# *Archaeomysis grebnitzkii*

A mysid, or opossum shrimp (Cserniavsky, 1882)

Phylum: Arthropoda
Subphylum: Crustacea
Class: Malacostraca
Order: Mysida
Family: Mysidae

## Description

**Size**—length of males 9-14 mm, females 13-21 mm (Holmquist 1975). These specimens (Columbia River) 4.5 mm and 17 mm.
**Color**—transparent, with stellar melanophores ("maculate'). Some mysids can change color to blend with their background (Tattersall and Tattersall 1951).
**Body**—carapace covers most of thorax, attached dorsally by anterior-most segments; the last thoracic segments are exposed, the posterior end of the carapace is free. Eyes are stalked; antennules are biramous; antennae have large scale-like squama ("exopodite'). Thoracic limbs have swimming exopodites; abdominal pleopods are reduced; uropods are lamellar, forming a tail fan. Females have a distinctive marsupium, composed of pairs of oostegites.
**Antennae**—almost as long as body; slender multiarticulate flagellum (fig. 1). 3 jointed peduncle is longer than its antennal scale, but shorter than the antennular peduncle (fig. 2).
**Antennae Scale**—(squama) extends to distal end of 2nd joint of peduncle; 3 ½x as long as broad. Straight outer margin, without setae: genus *Archaeomysis* (Banner 1948a); strong terminal spine, weak or absent distal suture. Scale is setose only (no spines) on anterior and inner margins (Kozloff 1974a) (fig. 2).
**Antennules**—peduncle with 1st joint about equal in length to remaining joints combined; 2nd joint with 2 spines on outer margin (Tattersall 1951) (fig. 2).
**Eyes**—large, movable, stalked, with black corneas; somewhat pear shaped. Rather less than twice as long as broad (eye and stalk) (fig. 2).
**Mouthparts**—labrum longer than broad (Tattersall and Tattersall 1951); with strong frontal spiniform process: genus *Archaeomysis* (Banner 1948a) (not figured).
**Carapace**—attached to 1st 2 or 3 thoracic segments (free dorsally at posterior edge): order Mysidacea (Banner 1948a) (figs. 1, 1a). Posterior margin with rounded lateral lobes: genus *Archaeomysis* (Banner 1948a); no fringe, etc. Carapace produced anteriorly into short rostrum (fig. 2).
**Rostrum**—"shortly produced": original description, genus *Archaeomysis* (Holmquist 1975); shorter than eyestalk (fig. 2). Can be grooved, bent down slightly, rounded: sp. *grebnitzkii* (Holmquist 1975).
**Thoracic Legs**—(pereiopods (Holmquist 1975)) - without well developed gills: suborder Mysida (Banner 1948a). 1st leg with exopodite (not figured); 2nd leg without a lobe-like process on merus (not figured). Limbs 3 – 8 with carpopropodus (carpus and propodus fused) of endopod divided into many subjoints: 9 - 11 in female legs (fig. 3), 7 - 9 subjoints in male legs (not figured). Exopod in both male and female legs 3 - 8 has a basal joint with an acute outer distal corner (fig. 3). No branchiae on thoracic legs: order Mysida (Mauchline 1980).
**Oostegites**—(females only): thoracic brood pouch of two pairs of lamellae: subfamily Gastrosaccinae (Mauchline 1980). Oostegites arise from 7th and 8th thoracic legs (Mauchline 1980) to form marsupium (fig. 1).
**Abdomen**—5th abdominal somite with a small medial projection; 6th somite with corresponding ridge (fig. 5). Females: lateral pleura on first somites help form brood pouch (fig. 1); inconspicuous pleura on somites 3-5, none on 6 (Banner 1948a) (not figured).
**Pleopods**—Male: Variable, order Mysida (Mauchline 1980). All biramous; 3rd with elongate exopod: genus *Archaeomysis* (Banner 1948a). 1st pleopod with uniarticulate endopod, multiarticulate exopod: spp. *Grebnitzkii* (Banner 1948a) of 7- 9 articles (Holmquist 1975) (not figured); 2nd pleopod with endopod of 4- 7 articles, exopod of 8 - 9 articless (not figured); 3rd pleopod with elongate copulatory exopod of 8 - 10 articles, endopod of 5 articles (Holmquist 1975) (fig. 4); 4th pleopod with exopod of 5 - 9 articles (Holmquist 1975); this specimen with 7 articles (fig. 5), endopod a simple plate; 5th pleopod like 4th, but shorter, with 4 - 8 exopod

Articles (Holmquist 1975) (not figured). Female: "usually degenerate" i.e. reduced: order Mysida (Mauchline 1980). All biramous: genus *Archaeomysis* (Mauchline 1980), each ramus of one small article. 1st pleopod with an elongate protopodite, with basal and distal tufts of long setae; endopod longer than exopod, and more than ½ as long as protopodite (fig. 6); 2nd pleopods with short protopodite and exopod, longer endopod (fig. 7); 3rd, 4th, and 5th pleopods like 2nd, but with shorter endopods (not figured).

**Uropods**—biramous, neither branch articulate (Banner 1948a): subfamily Gastrosaccinae. Both rami with setae on distal margin: genus *Archaeomysis* (Banner 1948a). Endopod longer than exopod, with statocyst near base, 2 basal spines (fig. 8). 6 spines on inner edge (male), 7 in female (Banner 1948a) (not figured). Exopod truncate, without suture: subfamily Gastrosaccinae (Mauchline 1980). Exopod with 14 lateral spines (male) or 17 (female) on outer margin (more than 10: genus *Archaeomysis);* no setae on outer exopod margin (Banner 1948a): subfamily Gastrosaccinae.

**Statocyst**—light and balance organ on endopod or uropod: order Mysida (fig. 8). (Found in all neritic, and in common oceanic mysids (Banner 1948a).) Distinguishes mysids from larval decapods (Green 1968).

**Telson**—with distinct apical cleft: subfamily Gastrosaccinae (Mauchline 1980) margins of cleft denticulate (Banner 1948a) (fig. 8). Telson 2 ½ x as long as broad (at base); 8 - 9 spines of each margin, last 2 spines long, strong, close together (fig. 8).

**Juveniles**—are miniature adults at post-emergence molt, when they are usually 1.5-3.0 mm long (Mauchline 1980).

## Possible Misidentifications

Mysidacea and Euphausiacea, being superficially similar in appearance, are often treated together (Banner 1948a; Mauchline 1980). (They were formerly combined as the Schizopoda.) Both are orders of the subclass Malacostraca, but euphausiids are in the division Eucarida with the Decapoda. Like the mysids, euphausiids differ from decapods in having biramous thoracic legs (Kasaoka 1974). Unlike the mysids, euphausiids have a carapace that is fused dorsally with all the thoracic segments. The mysid carapace is attached only to the 1st 2 or 3 thoracic segments; mysid females have oostegites, euphausiids do not.

Other orders of Pericarida include Isopoda, Tanaidacea, and Amphipoda, which are all fairly easily distinguished from Mysidacea. One order that might be confused is Cumacea, small crustaceans of up to ½ inch long, with an inflated, shrimplike carapace, a single compound recessed eye (except for some eyeless females of some species), and a flexible, tubular abdomen.

Mysids characteristically have large, stalked, movable eyes, and well developed exopodites on their thoracic legs. The females have oostegites. Additionally, northeast Pacific mysids lack thoracic gills, have reduced pleopods in the females – and usually in the males as well. They have a statocyst on the inner ramus of the uropod. The 2 oceanic species, the large *Gnathophausia gigas* (Willemoes-Suhm) and *Eucopia unquiculata* (Willemoes-Suhm) lack these characteristics; they do have the unattached carapace and 7 pairs of female oostegites.

The suborder Mysida, to which *A. grebnitzkii* belongs, lack gills or branchiae on the thoracic legs (fig. 3); they rarely have 7 pairs of female oostegites, and have rather reduced female pleopods. The male pleopods are often modified for copulation. (The other suborder is the Lophogastrida.) Mysidae is the only family in Mysida. There are 6 subfamilies; some are not found in the northeastern Pacific. Of those are:

The subfamily Boreomysinae (one genus, *Boreomysis* spp.) has at least 2 species in our area. These mysids have 7 pairs of oostegites in the female, not 2. Their thoracic legs have only 2-3 articulations, not many; the outer uropods have a spine or spines on the outer margin; the statocyst is reduced (Banner 1948a). This genus is bathypelagic and widely distributed; individuals could be found in our estuaries.

The subfamily Mysinae is composed of 4 or 5 tribes, 3 of.which occur in the northeastern Pacific: the Erythropini: the Mysini, and the Heteromysini. Characteristics of the subfamily Mysinae include a wide labrum, uropod exopods with only setae on

the outer margin (not spines only as in Gastrosaccinae), and 2 or 3 pairs of female oostegites. Like Gastrosaccinae, they can have various types of male pleopods. Northeastern Pacific genera of Mysinae include *Pseudomma* and *Holmesiella* (Erythropini), *Neomysis, Holmesimysis* and *Acanthomysis* (Mysini), and *Heteromysis* (Heteromysini).

The subfamily Mysidellina has but 1 genus, *Mysidella.* These mysids are stout and robust, with a labrum that is produced posteriorly into unequal lobes. *M. americana* has been found in deep water off British Columbia (Banner 1948a).

The subfamily Gastrosaccinae, to which *Archaeomysis* belongs, includes 8 genera (Banner 1948a); none of the others occurs in the northeastern Pacific. *(Gastrosaccus,* from Japan, is very close to *Archaeomysis* (N. li, 1964)). *Bowmaniella* (Bacescu, 1968) from the Atlantic, is known on the Pacific coast only from southernmost California south (Holmquist 1975). *B. banneri* is the new name for *Archaeomysis* species Tattersall (Holmquist 1975; Tattersall 1932)

*Archaeomysis maculata* (=*Callomysis maculata* (Holmes, 1895) is now considered to be a synonym of *A. grebnitzkii* (Holmquist 1975).

## Ecological Information

**Range**—Found only in northern Pacific (Holmquist 1975): S.W. Bering Sea, Washington, Oregon, northern California.
**Local Distribution**—estuaries of Coos Bay, Yaquina Bay, lower Columbia River. Also on open coast.
**Habitat**—primarily littoral; buried in sand; in sand, pebbles and boulder mixture on both open ocean coast and in inland waters. In mud and alga *Zostera;* with *Phyllospadix* and kelp intermixed (Holmquist 1975). Burrows in bottom substratum, rising to surface of water at night, especially during breeding season (Mauchline 1980; Tattersall and Tattersall 1951); very sensitive to oxygen reduction (Green 1968).
**Salinity**—quite variable: from fresh water to 34 ‰ (Holmquist 1975) (but salinity figures could refer to surface, and the species is an inhabitant of the saltier, bottom water (Holmquist 1975)).
**Temperature**—a wide range: from 8.5 °C or lower to 24 °C. (Holmquist 1975)
**Tidal Level**—predominantly intertidal; also found in shallow waters close to shore (Holmquist 1975). Moves up and down with tide. At extreme low water (Puget Sound (Banner 1948a)); subtidal (Coos Bay); intertidally and at low water on ocean beaches.
**Associates**—

## Quantitative Information

**Weight**—
**Abundance**—the most common mysid of the northeastern Pacific, followed by *Neomysis mercedis* (Holmquist 1975), which see.

## Life History Information

**Reproduction**—copulation at night lasts only a few seconds (Mauchline 1980). Occurs just after female releases young from brood pouch and then moults (Nouvel 1937, in Tattersall and Tattersall 1951). Sperm is shed into female brood pouch and female then lays eggs, which are immediately fertilized (Mauchline 1980). Early embryos are spherical or sub-spherical. Young develop to a subadult stage in brood pouch, and emerge from external genital openings of oviducts near bases of 6$^{th}$ thoracic legs (Mauchline 1980). Brood size can vary seasonally: largest produced in early summer *(Gastrosaccus,* Japan). Number of eggs depends on size of female and of embryos and in temperate and high latitudes on season, but not on temperature (Mauchline 1980). The Japanese *G. vulgaris,* similar in size to *A. grebnitzkii* (17 mm long), had 100 young in her pouch (Mauchline 1980). Numbers of broods/year not definitely known for *Archaeomysis,* but most shallow-living neritic and littoral species have 3/year, including the closely related *Gastrosaccus* at a comparable latitude (Japan) (Mauchline 1980): see “Longevity” below. Chromosome counts for *A. grebnitzkii* were 2n = 10, plus an extra small chromosome (Holmquist 1975). Sex ratios vary within populations; females frequently outnumber males (Mauchline 1980).
**Growth Rate**—larval development time depends on temperature: in *G. vulgaris* 10.9 - 25 days (Matsudaira *et al*. in Mauchline 1980). Mysids generally take about 1 year to

attain full growth; are sexually mature in considerably less time (Tattersall and Tattersall 1951). Females usually grow larger than males (Mauchline 1980). Number of instars is fewer than for most crustaceans. First and 2nd occur in marsupium, and 10 or more after release of young (Mauchline 1980).

**Longevity**—mysids will probably live 12 - 18 months in temperate water, over 2 years in Arctic (Tattersall and Tattersall 1951). No longevity rates known for *Archaeomysis.* Overwintering generation, most born in autumn, a few in summer, produces a few young in winter. Spring breeding is intensive: females may produce 2 broods; spring generation produces in summer (possibly twice), and usually dies by autumn (Mauchline 1980).

**Food**—feeds either on large masses picked up by thoracic endopods, or on fine suspended matter filtered by thoracic exopods (more usual method). Food can be living or dead: Danish *Gastrosaccus* spp., also bottom dwellers, eat detritus, algae, copepods and amphipods (Tattersall and Tattersall 1951). To stir up food for filtering, mysid will balance, head down, on antennal scales and inner flagella of antennulae, and create currents with thoracic exopods. It can also "plow" bottom with scales and flagellae (Cannon and Manton 1927, in Mauchline 1980). South African *Gastrosaccus* sp. feeds most often at night (Mauchline 1980).

**Predators**—fish are most important predators (Tattersall and Tattersall 1951): the major mysid eaten by Columbia River fishes (Haertel and Osterberg 1967). Birds: eider duck in Aleutians. Also shrimp, ctenophores, squid; possibly cetaceans and seals. Mysids are ground to paste for fish bait in Channel Islands; in India they can be eaten by humans (Tattersall and Tattersall 1951).

**Behavior**— locomotion mostly by exopods of thoracic legs (pleopods reduced, not locomotory); motion is rotary, unceasing. Also typical is an "escape mechanism": sudden downward flex of abdomen and tail fan; animal springs backward and can even leap out of water (Tattersall and Tattersall 1951), or through mud (Mauchline 1980). In some species, females will recapture escaped larvae (especially ones older than their brood) and return them to their marsupium. Larvae can belong to other individuals, or to other species. Males will eat escaped larvae (Mauchline 1980). Mysids avoid bright light (Tattersall and Tattersall 1951), but are attracted to weak light sources (and to lures) (Mauchline 1980). *Archaeomysis* did not respond to atmospheric pressure changes of 0.1 atm (Mauchline 1980). Other burrowers (*Gastrosaccus* sp.) have pronounced diel vertical migration: in substrate by day and pelagic at night. Females can migrate more regularly than other population components (*G. sanctus,* Mediterranean (Mauchline 1980)). Burrowing mysids orient by rheotaxis · by facing into water current. They may move offshore to avoid breaking waves; waves can also wash them out of their burrows (Mauchline 1980).

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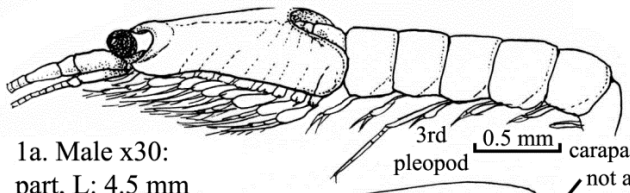
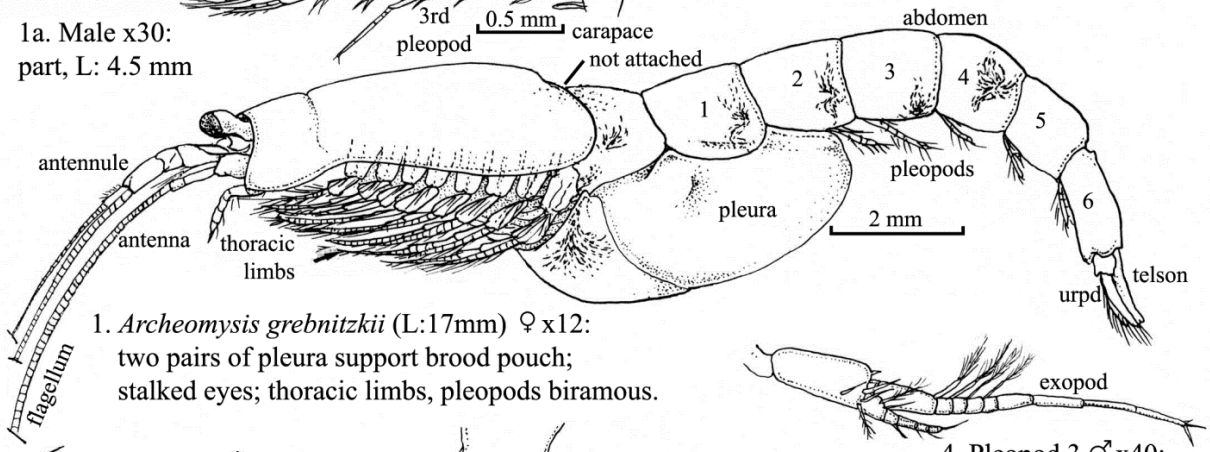


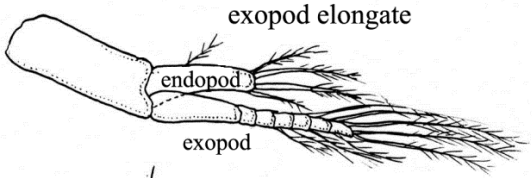
1a. Male x30:
part, L: 4.5 mm



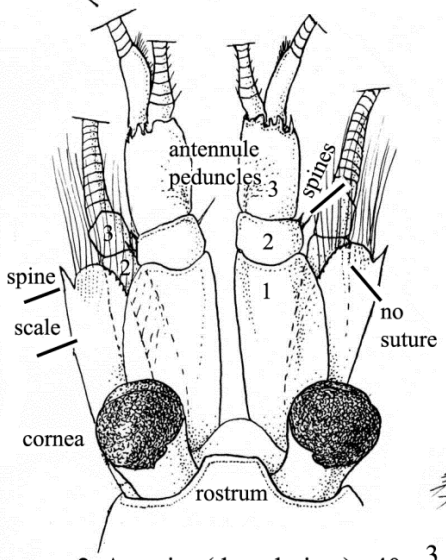

1. *Archeomysis grebnitzkii* (L:17mm) ♀ x12:
two pairs of pleura support brood pouch;
stalked eyes; thoracic limbs, pleopods biramous.



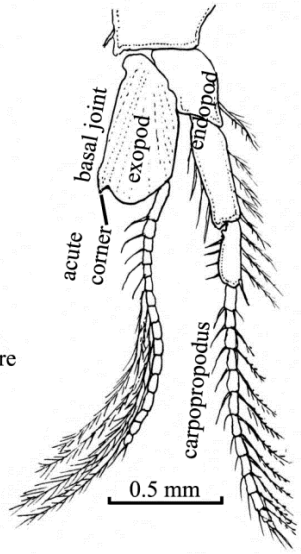

4. Pleopod 3 ♂ x40:
exopod elongate



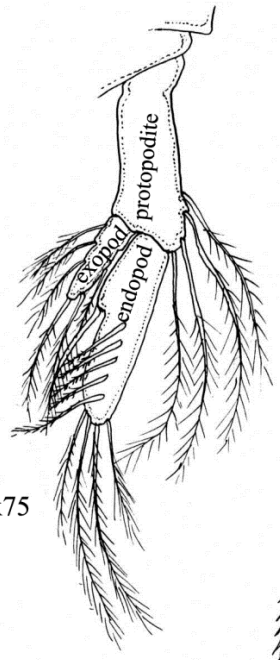

5. Pleopod 4 ♂ x75



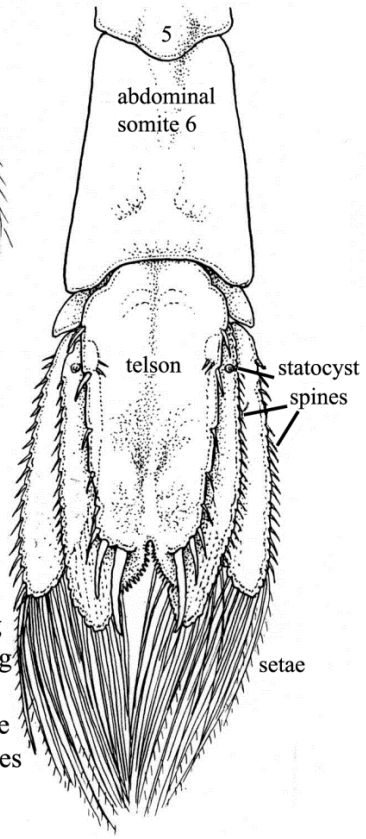

2. Anterior (dorsal view) x40:
rostrum truncate; antennal
scales with strong spine.



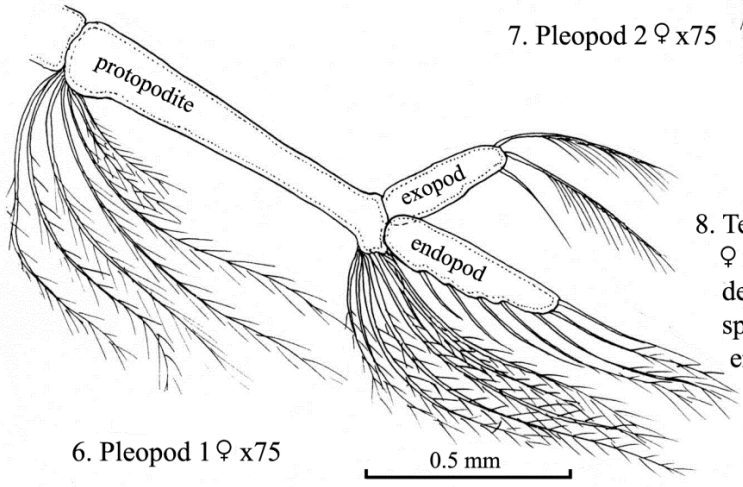

3. 7th thoracic limb ♀ x40




7. Pleopod 2 ♀ x75




8. Telson and uropods
♀ x40: telson cleft,
denticulate, 8 strong
spines.Uropods: long
endopods with
statocysts; truncate
exopods with spines
on outer margins.




6. Pleopod 1 ♀ x75