

Amphipoda of the Northeast Pacific (Equator to Aleutians, intertidal to abyss): XX.
Phoxocephaloidea - a review. Donald B. Cadien, LACSD
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Preface

The purpose of this review is to bring together information on all of the species reported to occur in the NEP fauna. It is not a straight path to the identification of your unknown animal. It is a resource guide to assist you in making the required identification in full knowledge of what the possibilities are. Never forget that there are other, as yet unreported species from the coverage area; some described, some new to science. The natural world is wonderfully diverse, and we have just scratched its surface.

Introduction to the Phoxocephaloidea

Members of the superfamily are exclusively burrowers. They are typically strongly rostrate, although loss of rostrum has occurred in the Urothoidae. Bodies are uniformly smooth, with some forms having limited cusping or spination of the pleosome. Legs typically are heavily endowed with robust setae or spines which assist in burrowing.

Northeast Pacific marine faunas have large numbers of phoxocephaloids, both in shallow and deeper samples. A strong radiation of the superfamily also occurred in the southern hemisphere, particularly in Australia (J. L. Barnard and Drummond 1978), and in southwestern Atlantic waters. Four families in the superfamily not occurring in the NEP are found there. Some of the species, especially in Phoxocephalidae, occur into the intertidal zone, living in sand pockets between rocks, and to the mid-tidal level on sandy shores (Dexter 1974, Fincham 1971). While the diversity of phoxocephaloids is generally greatest in sandy sediments, a few groups (especially the harpiniids) are more common in siltier sediments at greater depths. All phoxocephaloids appear to be free-living, with no known commensal or parasitic members. They may also form a measurable proportion of the hyperbenthos, as males leave the sediments on mating searches using their chemosensory antennal aesthetascs (and callynophores) to locate females.

Viewed as an early-arising (Bousfield 1982a, 1983) and plesiomorphic group (Bousfield 1979, Bousfield and Shih 1994), they are probably most closely associated with the Crangonyctoidea. That fresh-water group also arose early, undergoing a radiation in fresh-waters paralleling that of the phoxocephaloids in marine waters. Evidence of their connection remains in the structure of their calceoli (Bousfield and Shih, 1994), and in reproductive similarities (Conlan 1991). The composition of the superfamily has remained the same since it was first established (Bousfield 1979), although families described since 1979 have been added to it. The family Urothoidae was established in the 1979 paper. Despite strong morphological convergence with the similarly fossorial pontoporeoids, the phoxocephaloids are not closely related to them. They are, however, frequently confused in the literature, with members of the Platyischnopidae and Urothoidae usually listed as members of Haustoriidae in the superfamily Pontoporeoidea (see for instance Rabindranath 1971)

Diagnosis of the Phoxocephaloidea

“Plesiomorphic, smooth-bodied, rostrate, fossorial gammarideans usually having strongly dimorphic terminal pelagic male bearing sensory brush setae and calceoli on

peduncular segments of antenna 1 and 2, and calceoli on flagella esp. antenna 2; accessory flagellum strongly developed; mouthparts modified, usually with weak mandibular molar and palp, weakly armed plates of maxillae 1 and 2, and small inner plates of maxilliped; lower lip, inner lobes well developed; coxal plates deep, 4th large, strongly excavate behind; coxae 5-7 posteriorly lobate; gnathopods 1 and 2 non-amplexing, subsimilar, subchelate or chelate; peraeopods 5-7 dactylate, heteropodous, often markedly so; brood plates linear; coxal gill usually present on peraeopod 7; pleopods normal to powerful; uropods lanceolate, rami of 1 and 2 subequal; uropod 3 foliaceous, outer ramus 2-segmented; telson lobes deeply separated (or fused to a notch), apices with minute notch and spine.” (Bousfield 1979).

Ecological Commentary

Adoption of the fossorial “sand-swimming” life style has profound ecological consequences. These are clearly seen in the morphology of phoxocephaloids, and in their relationship to their environment (see Bousfield 1970 for a discussion of the evolutionary radiation of this habitat in phoxocephaloids and other burrowing families). Adoption of such a life style provides access to infaunal prey (bivalves, worms, other crustaceans) and precludes elaboration of antennal and anterior appendage modifications designed to capture suspended particulates, or harvest sediment surface organic particles.

Superfamily members for which diet has been established seem to be exclusively micro-predatory omnivores (Oliver et al 1982, Oakden 1984, Oliver and Slattery 1985). Some detrital aggregations were also present in the examined guts, but the major component of the diet appeared to be either larval or adult infauna. Oakden (1984) examined five different species from California, finding that nematodes and polychaetes formed the majority of the diet for most of the examined species. In at least one case, a small haustoriid amphipod, which shared the shallow sub-tidal habitat with the examined *Foxiphalus obtusidens*, was consumed. Copepods were also an appreciable percentage of gut content of most species, as were diatoms. Whether the later are selectively ingested, or taken incidentally in feeding on other infauna, is not currently known. The micro-predatory habit is reflected in the structure of the mandibles, which develops from a primitively simple triturating surface, through reduction to an advanced narrowed finger-like shape ringed with cutting teeth in evolutionarily more advanced members (Jarrett and Bousfield 1994a). This would correspond with unspecialized detritivory as the primitive state, and increasing specialization for micro-predation.

Predation on phoxocephaloids is assumed to be primarily by fish. Wakabara et al (1982) showed that phoxocephaloids were a small, but appreciable portion of the diets of three flatfishes in the western Atlantic. Reports from California also indicate flatfish (Ambrose 1976) and surfperch (Antrim 1982) as predators of phoxocephaloids. Muir & De Felice (1998) record predation on a species of *Mandibulophoxus* in Hawai’i by wrasses, bonefish, and snappers. Predation pressure from co-occurring invertebrates, however, also occurs and can induce flight from an area in affected phoxocephaloids (Ambrose 1984). At least a portion of this predation takes place in the water-column. Tests conducted by Oakden (1984) suggest that once in their preferred sediments, phoxocephaloids swim little outside of reproductive excursions. In unfamiliar or unwelcome sediments (too fine or too coarse), however, swimming was frequent and appeared related to search for more desirable bottom conditions (Oakden, Oliver and

Flegal 1983). They may also choose to relocate under the pressure of high population density (Ambrose 1986).

Both males and females swim. This is a function of the reproductive pattern exhibited by these animals. Conlan (1991) characterized the superfamily as “non mate-guarding pelagic searchers”. Plankton collections suggest that the sex ratio of the swimming individuals is not 1:1, with females outnumbering males significantly in the primitive Platyischnopidae (Rabindranath 1971). In the phoxocephalid *Rhepoxynius abronius* the sex ratio (based on benthic rather than pelagic samples) was much closer to even, but males outnumbered females during most months (Kemp et al. 1985). Copulation takes place in the water column, with both the male and female swimming (Bousfield 1979, Slattery 1985), after which the male apparently dies while the female returns to the sediment. The uneven sex ratio observed by Rabindranath (loc. cit.) would suggest that multiple copulations might occur prior to the death of the male, but this has not been experimentally demonstrated.

Evidence from a limited number of species suggests that all phoxocephaloids are multiparous, with between 2 and 13 broods per female (Sainte-Marie 1991). Life-spans of examined species were estimated at 6-14 months for females (Sainte-Marie l.c.). Phoxocephalidae in the subfamilies Metharpiniinae and Harpiniinae seem to have an annual reproductive cycle, while *Urothoe brevicornis* (Urothoidae) takes twice as long (Kemp et al. 1985).

Populations of *Rhepoxynius abronius* have been reliably harvested from nearshore waters along the Pacific coast, and have proven to be useful for toxicity bioassay purposes (Swartz et al 1984, 1985; Mearns et al 1986; Kohn et al 1994). Similarly, the platyischnopid *Tiburonella viscana* is used for bioassay in Brazil (Abessa and Sousa, 2003; Abessa et al. 1998). Phoxocephalid amphipods have also proven sensitive to PAH contamination in sediment bio-assay (Reichert et al 1985).

Key to NEP Phoxocephaloid subfamilies and genera (based on the Phoxocephalidae subfamily key of J. L. Barnard and Drummond 1978, emended by characters in Table II of Jarrett & Bousfield 1994b to include the newly created Metharpiniinae. Within subfamilies generic keys are based on Jarrett & Bousfield 1994,a, b, with modifications to increase clarity. Inclusion of Platyischnopidae and Urothoidae newly devised.

1. Head truncate, rostrum reduced or absent.....**Urothoidae**, 22
 Head pointed, rostrum present and large.....2
2. Rostrum cylindrical, bearing ventral retrorse protrusion.....**Platyischnopidae**, 3
 Rostrum hooded, with or without mid sagittal crest.....**Phoxocephalidae**, 4
3. Telson lacking lateral brush of setae, posterior lobe of coxa 4 tapered
 *Tiburonella*
 Telson with lateral setal brush, posterior lobe of coxa 4 not tapered...*Eudevenopus*
4. Basis of P5 narrow lacking posterior lobe, margins subparallel.....Harpiniinae, 5
 Basis of P5 broadened, with posterior lobe.....8
5. Mandibular molar tritritive.....*Coxophoxus*
 Mandibular molar non-tritritive.....6
6. Antenna 2 article 1 strongly ensiform.....7
 Antenna 2 article 1 not or only weakly ensiform.....*Harpiniopsis*

7. Eyes lacking	<i>Pseudharpinia</i>
Eyes present, pigmented or non-pigmented.....	<i>Heterophoxus</i>
8. Palp of maxilla 1 uniarticulate.....	Phoxocephalinae, 9
Palp of maxilla 1 biarticulate.....	13
9. Mandibular palp article 3 apex strongly produced.....	<i>Leptophoxus</i>
Mandibular palp article 3 apex not strongly produced.....	10
10. Mandibular molar tritritive.....	<i>Cephalophoxoides</i>
Mandibular molar non-tritritive, bearing spines, or absent.....	11
11. Rami of U1 and U2 bearing dorsal and/or terminal setae.....	<i>Hopiphoxus</i>
Rami of U1 and U2 lacking dorsal and terminal setae.....	12
12. G1 and G2 both subchelate.....	<i>Metaphoxus</i>
G1 parachelate, G2 subchelate.....	<i>Parametaphoxus</i>
13. Article 2 of antenna 1 shortened, Antenna 2 article 1 not ensiform... Brolginae, 19	
Article 2 of antenna 1 elongate, Antenna 2 article 1 ensiform....Metharpiniinae, 14	
14. Rostrum narrowed anterior to eyes.....	15
Rostrum unstricted anterior to eyes.....	17
15. [NOTE TRIPLET] Posterior margins of epimera 1 and 2 strongly setose, telson	
both distally and dorsally spined, urosomite 3 lacking dorsal hook.....	16
Posterior margins of epimera 1 and 2 weakly or asetose, telson distally and	
dorsally spined, urosomite 3 with dorsal hook.....	<i>Microphoxus</i>
Posterior margins of epimera 1 and 2 weakly or asetose, telson distally spined, but	
lacking dorsal spination, urosomite 3 lacking dorsal hook.....	<i>Rhepoxynius</i>
16. Uropod 1 and 2 rami bearing small subapical nails dorsally.....	<i>Metharpinia</i>
Uropod 1 and 2 rami lacking subapical nails dorsally.....	<i>Grandifoxus</i>
17. Posterior margins of epimera 1 and 2 bare, or with at most a few scattered setae....	
.....	<i>Foxiphalus</i>
Posterior margins of epimera 1 and 2 fully and densely setose.....	18
18. P 6 merus much longer than wide, telson lobes lacking dorso-lateral spines.....	
.....	<i>Majoxiphalus</i>
P 6 merus wider than long, telson lobes dorso-laterally spined.....	<i>Beringiaphoxus</i>
19. Mandibular molar tritritive.....	<i>Mandibulophoxus</i>
Mandibular molar non-tritritive.....	20
20. Mandibular molar bearing 3 or fewer spines, spines clumped or sharing a	
common base, basis of P3 not tapering distally.....	21
Mandibular molar bearing 4 or more spines, spines widely spread, basis of P3	
tapering distally.....	<i>Eyakia</i>
21. Posterior margin of epimeron 3 with one or more long setae near the base of the	
posterior margin.....	<i>Eobrolgus</i>
Posterior margin of epimeron 3 lacking long setae but may bear tiny imbedded	
setules at intervals.....	<i>Paraphoxus</i>
22. Head bearing small rostrum.....	<i>Urothoides</i>
Head lacking rostrum.....	<i>Urothoe</i>

NEP Phoxocephaloidea from McLaughlin et al. (2005), augmented by known provisionals. *= Taxa on the SCAMIT Ed. 9 list (Cadien & Lovell 2014). Valid taxa **bolded**, synonyms not.

Family Platyischnopidae

Eudevenopus honduranus Thomas and J. L. Barnard 1983 – Honduras to Ecuador, 1-40m

Eudevenopus metagracilis (J. L. Barnard 1964) - Northern Baja California to Bahia de Los Angeles, Gulf of California; 0-73m

Platyischnopus metagracilis J. L. Barnard 1964 (see Eudevenopus metagracilis)

Platyischnopus viscana J. L. Barnard 1964 (see Tiburonella viscana)

Tiburonella viscana (J. L. Barnard 1964) – Santa Monica Bay, California to Bahia Salinas, Costa Rica, Brazil - Argentina; 3-27m

Family Condukiidae – no representatives in the NEP

Family Cheidae – no representatives in the NEP

Family Ipanemidae – no representatives in the NEP

Family Urothoidae

Urothoe denticulata Gurjanova 1951 - NWP (Southern Bering Sea, Sea of Okhotsk) possibly into subarctic NEP – 150-300m

Urothoe elegans Bate 1857 – North Atlantic, southern Sea of Okhotsk (NWP), reported from Central California; 10-500m

Urothoe rotundifrons J. L. Barnard 1962 – Cape Basin, SE Atlantic; Cascadia Abyssal Plain, Oregon: 2813-2972m

Urothoe varvarini Gurjanova 1953 – NWP (Sea of Okhotsk, Sea of Japan, Kurile Strait) to SCB; 5-1292m

Urothoides inops J. L. Barnard 1967 - off Baja California; 2667-2706m

Family Simurothoidae – no representatives in the NEP

Family Phoxocephalopsidae – no representatives in the NEP

Family Phoxocephalidae

Subfamily Metharpiniinae

Beringiaphoxus beringianus Jarrett and Bousfield 1994 – Amchitka Id., Aleutians; 0-5m

Grandifoxus aciculatus Coyle 1982 – Bering sea to British Columbia; 2-100m

Grandifoxus acanthinus Coyle 1982 – Bering Sea to Prince William Sound, Alaska; 2-87m

Grandifoxus constantinus Jarrett and Bousfield 1994 – Amchitka Id. Aleutians; 0-5m

Grandifoxus dixonensis Jarrett and Bousfield 1994 – Queen Charlotte Islands, British Columbia; 110m

Grandifoxus grandis (Stimpson 1856) – Queen Charlotte Ids., British Columbia to Pacific Grove, California; 0-5m

Grandifoxus lindbergi (Gurjanova 1953) – Bering Sea to southern Vancouver Id. British Columbia; 1-3m

Grandifoxus longirostris (Gurjanova 1938) – Bering Sea to Vancouver Id.; 40-90m

Grandifoxus nasutus (Gurjanova 1936) – Bering Sea to Amchitka Id., Aleutians;
2-50m

Grandifoxus pseudonasutus Jarrett and Bousfield 1994 – Amchitka Id.,
Aleutians; 0-2m

Grandifoxus vulpinus Coyle 1982 – Bering Sea to Unimak Id., Aleutians;
2-87m

Majoxiphalus major (J. L. Barnard 1960) – Sitka, SE Alaska to Baja
California; 0-91m

Majoxiphalus maximus Jarrett and Bousfield 1994 – Bering Sea to northern
Vancouver Id., British Columbia; 1-2m

Metharpinia coronadoi J. L. Barnard 1980 – SCB; 18-43m

Metharpinia jonesi (J. L. Barnard 1963) – Central California to SCB; 0-18m

Metharpinia oripacifica J. L. Barnard 1980 – Pacific coast of Costa Rica;
4-20m

Microphoxus minimus J. L. Barnard 1960 – Playa Blanca, Costa Rica; 6-10m

Paraphoxus bicuspidatus J. L. Barnard 1960 (see Rhepoxynius bicuspidatus)

Paraphoxus cognatus J. L. Barnard 1960 (see Foxiphalus cognatus)

Paraphoxus daboius J. L. Barnard 1960 (see Rhepoxynius daboius)

Paraphoxus fatigans J. L. Barnard 1960 (see Rhepoxynius fatigans)

Paraphoxus floridanus J. L. Barnard 1960 (see Metharpinia oripacifica)

Paraphoxus gemmatus J. L. Barnard 1969 (see Rhepoxynius gemmatus)

Paraphoxus heterocuspidatus J. L. Barnard 1960 (see Rhepoxynius
heterocuspidatus)

Paraphoxus jonesi J. L. Barnard 1963 (see Metharpinia jonesi)

Paraphoxus lucubrans J. L. Barnard 1960 (see Rhepoxynius lucubrans)

Paraphoxus major J. L. Barnard 1960 (see Majoxiphalus major)

Paraphoxus milleri Thorsteinson 1941 (see Grandifoxus grandis)

Paraphoxus obtusidens Alderman 1936 (see Foxiphalus obtusidens)

Paraphoxus pallidus J. L. Barnard 1960 (see Rhepoxynius pallidus)

Paraphoxus similis J. L. Barnard 1960 (see Foxiphalus similis)

Paraphoxus stenodes J. L. Barnard 1960 (see Rhepoxynius stenodes)

Paraphoxus variatus J. L. Barnard 1960 (see Rhepoxynius variatus)

Paraphoxus vigitegus J. L. Barnard 1971 (see Rhepoxynius vigitegus)

Phoxus grandis Stimpson 1856 (see Grandifoxus grandis)

Pontharpinia robusta lindbergi Gurjanova 1953 (see Grandifoxus lindbergi)

Pontharpinia longirostris Gurjanova 1938 (see Grandifoxus longirostris)

Pontharpinia nasuta Gurjanova 1936 (see Grandifoxus nasutus)

Pontharpinia tridentata J. L. Barnard 1954 (see Rhepoxynius tridentatus)

Rhepoxynius abronius (J. L. Barnard 1960) – Queen Charlotte Islands, British
Columbia to Northern Baja California: 10-60m

Rhepoxynius barnardi Jarrett and Bousfield 1994 – Vancouver Island, British
Columbia, Canada: 59m

Rhepoxynius bicuspidatus (J. L. Barnard 1960) – Oregon to Bahia San Quintin,
Baja California, Mexico: ? to 475m (shallow records may = R. sp A)

Rhepoxynius boreovariatus Jarrett and Bousfield 1994 – Central British
Columbia, Vancouver Island to Washington state: 5-40m

- Rhepoxynius daboius** (J. L. Barnard 1960) – Alaska to northern Baja California, Mexico: 25-813m
- Rhepoxynius fatigans** (J. L. Barnard 1960) – North central British Columbia to northern Baja California, Mexico: 20-330m
- Rhepoxynius gemmatus** (J. L. Barnard 1969) – Peninsular side of the Gulf of California: 0-9m
- Rhepoxynius heterocuspидatus** (J. L. Barnard 1960) – Santa Maria Basin, central California to Bahia de Los Angeles, Gulf of California, Mexico: 0-146m
- Rhepoxynius homocuspидatus** J. L. Barnard and C. M. Barnard 1982 – Coal Oil Point, Santa Barbara Co., southern California to northern Baja California, Mexico: 0-64m
- Rhepoxynius lucubrans** (J. L. Barnard 1960) – SCB to Gulf of California, Mexico: 0-91m
- Rhepoxynius menziesi** J. L. Barnard and C. M. Barnard 1982 – Oregon to Panama: 0-507m
- Rhepoxynius pallidus** (J. L. Barnard 1960) – North central British Columbia, Canada to Puget Sound, Washington: 0-40m
- Rhepoxynius stenodes** (J. L. Barnard 1960) – Morro Bay, central California to Bahia San Cristobal, Baja California, Mexico: 2-374m
- Rhepoxynius tridentatus** (J. L. Barnard 1954) – Oregon to SCB; 20-80m
- Rhepoxynius variatus** (J. L. Barnard 1960) – Monterey Bay, central California to Bahia San Ramon, Baja California, Mexico: 4-197m
- Rhepoxynius vigitegus** (J. L. Barnard 1971) – Central British Columbia, Canada to off Oregon: 0-30m
- Rhepoxynius sp A** SCAMIT 1987§ - Morro Bay, central California to Rosarita Beach, northern Baja California, Mexico: 2-20m

Subfamily Broilginae

- Eobrolgus chumashi** J. L. Barnard and C. M. Barnard 1981 – SCB; 0-11m
- Eobrolgus spinosus** (Holmes 1905) – Bahia San Quintin to Gulf of California, tropical Western Atlantic; 0-73m
- Eyakia calcarata* of J. L. Barnard not (Gurjanova 1938) see *Eyakia* sp 2
- Eyakia robusta** (Holmes 1908) – central British Columbia to SCB; 20-250m
- Eyakia robusta* of J.L. & C. M. Barnard 1981 in part (Aleutian large specimens), not (Holmes 1908) see *Eyakia* sp 1
- Eyakia sp 1** Jarrett and Bousfield 1994 – Aleutians to Puget Sound; 0-81m
- Eyakia sp 2** Jarrett and Bousfield 1994 – Santa Monica to Baja California; 18-380m
- Foxiphalus aleuti** J. L. Barnard and C. M. Barnard 1982 – Unalaska to Catalina Id., SCB; 0-110m
- Foxiphalus apache** J. L. Barnard and C. M. Barnard 1982 – Anacapa Id., SCB to Gulf of California; 0-53m
- Foxiphalus cognatus** (J. L. Barnard 1960) – Tomales Bay, Northern California to Gulf of California; 0-325m
- Foxiphalus falciformis** Jarrett and Bousfield 1994 – Queen Charlotte Ids., British Columbia to central Oregon; 0m

- Foxiphalus fucaximeus** Jarrett and Bousfield 1994 – Neah Bay, Washington;
0m
- Foxiphalus golfensis** J. L. Barnard and C. M. Barnard 1982 – Pt. Conception to
Gulf of California; 0-91m
- Foxiphalus obtusidens** (Alderman 1936) – Kurile Ids. NWP to Colombia;
0-210m
- Foxiphalus secasius** J. L. Barnard and C. M. Barnard 1982 – Secas Id., Panama;
22-46m
- Foxiphalus similis** (J. L. Barnard 1960) – Prince William Sound, Alaska to SCB;
10-300m
- Foxiphalus slatteryi** Jarrett and Bousfield 1994 – Amchitka Id., Alaska; 0-5m
- Foxiphalus xiximeus** J. L. Barnard and C. M. Barnard 1982 – Aleutian Ids to
SCB; 0-20m
- Mandibulophoxus alaskensis** Jarrett and Bousfield 1994 – SE Alaska to
Vancouver Island, British Columbia, Canada: 0-?20m
- Mandibulophoxus gilesi** J. L. Barnard 1957 – Vancouver Island, British
Columbia, Canada to SCB: 0-20m
- Mandibulophoxus mayi** Jarrett and Bousfield 1994 - British Columbia, Canada:
0-30m
- Paraphoxus beringiensis** Jarrett and Bousfield 1994 – Bering Sea, Alaska: 45m
- Paraphoxus communis** Jarrett and Bousfield 1994 – southern Vancouver Island,
British Columbia, Canada: 15-45m
- Paraphoxus gracilis** Jarrett and Bousfield 1994 – southeastern British Columbian
mainland, Canada: 60-160m
- Paraphoxus oculatus* (Sars 1879) (see *Paraphoxus* sp 1)
- Paraphoxus pacificus** Jarrett and Bousfield 1994 – Prince William Sound,
Alaska to southern British Columbia mainland: 0-40m
- Paraphoxus robustus* Holmes 1908 (see *Eyakia robusta*)
- Paraphoxus rugosus** Jarrett and Bousfield 1994 – Beaufort Sea to Bering Sea,
Alaska: 147-275m
- Paraphoxus similis** Jarrett and Bousfield 1994 – Berkley Sound, British
Columbia, Canada: 24-34m
- Paraphoxus sp 1** Jarrett and Bousfield 1994 – Santa Maria Basin, central
California to SCB: 30-390m
- Paraphoxus spinosus* Holmes 1905 (see *Eobrolgus spinosus*)
- Pontharpinia calcarata* Gurjanova 1938 (see *Eyakia calcarata*)
- Subfamily Phoxocephalinae
- Cephalophoxoides homilis** (J. L. Barnard 1960) – Monterey, central California
to Bahia San Cristobal, Baja California, Mexico: 62-2059m
- Cephalophoxoides kergueleni** (Stebbing 1888) – Gulf of Panama; 1749m
- Hopiphoxus simillimus** (J. L. Barnard 1967) – Baja Abyssal Plain, Mexico:
2667-2706m
- Leptophoxus falcatus icelus** J. L. Barnard 1960 – Santa Maria Basin, central
California to northern Baja California: 375-2258m
- Metaphoxus frequens** J. L. Barnard 1960 – SE Alaska to northern Baja
California, Mexico: 4.3-458m

Metaphoxus fultoni J. L. Barnard 1960 (see Parametaphoxus fultoni)
 Metaphoxus simillimus J. L. Barnard 1967 (see Hopiphoxus simillimus)
 Parametaphoxus fultoni (J. L. Barnard 1960) (see Parametaphoxus sp 1)
Parametaphoxus quaylei Jarrett and Bousfield 1994 – North central British
 Columbia, Canada to Washington state: 8-100m
Parametaphoxus sp 1 Chapman MS – Monterey Bay, central California to Bahia
 San Quintin, Baja California, Mexico: 0-170m
 Phoxocephalus homilis J. L. Barnard 1960 (see Cephalophoxoides homilis)
 Subfamily Harpiniinae
Coxophoxus hidalgo J. L. Barnard 1966
 Harpinia abyssalis productus J. L. Barnard 1964 (see Pseudharpinia abyssalis
 productus)
 Harpinia affinis Holmes 1908 (see Heterophoxus affinis)
 Harpinia ayutlanta J. L. Barnard 1964 (see Pseudharpinia ayutlanta)
 Harpinia excavata Chevreux 1887 (see Pseudharpinia sanpedroensis or P.
 Inexpectata)
Harpinia mucronata Sars 1879 – Northeast Atlantic, Polar Sea, Kara Sea,
 Barents Sea, to Gulf of the Farallones: 28-1134m except 2045-3085 in
 The Gulf of the Farallones
 Harpinia oculata Holmes 1908 (see Heterophoxus oculatus)
Harpiniopsis emeryi J. L. Barnard 1960 – Oregon to Baja Abyssal Plain,
 Mexico: 344-2800m
Harpiniopsis epistomata J. L. Barnard 1960 – Oregon to northern Baja
 California, Mexico: 371-1626m
 Harpiniopsis excavata (Chevreux 1887) (see Pseudharpinia sanpedroensis or P.
 inexpectata)
Harpiniopsis fulgens J. L. Barnard 1960 – North central British Columbia,
 Canada to Baja Abyssal Plain, Mexico: 128-2667m
Harpiniopsis galera J. L. Barnard 1960 - Oregon to SCB: 80-2800m
Harpiniopsis gurjanovae Bulycheva 1936 – Sea of Okhotsk, Bering Sea to
 British Columbia, Canada: 20-25m
Harpiniopsis naiadis J. L. Barnard 1960 – Oregon to Baja Abyssal Plain,
 Mexico: 339-3800m
Harpiniopsis percellaris J. L. Barnard 1971 – Oregon: 600-2600m
Harpiniopsis petulans J. L. Barnard 1966 – Oregon to northern Baja California,
 Mexico: 1265-1720m
Harpiniopsis profundis J. L. Barnard 1960 – SCB to Baja Abyssal Plain,
 Mexico: 385-2398m
Harpiniopsis sp D J. L. Barnard 1960 – Galapagos; 116-120m
 Harpiniopsis sp 1 of Thomas 1991 – Gulf of the Farallones: 2045-3085m
 Harpiniopsis sp 2 of Thomas 1991 – Gulf of the Farallones: 2045-3085m
Harpiniopsis sp 2 Thomas & McCann 1995 – Santa Maria Basin, central
 California; 409m
 Harpiniopsis sanpedroensis J. L. Barnard 1960 (see Pseudharpinia sanpedroensis)
Harpiniopsis triplex J. L. Barnard 1971 – Oregon: 2000-2800m
Heterophoxus affinis (Holmes 1908) – SE Alaska to San Diego, southern

- California: 150-600m
Heterophoxus conlanae Jarrett and Bousfield 1994 – SE Alaska to Puget Sound, Washington: 0-40m
Heterophoxus ellisi Jarrett and Bousfield 1994 – southern British Columbia, Canada to SCB: 60-305m
Heterophoxus nitellus J. L. Barnard 1960 – SCB to Costa Rica: 20-1400m
Heterophoxus oculatus (Holmes 1908) SCB: 60-305m
Heterophoxus pennatus Shoemaker 1925 – Gulf of California, Mexico: surface
Pseudharpinia abyssalis productus J. L. Barnard 1964 – Guatemala Basin, Guatemala: 3503-3517m
Pseudharpinia ayutlanta (J. L. Barnard 1964) – Gulf of Panama: 1609-1746m
Pseudharpinia excavata (Chevreux 1887) (see *P. sanpedroensis* or *P. inexpectata*)
Pseudharpinia inexpectata Jarrett and Bousfield 1994 – southern British Columbian mainland and Vancouver Island, Canada: ?
Pseudharpinia productus (J. L. Barnard 1964) (see *P. abyssalis productus*)
Pseudharpinia sanpedroensis (J. L. Barnard 1960) - Oregon to Baja Abyssal Plain, Baja California, Mexico: 400-5110m
Pseudharpinia sp 1 of Thomas & McCann 1995 – Santa Maria Basin, central California: 396-409m

COMMENTS BY FAMILY

Family Platyischnopidae – The Platyischnopidae is one of the more easily recognized of the phoxocephaloid families, although erected only in 1979 (J. L. Barnard & Drummond 1979). It is distributed primarily in the Pacific, with some representatives in the Western Atlantic and Caribbean, and a single genus known from the Indian Ocean. In the Pacific, most diversity in the family is in austral waters, with a small group of species from the North East Pacific. The nine component genera are all small, and probably reflect recent divergence. One of the more conspicuous aspects of platyischnopids is presence of a rostral button or sclerotized keel on the head. This is found in all genera except *Skaptopus*, which is viewed as plesiomorphic (Thomas & J. L. Barnard 1983).

Description “**Head** free, not coalesced with peraeonite 1; exposed; longer than deep; rostrum present, long; eyes present, well developed or obsolescent, or absent; not coalesced; 1 pair; not bulging. Body laterally compressed; cuticle smooth.

Antenna 1 shorter than antenna 2, or subequal to antenna 2, or longer than antenna 2; peduncle with many robust and slender setae; 3-articulate; peduncular article 1 shorter than article 2; antenna 1 article 2 longer than article 3; peduncular articles 1-2 not geniculate; accessory flagellum present; antenna 1 callynophore present. *Antenna 2* present; short, or greater than body length; articles not folded in zigzag fashion; without hook-like process; flagellum shorter than peduncle, or as long as peduncle, or longer than peduncle; 5 or more articulate; not clavate; *calceoli* present.

Mouthparts well developed. *Mandible* incisor dentate; lacinia mobilis present on both sides; accessory setal row without distal tuft; molar present, medium, non-trititative; palp present. *Maxilla 1* present; inner plate present, weakly setose apically;

palp present, not clavate, 1-2 -articulate. *Maxilla 2* inner plate present; outer plate present. *Maxilliped* inner and outer plates well developed or reduced, palps present, well developed or reduced; **inner plates reduced**, separate; outer plates present, large or small; palp 4-articulate, article 3 without rugosities. *Labium* smooth.

Peraeon. Peraeonites 1-7 separate; complete; sternal gills absent; pleurae absent.

Coxae 1-7 well developed, none fused with peraeonites. *Coxae 1-4* longer than broad, overlapping, coxae not acuminate. *Coxae 1-3* not successively smaller, none vestigial. *Coxae 2-4* none immensely broadened.

Gnathopod 1 not sexually dimorphic; smaller (or weaker) than gnathopod 2, or subequal to gnathopod 2; smaller than coxa 2, or subequal to coxa 2; gnathopod 1 merus and carpus not rotated; gnathopod 1 carpus/propodus not cantilevered; subequal to propodus, or longer than propodus; gnathopod 1 not produced along posterior margin of propodus; dactylus large. *Gnathopod 2* not sexually dimorphic; chelate; coxa smaller than but not hidden by coxa 3, or subequal to but not hidden by coxa 3; ischium short; merus not fused along posterior margin of carpus or produced away from it; carpus/propodus not cantilevered, carpus elongate, subequal to propodus or longer than propodus, not produced along posterior margin of propodus.

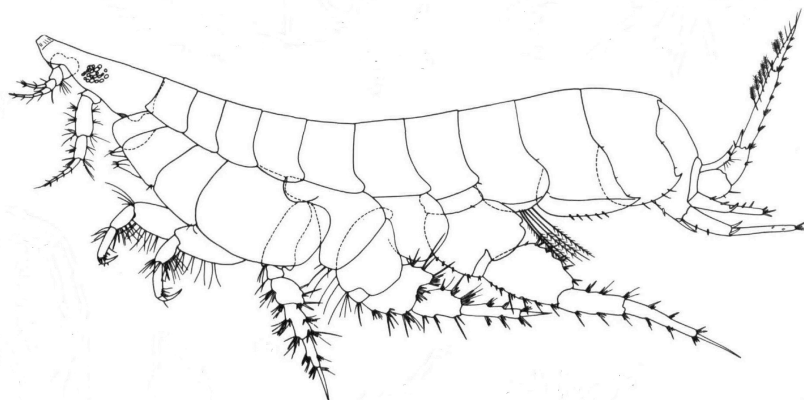
Peraeopods heteropodous (3-4 directed posteriorly, 5-7 directed anteriorly), none prehensile. *Peraeopod 3* well developed. *Peraeopod 4* well developed. 3-4 not glandular; 3-7 without hooded dactyli, 3-7 propodi without distal spurs. Coxa well developed, longer than broad; carpus shorter than propodus, not produced; dactylus well developed. Coxa larger than coxa 3, not acuminate, with well developed posteroventral lobe; carpus not produced. **Peraeopods 5-7 with many rows of facial and marginal robust setae, or with many rows of marginal robust setae;** dactyli without slender or robust setae. **Peraeopod 5** well developed; shorter than peraeopod 6; *coxa* smaller than coxa 4, **without posterior lobe;** basis expanded, subrectangular or subquadrate, with posteroventral lobe or without posteroventral lobe; merus/carpus free; carpus expanded, or weakly expanded, or linear; setae absent. *Peraeopod 6* shorter than peraeopod 7; merus/carpus free; dactylus without setae. *Peraeopod 7* with 6-7 well developed articles; longer than peraeopod 5; similar in structure to peraeopod 6; with 7 articles; basis expanded, without dense slender setae; dactylus without setae.

Pleon. Pleonites 1-3 without transverse dorsal serrations, without dorsal carina; without slender or robust dorsal setae. *Epimera 1-3* present. *Epimeron 1* well developed. *Epimeron 2* without setae.

Urosome not dorsoventrally flattened; urosomites 1 to 3 free; urosomite 1 longer than urosomite 2, or much longer than urosomite 2; urosome urosomites not carinate; urosomites 1-2 without transverse dorsal serrations. *Uropods 1-2* apices of rami with robust setae. *Uropods 1-3* similar in structure and size. *Uropod 1* peduncle without long plumose setae, without basofacial robust seta, without ventromedial spur. *Uropod 2* well developed; without ventromedial spur, without dorsal flange; inner ramus shorter than outer ramus, or subequal to outer ramus. **Uropod 3 sexually dimorphic;** peduncle short; outer ramus longer than peduncle, 2-articulate, without recurved spines. *Telson* laminar; deeply cleft, or moderately cleft, or weakly cleft, or emarginate, or entire; longer than broad, or as long as broad; apical robust setae present, or absent.” (Lowry and Springthorpe 2001).

Key to NEP Genera of Platyschnopidae (from Thomas & J. L. Barnard 1983)

Telson lacking lateral brush of setae, posterior lobe of coxa 4 tapering..... *Tiburonella*
 Telson with lateral brush of setae, posterior lobe of coxa 4 not tapering..... *Eudevenopus*



Eudevenopus honduranus (From Thomas and J. L. Barnard 1983)

Eudevenopus – A small genus currently containing four species. Two of these, *E. metagracilis* and *E. honduranus* are represented in the NEP. A key to the species was provided by Thomas & J. L. Barnard (1983), and a couplet from that key which will separate the two NEP species is included below;

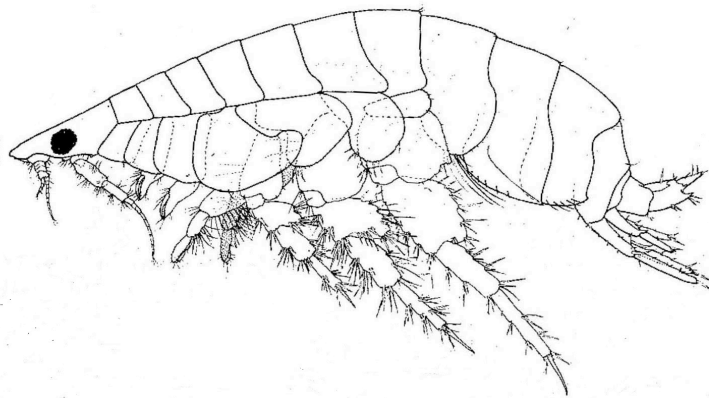
- Epimeron 2 tooth small, dactyl of pereopod 7 long, subequal or exceeding article 6, inner ramus of uropod 2 shortened, at least one dorsal spine on outer ramus of uropod 1 elongate..... **E. metagracilis**
 Epimeron 2 tooth medium, dactyl of pereopod 7 short, not exceeding article 6, inner ramus of uropod 2 scarcely shortened, dorsal spines on outer ramus of uropod 1 short 2.....**E. honduranus**

Eudevenopus honduranus is known from both the Western Caribbean and the Eastern Pacific, although occurring only sparingly in the latter. *Eudevenopus metagracilis* is not yet reliably reported from waters north of Mexico, although it may very well occur along the southern California coast in very shallow clean well-sorted sand bottoms.

Separation of *E. honduranus* from *E. capuciatius* and *E. gracilipes* has been difficult and controversial. Material of *E. capuciatius* from Brazil has recently been redescribed (Sousa-Filho & Serejo 2012), clarifying that species.

Diagnosis: “*Platyschnopidae* with midsagittal cephalic tooth, equatorial sensory pits. Article 2 of antenna 1 short, bearing only one main group of thin setal spines, article 3 of male not enlarged; article 1 of male flagellum not enlarged nor densely armed. Article 4 of female antenna 2 not elongate and poorly armed (compared to other genera). Mandibular incisors elongate, broad, 3-toothed like phoxocephalids; laciniae mobilis on right and left sides diverse, right thin and linguiform, left flabellate; raker spines 3 or more on both right and left sides, not strongly diverse; molars tiny, nontritulative, each

with 2 spines; no mandibular calluses. Inner plate of maxilla 1 small, subcircular, with one medially pointing seta, outer plate with 7 normal-sized spines (neither mopped nor strongly diverse), palp 1-articulate, setae more than 2 and not aberrant or gigantic. Plates of maxilla 2 ordinary. Plates of maxilliped weak and poorly armed; palp article 2 sparsely spinose medially; dactyl unguiform, lacking apical nail. Coxae 1-4 increasing in size in ordinary progression, none of coxae 1-3 of unusual form or stunted, coxa 3 scarcely expanded distally, coxa 1 rectangular, coxa 2 weakly expanded apically, coxa 4 very large, with broadly rectangular posterior lobe. Article 5 of gnathopods subequally as long as article 6, gnathopods strongly chelate. Article 2 of pereopod 5 thin, scarcely expanded except weakly expanded apically. Article 2 of pereopod 7 with soft notch and cusp posteroventrally, dactyls of ordinary length. Pleon dorsally untoothed. Article 2 on outer ramus of uropod 3 thick, long, well armed. Telson poorly cleft, lacking dorsal spines except submarginally near apex, bearing on each side lateral brush of several immensely long setae.” (from Thomas & J. L. Barnard 1983)



Tiburonella viscana (From J. L. Barnard 1963)

Tiburonella – Only two species are currently allocated to the genus, one from the NEP, and a second from the Caribbean (Ortiz et al 2000). The two can be easily separated by the setation of the anterior margin of article 4 of antenna 2; setose the entire length of the article in *T. morrocoyensis* vs only in scattered sheaves in *T. viscana*. This is true in both sexes. While the general appearance of the two is very similar, much of this resemblance is due to their modifications for sand diving. It is not clear if the two species represent a cognate pair separated by the Isthmus of Panama. These are very shallow water species, but can occur in abundance if the appropriate habitat is sampled.

Diagnosis: “*Platyischnopidae* with midsagittal cephalic tooth or keel, sensory pits well developed and equatorial. Article 2 of antenna 1 not elongate, not spinose dorsally and ventrally, often bearing setae distally, article 3 on male not enlarged, not densely armed with aesthetascs, article 1 of flagellum in male weakly enlarged but poorly armed. Article 4 of female antenna 2 not elongate and moderately or well armed (compared to other genera). Mandibular incisors elongate, broad, grossly 3-toothed like phoxocephalids but also superficially serrate; laciniae mobiles on both right and left sides diverse, right side thin, left flabellate, raker spines well developed but interraker setules large relative to rakers (unusual in *Platyischnopidae*), mandibular calluses absent. Inner plate of maxilla 1 large, subrectangular, with 3+ medially pointing setae in

adults, outer plate with 9 normal-sized spines (neither strongly diverse nor "mopped"—as shown in J. L. Barnard and Drummond, 1979:3, fig. 2: aXI), palp 1-articulate, armed with several setae. Plates of maxilla 2 alike. Inner plate of maxilliped rectangular, truncate, apex well armed, outer plate large but poorly armed, palp article 2 moderately setose medially. Coxae 1-4 increasing in size in ordinary progression, none of coxae 1-3 of unusual form or stunted, coxa 3 scarcely expanded distally, coxae 1-2 rectangular, coxa 4 very large, with large posterior lobe, quadrate or rounded. Article 5 of gnathopods not longer than article 6, gnathopods strongly chelate. Article 2 of pereopod 5 moderately expanded or thin. Article 2 of pereopod 7 without posterior serrations, with soft notch, dactyls of ordinary length or elongate. Pleon untoothed dorsally. Article 2 on outer ramus of uropod 3 thick, well developed, well armed. Telsonic cleft deep, dorsal spines scarcely facial, mostly in terminal depressions, no lateral brushes of setae.” (from Thomas & J. L. Barnard 1983)

Family Urothoidae – A moderate sized family with 64 species distributed among six genera. Most of the diversity is within the genus *Urothoe* (44 species) or *Urothoides* (10 species), the two genera known from the North East Pacific. Sittrop et al (2014) provide a generic key to the family and erect two new genera, as well as transferring two genera from the Urothoidae to the Phoxocephalopsidae. Members are typically pulciform, with very short or non-existent rostra and blunt heads. They strongly resemble the genus *Eohaustorius* from the Haustoriidae in the Pontoporeoidea in general appearance. Urothoids typically occupy deeper siltier habitat than haustoriids within the NEP. The two genera occurring in the NEP can be separated by presence of a short rostrum (*Urothoides*) vs rostrum absent (*Urothoe*).

Description “**Head** free, not coalesced with pereonite 1; exposed; longer than deep, or deeper than long; rostrum present, short; eyes present, well developed or obsolescent, or absent; not coalesced; 1 pair; not bulging. Body laterally compressed; cuticle smooth.

Antenna 1 shorter than antenna 2, or subequal to antenna 2, or longer than antenna 2; peduncle with many robust and slender setae, or with sparse robust and slender setae; 3-articulate; peduncular article 1 shorter than article 2, or subequal to article 2; article 2 longer than article 3; **peduncular articles 1-2 not geniculate**; accessory flagellum present; antenna 1 callynophore present, or absent. *Antenna 2* present; short, or long, or greater than body length; articles not folded in zigzag fashion; without hook-like process; flagellum shorter than peduncle, or as long as peduncle, or longer than peduncle; 5 or more articulate, or less than 5-articulate; not clavate; *calceoli* present, or absent.

Mouthparts well developed. *Mandible* incisor dentate; lacinia mobilis present on both sides; accessory setal row without distal tuft; molar present, medium, tritulative; palp present. *Maxilla 1* present; inner plate present, strongly setose along medial margin; palp present, not clavate, 2 -articulate. *Maxilla 2* inner plate present; outer plate present. *Maxilliped* inner and outer plates well developed or reduced, palps present, well developed or reduced; inner plates well developed, separate; outer plates present, small; palp 4-articulate, article 3 without rugosities. *Labium* smooth.

Peraeon. Peraeonites 1-7 separate; complete; sternal gills absent; pleurae absent.

Coxae 1-7 well developed, none fused with peraeonites. *Coxae 1-4* longer than broad, overlapping, coxae not acuminate. *Coxae 1-3* not successively smaller, none vestigial or coxae 1-2 vestigial. *Coxae 2-4* none immensely broadened.

Gnathopod 1 not sexually dimorphic; subequal to gnathopod 2; smaller than coxa 2, or subequal to coxa 2; gnathopod 1 merus and carpus not rotated; gnathopod 1 carpus/propodus not cantilevered; longer than propodus; gnathopod 1 slightly produced along posterior margin of propodus, or not produced along posterior margin of propodus; dactylus large. *Gnathopod 2* not sexually dimorphic; subchelate; coxa smaller than but not hidden by coxa 3, or subequal to but not hidden by coxa 3; ischium short; merus not fused along posterior margin of carpus or produced away from it; carpus/propodus not cantilevered, carpus elongate, longer than propodus, slightly produced along posterior margin of propodus or not produced along posterior margin of propodus.

Peraeopods heteropodous (3-4 directed posteriorly, 5-7 directed anteriorly), none prehensile. *Peraeopod 3* well developed. *Peraeopod 4* well developed. 3-4 not glandular; 3-7 without hooded dactyli, 3-7 propodi without distal spurs. Coxa well developed, longer than broad; carpus longer than propodus, not produced; dactylus well developed. Coxa larger than coxa 3, not acuminate, without posteroventral lobe; carpus not produced. *Peraeopods 5-7* with many rows of facial and marginal robust setae, or with many marginal slender setae and few or no robust setae; dactyli without slender or robust setae. *Peraeopod 5* well developed; shorter than peraeopod 6; coxa smaller than coxa 4, without posterior lobe; basis expanded, check, with posteroventral lobe or without posteroventral lobe; merus/carpus free; carpus expanded; setae absent. **Peraeopod 6 longer than peraeopod 7**; merus/carpus free; dactylus without setae. *Peraeopod 7* with 6-7 well developed articles; longer than peraeopod 5; similar in structure to peraeopod 6; with 7 articles; basis expanded, without dense slender setae; dactylus without setae.

Pleon. Pleonites 1-3 without transverse dorsal serrations, without dorsal carina; without slender or robust dorsal setae. *Epimera 1-3* present. **Epimeron 1 poorly developed.** *Epimeron 2* setose.

Urosome not dorsoventrally flattened; urosomites 1 to 3 free; urosomite 1 longer than urosomite 2, or much longer than urosomite 2; urosome urosomites not carinate; urosomites 1-2 without transverse dorsal serrations. *Uropods 1-2* apices of rami with robust setae, or without robust setae. *Uropods 1-3* similar in structure and size. *Uropod 1* peduncle without long plumose setae, without basofacial robust seta, without ventromedial spur. *Uropod 2* well developed; without ventromedial spur, without dorsal flange; inner ramus shorter than outer ramus, or subequal to outer ramus. *Uropod 3* not sexually dimorphic; peduncle short; outer ramus longer than peduncle, 2-articulate, without recurved spines. *Telson* laminar; deeply cleft, or moderately cleft, or weakly cleft, or emarginate, or entire; as long as broad, or broader than long; apical robust setae absent.” (Lowry and Springthorpe 2001).

Urothoe – Four species in the genus have been reported from the NEP, although their status is not unambiguous. In particular the report of *Urothoe elegans*, a north Atlantic species, from deep-water off Central California by Thomas & McCann (1995) has been questioned. This and *U. varvarini* Gurjanova 1953 are extremely similar, and their synonymy is possible. It is also possible that the two are indeed separate, and that *U. elegans* has a remnant population in the NEP, a relict of a previous Circumboreal distribution. The third possibility is that *U. elegans* does not occur in the NEP and its

report was in error. The report of a number of specimens of *Urothoe rotundifrons* from sites on the Cascadia Abyssal Plain by Dickinson (1976) are also dubious, if only on zoogeographic grounds. The species was described from the Cape Basin off South Africa in the Southeast Atlantic at similar depths, and has no intervening records. No specimens are available to corroborate these records, which must remain questionable. Gurjanova (1962) provides a key to the species known from the North Pacific (both east and west) and several others morphologically similar:



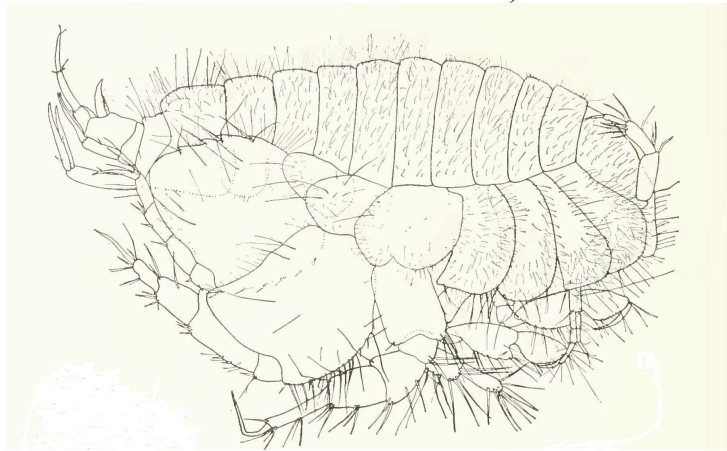
Urothoe brevicornis Bate 1862, a North Atlantic species (source: eol.com)

Key to North Pacific *Urothoe* species, and related forms (from Gurjanova 1962)

1. Postero-distal angle in epimeral plate 3 straight or rounded, lacks curved upward process; anterodistal angle of head almost straight, without process2
 Postero-distal angle in epimeral plate 3 forms a long process curved up; anterodistal angle of head forms a pointed process.....6
2. Gnathopod 1 with well developed subchela; segment 6 broadens distally, palmar margin long, strongly oblique; gnathopod 2 similar in structure.....3
 Gnathopod 1 simple, its segment 6 linear, lacks the palm; gnathopod 2 with a subchela, palmar margin short, transvers.....*U. orientalis* (NWP)
3. Segment 5 in pereopod 3 strongly broadened distally, considerably broader than segment 4; segment 6 broadens toward the middle; both these segments have long transverse series of strong spines.....4
 Segment 5 in pereopod 3 does not broaden distally, its width equals that of segment 4; segment 6 linear in form; both these segments bear groups of spines.....5
4. Basal segment in pereopod 3 strongly broadened distally; segment 7 lacks spines, only its anterior margin notched.....*U. pulchella* (Atlantic)
 Basal segment in pereopod 3 tapers distally, segment armed with strong spines along the anterior margin.....*U. spinidigitus* (Indian Ocean)

5. Segment 6 in gnathopods 1 and 2 without locking spines; coxal plate 1 with a cluster of long thin setae at the apex; basal segment in pereopod 3 does not broaden distally.....*U. elegans*
 Segment 6 in gnathopods 1 and 2 with one strong and thick locking spine; coxal plate 1 with a group of thick long spines at the apex; basal segment in pereopod 3 distinctly broadens distally.....*U. varvarini*
6. Eyes present; the pointed process on the antero-distal angle of head serves as a direct continuation of the anterior head margin which uniformly continues into the point of the process; the process on the postero-distal angle of epimeral plate 3 is bent back and up at an angle to the posterior margin of the plate; gnathopods 1 and 2 similar in structure, with a well-developed subchela.....*U. denticulata*
 Eyes absent; process on the antero-distal angle bent forward at a right angle to the anterior margin of the head; the process on the postero-distal angle of epimeral plate 3 curved straight up, almost parallel to the posterior margin of the plate; gnathopod 1 simple, with linear segment 6 lacking the palm; gnathopod 2 with subchela and a short weakly oblique palmar margin.....
*U. falcata* (South Atlantic)

Diagnosis : “*Body short. Head with small rostrum. A1 not geniculate, peduncle robust, flagellum short. A2 flagellum short in female, filiform multiarticulate in male. Molar process large, poorly ridged. Mxp palp 4-articulate. Gnathopods subchelate or simple. P5 structurally different from P6-7. U1-2 rami slender. U3 rami broad. Telson fully cleft.*” (from Bellan-Santini in Bellan-Santini et al 1989)



Urothoides inops (From J. L. Barnard 1967)

Urothoides - Represented in the NEP by a single species, *U. inops* J. L. Barnard 1967 from deep water off Baja California. All other representatives occur in the southern hemisphere. Resembles the haustoriid genus *Eohaustorius* grossly, and bears a definite rostrum lacking in the genus *Urothoe*, and in other urothoids. There is currently no comprehensive key to the genus, although the Australian forms, where most diversity resides are keyed in J. L. Barnard & Drummond 1979.

Diagnosis: “*Pereopod 7 of phoxocephalid form, thus article 2 shield-like and rest of leg slender and short. Uropods 1-2 with rami. Uropod 3 long and slender. Telson ordinary.*” (from J. L. Barnard & Karaman 1991)

Family Phoxocephalidae – A rather large and diverse family distributed world-wide, and from intertidal to abyssal depths. It is currently divided into eleven subfamilies, of which four occur in the NEP. Placement of genera within subfamilies is in a state of flux, and many have moved since the regional reviews of Jarrett & Bousfield (1994 a,b) . While some disagreement on placement remains, a consensus position is provided in WoRMS, and is followed here. The four subfamilies recognized in the NEP are Metharpiniinae , with 6 genera and 34 species; Brologinae, with 26 species in 5 genera; Phoxocephalinae, with 7 species in 5 genera; and Harpiniinae with 20 species in four genera. The subfamilies Birubiinae, Joubinellinae, Leongathinae, Palabriaphoxinae, Parharpiniinae, Pontharpiniinae, and Timipeginae are not known to be represented in the NEP fauna. The subfamilial organization of the family has not been phylogenetically tested, and may eventually prove unsupported. In a preliminary cladistic analysis Taylor & Poore (2001) failed to find any of the supposed subfamilies to be monophyletic. More investigation using even broader taxon sampling is needed to either confirm or modify these initial results. A key to genera within the family regardless of subfamily by Lisa Haney (2005) is available on the SCAMIT website in the taxonomic toolbox. This treats genera reported by SCAMIT members from the Southern California Bight (SCB). Several draft keys to species from the same area are in circulation, but none have been finalized and posted.

Description: “**Head** free, not coalesced with peraeonite 1; exposed; longer than deep; anteroventral margin weakly recessed or moderately recessed or strongly recessed or straight or concave or oblique, anteroventral margin deeply excavate or shallowly excavate, anteroventral corner hooked; rostrum present or absent (check), short or moderate or long; eyes present, well developed or obsolescent, or absent; coalesced, or not coalesced; 1 pair; not bulging. Body laterally compressed; cuticle smooth.

Antenna 1 shorter than antenna 2, or subequal to antenna 2, or longer than antenna 2; peduncle with many robust and slender setae, or with sparse robust and slender setae; 3-articulate; peduncular article 1 shorter than article 2, or subequal to article 2, or longer than article 2; antenna 1 article 2 longer than article 3; peduncular articles 1-2 not geniculate; accessory flagellum present; antenna 1 callynophore present, or absent.

Antenna 2 present; short, or medium length, or long, or greater than body length; articles not folded in zigzag fashion; article 1 with hook-like (ensiform) process, or without hook-like process; flagellum shorter than peduncle, or as long as peduncle, or longer than peduncle; less than 5-articulate, or 5 or more articulate; not clavate; *calceoli* present, or absent.

Mouthparts well developed. *Mandible* incisor dentate, or smooth, or minutely serrate; lacinia mobilis present on both sides; accessory setal row without distal tuft; molar present, medium, tritulative or non-tritulative; palp present. *Maxilla 1* present; inner plate present, weakly setose apically or without setae; palp present, not clavate, 1 - articulate or 2 -articulate. *Maxilla 2* inner plate present; outer plate present. *Maxilliped* inner and outer plates well developed or reduced, palps present, well developed or

reduced; inner plates well developed or reduced, separate; outer plates present, small or vestigial; palp 4-articulate, article 3 without rugosities. *Labium* smooth.

Peraeon. Peraeonites 1-7 separate; complete; sternal gills absent; pleurae absent.

Coxae 1-7 well developed, none fused with peraeonites. *Coxae 1-4* longer than broad, overlapping, coxae not acuminate. *Coxae 1-3* not successively smaller, none vestigial. *Coxae 2-4* coxa 4 immensely broadened, or none immensely broadened.

Gnathopod 1 not sexually dimorphic; smaller (or weaker) than gnathopod 2, or subequal to gnathopod 2; subequal to coxa 2, or larger than coxa 2; gnathopod 1 merus and carpus not rotated; gnathopod 1 carpus/propodus cantilevered on narrow hinge, or carpus/propodus not cantilevered; shorter than propodus, or subequal to propodus, or longer than propodus; gnathopod 1 not produced along posterior margin of propodus; dactylus large. *Gnathopod 2* not sexually dimorphic; subchelate, or parachelate, or chelate; coxa smaller than but not hidden by coxa 3, or subequal to but not hidden by coxa 3; ischium short, or elongate; merus not fused along posterior margin of carpus or produced away from it; carpus/propodus cantilevered on narrow hinge or carpus/propodus not cantilevered, carpus short or elongate, shorter than propodus or subequal to propodus or longer than propodus, not produced along posterior margin of propodus.

Peraeopods heteropodous (3-4 directed posteriorly, 5-7 directed anteriorly), none prehensile. *Peraeopod 3* well developed. *Peraeopod 4* well developed. 3-4 not glandular; 3-7 without hooded dactyli, 3-7 propodi without distal spurs. Coxa well developed, longer than broad; carpus shorter than propodus, not produced; dactylus well developed, or small or poorly developed. Coxa larger than coxa 3, not acuminate, with well developed posteroventral lobe; carpus not produced. *Peraeopods 5-7* with many rows of facial and marginal robust setae, or with many marginal slender setae and few or no robust setae, or with few robust or slender setae; dactyli without slender or robust setae. *Peraeopod 5* well developed; shorter than peraeopod 6; coxa smaller than coxa 4, with ventrally produced posterior lobe or with posterodorsal lobe; basis expanded or linear, subrectangular or subtriangular, with posteroventral lobe or without posteroventral lobe; merus/carpus free; carpus expanded, or weakly expanded, or linear; setae absent.

Peraeopod 6 longer than peraeopod 7; merus/carpus free; dactylus without setae.

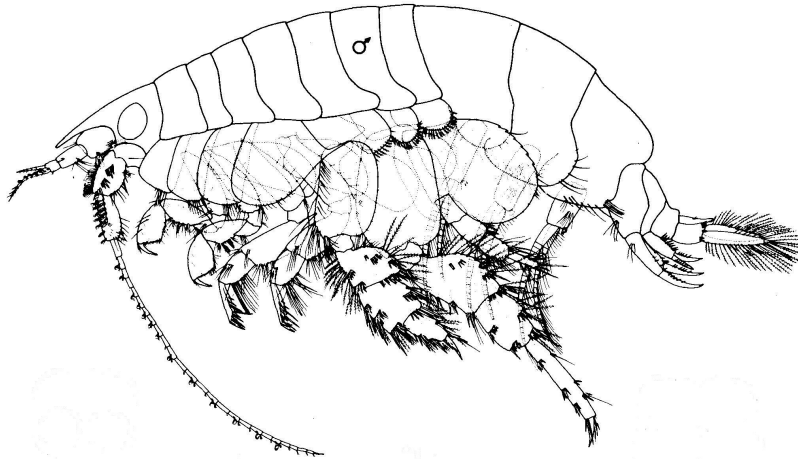
Peraeopod 7 with 6-7 well developed articles; shorter than peraeopod 5, or subequal to peraeopod 5; **different in structure to peraeopod 6**; with 7 articles; basis expanded, with long dense slender setae or without dense slender setae; dactylus without setae.

Pleon. Pleonites 1-3 without transverse dorsal serrations, without dorsal carina; without slender or robust dorsal setae. *Epimera 1-3* present. *Epimeron 1* well developed. *Epimeron 2* setose, or without setae.

Urosome not dorsoventrally flattened; **urosomites 1 to 3 free**; urosomite 1 subequal to urosomite 2, or longer than urosomite 2, or much longer than urosomite 2; urosome urosomite 1 carinate, or urosomites not carinate, or urosomite 3 carinate; urosomites 1-2 without transverse dorsal serrations. *Uropods 1-2* apices of rami with robust setae, or without robust setae. *Uropods 1-3* similar in structure and size. *Uropod 1* peduncle without long plumose setae, without basofacial robust seta, with ventromedial spur or without ventromedial spur. *Uropod 2* well developed; without ventromedial spur, without dorsal flange; inner ramus subequal to outer ramus. *Uropod 3* sexually dimorphic, or not sexually dimorphic; peduncle short; outer ramus shorter than peduncle

or subequal to peduncle or longer than peduncle, 1-articulate or 2-articulate, without recurved spines. **Telson laminar; deeply cleft**; longer than broad, or as long as broad, or broader than long; apical robust setae present, or absent.” (Lowry and Springthorpe 2001).

Subfamily Metharpiniinae – While not endemic, the Metharpiniinae are distributed primarily in the NEP. All genera in the subfamily are represented in the NEP, and nearly 70% of the species occur within the region. A number of other subfamily members are known from the NWP, with scattered representatives in the Western South Atlantic (Brazil, Argentina), and the sub-Antarctic. A key to the genera within the subfamily is provided by Jarrett and Bousfield 1994b. The key includes all genera included here as well as the genus *Foxiphalus*, since removed to the Brolginae.



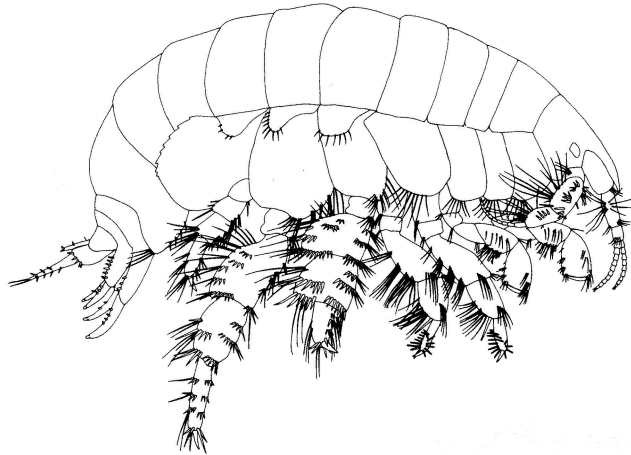
Beringiaphoxus beringanus (From Jarrett and Bousfield 1994b)

Beringiaphoxus – A monotypic endemic genus found only in the Northeast Pacific. It most closely approaches some members of *Grandifoxus*, but lacks the rostral constriction of members of that genus.

Diagnosis. “*Pigmented eyes large, lateral, in both males and females. Rostrum large, hooded, not incised in front of eyes. Antenna 2 (female), peduncular segment 1 weakly or not ensiform; segment 3 with 3-4 lateral setae; segment 4 with single row of facial spines, anterior margin with setal clumps, but no spines; segment 5 with 2 rows of facial spines. Mandible, molar weak, with slender marginal blades; spine row strong; left lacinia 4-dentate, right lacinia bifid; palp segment 2 not expanded. Lower lip broad, shallow. Maxilla 1 & 2 ordinary. Maxilliped, inner plate with 2 apical spines; palp, dactyl strong basally stout. Coxae 1-3 large, increasing posteriorly, lower margins rounded, hind corners lacking cusps. Coxa 4 large, narrowing distally, lower margin rounded.*

Gnathopods 2, carpus stronger and deeper than in 1, propods broadening distally. Pereopods 3 & 4 very strong; 4 expanding distally, 5 short, deep. Pereopod 5, segment 4 broader than deep, facial rows of spines strong. Pereopod 5, basis very broad; segment 4 broader than deep; segment 5 longer than 4 but shorter than 6. Pereopod 7, hind margin of basis with numerous (10+) teeth or serrations; segment 5 expanded, as broad as deep (copulatory spines of mature male unknown). All pereopod dactyls medium. Uropod 1, peduncle with baso-facial cluster of 5-6 setae, spine; rami long,

spinose posteriorly. Uropod 2, peduncle and outer ramus marginally spinose; inner ramus bare. Uropod 3, rami markedly unequal (female), broad throughout, slightly tapering distally, terminal segment minute; in penultimate male rami broad, nearly subequal, inner margins plumose-setose, Telson lobes broad, with dorso-lateral and apical spines. Coxal gills large, drop-shaped on pereopods 2-6, slender on pereopod 7. Mature male unknown.” (from Jarrett & Bousfield 1994b)



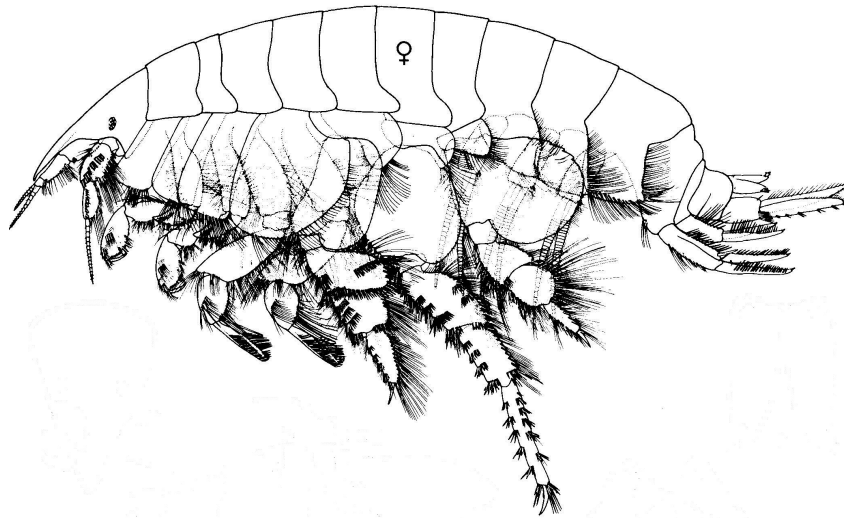
Grandifoxus longirostris (From Coyle 1982)

Grandifoxus - A genus endemic to the North Pacific, with most representatives in the NEP, and a subset from the NWP in Russian and Korean waters. Fifteen species are currently recognized, of which 9 occur in the NEP. The genus was reviewed by J. L. Barnard (1980) and Coyle (1982). Six additional species have been described since Coyle’s review, 3 by Jo in 1989, and 3 more by Jarrett & Bousfield in 1994. No comprehensive key to the genus exists, but that of Jarrett & Bousfield (1994b) contains all species but those erected by Jo from Korean waters. It can be used to separate members of the NEP contingent of the genus. Jo (1989) points out that *G. nasutus* of Gurjanova does not fully conform to the generic diagnosis, and excluded it from the genus in his treatment. It is retained in *Grandifoxus* here and in WoRMS.

Diagnosis: “*Eyes present. Flagella of antennae 1-2 unreduced in female, article 2 of antenna 1 ordinary to elongate, ventral setae narrowly to widely spread; article 1 of antenna 2 not to strongly ensiform, article 3 with 3+ setules or setae in adults, facial spines on article 4 in 2 or more rows, lacking special apical spines, article 5 ordinary in size. Right mandibular incisor with 3 teeth, molar not triturative, pillow-shaped, bearing 4 or more splayed, semi-articulate spines, usually bearing pubescence; palpar hump small to medium. Palp of maxilla 1 biarticulate, inner plate with 4 setae. Setation of maxilla 2 ordinary. Inner plate of maxillipeds ordinary, apex of palp not or weakly protuberant, dactyl elongate, apical nail mostly immersed, short.*

Gnathopods ordinary, small, similar, gnathopod 2 weakly enlarged, article 5 of gnathopods 1-2 elongate, without eusirid attachment, palms oblique to transverse, hands of gnathopods 1-2 setose anteriorly, weakly trichophoxin in shape. Article 2 of pereopod 5 of broad form; articles 4-5 of pereopods 5-6 broad; article 2 of pereopods 5-6 not setose posteriorly; pereopod 7 ordinary, article 2 naked ventrally, article 3 ordinary, dactyl normal.

Peduncle of uropod 1 normally elongate, without apicoventral spike, with or without enlarged displaced medial spine, peduncular apices of uropods 1-2 not combed, inner ramus of uropod 1 with one row of marginal spines, no rami continuously spinose to apex, inner ramus of uropod 2 ordinary; uropod 3 ordinary, very short, article 2 of outer ramus carrying 2 medium to long apical setae. Telson ordinary, with 2-4 apical spines or setae on each lobe plus setules, usually with special dorsal and lateral spines or setae. Epimera (1), 2, 3 bearing numerous long posterior setae, without midfacial setae above ventral facial ridge, epimeron 3 ordinary. Urosomite 1 without large lateral facial spines, bearing one or more midventral or lateral crescents or bundles of setae; urosomite 3 without dorsal hook or special process.” (from J. L. Barnard 1979)

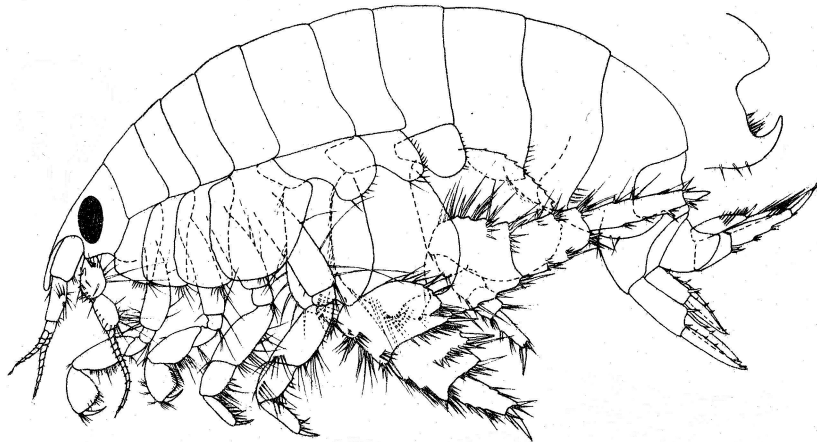


Majoxiphalus maximus (From Jarrett and Bousfield 1994b)

Majoxiphalus – A small endemic genus with two representatives in the NEP. WoRMS currently does not have the type species *M. major* listed within the genus, and a correction has been sent to the editor for this group. WoRMS has *Majoxiphalus major* listed as *Foxiphalus major* at present. Jarrett & Bousfield (1994b) who erected the genus, provide a key to the two forms currently known, and descriptions of both. The genus is easily separated grossly by the elongate, acute, unconstricted rostrum which renders the head much longer than in other members of the family.

Diagnosis: “Pigmented eyes very small (female). Rostrum elongate, not incised in front of eyes, apex acute. Antenna 1, segment 2 slightly longer than segment 1. Antenna 2, segment 1 weakly ensiform, segment 3 lacking lateral setae; segment 4, facial spines in 3 linear clusters; anterior margin with clusters of setae, not spines; segment 5, facial spines in single long submarginal row (female), with 7 anterior marginal calceoli (male); flagellum (of male) short, segments alternately calceolate. Mandible, molar small with 8-10 marginal blades; spine row strong; left lacinia 4-dentate, right lacinia irregularly bifid; palp segment 2 broadened, setose; segment 3, with two clusters of “A” setae, apex strongly oblique. Lower lip tall, shoulder cones weak. Maxilla 2, inner and outer plates subequal in width. Maxilliped inner plate with 2 (1-3) apical spines, outer plate slender, palp medium strong, dactyl slender. Coxal plates 1-3 large, deep, lower margins strongly setose. Coxa 4 very large, hind margin arcuate. Gnathopods 1 & 2 differing in strength of carpus: gnathopod 2, carpus with medium-short posterior lobe;

propod subovate, palm oblique. Pereopods 3 & 4 very powerful, segment 5 short and deep, postero-distal spine strong, long, accompanied by 1-3 slender accessory spines; segment 6 elongate, marginal spines slender, very numerous; dactyls very small. Pereopod 5, segment 4 broader than deep; segment 5 narrower and deeper than 4, segment 6 longer than 5, hind margin strongly setose. Pereopod 6, basis large, subovate; segments 4 & 5 little broadened, elongate; segment 6 elongate, margins spinose; dactyl strong. Pereopod 7, segments 4 & 5 broadened, 5 longer than 6, copulatory spines elongate, slender, setulose distally; dactyl long. Pleon plates 2 & 3, hind corners subacute, hind margin richly setose. Urosome 1 with ventral cluster of setae. Uropod 1 peduncle baso-facially richly setose; inner margin spinose, distal displaced spine strong; rami long, finely spinose. Uropod 2, rami long, outer ramus spinose, inner ramus weakly spinose or unarmed. Uropod 3, rami subequal, lanceolate (both sexes), margins weakly (female) setose; terminal segment distinct, with 1-2 short apical setae. Telson lobes narrowing distally, with 1-4 apical spines, dorso-lateral spines lacking. Coxal gills large, broad, on pereopods 2-7.” (from Jarrett & Bousfield 1994b)



Metharpinia jonesi (From J. L. Barnard 1963)

Metharpinia – As currently defined the genus has nine members split between the NEP and the Western Atlantic. In the latter it ranges from south temperate to subantarctic waters, and in the former from tropical to temperate regions. No comprehensive key to the genus exists, but that provided by J. L. Barnard (1980) can be used to separate the two species in the genus known from the NEP. Alonso de Pina (2003) in her discussion of two new species from Argentine waters, notes that the use of a posteriorly hooked third epimeron is not a reliable character for recognition of *Metharpinia*. This should be considered when reading the diagnosis provided here.

Diagnosis: “Eyes present. Flagella of antennae 1-2 unreduced in female; article 2 of antenna 1 ordinary to elongate, ventral setae narrowly to widely spread; article 1 of antenna 2 not ensiform, article 3 with 2 setules, facial spines on article 4 in 2 or more rows, article 5 ordinary in size. Right mandibular incisor with 3 teeth; molar not triturative, medium, pillow-shaped or elongate, conical, weakly granulated, bearing 4 or more splayed semi-articulate spines, not (type) or bearing pubescence; palpar hump small. Palp of maxilla 1 biarticulate; inner plate with 4 setae. Setation of maxilla 2 ordinary. Inner plate of maxillipeds ordinary; apex of palp weakly protuberant, dactyl elongate, apical nail mostly immersed, obsolescent.

Gnathopods ordinary, small, similar; article 5 of gnathopods 1-2 elongate, without eusirid attachment; palms oblique, hands ordinary, ovato-rectangular, poorly setose anteriorly. Article 2 of pereopod 5 broad; articles 4-5 of pereopods 5-6 broad to medium; article 2 of pereopods 5-6 not setose posteriorly; pereopod 7 ordinary, article 2 naked or weakly setulose ventrally, article 3 ordinary, dactyl normal.

Peduncle of uropod 1 normally elongate, without apicoventral spike, without displaced apicomedial spine; peduncular apices of uropods 1-2 not combed; inner ramus of uropod 1 with one row of marginal spines, rami with one or two accessory nails but no main nails, inner ramus of uropod 2 ordinary; uropod 3 ordinary, article 2 of outer ramus long, carrying medium apical setae. Telson extraordinary, with 1-3 apical spines or setae on each lobe plus setules, with special dorsal and lateral brush of setae. Epimera 1-3 bearing numerous long posterior setae, without midfacial setae above ventral facial ridge, epimeron 3 ordinary. Urosomite 1 with lateral facial setae, often bearing one or more midventral crescents or bundles of setae; urosomite 3 without dorsal hook or with weak dorsal hump.” (from J. L. Barnard 1979)

Microphoxus – A small genus of five species distributed in the Western Atlantic and NEP. The single NEP species, *M. minimus* can be separated from all others using the comprehensive generic key of Bustamante (2002).

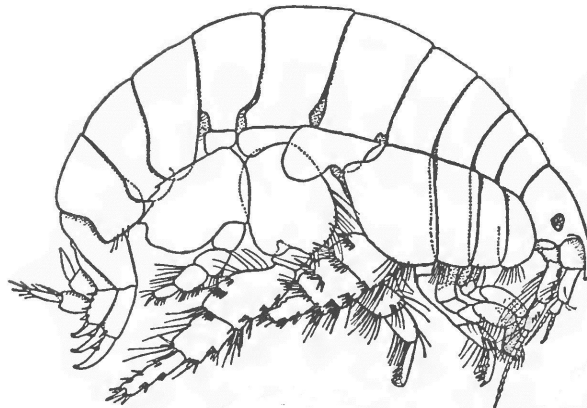
Diagnosis: “Eyes present. Flagella of antennae 1-2 unreduced in female; article 2 of antenna 1 ordinary, ventral setae widely spread; article 1 of antenna 2 not ensiform, article 3 with 2 setules, facial spines on article 4 in 2 or more rows, without special apical spines, article 5 ordinary in size. Right mandibular incisor with 3 teeth; molar not tritirative, small, pillow-shaped, bearing 3-4 splayed, semi-articulate spines, not bearing pubescence; palpal hump small. Palp of maxilla 1 biarticulate, inner plate with 1-4 setae. Setation of maxilla 2 ordinary. Inner plate of maxillipeds ordinary, apex of palp not or weakly protuberant, dactyl elongate, apical nail distinct, short.

Gnathopods small, similar, article 5 elongate, without eusirid attachment, palms almost transverse, hands heavily setose anteriorly, almost trichophoxin in shape. Article 3 of pereopod 5 of broad form, articles 4-5 of pereopods 5-6 broad, article 2 of pereopods 5-6 no setose posteriorly, pereopod 7 ordinary, article 2 naked or weakly setulose ventrally, article 3 ordinary, dactyl normal.

Peduncle of uropod 1 normally7 elongate, without apicoventral spike, without special displaced spine, peduncular apices of uropods 1-2 not combed; inner ramus of uropod 1 with one row of marginal spines, one or more rami continuously spinose to apex, or with subapical spines (not of nail category) inner ramus of uropod 2 ordinary; uropod 3 ordinary, article 2 of outer ramus carrying long apical setae. Telson ordinary, with only 1-2 apical spines, or setae on each lobe plus setules, with special dorsal and lateral spines or setae. Epimera 1-2 lacking or bearing numerous long posterior setae, without midfacial setae above ventral facial ridge, epimeron 3 ordinary, of rounded classification and bearing 3 or more long setae. Urosomite 1 with or without lateral facial setae, bearing one or more midventral crescents or bundles of setae, or generally naked except for sparse apicoventral setae or spines near base of uropod 1; urosomite 3 with dorsal hook or special process.” (from J. L. Barnard 1967)

Rhepoxynius – A sizeable (19 described species) and abundant shallow dwelling genus restricted to North American waters. All but two of the species are found in the NEP, the others in the temperate Western Atlantic. The genus was monographed by J. L.

and C. M. Barnard (1982), who provide both a proposed evolutionary scenario and a key to the known taxa. Within this they included three forms not listed as valid species here; *R. species D*, *R. species C*, and *R. species L*. Based on comments and discussion in that paper we view them as gerontic *R. menziesi*, a terratogenic individual of unclear affinity, and hybrids of *R. homocuspidadatus/heterocuspidadatus*, respectively. An additional undescribed form is listed here, *R. sp A*. *Rhepoxynius sp A* was known early on and was treated as a shallow-water ecophenotype of *R. bicuspidatus* by J. L. Barnard (1960), but is viewed as a valid taxon by SCAMIT. It can be separated from that taxon by the characters provided on the voucher sheet for *R. sp A* in the taxonomic toolbox on the SCAMIT website. The bathymetric range provided for *R. bicuspidatus* in the 1982 review probably reflects a compounding of the two species, with the shallowest records reflecting *R. sp A* of SCAMIT. The final difference between that review and this is the inclusion here of *R. boreovariatus*, described by Jarrett & Bousfield (1994b). They provide a key which will allow separation of that species from other genus members in the NEP. They also recognize *R. pallidus* as a full species, while it was treated as a subspecies of *R. tridentatus* in J. L. & C. M. Barnard (1982). Whether the Atlantic *R. epistomus* and the Pacific *R. menziesi* form a cognate pair separated by divergence following closure of the Panamanian inter-ocean connection is not entirely clear, but seems likely.



Rhepoxynius pallidus (From J. L. Barnard 1960)

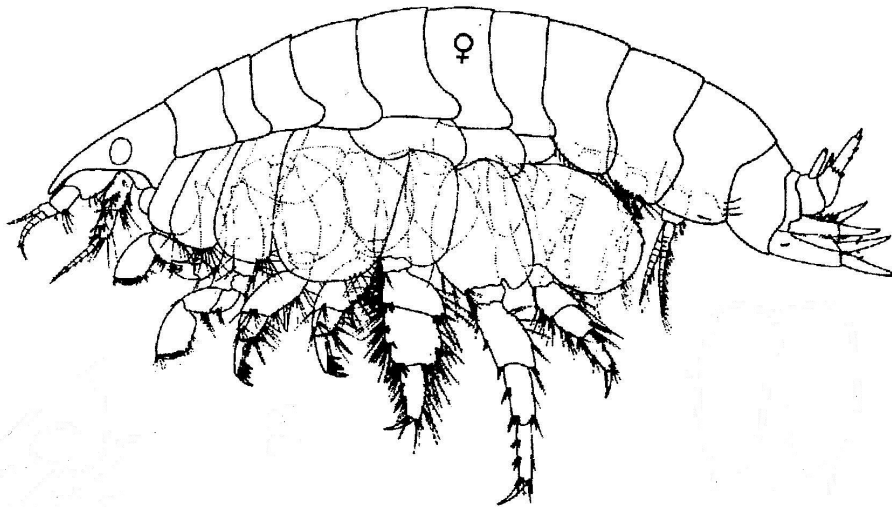
Diagnosis: “Eyes present. Flagella of antennae 1-2 unreduced in female, though somewhat short on antenna 1; article 2 of antenna 1 ordinary to elongate, ventral setae widely to narrowly spread; article 1 of antenna 2 weakly ensiform, article 3 with 2 setules, facial spines on article 4 in 2 or more rows, article 5 ordinary in size. Right mandibular incisor with 3 teeth, molar not triturative, small, pillow-shaped, bearing 4 or more splayed, semi-articulate spines, usually bearing pubescence; palmar hump small, Palp of maxilla 1 biarticulate, inner plate with 4 setae. Setation of maxilla 2 ordinary. Inner plate of maxillipeds ordinary apex of palp weakly protuberant, dactyl elongate, apical nail distinct to weak.

Gnathopods ordinary, small, similar, article 5 of gnathopods 1-2 elongate, without eusirid attachment; palms weakly oblique to transverse, hands ordinary, ovato-rectangular to weakly trichophoxin in shape, poorly setose anteriorly. Article 2 of pereopod 5 of broad form; articles 4-5 of pereopods 5-6 broad to medium; article 2 of

pereopods 5-6 not setose posteriorly; pereopod 7 ordinary, article 2 naked or weakly setulose ventrally, article 3 ordinary, articles 5-6 usually with weak apical comb, dactyl normal.

Peduncle of uropod 1 normally elongate, without apicoventral spike, with or without displaced apicomedial spine, peduncular apices of uropods 1-2 combed or not, inner ramus of uropod 1 with one row of marginal spines, no rami continuously spinose to apex; inner ramus of uropod 2 ordinary; uropod 3 ordinary, article 2 of outer ramus carrying 2 long apical setae. Telson ordinary, with 2-4 apical spines or setae on each lobe plus setules, without special dorsal and lateral spines or setae. Epimera 1- lacking long posterior setae, without midfacial setae above ventral facial ridge, epimeron 3 ordinary, all posterior setae confined to narrow ventral clump. Urosomite 1 with or without facial setae or spines, bearing 2 ventral crescents or bundles of setae, otherwise generally naked except for sparse apicoventral setae or spines near base of uropod 1; urosomite 3 without dorsal hook or special process. “ (from J. L. Barnard 1979)

Subfamily Brolginae – As currently defined the Brolginae contains sixteen genera described over an 11 decade period between 1891 and 2001. Five of these genera occur in the NEP. *Foxiphalus* is the most speciose of these, with the remaining genera consisting of 2-4 NEP representatives. Previously the genus *Foxiphalus* was allocated to the Metharpiniinae (Jarrett & Bousfield 1994b), but it is placed in Brolginae in WoRMS. *Mandibulophoxus* (previously in Pontharpiniinae), and *Eyakia* (previously in Parharpiniinae) were also reallocated to Brolginae in WoRMS. Rationales for these changes were not presented, and are unclear.



Eobrolgus chumashi (From Jarrett and Bousfield 1994a)

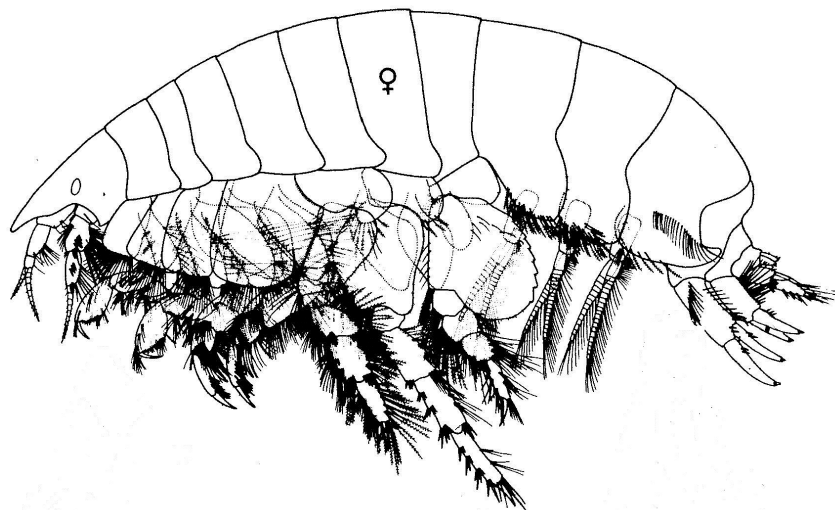
Eobrolgus – A small genus currently restricted to the North Pacific and the temperate Western Atlantic, with one species in the NWP, and two in the NEP (one introduced from the Atlantic). J. L. & C. M. Barnard review the genus (1981) and helped to clarify issues regarding early identifications. The two species reported from the NEP are cognates; *E. chumashi* native to the NEP, and *E. spinosus* a western Atlantic cognate twin later reintroduced by human transport into California embayments. Before the

differences between the two were recognized, *E. chumashi* was also recorded as *E. spinosus* in California waters. The third species, *E. pontarpinoides* (Gurjanova 1953) is known only from the NWP. The three species are keyed in the J. L. & C. M. Barnard 1981 paper.

Diagnosis: “Eyes present, Flagella of antennae 1-2 unreduced in female; article 2 of antenna 1 ordinary, ventral setae confined apically; article 1 of antenna 2 not ensiform, article 3 with 2 setules, facial spines on article 4 in 2 or more rows, lacking special apical spines, article 5 ordinary in size. Right mandibular incisor with 3 teeth, molar not triturate, pillow-shaped, bearing 4 or more splayed, semi-articulate spines, usually bearing pubescence, palpar hump medium. Palp of maxilla 1 biarticulate, inner plate with 4 setae. Setation of maxilla 2 ordinary. Inner plate of maxillipeds ordinary, apex of palp not or weakly protuberant, dactyl elongate, apical nail obsolescent to absent.

Gnathopods small, similar, article 5 of ordinary length, very short, cryptic on gnathopod 2, elongate on gnathopods 1, 2, palms oblique, hands of gnathopods 1-2 ovato-rectangular, poorly setose anteriorly. Article of pereopod 5 of broad form; articles 4-5 of pereopods 5-6 broad and narrow respectively, article 2 of pereopods 5-6 not setose posteriorly; pereopod 7 ordinary, article 2 naked ventrally, article 3 ordinary, dactyl normal.

Peduncle of uropod 1 normally elongate, without apicoventral spike, without enlarged displaced spine, peduncular apices of uropods 1-2 combed; inner ramus of uropod 1 with one row of marginal spines, no rami continuously spinose to apex; inner ramus of uropod 2 ordinary, uropod 3 ordinary, article 2 of outer ramus carrying 2 medium to long apical setae. Telson ordinary, with 1-2 apical spines or setae on each lobe plus setules, without special dorsal and lateral spines or setae. Epimera 1-2 lacking numerous long posterior setae, without midfacial setae above ventral facial ridge, epimeron 3 ordinary, bearing one or more long setae. Urosomite 1 without large facial spines, generally naked except for sparse apicoventral setae or spines near base of uropod 1; urosomite 3 without dorsal hook or special process.” (from J. L. Barnard 1979)



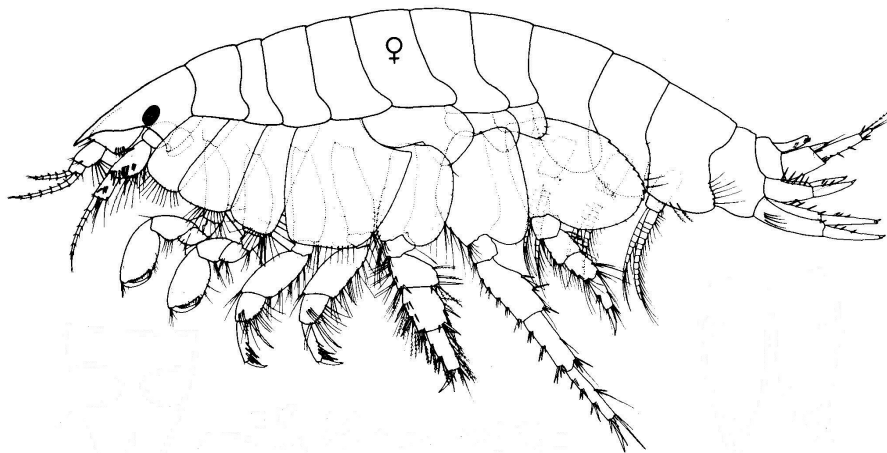
Eyakia robusta (From Jarrett and Bousfield 1994a)

Eyakia – The genus contains five described species and two provisionals erected by Jarrett & Bousfield (1994a) based on reinterpretation of specimens originally identified as being described. Three of these, including the two provisionals, are reported from the NEP. The remaining species are NWP in distribution. The key to the genus provided by Jarrett & Bousfield (loc. cit.) can be used in separating these forms.

Diagnosis: “*Eyes present. Flagella of antennae 1-2 unreduced in female; article 2 of antenna 1 ordinary, ventral setae widely spread; article 1 of antenna 2 not ensiform, article 3 with 2 setules, facial spines on article 4 in 2 rows, plus special apical spines, article 5 ordinary in size. Right mandibular incisor with 3 teeth, molar not tritulative, pillow-shaped, bearing 3-4 splayed, semi-articulate spines, one of these very large, usually bearing pubescence; palpar hump small. Palp of maxilla 1 biarticulate, inner plate with 4 setae. Setation of maxilla 2 ordinary. Inner plate of maxillipeds ordinary, apex of palp not or weakly protuberant, dactyl elongate, apical nail distinct, short.*

Gnathopods dissimilar, gnathopod 2 moderately to strongly enlarged, article 5 of gnathopod 1 of ordinary length, but short on gnathopod 2, without eusirid attachment, palms oblique; hands of gnathopods 1-2 narrowly ovate, elongate, poorly setose anteriorly; article 2 of pereopod 5 of bread form, but tapering distally; articles 4-5 of pereopods 5-6 narrow to medium; article 2 of pereopods 5-6 not setose posteriorly; pereopod 7 ordinary, article 2 naked or weakly setulose ventrally, article 3 ordinary, dactyl normal.

Peduncle of uropod 1 normally elongate, without apicoventral spike, without enlarged displaced spine, peduncular apices of uropods 1-2 not combed; inner ramus of uropod 1 with one row of marginal spines, no rami continuously spinose to apex; inner ramus of uropod 2 ordinary, uropod 3 ordinary, article 2 of outer ramus carrying 2 medium to long apical setae. Telson ordinary, with only 1-2 apical spines or setae on each lobe plus setules, without special dorsal and lateral spines or setae. Epimera 1-2 lacking long posterior setae, without midfacial setae above ventral facial ridge, epimeron 3 ordinary. Urosomite 1 without large lateral facial spines, bearing one or more ventral crescents or bundles of setae or generally naked except for sparse apicoventral setae or spines near base of uropod 1, urosomite 3 without dorsal hook or special process.” (from J. L. Barnard 1979)



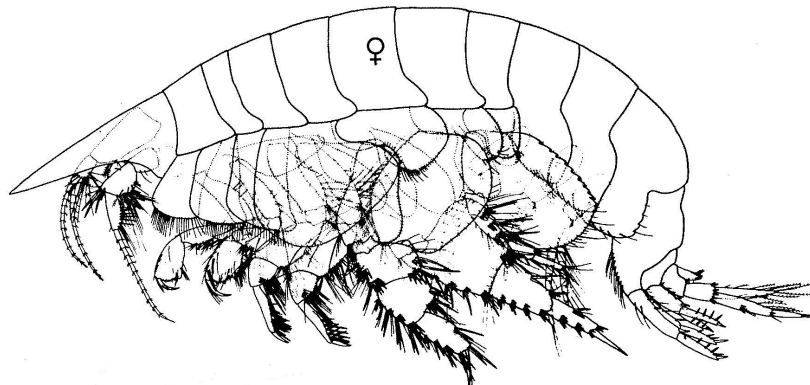
Foxiphalus similis (From Jarrett and Bousfield 1994b)

Foxiphalus – An eleven member genus endemic to the NEP. WoRMS currently has twelve species listed under *Foxiphalus*, but one of these, *F. major*, has been removed to the genus *Majoxiphalus* as its type, and should not still be listed as a *Foxiphalus*. No comprehensive key to the genus exists as the most recent treatment (Jarrett & Bousfield 1994b) restricts its key to the species from the central and northern portions of the NEP only. That key, and the key provided by J. L. & C. M. Barnard (1982) each include eight of the eleven species. In the absence of a comprehensive key, both should be utilized. Four of these are frequently encountered in environmental monitoring samples in the SCB. In order of decreasing frequency these are *F. obtusidens*, *F. golfensis*, *F. similis*, and *F. cognatus*. Records of other species from this area are very sparse.

Diagnosis: “*Eyes present. Flagella of antennae 1-2 slightly reduced in female; article 2 of antenna 1 elongate, ventral setae widely to narrowly spread; article 1 of antenna 2 ensiform, article 3 with 2 setules, facial spines on article 4 in 2 or more rows, article 5 ordinary in size. Right mandibular incisor with 3 teeth, molar not triturative, granulate-striate, small to medium, or elongate plaque-forming, bearing 3 or more splayed, semi-articulate spines, usually bearing pubescence; palpar hump medium. Palp of maxilla 1 biarticulate, inner plate with 4 setae. Setation of maxilla 2 ordinary. Inner plate of maxilliped ordinary, apex of palp weakly protuberant, dactyl elongate, apical nail distinct, short.*

Gnathopods ordinary, small, similar, article 5 elongate, without eusirid attachment, palms oblique, hands of gnathopods 1-2 ovato-rectangular, elongate, poorly setose anteriorly. Article 2 of pereopod 5 of broad form; articles 4-5 of pereopods 5-6 narrow to medium; article 2 of pereopods 5-6 not setose posteriorly; pereopod 7 ordinary, article 2 naked or weakly setulose ventrally, article 3 ordinary, dactyl normal.

Peduncle of uropod 1 normally elongate, without apicoventral spike, with or without displaced enlarged apicomedial spine, peduncular apices of uropods 1-2 not combed, inner ramus of uropod 1 with one row of marginal spines, no rami continuously spinose to apex, inner ramus of uropod 2 ordinary; uropod 3 elongate, article 2 of outer ramus carrying 2 short apical setae. Telson ordinary, with only 2-4 apical spines or setae on each lobe plus setules, often with special dorsal and lateral spines or setae. Epimera (1), , 3, bearing numerous long posterior setae, without midfacial setae above ventral facial ridge, epimeron 3 ordinary. Urosomite 1 without large lateral facial spines, bearing one or more lateral or midventral crescents or bundles of setae; urosomite 3 without dorsal hook or special process.” (from J. L. Barnard 1979)



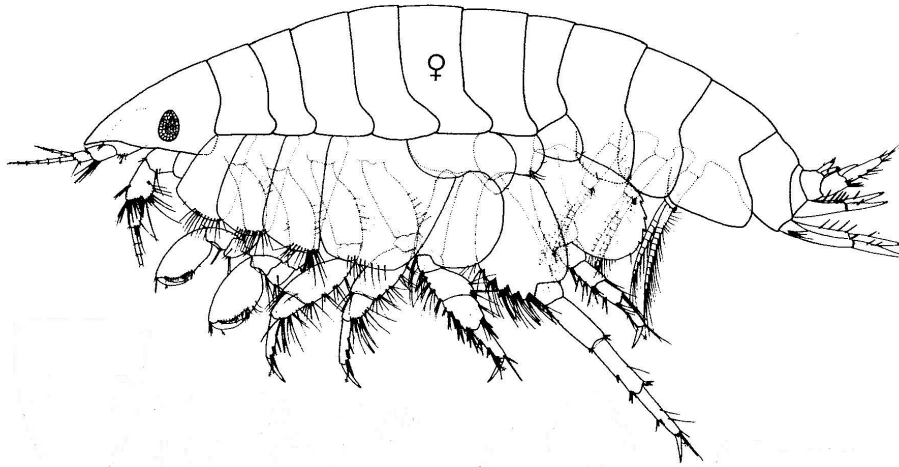
Mandibulophoxus gilesi (From Jarrett and Bousfield 1994a)

Mandibulophoxus – A predominantly North Pacific genus, with three species in the NEP, and two in Korean waters. It is also known from Hawai'i, South Africa, and the Indian Ocean (J. L. Barnard 1957), but seems not to be present in the Western Atlantic, as many other phoxocephalid genera are. While there is no comprehensive key to the genus available, the three species known to occur in the NEP are keyed in Jarrett & Bousfield (1994a).

Diagnosis: “*With the characters of the subfamily. Rostrum elongate, unstricted. Pigmented eyes lacking or vestigial. Antenna 1, flagellum and accessory flagellum multisegmented; peduncular segment 2 short, posterior marginal setae confined distally; segment 3 very short, unarmed. Antenna 2, segment 1 normal (not ensiform); segment 3 with 2 setules; segment 4 deeper than 5. 00tb spinose behind. Antennae of male shorter, with fewer flagellar segments; antennae 2, peduncular segment S deep, with 4 very large medial facial calceoli inserted near posterior' margin. Upper lip, epistome not produced. Lower lip broad, squat, outer lobes with cones. Mandible, molar of B & D type, with 3 apical spines; blades 6-8, ordinary, alternating with smaller blades; left lacinia 6-8 dentate, flabellate; right lacinia lacking; left incisor 100cusate; right incisor 5-6 cusate; mandibular body with large palpar hump; palp segment 3 lacking "A" and "C" setae (of Cole, 1980). Maxilla 1, outer plate with apical spines, inner plate 3-5 setose; palp broad. Maxilla 2, inner plate small, with distal submarginal (facial?) row of slender pectinate spines. Maxilliped, plates narrow, small, inner lacking apical conical spines; palp large, inner margin often spinose; dactyl slender, longer than segment 3. Coxae 1-3, lower margins moderately to strongly setose; coxae 4 very broad. Gnathopods 1 & 2 unequal. Regularly subchelate, 2 little larger. Gnathopod 1, carpus elongate, subequal to propod. Gnathopod 2, carpus short, length about half propod. Peraeopods 3 & 4, similar in size and form; segment 4 expanding distally, 5 short, stout, segment 6 spatulate; dactyl slender. Peraeopod 5, basis broadening distally, pyriform; segments 4 & 5 broad, 6 slender. Peraeopod 6, basis broadly rounded; segment 4 proximally very broad, segments 5-7 tapering distally. Peraeopod 7, basis hind lobe very broad and deep, exceeded below only by segment 6 and dactyl; dactyl may be short in male. Pleon plate 2 smooth behind, setose anteriorly below; pleon 3 squarish and weakly cusate and setose behind. Uropods 1 & 2, inner ramus the shorter; rami with few stout distal marginal and apical spines; peduncle of uropod 1 with stout disto-lateral spine. Uropod 3 slender, inner ramus medium long; inner margin of rami usually setose (both sexes). Telson lobes medium broad, apices rounded, each with 2- 3 strong spines but no lateral setae. Brood plates slender, with long distal setae. Coxal gills slender, simple, smallest on peraeopod 7.*” (from Jarrett & Bousfield 1994a)

Paraphoxus - A moderately sized genus of 15 species, half of which are reported from the NEP. The remainder occur in the North Atlantic (1, the type), Mediterranean (1), New Zealand (2), Antarctic/subantarctic (2), and Northwest Pacific (2, 1 also reported from the NEP). The treatment of Jarrett & Bousfield (1994a) is the most recent, and introduces two provisional species to stand for taxa considered previously misidentified, one of which occurs in the NEP. Of the eight taxa reported from the NEP, all are in the key provided by Jarrett & Bousfield (1994a) along with the type *P. oculatus*,

from the Northeast Atlantic, and the two forms from the Northwest Pacific. The species are most frequent in, and many are restricted to, Boreal or Borearctic waters. Occurrences in the warmer south are few. Without reexamining his material, Jarrett & Bousfield reinterpreted the *P. oculatus* identifications of J. L. Barnard from the region as a new species separate from the *P. oculatus* of Sars, naming it *P. sp 1*. This name is being used for those few individuals taken in the SCB belonging to "*P. oculatus*" of J. L. Barnard 1960 et seq. Records of *P. oculatus* from this area identified prior to 1994 should be modified to reflect this change.



Paraphoxus similis (From Jarrett and Bousfield 1994a)

Diagnosis (after Sars, 1895):" *Female ov. (5.0 mm): Eyes small, rounded. Antenna 1, flagellum 7-segmented, accessory flagellum 4-segmented. Antenna 2, peduncular segment 4 with distal fan of 10-12 stout spines; flagellum 8- segmented. Mandibular molar with 2 apical spines, blade row of 7-8 spines; palp segments 2 & 3 subequal, segment 3 with 1 (2?) facial "A" seta, segment 2 with strong distal, and weak middle, marginal seta. Maxilla 1, outer plate with 11 apical spines; palp 2-segmented (1-segmented in Sars ' description, but his illustration shows marginal separation lines). Maxilliped, outer plate with 9-10 stout inner marginal masticatory spines. Coxal plate 1 with about 14 tightly grouped lower marginal simple setae; coxa 4 broader than deep. Gnathopods 1 & 2, propods stout, closely subequal in size, segment 5 of pereopod 2 distinctly shorter than in pereopod 1, With 3-4 posterior setae. " Pereopods 3 & 4, segment 5 postero-distally With unequal pair of medium spines not exceeding apex of .segment 6 that has 4 inner marginal spines; dactyls subequal m length to segment 6. Pereopod 5, basis relatively broad, ~md margin slightly convex; segment 6 with 2 anterior marginal spines and one posterior marginal seta.. Pereopod 6 elongate, segments 5 & 6 moderately spinose with total of about 10 clusters of spines and long setae. Pereopod 7, hind margin of basis with 12-14 weak teeth, lower margin evenly convex.*

Pleon 3 posteriorly produced, hind comer rounded. Uropod 1, baso-facial fan of 4-5 short slender spines; outer ramus equal to peduncle, with 2-3 slender marginal spines, inner ramus with 2 marginal spines. Uropod 2, rami longer than peduncle, with 1-2 marginal spines; peduncle With 4-5 long stout outer marginal spines. Uropod 3,

peduncle with weak distal fan of spines; inner ramus slender, > 1/2 proximal segment of outer ramus, terminal segment slender, elongate. Telson lobes each with pair of apical spines and setae.” (from Jarrett & Bousfield 1994a)

Subfamily Phoxocephalinae - Like Brolginae, this subfamily contains 16 genera; representatives of five of these occur in the NEP. The subfamily is not speciose within the region, with each genus having only one-few regional species. The genus *Cephalophoxoides* has also been placed in Brolginae by some workers.

Diagnosis: “*Article 2 of antenna 1 usually shortened; mandibular molar fully triturative or reduced to a small hump with articulate spines; palp of maxilla 1 uniarticulate; solution on maxilla 2 reduced; gnathopod 2 significantly enlarged, or as small as gnathopod 1; article 2 of pereopod 3 of broad form; pereopod 5 ordinary.*” (from J. L. Barnard & Drummond 1978)



Cephalophoxoides kergueleni (From J. L. Barnard 1967)

Cephalophoxoides – An eight member genus represented in the NEP by two species, *Cephalophoxoides homilis*, and *C. kergueleni*. The later species may eventually prove to be distinct, given the wide separation of type locality in the Southeast Atlantic and its collection point in the Gulf of Panama at 1749m. The genus grew substantially when J. L. Barnard & Karaman (1991) removed eight species from *Phoxocephalus*, transferring them to *Cephalophoxoides*. Among these was the type of the genus, which had been removed from *Phoxocephalus* somewhat earlier by Gurjanova (1977). Some confusion remains on this issue in WoRMS, which lists five of the species (*burleus*, *keppeli*, *kukathus*, *rupullus*, and *tunggeus*) both as *Cephalophoxoides* and as *Phoxocephalus*. All of these species were described initially in *Phoxocephalus* as Gurjanova’s new taxon was too recent for inclusion in the monograph on austral phoxocephalids. The two genera are similar, differing most visibly in the eyes and gnathopods. The NEP species can be easily separated from other phoxocephalids with long unrestricted rostra by the thickening of the carapace at the rostral tip, producing a slightly enlarged “drip”. Stebbing’s *C. kergueleni* can be separated from *C. homilis* by

lacking stout setae on the outer ramus of the second uropod. All other members are austral.

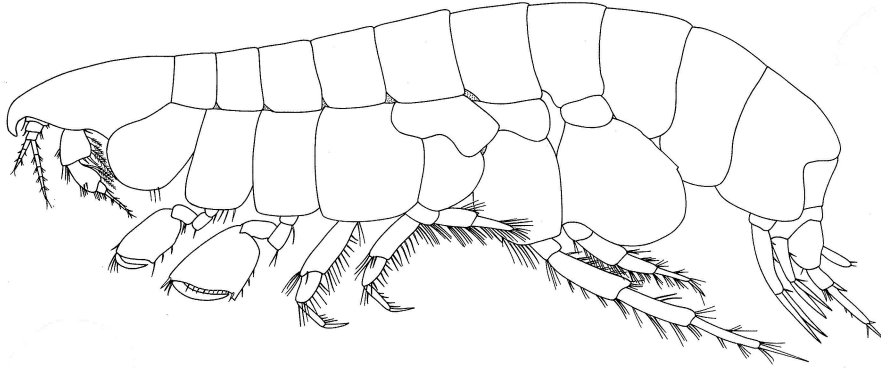
Diagnosis: “*Rostrum unconstricted. Pigmented eyes well developed. Antennae short (female). Antenna 2 (male), peduncular segment 5 weakly calceolate, flagellum elongate, calceolate. Mandibular molar triturative; palp segment 3 much shorter than 2. Maxilla 1, outer plate 7-spinose; palp 1- segmented. Maxilliped, plates small, weakly armed; inner plate with apical spine(s). Coxae 1-4 large, deep, setose below. Gnathopods large, subchelate, propods unequal in size, 2 enlarged; carpus short, hind lobes cryptic. Pereopods 3 & 4 stout, dactyls long. Pereopod 5, basis very broad; segments 4 & 5 not expanded. Pereopod 6 elongate, segments 4-6 slender; dactyl long. Pereopod 7, basis very broad, hind margin not dentate; dactyl long; segment 5 (male) not modified, or equipped with copulatory spines. Pleon plate 3 large, margins smooth. Uropods 1 & 2, inner rami marginally spinose. Uropod 1, outer ramus shorter than inner. Uropod 3, fully setose, aequiramus in male, non-setose but sub-aequiramus in female; terminal segment of outer ramus elongate. Telson lobes with single apical spine. Coxal gill on pereopod 7 small.*” (from Jarrett & Bousfield 1994a)

Hopiphoxus - A monotypic genus erected to house *Metaphoxus simillimus* of J. L. Barnard, based on a single female specimen from over 2600m depths off Baja California. It is only present in the NEP, and can be differentiated from other genera in the family using the key provided in J. L. Barnard & Drummond (1978).

Diagnosis.—“*Eyes absent. Flagellum of antenna 2 reduced in female. Article 2 of antenna 1 shortened, ventral setae confined apically. Article 1 of antenna 2 not ensiform; article 2 with 2 setules; facial spines on article 4 in one main row; article 5 short. Right mandibular incisor with 3 teeth; molar not triturative, medium, pillow-shaped, bearing 2 splayed, semi-articulate spines, bearing fuzz; palpar hump small. Palp of maxilla 1 uniarticulate; inner plate naked. Setation of maxilla 2 weak. Inner plate of maxillipeds ordinary, apex of palp article 3 not protuberant, dactyl elongate, apical nail distinct, short. Gnathopods dissimilar, gnathopod 2 strongly enlarged; article 5 of gnathopods 1-2 very short, cryptic; gnathopods 1-2 with weak eusirid attachments; palms oblique, hands of gnathopods 1-2 broadened, poorly setose anteriorly. Article 5 of pereopods 1-2 setose posteroproximally. Article 2 of pereopod 3 of broad form, articles 4-5 of pereopods 3-4 narrow, article 2 of pereopods 3-4 not setose posteriorly; pereopod 5 ordinary, article 2 naked ventrally, article 3 ordinary, dactyl normal. Epimera 1-2 lacking long posterior setae, without midfacial setae above ventral facial ridge; epimeron 3 of rounded classification and lacking long setae. Urosomite 1 generally naked; urosomite 3 without dorsal hook or special process. Peduncle of uropod 1 normally elongate, without apicoventral spike, without special enlarged apicolateral-medial spine, [Peduncular apices of uropods 1-2 not combed]; inner ramus of uropod 1 with one row of marginal setae, outer ramus shortened, some rami continuously setose to apex, inner ramus of uropod 2 ordinary. Uropod 3 ordinary, elongate article 2 of outer ramus carrying 2 short to vestigial apical setae. Telson elongate, with only one apical spine on each lobe.*” (from J. L. Barnard & Drummond 1978)

Leptophoxus – A small genus containing currently only a single species, with two subspecies: one in the North Atlantic (*Leptophoxus falcatus falcatus*) and one in the NEP (*Leptophoxus falcatus icelus*). This is one of the genera with a long acute rostrum, but in this genus it is deflexed ventrally into an anterior hook simplifying recognition.

While not providing a key to separate the two subspecies, J. L. Barnard (1960) points out a series of characters to differentiate the two. Zoogeography alone should suffice. There is a provisional species which may belong in this genus from bathyal depths off Liberia and Angola in the Southeast Atlantic. Although it shares the sharply deflexed rostral hook of *Leptophoxus*, other characters may be sufficient to place it outside the genus, and requires creation of another.

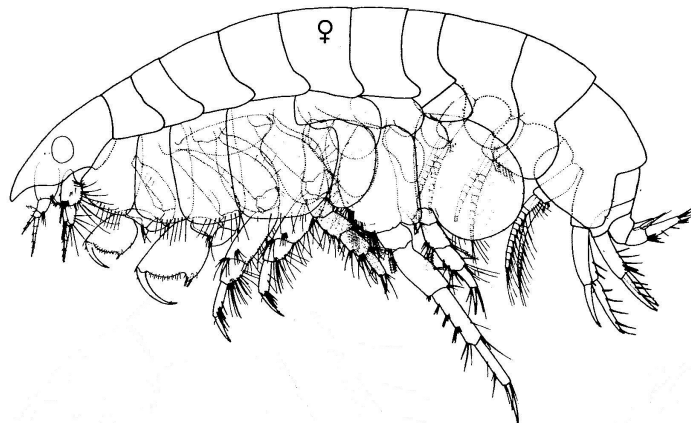


Leptophoxus falcatus (From J. L. Barnard and Karaman 1991)

Diagnosis: “Eyes absent. Flagella of antennae 1-2 reduced in female. Article 2 of antenna 1 especially shortened, ventral setae confined apically. Article 1 of antenna 2 not ensiform; [Particle 3 with 2 setules]; facial spines on article 4 in 2 rows; article 5 ordinary in size. Right mandibular incisor with 3 teeth; molar not triturative, small, pillowshaped, bearing semi-articulate spines, [usually not bearing fuzz]; palpar hump medium. Palp of maxilla 1 uniarticulate; inner plate naked. Setation of maxilla 2 weak. Inner plate of maxillipeds ordinary, apex of palp article 3 strongly protuberant, dactyl elongate, apical nail distinct, short. Gnathopods dissimilar, gnathopod 2 strongly enlarged; article 5 of gnathopods 1-2 very short, cryptic on gnathopod 2, with eusirid attachment, palms oblique, hand of gnathopod 2 broadened, both hands poorly setose anteriorly. Article 5 of pereopods 1-2 setose posteroproximally. Article 2 of pereopod 3 of broad form, articles 4-5 of pereopods 3-4 narrow, article 2 of pereopods 3-4 not setose posteriorly; pereopod 5 ordinary, article 2 naked ventrally, article 3 ordinary, dactyl normal. Epimera 1-2 lacking long posterior setae, without midfacial setae above ventral facial ridge; epimeron 3 of rounded classification and lacking long setae. Urosomite 1 generally naked; urosomite 3 without dorsal hook or special process. Peduncle of uropod 1 normally elongate, without apicoventral spike, without special enlarged apicolateral-medial spine; [Peduncular apices of uropods 1-2 not combed]; inner ramus of uropod 1 with marginal spines in one row, no rami continuously spinose to apex, inner ramus of uropod 2 ordinary. Uropod 3 ordinary, elongate article 2 of outer ramus carrying 2 short apical setae. Telson elongate, with only 2 apical spines or setae on each lobe plus setules, without special dorsal and lateral spines or setae.” (from J. L. Barnard & Drummond 1978)

Metaphoxus – There seems to be some confusion as to the actual composition of this genus. The type *M. typicus* has been synonymized with *M. pectinatus* by J. L. Barnard & Karaman 1991, as have *M. kroyeri* and *M. simplex*, leaving *M. simplex* as the

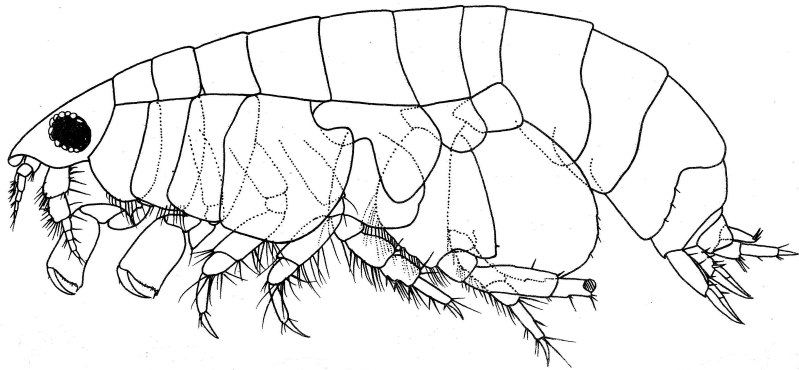
current name of the type species. *Metaphoxus kroyeri* which is described in the same paper as *M. simplex*, is a homonym, and unavailable for nomenclatural purposes. *Metaphoxus pectinatus* is retained as a valid taxon in WoRMS, despite the earlier synonymy. *Parametaphoxus fultoni* is also retained in *Metaphoxus* in WoRMS, despite it's being the type species of *Parametaphoxus*, viewed in WoRMS as a valid taxon. Making the appropriate adjustments, the nine member genus currently in WoRMS has seven valid members, only one of which occurs in the NEP. Most members are austral, with single taxa in the Northeast Atlantic, Mediterranean, and NEP. The local representative can be separated from other genera in the subfamily using the key provided by Jarrett & Bousfield (1994a).



Metaphoxus frequens (From Jarrett and Bousfield 1994a)

Diagnosis. “Rostrum unstricted. Eyes present. Article 2 of antenna 1 short to medium (type) in length, ventral setae almost confined apically. Article 1 of antenna 2 [?not ensiform, article 3 with ?2 facial setules], facial spines on article 4 in 2+ rows, spines thick, article 5 ordinary. Right mandibular incisor with 3 teeth, right lacinia mobilis flabellate, molar not triturative, [?without spines]; palpar hump large, apex of palp article 3 rounded. Inner plate of maxilla 1 without setae, palp 1- articulate. Maxillipedal plates poorly armed, apex of palp article 3 not strongly protuberant, dactyl stubby to elongate, apical nail distinct. Gnathopods large, dissimilar, gnathopod 2 moderately enlarged, article 5 of gnathopod 1 free, elongate, on gnathopod 2 short, cryptic, palms transverse to oblique respectively, propodus broadened, poorly setose anteriorly. Article 5 of pereopods 3-4 with posteroproximal setae, article 6 with thick armaments. Article 2 of pereopod 5 of broad form, articles 4-5 of pereopods 5- 6 broad to narrow respectively; pereopod 7 ordinary, article 3 and dactyl ordinary. Epimera 1-2 [?without long facial brushes or posterior setae], epimeron 3 of rounded classification, bearing 3 or fewer long setae. Urosomite 3 [?without dorsal hook]. Peduncle of uropod without inter-ramal spike, without major displaced spine, rami of uropods 1-2 not continuously spinose to apex, inner ramus of uropod 1 without marginal spines. Inner ramus of uropod 2 ordinary. Uropod 3 ordinary, rami longer than peduncle, bearing vestigial article 2 on outer ramus, with 2 apical setae. Telson slightly elongate.” (from J. L. Barnard & Karaman 1991)

Parametaphoxus – Created by Gurjanova along with a number of other phoxocephalid genera (1977), the genus currently contains five species (including the type *P. fultoni*, again removed from *Metaphoxus*); *P. fultoni* [type], *P. asiaensis* [listed as subspecies of *fultoni* in WoRMS], *P. tulearensis*, *P. quaylei*, and *P. sp 1*. The last two species occur in the NEP. In their discussion of *P. quaylei*, Jarrett & Bousfield (1994a) mention the likelihood that the specimens listed as *Metaphoxus fultoni* from the NEP by J. L. Barnard belonged either to *P. quaylei*, or to a closely similar species, but that this could not be determined until the nature of the male copulatory spines had been investigated. John Chapman has done so, and finds that they differ between *P. quaylei* from boreal-subarctic waters in the NEP, and another species in the south. This southern form is provisionally named *Parametaphoxus sp 1*, and is the only form taken south of Oregon. The latter species represents the *Metaphoxus fultoni* identifications of J. L. Barnard from California collections. Chapman's results were announced and demonstrated at a SCAMIT Phoxocephalid workshop.



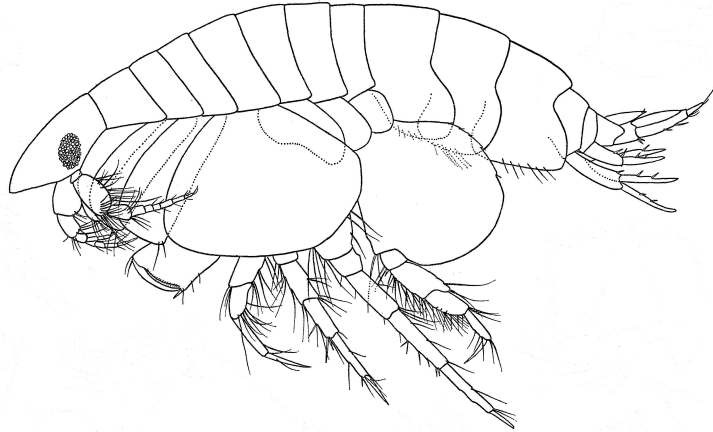
Parametaphoxus sp 1 (From J. L. Barnard 1964)

Diagnosis: “Very close to *Metaphoxus Bonnier*, but differing mainly in the form of form of the gnathopods (J. L. Barnard & Karaman, loc. cit.). In *Metaphoxus fultoni* (Scott) (designated type of *Parametaphoxus*, as illustrated by Lincoln, 1979: 367), the palm of gnathopod 1 is parachelate and the posterior lobe of the carpus is free, whereas in gnathopod 2, the palm is nearly vertical, and the posterior lobe of the carpus is evanescent and cryptic. Female: Rostrum short. Pigmented eyes present. Antennae short. Mandible, molar non-triturative, apex with 0-1 bladespines; spine row short left lacinia unevenly 5-6 dentate, right lacinia blade-like; palp segment 3 with truncate apex. Maxilla 1, inner plate irregularly shaped, palp short. Maxilla 2, outer plate small. Maxilliped, outer plate small, weakly spinose. Coxae 1-4 deep, lower hind corners weakly setose. Gnathopods powerful, propods somewhat dissimilar in form and size, 1 smaller but longer, and palm somewhat parachelate, rather than vertical or truncate; carpus of 1 elongate, shallow, “semi-eusiroidean” in form. Peraeopods 3 & 4 moderate, hind margin of segment 6 nearly bare. Peraeopod 5, hind lobe of coxa deep, basis very broad; segments 4 & 5 narrow. Peraeopod 6, basis very large, deeply lobate; distal segments slender, elongate. Peraeopod 7, basis extremely large, subtriangular. Pleon plate 3 ordinary, unarmed. Uropods 1 & 2, rami subequal, weakly armed. Uropod 3 small, margins nearly bare, inner ramus short. Telson lobes slender elongate (length > 3X width), apices with 2 spines. Coxal gills relatively small, sac-like on peraeopods 2-6, minute or lacking on peraeopod 7. Male: Antenna 1, flagellum calceolate. Antenna 2,

peduncle 5 with 2 calceoli; flagellum elongate, segments calceolate. Peraeopod 7, segment 5, anterior margin incised, with close-set, copulatory spines. Uropod 3, rami unequal, margins weakly plumose-setose.” (from Jarrett & Bousfield 1994a)

Subfamily Harpiniinae – The subfamily contains 10 genera, four of which occur in the NEP. Members of the subfamily tend to favor deeper siltier bottoms than those occupied by members of most other subfamilies. Eyes, for the most part, are absent, but in a few species with shallower populations (i.e. *Heterophoxus oculatus*) they may be both present and conspicuous. In this species shallow populations are eyed. As one progresses into deeper waters the eyes are gradually lost; first becoming less pigmented and cohesive, and then disappearing. No other morphological changes seem to accompany this eye loss, and the eyed and eye-less populations cannot be otherwise separated morphologically.

Diagnosis: “*Article 2 of antenna 1 especially shortened; mandibular molar fully triturative or reduced to a small hump with articulate spines; palp of maxilla 1 uni- or biarticulate; setation on maxilla 2 ordinary or reduced; gnathopod 2 significantly enlarged or as small as gnathopod 1; article 2 of pereopod 3 of narrow form; pereopod 5 usually with enlarged article 3.*” (from J. L. Barnard & Drummond 1978)



Coxophoxus hidalgo (From J. L. Barnard 1966)

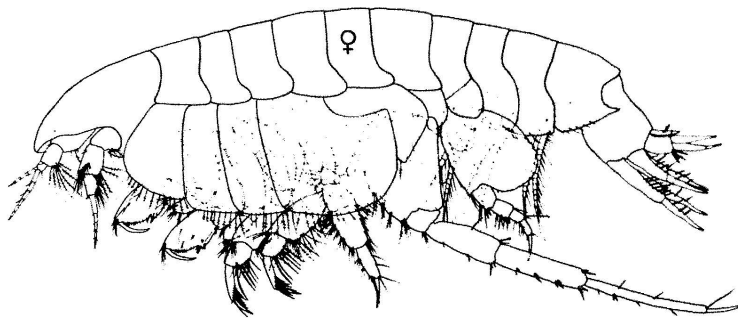
Coxophoxus – A small genus of only three members, two from the south (Southeast Atlantic and subantarctic), and one from the NEP. Although similar to *Heterophoxus* in general appearance, *Coxophoxus* can be easily separated based on the huge rounded basis on pereopod 7, and the enlarged unexcavate coxa 4.

Diagnosis: “*Article 2 of pereopod 3 slender, scarcely wider than article 3; palp of maxilla 1 uniarticulate; flagellum of antenna 2 multiarticulate; gnathopods enlarged, first smaller than second; body of mandible lacking large process at juncture of palp, molar large, with ridged triturating surface; palp article 4 of maxilliped bearing large apical spine or spines, palp article 3 not produced; eyes present; antenna 2 lacking basal ensiform process; anteroventral corner of head unproduced; dorsoposterior edge of coxa 4 not excavate.*” (from J. L. Barnard 1966)

Harpinia – A single species of *Harpinia* is reported from the area, and as the specimens which form the basis for the report cannot be examined, the report is dubious. Not only is it of a Northeast Atlantic species, with no records in the Northwest Atlantic, but the species, *H. mucronata*, bears very striking similarities to *Harpiniopsis percellaris*.

In Barnard's 1960 key to the harpiniids, which includes *mucronata*, but not the as yet undescribed *percellaris*, both would key to the same place. Furthermore, *H. mucronata* is an Arctic form reported from the Polar sea, the Laptev, Kara, and Barents Seas, and the cold Northeast Atlantic from between 28 and 1134m (J. L. Barnard 1960). *Harpiniopsis percellaris* is known from abyssal depths in the NEP, and the recorded NEP specimens of *H. mucronata* are also from abyssal depths. Without reexamining the material we cannot be sure, but it seems likely that the report of *H. mucronata* is in error, and the genus does not occur in the NEP.

Harpiniopsis – The genus was treated by J. L. Barnard in his 1960 family monograph, but a number of new species have been since described. Twenty-nine species are currently recognized in the genus, 11 known from the NEP. J. L. Barnard and Karaman characterize the genus as “cosmopolitan in cold water except North Atlantic”, although J. L. Barnard's provisional *H. sp D* is from the Galapagos. No comprehensive key to the genus exists, and that of J. L. Barnard (1960) covers 6 of the 10 regional species. The others, *H. gurjanovae*, *H. percellaris*, *H. petulans*, and *H. triplex* need to be added for an efficient regional key to be formed. Because of similarities between the two genera, *Harpiniopsis* and *Pseudharpinia* will be keyed together.



Harpiniopsis fulgens (From Jarrett and Bousfield 1994a)

Key to NEP *Harpiniopsis* and *Pseudharpinia* (modified from J. L. Barnard 1960)

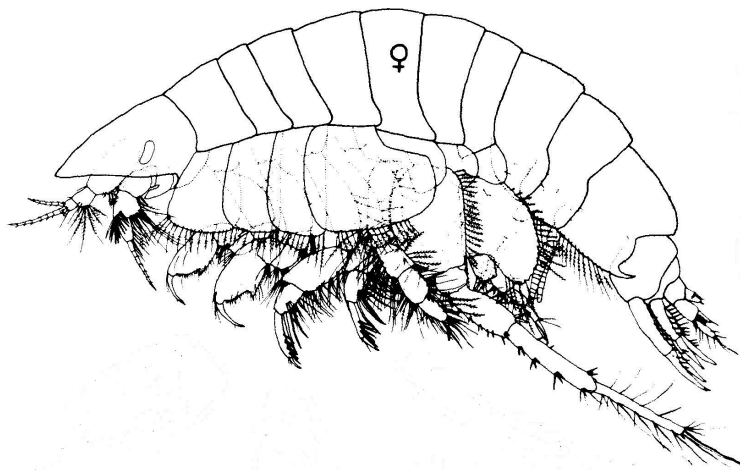
1. Epistome strongly produced.....2
Epistome unproduced, rounded.....3
2. Third epimeron rounded.....*H. epistomata*
Third epimeron bearing strong upturned tooth.....*H. petulans*
3. Third epimeron with tooth at lower posterior corner.....4
Third epimeron lacking tooth at lower posterior corner.....13
4. Head with acute process at lower corner.....5
Head lacking acute process at lower corner.....14
5. P7 basis with expanded flattened margin anteriorly which bears 10+ large plumose setae.....*P. sanpedroensis*
P7 basis lacking expanded flattened anterior margin, may bear 2-3 plumose setae or a stout seta.....6
6. P7 basis with large posterior spike(s) or teeth, much larger than others along posterior margin..7

- P7 basis with small posterior teeth, or with all teeth subequal.....10
7. P7 basis bearing a single acute spike below a posterior sinus, no other dentition on the posterior margin.....*H. percellaris*
P7 basis bearing 2 or 3 enlarged teeth or spikes on posterior margin.....8
8. P7 basis with two ventral teeth in series enlarged on posterior margin, ventral-most the largest.....*H. profundis*
P7 basis with three enlarged teeth or spikes on posterior margin.....9
9. P7 basis with three large spikes on posterior margin; 3rd epimeron with small postero-distal tooth.....*H. gurjanovae*
P7 basis with three enlarged teeth on posterior margin; 3rd epimeron with large strongly upswept postero-distal tooth.....*H. triplex*
10. 3rd Epimeron prolonged into a sharp upturned tooth.....11
3rd Epimeron acute, but short and not upswept.....*H. fulgens*
11. Antero-distal margin of P7 basis bearing one stout seta; ventral head corner with long slender acute cusp.....*P. ayutlanta*
Antero-distal margin of P7 basis lacking stout seta, may bear either plumose, simple, or setose setae there; ventral head corner acute, but cusp very short.....12
12. Antero-distal margin of P7 bearing plumose setae; ventral margin of 3rd epimeron with a single short seta; postero-distal tooth very long and slender...
.....*P. abyssalis productus*
Antero-distal margin of P7 bearing simple or setose setae; ventral margin of 3rd epimeron with 5+ long setae; postero-distal tooth relatively short and thick
.....*P. inexpectata*
13. Third pleonal epimeron prolonged behind.....*H. naiadis*
Third pleonal epimeron subquadrate behind.....*H. sp D*
14. Third pleonal epimeron tooth long.....*H. emeryi*
Third pleonal epimeron tooth short.....*H. galera*

Diagnosis: “ Rostrum unstricted, head often with antenna1 tooth. Eyes absent. Article 2 of antenna 1 short, ventral setae weakly ventral or almost confined apically. Article 1 of antenna 2 not or weakly, ensiform, article 3 with several facial setules, facial spines on article 4 in 1 main row, spines thin, article 5 ordinary to short. Right mandibular incisor with 3-4 teeth, right lacinia mobilis bifid or simple, flabellate or thin, molar not triturative, with 2+ splayed spines; palpar hump small, apex of palp article 3 oblique. Inner plate of maxilla 1 with 2 setae, palp 2- articulate. Maxillipedal inner plates poorly armed, thick, apex of palp article 3 not strongly protuberant, dactyl stubby, apical nail distinct, elongate. Gnathopods ordinary, small, similar, or gnathopod 2 weakly enlarged, article 5 of gnathopods 1-2 very short, free to cryptic, palms oblique, propodus ordinary to thin, ovato-rectangular to elongate, poorly setose anteriorly, Article 5 of pereopods 3-4 with posteroproximal setae, article 6 with thin armaments. Article 2 of pereopod 5 of narrow form, articles 4-5 of pereopods 5-6 narrow; pereopod 7 ordinary (often with spike teeth), article 3 enlarged, dactyl ordinary. Epimera 1-2 without long facial brushes or posterior setae, epimeron 3 variable, of ordinary or rounded classification, bearing 3 or more or 3 or fewer long sew, Urosomite 3 without

dorsal hook. Peduncle of uropod 1 without inter-ramal spike, without major displaced spin[^], rami of uropods 1-2 not continuously spinose to apex, without subapical spines or nails, inner ramus of uropod 1 with 1 row of marginal spines. Inner ramus of uropod 2 ordinary. Uropod 3 ordinary, one of rami longer than peduncle, bearing article 2 on outer ramus, with 0-2 apac3 setae. Telson ordinary or with supernumerary lateral 6% dorsal setae.” (from J. L. Barnard & Karaman 1991)

Heterophoxus – J. L. Barnard (1960) listed only four taxa within this genus. It has since grown, although the number of valid taxa remains in dispute. J. L. Barnard & Karaman (1991) listed 6 valid species, including the two described from South Africa by Griffiths (1975). Jarrett & Bousfield (1994a) list eight, including one provisional, from the Northeast Pacific alone. WoRMS currently lists 10 species, not including *H. affinis* and *H. nitellus*, which they view as synonyms of *H. oculatus*. This follows J. L. Barnard & Karaman (1991), although *H. pennatus* of Shoemaker (1925), also synonymized with *H. oculatus*, is retained as valid in WoRMS. They also retain *H. ellisi*, which we have had very great difficulty in separating from *H. oculatus* in the SCB. The contention centers on the number of valid taxa in the NEP, as those from other regions appear stable. The genus is widely distributed, with three Antarctic species, two from southern Africa, one each from the Southeast and Southwest Atlantic, and a flock of uncertain size here in the NEP. The animals are generally a bit more robust than members of either *Harpiniopsis* or *Pseudharpinia*, with heavier bodies. Eyes may or may not be present, while lacking in the other two genera. Presence of eyed and blind populations of *H. oculatus* tend to be distributed along a bathymetric gradient, with shallow populations eyed, and deeper populations blind.



Heterophoxus ellisi (From Jarrett and Bousfield 1994a)

While regional workers generally accept the species synonymized by J. L. Barnard & Karaman (and WoRMS), there is considerable ontogenic variability in setal counts, in the presence and placement of doubly and triply inserted setal clusters on P6, and in degree of vertical sweep and size/sharpness of the third epimeron posterior tooth. All these characters are utilized as key by Jarrett and Bousfield (1994a) calling into question the validity of their species separations. To the extent that they represent actual

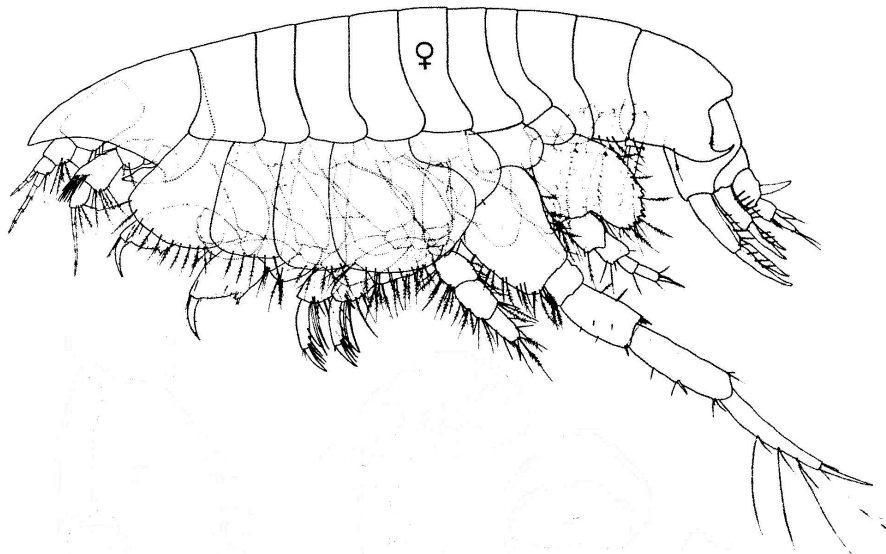
taxonomic entities, the “species” present in the NEP can be distinguished using the key in Jarrett & Bousfield (1994a). The strongly ensiform first article of the second antenna helps separate members of this genera from others in the subfamily.

Diagnosis: “ *Rostrum unconstricted. Eyes present. Article 2 of antenna 1 short, ventral setae widely spread, but almost confined apically. Article 1 of antenna 2 strongly ensiform, article 3 with many facial setules, facial spines on article 4 in 1 main row, spines thin, article 5 very short. Right mandibular incisor with 4+ teeth, right lacinia mobilis bifid, flabellate, molar not triturrative, with 3 basally fused spines; palpar hump medium, apex of palp article 3 oblique. Inner plate of maxilla 1 with 2 setae, palp 2-articulate. Maxillipedal inner plates partly fused, poorly armed, apex of palp article 3 not strongly protuberant, dactyl not elongate, but apical nail distinct. Gnathopods small, similar, article 5 of gnathopods 1- very short, without eusirid attachment, almost cryptic, palms oblique, propodus of gnathopods 1-2 ovato-rectangular, elongate, poorly setose anteriorly. article 5 of pereopods 3-4 with posteroproximal setae, article 6 with thin armaments. Article 2 of pereopod 5 of narrow form, articles 4-5 of pereopods 5-6 narrow; pereopod 7 of ordinary size, article 3 enlarged, dactyl ordinary. Epimera 1-2 without long midfacial brushes or posterior setae, epimeron 3 of ordinary classification, bearing 3 or more long setae. Urosomite 3 without dorsal hook. Peduncle of uropod 1 without inter-ramal spike, without displaced spine, rami of uropods 1-2 continuously spinose to apex, or not, inner ramus of uropod 1 with 1 row of marginal spines. Inner ramus of uropod 2 ordinary. Uropod 3 ordinary, one of rami longer than peduncle, bearing article 2 on outer ramus, with 2 apical setae. Telson ordinary or with supernumerary lateral spines.” (from J. L. Barnard & Karaman 1991)*

Pseudharpinia -- The genus is listed as having 18 valid species, one with two subspecies in WoRMS. To this should be added a provisional species reported from the NEP, *Pseudharpinia* sp 1 (Thomas & McCann 1995). Because of differences in interpretation and synonymy between workers, however, the number of these that occur in the NEP is unclear. At the center of the controversy is the definition of *Pseudharpinia excavata*, its variability, and its synonymy with *P. sanpedroensis*, and/or *P. inexpectata*. Jarrett & Bousfield’s (1994a) comment “Material from the northern regions is clearly distinct from that identified a *P. sanpedroensis* by J. L. Barnard 1960, and even further remote from Chevreux's original *P. excavata*” seems to be supported by the published drawings of the animals concerned. J. L. Barnard himself proposed the synonymy of *Harpiniopsis sanpedroensis* and *Harpinia excavata* in J. L. Barnard (1964). He had earlier (J. L. Barnard 1961) expressed the possibility that *Harpiniopsis sanpedroensis* was a subspecies (or variety) of *Harpinia excavata*. No detailed comparison was made at the time, and the subject arose during a consideration of the possibility of interoceanic dispersal of the bathyal fauna. In later papers he followed this synonymy (J. L. Barnard 1966, 1967, 1971) while considering a growing body of specimens from several areas, including the south Atlantic (J. L. Barnard 1962) which he referenced in his proposal of synonymy. In his discussion of the synonymy he characterized *H. excavata* as “a widely distributed, pan-oceanic, stem species with sub-specific localization.” He continues on to outline three forms he considers subspecies (the North Atlantic type, the South Atlantic form, and the Northeast Pacific form), but defers their description pending additional material from intermediate locations. While this accrued, the descriptions were never promulgated. At this point his view was that bathyal

species tended to have cosmopolitan distributions, and he drew upon a related specimen identified as *Phoxocephalus kergueleni* from bathyal Panama for evidence of this. While it does seem reasonable that bathyal species may have broader distributions on contiguous slopes than shelf species, the idea of cosmopolitanism in peracarid arthropods is largely discredited. Animals with no pelagic dispersal are very unlikely to be able to cover the globe, and tests of cosmopolitanism with several groups have failed based on genetic evidence (Brandt et al 2013).

The question remains, “What species are present in the Northeast Pacific?” Based on the comments of Jarrett & Bousfield (1994a) they view the complement of species as four, but didn’t include *P. ayutlanta* from the Bay of Panama. Of their four, one is clearly an error as *P. cinca*, which they list as Northeast Pacific regional, is from the Southeast Atlantic. Adjusting for the incorrect inclusion and the omission they would view the fauna as of four taxa, none *P. excavata*. They reject the synonymy of *P. sanpedroensis* with *P. excavata*, presumably viewing each of the regional forms of J. L. Barnard as species level entities. Regional species are *P. ayutlanta* (Gulf of Panama), *P. abyssalis productus* (Guatemala Basin), *P. sanpedroensis* (temperate NEP), and *P. inexpectata* (boreal NEP). These four can be separated using the key provided above to the *Harpiniopsis/Pseudharpinia* complex in the NEP. Characters utilized as discriminatory include conformation of the head cusp, the 3rd epimeron, the setation of its ventral margin, and the structure and setation of the anterior margin of the basis of P7. This is contrary to the view espoused by J. L. Barnard, and to that adopted on WoRMS, where the variability of *P. excavata* is viewed as sufficient to encompass forms occurring remote from the type locality. On zoogeographic grounds alone, I find the Jarrett and Bousfield position more justified, and view the reports of *P. excavata* by J. L. Barnard as all referable to his *P. sanpedroensis* or *P. inexpectata*.



Pseudharpinia inexpectata (From Jarrett and Bousfield 1994a)

Unfortunately Jarrett & Bousfield (loc. cit.) do not provide explicit differentiation on these taxa in their description of *P. inexpectata*, and do not provide a key to the genus that might offer clues to the evidence they view as conclusive. Their statement that the forms are “clearly different” is suggestive, but not helpful. Their synonymy is also rather

confusing, listing *P. sanpedroensis* of J. L. Barnard 1960 (plates 64-65 in part) in the synonymy of *P. inexpectata*. These two plates illustrate the type and paratype, both from off Santa Catalina Island in southern California, and so should not reflect the northern *P. inexpectata*. In the same synonymy they exclude the records of *P. excavata* in J. L. Barnard 1966 from equality with their new species. These records are of material collected in southern California submarine canyons and basins, which were listed as *Harpiniopsis excavata* as J. L. Barnard had earlier decided his *H. sanpedroensis* was a synonym of that species (J. L. Barnard 1964). So according to their synonymy, *P. sanpedroensis* is and is not a synonym of *P. inexpectata*. Indeed unexpected! I adopt the view here that their species is not the same as J. L. Barnard's, which were it to be, would place *P. inexpectata* as an objective junior synonym of *P. sanpedroensis* (or by extension *P. excavata* if that synonymy is accepted). Characters separating the two (based on their descriptions, not examination of specimens) are;

1. Mandibular palp article 2 with cluster of anterior setae at mid length in *P. s.*, lacking in *P. i.*
2. Mandibular palp article 3 with long seta on the lateral margin lacking in *P. i.*
3. Posterior excavation of coxa 4 smaller and more oblique in *P. i.* than in *P. s.*
4. P6 propod long and linear, with parallel sides, not tapering as in *P. i.*
5. P6 basis posterior margin inflated proximally, forming a lobe in *P. i.*, linear in *P. s.*
6. P6 basis antero-distally with cluster of long plumose setae in *P. i.*, with two short simple setae in *P. s.*
7. Postero-ventral cusp of epimeron 3 set off by a sinus from the posterior margin of the epimeron in *P. i.*, continuous with margin in *P. s.*
8. P7 basis with flattened oblique antero-ventral margin bearing 10 or more long plumose setae in *P. s.*, lacking oblique flattening and bearing only one long and one short seta, the long one setose in *P. i.*
9. Telson lobes bearing a long recurved stout seta distally in *P. i.*, and one short straight stout seta + one short simple seta in *P. s.*
10. Telson lobes angularly tapering distally in *P. s.*, evenly rounded in *P. i.*
11. Third uropod rami broader for length in *P. s.*, with terminal article of endopod much longer relative to basal article in *P. s.* than in *P. i.*
12. Cluster of dorsal setae on posterior of pleonite 3 in *P. s.*, lacking in *P. i.*
[presence of such setae has proven a reliable specific level character in other members of the family, particularly the brolgine *Foxiphalus golfensis*]
13. P7 dactyl more than twice propod length in *P. s.*, slightly more than propod length in *P. i.*

Some of these differences are no doubt trivial, but the compared females were nearly the same length and state of maturity (4.5 vs 5mm). That several of the characters are likely to be ontogenically variable is shown by the presence of 15 long plumose setae on the oblique anterior margin of the immense (13mm) specimen of *P. sanpedroensis* taken by J. L. Barnard off Baja California. He further comments on the addition with growth of setae to the anterior margin of the P7 basis (as P5) in the discussion of materials identified as *H. excavata* in the same paper (J. L. Barnard 1967). The comments

of J. L. Barnard (1971) on a series of specimens from off Oregon suggest that this is a zoogeographic transition zone in which both *P. sanpedroensis* and *P. inexpectata* are present (both identified as *H. excavata* in that paper).

The question of whether or not *Pseudharpinia producta* of J. L. Barnard 1964 is a valid species (as per Jarrett & Bousfield 1994a) or retained at subspecific level under *Pseudharpinia abyssalis* (original and WoRMS placement) hinges on the degree of difference from the nominal species. As J. L. Barnard called out only the more elongate posterior tooth of the 3rd epimeron to distinguish the subspecies, I would agree that specific status is not warranted. It is retained here as a subspecies of *P. abyssalis* with the proviso that additional investigation is likely to provide sufficient basis for specific level separation.

The status of the provisional *Pseudharpinia* sp 1 (Thomas & McCann 1995) is unclear. They provide limited description, and so it is not entirely clear if the form can be separated from *P. sanpedroensis* and *P. inexpectata*. It seems to have some characters of one, and others of the second species. It is retained as a valid species level taxon for the moment.

Diagnosis.: “Rostrum unconstricted. Eyes absent. Article 2 of antenna 1 short, ventral setae widely spread. Article 1 of antenna 2 ensiform, article 3 with several facial setules, facial spines on article 4 in 1 or weakly 2 rows, spines mostly thin, article 5 very short. Right mandibular incisor with [?4 teeth, right lacinia mobilis ?bifid, flabellate], molar not triturative, with 4+ splayed spines; palpar hump small, apex of palp article 3 oblique. Inner plate of maxilla 1 with 2 setae, palp 2- articulate. Maxillipeds ordinary, apex of palp article 3 not strongly protuberant, dactyl stubby, apical nail distinct. Gnathopods ordinary, small, similar, gnathopod 2 weakly enlarged, article 5 of gnathopods 1-2 short, free, palms oblique, propodus of gnathopods 1-2 thin, ovato-rectangular, poorly setose anteriorly. Article 5 of pereopods 3-4 with posteroproximal setae, article 6 with [?thin] armaments. Article 2 of pereopod 5 of narrow form, articles 4-5 of pereopods 5-6 narrow; pereopod 7 of ordinary size, article 3 enlarged, dactyl ordinary. Epimera 1-2 without long facial brushes or posterior setae, epimeron 3 of ordinary classification, bearing 3 ac more long setae. Urosomite 3 without dorsal hook, Peduncle of uropod 1 without inter-ramal spike, without major displaced spine, some rami of uropods 1-2 continuously spinose to apex, with subapical spines or nails, inner ramus of uropod 2 often with 2 rows of marginal spines. Inner ramus of uropod 2 ordinary, Uropod 3 ordinary, one of rami longer than peduncle, bearing article 2 on outer ramus, with 2 apical setae & Telson ordinary or with supernumerary lateral or dorsal spines.” (from J. L. Barnard & Karaman 1991)

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