

THE CEPHALOCARIDA, A NEW SUBCLASS OF CRUSTACEA FROM LONG ISLAND SOUND*

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In the course of a study of the benthic communities of Long Island Sound, eight individuals of a species of crustacean which could not be fitted into any of the known subclasses were discovered. The present paper is devoted to the description of their external anatomy. It is hoped that it will be the first of a series dealing with this most peculiar organism.

FAMILY HUTCHINSONIELLIDAE nov.

WITH CHARACTERS OF THE GENUS

Hutchinsoniella gen.nov.

Head large, horseshoe-shaped, produced backward over first thoracic segment as a short carapace, and bearing antennules, biramous antennae, palpless mandibles, and a single pair of biramous maxillae. Ten postcephalic appendages; first eight appendages biramous with at least a two-jointed protopodite bearing a large pseudopodite on the basipodite and produced medially as a large complex gnathobase on all pairs; endopodite apparently six-jointed, exopodite two-jointed; ninth appendage lacking endopodite; tenth appendage reduced to two joints. Postcephalic segments 2-9 produced backwards at sides as well-developed pleura, segment 10 probably genital and with the succeeding nine abdominal segments bearing pleural spines. Telson with caudal furca armed with very long setose spines. Egg attached to tenth postcephalic segment of female. Generotype *Hutchinsoniella macracantha* sp.n.

Hutchinsoniella macracantha sp.nov.

Horseshoe-shaped head approximately as long as wide, making up 17-18 per cent of the total length of the animal excluding the caudal spines. Eyes absent. Labrum (Fig. 1, C) not produced backward greatly, covering a well-developed buccal cavity leading to an esophagus visible anteriorly.

Antennules (Fig. 2, A) with six wide basal joints and a thin terminal strap-shaped filamentous portion of about 35 joints. Distal surface of the second basal joint bearing a small knob apparently separated by an articulation (Fig. 2, B). The initial joint of the filament about equal to the length of the next four. A few hairs on and about the knob and larger cluster of long hairs present on the distal ends of the third and sixth basal segments of the antennules.

Antennae (Fig. 2, C) apparently made up of a two-jointed protopodite and two rami, one a two-jointed endopodite with the second segment rectangular in shape, the other a large club-shaped exopodite composed of about eighteen joints covered with numerous long hairs. Second segment of protopodite with a knoblike eminence bearing hairs (Fig. 2, D).

Mandibles without palp; median surface forming grinding molar plate covered with numerous tiny papillae and an incisor component of two spines with a movable bristle in between (Fig. 2, E).

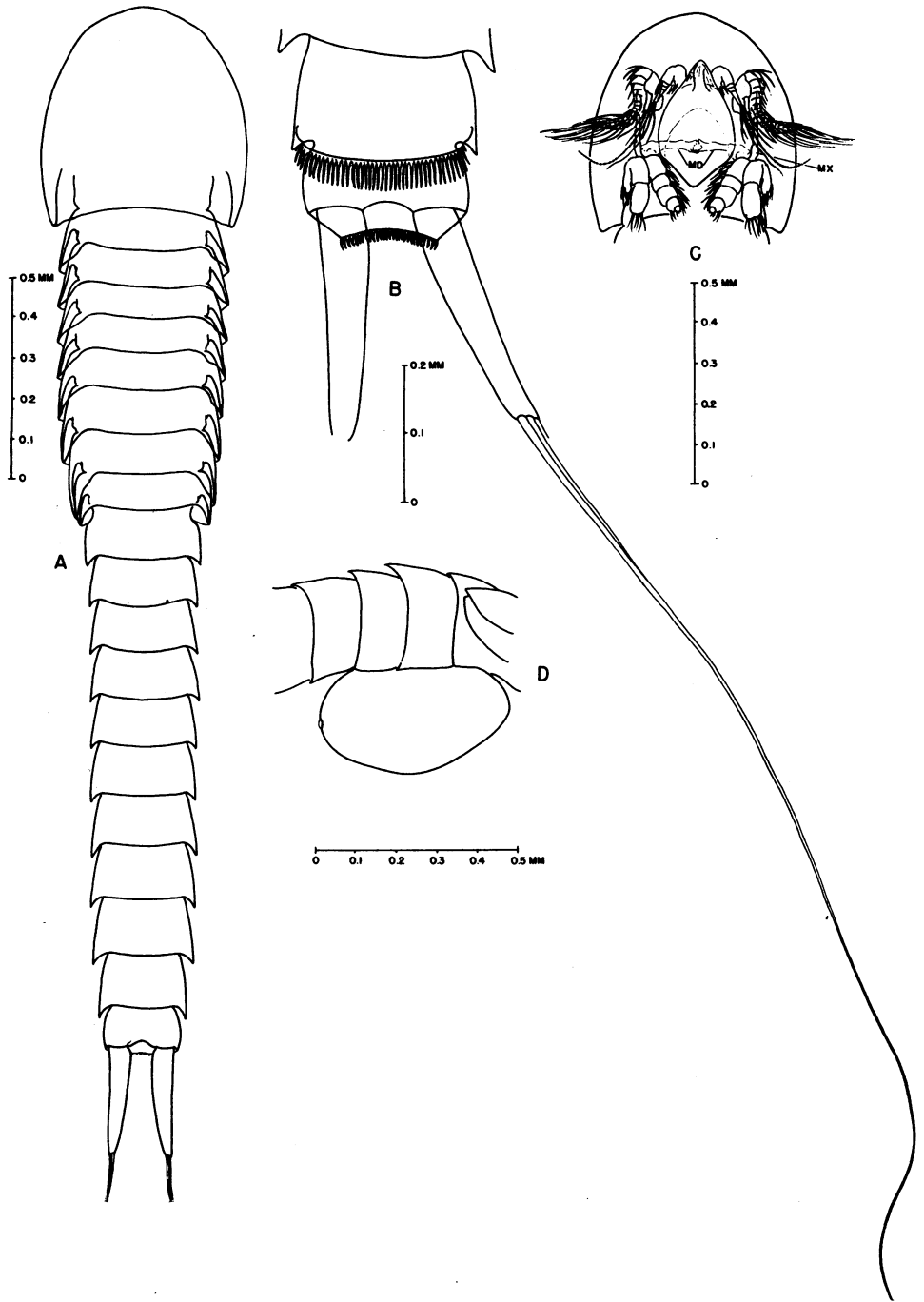


FIG. 1.—A, dorsal view of *Hutchinsoniella*. B, ventral view of posterior end of animal. C, ventral view of head region; MD, mandibles; MX, maxilla. D, lateral view showing egg attached to female.



FIG. 2.—A, antennule with terminal part of filamentous portion twisted. B, basal section of antennule, showing small articulating knob. C, antenna. D, basal section of antenna, showing knoblike eminence. E, mandible. F, maxilla. G, first thoracic appendage. H, ninth thoracic appendage, showing interlocking processes of gnathobases; EX, exopodite; PEP, pseudopodite. I, rudimentary tenth appendage.

Single pair of maxillae (Fig. 1, *C*, *MX*; Fig. 2, *F*) biramous and made up of a protopodite with an elongate gnathobase possessing two spines, the terminal portions of which are covered with fine hairs; a four-jointed endopodite with four terminal spines; a single-jointed exopodite with five terminal spines, one of which is very minute. (The homologies are tentative and subject to revision.)

First thoracic segment covered by carapace. Postcephalic segments 2-9 bear prominent pleura, and, together with thoracic segment 1, make up the thorax. On segments 10-18, the pleura represented by well-marked spines.

First seven thoracic appendages essentially similar. Protopodite at least two-jointed, with flattened paddle-like pseudopodite derived from the basipodite on its lateral surface; a complex gnathobase of many lobes and spines on its medial margin. Exopodite two-jointed, flattened, the proximal joint being pentagonal and the distal joint circular in outline. A fringe of long spines on the distal edge of the second joint. Distal five joints of endopodite distinct, borne on a basal extension of the basipodite which may represent a sixth joint. The medial surface of the endopodite gives rise to numerous spines. The terminal joint round, smaller than the others, and giving rise to three short thick spines (Fig. 2, *G*). In segment 8 these three spines replaced by an elongate conical structure. The endopodite lost on ninth segment; the gnathobase can be clearly seen as shown somewhat schematically in Figure 2, *H*. On tenth segment the appendage greatly reduced, consisting merely of two joints (Fig. 2, *I*). In female this appendage used to hold egg case.

Genital segment probably tenth. No genital aperture discovered. Female bears single egg case, apparently containing a single large egg beneath 10-12 segments (Fig. 1, *D*).

Segments 11-18 lack appendages and may be considered to constitute the abdomen. The eighteenth segment bears a row of about forty-five equally spaced spines on distal ventral margin. A similar row of about twenty-eight smaller spines present on the distal ventral margin of telson. The posterior dorsal margin of telson excavated over anus. The telson gives rise to two elongate caudal furca, the rami of which are more than five times as long as wide. Each ramus bears three spines, two relatively small while the inner one is extremely long, being about one-half as long as total length of animal (Fig. 1, *B*).

Over-all length, excluding caudal spine, 2.85 mm.; width of abdomen, 0.33 mm.

Long Island Sound.—(1) Holotype, 2.85 mm. in length, stn. 8 (lat. 41-13.6; long. 72-46.4), July 23, 1954, on muddy bottom in 12-14 meters of water. Deposited in Peabody Museum of Yale University (Cat. No. 3617). (2) Paratype, 2.95 mm., stn. 3 (lat. 41-06.3; long. 73-00.2), August 20, 1954, on muddy bottom in 18-20 meters of water. (3) Paratype, female 2.30 mm. with egg case, stn. 8, August 1, 1953. (4) Paratype, female 2.80 mm. with remnants of egg case, stn. 7 (lat. 41-13.6; long. 72-50.6), September 10, 1954, on muddy bottom in 9-11 meters of water. (5) Paratype, 2.57 mm., stn. 7, May 20, 1954. (6) Paratype, 2.85 mm., stn. 8, July 23, 1954. (7) Paratype, dissected, stn. 8, July 23, 1954. (8) Paratype, dissected, stn. 3, December 23, 1953. All specimens collected by author.

It is not improbable that all the specimens are females.

It is apparent from the above description that *Hutchinsoniella* cannot be placed in any of the known subclasses as presently defined. It is therefore proposed that

a new subclass, Cephalocarida, be erected for this genus. The subclass may be defined as Crustacea with a large head posteriorly covering the first thoracic segment, with significantly more postcephalic segments than in the Malacostraca (which have fourteen or fifteen), with biramous thoracic appendages but no abdominal pleopods.

Discussion.—Regarding affinities, only three subclasses need be considered; the Branchiopoda, the Malacostraca, and the Copepoda. *Hutchinsoniella* possesses in common with the Branchiopoda the large number of thoracic and abdominal segments, the absence of pleopods on the abdomen, the presence of a furca, the mode of carrying the egg case, and the presence of gnathobases on all the thoracic appendages, although the rest of the appendage is totally different. However, its inclusion in the Branchiopoda must be ruled out by the form of the thoracic appendages, since they are far closer to the ideal biramous appendage even than the posterior thoracic appendages of the Devonian *Lepidocaris*.¹

The most striking malacostracan character is the form of postcephalic appendages, which, except for the presence of an epipodite-like structure on the basipodite rather than the coxopodite, are comparable to those of the Syncarida. It is just possible that the knoblike structure on the second segment of the antennule represents a second antennular ramus as in many Malacostraca. The number of segments and the absence of pleopods on the abdomen prevent *Hutchinsoniella* from being included in this subclass.

The large head, the method of carrying the egg, the absence of pleopods on the abdomen, and the shape of the caudal furca indicate affinities to the Copepoda. An extreme reduction of segments, some simplification of the appendages, and a fusion of the head to the first thoracic segment which it covers would convert *Hutchinsoniella* into an organism comparable to a copepod.

A peculiar feature of the animal is the presence of the pseudepipodite on the basipodite of the thoracic appendage. The Branchiura, however, possess a slender structure known as the flagellum, of doubtful homology,² that similarly is given off by the distal segment of the protopodite.

The second maxillae may have been lost, as in the cladocerans. It is, however, just conceivable that the first pair of thoracic appendages may be the homologue of the second pair of maxillae in other crustaceans.

The fact that the mandible lacks a palp may appear inconsistent with the general primitiveness of the animal. However, Borradaile³ pointed out that among the decapods of the tribe Carides the palp disappears and reappears from genus to genus. At least in some groups of Crustacea the palp is evidently of little phylogenetic importance.

In conclusion, *Hutchinsoniella* may be looked upon as an extremely primitive crustacean at about the same level of complexity as the Branchiopoda but probably related to the ancestral stock that gave rise to Copepoda, Branchiura, and possibly the Malacostraca.

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¹ D. J. Scourfield, *Trans. Roy. Soc. London, B*, **214**, 153-187, 1926.

² W. T. Calman, *Crustacea*, in Sir Ray Lankester (ed.), *A Treatise on Zoology*, Part VII, fasc. 3 (1909).

³ L. A. Borradaile, *Ann. Mag. Natural. Hist.*, 7th ser., **19**, 457-486, 1907.