is, 16 × 50 or 800 units of Au/SH per milliliter. Each 500 ml of plasma thus contained 400,000 units of Au/SH. The total number of units of Au/SH in each fraction was then calculated relative to the total number of units in the starting plasma (Table 1).

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Reproductive System of Hutchinsoniella macracantha

Abstract. *The cephalocarid crustacean* Hutchinsoniella macracantha *is a hermaphroditic species. Ova and sperm develop simultaneously. Ovaries and testes are separate, but the oviducts and vasa deferentia join and exit through a pair of common genital ducts.*

The subclass Cephalocarida has been given considerable attention with regard to questions of crustacean phylogeny. Comparative studies of external morphology, skeletomusculature, larval development, and behavior in the best-known species, *Hutchinsoniella macracantha* Sanders (*1*), all demonstrate that members of this subclass are the most primitive known crustaceans (*2*). These studies also suggest some of the basic patterns in crustacean evolution. Our investigation of the internal anatomy reveals a condition of the reproductive system which, while not necessarily primitive, is certainly unusual among arthropods (*3*).

Hutchinsoniella macracantha is a true hermaphrodite (Fig. 1). All adults possess well-developed ovaries and testes. These two pairs of organs are the only places in the genital system where chromosomal figures of dividing cells have been observed. Testes are sausage-shaped bodies located dorsal to the gut from the seventh to the twelfth postcephalic segments. Each ovary is a much smaller cluster of cells appressed to the medial surface of the tubule of the maxillary gland in the posterior portion of the cephalon.

Each oviduct arises from the ovary's medial surface and extends toward the gut within the diffuse ventrolateral mesentery that invests the ventral longitudinal muscle bundle and the gut. It then turns posteriorly and runs the length of the thorax within the mesentery and dorsal to the ventral longitudinal muscle. In the thorax, ova are sparsely distributed and small, appearing as they do within the ovary. The oviduct continues posteriorly into the abdomen, where ova begin to enlarge. In the 18th postcephalic segment the oviduct doubles back upon itself dorsally and extends forward into the thorax up to the sixth postcephalic segment. At the posterior flexure there is an accumulation of ova; here they are very large but still lack yolk. Between the flexure and the terminal portion of the oviduct there is one more ovum; it is extremely large, extends through several segments, and is heavily laden with yolk. This is the mature ovum, ready to be laid. The maturation of but a single pair of ova relates to the fact that cephalocarids brood only one pair of eggs at a time.

The anterior ends of the pair of testes are joined together in the seventh postcephalic segment, dorsal to the gut. From this juncture spring the vasa deferentia, each of which descends obliquely anteriorly and joins the oviduct in the sixth postcephalic segment. The now common genital duct descends into the sixth thoracic limb and exits on the posterior face of the protopod.

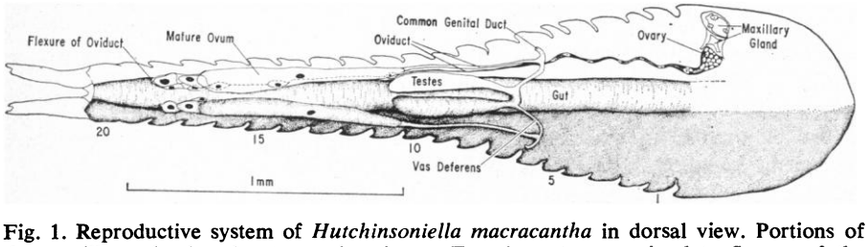

Fig. 1. Reproductive system of *Hutchinsoniella macracantha* in dorsal view. Portions of the maxillary gland and gut are also shown. Female system proximal to flexure of the oviduct is not shown on the right side of the animal. Numbers beneath the figure label postcephalic segments.

Among the free-living Crustacea are very few cases of hermaphroditism in which both sexes function simultaneously (*4*). Within the subclass Cirripedia, the Thoracica are generally cross-fertilizing hermaphrodites, and here the genital pores are on separate segments. Cephalocarids, as exemplified by *H. macracantha*, also generate sperm and ova simultaneously. They are unique in discharging these products through a common duct.

There is no clear-cut structural evidence that rules out the possibility of self-fertilization. However, cephalocarids are mobile and inhabit normal marine soft-bottom environments at reasonable population densities (*5*). Thus, there is no obvious adaptive reason why such organisms should practise self-fertilization.

Cephalocarids have never been observed mating. It has been assumed that the modified endopod of the seventh thoracic limb is a clasping organ; yet the separation of the genital pore from the ninth postcephalic segment, which bears the brooded egg, suggests that this modification may actually serve in directing the egg as it is laid to its place of attachment. Cephalocarid sperm is nonmotile (*6*), which indicates that individuals participating in cross-fertilization must come into intimate contact. There is no evidence of the formation of spermatophores.

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