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MYSID STATOLITHS IN SHELF SEDIMENTS OFF NORTHWEST NORTH AMERICA[1]

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ABSTRACT

Sand-sized flattened ellipsoids, the statoliths from mysid (opossum shrimp) uropods, are a persistent element in and are restricted to shelf sediments. Smaller, less flattened, non-fluoride statoliths have been found at lower bathymetric levels.

Statoliths are the minute particles contained within the statocysts (equilibrium receptors) of many species of Mysidacea (Crustacea, Malacostraca: commonly called opossum shrimp). One statocyst with enclosed single statolith is located in each inner uropod of the mysid telson. The structure is shed during ecdysis (Waterman, 1961). The sand size statoliths are often encountered in examination of marine sediment coarse fractions for foraminiferids.

Statoliths from the sediments are opaque brown or creamy translucent, nearly circular to elliptical in outline and slightly convexo-concave in profile (fig. 1). Nearly circular, creamy porcellaneous statoliths identical with figure 1 (A,J) were dissected from formalin-preserved specimens of *Neomysis rayii* from the Strait of Juan de Fuca. Circular statoliths approximately one-third smaller with surfaces resembling frosted glass were found in statocysts of *Neomysis awatchensis* from Lake Washington. The composition of *Neomysis rayii* statoliths and of similar forms from the sediments was found to be calcium fluoride with an undetermined organic base (M. Grant Gross, University of Washington, personal communication, 1965).

Enbysk (1960) reported the almost universal occurrence of mysid statoliths in shelf sediments off northwest North America and noted their absence from slope samples. (Appreciation is expressed to Frances Parker and Robert Langford of Scripps Institute of Oceanography for initially identifying these forms.) Sediments cored from Port Orchard, a shallow inlet of Puget Sound, contained 5 statoliths per gram dry total sample; shelf samples contained 1 or 2 per gram. Statoliths are a persistent element in Chukchi, Bering and Gulf of Alaska shelf samples, although not so numerous as in shelf and Strait samples off British Columbia and Washington.

The reason for the apparent restriction to shallow water samples derives from the habitat of mysid species of these waters. Most species of of mysids are neritic. The animals are found in the plankton, on the bottom and burrowed into the bottom. Seventeen species are reported from the neritic of the northeast Pacific, either in inland waters or open waters over the continental shelf. An additional five are reported primarily from the littoral zone (Banner, 1948). All the shallow species possess statocysts. In addition 3 species with reduced statocysts occur in waters near the coast but are not restricted to the neritic. Statoliths were dissected only from the two species mentioned, and cursory examination of three other species yielded no statoliths. (All species were not examined.) Of the oceanic species, three have statocysts and two do not. Statoliths were not observed in the few oceanic specimens examined. The neritic species are thus much more numerous; all possess statocysts and two species at least contain statoliths. The contribution of statoliths to the bottom from oceanic species would seem negligible. The swarming and settling habit and numerous molts could produce an extraordinary accumulation below certain shoaling areas. This is notable at the entrance to the Strait of Juan de Fuca and in Port Orchard off Puget Sound where statoliths increase both in numbers and relative to benthonic foraminiferid numbers.

The small elliptical outline statolith, lacking a dorsal rim, figured by Bandy and Kolpack (1963, text-fig. 31B) from Tertiary deep water sediments (est. 1500 m) appears to be identical with specimens from slope sediments off Oregon (Gerald Fowler, Oregon State University, personal communication 1965), and those found rarely by us in Gulf of Alaska bathyal samples. In a sandy silt sample off British Columbia at

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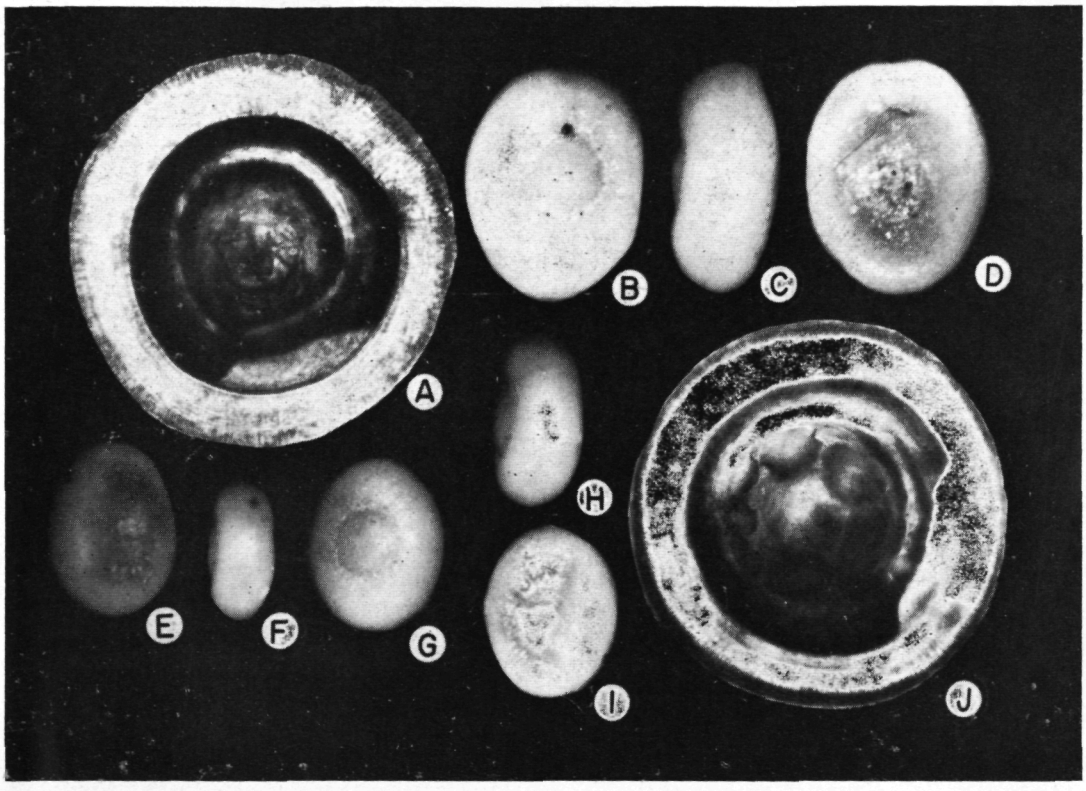

FIG. 1.—Mysid statoliths from bottom sediments.

A. J. Medium size, round form. 37 m, Port Orchard (Puget Sound), Washington. (A) Concave ventral side; (J) Convex dorsal side; 0.350 mm diameter; in water mount.
B–D. Large elongate form; E–I. Small elongate form; 150 m, continental shelf off Point Grenville, Washington. (B) Dorsal. (C) Side. (D) Ventral; 0.375 mm longest dimension. (E–I) 0.225 mm longest dimension.

166 m, this same form occurred as individuals and in a clump of 42 individual statoliths held together by organic material which stained dark red in the protein specific rose bengal. Statoliths removed from this clump did not contain fluoride. Some larger crustacean may be the bearer of this multiple statolith type statocyst. Individual statoliths could erroneously be attributed to mysids. Analyses have not been made of other deep water occurrences noted above.

In summary, mysid statoliths of the type illustrated here are a persistent biogenic component of shelf sediments due to the living habit of mysids. Swarming, settling and ecdysis of individuals over shoal areas may contribute anomalously high statolith numbers and thus anomalous fluoride concentrations to the sediments below.

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