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MICTACEA, A NEW ORDER OF CRUSTACEA PERACARIDA

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ABSTRACT

A new order, Mictacea, is proposed within the superorder Peracarida for *Hirsutia bathyalis* Sanders, Hessler, and Garner and *Mictocaris halope* Bowman and Iliffe. The new order is characterized by a unique combination of characters, most of which are not unique to the Mictacea, but are found in at least one other peracaridan order.

Two new species of peracarid crustaceans, both representatives of the new order diagnosed below, were discovered independently by Bowman and Iliffe (1985) and Sanders, Hessler, and Garner (1985). When our discoveries became mutually known, we decided to prepare jointly a characterization of the new order that would encompass the features of both species. In order to achieve this goal, it was decided that description of the new crustacean species and of the new genera and families required for them should be published in two separate papers, with a third paper by all of us proposing a new order for these taxa. Thanks to the good offices of the editor of this journal, it has been possible to publish all three manuscripts in this issue.

Of the two species of the new order, *Hirsutia bathyalis* and *Mictocaris halope*, only the female of *Hirsutia* is known. In the diagnosis of the new order that follows it is assumed that the sexual dimorphism of *Mictocaris* will also be found in *Hirsutia*.

Superorder Peracarida Calman, 1904

Mictacea, new order

Body slender, cylindrical. Head fused to first thoracic somite (somite of maxilliped). Carapace not developed posteriorly but small lateral carapace folds covering bases of maxilla 1, maxilla 2, and maxilliped; elliptical area dorsal to carapace fold inflated, thin-walled, apparently functioning in respiratory exchange. Pereionites and pleonites all free. Telson free, entire. Movable eyestalks present (visual elements absent in *Mictocaris*; eyestalks not found in *Hirsutia*). Antenna 1 with 3-segmented peduncle and 2 multisegmented flagella. Antenna 2 with 5-segmented peduncle having reduced scale (exopod) on segment 2. Mandible type II of Watling (1983), rolling dual purpose type with oblique hinge line, widely separated incisor and molar processes, lacinia mobilis on left mandible, well-developed spine-row, and 3-segmented palp. Maxilla 1 with inner and outer lobes; palp absent. Maxilla 2 with divided outer lobe and undivided inner lobe. Maxilliped without epipod, with or without oostegite in ♀, palp 5-segmented. Pereiopods 1–5 or 2–6 with natatory exopods, in ♀ with oostegites, without branchiae; coxa-basis articulation monocondylic, limb plane of endopod bending only at merus-carpus articulation. Male pereiopod 7 with penes on coxa. Pleonites 1–5 with reduced 1-segmented uniramous pleopods; ♂ pleopod 2 enlarged, 2-segmented. Uropod biramous, rami 2–5-segmented. Embryo flexed dorsally. Eggs hatching as manca lacking pereiopod 7.

Composition.—*Hirsutia bathyalis* Sanders, Hessler, and Garner, 1985, family Hirsutiidae; *Mictocaris halope* Bowman and Iliffe, 1985, family Mictocarididae.

Etymology.—From the Greek "miktos" (mixed, blended) plus "-acea," the most common ending for names of peracaridan orders. The name reflects the fact that very few of the characters of the Mictacea are unique to this order; most are found also in at least one other peracaridan order.

RELATIONSHIPS

The Mictacea clearly belong to the superorder Peracarida for the following reasons: (1) presence of oostegites; (2) single maxilliped of typical peracarid form, i.e., dominated by a large basis with large anteriorly directed endite and with a 5-segmented endopodal palp; (3) pereiopodal coxae partly immobilized, the necessary flexibility at the base of the limb being provided by the single hinge point between coxa and basis (Fig. 1A); (4) elongate pereiopodal basis (Fig. 1B); (5) limb plane of pereiopodal endopod bending only at merus-carpus articulation (Fig. 1B); (6) lacinia mobilis present; and (7) 7 free thoracic somites.

The validity of the Peracarida has been challenged by Schram (1981) and Watling (1981, 1983), but defended by Hessler (1983). Whatever the eventual outcome of this debate, most of the morphological characteristics of the Mictacea can be found in members of one or more of the orders traditionally placed within the Peracarida. To what extent these similarities represent convergences is a subject left for future investigations.

In general appearance the Mictacea are most similar to the Mysidacea, Spelaeogriphacea, and Thermosbaenacea, but these orders differ from the Mictacea in details that are far from trivial. All three have a posterior carapace fold and a maxilliped with an epipod. In the Mictacea, as in the Amphipoda, the lack of an epipod is associated with the absence of a well-developed carapace. If a carapace is much reduced or absent, a pericaridan maxillipedal epipod cannot perform its usual function of ventilating the respiratory structures. The Isopoda lack a carapace, yet have an epipod, but here the latter does not function in ventilation but forms a lateral wall to the mouthparts.

The Mysidacea differ in lacking a manca, in the different articulation of the pereiopods, and in the 1-segmented rami of the uropods. In *Spelaeogriphus* the exopods of pereiopods 4–6 are large and natatory with paddle-shaped rami bearing marginal setae; no pleopods are modified in the male; and the uropods have 2-segmented exopods and 1-segmented endopods. The Thermosbaenacea have a dorsal marsupium, lack eyestalks and a scale on antenna 2, and the pereiopods have 1 less segment. But if one had only the posterior end of a mictacean, it could easily be placed in the Thermosbaenacea because of its penes on pereiopod 7, the modified male pleopod 2, and the structure of the reduced pleopods. One would need only to modify the definition of the Thermosbaenacea to include more segments for the uropodal rami.

Both *Hirsutia* and *Mictocaris* possess oostegites, but there are differences that merit comment. *Mictocaris* has oostegites without marginal setae on the maxillipeds and pereiopods 1–5, arising medially from the coxae. *Hirsutia* has oostegites with marginal setae on pereiopods 2–6, arising posteriorly from the coxae. The significance of this posterior insertion to the possible origin of oostegites from epipods is discussed by Sanders, Hessler, and Garner (1985). Too much weight should not be given to the presence versus absence of marginal setae, since both conditions are found in some of the other orders of Peracarida. Among the Amphipoda marginal setae occur in the Gammaridea but are absent in the Hyperiidea except the Scinoidea. Most isopods lack marginal setae, but they are present in the Epicaridea.

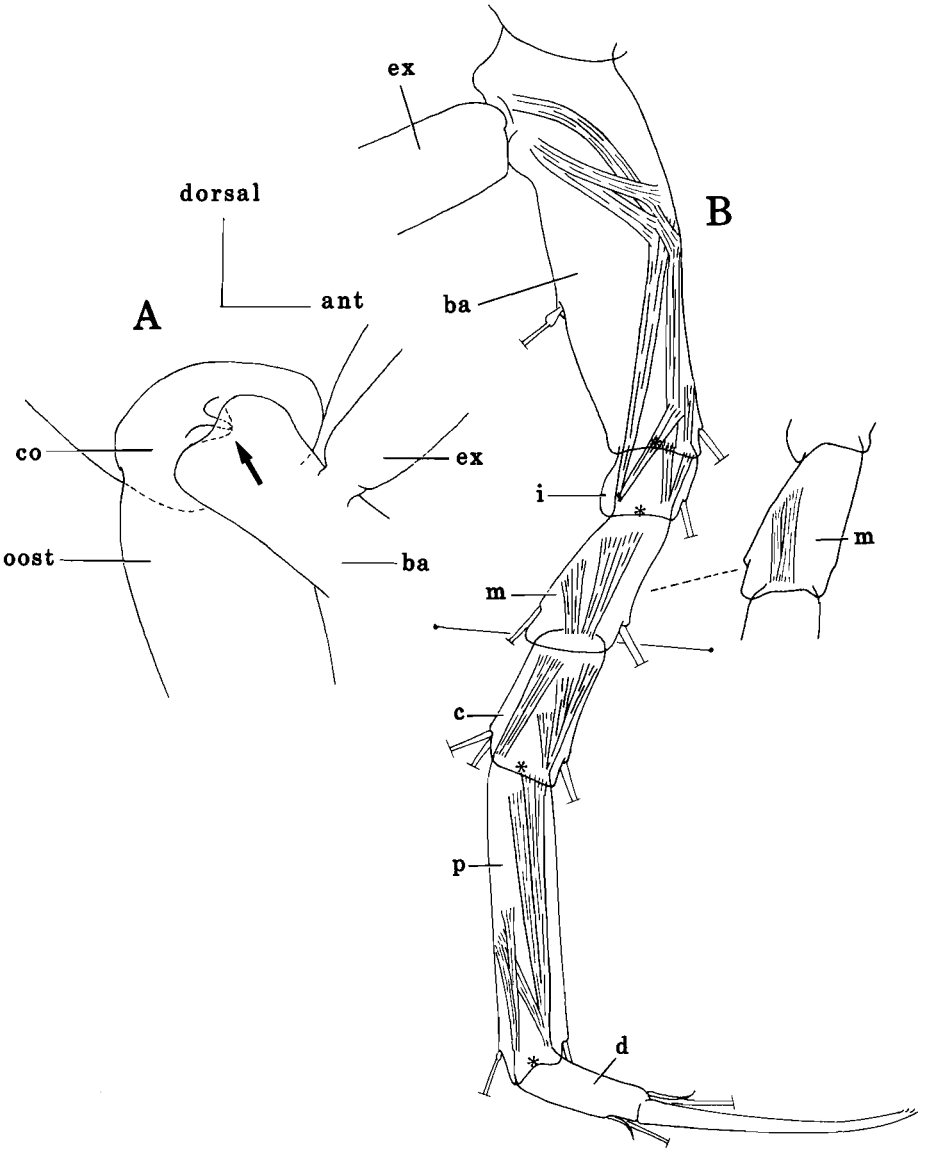

Fig. 1. *Mictocaris halope.* A, Base of right pereiopod 5 on preparatory female, showing monocondylic articulation of basis and coxa (arrow) that is typical of the Peracarida (Hessler, 1982). B, Right pereiopod 3 on mature male, anterior view, showing articulations and intrinsic musculature. The shaft of the limb lies in a single plane. Asterisks indicate hinge lines normal to this plane and therefore restricting movement to within it. Only the hinge line between merus and carpus is parallel to the limb plane (line with dotted termini) and permits bending of the plane (Hessler, 1982). The drawing of the isolated merus shows the posterior muscles. Symbols: ba, basis; c, carpus; co, coxa; d, dactylus; ex, exopod; i, ischium; m, merus; oost, oostegite; p, propodus.

Calman (1909) proposed a general evolutionary pattern for the Eumalacostraca wherein the various diverging lineages arose from a common morphology called the caridoid facies. Each of the eumalacostracan superorders has orders that closely approximate this condition: Anaspidacea in the Syncarida; Euphausiacea and Natantia among the Eucarida; Mysidacea among the Peracarida (Hessler, 1983). In this scheme the Mictacea occupy an intermediate position by displaying many features of the caridoid facies in reduced form: carapace, stalked eyes, antennal scale, pleopods, and to some extent pereiopodal exopods. Much of the similarity of the new order to the Spelaeogriphacea and Thermosbaenacea can be interpreted in terms of this intermediacy.

Schram (1981), using three characters (presence or absence of a ventral thoracic brood pouch in females, nature of carapace, and schizopodous versus uniramous pereiopods), constructed six different phenograms of possible eumalacostracan morphotypes. In all six phenograms the Mictacea would occupy the top branch, paired either with the Hemicaridea (Spelaeogriphacea plus Cumacea plus Tanaidacea), the Acaridea (Isopoda plus Amphipoda), or the Syncarida.

Watling (1981) attempted to elucidate relationships among the peracaridan orders by a Hennigian analysis, using 29 characters to which he assigned plesiomorphic and apomorphic states. The initial separation was into mancoid and non-mancoid lines, in contrast to Schram's classification, which did not consider the mancoid condition. In Watling's scheme the Mictacea would branch off near the base of the mancoid line.

In a more recent study Watling (1983) analyzed six characters in proposing a revised classification of the Eumalacostraca. In the arrangement that emerged three lineages were identified: Syncarida-Eucarida, Isopoda-Brachycarida (Hemicarida plus Thermosbaenacea), and Amphipoda. The Mictacea would have formed a third branch of the Isopoda-Brachycarida lineage.

The above phylogenetic schemes of Schram and Watling are two recent ones of many that could be commented upon. A detailed discussion of crustacean phylogeny is beyond the scope of this paper, which is intentionally limited to defining the new order Mictacea and comparing it with known orders of Peracarida.

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