres membres de la famille: six empreintes musculaires, organe de Zenker en forme de "Y" en une furca exceptionnellement grande. Certains autres caractères des valves et des appendices se retrouvent chez différents genres de la famille, ce qui suggère une évolution du type mosaïque. Les relations de *Peripontocypris* avec d'autres genres, et sa position taxonomique sont discutées.

Mots-clés: Ostracoda, faune marine, taxonomie, nouveau genre, Indo-Pacifique.

Introduction

The Pontocyprididae is an ancient and morphologically diverse family of marine Cypridoidea. Especially thanks to the works of MÜLLER (1894) and MADDOCKS (1969 and 1991) much of the diversity has been described. Several species, species groups and genera, however, remain poorly understood, and need to be restudied. The

discovery of a new genus, with a wide distribution in the Indo-Pacific (Maldive Islands, Papua New Guinea and Easter Island) would not be surprising in this respect, were it not that the new genus is characterized by a set of features which is unique among pontocypridids. The new genus is described on the basis of two new species. From only one of the two species soft parts were available for study. All studied specimens are deposited in the collections of the Royal Belgian Institute of Natural Sciences, Brussels. The "Index and Bibliography of Marine Ostracoda", published by KEMPF (1986) was extensively used when working on the taxonomic part of the present paper.

Taxonomic Account

Order Podocopida MÜLLER, 1894
Suborder Podocopina SARS, 1866
Superfamily Cypridoidea BAIRD, 1845
Family Pontocyprididae MÜLLER, 1894

Genus *Peripontocypris* gen. nov.

DERIVATION OF NAME

Greek *peri* (around) and *Pontocypris*, alluding to the wide ventral inner lamella (gender: feminine).

TYPE SPECIES

Peripontocypris magnafurcata gen. nov. sp. nov. (here designated).

DIAGNOSIS

Medium-sized triangular valves with asymmetrical posterior extremities; muscle scar pattern consisting of six elongate scars arranged in a rosette-like pattern; wide calcified ventral inner lamella; anterior vestibulum constricted; Zenker's organ Y-shaped, with central capsule; furca large with three long posterior setae.

Peripontocypris magnafurcata sp. nov.
(Figs 1-16, 19-23)

DERIVATION OF NAME

Latin *magna* (large) and *furcata*, referring to the large furca.

TYPE LOCALITY

Republic of the Maldives, North Malé Atoll, Baros Island, west side, reef top, with sand patches, *Halimeda* and dead coral, depth 1 m, 4°16'35"N, 73°25'00"E (Leg.: J. VAN GOETHEM, 16 January 1980, station 6).

HOLOTYPE

A dissected male with valves stored dry (O.C. 2118a) and soft parts preserved in a glycerine preparation (O.C. 2118b).

PARATYPES

Four dissected males, and four dissected females, O.C. 2119-2126; eight valves and carapaces (adults and juveniles), O.C. 2127; three adult females and nine juveniles preserved in alcohol (O.C.2128), all from the type locality.

OTHER MATERIAL

- Three males and one female, preserved in alcohol, from the Maldivian Islands, N. Malé Atoll, Baros Island, collected from other stations than the type locality, O.C. 2129-2132, leg. J. VAN GOETHEM, 14-19 January 1980, stations 5 (depth 1 m), 11 (depth 1 m), 17 (depth 30 cm) and 22 (depth 1 m).

- One dissected female with valves stored dry (O.C. 2133a) and soft parts preserved in a glycerine preparation (O.C.2133b), from Papua New Guinea, Laing Island, lagoon, depth 16 m, sand (Leg.: J. VAN GOETHEM, 30 May 1977, station 243).

- Three right valves, one left valve, 1 adult carapace and 1 juvenile carapace from Easter Island, Hanga Roa, depth 16 m, sand, O.C. 2134-2136 (Leg.: CL. MASSIN, December 1993, station 92).

DIAGNOSIS

Left valve with bifid posterior extremity, left valve with one pointed extremity; ventral calcified inner lamella relatively narrow; posterior cardinal angle indistinct.

DESCRIPTION

Valves medium-sized, elongate, thin-shelled and transparent; anterior margin broadly rounded; posterior margin pointed in the right valve, and bifid in the left valves (in both sexes); dorsal margin tapering towards the posterior end, with an indistinct posterior cardinal angle; ventral margin nearly straight; carapace in dorsal view fusiform, with maximum width situated in the anterior third; left valves overlapping right ones; anterior and posterior inner lamellae wide, with large anterior and posterior vestibula; anterior vestibulum constricted; fused zone narrow with numerous pore canals, some of them false and occasionally bifurcate; additional fused zone in males in the postero-dorsal area; ventral inner lamella wide with numerous long pore canals and some short false pore canals; central muscle scar pattern consisting of six elongate scars arranged in a rosette-like pattern; valve surface smooth, with large pores, and covered with many spiky hairs; sexual dimorphism: female valves slightly higher than male valves; males further characterized by the presence of a postero-dorsal fused zone (absent in females).

Very small median eye, with two cups.

Antennule (Fig.3) slender, with seven segments (segments 1 and 2 fused without suture); proximal segment long and slender; distal segments becoming shorter towards the tip; proximal segment with a ventral spine and a long distal seta, oriented in dorsal direction; setae of distal segments long.

Antenna (Fig. 5): endopodite sturdy, four-segmented; small seta-like exopodite; swimming setae present, extending to the middle of the terminal claws; male sensory setae distally striped; aesthetasc Y large; largest terminal claws bifid.

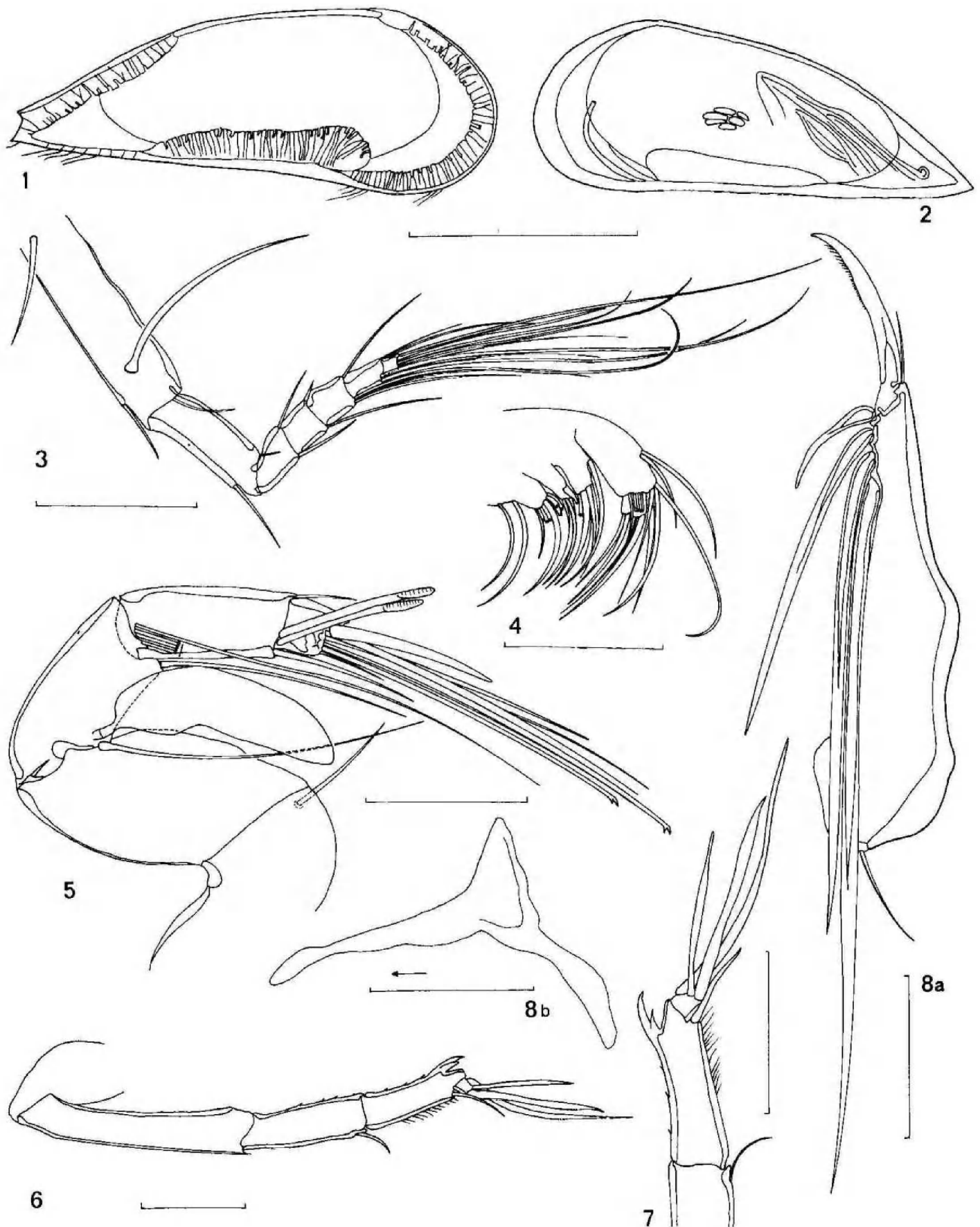
Mandible (Fig. 9) four-segmented; epipodite with four Strahlen; five large sigmoid claws: one on the third segment and four on the fourth segment.

Maxillule (Fig. 4) with small respiratory plate with 14 Strahlen; two-segmented palp; distal segment small, subquadrate: lobes with numerous long and simple setae. First thoracic leg dimorphic; three-segmented and pediform in females (Fig. 14) with one long and one short terminal seta; in males (Figs 11-12) transformed to large clasping apparatus, with long curved distal hook; one long and slender seta and two stout pegs: inner peg on right palp almost straight with rounded distal extremity, inner peg on left palp curved with pointed distal extremity.

Second thoracic leg (Fig. 15) five-segmented, with two large and bifid terminal claws.

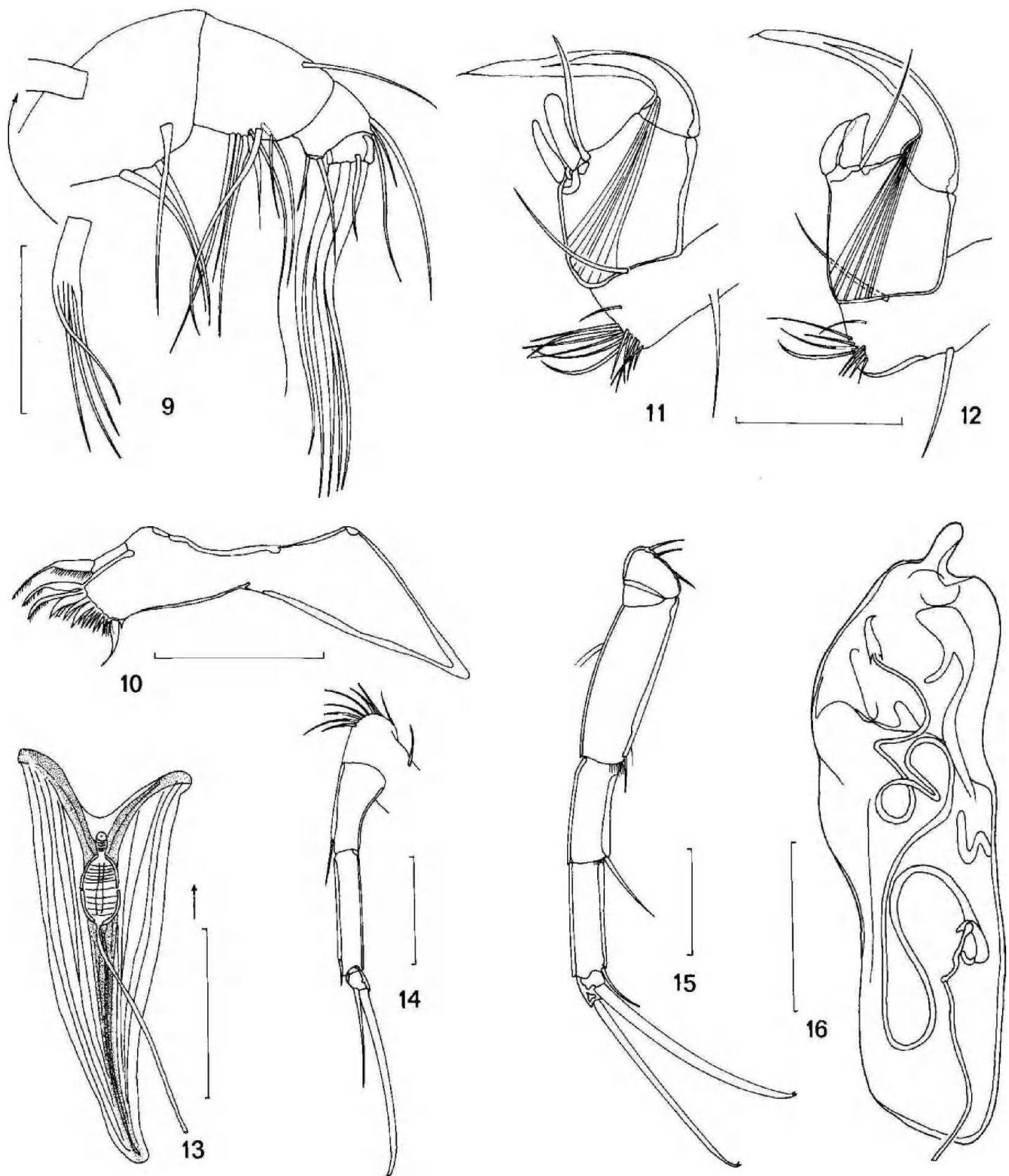
Third thoracic leg (cleaning limb)(Figs 6-7) with three long terminal setae, and one short seta on the penultimate segment (remark: all these setae are smooth, and even at high magnification no barbs or vestigial barbs could be observed).

Furca (Fig. 8a): remarkable by its size and by the position and length of certain setae; proximal claws overlying the ramus; from the tip of the distal claw to the tip of the proximal claw, length of furca is about one third of the length of the whole animal.



Figs 1-8. - *Peripontocypris magnafurcata* gen. nov, sp. nov., Baros Island, Republic of the Maldives.

Fig. 1. Left valve, male, internal view, holotype, O.C. 2118. - Fig. 2. Right valve, female, internal view, paratype, O.C. 2119. - Fig. 3. Antennule (upside-down), male, holotype. - Fig. 4. Maxillule, male, holotype. - Fig. 5. Antenna, male, holotype. - Third thoracic leg (cleaning limb), male, holotype. - Fig. 7. Idem, detail, holotype. - Fig. 8a. Furca, female, paratype, O.C. 2122. - Fig. 8b. Furcal attachment, male, paratype, O.C. 2126, arrow pointing in anterior direction. Scales: figs 1-2: scale 0,3 mm; figs 3-8: 50 μ m.



Figs 9-16. -*Peripontocypris magnafurcata* gen. nov., sp. nov., Baros Island, Republic of the Maldives.

Fig. 9. Mandibular palp, male, holotype. - Fig. 10. Mandible, female, paratype, O.C. 2120. - Fig. 11. Right male clasper apparatus, paratype, O.C. 2119. - Fig. 12. Left male clasper apparatus, paratype, O.C. 2119. - Fig. 13. Zenker's organ, male, paratype, O.C. 2119, arrow pointing in anterior direction, stippled area chitinized. - Fig. 14. First thoracic leg, female, paratype, O.C. 2122. - Fig. 15. Second thoracic leg, male, paratype, O.C. 2119. - Fig. 16. Hemipenis, male, paratype, O.C. 2119. All scales 50 μ m

Furcal attachment (Fig. 8b) triramous, relatively small, but stout.

Copulatory appendage (Fig. 16) large and oblong, with long and coiled ductus ejaculatorius and short copulatory tube; distally ending in a narrow rounded process. Testical loops partially situated in the vestibula (Fig. 2).

Zenker's organ (Fig. 13) Y-shaped, with central ringed and chitinized capsule; branches of the Y chitinized (stippled in Fig. 13); muscles attached to the Y-branches and to the posterior chitinous extremity giving the whole organ a triangular aspect; vas deferens connected to posterior part of capsule; anterior opening of capsule connected to testes.

Colour of specimens fixed with formol and preserved in alcohol: colourless and transparent.

DIMENSIONS

Holotype: length 0.63 mm, height 0.23 mm.

Paratypes: length 0.61 - 0.66 mm; height 0.23 - 0.25 mm.

The specimens from Easter Island are slightly smaller: length 0.57 - 0.62 mm, height 0.22 - 0.23 mm.

DIFFERENTIAL DIAGNOSIS

Peripontocypris magnafurcata sp. nov. differs from *P. milleri* sp. nov. (see below) by its narrow ventral inner lamella, by its dense ventral pore canal pattern, by its smaller muscle scar pattern, by the bifid posterior extremity of the left valve and the acute posterior extremity of the right valve (bluntly truncate in left valve and acute with two spines in right valve in *P. milleri*). *Peripontocypris magnafurcata* has a nearly straight ventral margin and the valves are less high.

OCCURRENCE

The species was found in three different regions of the Indian and Pacific Oceans: Maldiv Islands (Baros Island), the type locality, Papua New Guinea (N. coast, Laing Island), and Easter Island. The wide distribution of this species suggests that it can be expected in many more localities in the Indo-Pacific, and it is, therefore, somewhat surprising that it has not been recorded previously. In all stations the species was found living on coral sand, in shallow water. It is probably a sediment dweller, but the presence of swimming setae on the second antenna suggests some swimming ability.

Peripontocypris milleri sp. nov.

(Figs 17-18, 24-28)

DERIVATION OF NAME: in honour of Mr. Miller MAGAP, senior technician, for more than twenty years, at the Leopold III Biological Station, Laing Island, who untimely passed away in 1997.

TYPE LOCALITY: Laing Island, Northern Papua New Guinea, bottom sample in the lagoon, coral sand, depth 16 m, 4°10'22" S, 144°52'22" E (Leg.: J. VAN GOETHEM, 30 May 1977, station 243).

HOLOTYPE: two isolated valves belonging to one carapace, O.C. 2137.

PARATYPES: two carapaces, two right valves, one juvenile right valve, O.C. 2138-2140.

OTHER MATERIAL: two adult carapaces and one juvenile carapace, Papua New Guinea, Madang Lagoon, Nagada Patch Reef, depth 15 m, O.C. 2141 (Leg. CL. MASSIN, 7 October 1996, station 29).

DIAGNOSIS

Left valve with bluntly truncate posterior extremity, right valve with pointed end, with two spines; wide ventral calcified inner lamella; posterior cardinal angle distinct.

DESCRIPTION

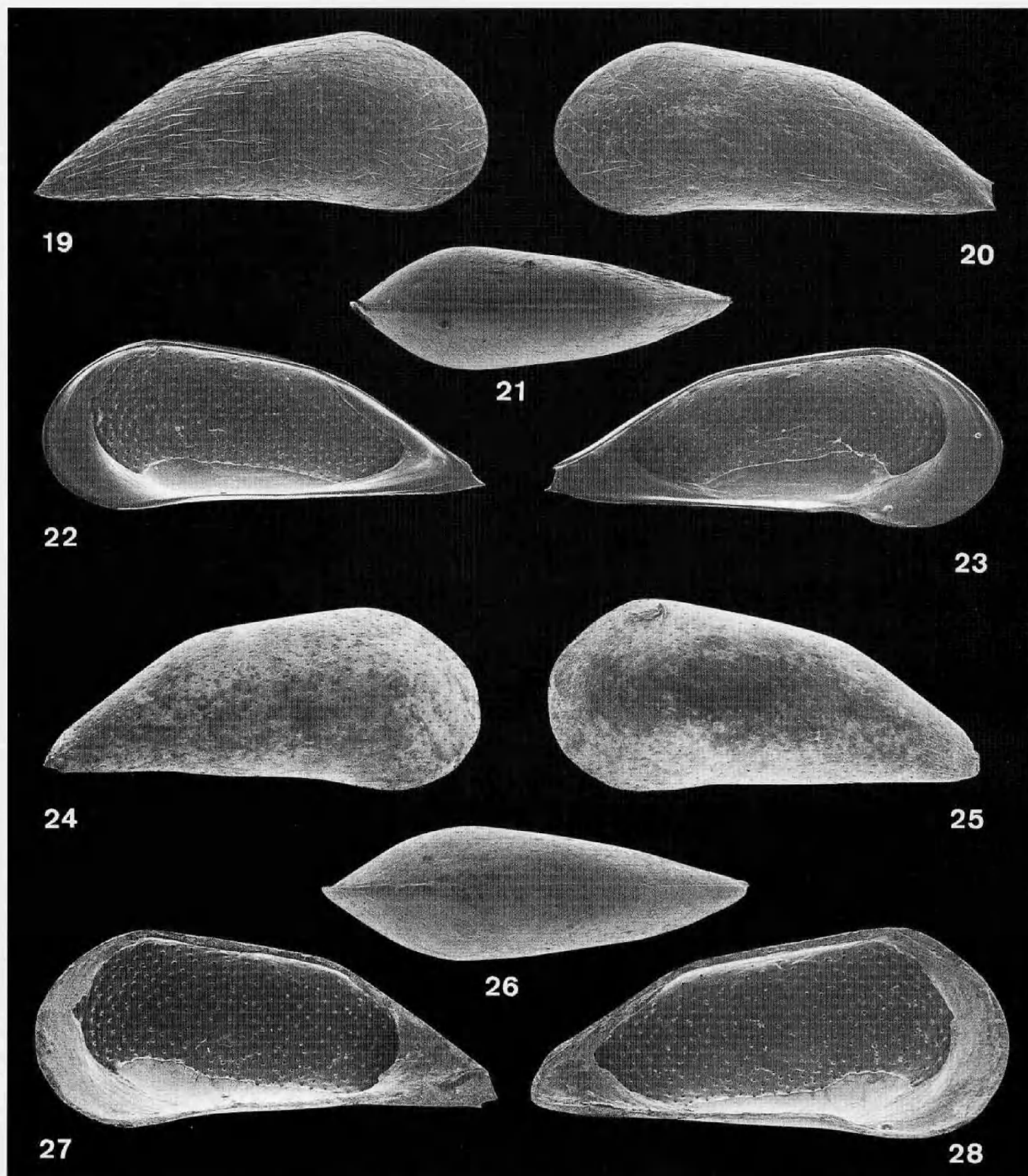
Valves medium-sized, elongate, thin-shelled; valves opaque (this may be due to the state of preservation of the valves and carapaces in the sediment); anterior margin broadly rounded, posterior extremity bluntly truncate in left valve and acute, with two spines, in right valve; dorsal margin tapering towards the posterior extremity, with distinct posterior cardinal angle; ventral margin slightly concave; carapace in dorsal view fusiform, with maximum width situated in the anterior third; left valve overlapping right; anterior and posterior inner lamellae wide, with large anterior and posterior vestibula; anterior vestibulum constricted; anterior and posterior fused zone narrow, with numerous pore canals, some false; wide ventral calcified inner lamella with long pore canals; central muscle scar pattern large, consisting of six elongate scars situated very closely together in a rosette-like pattern; postero-median scar in some specimens with scar suture, giving the impression that the pattern consists of seven scars; valve surface smooth.

Soft parts unknown; no specimens with soft parts were found.

DIMENSIONS

Holotype: length 0.62 mm, height 0.27 mm.

Paratypes: length 0.62-0.65 mm; height 0.24-0.27 mm.



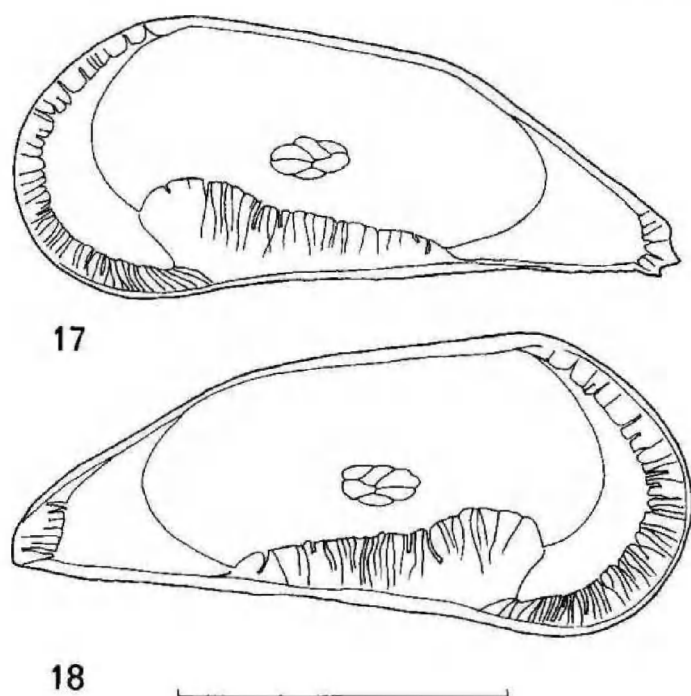
Figs 19-23. - *Peripontocypris magnafurcata* gen. nov., sp. nov. Figs 19, 20, 22, 23 from Baros Island, Republic of the Maldives. Fig. 21 from Easter Island.

Fig. 19. Right valve, female, lateral view, paratype, O.C. 2122. - Fig. 20. Left valve, male, lateral view, holotype, O.C. 2118. - Fig. 21. Carapace, dorsal view, Easter Island, O.C. 2136. - Fig. 22. Right valve, male, internal view, paratype, O.C. 2127. - Fig. 23. Left valve, female, internal view, paratype, O.C. 2127.

Figs 24-28. - *Peripontocypris milleri* gen. nov., sp. nov., Laing Island, Papua New Guinea.

Fig. 24. Right valve, lateral view, holotype, O.C. 2137. - Fig. 25. Left valve, lateral view, holotype. - Fig. 26. Carapace, dorsal view, paratype, O.C. 2138. - Fig. 27. Right valve, internal view, holotype. - Fig. 28. Left valve, internal view, holotype.

Magnification: 125 X.



Figs 17-18. – *Peripontocypris milleri* gen. nov., sp. nov., internal view of right valve (top) and left valve (bottom), holotype, O.C. 2137, Laing Island, Papua New Guinea. Scale 0.3 mm.

DIFFERENTIAL DIAGNOSIS

Peripontocypris milleri sp. nov. can be distinguished from *P. magnafurcata* sp. nov. by its wider ventral calcified inner lamella, by its less dense ventral pore canal pattern, by its larger muscle scars, by the bluntly truncate posterior extremity of the left valve (bifid in *P. magnafurcata*) and the acute posterior extremity of the right valve with two spines (acute without spines in *P. magnafurcata*). Furthermore, *P. milleri* has a slightly concave ventral margin, and the valves are somewhat higher.

General discussion

The new genus *Peripontocypris* occupies a special position in the family Pontocyprididae. The valves and the soft parts are characterized by a unique set of features. When discussing the taxonomic status of the genera *Comontocypris*, *Iliffeoecia* and *Kareloecia* MADDOCKS (1991) already stressed that some pontocypridid genera provide a striking example of mosaic and convergent evolution. This is also true for *Peripontocypris*.

The muscle scar pattern is unique among pontocypridids. No other genus of this family is known to have six adductor scars. All known species (see MADDOCKS, 1969, 1991) have a basic pattern consisting of a simple arrangement of five scars. The configuration of these five scars shows some variability, but the basic pattern is relatively stable and easily recognizable. This is the first reported case of pontocypridids with six scars. Whether the supplementary sixth scar is the result of scar division

is difficult to assess. It should be mentioned, however, that in *P. milleri* the postero-median scar in some specimens shows a scar suture, giving the impression that the pattern consists of seven scars. This observation points towards a possible tendency of scar division in the genus. Because of the six scars, the new genus *Peripontocypris* can easily be distinguished from all other pontocypridids. The diagnosis of the family Pontocyprididae therefore has to be emended in the following way: valves with a distinct arrangement of five, and sometimes six, adductor muscle scars.

A second remarkable characteristic is the presence of a wide calcified ventral inner lamella and a constricted anterior vestibulum. These features, have, up to now, only been observed in *Argilloecia* SARS, 1866 (see MADDOCKS, 1969) and *Liasina* GRAMANN, 1963 (= *Iliffeoecia* MADDOCKS, 1991) (see also MALZ & LORD, 1976, MADDOCKS & ILIFFE, 1986 and WOUTERS, 1996). Species of *Argilloecia* vary in width of the ventral fused zone. In both Recent and fossil species of *Liasina*, this zone is very wide, mostly in the antero-ventral area, while the anterior vestibulum is strongly constricted. In *Peripontocypris*, the ventral fused zone is wide, and in the two new species, it appears to be a relatively stable feature with little variation. There are, however, two somewhat overlooked pontocypridid species, showing a widening of the ventral calcified zone, and a constriction of the anterior vestibulum. These are *Pontocypris succinea* MÜLLER, 1894 and *Pontocypris subfusca* MÜLLER, 1894, both described from the Gulf of Naples, and provisionally assigned to the subgenus and later to the genus *Schedopontocypris* MADDOCKS, 1969 (by MADDOCKS, 1969 and 1991). MÜLLER (1894, p. 101 and 248) described this feature as *doppelte Verwachsungslinie* (double line of concrescence) or *secundäre Verwachsungslinie* (secondary line of concrescence), a structure which was rediscussed by HARTMANN (1966, p. 70). The present author found a carapace (without soft parts) of a related species, called ?*Schedopontocypris* sp. cf. *S. subfusca* (MÜLLER, 1894), in a sediment sample from the Comoro Islands. The valves clearly show a wide ventral fused zone and a constricted anterior vestibulum (Figs. 29 and 30). As far as this character is concerned, this species as well as *Schedopontocypris succinea* and *S. subfusca* show some resemblance to the new genus, although the calcified inner lamella is not as wide. Other characters, such as the muscle scar pattern, and the morphology of the soft parts (see further) are different.

The shape of the valves in the new genus is *Pontocypris*-like. Even the asymmetry of the posterior extremity of the valves reminds us of *Pontocypris*. MÜLLER (1894) described left/right valve asymmetry in Mediterranean species of the genus *Pontocypris*. In these species the posterior or postero-ventral margin of the right valve is serrate, whereas in the left valve this extremity is pointed or rounded. This type of asymmetry is also found in *Peripontocypris*. In *Peripontocypris milleri*, the posterior margin of the right valve is set with teeth and the left valve is rounded to slightly truncate, as in *Pontocypris*.

In *Peripontocypris magnafurcata*, on the contrary, the left valve shows teeth and the right valve is pointed.

In *Peripontocypris* the left valve overlaps the right one. This is opposite to the situation in most other pontocypridids, such as *Argilloecia*, *Comontocypris*, *Ekpontocypris*, *Kareloecia*, *Pontocypris*, *Propontocypris* and *Thomontocypris*, which have a right over left valve overlap. Only in *Liasina* does the left valve also overlap the right. When the morphology of the valves of *Peripontocypris* gen. nov. is compared to that of other pontocypridid genera, it can be concluded that the shape and the left/right posterior asymmetry of the new genus are as in *Pontocypris*, the wide ventral calcified inner lamella and the constricted anterior vestibulum as in *Argilloecia* and *Liasina* (and to some extent as in some *Schedopontocypris* species), the left valve overlap as in *Liasina*. The muscle scar pattern, finally, is unique in the family Pontocyprididae.

Not only the valves show a distinct set of characters, also the soft parts have some interesting and unique features, which do not fit neatly in the family Pontocyprididae. Pontocypridids usually have large Y-aesthetascs on the antenna. The aesthetasc observed in *Peripontocypris magnafurcata*, however, is extremely large, and is not comparable to what has been described up to now. The male bristles are distally striped, which, according to

MÜLLER (1894, p. 40), would be characteristic for the genus *Pontocypris*.

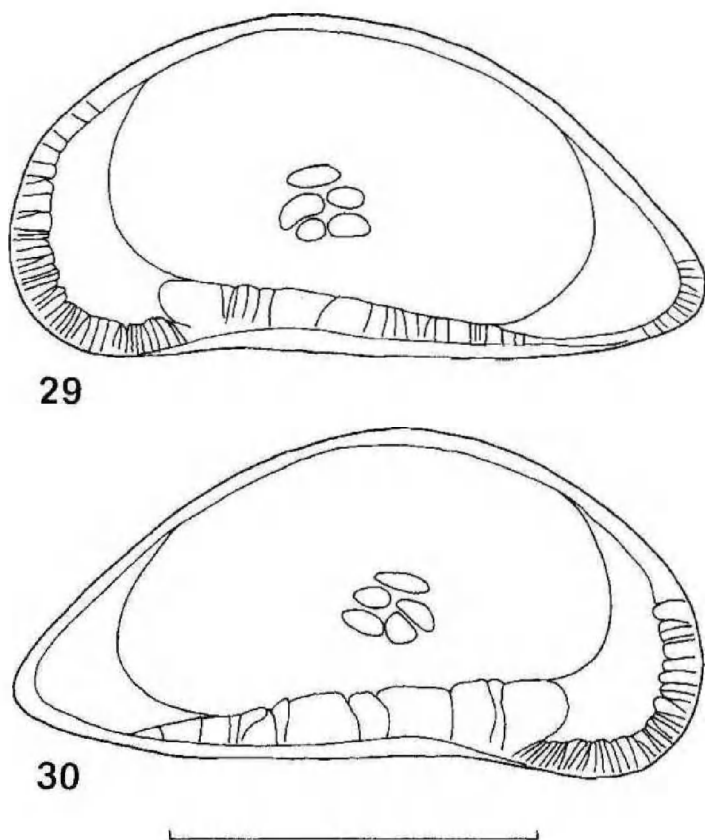
The sixth limb (= 2nd thoracic leg) has two long terminal claws. The accessory claw is as long as the primary one. This character has never been seen in the genera of the *Propontocypris* genus-group (*sensu* MADDOCKS, 1991), but only in the genus *Argilloecia*. Since the other appendages of *Peripontocypris* do not resemble those of *Argilloecia*, this long accessory claw must be interpreted as a homeomorphic feature.

The seventh limb (= 3rd thoracic leg) is set with four terminal setae, three long and one short, none pectinate or reflexed. Even at high magnification (1000 X, immersion) barbs could not be observed. The absence of a pectinate seta is only known in the genus *Abyssocypris* VAN DEN BOLD, 1974 (see MADDOCKS, 1977). All other known pontocypridids have a pectinate seta on the last segment. Although *Peripontocypris* shows some resemblance with *Abyssocypris* in this respect, the latter differs by a multitude of characters, e.g. muscle scar pattern, ovoid carapace shape, small anterior and no posterior vestibulum, markedly different Zenker's organ, reduced furca, strongly developed antennule etc.

The structure of the Zenker's organ is remarkable and unique in the family. Its triangular morphology, consisting of a Y-shaped chitinous structure surrounded by muscles, differs from all other known pontocypridids. MADDOCKS (1991, p.312) defined five character states for the shape of the Zenker's organ. The only character state corresponding to some extent with the Zenker's organ of *Peripontocypris* is state (3): "a short, irregular to wavy-sided tube, with terminal chitinous flanges for muscle attachment". This type of Zenker's organ occurs in *Schedopontocypris succinea* (MÜLLER, 1894) and particularly in *S. subfusca* (MÜLLER, 1894). In the latter species the Zenker's organ is subrectangular with a central Y-shaped structure (based on MÜLLER, 1894, pl. 9, figs 42,43). As far as can be judged from MÜLLER's figures, the resemblance is only superficial.

The furca of *Peripontocypris* is remarkable by its size and by the length of two of the three posterior setae. The length of the whole appendage, from the tip of the distal claw to the tip of the long posterior seta is about one third of the length of the whole animal. No other ostracod is known to have such a large furca.

If we try to apply the character states defined by MADDOCKS (1991) to *Peripontocypris*, it becomes clear that *Peripontocypris* does not fit in any of the genus-groups. The new genus shows a number of features which are unknown in other pontocypridids, such as six adductor scars, triangular Zenker's organ and exceptionally large furca. Other characteristics of the new genus can be recognized in three of the four groups described by MADDOCKS (1991): the *Abyssocypris* genus-group, the *Argilloecia* genus-group and the *Propontocypris* genus-group. Because of its very distinct morphology, *Peripontocypris* gen. nov. cannot be assigned to any of these groups, and therefore has an isolated position within the family Pontocyprididae.



Figs 29-30. ?*Schedopontocypris* sp. cf. *S. subfusca* (MÜLLER, 1894). Internal view of right valve (top) and left valve (bottom). Comoro Islands, Grande Comore, Fomboni, depth 14 m, O.C. 2142. Leg.: J.-L. KENNES, Expedition Karthala, August 1st, 1981 (station 6). Scale 0,3 mm.

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