Amphipoda of the Northeast Pacific (Equator to Aleutians, intertidal to abyss): XXIII.
Oediceratoidea - 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 Oediceratoidea

They are a moderately old group, stemming from the middle-upper Cretaceous (Bousfield 1982b), but have a preponderance of apomorphic character states (Bousfield 1983). The superfamily consists primarily of the family Oedicerotidae, which is distributed world-wide, and two small families of southern distribution neither with NEP representatives, the Exoedicerotidae and the Paracalliopiidae (Bousfield and Shih 1994). The Exoedicerotidae are viewed as the most primitive members of the superfamily (J. L. Barnard and Drummond 1984). The Paracalliopiidae also seem generally less apomorphic than the Oedicerotidae.

Diagnosis of the Oediceratoidea

"*Moderately apomorphic, strongly rostrate, strongly fossorial marine amphipods having a moderately dimorphic terminal male stage; brush setae borne on peduncles of antennae 1 and 2 or conjoint flagellum of antenna 1, and occasionally calceoli on flagellum of 2; accessory flagellum lacking or vestigial; eyes large, occasionally lateral, but usually fused mid-dorsally at base of rostrum; mouthparts basic but somewhat modified; upper lip, margin not distinctly incised; lower lip broad, inner lobes well developed; mandibular molar variable, usually strong, palp slender; maxilla inner plates weakly setose, apex of maxilla 1 outer plate with eight spine-teeth; maxilliped outer plate and palp strong; coxal plates medium, 4th not strongly excavate; coxae 5 and 6 deep, equilobate; gnathopod 1 and 2 non- (or weakly) amplexing, subsimilar, subchelate (or chelate), carpal lobes usually prominent; pereopods 5 and 6 subsimilar, homopodous; pereopod 7 large, dissimilar, segments elongate; brood plates linear; coxal gill usually lacking on pereopod 7; pleopods strong; uropods narrow lanceolate, rami subequal; uropod 3, rami non-foliaceous, outer ramus 1-segmented; telson lobes fused (or nearly so), distal margin nearly bare.*" (from Bousfield 1978)

Ecological Commentary

Information on the life history of a number of oedicerotoids is available. Members of the family Exoedicerotidae are shore associated, living either in the surf-zone of beaches (J. L. Barnard and Thomas 1988), or in brackish pools or streams in the intertidal (J. L. Barnard and Drummond 1984). Paracalliopiids are found in similar conditions, but on rocky rather than sandy beaches, particularly in brackish high tidepools (J. L. Barnard and Drummond 1992). Being much more numerous, the members of the

Oedicerotidae have been investigated more completely than members of the first two families in the superfamily. While well represented on continental shelves (the fifth most abundant family, J. L. Barnard 1962), they are also important in deeper water. On the Cascadia Abyssal Plain almost one third of the numerically dominant amphipod species were oedicerotids (Dickinson and Carey 1978). An even higher profile for oedicerotids was observed in the San Diego Trough off Southern California, where 40% of the numeric dominants were members of the family. Nearby, however, in the Tanner Basin, their importance was less (13% of the dominants were oedicerotids)(Dickinson 1978).

Enequist (1949) gives a description of the habits of a series of oedicerotids in the genera *Westwoodilla*, *Monoculodes*, *Perioculodes*, *Bathymedon*, *Arrhis*, and *Synchelidium*. He found the behavior of all to be quite similar. First, all are fossorial, but are also good swimmers. He observed animals in captivity, freeing them into vessels of seawater with bottoms of native sediments from their areas of collection. He observed "As soon as they strike the bottom they burrow down into the superficial layer with the aid of the pereopods, so that only the dorsal part of the cephalon and the thorax is visible above the mud." This is the standard life position assumed by all oedicerotids.

Observations of feeding from this position were also made: "Feeding takes place while the animal slowly burrows ahead through the surface layer. The gnathopods loosen the bottom material in front of and below the head and the body is impelled forwards with the aid of the uropods and the seventh pair of pereopods. The widened joints of the pereopods with their moderately well-developed rows of setae along the margins prevent a collapse of the sides from filling the cavity or 'tunnel' surrounding the gills and marsupium. The periodic activity of the pleopods supplies oxygenic water to the gills and probably to some extent assists in transporting the loosened material backwards. As the animals do not exude any secretion that binds the bottom material, the excavated furrow collapses behind the animal."

The nature of the food taken was estimated by Enequist as "all the species examined in captivity ingested a loose detritus sifted from the water or combed up by the maxillipeds from the material passed to them by the gnathopods. It is nevertheless probable that, for certain species not in captivity, foraminifera, crushed by the mandibles, play a part as a food resource." Studies of the gut contents of two species of *Synchelidium* in the surf zone (Yu et al 2003) show that ingestion is not haphazard, and that if the animals deposit feed, they do so selectively. Harpacticoid copepods were the most widely consumed item (80% of examined guts), and constituted up to 75% of the gut contents in individual animals. This pattern was observed in the guts of both species examined. These animals are suspected to play an important part in energy transfer from their meiofaunal prey to megafaunal predators such as decapods, surf fishes, and shorebirds (Yu and Suh 2002). *Synchelidium lenorostralum* (now *Eochelidium lenorostralum* fide Bousfield and Chevrier 1996) had an annual production/biomass ratio in excess of 5 (Yu and Suh 2002).

In one local species, *Americhelidium micropleon* (formerly *Synchelidium*), the population lives intertidally rather than subtidally in the surf zone or shallow sublittoral where the surf-zone species mentioned above were located (Yu et al 2002) . They are often found relatively high on the beach, where they maintain their position by movements very similar to those undertaken by sand crabs. They respond to the increase in pressure caused by the movement of wave swash up the beach, swimming out of the

sediment to be carried further up the beach by the water motion. The pressure response was carefully documented in the laboratory by Enright (1962, 1963), but since the organism had not yet been formally described, he called it *Synchelidium* sp. Some of Enright's specimens were among paratype material when the animal was described (J. L. Barnard 1977).

Shallow living oedicerotoids are susceptible to human impacts associated with beach maintenance. As such habitats are often subject to an annual cycle of build-up and removal of sand, humans take pains to counteract this by adding material to beaches being moved offshore by waves. The effect of these activities was documented for an exoedicerotid in Australian waters (Jones et al 2008), but similar impacts also are expected in local waters.

Reproduction in some shallow sublittoral species such as *Synchelidium lenorostralum* occurs year-round (Yu et al 2002). Fincham (1971) reported on three species of oedicerotids; *Perioculodes longimanus*, *Pontocrates altamarinus*, and *Pontocrates arenarius* from the intertidal and shallow subtidal of an English beach. He found none of the three bred continuously, with reproduction limited to spring and summer, or to spring, summer and fall depending on species. Beare and Moore (1998) found both *P. longimanus* and a species of *Pontocrates* to breed year-round, but with diminished numbers of ovigerous females in winter. All three examined oedicerotids seemed to have population characteristics indicating a single year of life as the norm, with a single generation per year. In the colder waters of the Arctic at Svalbard, oedicerotids show several patterns, some reproducing over the winter (*Acanthostepheia malmgreni*, *Monoculodes packardi*), and some in summer (*Arrhis polyonyx*, *Monoculodes borealis*, *M. longirostris*, *Paroedicerodes lynceus*), with no evidence of year-round breeding (Węsławski and Legeżyńska, 2002). All of these life history examinations have been restricted to shallow water species. Since most of the oedicerotid diversity is in deeper water, it is unclear which of the above patterns will prove typical for the family once deeper dwelling species are evaluated. The little data available from deeper water species (*Arrhis polyonyx*, to 400m; Sainte Marie and Brunel 1983) suggest various strategies will be employed by deep as well as shallow dwelling taxa. Attempts to tease out depth effects on life-history traits have begun (Sainte-Marie 1991).

Parasites, specifically brood parasites, have been mentioned several times in association with oedicerotid amphipods. J. L. Barnard (1961) illustrates an unidentified female isopod removed from the brood pouch of the holotype of *Oediceroides trepadora* taken at 875m in the Gulf of Panama. Beare and Moore (1998) also mention brood parasites from their shallowly collected *Perioculodes longimanus*, identifying them as the nicothoid copepod *Sphaeronella minuta.* Members of this copepod family are known to parasitize a variety of crustaceans, including, amphipods (Beare and Moore 1998; Boxshall and Harris 1988; Costello and Myers 1989), cumaceans (Boxshall and Defaye 1995), decapods (Boquet et al 1958; Boxshall and Defaye 1995; Humes and Boxshall 1993; Santos and Björnberg 2004), isopods (Boxshall and Harris 1988; Boxshall and Lincoln 1983), mysids (Daly and Damkaer 1985; Mauchline 1969), and ostracods (Bowman and Kornicker 1968; Torres and Cohen 2005). The effect of this parasitism can range from loss of some eggs, through loss of entire brood or host death, depending on the specific association involved. It is possible that the "isopod" illustrated by J. L.

Barnard from *Oediceroides* is also a nicothoid, although the illustration does look like an isopod based on the appendages.

Swimming is common in oedicerotids, both males and females. Detailed comments on hyperbenthic occurrences in *Arrhis polyonyx* are provided by Sainte-Marie and Brunel (1983). The same authors provide information on the distribution of swimming oedicerotids in the water column of the Gulf of St. Lawrence in the Western Atlantic. They found that oedicerotids (14 different species) were the overwhelming dominants among swimming amphipods, comprising over 87% of their catch total. Different species were found in different levels of the water column (Sainte-Marie and Brunel 1985). Dauvin et al (1994) provide information on suprabenthic occurrence of several oedicerotid species from the English Channel. Additional information on these and other species, including characterization of swimming excursion timing, and sex-ratio of the population in the water column, is provided by Dauvin and Zouhiri (1996). It is assumed that swimming is equally well developed in NEP species in the family, but no area-specific data are currently available.

Key to NEP Oedicerotoid genera – A comprehensive key to the genera occurring in the NEP does not exist in the literature. The key of J. L. Barnard and Karaman (1991) deals with world genera known at the time, but a number of additional generic level taxa have since been added. The keys provided by Bousfield and Chevrier (1996) deal with a subset of the family, that centered on the 'Monoculodes' cluster of genera in the NEP, but not with the family as a whole. The following key, with some couplets adapted from the above keys, is offered to remedy that situation. It is also restricted to those genera reported from the NEP. As no members of the Exoedocerotidae or Paracalliopiidae occur in the region, these families are not included in the key. I apologize for resorting to mouthparts in this key, but could find no viable alternative to use of mandibular characters.

1a. Some or all pereonites and pleonites dorsally toothed or carinate.....2
1b. No peronites or pleonites dorsally toothed or carinate.....3
2a. Pleonites 2 and 3 with posterio-dorsal tooth.....Oedicerina
2b. Pleonites 1-3 with low dorsal carina.....Kroyera
2c. Pereonites and pleonites with dorsal carina.....Acanthostepheia
3a. G2 propod elongate and chelate or subchelate.....4
3b G2 propod not particularly elongate, not chelate, may be subchelate.....6
4a. G2 subchelate; ventral lobe of carpus elongate, reaching well beyond the end of the propod.....Finoculodes
4b. G2 chelate; carpus lacking ventral lobe.....5
5a. Telson posterior margin rounded or truncate; animal lacking pigment..... .....Americhelidium
5b. Telson posterior margin emarginate or truncate; if truncate animal strongly brown speckled.....Eochelidium
6a. Article 1 of antenna 1 bearing large sharp tooth.....Cornudilla
6b. Article 1 of antenna 1 lacking tooth.....7
7a. Both G2 propod and carpal lobe with strong distal taper.... ...Monoculopsis
7b. G2 propod and carpal lobe not strongly tapering.....8

8a. Mandibular palp absent.....Macharionyx
8b. Mandibular palp present.....9
9a. Mandibular incisor poorly toothed.....10
9b. Mandibular incisor well toothed.....13
10a. Coxa 3 or 4 ventrally excavate.....11
10b. Coxa 3-4 not ventrally excavate.....12
11a. Article 2 of antenna 1 shorter than article 1.....Aceroides
11b. Article 2 of antenna 1 as long as article 1.....Arrhis
12a. Eyes feeble or absent, article 2 of mandibular palp straight.....Bathymedon
12b. Eyes well developed, article 2 of mandibular palp geniculate.....Westwoodilla
13a. Anterior head lobe truncate.....Oediceroides (abyssorum only)
13b. Anterior head lobe acute.....14
13c. Anterior head lobe rounded to subacute.....15
14a. Coxa 4 with prominent posterior projection.....Oediceroides
14b. Coxa 4 lacking posterior projection.....Paroediceros
15a. Coxa 4 with very large posterior projection, equaling the width of the remainder of the coxa.....Oediceropsis
15b. Coxa 4 various; subquadrate, with slight ventro-posterior projection or acute tooth, or with small lobe.....16
16a. G1 carpal lobe short, not reaching ½ way along propod.....Monoculodes
16b. G1 carpal lobe reaching to ½ the propod length or more, often as long as propod.....17
17a. G1 carpus large, length greater than depth; carpal lobe short; G2 carpal lobe not reaching beyond postero-distal angle of palm.....18
17b. G1 carpus short, anterior edge narrow, length less than depth; G2 carpal lobe elongate, tip exceeding postero-distal angle of palm.....19
18a. Rostrum elongate, only the apex deflexed; eye restricted to rostrum; P3 and P4 segment 4 strongly broadened and setose antero-distally.....Rostroculodes
18b. Rostrum not elongate, deflexed, apex acute; eye at base of rostrum; P3 and P4 segment 4 only slightly broadened and setose antero-distally.....Deflexilodes
19a. P7 basis postero-distal lobe large, usually extending below ischium; coxa 5 very large, depth nearly equal to coxa 4.....Pacifoculodes
19b, P7 basis postero-distal lobe small, shallow, or lacking; coxa 5 not enlarged, depth clearly less than that of coxa 4.....Hartmanodes

List of NEP Oedicerotid taxa based on McLaughlin et al 2005 augmented by addition of known provisionals. Taxa listed in the SCAMIT Edition 9 (Cadien and Lovell 2014) are indicated by an asterisk. Valid taxa are **bolded**, synonyms are not.

Oedicerotidae

Acanthostepheia behringiensis (Lockington 1877) – N. Atlantic, Arctic Alaska; 10-60m

Acanthostepheia malmgreni (Goës 1866) – N. Atlantic, Arctic Alaska; 0-550m

Aceroides callida J. L. Barnard 1967 – Baja California; 1095-1205m

Aceroides edax J. L. Barnard 1967 – San Diego Trough to Baja California: 1095-2475m

Aceroides latipes (G.O.Sars 1882) – N. Atlantic, Arctic Alaska; 25-660m

Aceroides sp A Thomas & McCann 1995 – Central California; 927m

Aceroides sp 1 of Thomas 1991 – Gulf of the Farallones: 2045-3085m

***Americhelidium micropleon** (J. L. Barnard 1977) – San Francisco to San Diego; 0-5m

Americhelidium millsi Bousfield & Chevrier 1996 – Washington; 0-2m

Americhelidium pectinatum Bousfield & Chevrier 1996 – British Columbia to No. Oregon; 0-50m

***Americhelidium rectipalmum** (Mills 1962) – Aleutians to Costa Rica; 0-398m

Americhelidium setosum Bousfield & Chevrier 1996 – SE Alaska to Puget Sound; 0-52m

***Americhelidium shoemakeri** (Mills 1962) – Aleutians to SCB; 3-183m

Americhelidium variabilum Bousfield & Chevrier 1996 – British Columbia to Washington; 4-70m

Amphithonotus malmgreni Goës 1866 (= Acanthostepheia malmgreni)

Arrhis luthkei Gurjanova 1936 – NWP to SE Alaska; 20-40m

Bathymedon caino J. L. Barnard 1967 – Cascadia Abyssal Plain, Oregon to Baja California; 1095-2800m

Bathymedon candidus J. L. Barnard 1961 – Indian Ocean, Baja California; 2000-2398m

Bathymedon covilhani J. L. Barnard 1961 – Oregon to Panama; 200-1720m

Bathymedon curtipalpus Vinogradov 1993 – East Pacific Rise at 21° N; abyssal

Bathymedon flebilis J. L. Barnard 1967 – Oregon to Baja California; 800-2475m

***Bathymedon kassites** J. L. Barnard 1966 – Monterey to San Diego Trough: 300-1353m

Bathymedon nanseni Gurjanova 1946 – NWP, Arctic Alaska; ?m

Bathymedon nepos J. L. Barnard 1967 – Baja California; 2667-2706m

***Bathymedon pumilus** J. L. Barnard 1962 – Oregon to SCB; 66-800m

***Bathymedon roquedo** J. L. Barnard 1962 – SCB; 22-150m

***Bathymedon vulpeculus** J. L. Barnard 1971 – Oregon to San Diego Trough: 294-2820m

Bathymedon sp A J. L. Barnard 1971 – Oregon to Baja California; 1748-2800m

Bathymedon sp a of Dickinson 1976 – Cascadia Abyssal Plain, Oregon to San Diego Trough: 1244-2820m

Bathymedon sp w of Dickinson 1976 – Cascadia Abyssal Plain, Oregon: 2800m
Bathymedon sp z of Dickinson 1976 – Cascadia Abyssal Plain, Oregon to San Diego Trough: 1235-2800m
Bathymedon sp 1 of Dickinson 1976 – Cascadia Abyssal Plain, Oregon: 2787-2820m
Bathymedon sp 2 of Dickinson 1976 – Cascadia Abyssal Plain, Oregon: 2787-2824m
Bathymedon sp 3 of Dickinson 1976 – Cascadia Abyssal Plain, Oregon: 2808m
Bathymedon sp 4 of Dickinson 1976 – Cascadia Abyssal Plain, Oregon: 2810m
Bathymedon sp 5 of Dickinson 1976 – Cascadia Abyssal Plain, Oregon: 2810m
Bathymedon sp 6 of Dickinson 1976 – Cascadia Abyssal Plain, Oregon: 2800m
Cornudilla cornuta (J. L. Barnard 1969) – Baja California to Gulf of California; 19-46m
Deflexilodes aenigmaticus Bousfield & Chevrier 1996 – SE Alaska to British' Columbia; 6-50m
***Deflexilodes norvegicus** (Boeck 1861) – N. Atlantic, Arctic, SCB; 20-796m
Deflexilodes similis Bousfield & Chevrier 1996 – Aleutians to Vancouver Id.; 12-20+m
***Eochelidium sp A** SCAMIT 1996§ - Puget Sound to SCB; 5-20m
Finoculodes omnifera J. L. Barnard 1971 – Oregon to Tanner Basin, SCB: 800-1302m
***Hartmanodes hartmanae** (J. L. Barnard 1962) – SCB to Baja California; 1-146m
***Hartmanodes murrius** (J. L. Barnard 1962) – SCB; ?-102m
Hartmanodes nyei (Shoemaker 1933) – Florida, Brazil, Gulf of California; 0-1m
***Hartmanodes sp SD1** Pasko 1997§ - SCB; 31-98m
Kroyera carinata Bate 1857 – N. Atlantic, Mediterranean, Japan, British Columbia(?) - 5-75m
Machaironyx muelleri Coyle 1980 – Bering Sea, Aleutians; 24m
Monoculodes borealis Boeck 1870 (see Rostroculodes borealis)
Monoculodes brevirostris Bousfield & Chevrier 1996 – British Columbia; 44-240m
Monoculodes castalskii Gurjanova 1951 – NWP to Aleutians; 80-290m
Monoculodes crassirostris Hansen 1887 (see Pacifoculodes crassirostris)
Monoculodes diamesus Gurjanova 1936 – NWP to British Columbia; 20-576m
Monoculodes diversisexus J. L. Barnard 1967 – Cascadia Abyssal Plain, Oregon to Baja California; 791-2809m
***Monoculodes emarinatus** J. L. Barnard 1962 – Oregon to Baja California; 55-294m
***Monoculodes glyconicus** J. L. Barnard 1962 – Oregon to SCB; 216-800m
Monoculodes hartmanae J. L. Barnard 1962 (see Hartmanodes hartmanae)
Monoculodes latimanus (Goës 1866) – N. Atlantic, SE Alaska to San Diego Trough: 10-2816m
***Monoculodes latissimanus** Stephensen 1931 – N. Atlantic, Mediterranean, SCB to Baja California; 150-2393m

Monoculodes longicornis Boeck 1870 (see Monoculopsis longicornis)
Monoculodes murrius J. L. Barnard 1962 (see Hartmanodes murrius)
Monoculodes necopinus J. L. Barnard 1966 – Cascadia Abyssal Plain, Oregon to Baja California: 1200-2820m
Monoculodes nyei Shoemaker 1933 (see Hartmanodes nyei)
Monoculodes perditus J. L. Barnard 1966 – British Columbia to SCB; 20-200m
Monoculodes recandesco J. L. Barnard 1967 – Cascadia Abyssal Plain, Oregon to Baja California; 2398-2820m
Monoculodes schneideri G. O. Sars 1895 (see Rostroculodes schneideri)
Monoculodes spinipes Mills 1962 (see Pacifoculodes spinipes)
Monoculodes sudor J. L. Barnard 1967 – Baja California; 791-842m
Monoculodes zernovi Gurjanova 1936 (see Pacifoculodes zernovi)
Monoculodes sp SD1 (see Hartmanodes sp SD1)
Monoculodes sp B of Dickinson 1976 – San Diego Trough: 1200m
Monoculodes sp x of Dickinson 1976 – Cascadia Abyssal Plain, Oregon: 2800-2813m
Monoculodes sp y of Dickinson 1976 – Cascadia Abyssal Plain, Oregon to San Diego Trough: 1238-2824m
Monoculodes sp z of Dickinson 1976 – Cascadia Abyssal Plain, Oregon to San Diego Trough: 1244-2820m
Monoculodes sp 1 of Dickinson 1976 – Cascadia Abyssal Plain, Oregon: 2803 -2808m
Monoculopsis longicornis (Boeck 1870) – N. Atlantic, Arctic Alaska; 20-200m
Oedicerina denticulata Hendrycks and Conlan 2003 – off Pt. Conception; 4050m
Oediceroides abyssorum (Shoemaker 1925) – Cascadia Abyssal Plain, Oregon to Baja California 1606-2800m
Oediceroides morosa (J. L. Barnard 1966) – SCB to Baja California; 813-2705m
Oediceroides trepadora (J. L. Barnard 1961) – Cascadia Abyssal Plain, Oregon to Panama: 825-2820m
Oediceroides sp y of Dickinson 1976 – Cascadia Abyssal Plain, Oregon: 2803 -2820m
Oediceroides sp 1 of Thomas 1991 – Gulf of the Farallones: 2045-3085m
***Oediceropsis elsula** J. L. Barnard 1966 – SCB; 644-813m
Oediceropsis morosa J. L. Barnard 1966 (see Oediceroides morosa)
Oediceropsoides abyssorum Shoemaker 1925 (see Oediceroides abyssorum)
Oediceros latimanus Goës 1866 (see Monoculodes latimanus)
Oediceros longirostris Goës 1866 see Rostroculodes longirostris)
Oediceros lynceus M. Sars 1858 (see Paroediceroides lynceus)
Oediceros obtusus var. latipes (see Aceroides latipes)
Oedicerus behringiensis Lockington 1877 (see Acanthostepheia behringiensis)
Oedicerus norvegicus Boeck 1861 (see Deflexilodes norvegicus)
***Pacifoculodes barnardi** Bousfield & Chevrier 1996 – SCB; 17-98m
Pacifoculodes bruneli Bousfield & Chevrier 1996 – Gulf of Alaska to SE Alaska; 0-5m

Pacifoculodes crassirostris (Hansen 1887) – N Atlantic, NWP, Aleutians; 20-200m
Pacifoculodes levingsi Bousfield & Chevrier 1996 – British Columbia; 30-45m
Pacifoculodes spinipes (Mills 1962) – British Columbia to N. California; 0-10m
Pacifoculodes zernovi (Gurjanova 1936) – NWP, Arctic Alaska to British Columbia; 2-40m
Paroediceros lynceus (M. Sars 1858) – N. Atlantic, NWP, Arctic Alaska; ?m
Paroediceroides trepadora J. L. Barnard 1961 (see Oediceroides trepadora)
Rostroculodes borealis (Boeck 1870) – N. Atlantic, Arctic Alaska; 80-200m
Rostroculodes longirostris (Goës 1866) – N. Atlantic, Arctic Alaska to SE Alaska; to 887m
Rostroculodes schneideri (G. O. Sars 1895) – N. Atlantic, Arctic Alaska; 5-60m
Synchelidium micropleon J. L. Barnard 1977 (see Americhelidium micropleon)
Synchelidium rectipalmum Mills 1962 (see Americhelidium rectipalmum)
Synchelidium shoemakeri Mills 1962 (see Americhelidium shoemakeri)
Westwoodilla caecula of authors NEP not (Bate 1857) (see Westwodilla tone)
Westwoodilla cornuta J. L. Barnard 1969 (see Cornudilla cornuta)
***Westwoodilla tone** Jansen 2002 – British Columbia to San Diego, 22-223m

Comments by Family (within the superfamily only Oedicerotidae occur in the NEP)

Family Oedicerotidae – A very large and widely distributed family of fossorial amphipods with many genera, but no identified subfamilial structure. Several major groups of species were revised by Bousfield and Chevrier (1996), but many other genera have yet to be addressed in their ongoing treatment of the family in the NEP. Barnard and Karaman list 29 genera in the family, with another subsequently added by Jo (1990), one by Hirayama (1992) , and 8 by Bousfield and Chevrier (1996), for a total of 39 genera. A few subsequent additions bring the total to 47 genera currently listed as valid for the family in WoRMS (Horton & De Broyer 2014). Twenty-one of these are reported to occur either in the NEP, or in the adjacent Arctic seas (i.e. Bering Sea). Seven of these genera are discussed by Bousfield and Chevrier (1996); these are asterisked in the following genus descriptions. A discussion of their review, and comments on the characters used, and their interpretability, was released through SCAMIT in 1996. It is available on the SCAMIT website under Newsletters, vol 15(6) on pages 4-11.

Description: "***Head*** *free, not coalesced with peraeonite 1; exposed; as long as deep, or longer than deep; anteroventral margin oblique; rostrum present or absent, short or long; eyes present, well developed or obsolescent, or absent; coalesced, or not coalesced; 1 pair; not bulging. Body laterally compressed, or subcylindrical; cuticle smooth.*

Antenna 1 shorter than antenna 2, or subequal to antenna 2, or longer than antenna 2; peduncle 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, or absent; antenna 1 callynophore present, or absent. Antenna 2

present; short, or medium 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, or smooth; accessory setal row without distal tuft; molar present, medium, triturative or non-triturative; palp present. Maxilla 1 present; inner plate present, strongly setose along medial margin or weakly setose apically; 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. Coxae 2-4 none immensely broadened.

Gnathopod 1 not sexually dimorphic; subequal to gnathopod 2; subequal to coxa 2; gnathopod 1 merus and carpus not rotated; gnathopod 1 carpus/propodus not cantilevered; shorter than propodus, or subequal to propodus, or longer than propodus; gnathopod 1 strongly produced along posterior margin of propodus, or slightly produced along posterior margin of propodus, or not produced along posterior margin of propodus; dactylus large. Gnathopod 2 not sexually dimorphic; simple, or 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 short or elongate, shorter than propodus or subequal to propodus or longer than propodus, strongly produced along posterior margin of propodus or 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 or broader than long or as long as broad; carpus subequal to propodus, not produced; dactylus well developed. Coxa subequal to coxa 3 or larger than coxa 3, not acuminate, with well developed posteroventral lobe or without posteroventral lobe; carpus not produced. Peraeopods 5-7 with many rows of facial and marginal robust setae; dactyli without slender or robust setae. Peraeopod 5 well developed; shorter than peraeopod 6, or subequal in length to peraeopod 6; **coxa smaller than coxa 4**, without posterior lobe or equilobate; basis expanded or slightly expanded, subrectangular or subovate, without posteroventral lobe; merus/carpus free; carpus linear; setae absent. Peraeopod 6 shorter than peraeopod 7; merus/carpus free; dactylus without setae. **Peraeopod 7** with 6-7 well developed articles; **immensely elongate**; different 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, or 1 free, 2 and 3 coalesced; 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 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 subequal to outer ramus. Uropod 3 not sexually dimorphic; peduncle elongate; outer ramus subequal to peduncle or longer than peduncle, 1-articulate, without recurved spines. Telson laminar; notched, or emarginate, or entire; as long as broad; apical robust setae present, or absent.*" (from Lowry and Springthorpe 2001).

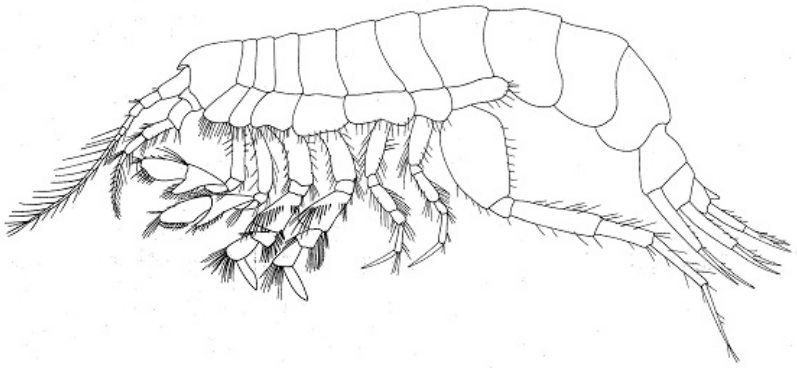
Acanthostepheia – There are three species in the genus according to J. L. Barnard and Karaman (1991), two of which have been reported from Arctic Alaska by Shoemaker (1955). They are listed as from the NEP by McLaughlin et al (2005) in consequence, but both forms are not likely to penetrate further south into the temperate or even boreal NEP. Descriptions of the two species are available in Gurjanova (1951).

Diagnosis: **"***Cutting edge of mandible projecting and toothed; molar large, ridged, cup-shaped, dentate. Inner lobes of lower lip separate. Gnathopods similar to one another, subchelate, stout, carpus with blunt strong posterior lobe partially guarding propodus, palm of both gnathopods oblique. Uropod 2 fully reaching end of rami on uropod 3. Uropod 3 well developed*." (from J. L. Barnard and Karaman 1991)

Acanthostepheia malmgreni (from www.meerwasser-lexikon.de)

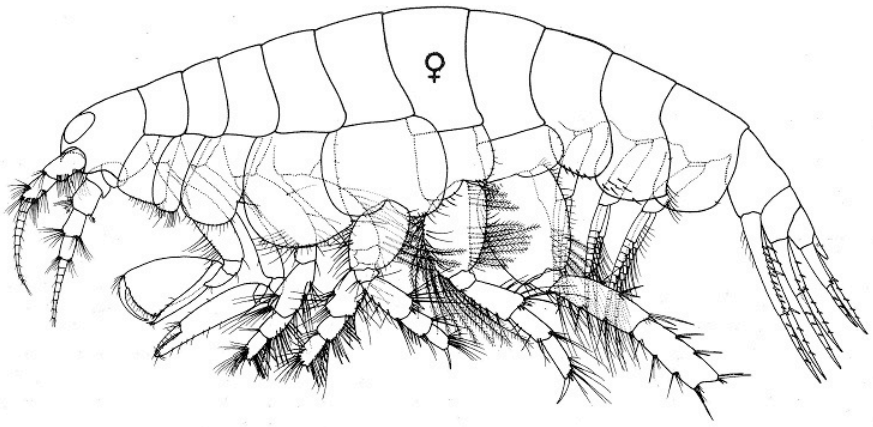
Aceroides – Three of the 8 described species in the genus are reported from the NEP, one circumarctic, two from bathyal or abyssal depths off Baja California, along with one provisional from mid-bathyal depths in Central California. This latter provisional, while described briefly in Thomas and McCann (1995) remains unillustrated. It was reviewed earlier by J. L. Barnard during one of the SCAMIT symposia he headed, and he agreed that it was a species separate from those known at the time. The circum-arctic form *A. latipes* is well illustrated in a variety of publications (i.e. J. L. Barnard and

Karaman 1991, fig. 98f; Sars, 1895 plt. 120), and the original descriptions of both the other species are in J. L. Barnard (1967), where diagnostic parts are illustrated, but not the entire organisms. The generic boundaries in this part of the Oedicerotidae are often very indistinct, a problem discussed in J. L. Barnard (1967 pp.93-97), and partially reprised in J. L. Barnard and Karaman (1991, pp. 551-553). The latter authors provide a compound key to species of *Aceroides*, *Arrhis*, and *Anoediceros* known by the time their manuscript was completed (1986), but even there confusion reigns, with *Arrhis luthkei* referred to as *Aceroides luthkei*! Rather than try to bring light into this dimness, we will follow the allocations of others, specifically McLaughlin et al (2005) and WoRMS, for the species in these genera.



Aceroides latipes (from J. L. Barnard & Karaman 1991)

Diagnosis: **"***Cutting edge of mandible scarcely projecting and either poorly or well toothed; molar medium, ridged. Inner lobes of lower lip separate or fused. Gnathopods similar to one another, subchelate, moderately stout, carpus with sharp strong posterior lobe projecting distalwards, partially guarding propodus; palm of both gnathopods oblique. Uropod 2 fully reaching end of rami on uropod 3. Uropod 3 well developed."* (from J. L. Barnard & Karaman 1991)



Americhelidium rectipalmum (from Bousfield & Chevrier 1996)

***Americhelidium** – Erected by Bousfield and Chevrier (1996) this genus is endemic to the Northern Pacific except for one disjunct member in the NW Atlantic. Most members are in the NEP, but several taxa are known from the NWP. A key is provided by Bousfield and Chevrier (1996), but it embodies a series of difficulties laid

out in my discussion in the SCAMIT NL in 1996. In recent years several provisional taxa have been proposed by me, and subsequently withdrawn. Dean Pasko has worked for some time with members of this group, and feels that he finally has a handle on them. He has prepared a key to the known NEP species, including provisionals. The genus, while still known as *Synchelidium*, was considered a killer problem. It was the final group attempted by Clarence R. Shoemaker prior to his death. He had a manuscript in progress when he died, which was further modified by J. L. Barnard who planned to describe four new species in the genus from the SCB. Only one of these actually made it into print (*S. micropleon* J. L. Barnard 1977) before JLB threw up his hands and abandoned the group with pleas for someone else to take over. He had wrestled, ultimately without success, with the sizeable material of this genus in the collections of the Allan Hancock Foundation. These are now in the Natural History Museum of Los Angeles County, available for examination by whomever has the time and emotional fortitude.

Members of the genus are easy to recognize, given the elongate and fully chelate nature of the second gnathopod, they are unlike any other NEP oedicerotid genus. Generally small, and virtually all white, they have a uniform overall gestalt. Most similar locally is the introduced *Eochelidium sp A*, which is, however, considerably larger, and conspicuously marked with brown pigment. All members are shelf inhabitants, with most specimens being taken in relatively shallow water. *Synchelidium shoemakeri* was reported from the intertidal of all investigated Seattle area beaches (Armstrong et al 1976), although the identity of the species is uncertain, since all *Americhelidium* other than *A. rectipalmum* would have been recorded as *S. shoemakeri* at that time. Members of the genus are also known from the intertidal zone of California (*A. micropleon*) and the Pacific coast of Costa Rica (as *Synchelidium* sp. Dexter 1974).

Diagnosis: **"***Medium to relatively large species, distinguished by the characters of the key (p. 124) and the following. Antennae 1 & 2 sexually dimorphic. Flagella (♀) subequal, short, 4- 10-segmented. Antenna l (♀), peduncular segment* ***2*** *shorter than 1.*

Lower lip, inner lobes fused medially or nearly so. Mandibular palp segment 3 shorter in female, shorter than segment 2, lacking outer marginal setae; right lacinia bifid; incisor weakly toothed; molar with 1-2 spines. Maxilla 1, outer plate with 7 apical spines; palp segment 2 weakly setose. Maxilla 2, outer plate not expanded or truncate distally. Maxilliped, inner plate short, with 2-4 apical setae; outer plate short to medium, with 3-8 inner marginal spines; palp segment 2 stout.

Coxae 1-4 deep, 3 broad, 4 very broad, usually acutely produced behind. Coxa 5 deep, weakly postero-lobate; coxa 6 deep, strongly anterolobate. Gnathopods 1 & 2 dissimilar. Gnathopod 1 strongly subchelate; carpus, anterior margin short, posterior lobe slender, extending beyond palm of propod; palm of propod nearly vertical, weakly toothed. Gnathopod 2 less powerful, cheliform; anterior margin of carpus small but free, not fused to propod, carpal lobe fused to posterior margin of elongate propod, line of demarcation often visible.

Peraeopods 3 & 4, segment 5 longer than 6, dactyls very short or minute. Peraeopods 5 & 6, bases somewhat unlike in size and form, with strong median row of plumose setae; segment 5 longer than 6; dactyls very short. Peraeopod 7,basis markedly posterolobate, often with strong antero proximal row of short spines; dactyl elongate, margins setose and or spinose.

Pleon plate 2, hind corner subquadrate or variously

produced; pleon plate 3 subquadrate or obtuse.. Uropods 1- 3, rami slender, margins weakly spinose, outer ramus generally the shorter. Telson short to medium, apex truncate or rounded, unarmed.

Coxal gills and brood plates regular."(from Bousfield & Chevrier 1996)

Arrhis phyllonyx (from www.iopan.gda.pl)

Arrhis – A small four species genus, with only a single representative in the NEP, *A. luthkei*. The single NEP record of this is from a fjord in SE Alaska and remains in the grey literature. The animal is unlikely to be found appreciably more to the south in the NEP, and has not yet been noted in samples from the slope and Abyssal plain off Oregon, suggesting that no tropical submergence has taken place. Consult the description of the species in Gurjanova (1951). While bearing a geniculate article 2 of the mandibular palp as in *Westwoodilla*, members of *Arrhis* have a very narrow and elongate lobe on the carpus of G2 unlike that in *Westwoodilla.* The discussion of generic distinctions in the cluster of genera including *Oediceroides*, *Monoculodes*, *Arrhis*, and *Aceroides* alluded to above (J. L. Barnard 1967) should be revisited here. Detailed ecological information on one member of the genus is provided by Sainte-Marie and Brunel (1983).

Diagnosis: **"***Cutting edge of mandible scarcely projecting and untoothed; molar medium, ridged. Inner lobes of lower lip separate. Gnathopods similar to one another, subchelate, moderately stout, carpus with sharp (or blunt) strong posterior lobe projecting distalwards but partially guarding propodus (often only and especially on gnathopod 2); palm of both gnathopods oblique. Uropod 2 fully reaching end of rami on uropod 3. Uropod 3 well developed* " (from J. L. Barnaard and Karaman 1991)

Bathymedon - One of the most speciose genera in the family, with 24 described species as of 1991 (J. L. Barnard and Karaman 1991), and 25 currently in WoRMS (Lowry 2014). Ten of these are reported from the NEP, along with an additional ten provisional species from the Cascadia Abyssal Plain. Since the nine provisional species erected by Dickinson were not described, and cannot be currently distinguished, these forms are just markers for considerable variation in deep water representatives of the genus in the NEP. John Byrne (CSDMWWD) has produced a key to the species of *Bathymedon* known from California and adjacent regions (see SCAMIT website, Taxonomic Tools). This includes the provisional *B. sp A* of J. L. Barnard 1971, but does

not include the northern *B. nanseni* listed by McLaughlin et al (2005) as from the NEP. His key can be modified to include this form fairly easily, by the separation of couplet 9, and the addition of a 10th couplet as follows:

Bathymedon kassites (photo MBARI)

9a. Coxa 4 distally emarginate.....10
b. Coxa 4 distally flat or convex.....*Bathymedon flebilis*
10a. Gnathopod 1, palm and hind margin following the same line, with a slight offset at the defining spine; G2, palm and hind margin following the same line, with a slight offset at the defining spine.....*Bathymedon sp A*
b. Gnathopod 1, hind margin distinctly concave, propod widest anteriorly; Gnathopod 2 triangular, with hind margin forming a distinct angle with the palm and propod widest at the defining tooth.....*Bathymedon nanseni*

The genus is little separated from *Westwoodilla*. As stated by Barnard and Karaman (1991), "Generally we have placed in *Bathymedon* any species with either weak rostrum, poorly developed eyes, or straight article 2 of the mandibular palp; but some of those species have mixtures of the *Westwoodilla* form of the 3 cited characters." The alternate states of those three characters are typical of *Westwoodilla*: large strong rostrum, well defined eyes, and geniculate article 2 of the mandibular palp.

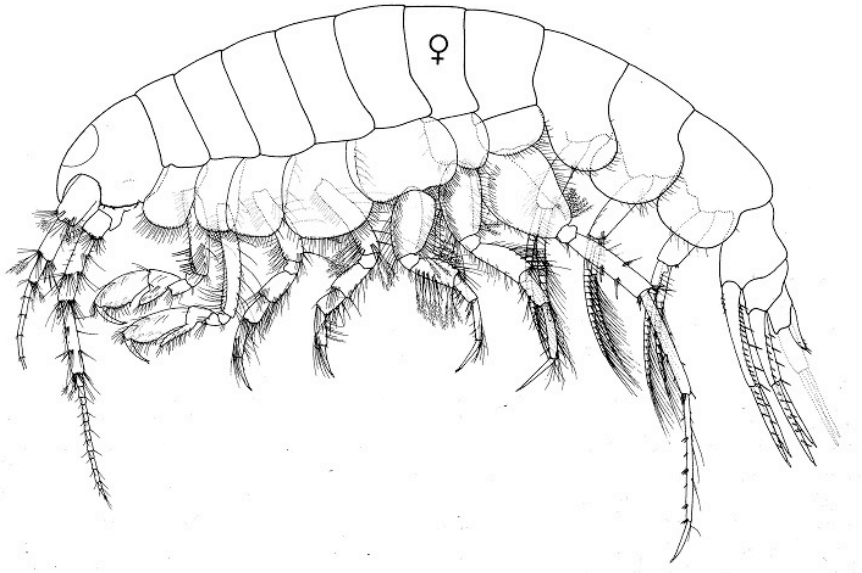
Diagnosis**: "***Cutting edge of mandible not projecting and untoothed; molar medium, ridged. Inner lobes of lower lip separate. Gnathopods somewhat diverse, subchelate, slender, usually gnathopod 2 more slender, carpus of gnathopod 1 with blunt moderately developed posterior lobe projecting distalwards at right angles, lobe becoming obsolescent on gnathopod 2, with carpus more elongate; palm of both gnathopods oblique. Uropod 2 almost reaching end of rami on uropod 3. Uropod 3 well developed*." (from J. L. Barnard and Karaman 1991)

Cornudilla – A monotypic genus from Baja California. Originally described as *Westwoodilla cornuta*, the species was transferred to the newly created taxon *Cornudilla* by J. L. Barnard and Karaman (1991). They characterize this as the only oedicerotid with

a non-triturative mandibular molar which lacks posterior carpal lobes on the gnathopods. While no records of this animal are known from outside the Gulf of California, it may be a northern migrant during particularly strong southern water intrusions (strong El Niño events), and should be watched for in the SCB.

Diagnosis: **"***Cutting edge of mandible scarcely projecting and untoothed; molar large, lacking ridges, bulging. Inner lobes of lower lip separate. Gnathopods similar to one another, feeble, subchelate, carpus not lobate; palm of both gnathopods oblique. Uropod 2 fully reaching end of rami on uropod 3. Uropod 3 well developed.*" (from J. L. Barnard and Karaman 1991)

***Deflexilodes** – Carved off from other members of the "*Monoculodes* supergenus" by Bousfield and Chevrier (1996), and based on characters used in the generic key provided above. SCB forms are keyed in the draft key prepared by Dean Pasko (CSDMMD) to members of the same group of taxa. Of the three species in the genus reported from the NEP, only *D. norvegicus* reaches into temperate waters. Neither of the other two are known south of Vancouver Island. Our local *D. norvegicus* is a very broad ranging species, and it may not really be equivalent to the North Atlantic/Arctic form whose name it has been given locally (as intimated by Bousfield and Chevrier 1996). While noting slight differences from the descriptions of Sars (1895), J. L. Barnard (1962) found the SCB material sufficiently similar that he chose not to reillustrate it, relying instead on Sars' drawings. The species has a broad bathymetric distribution, being relatively shallow in boreal/Arctic areas and submerging to 796m in submarine canyons in the SCB. The genus has a relatively strongly deflexed rostrum (around 45°), which helps separate it from similar forms in the "Monoculodes group".



Deflexilodes similis (from Bousfield & Chevrier 1996)

Diagnosis: *"Head, rostrum large, apex variously deflexed. Body, especially pleon segments, smooth or weakly carinated mid-dorsally. Eyes sexually dimorphic, usually partly basal on head. Antennae various, usually slender, sexually dimorphic. Antenna 1 (female) longer than peduncle of antenna 2.*

Lower lip broad, inner lobes distinct. Mandible, molar triturative; palp, inner margin of segment 2 with stout setae of irregular length; segment 3 relatively short.

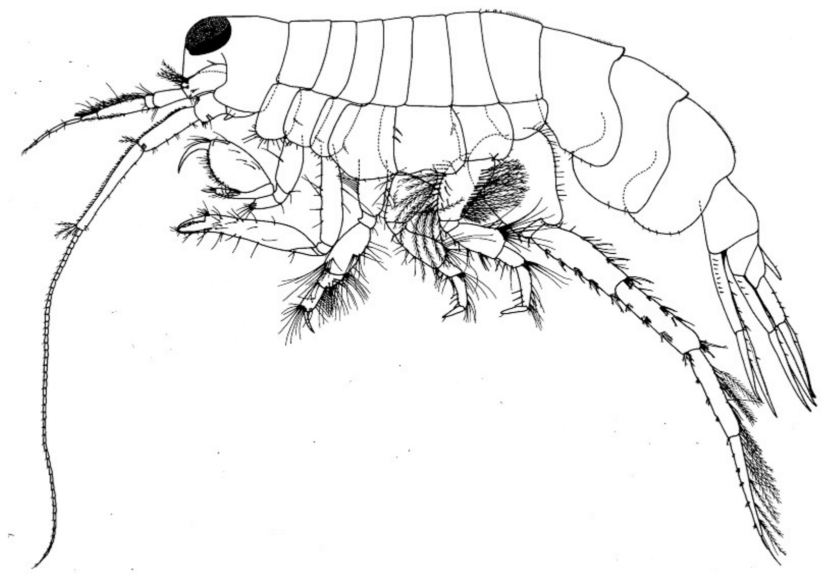
Maxilla 1, outer plate with 9 apical spines. Maxilla 2, inner plate broader than outer. Maxilliped, inner plate with apical spine(s) and setae; outer plate medium, broad, narrowed basally; palp segment 2 broadened, distal margin oblique.

Coxal plates normal, deep. Coxa 1 not expanded. Gnathopod 1, carpus long, lower lobe short, not reaching palmar angle; propod distally deflexed, lower margin concave. Gnathopod 2, basis elongate; carpus medium, posterior lobe medium, not closely guarding propod nor exceeding palmar angle; propod broadening distally, spine at postero-distal angle not elongate.

Coxa 4 broadened postero-distally. Peraeopods 3 & 4 weakly to moderately fossorial (segments stout, setose); segment 5 <6; dactyls longer than segment 6, chitinous rings usually small. Coxa 5 deep, aequilobate. Coxa 6 regularly postero-lobate. Peraeopods 5 & 6 subsimilar; segment 5 < 6; dactyls slender, <segment 6, chitinous rings distinct. Peraeopod 7, basis not greatly broadened proximally, hind lobe small or lacking.

Pleon plates 2 & 3 rounded or broadly obtuse behind. Uropods 1 & 3, rami variously unequal, longer than peduncles

Telson short, apical margin straight or convex, with 4 small spines and/or setae." (from Bousfield & Chevrier 1996)



Eochelidium miraculum (from Imbach 1967)

***Eochelidium** - Known from the NEP by a single apparently introduced species. This is maintained as a provisional, *Eochelidium sp A* on the SCAMIT list, although other workers (Chapman 2007) refer to this animal as *Eochelidium cf. miraculum*. The animal is the same, regardless of name usage. I have seen specimens from Puget Sound shallow waters (taken during WEMAP) which are identical to material collected in Los Angeles/Long Beach outer harbors. I found sufficient difference in the local material to prevent its assignment to any of the described species. Chapman apparently feels that the similarities to *E. miraculum* are sufficiently strong that *cf. miraculum* is a more appropriate name for the animal. A population persists in the LA/LB Outer Harbor complex, but I am not sure that it has spread further along the coast in the SCB. The

genus is keyed in the Bousfield and Chevrier (1996) key to the *Synchelidium* complex (p. 120), and the described species are keyed in a second key on pg. 122. It differs from all local *Americhelidium* species in being prominently marked with brown pigment; and is also larger and more robust than *Americhelidium* spp.

Diagnosis: **"***Body (peraeon and/or pleon) smooth to dorsally rugose . Head, rostrum short to very short, strongly deflexed apically. Eyes sexually dimorphic, located wholly on rostrum, or nearly so. Antennae sexually dimorphic. Antenna 1 (female) short, little (or not) exceeding peduncle of antenna 2. Antenna 2, peduncular segment 5 longer than segment 4.*

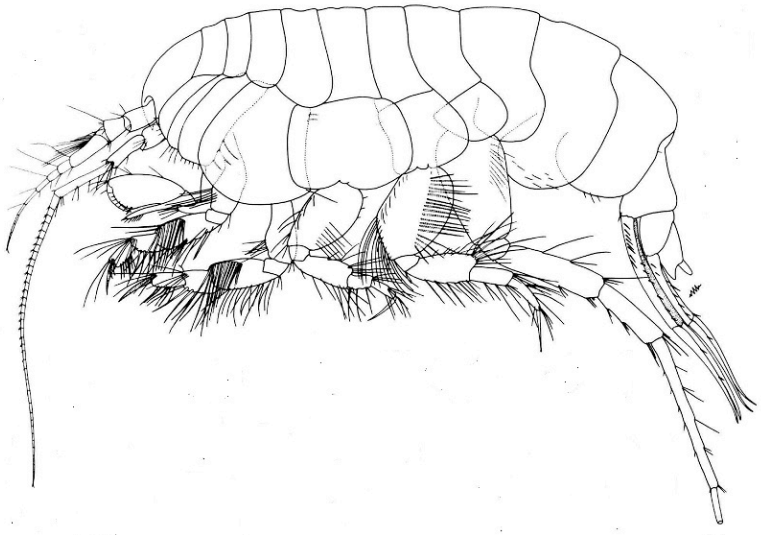
Lower lip, inner lobes fused medially or nearly so. Mandibular molar with spine and accessory setae; right lacinia bifurcate, 1 tooth serrate; left lacinia 5-dentate; palp segment 3 not shortened in female, outer and inner margins setose. Maxilla 1, outer plate with 9 apical spines. Maxilla 2, outer plate slender; inner plate lacking facial setae. Maxilliped, inner plate with 4-8 apical setae; outer plate tall, inner margin with multiple masticatory spines; palp segment 2 not broadened medially; dactyl regular, curved.

Coxa 1, hind corner produced posteriorly, setose. Gnathopod 1 subcheliform, palm finely rugose; carpus, anterior margin distinct, lobe short, not exceeding palm. Gnathopod 2 cheliform, anterior carpal margin totally fused with propod.

Coxa 4 not broadened. Peraeopods 3 & 4, segment 5 short; dactyls medium, length not (or little) exceeding segment 6. Coxa 5 deep, aequilobate. Coxa 6, anterior lobe not produced strongly below. Peraeopods 5 & 6 subsimilar in form, but peraeopod 6 larger, stronger; segment 5 shorter than 6; dactyls medium to long. Peraeopod 7, basis strongly lobate below.

Pleon plate 2, hind corner obtuse, subquadrate, or weakly acute, not broadly rounded. Uropods 1 & 2, outer ramus the shorter. Uropod 3, rami subequal. Telson, apical margin straight or slightly emarginate, unarmed; penicillate setae arising distally.

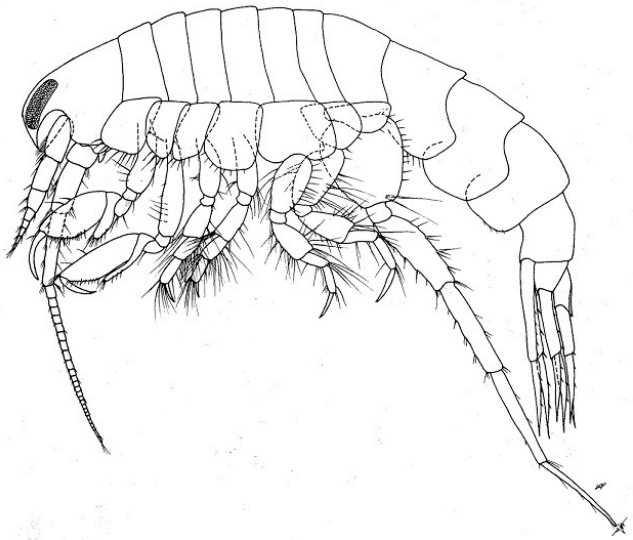
Coxal gills large, elongate, lobate. Brood plates very slender, elongate, with distal marginal setae." (from Bousfield & Chevrier 1996)



Finoculodes omnifera (from J. L Barnard 1971)

Finoculodes – Is a *Synchelidium*-like monotypic genus described from off Oregon in 800m. It was also taken off Northern California by MEC in the 1990's, and a single specimen was reported from 1302m in the Tanner Basin by Dickinson 1976. *F. omnifera* has a particularly elongate ventral lobe on the carpus of G2, which protrudes well beyond the transverse closure of the dactyl on the palm of that appendage. It otherwise resembles *Synchelidium* in aspect, although lacking eyes. So far known only from slope depths in the middle bathyal zone.

Diagnosis: "*Rostrum distinct; upper lip rounded anteriorly from lateral view, not acute; mandibular molar small, lacking triturative surface, armed with a large articulated process, setulose; mandibular palp well developed, article 3 nearly as long as 2, both apically and marginally setose; lower lip with separate inner lobes defined at least by fold of chitin, maxillae and maxilliped resembling Perioculodes longimanus (Bate, in Sars, 1895) ; antenna 1 much shorter than 2, peduncle short, article 3 of peduncle very short, about half as long as article 2, article 2 shorter than 1, antenna 2 slender, about three-fourths as long as body; gnathopod 1 stouter and shorter than 2, both gnathopods with fifth articles supplied with very long posterior lobes guarding posterior edges of sixth articles and exceeding their palmar corners, palm of gnathopod 1 oblique, that of gnathopod 2 transverse; uropod 3 unknown."* (from J. L. Barnard 1971)



Hartmanodes hartmanae (from J. L. Barnard 1962)

***Hartmanodes** – Has three described species, and a provisional from the SCB. *H. nyei* has been reported by J. L. Barnard (1962) from the head of the Gulf of California, but is otherwise unknown in the NEP. It was described from Florida, and is known primarily from the warm waters of the Western Atlantic. The two other described species (*H. hartmanae* and *H. murrius*) are both listed in SCAMIT Taxonomic Listing Ed. 4. *H. hartmanae* is by far the more common, with records of *H. murrius* from the Channel Islands in regional surveys (the type locality was off Catalina Island). The provisional *H. sp. SD1* is known only from off San Diego. *H. hartmanae* occurs at least as far south as Bahia San Quintin and Bahia San Cristobal on the outer coast of Baja California (J. L. Barnard 1964a, b). These species can be keyed in the draft key to members of the *Monoculodes* generic complex generated by Dean Pasko. Members of this genus are

generally recognizable by the extremely abrupt downturn of the rostrum at 90°. They are shallow shelf animals; the genus is absent from slope and basin collections.

Diagnosis: **"***Peraeon and pleon segments 2 & 3 smooth. Rostrum large, apex strongly deflexed. Eyes nearly totally on rostrum, sexually dimorphic. Antennae short, sexually dimorphic. Antenna 1, very short, not attaining end of peduncle of antenna 2; peduncular segment 2 not longer than segment 1, segment 3 medium; flagellum callynophorate in male. Antenna 2, peduncular segment 5 >segment 4; flagellum elongate in male. Mouthparts not described for any component species. Coxa 1 little broadened distally. Coxae 2 & 3, lower margins oblique; coxa 3 shallowly incised below. Coxa 4, medium broad, little produced behind. Gnathopods 1 & 2 strongly differing in form and size, not sexually dimorphic. Gnathopod 1, meral process obsolescent; carpus narrow, posterior lobe medium large; propod long ovate, not deflexed distally. Gnathopod 2, basis moderately setose anterodistally; carpus narrow, hind lobe elongate, closely guarding propod, tip exceeding palmar angle; propod elongate, slightly narrowing distally. Coxa 5 large, deep, aequilobate. Coxa 6 medium deep. Peraeopods* ***3*** *& 4 fossorial, segment 4 distally broadened and setose; segment 5* ***>6;*** *dactyls slender, medium short, tips with minute chitinous rings. Peraeopods 5 & 6 fossorial, segment 4 broadened, setose; segment 5* ***6*** *segment 6; dactyls slender, chitinous rings very small. Peraeopod 7, basis regularly broadened, narrowing distally, postero-distal lobe small, shallow; segment 5 not shorter than 4 & 6; margins of dactyl setose. Pleon plates 2 & 3, hind corners sharply obtuse. Uropods 1 & 2, rami slightly unequal, shorter than peduncles. Uropod* ***3,*** *rami nearly unarmed, outer ramus slightly the shorter. Telson short, not narrowing distally, apical margin nearly straight, apex truncate or slightly emarginate, nearly bare. Coxal gills large, rectangular. Brood plates elongate, slightly broadening distally, margins strongly setose.* " (from Bousfield & Chevrier 1996)

***Kroyera** – A monotypic genus known from the North Atlantic and questionably from the NEP. Bousfield and Chevrier (1996) doubt the early records from the Vancouver Island region, noting that in their thousands of oedicerotid specimens taken from the littoral of the NEP, none have been carinate as is *Kroyera carinata*. They reprint Sars illustration of the species, but it is better seen in Sars (1895) where both the male and female are depicted.

Diagnosis: **"***Body, especially pleon, mid-dorsally weakly carinated. Head, rostrum large, strongly deflexed distally; inferior head lobe rounded. Eye nearly totally on rostrum. Antennae short, weakly sexually dimorphic, Antenna 1short, not reaching end of peduncle 5 of antenna 2, flagellum weakly callynophorate in male; peduncular segment 2 slender, length > segment 1; segment 3 short. Antenna 2, peduncular segment 5 >4; flagellum shorter than peduncle, somewhat elongate in male.*

Lower lips broad. Mandible, molar large, triturative; left lacinia 5-dentate; palp slender, segment 3 shorter than segment 2. Maxilla 1, outer plate with 9 apical spines; palp slender, lacking distal setae. Maxilla 2, plates narrow. Maxilliped, inner plate short, apex setose; outer plate slender, outer distal margin setose; palp segment 2 broadening to truncate distal margin; segments 3 & 4 small.

Coxa 1 rounded distally, hind margin with spine(s); coxae 2 & 3 narrow, lower margins oblique; coxa 4 medium, little produced posteriorly. Gnathopods 1 & 2 medium, strongly dissimilar, not sexually dimorphic. Gnathopod 1, propod subovate, slightly distally deflexed; meral process obsolescent; carpus medium, hind lobe large. Gnathopod

2, propod elongate, not narrowing distally; carpus narrow, hind lobe reaching palmar angle.

Peraeopods ***3*** *& 4, segment 4 strongly fossorial, setose; segment 5 <segment 6; segment 6 linear; dactyls minute. Coxa 5 medium large. Peraeopods 5 & 6 differing in length; segment 4medium, fossorial; segment 5 subequal to segment 6; dactyls very small, chitinous rings not visible. Peraeopod 7, basis regular, postero-distal lobe small; segment 5 longer than 4; dactyl elongate, margins weakly spinose.*

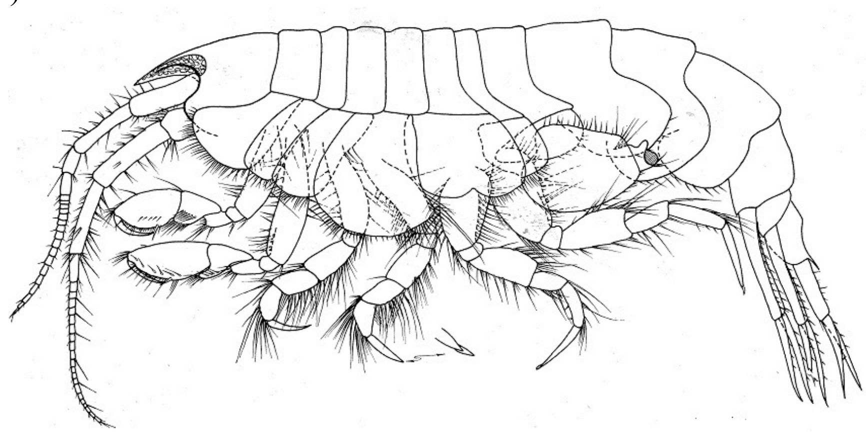
Pleon plate 2 broadly rounded behind. Uropods 1- 3, rami and peduncles subequal.

Telson short, apical margin truncate, setae minute.

Coxal gills elongate, sac-like, distally rounded. Brood plates very slender, marginally and apically setose." (from Bousfield & Chevrier 1996)

Machaironyx – The type and only species of this genus is known from Arctic Alaska. It is very unlikely to occur further south in the NEP. Consult Coyle (1980) for a description of the animal. The genus is not keyed by Bousfield and Chevrier (1996).

Diagnosis: "*Mandible lacking palp, cutting edge projecting and untoothed, molar cylindrical, surface smooth; inner lobes of lower lip separate; head with small rostrum; antenna 2 armed with numerous stout spines; pereopods 1 and 2 similar, subchelate, weak; uropod 3 biramus, short, reaching to halfway along the rami of uropod 2*." (from Coyle 1980).

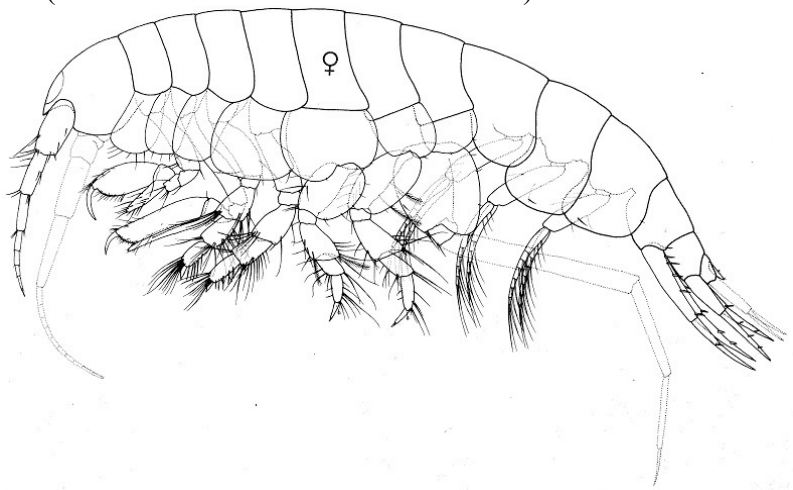


Monoculodes glyconica (from J. L. Barnard 1962)

***Monoculodes** – The largest genus in the family, with 54 nominate species in J. L. Barnard and Karaman (1991). Twelve described species occur in the NEP, along with 5 undescribed provisionals. These are currently uninterpretable, and were recorded from the Cascadia Abyssal Plain (4) or the San Diego Trough (1) by Dickinson (1976). One of these five, *Monoculodes sp Y*, was among the most abundant amphipods taken at stations near the Cascadia Channel, well out on the Abyssal Plain (Dickinson and Carey 1978). A further provisional *Monoculodes sp SD1* has now been transferred to *Hartmanodes*. All of the described species in the genus known from the NEP are keyed by Bousfield and Chevrier (1996 p. 84). While I recommend you use this key, you will find problems with it. The fact that it was never beta tested is apparent from the number of typos persisting in the published version. Not only wasn't it beta tested, it wasn't even proofed! Although an equivalent extensive examination has not been conducted, you should expect the same sorts of difficulties in applying this key as were detected in the *Americhelidium*

key. A subset of the NEP species which occur at depths in the SCB which we normally sample is keyed in the draft key to the *Monoculodes* group by Dean Pasko. Unless you don't know where your specimen comes from, his key should be the first one you try for NEP *Monoculodes*. Normally one seeks useful characters in the head (eyes, rostrum, lateral cephalic lobe, antennal sinus), the gnathopods (size, shape, nature and size of posterior lobes of carpus), pleonal epimera, and telsons. Legs, if present, can also be informative, particular the basis of the 7th pereopod.

Diagnosis: **"***Cutting edge of mandible slightly projecting and toothed; molar large, ridged. Inner lobes of lower lip separate. Gnathopods diverse, gnathopod 1 stout, gnathopod 2 much more slender and longer, carpus with blunt strong posterior lobe guarding propodus, less on gnathopod 1, very strongly on gnathopod 2, palm of both gnathopods oblique. Uropod 2 almost reaching end of rami on uropod 3. Uropod 3 well developed.*" (from J. L. Barnard & Karaman 1991)



Monoculopsis longicornis (from Bousfield & Chevrier 1996)

Monoculopsis – A small genus with one species in the Arctic, and one in the Antarctic. The Arctic species is *M. longicornis*, known from both the NEP and the North Atlantic. It is illustrated in Bousfield and Chevrier (1996, p. 117). We will not see this animal in the temperate waters of the SCB.

Diagnosis: "*Body smooth. Rostrum short, regular. Pigmented eyes basal. Antennae weakly sexually dimorphic. Antenna 1 longer than antenna 2 (adult), not callynophorate in male; peduncular segment 3, length = segments 1, 2.*

Lower lip, inner lobes separate. Mandible, molar triturative; spine row with 4 blades; left lacinia 5-dentate; right lacinia flabellate; incisor strongly toothed; palp regularly 3-segmented, segment 3 shorter than 2. Maxilla 1, inner plate with 2 apical setae; outer plate with 8-9 apical spines; palp regularly 2-segmented. Maxilla 2, plates small, regular, inner plate lacking facial setae. Maxilliped, inner plate with apical setae; outer plate medium, margins convex, apex rounded; palp segment 2 stout; dactyl strong.

Coxa 1 broadened distally. Coxa 4 broad. Gnathopods 1 & 2 strongly subchelate, propods dissimilar in form and size, narrowing distally, palms short, oblique; carpus, anterior margin distinct, hind lobe elongate, guarding propod below.

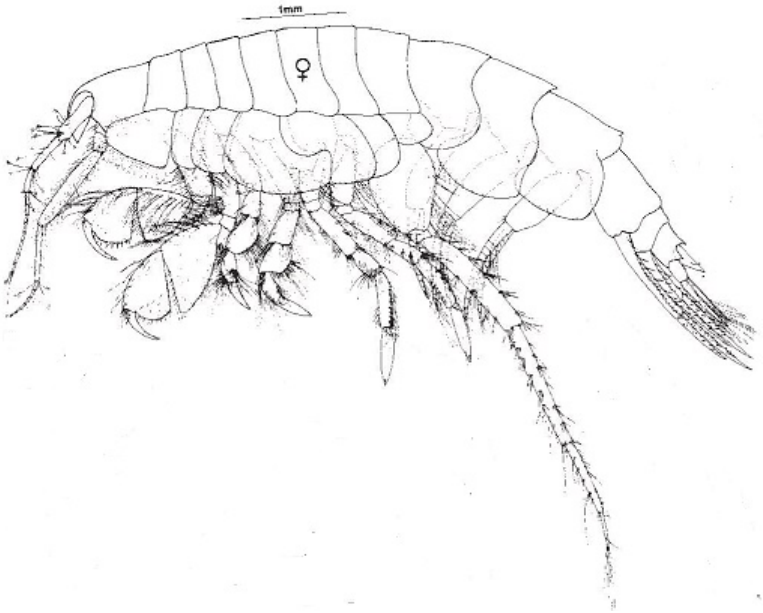
Peraeopods 3-4 strongly fossorial; segment 5 longer than 6; dactyls short. Coxae 5 broad, deep, anterolobate. Coxa 6 postero-lobate. Peraeopods 5 & 6 somewhat

unequal, bases dissimilar; segment 5 short; dactyls medium. Peraeopod 7, basis broad, postero-distal lobe distinct; dactyl elongate.

Pleon plate 2 subquadrate; pleon plate 3 rounded behind. Uropods 1-3 regular; rami regularly lanceolate, outer ramus slightly the shorter.

Telson short, narrowing distally, apex subtruncate.

Coxal gills and brood plates undescribed." (from Bousfield & Chevrier 1996)



Oedicerina denticulata (from Hendrycks & Conlan 2003)

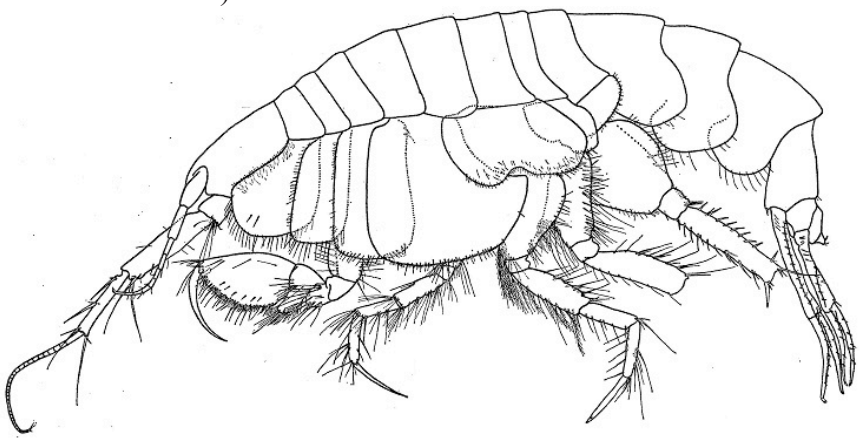
Oedicerina – A small genus, with only 3 species. It is nonetheless distributed widely in the deep sea, with the type from the North Atlantic, the second species from off Madagascar in the Indian Ocean, and the third from the North Pacific off Point Conception. The local species is known only from the type lot of four individuals from 4050m depth. The genus should be easily recognizable by the very prominent posterior lobe on coxa 4. A key to the known species is presented in Hendrycks and Conlan (2003). This has been superseded by a new key including two newly described members of the genus from the North Atlantic (Coleman and Thurston 2014).

Diagnosis: **(key characters embolded). "***Rostrum well-developed, moderately to strongly deflexed. Antennae sexually dimorphic or not, length medium. Antenna 1 about as long as head and pereonites 1–4 combined, peduncle article 1 longer than articles 2 and 3. Antenna 2 subequal to or weakly longer than antenna 1; peduncle article 4 longer than article 5. Lower lip, inner lobes prominent, separate. Mandible, molar triturative; incisor 5-dentate. Maxilla 1, outer plate 9-dentate; palp slender, article 2 subequal to or longer than article 1. Maxilla 2, plates short, inner broader than outer. Maxilliped, palp article 2 sub-triangular, breadth greatest at half-length, inner margin strongly convex; article 3 produced mediodistally; article 4 longer than article 3.*

Coxal plates 1–4 deep, as long or longer than height of corresponding pereonite. ***Gnathopod 1****, coxa expanded distally;* ***carpus and propodus*** *subequal in length,* ***strongly expanded posterodistally****. Gnathopod 2,* ***carpus longer than propodus, both strongly expanded posterodistally****. Pereopods 3 and 4 fossorial (setose);* ***coxa 4 deeply excavate posteriorly, posterodistal lobe strong, subrectangular****. Pereopod 5, coxa bilobate,*

posterior lobe as long as coxa 4. Pereopod 6, coxa bilobate, posterior lobe strong. Pereopod 7, basis expanded.

Pleonites, some or all carinate or toothed. Epimera 1–3, 1 and 3 rounded, 2 obtusely rounded, posterior margin convex or sinuous. Uropods 1–2, outer ramus subequal to or shorter than inner ramus. Uropod 3, peduncle short; rami subequal, not extending as far as apices of uropods 1–2. Telson notched 30–40%, apices acute." (from Coleman and Thurston 2014).



Oediceroides morosa (from J. L. Barnard 1966)

Oediceroides – Is home to four regional species, three from off Baja California in deep water (with *O. morosa* ranging north into the SCB), and a provisional from the Cascadia Abyssal Plain. This later species was among the most abundant amphipods recovered at stations near the Cascadia Channel (Dickinson and Carey 1978), but remains without a diagnosis or illustration to allow us to recognize it. The three deep-water representatives from off Baja California are well described by Shoemaker (1925) as *Oediceropsoides abyssorum*, or by J. L. Barnard (1966) as *Oediceropsis morosa* and *O. trepadora*. The genus is relatively large and widely distributed, with 23 species allocated to it by J. L. Barnard and Karaman (1991). These species are either bathyal or abyssal, none occurring shallower than 800m. The three described regional forms can be distinguished by the following key

1a. Rostrum robust, nearly as long as the rest of the head; lateral cephalic lobe broad, truncate.....*Oediceroides abyssorum*

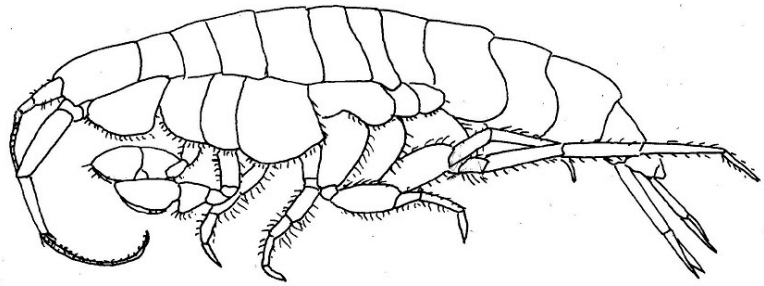
b. Rostrum much shorter than rest of the head, extending no more than ½ the length of the first article of Antenna 1; lateral cephalic lobe not broad and truncate.....2

2a. Epimeron of pleon 2 straight at posterio-ventral section; G2 merus lacking antero-ventral spines, bearing a group of short setae in that position .....*Oediceroides trepadora*

b. Epimeron of pleon 2 evenly rounded posterio-ventrally; G2 merus bearing two or more stout spines antero-ventrally.....*Oediceroides morosa*

Diagnosis: **"***Cutting edge of mandible projecting and toothed; molar large, ridged. inner lobes of lower lip separate. Gnathopods similar to one another, moderately stout, or weak, carpus with blunt, strong to small posterior lobe projecting distalwards at*

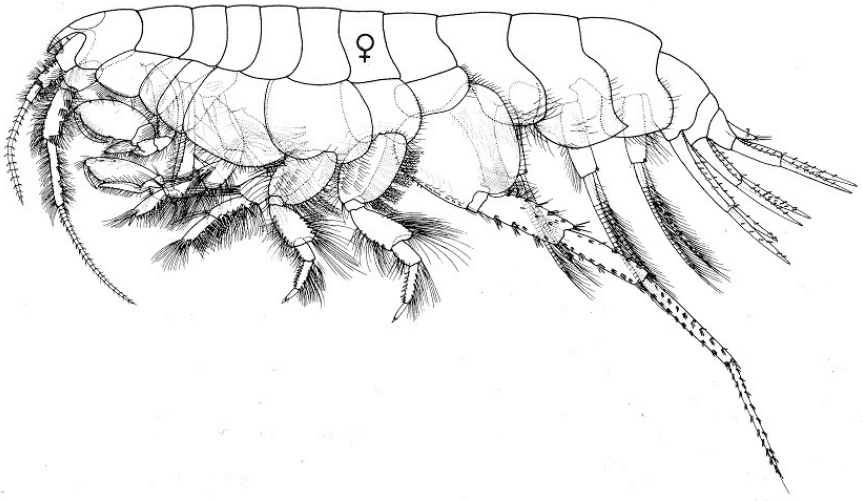
right angles, not guarding propodus; lobe sometimes becoming obsolescent; palm of both gnathopods oblique. ***Uropod*** *2 reaching end of rami on uropod 3. Uropod 3 well developed*." (from J. L. Barnard and Karaman 1991)



Oediceropsis bicornis (from Bellan-Santini 2007)

Oediceropsis – As restricted by J. L. Barnard and Karaman (1991), this is a small genus of three species, one occurring in the NEP. Several forms described in the genus were transferred to others by them. The local species, *Oediceropsis elsula* occurs on coastal slopes, and was taken in B'03 sampling of this environment. It is described and illustrated by J. L. Barnard (1966). The two other genus members are from the North Atlantic.

Diagnosis: **"***Cutting edge of mandible projecting and well toothed; molar medium, ridged. Inner lobes of lower lip separate. Gnathopods similar to one another, subchelate, moderately stout, carpus with blunt strong posterior lobe projecting distalwards at right angles, not guarding propodus; palm of both gnathopods oblique. Uropod 2 fully reaching end of rami on uropod. 3. Uropod 3 well developed.*" (from J. L. Barnard and Karaman 1991)



Pacifoculodes spinipes (from Bousfield & Chevrier 1996)

***Pacifoculodes** – Six species from the NEP were placed in this genus by Bousfield and Chevrier (1996), who created it. These species would have previously been known as *Monoculodes*. The genus is keyed in the "*Monoculodes* supergenus" key of Bousfield and Chevrier (1996, p.80), and the species in it are also keyed by them (p. 104). Only one of these species (*P. barnardi*)occurs in the SCB, and is included in the draft key to the *Monoculodes* group species by Dean Pasko. The five remaining species

are Arctic/Boreal, and none are distributed further south than Northern California. This species, *P. spinipes*, was previously reported from the SCB (i.e. J. L. Barnard 1962) but southern specimens were separated and described as *P. barnardi* by Bousfield and Chevrier (1996). Species in the genus have relatively long, only slightly deflexed rostra, with the eye placed well back at the rostral base.

Diagnosis: " *Medium to large monoculodids, characterized by head, rostrum regular, usually not strongly deflexed, fused eyes partly or wholly on rostrum; anterior head lobe acute or sharply rounded, inferior margin oblique. Body smooth above, often maculated in colour. Antenna 1 short to medium; peduncular segment 2 subequal to segment 1; segment 3 not elongate. Antenna 2 longer than antenna 1; peduncular segment 4 & 5 setose.*

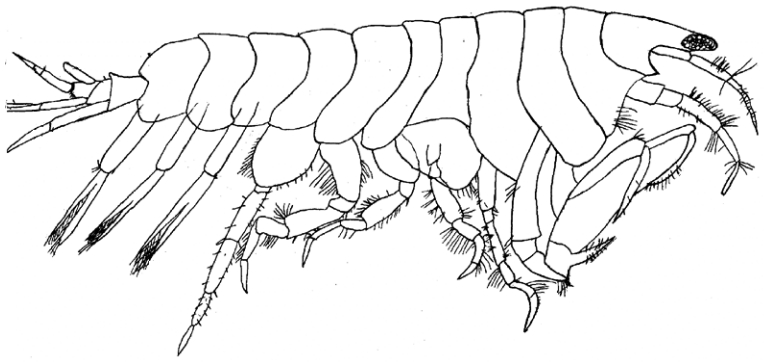
Lower lip broad, inner lobes separated. Mandible, molar with triturative apex; spine row with 4-6 blades; incisor toothed; left lacinia 5-7 dentate, right lacinia irregularly bifid; palp segment 3 variously shorter than segment 2. Maxilla 1, outer plate with 9 apical spine teeth; palm segment 2 stout, setose. Maxilla 2, outer plate not broadened. Maxilliped; inner plate apically setose; outer plate tall, outer margin convex, inner strongly masticatory; palp segment 2 broad, distally subtruncate.

Coxa 1 distally broadest, lower margin strongly setose. Coxa 2 narrow, lower margin variously oblique, hind margin with longish spines. Coxa 3 regularly deep, rounded below, hind margin spinose. Gnathopods not sexually dimorphic. Gnathopod 1, basis antero-distally setose, propod large, longer than deep, hind margin short; carpus, anterior margin medium to narrow, posterior lobe large, extending beyond palmar angle. Gnathopod 2, basis elongate, antero-distally setose; propod elongate ≈ 2-4 X maximum depth, often narrowing distally; palm oblique; carpus, anterior margin narrow; postero-distal lobe slender, elongate, usually closely guarding propod throughout.

Coxa 4 broadened distally, hind corner acute, produced,. Peraeopods 3 & 4, segments 4-6 strongly setose; segment 5 longer than 6; dactyls slender, much shorter than, and overhung anterodistally by segment 6. Coxa 5 deep, weakly posterolobate. Coxa 6 medium deep. Peraeopods 5 & 6, segment 4 stout, broadest distally; segment 5 shorter than 6; dactyls short to medium, not (or little) longer than segment 6. Peraeopod 7 large, elongate, basis very broad proximally, hind margin convex, narrowing distally to distinct lower hind lobe; segments 4-7, margins spinose.

Pleon plate 2, hind corner quadrate to acutely produced; plate 3 rounded behind. Pleopods regular. Uropod 1, outer ramus often the shorter. Uropod 3 large, rami strong, margins spinose. Telson, apical margin straight to slightly incised, with 2 pairs of unequal setae.

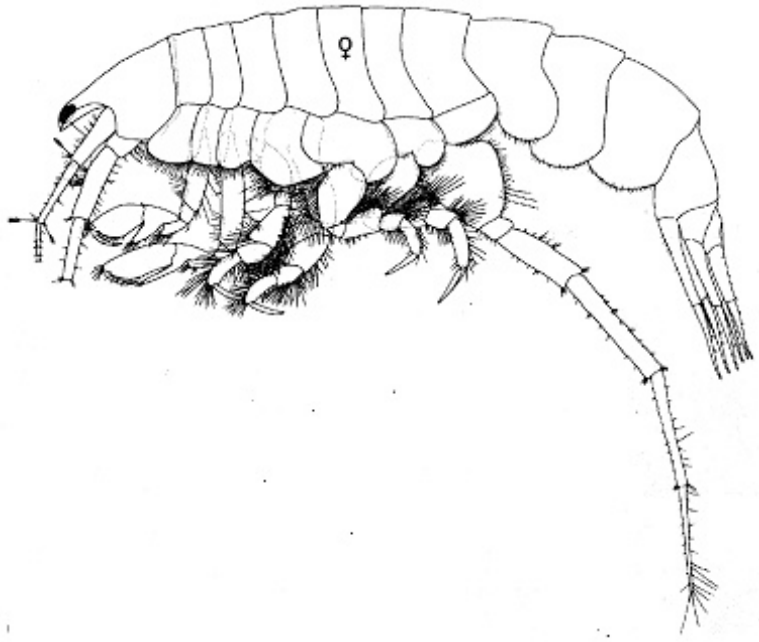
Coxal gills large, sac-like. Brood plates setose marginally and apically." (from Bousfield and Chevrier 1996)



Paroediceros lynceus (from www.msubiology.info)

Paroediceros – The circumarctic *P. lynceus* is the sole NEP representative of this taxon, an Arctic-Boreal genus with 5 species (J. L. Barnard and Karaman 1991). It is fully illustrated in Sars (1895, plt. 103). Members of this genus are very unlikely to penetrate further south than currently recorded, and will not occur in the SCB.

Diagnosis: **"***Cutting edge of mandible projecting and well toothed; molar medium, lacking ridges, subconical, bulging, setulose. Inner lobes of lower lip separate. Gnathopods somewhat diverse, moderately stout, large, carpus on gnathopod 2 with blunt strong posterior lobe projecting distalwards, guarding propodus, lobe becoming obsolescent on gnathopod 1; palm of both gnathopods oblique. Uropod 2 fully reaching end of rami on uropod 3. Uropod 3 well developed."* (from J. L. Barnard and Karaman 1991)



Rostroculodes longirostris (from Bousfield & Chevrier 1996)

***Rostroculodes** – The three NEP members of this genus are now known nearly exclusively from the Arctic, although *R. longirostris* has been reported in the grey literature from Juneau in the Alaskan panhandle (SE Alaska). They are relatively distinctive, with produced narrow rostra with nearly terminal eyes. None should be

expected to penetrate further into the boreal zone than the current record, and none will be taken in the SCB.

Diagnosis: *"Peraeon and pleon segments 2 & 3 smooth or weakly carinate mid-dorsally. Rostrum elongate, straight or slightly deflexed and bearing eyes apically or subapically. Antenna 1, peduncle slender, segment 2 distinctly longer than l, segment 3 very short; flagellum weakly callynophorate in male. Antenna 2, flagellum elongate in male.*

Mouthparts *(based on R. vibei Just): molar slender, apex small, weakly triturative, rimmed by cutting teeth; spine row with slender blades; left lacinia 5-dentate, incisor weakly dentate; palp slender, segment 2 & 3 subequal in length. Maxilla 1, outer plate with 7 apical spines; palp slender, tapering distally. Maxilla 2, inner plate small. Maxilliped, inner plate short, apically setose; outer plate tall, narrow, inner margin strongly spinose; palp segment 2 broad, distal margin subtruncate.*

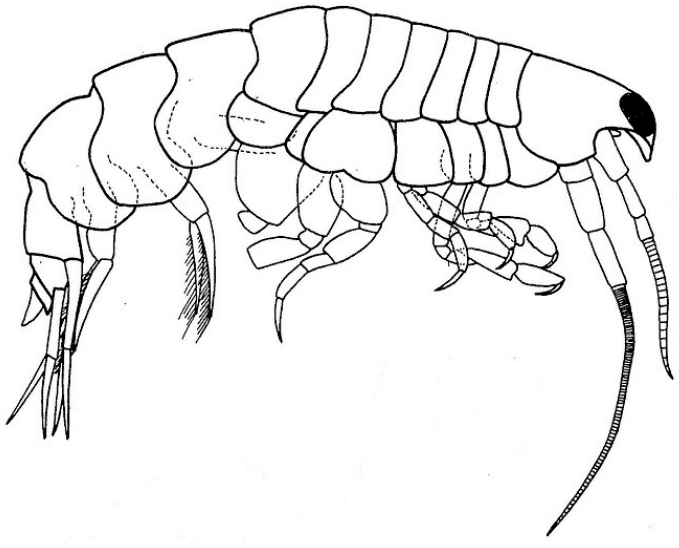
Coxa 3, lower margin shallowly incised. Coxa 4, not broadened, lower margin angular. Gnathopods regular, not sexually dimorphic. Gnathopod 1, carpal lobe large; propod relatively small, little longer than carpus, deflexed distally. Gnathopod2, basis medium to strongly setose anterodistally; carpal lobe medium strong, not reaching palmar angle; propod expanding and deflexed distally.

Peraeopods 3 & 4 fossorial; segment4 distally broadened and setose; dactyl large, thick, tips with minute chitinous rings .Coxa 5 medium deep, postero-lobate. Peraeopods 5 & 6 fossorial, segment 4 broadened, setose; dactyls elongate, thick, chitinous rings very small. Peraeopod 7, basis regularly broadened, tapering distally, not incised behind, lacking lower lobe; dactyl elongate, margins setose.

Pleon plates 2 & 3, hind corners obtuse or rounded. Uropods 1 & 2 rami subequal. Uropods 3, outer ramus slightly the shorter. Telson medium, apex truncate or slightly emarginate, weakly armed.

Coxal gills not described.

Brood plates elongate, slightly broadening distally, margins strongly setose." (from Bousfield & Chevrier 1996



Westwoodilla tone (from Jansen 2002)

Westwoodilla – J. L. Barnard and Karaman (1991) recognized 10 species in this genus, of which only *W. caecula* was reported from the NEP prior to the last few years. There is considerable variability within this taxon, and E. L. Bousfield believed it concealed several new species, with the North Atlantic *W. caecula* perhaps not even occurring in the NEP (Bousfield, personal communication). The review of the genus by Jansen (2002) rediagnosed European taxa, and described new ones previously identified as those taxa from other parts of the globe. Contrary to Bousfield's intuition, Jansen found only a single species of *Westwoodilla* in the NEP, which he described as *W. tone*. All local *Westwoodilla* are now treated as *W. tone*, following Jansen's conclusions.

Diagnosis: "*Head: Dorsal part slightly convex, ventral part forming large wide lobe, ventral margin convex; large anterodorsal rostrum with large, red, suboval, multifaceted eyes that meet dorsally; triangular process present anterior to eyes; suborbital arc large, ventral margin forming straight angle with ventral lobe. Pereon: Segments progressively increasing in length; segment 1 slightly lobate anteroventrally, ventral margins of segments 1-4 convex, ventral margins of segments 5-7 straight or nearly so. Pleosome: Segments increasing in size distally, epimeral plates rounded. Urosome: Segment 1 dorsal margin convex distally, posterior and ventral margins nearly straight. Upper lip: Subtriangular, about 1.3 times as wide as long. Mandible: Molar subcircular, surface pitted, margin serrate with few submarginal PS [plumose setae]. Lacinia mobilis in row with 3 PS; right bifid; left about as long as right but more robust and distally serrate. Incisor simple, smooth, oval and massive. Palp 3articulate. Maxilla 1: Inner plate suboval reaching to 2/3 of outer plate; apex with 2 moderate setae. Outer plate reaching to about 1/2 of palp article 2; distal margin with 1 serrate, 4 bifid and 4 simple stout setae flanked by 1 very short plumose tuft. Palp article 2 lateral margin convex with 1-3 SS [simple setae]; medial margin concave on proximal 1/2 and convex on distal 1/2 with row of 3 SS and distally with row of 3 stiff serrate setae. Maxilliped: Inner plate extending to about midpoint of palp article 1; inner margin straight with 1 SS subdistally; outer margin convex; distal margin straight. Outer plate reaching end of palp article 2; outer margin convex. Palp with 4 articles. Lower lip: Mandibular lobe in about 45° angle with outer lobe. Inner distal surface of outer lobe and mandibular lobe covered with minute slender setae. Inner lobe rounded.*

Gnathopod 1: Ischium subquadrate, 0.1-0.2 times as long as basis, 1.1-1.3 times as long as wide. Carpus slightly lobate, never guarding propodus. Propodus subchelate; posterior margin smoothly convex with 1 robust moderate SS subproximally, and distally with 1 shaped sickle shaped seta and 1 short thick submarginal seta. Dactylus 6.1-7.1 times as long as wide, 0.6 times as long as propodus, anterior margin with short SS proximally.

Gnathopod 2: As for Gl but dactylus 6.0-7 times as long as wide, 0.6-0.8 times as long propodus, anterior margin with short SS proximally.

Pereopod 3: Coxal plate subquadrate, 1.5-1 times as long as wide; posterior margin concave. Ischium quadrate, 0.2 times as long as basis, 0.91.2 times as long as wide. Merus 2.1-3.2 times as long as ischium 2.6-2.7 times as long as wide. Carpus 0.7-0.9 times as long as merus. Dactylus 0.9-1.2 times as long as propodus; proximal anterior margin with 1 short SS.

Pereopod 4: Coxal plate subquadrate, 1.2-1.5 times as long as wide. Ischium quadrate, 0.2 times as long as basis, 0.8-1.0 times as long as wide. Merus 3.1 times as long as ischium. Carpus 0.7-0.9 times as long as merus. Dactylus 0.8-1.3 times as long as propodus; proximal anterior margin with 1 short SS.

Pereopod 5: Coxal plate ventrally bilobed. Ischium quadrate, 0.2-0.3 times as long as basis, 0.6-0.8 times as long as wide. Merus 2.9-3.7 times as long as ischium. Carpus 0.6-0.7 times as long as merus. Propodus 1.1-1.4 times as long as carpus. Dactylus 1.1-1.5 times as long as propodus; posterior margin with 1 short SS proximally.

Pereopod 6: Coxal plate 0.9-1.2 times as wide as long; with anteroventral notch. Ischium 0.20.3 times as long as basis, 0.7-1.1 times as long as wide. Merus 3.0-3.5 times as long as ischium. Carpus about 0.7 times as long as merus. Propodus slender 1.3-1.4 times as long as carpus. Dactylus 1.0-1.2 times as long as propodus; posterior margin with 1 short SMS at proximal end.

Pereopod 7: Coxal plate suboval, 1.5-1.8 times as wide as long. Ischium quadrate, 0.1-0.2 times as long as basis, 0.6-0.9 times as long as wide. Merus 4.3-5.4 times as long as ischium. Carpus 0.9-1.3 times as long as merus. Propodus 1.0-1.2 times as long as carpus. Dactylus 0.8-0.9 times as long as propodus.

Pleopod 1: Peduncle 1.7-2.1 times as long as wide; distal margin medially with 2 short robust setae with hooks. Inner ramus nearly reaching end of outer one; article 1 with row of 3-4 bifid SS and 1 PS; following articles with 2 moderately long to long PS each. Outer ramus with 1-3 articles more than inner; articles (except 1st) with 2 moderately long to long PS each. Pleopod 2: As for pleopod 1 but peduncle 1.9 times as long as wide. Pleopod 3: As for pleopod 1 but peduncle 1.72.2 times as long as wide.

Uropod 1: Peduncle 1.1-1.3 times as long as inner ramus. Inner ramus 1.0--1.1 times as long as outer one. Uropod 2: Inner ramus 1.1-1.2 times as long as outer ramus. Uropod 3: Peduncle 0.8--0.9 times as long as inner ramus. Inner ramus 1.0--1.1 times as long as outer ramus. Telson: Ventral margin with symmetrical setation. From apex each side with 1 short SS, 1 moderate PS, and a pair of 1 moderate and 1 long PS." (from Jansen 2002)

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