

**Amphipoda of the Northeast Pacific** (Equator to Aleutians, intertidal to abyss): IX.  
Photoidea - a review Donald B. Cadien, LACSD  
22 July 2004 (revised 21 May 2015)

**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 Photoidea**

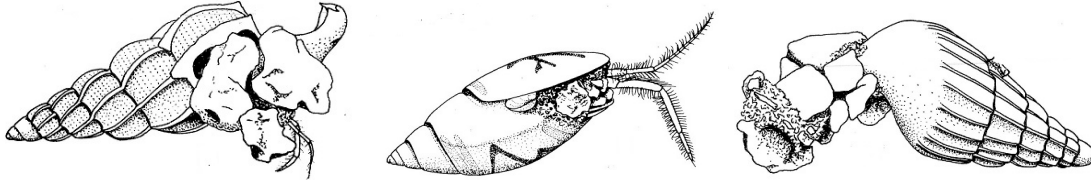
Over more than a century the position of the photids has been in dispute. Their separation was recommended by Boeck (1871), a position maintained by Stebbing (1906). Others have relegated the photids to the synonymy of the isaeids, and taxa considered here as photids have been listed as members of the Family Isaeidae in most west coast literature (i.e. J. L. Barnard 1969a, Conlan 1983). J. L. Barnard further combined both families, along with the Aoridae, into an expanded Corophiidae. The cladistic examination of the corophioid amphipods by Myers and Lowry (2003) offered support to the separation of the photids from the isaeids, although the composition of the photids was not the same as viewed by Stebbing or other earlier authors. The cladistic analysis indicated the Isaeidae were a very small clade separated at superfamily level from the photids, the neomegamphopids, and the caprellids within the infraorder Caprellida. The Isaeoidea contained only the single family Isaeidae, with two genera; *Isaea* and *Pagurisaea*, neither with NEP representatives. All species previously considered as isaeids regionally were relegated to other groups, principally the Photoidea. The positions adopted by Myers & Lowry in 2003 were further substantiated in their treatment of the Senticaudata (Lowry & Myers 2013).

**Diagnosis of the Photoidea**

“Head rectangular, anterior distal margin recessed, lateral cephalic lobe weakly to strongly extended; eye, if present, situated proximal to lobe, at least partly enclosed in extended lobe, or completely enclosed in extended lobe, anterior ventral margin weakly to moderately recessed and moderately excavate, or strongly recessed and strongly excavate. Antenna 1 peduncular article 3 almost always more than half, usually much more than half the length of article 2, rarely short (*Falcigammaropsis*), half or less length of article 2. Mandible palp variable. Gnathopod 1 variable. Gnathopod 2 in male larger than gnathopod 1, merus not enlarged. Pereopod 5 carpus long, subrectangular, or small, lunate or reniform. Pereopods 5-7 with or without accessory spines on anterior margin. Pereopod 7 longer or much longer than pereopod 6. Urosomite 1 and 2 coalesced or free. Uropods 1 and 2 peduncle with or without distoventral corona of cuticular spines. Uropod 3 peduncle variable, biramous, or uniramous; outer ramus with or without recurved spines. Telson with horizontal rows of recurved hooks, with patches of small denticles, or without hooks or denticles.” (Myers and Lowry 2003).

## Ecological Commentary

Species in the tribe Siphonoecetini of the subfamily Ischyrocerinae are domiciliary, making homes in broken shells, empty crab dactyls, or other structures of biological or abiotic origin. They sculpt these to their own requirements by building together fragments into a coarse tube, or extending a natural cavity by cementing sand grains or debris together into a domicile (a number of different domiciles constructed by *Siphonoecetes* are illustrated in J. L. Barnard and Thomas 1984). They carry this domicile around with them, much as a hermit crab carries its shell. Their walking is, however, accomplished largely with their long robust antennae rather than their short legs.



Domiciles of several species of *Caribboecetes*, with apertures extended to varying degree by constructions of amphipod secretions and sand grains/shell debris (from Just 1984)

Such domiciliary behavior is also noted in the other tribe within the subfamily Ischyrocerinae, the Ischyrocerini. Members of the genus *Cerapus*, also antennapedal, manufacture tubes as domiciles (J. L. Barnard et al 1991). Rather than use tubes permanently attached to the substrate, these animals temporarily attach to other things (rocks, wormtubes, algae, etc.) with amphipod silk produced by glands in pereopods 3 and 4. I have personally observed *Notopoma* sp A accumulated in the lee of onuphid worm tubes on shallow sandy bottoms in the SCB. Some were attached there, others loose and scrabbling to maintain their position. They seemed to be using the Venturi eddy in the current lee of the tube as a point of concentration of saltatory or drift particulate matter moving with the bottom nepheloid layer. The domiciles constructed by this species are straight, open at both ends, and constructed of carefully chosen organic material cemented together. A second species of *Notopoma* from the SCB constructs a similar domicile using somewhat different material.



*Cerapus* sp in their self-constructed agglutinated silt tubes, open at both ends. The animals crawl or swim carrying the tube with them (from J. L. Barnard et al 1991)

Some members of the Photidae are also known to construct domiciles. Carter (1982) describes modification and occupation of small gastropod shells by *Photis conchicola*. The shell modification is the construction of a soft amphipod-silk tube within the aperture of the gastropod shell. Such modified shells are carried about by the amphipod until a desirable attachment site is located. One or more attachments of amphipod silk are then spun, which serve as suspensory ligaments attaching the domicile to the substrate. A second member of the family has been recovered from non-motile domiciles constructed by attachment of amphipod-silk tubes within an empty test of a balanoid barnacle. This was constructed and occupied by *Gammaropsis tonichi* in a barnacle attached to a larger shell occupied by a hermit crab. This housing complex was recovered in a trawl off Palos Verdes. *Photis* tubes are frequently attached to relatively flimsy substrate such as filamentous algae or hydroid stems, and often come up in benthic samples with the animals still inside. It is not unusual in such cases to find a female with a hatching brood in a single tube. Whether the mancae remain within the tube for long after hatching is not known, but the possibility of parental care is worth investigating. Male/female pairs within individual tubes are also often encountered.



Epibionts on the branches of black coral. The fuzzy grey-brown growth along the branches is *Ericthonius rubricornis* tube masses (from Love et al 2007)

Construction of such sessile tubes is also characteristic of some Ischrocerinae, such as *Ericthonius*. Animals in this genus live in dense aggregations, and we see their tube masses on the skeletons of gorgonians in trawls off Palos Verdes. *Ericthonius brasiliensis* constructs dense tube masses in bays among other fouling organisms, while *Ericthonius rubricornis* is found on gorgonian skeletons, black coral skeletons (Love et al

2007), and other hard substrates offshore. These tubes tend to be basally attached to a common mat, and the animals move into and out of them at will.

Members of the Kamakidae (*Amphideutopus oculatus*) are also tube-builders (J. L. Barnard 1961), sometimes in communal masses, but more frequently as individual tubes attached to hard substrate along their long axis. Tube attachments are non-random, and are usually made by the organism with an eye to providing favorable locations for feeding on suspended particulates. This is probably why so many dense colonies of *Erichthonius* are found on erect structures such as gorgonian skeletons, which elevate them off the bottom into the current.

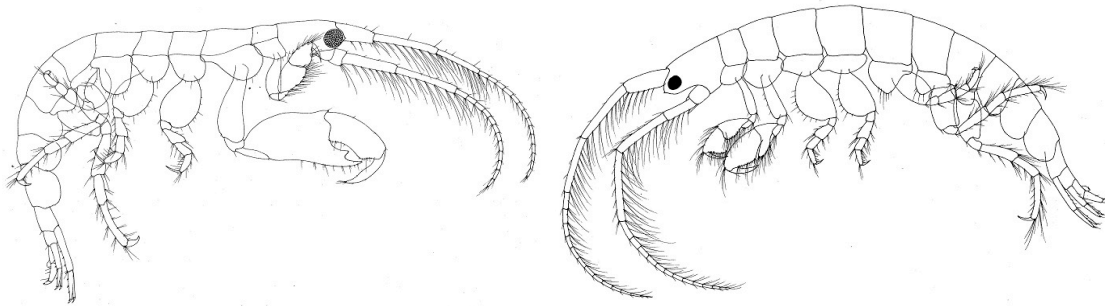
In some cases a specialized symbiosis is maintained between a photid species and a biological substrate. In one local case, an undescribed *Podoceropsis* is found in association with the box crab *Lopholithodes foraminatus*, where it builds its tubes along the underside of the carapace edge and between the tubercles on the legs of the crab. This crab has a habit of retracting the legs against the body and pumping water through gaps in the retracted legs to form a respiratory current. This provides a well-defined and reliable flow along particular pathways on the crab exoskeleton, which are chosen as attachment points for amphipod tubes. The amphipod is very occasionally found free living, but the relationship is basically obligate.

Similar relationships between other photids in the genus *Podoceropsis* have been previously noted, as the name *Podoceropsis chionoecetophila* attests. This species is taken in association with the Tanner Crab, *Chionoecetes tanneri*, where it lives among the egg mass of the crab (Conlan 1983). As crabs routinely ventilate their egg masses by abdominal flexure, a reliable current is generated as in the previous case. It is unlikely that the amphipods feed on the eggs themselves, although opportunistic carnivory has been observed for some similar corophioids (Myers and Lowry 2003). The deep water *Podoceropsis grasslei* also associates with a lithodid crab (Soto & Corona 2007). Several different species of amphipods, including photoids, were found to be associated with crabs in the Falkland Islands (Vader & Krapp 2005). *Podoceropsis nitida*, from the Atlantic, is also a crab associate, in this case hermit crabs (Vader 1971, Myers & McGrath 1982). Other photoids have also been reported associated with hermit crabs (Chevreux 1908, Vader & Myers 1998). Some ischyrocerids, particularly *I. anguipes* (Dvoretzky & Dvoretzky 2009), and *I. commensalis* (Dvoretzky & Dvoretzky 2011) are associated with crabs. Host species range from *Chionoecetes opilio* (Steele et al 1986), *Hyas araneus* (Vader 1996), and *Lithodes maia* (Dvoretzky & Dvoretzky 2008) through *Paralithodes camtschaticus* (reported by numerous authors).

Feeding methods within the corophioideans form a basic part of the evolutionary scenario proposed by Myers and Lowry (2003). The caprelloid clade, including all members of the Photoidea, are interpreted as specializing as passive suspension feeders, capturing current borne particles. Their morphology includes development of both antennae as feeding structures through lengthening the peduncular and flagellar articles and increasing setal density and/or length. The result is a feeding net for the capture of water borne particles. The anterior portion of the head was recessed around the antennal bases to allow broader lateral spread of the net.

This recession allowed the secondary development of antennapedalism in ischyrocerid and photid clades, which was accompanied by reduction in antennal setation and strengthening of the musculature supporting the antennae. The authors suggest that

within advanced members of the ischyrocerid clade a raptorial maxilliped palp has developed, and some forms (such as *Bonnierella*) may be ambush predators, having adapted beyond the original passive suspension feeding life-style.



*Ericthonius brasiliensis* male/female sexual dimorphism (from Lincoln 1979)

Within the photoids sexual dimorphism is the norm, with major differences found primarily in the chelae. The ischyrocerid clade member *Jassa* is a good example. The patterns of difference between males and females, and how these change with age/molt stages is explored by Conlan (1989, 1990). She found a similar pattern in *Microjassa* and related genera (Conlan 1995a, b). In both cases the “thumb”, an enlarged mid-propodal lobe of the second gnathopod of the male, becomes progressively enlarged with each molt. Based on the morphology of the second gnathopod males can easily be molt-staged. Such sexual differences can create problems for the environmental taxonomist, who finds that the females of many species are extremely similar; the species being distinguished almost exclusively on the secondary sexual characteristics of the male. Diligent search and abundant material can allow the more subtle characters that separate females to be fully understood, but much work remains to be done in this area.

**Key to NEP Photoid families and genera** (family separation modified from Myers & Lowry 2003) – drcadieu 21 May 2015

1. Uropod 3 peduncle long, more than 2x as long as broad.....2  
    Uropod 3 peduncle short, less than 2x as long as broad.....Kamakidae  
    (*Amphideutopus*)
2. Uropod 3 peduncle narrowed distally.....Ischyroceridae  
    (see separate key under the family for generic separation)  
    Uropod 3 peduncle parallel-sided.....Photidae (3)
3. Uropod 3 uniramous.....*Ampelisciphotis*  
    Uropod 3 biramous.....4
4. Uropod 3 with one ramus distinctly shortened.....8  
    Uropod 3 with rami subequal.....5
5. Accessory flagellum a minute button.....*Podoceroopsis*  
    Accessory flagellum formed of one or more normal segments.....6
6. Accessory flagellum of 3+ segments.....*Gammaropsis*  
    Accessory flagellum of 1-2 segments.....7

7. Uropod 3 peduncle shorter than rami.....*Megamphopus*  
 Uropod 3 peduncle longer than rami.....*Posophotis* ♀  
 8. Uropod 3 outer ramus of 1 article..... *Posophotis* ♂  
 Uropod 3 outer ramus of 2 articles..... *Photis*

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

Family Ischyroceridae

Subfamily Bonnierellinae

**Bonnierella californica** J. L. Barnard 1966 – Cascadia Abyssal Plain,

Oregon to San Diego Trough:1215-2820m

**Bonnierella palenquia** J. L. Barnard 1967 – off Baja California: 1095-1205m

**Bonnierella sp CS1** Cadien 2004§ - Cascadia Slope, off Newport, Oregon: 732-1372m

Subfamily Ischyrocerinae

**Alatajassa diversa** Conlan 2007 – Aleutian Ids., Alaska : 0m

**Alatajassa similis** Conlan 2007 – Alaska to Humboldt Co., Northern California: 0-1m

**Caribboecetes jenikarpae** Just 1984 – Zihuantanejo, Pacific Mexico; 0-2m

*Cerapus rubricornis* Stimpson 1853 (see *Erichthonius rubricornis*)

*Cerapus tubularis* CMPLX (see *Notopoma* sp A)

*Cerapus* sp A Cadien 1992§ (see *Notopoma* sp A)

*Cerapus* sp B Cadien 1992§ (see *Notopoma* sp B)

\***Erichthonius brasiliensis** (Dana 1853) – “Pantropical” in the Atlantic and Pacific; NEP from Puget Sound to Galapagos, Ecuador: 0.9-86m

*Erichthonius hunteri* of Barnard (see *E. rubricornis*)

\***Erichthonius rubricornis** (Stimpson 1853) – Arctic and Boreal North Atlantic, and North Pacific; NEP from at least Santa Maria Basin, Central California to SCB: 13-550m

\***Erichthonius sp A** SCAMIT 2012§ - Pt. Arena, Northern California to Cayucos, Southern California: 9-15m

*Erichthonius* sp IS 1 Cadien 2008§ (see *Erichthonius* sp A)

\***Erichthonius sp SD1** Pasko 1999§ - off Pt. Loma, Southern California: 19-85m

*Eurystheus ventosa* J. L. Barnard 1962 (see *Ventojassa ventosa*)

\***Ischyrocerus anguipes** Krøyer 1838 – NE & NW Atlantic, NWP; Barents Sea to SCB: 0-326m

**Ischyrocerus gurjanovae** Kudrjashov 1975 – NWP: 0-76m

**Ischyrocerus malacus** J. L. Barnard 1964 - Monterey Bay, Central California:1593m

*Ischyrocerus parvus* Stout 1913 (see *I. anguipes*)

\***Ischyrocerus pelagops** J. L. Barnard 1962 – San Francisco, Central California to SCB: 12-120m

**Ischyrocerus tuberculatus** (Hoek 1882) – Arctic NEP: depth ?

**Ischyrocerus tzvetkovae** Kudrjashov 1975 – NWP: 0-47m

**Ischyrocerus sp A** J. L. Barnard 1969 – SCB, Cayucos to La Jolla: 0-5m

- \***Ischyrocerus sp B** J. L. Barnard 1969 – SCB, Cayucos to La Jolla: 0-5m
- \***Ischyrocerus sp C** Paquette 1989 § - Shelter Cove, Northern California to Goleta, Southern California: 8-30m
- Jassa borowskyi** Conlan 1990 – Sea of Japan; British Columbia, Canada to Cayucos, California: 0-20m
- Jassa carltoni** Conlan 1990 – SCB: 0m
- Jassa marmorata** Holmes 1903 – NE and NW Atlantic, SE and SW Atlantic, Gulf of Mexico, Australia & New Zealand, China and Japan; NEP from Alaska to the SCB: 0-30m
- Jassa morinoi** Conlan 1990 – NE and SE Atlantic, Mediterranean, Japan; British Columbia, Canada to SCB: 0-7m
- Jassa myersi** Conlan 1990 – SCB: 0m
- Jassa oclairi** Conlan 1990 – Aleutian Islands to British Columbia, Canada: 0-12m
- Jassa shawi** Conlan 1990 – British Columbia, Canada to SCB: 0m
- \***Jassa slatteryi** Conlan 1990 – NE Atlantic, SW and SE Atlantic, Mediterranean, Japan, Korea, Chile; Queen Charlotte Ids., British Columbia, Canada to SCB, Galapagos: 0-40m
- Jassa staudei** Conlan 1990 – British Columbia, Canada to SCB: 0-82m
- \***Microjassa barnardi** Conlan 1995 – Mouth of the Columbia River, Oregon to SCB: 0.5-52m
- Microjassa boreopacifica** Conlan 1995 – SE Alaska to Vancouver Id., British Columbia, Canada: 0-61m
- \***Microjassa bousfieldi** Conlan 1995 – Santa Maria Basin, Central California to Palos Verdes, Southern California: 90-172m
- Microjassa chinipa* J. L. Barnard 1979 (see *Neoischyrocerus chinipa*)
- Microjassa claustris* J. L. Barnard 1969 (see *Neoischyrocerus claustris*)
- \***Microjassa litotes** J. L. Barnard 1954 – Torch Bay, Alaska to SCB: 0-44m
- Microjassa macrocoxa** Shoemaker 1942 – Bahia de San Quintin, outer coast of Baja California to Bahia de Los Angeles, Gulf of California, Mexico: 0-54m
- Microjassa sp A* Conlan 1995a (see *M. bousfieldi*)
- Neoischyrocerus chinipa** (J. L. Barnard 1979) – Galapagos Ids., Panama: 0-9m
- \***Neoischyrocerus claustris** (J. L. Barnard 1969) – SCB: 0-8m
- \***Notopoma sp A** SCAMIT 2013§ - SCB, Goleta to Tijuana: 5-196m
- Notopoma sp B** (Cadien 1994§) – Pt. Loma, San Diego, Southern California: 0m
- Parajassa angularis* Shoemaker 1942 (see *Ruffojassa angularis*)
- Pseuderichthonius sp A* of Dickinson 1976 – San Diego Trough: 1200-1244m
- Pyctilus brasiliensis* Dana 1853 (see *Erichthonius brasiliensis*)
- Ruffojassa angularis** (Shoemaker 1942) – Carmel, Central California to Bahia Magdalena, Baja California: 0-30m
- Ventojassa ventosa** (J. L. Barnard 1962) – SCB: 0m
- Family Kamakidae  
 Subfamily Aorchinae
- \***Amphideutopus oculatus** J. L. Barnard 1959 – Pt. Conception to Costa Rica: 2-162m

Family Photidae

- \***Ampelisciphotis podophthalma** (J. L. Barnard 1958) – Pt. Sal, Central California to SCB: 12-90m
- Eurystheus spinosus Shoemaker 1942 (see Gammaropsis spinosa)
- Eurystheus tenuicornis var lobata Shoemaker 1942 (see Gammaropsis shoemakeri)
- Eurystheus tenuicornis Shoemaker 1942 (see Gammaropsis thompsoni)
- Eurystheus thompsoni Walker 1898 (see Gammaropsis thompsoni)
- Eurystheus tonichi J. L. Barnard 1969 (see Gammaropsis tonichi)
- \***Gammaropsis barnardi** Kudryashov and Tzvetzkova 1975 – (see Podoceropsis barnardi )
- Gammaropsis dubia** (Shoemaker 1942) – Costa Rica: 20-30m
- Gammaropsis ellisi** Conlan 1983 – SE Alaska to British Columbia, Canada: 0-72m
- Gammaropsis effrena** (J. L. Barnard 1964)- Corona del Mar, Southern California: 0
- \***Gammaropsis mamola** ( J. L. Barnard 1962) (see Megamphopus mamola)
- \***Gammaropsis martesia** (J. L. Barnard 1964) – Carmel, Central California to the outer coast of Baja California, Mexico: 0-84m
- Gammaropsis miri** Vinogradov 1994 – Northeast Pacific: 2152m
- Gammaropsis ocellata** (Conlan 1994) – Cascadia Slope, Oregon, to Santa Maria Basin, Central California: 590-732m
- \***Gammaropsis shoemakeri** Conlan 1983 – Vancouver Id., British Columbia, Canada to Magdalena Bay, Outer coast of Baja California, Mexico: 0-27m
- \***Gammaropsis spinosa** (Shoemaker 1942) - Vancouver Id., British Columbia, Canada to the Gulf of California, Mexico: 0-44m
- \***Gammaropsis thompsoni** (Walker 1898) – SE Alaska to Bahia de Los Angeles, Gulf of California, Mexico: 0-150m
- \***Gammaropsis tonichi** ( J. L. Barnard 1969) - Palos Verdes, California through the Gulf of California, Mexico: 0-38m
- Gammaropsis sp A of Dickinson 1976 – Cascadia Abyssal Plain, Oregon: 2813-2824m
- Gaviota podophthalma J. L. Barnard 1958 (see Ampelisciphotis podophthalma)
- Megamphopus mamola** J. L. Barnard 1962 – Monterey to San Diego: 25-60m
- Megamphopus martesia J. L. Barnard 1964 (see Gammaropsis martesia)
- \***Photis bifurcata** J. L. Barnard 1962 – SE Alaska to SCB: 0-224m
- \***Photis brevipes** Shoemaker 1942 – Prince William Sound, Alaska to Bahia de los Angeles, Gulf of California, Mexico: 0-190m
- \***Photis californica** Stout 1913 – Monterey Bay, Central California to Bahia de los Angeles, Gulf of California, Mexico: 0-196m
- \***Photis chiconola** J. L. Barnard 1964 – Monterey Bay, Central California: 1382-1549m
- \***Photis conchicola** Alderman 1936 – Mukkaw Bay, Washington to La Jolla, southern California: 0-151m
- Photis elephantis** J. L. Barnard 1962 – Corona del Mar, southern California to the



head of the Gulf of California, Galapagos Ids.: 0-6m

**Photis kurilica** Gurjanova 1955 – Cascadia Abyssal Plain, Oregon: 2813-2824m

\***Photis lacia** J. L. Barnard 1962 – British Columbia, Canada to SCB: 7-196m

\***Photis linearmanus** Conlan 1994 – Purissima Pt. Central California to SCB: 14-148m

\***Photis macinerneyi** Conlan 1983 – Vancouver Id., British Columbia, Canada to SCB: 0-61m

\***Photis macrotica** J. L. Barnard 1962 – Monterey Bay, Central California to Bahia San Cristobal, outer coast of Baja California, Mexico: 55-160m

**Photis malinalco** J. L. Barnard 1967 – Head of the Gulf of California, Mexico to Ecuador, Galapagos Ids.: 0-6m

\***Photis parvidons** Conlan 1983 – British Columbia, Canada to SCB: 0-394m

**Photis spinicarpa** Shoemaker 1942 – Bahia Magdalena, west coast of Baja California: 20-30m

**Photis typhlops** Conlan 1994 – Cascadia Slope, Oregon to Santa Barbara, Southern California: 188-2005m

\***Photis viuda** J. L. Barnard 1962 – Santa Cruz Id., Southern California to Bahia San Cristobal, outer coast of Baja California, Mexico: 37-400m

\***Photis sp A** MBC 1972§ - SCB: 28.1-63m

\***Photis sp B** Paquette 1987§ - SCB: 24.8-83m

\***Photis sp C** MEC 1972§ - SCB to Ensenada, Baja California, Mexico: 34-192m

\***Photis sp E** SCAMIT 1995§ - Off Pt. Loma: 138m

Photis sp F SCAMIT 1995§ (see *Photis conchicola*)

\***Photis sp OC1** Diener 1992§ - SCB to Northern Baja California, Mexico: 12-152m

**Photis sp OC2** Pasko 2013§ - SCB: 54-60m

Photis sp SD7 (see *Photis parvidons*)

**Photis sp SD9** Pasko 1999§ - Pt. Loma, San Diego, Southern California: 0m

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

**Podoceropsis amchitkensis** Conlan 1983 – Aleutian Ids., Alaska: 0m

**Podoceropsis angustimana** Conlan 1983 – British Columbia, Canada: 11-72m

**Podoceropsis barnardi** (Kudryashov and Tzvetskova 1975 ) - NWP; Vancouver Id., British Columbia, Canada: 17-100m

**Podoceropsis chionoecetophila** Conlan 1983 – Bering Sea to Palos Verdes Peninsula, Southern California: 36-600m

*Podoceropsis dubia* Shoemaker 1942 (see *Gammaropsis dubia*)

**Podoceropsis grasslei** Soto and Corona 2006 – Guaymas Basin, Gulf of California, Mexico: 2000-2100m

*Podoceropsis ocellatus* Conlan 1994 (see *Gammaropsis ocellata*)

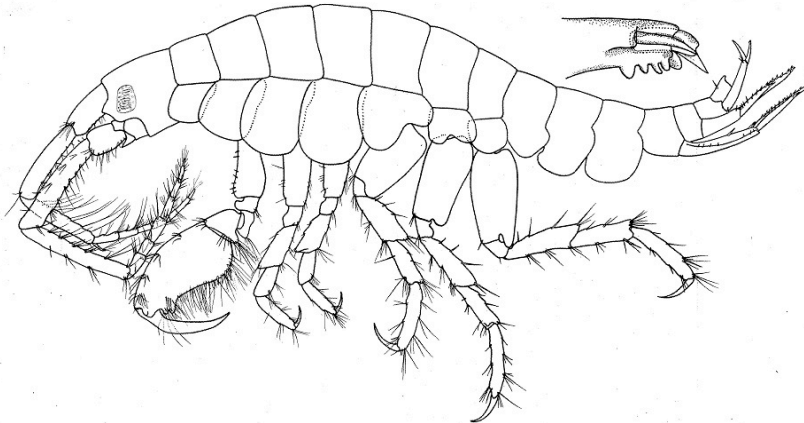
\***Podoceropsis ociosa** (J. L. Barnard 1962) – SCB: 0.8-190m

**Podoceropsis setosa** Conlan 1983 – Aleutian Ids., Alaska: 0m

**Podoceropsis sp A** Cadien 1992§ - SCB: 61-137m

**Posophotis seri** J. L. Barnard 1979 – Head of the Gulf of California, Mexico to Panama, Galapagos Ids.: 0-6m

## Comments by Family



*Ischyrocerus malacus*, with detail of the spinose tip of the 3<sup>rd</sup> uropods found in many ischyrocerids (from J. L. Barnard 1964)

**Family Ischyroceridae** – The family is divided into two subfamilies, the Bonnierellinae and the Ischyrocerinae, both represented in the NEP. The Ischyrocerinae is by far the more diverse, itself being divided into two tribes, the Ischyrocerini and the Siphonoecetini. The Ischyrocerinae is defined as having recurved spines on the outer ramus of uropod 3, a character used in the past to distinguish the entire family. Within the subfamily one of the tribes (the Siphonoecetini) has lost this character. Both subfamilies, and both tribes within the Ischyrocerinae, are represented in the NEP fauna. The Ischyrocerinae has 40 world-wide genera; 17 in the Ischyrocerini and 23 in the Siphonoecetini.

We have eleven genera from this family represented in the SCB; *Alatajassa*, *Caribboecetes*, *Erichthonius*, *Ischyrocerus*, *Jassa*, *Microjassa*, *Neoischyrocerus*, *Notopoma*, *Ruffojassa*, *Ventojassa*, and the deep water *Bonnierella*. There is not currently a key available to separate them all. I will attempt to provide one below.

Key to the genera of Ischyroceridae in the NEP (modified from J. L. Barnard 1973)  
dcadien – 22 April 2015

1. U2 lacking, U3 without rami.....*Caribboecetes*  
U2 present, U3 with 1-2 rami.....2
2. U3 with 1 ramus, or with 2 rami of which 1 is vestigial.....3  
U3 with 2 fully developed rami.....5
3. U2 with 1 ramus..... *Notopoma*  
U2 with 2 rami.....4
4. Telson bearing pads of recurved cusps dorsally..... *Erichthonius*  
Telson with a row of hooks posteriorly on each side of the telson ....*Alatajassa*
5. Article 2 of Per 5-7 linear; article 4 of mxpd palp clawlike and larger than article 3.....*Bonnierella*  
Article 2 of Per 5-7 subovate or broadly rectangular; article 4 of mxpd palp shorter than article 3 and blunt or subconical.....6
6. Article 5 of G1 much longer than article 6.....*Ventojassa*  
Article 5 of G1 as long as or shorter than article 6.....7

7. Accessory flagellum a small scale.....*Ruffojassa*  
Accessory flagellum multisegmented and elongate.....8
8. Coxae 5 and 6 subequal in length; coxa 1 half as long as coxa 2.....*Microjassa*  
Coxa 5 much longer than 6; coxa 1  $\frac{3}{4}$  as long as coxa 2.....9
9. Outer ramus of U3 with basally immersed hooked terminal spine; distolateral margin of ramus with 2-4 large reverted cusps.....10  
Outer ramus of U3 immersed spine, if present, never hooked; distolateral margin of ramus with 0-7+ perpendicular, small blunt denticles...*Ischyrocerus*
10. Urosomite 1 with dorsal pair of erect setae; distodorsal margin of U3 peduncle with a series of stout spines.....*Jassa*  
Urosomite 1 lacking dorsal setae; distodorsal margin of U3 peduncle with a single or a pair of stout spines.....*Neoischyrocerus*

Description: “**Head** free, not coalesced with peraeonite 1; exposed; as long as deep, or longer than deep, or deeper than long; anteroventral margin moderately recessed or strongly recessed, anteroventral margin deeply excavate or shallowly excavate; rostrum present or absent, short or moderate or long; eyes present, well developed or obsolescent, or absent; not coalesced; 1 pair; not bulging. Body cylindrical, or subcylindrical, or laterally compressed; 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 shorter than article 3, or subequal to article 3, or longer than article 3; peduncular articles 1-2 not geniculate; accessory flagellum present, or absent; antenna 1 callynophore absent. **Antenna 2** present; short, or medium length, or long; 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 absent.

Mouthparts well developed. Mandible incisor dentate; lacinia mobilis present on both sides; accessory setal row without distal tuft; molar present, medium, triturative; palp present. Maxilla 1 present; inner plate present, weakly setose apically or without setae; 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, 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 or as long as broad or broader than long, overlapping or discontinuous, coxae not acuminate. **Coxae 1-3** not successively smaller, **none vestigial or coxa 1 reduced or coxa 1 vestigial.** Coxae 2-4 none immensely broadened.

Gnathopod 1 sexually dimorphic, or not sexually dimorphic; smaller (or weaker) than gnathopod 2, or subequal to gnathopod 2, or larger (or stouter) than gnathopod 2; vestigial, hidden or partially hidden by coxa 2, or smaller than coxa 2, or 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;

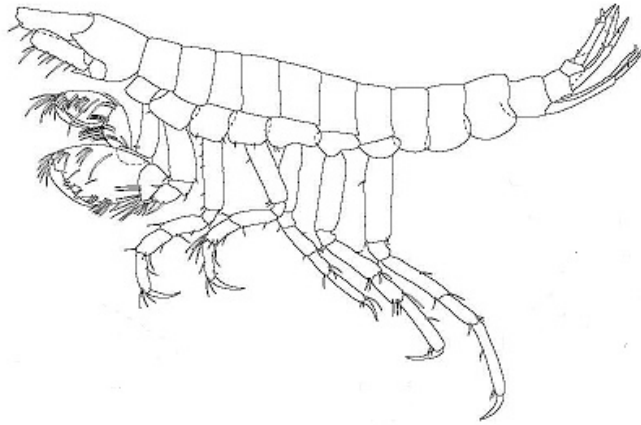
*gnathopod 1 not produced along posterior margin of propodus; dactylus large. Gnathopod 2 sexually dimorphic, or not sexually dimorphic; simple, or carpochelate, or subchelate; coxa smaller than but not hidden by coxa 3, or subequal to but not hidden by coxa 3; ischium short; merus not fused along posterior 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, not produced along posterior margin of propodus.*

*Peraeopods heteropodous (3-4 directed posteriorly, 5-7 directed anteriorly) or homopodous (3-7 directed posteriorly), none prehensile. Peraeopod 3 well developed. Peraeopod 4 well developed. 3-4 with glandular basis, or 3-4 not glandular; 3-7 without hooded dactyli, 3-7 propodi without distal spurs. Coxa well developed, longer than broad or as long as broad; carpus shorter than propodus or longer than propodus, produced anteriorly or not produced; **dactylus well developed**. Coxa subequal to coxa 3, acuminate ventrally or not acuminate, with well developed posteroventral lobe or without posteroventral lobe; carpus not produced. Peraeopods 5-7 with few robust or slender 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 or subequal to coxa 4 or larger than coxa 4, with posterodorsal lobe or without posterior lobe; **basis** expanded or slightly expanded, **subrectangular**, without posteroventral lobe; merus/carpus free; carpus linear, or reniform; setae absent. Peraeopod 6 shorter than peraeopod 7, or subequal in length to 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, or different in structure to peraeopod 6; with 7 articles; 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 dorsoventrally flattened, or not dorsoventrally flattened; urosomites 1 to 3 free, or 1 and 2 free, 3 coalesced with telson, or 1 and 2 coalesced, 3 coalesced dorsally with telson; urosomite 1 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 radically dissimilar in structure and size, or 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. Uropod 3 not sexually dimorphic; **peduncle elongate**; outer ramus shorter than peduncle or subequal to peduncle, 1-articulate, with recurved spines or without recurved spines. **Telson thickened dorsoventrally**; deeply cleft, or moderately cleft, or weakly cleft, or entire; longer than broad, or as long as broad, or broader than long; apical robust setae absent.” (Lowry and Springthorpe 2001).*

Subfamily Bonnierellinae - The subfamily contains only two genera, one occurring in the NEP. This genus, *Bonnierella*, is found world-wide in deep water, and local representatives are not found more shallowly than 700m.



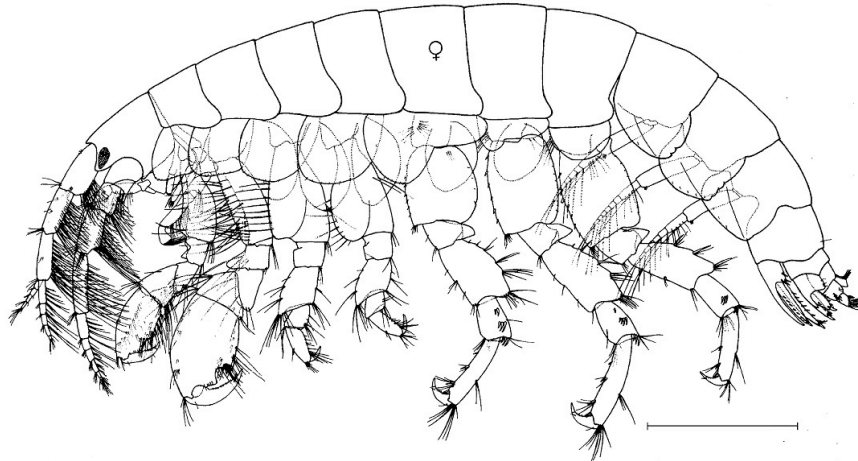
*Bonnierella linearis* (from Souza-Filho & Serejo 2014)

**Bonnierella** – A moderate sized genus of deep-sea ischyrocerids recently monographed by Souza-Filho & Serejo (2014). These authors added two new species to the genus, and provided an updated comprehensive key. *Bonnierella linearis californica* [retained at subspecies level in Barnard and Karaman 1991] was described by Barnard (1966a) from the Tanner Basin off the SCB. This has been raised to full specific status in Lowry (2015c). Barnard (1967) also described *B. palenquia* from the Baja Abyssal Plain somewhat to the south. An apparently different (based on male gnathopod configuration) undescribed species is found off Oregon. Barnard gave a key to the described members of the genus in his 1967 paper, now superseded by that of Souza-Filho & Serejo (2014).

Diagnosis: “*Antenna 1 subequal to antenna 2; peduncular article 1 long and rectangular; article 1 longer than article 2. Eyes absent. Mandibular palp well developed and 3-articulate. Gnathopod 1 carpus shorter than propodus. Gnathopod 2 subchelate in both sexes; carpus shorter than propodus. Coxae 1–7 wider than long. Coxa 4 posterior margin not excavated. Pereopods 3–7 basis rectangular. Pereopod 4 merus equal to merus of pereopod 3. Pereopod 5 similar to pereopods 6 and 7; carpus long, subrectangular, and without denticles or spines on posteroventral margin. Pleosomite without lateral ridges. Peduncle of pleopods slender and not expanded. Pleopod 2 inner ramus present, as long as outer ramus. Urosomite 1 without dorsal spines. Uropod 1 peduncle with acute interamal process; outer margin of outer ramus smooth. Uropod 2 biramous; outer margin of rami smooth, with robust setae. Uropod 3, outer ramus with recurved spines (only visible with high magnification). Telson without hooks or denticles.*” (from Souza-Filho & Serejo 2014)

Subfamily Ischyrocerinae- Most of the NEP diversity in the subfamily is concentrated in the Tribe Ischyrocerini (7 genera), with 3 genera in the Tribe Siphonoecetini.

**Alatajassa** – A two member endemic genus in the NEP, both species occurring in the Aleutians. One of these extends far to the south, reaching Humboldt Bay in Northern California.



*Alatajassa similis*. Scale bar 1mm. (from Conlan 2007)

*Diagnosis:* “Head: rectangular; lateral cephalic lobe extended, apically rounded, partly enclosing the eye; anteroventral margin strongly recessed.

*Antenna 1:* shorter than antenna 2; both antennae with long filtering setae on the posterior margins; antenna 1 with article 3 as long as article 1; accessory flagellum 3¼-4¼ articles (¼ article a small button relative to the others), flagellum shorter than articles 1-3 combined.

*Antenna 2:* without spines distally, flagellum shorter than articles 4-5 combined.

*Upper lip:* ventral margin not cleft.

*Mandible:* with strong molar, molar flake, incisor, and lacinia mobilis; with 4-11 spines in spine row; palp large and strongly setose, article 3 oblique, about equal in length to article 2.

*Lower lip:* with short setae on distal and facial margins; outer lobe, inner margin evenly convex, without distal slit.

*Maxilla 1:* inner plate with a few short setae; palp with facial row of setae.

*Maxilla 2:* without facial row of setae.

*Gnathopods 1 and 2:* ischium with small anterior wing-like expansion.

*Gnathopod 1:* coxa 80% the size of and similar in shape to coxa 2; palm obliquely transverse or excavate and defined by long spine. *Gnathopod 2:* propodus about 1.5× as large as gnathopod 1; palm excavate and defined by long spine, little sexually dimorphic.

*Pereopods 3-4:* merus extending halfway over carpus; propodus 80% the length of merus; dactyli short, tips rounded and with gland pore.

*Pereopods 5-7:* similar in size and shape; basis increasingly more rectangular posteriorly, with a cluster of setae at the junction of the coxa; ischium posteriorly flanged; carpus with 2-3 clusters of spines posterolaterally.

*Epimera 1-3:* with mediolateral crease.

*Pleopod 1:* sexually dimorphic, peduncle anteriorly and medially incurved to form a channel.

*Urosomite 1:* with pair of short setae on posterior dorsal margin.

*Uropod 1:* peduncle with posterodistal spinous process as long as outer ramus; inner ramus with distal setae in addition to spines.

*Uropod 2:* posterodistal spinous process 0.5-1× length of outer ramus.

*Uropod 3:* uniramous; peduncle short, with 2 clusters of spines dorsally; ramus

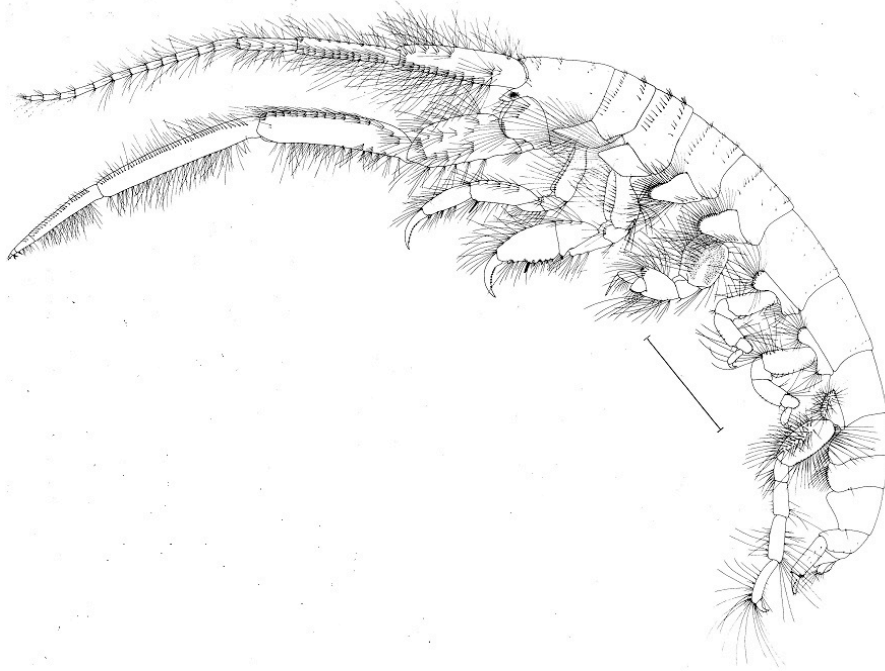
about 75% length of peduncle, with numerous dorsally directed spines, those most distally as long as or longer than the ramus.

*Telson:* with several hooks on each dorsolateral corner, accompanied by numerous spines directed dorsally between the hooks.

*Gills:* simple, oval, on pereopods 2-6.

*Sternites:* without sternal spines.

*Brood plates:* broader basally than apically, with long, hook-tipped setae.” (from Conlan 2007)



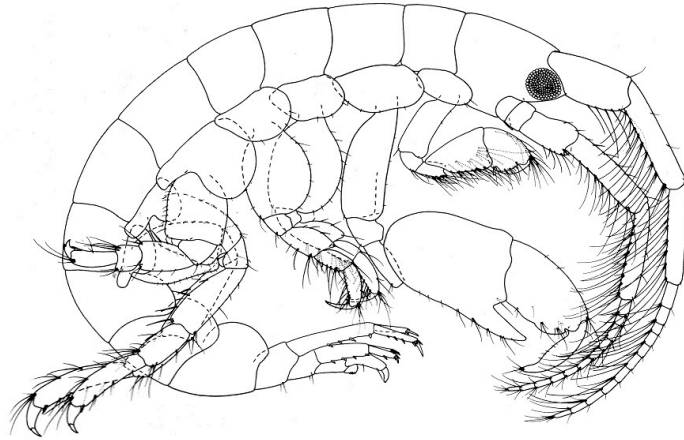
*Caribboecetes jenikarpae* (from Just 1984)

**Caribboecetes** – Just (1983) created a new subfamily of the Family Corophiidae, the Siphonoecetinae. This was transferred to the family Ischyroceridae by Myers and Lowry (2003), and down-graded to a tribe within the subfamily Ischyrocerinae. One member of this genus is taken in the NEP, *Caribboecetes jenikarpae* Just 1984 from southern Mexico. Although I have not seen these animals alive, I have observed other members of the genus in the Caribbean. They have very large antennae, and use them for locomotion: that is, they are antennapedic. The species I observed lived in very coarse shell hash, and was quiescent below the surface among the interstices of the debris when the sediment was agitated. Once it settled and disturbance ceased, the animals fairly rapidly crawled about within the upper levels of the bottom, apparently searching for particulate detritus within the interstices of the shell hash. While not identified at the time, it is likely that this species was *Caribboecetes barbadensis*. This species is not as large as *C. jenikarpae*, which is likely to be equally if not more active. It is described as living in debris accumulated between ripple marks on fine sand beaches.

Diagnosis: “Urosomite 2 free. Urosomite 3 and telson fused dorsally. Uropod 1 biramous, inner ramus 1/3 or less the length of outer ramus. Uropod 2 absent. Uropod 3 with unexpanded peduncle, ramus absent. Rostrum pointed, straight or curved. Pereopods 1 and 2 simple. Dactylus of pereopods 5-7 without accessory tooth. Coxal

plates 3 and 4 with dentate distal margin and a short, pectinate seta in each indentation. Oostegites on pereopods 2-5. Gills on pereopods 4-6.” (from Just 1983)

[**Cerapus**] – Despite numerous mentions in the literature, this genus is not represented in the NEP. Local animals ascribed to *Cerapus* have proven to belong in *Notopoma*, and are discussed under that genus.



*Ericthonius rubricornis* male (from Myers & McGrath 1984)

**Ericthonius** – like both *Cerapus* and *Notopoma*, *Ericthonius* has a modified telson which bears a field of denticles on its posterior dorsal surface. These are fairly obscure in *Cerapus* and *Notopoma*, but are quite prominent in *Ericthonius*, looking almost like thin velcro pads glued to the top of the telson. Although I usually identify our two *Ericthonius* species based on the antennae, eyes and gnathopods, the telson specialization is a very useful confirmatory character for the genus.

We have two described species which occur in the SCB, both broadly ranging: *E. brasiliensis* and *E. rubricornis*. Conlan (1995a) treats the latter species, providing good illustrations and description and recapping the nomenclatural history in her synonymy. It is as *E. hunteri* in Barnard 1962. Lincoln (1979) also provides a good representation of this species. Our second local species is *E. brasiliensis*. While *E. rubricornis* is the offshore form we normally take in all but our shallowest samples, *E. brasiliensis* is found among fouling organisms in bays and harbors. It also shows up in shallow sublittoral samples now and then, but is not very frequent outside embayments. Since it can, like some other corophioids (notably *Laticorophium baconi*) form fouling encrustations on ship hulls there is always a chance that *E. brasiliensis* will show up offshore as a ship supplied contaminant. Barnard distinguished between these two with the following couplet (from his Light’s Manual key, J. L. Barnard 1975):

Article 5 of male gnathopod 2 with apical tooth bifid.....*E. brasiliensis*  
 Article 5 of male gnathopod 2 simple.....*E. hunteri* [now = *rubricornis*]

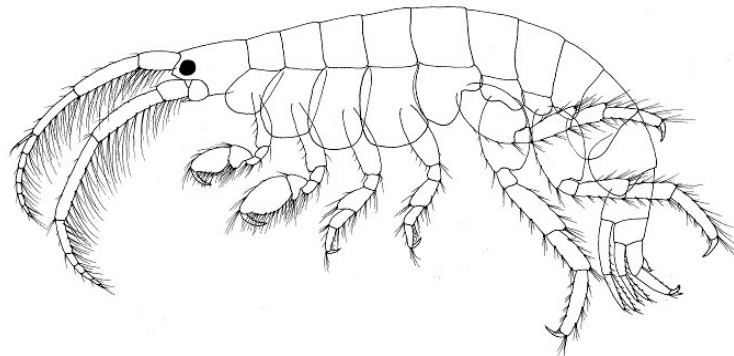
Females can be distinguished by eye-color (*brasiliensis* bright red in life fading to pale in preservation while *rubricornis* have black eyes). Stebbing in his 1906 key also uses the male character to separate the two species, and no one else seems to provide female characters other than eye color to separate the two. The name *E. brasiliensis* is currently carried on WoRMS (Lowry 2015e) as a synonym of *E. punctatus*. Krapp-



Schickle (2013) addressed this issue, and concluded that the error arose from incorrect synonymies in the European literature. If the two are in fact synonyms, *E. brasiliensis* would have priority. Myers & McGrath (1984) treat both species as valid, and provide characters for their separation. McLaughlin et al (2005) provide a questionable record for *E. difformis* in the NEP without specific location. Until this can be substantiated further, the species is not viewed as occurring in the study area. Myers & McGrath (1984) show the distribution of the species as exclusively European.

Two provisional species are also reported from the NEP, both occurring in the SCB. One of these, *Erichthonius* sp A (formerly *E. sp IS1*) is easily distinguished from all others as it has a vestigial inner ramus on the 3<sup>rd</sup> uropod. While closely resembling *Erichthonius*, this is such a basic structural difference that the species should probably be removed to a new genus. It can also be separated from *E. rubricornis* and *E. brasiliensis* by eye color, which is clear. The second provisional, *E. sp SD1*, is much more similar to described forms, particularly *E. brasiliensis*. It differs consistently in smaller size at maturity (2-3mm), in the shapes of both male and female coxae 1 and 2, and in the longer basis of the male second gnathopod.

Diagnosis: “*Body depressed, especially in male. Coxal plates short and scarcely contiguous; plate 2 and 5 longer than rest. Head elongate, lateral lobes very large, prolonged, apically acute. Mouthparts basic; upper lip entire, lower lip with inner lobes well developed; mandible with large triturative molar, palp robust, distal article broad, setose; maxilliped inner and outer plates well developed, palp slender. Antennae subequal, slender, ventral margins with long setae; accessory flagellum absent. Gnathopod 1 in male and gnathopods 1-2 in female subchelate; gnathopod 2 in male very large and complexly carpocheate. Pereopods 3-4 basis broadly oval. Uropods 1-2 biramous, spinose; uropod 3 uniramous, ramus much shorter than peduncle, apex with minute reverted denticles. Telson broad, bilobed, surface minutely spinulose.*”



*Ischyrocerus anguipes* female (from Lincoln 1979)

**Ischyrocerus** – – The boundaries of this genus have widened and then shrunk over the years as new species were described, and later new genera were added to which those species were transferred from *Ischyrocerus*. The genus is currently large, with 42 species deemed valid. It is very broadly distributed worldwide, and has representatives from the intertidal zone to depths of over 2000m.

We have four species listed under *Ischyrocerus* in Ed. 9 (Cadien & Lovell 2014), *I. anguipes*, *I. pelagops*, *I. sp B*, and *I. sp C*. *Microjassa litotes*, which was listed by Barnard & Karaman (1991) as among species assigned to the genus, was re-removed to

*Microjassa* by Conlan (1995). *Ischyrocerus pelagops* was described by J. L. Barnard (1962), and sp B was characterized by J. L. Barnard 1969. *Ischyrocerus* sp C should probably be removed from the list because, although it was examined and discussed at a SCAMIT meeting, no voucher sheet was ever produced. Many specimens provided from Northern California by Tony Chess were examined during the meeting. Carol Paquette's records are from Goleta, which extends the range into our area. The species can be distinguished from other local *Ischyrocerus* by the structure of the male G2.

McLaughlin et al (2005) record three species of *Ischyrocerus* as occurring on the Pacific Coast of North America which are here viewed as extralimital; *I. gurjanovae*, *I. tzvetkova*, and *I. tuberculatus*. The first two were described by Kudrjashov (1975) from the NWP, and have no authenticated records from the NEP. The third, *I. tuberculatus* does occur in the Arctic NEP, but above the Aleutians, and so outside the coverage area.

There is an *Ischyrocerus* species from deeper water, *I. malacus* of J. L. Barnard 1964, which should probably be compared with the other species. Barnard (1962) has opined that *I. parvus* of Stout 1913 from Laguna is the same as “the *I. minutus* phase of *I. anguipes* Krøyer”. As there are no records of *I. parvus* anywhere after Stout, it seems that Barnard's interpretation is probably the appropriate one, although he later considered that his *Ischyrocerus* sp A (Barnard 1969) might be *I. parvus*. Lowry (2015f) retains it as a valid species, probably as a conservative position pending further investigation.

The status of *I. anguipes* itself has been questioned. Chapman (2007) regards it as a likely sibling species complex. Synonymization of *I. minutus* with *I. anguipes* (Stebbing 1906) has been both followed and disputed subsequently. Walker (1898) recorded *I. minutus* from Puget Sound, but provided no particulars, no illustration, and no description. J. L. Barnard (1954a), while discussing *I. anguipes* from Oregon, placed Walker's record of *I. minutus* into the synonymy of *I. anguipes*, presumably based on Stebbing (1906). King & Holmes (2004) have disputed the synonymy based in part on reexamination of Sars material from the North Atlantic. They found the two were fully separable, and that *I. minutus* was not just a smaller southern form of *I. anguipes*. Confusingly Lowry (2015f) both retains *I. minutus* and *I. anguipes* as valid taxa, and notes that *I. minutus* is accepted as a synonym of *I. anguipes*. There are similarities between J. L. Barnard's (1969) *Ischyrocerus* sp B, and *I. minutus* as illustrated by Sars (1895) and King & Holmes (2004), particularly in the presence of small denticulations along the margin of the shaft of the terminal spine of U3 outer ramus. His *I. sp B* animals are also more robust at smaller size than his *I. anguipes*, as would be expected of *I. minutus* as interpreted by King & Holmes. The status of earlier NEP records is thus in doubt, and the possibility that we have both species, or *I. minutus* rather than *I. anguipes* regionally remains uninvestigated. Given this unsettled nomenclature, no key to the genus is offered here.

Diagnosis: “Body slender, depressed, especially in male. Coxal plates contiguous, moderately large; plate 1 about as long as plate 2; plate 4 not emarginate posteriorly; plate 5 with large anterior lobe. Antennae variable, strongly setose on posterior margins, peduncle robust, flagellum short; antenna 1 peduncle article 3 longer than 1; accessory flagellum small but distinct, 1 or 2-articulate. Gnathopod 2 in female slightly larger than 1; in male gnathopod 2 very large, propodus without process on proximal margin of palm. Pereopods 3-4 small. Pereopods 5-7 robust, spinose and setose. Uropods 1-3

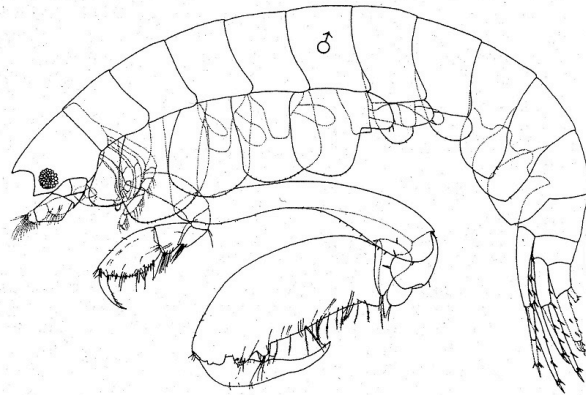
*biramous; uropod 3 peduncle elongate, robust, rami short, outer ramus with group of reverted denticles.*" (from Lincoln 1979)

**Jassa** – - The genus *Jassa* was monographed by Conlan (1990). The nine species recorded from the NEP can be compared with all other members of the genus using her key. *Jassa* has an elaborate ontogenetic change pattern, particularly in males. Their gnathopods undergo some extreme modification with increasing maturity. Conlan presents all this, and it is of value to internalize the process so it can be used to view development in other corophioids, although the pattern of change differs between genera.

Diagnosis: "*Body slender, depressed, especially in male. Coxal plate 1 more than three-quarters length of plate 2; plate 4 not emarginate posteriorly; plate 5 longer than plate 6. Antenna 1 and 2 variable, strongly setose on posterior margins, peduncle large, flagellum short; accessory flagellum small but distinct, 1 or 2-articulate. Mouthparts basic. Gnathopod 2 much larger than 1 especially in male; gnathopod 2b' propodus with palm delimited by large proximal process. Pereopods 3-4 basis broad; pereopods 5-7 successively longer. Uropods 1-3 biramous; uropod 3 peduncle robust, elongate, rami short, outer ramus with hooked apical spine and 1-3 reverted denticles. Telson triangular.*" (from Lincoln 1979)

**Microjassa** – This genus is even more recently monographed than *Jassa*, by Conlan 1995. She reviews the nomenclatural history as well as fully keying both females/juveniles and males of the four NEP species along with the known species worldwide. We get three species...*M. litotes*, *M. barnardi*, and *M. bousfieldi* in the SCB. *M. macrocoxa* has not been reported from our area, but occurs just to the south and could show up (especially in the San Diego area) during strong ENSO events. Conlan treats it fully, but if you wish to see the OD go to Shoemaker (1942).

Diagnosis: "*Antenna 1, accessory flagellum 1 article. Coxa 1 and especially cox? 5 half or less the depth of coxae 2-4; coxa 4 posteriorly excavate. Gnathopods 1 and 2 and pereopods 5-7, face of dactyl not serrated. Adult male with stridulating nodules or ridges on basis of gnathopod 2 and associated ridges on medial face of coxae 2 or 3.*" (from Conlan 1995)

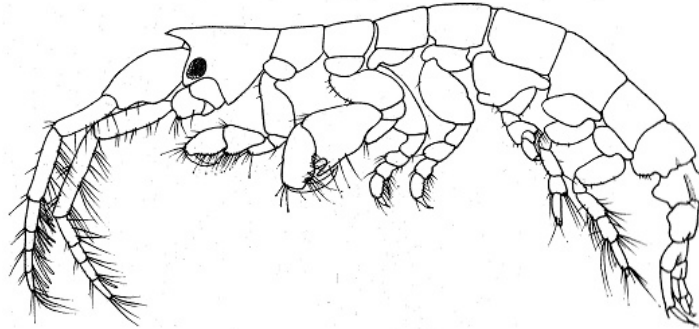


*Neoschyrocerus claustris* (from Conlan 1995)

**Neoschyrocerus** – This genus was described in the same paper in which Conlan (1995) monographed *Microjassa*. It was carved out of the *Ischyrocerus/Microjassa* block and contains only one species which occurs in the SCB, *Neoschyrocerus claustris*, as well as a second regional species *N. chinipa* from further south. Barnard described this in 1969 as *Microjassa*, where it remained until transferred to *Neoschyrocerus* by Conlan.

The other two species in the genus are from Hawaii and Cuba. Conlan (1995) provides a key to the members of the genus.

Diagnosis: “*Antenna 1, accessory flagellum 2 articles (second minute). Coxa 1 and especially coxa 5 more than half depth of coxae 2-4; coxa 4 not posteriorly excavate. Gnathopods 1 and 2 and pereopods 5-7, face of dactyl serrated. Adult male without stridulating nodules or ridges on basis of gnathopod 2 and associated ridges on medial face of coxae 2 or 3.*” (from Conlan 1995)



*Notopoma* sp A male (as *Cerapus tubularis* in J. L. Barnard 1962)

**Notopoma** – Fifteen species are described in the genus world-wide, with two provisional forms known from the NEP. Animals in this genus are tubicolous, and the two undescribed species which occur in SCB waters differ in the tube they construct. Both forms have been relegated to *C. tubularis* in the past (e.g. J. L. Barnard 1962). More recent investigations (Morino 1976, Lowry & Thomas 1991) have shown that a number of undetected species lurk under the broad interpretation of Say’s *C. tubularis*. With the reexamination and more detailed description of material from the first reviser (the types are lost) by Lowry & Berents 1989, who designated a neotype, the sibling species and misidentified taxa from around the world could begin to be separated. Extensive groups of species in the genus have been found in the tropics, and we have two distinctly different forms which occupy different habitats locally. By far the most common is *Notopoma* sp A, which is from shallow sublittoral sandy bottoms in the SCB. The second form, *Notopoma* sp B, is known so far from a single collection from surfgrass root sievings intertidally on Point Loma. All material of this has been forwarded to Jim Thomas in Florida, who is working on a revision of the *Cerapus* group from the Americas along with Jim Lowry.

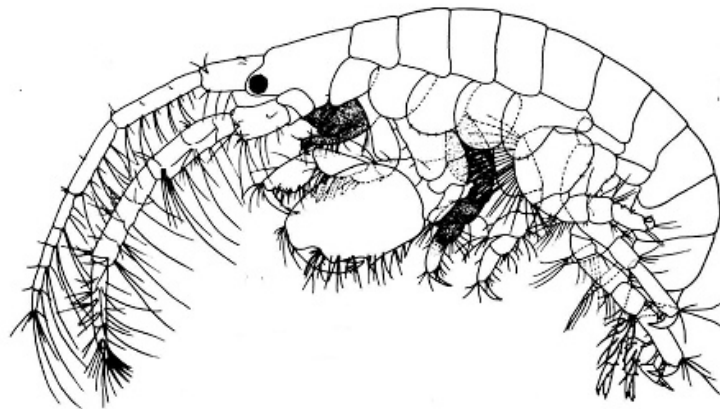
*Notopoma* sp A has (as far as I have been able to tell) unique configuration of the head, and may prove sufficiently different that it requires a new genus. The animals are antennapedic, using the robust first antennae to drag themselves and their tubes (which are not attached) around on the sandy sediments where they live. The animals concentrate, either actively or passively, around flow interrupters on the bottom (typically tubes of onuphid polychaetes such as *Diopatra*). I assume they are surface detritivores and benefit from being in the polychaete tube proximity both by being able to hold on to the tube (and avoid being washed away in the surge and/or current) as well as by the abundance of organic particles which are captured by the “sticky” water in the flow boundary around the tube.

The special structures of the head all seem related to the antennapedism of the animal, as they are structural reinforcements to restrict cuticle flexion and provide more

rigid points for strong basal muscle attachments for antenna 1. They involve a network of anastomosing ridges surrounding the insertions of the first antennae, which are connected to a subrostral spine at their nexus. A ridge runs up to the underside of the rostrum from this spine. The spine also serves as a “lock” for the antennal bases when the animal draws the antennae within the tube and rotates them so that their expanded first articles form an operculum to close the tube. Quite an elaborate system. The genus *Bathypoma* (Lowry & Berents 1996) from bathyal depths in Tasmania also can form an operculum from the antenna 1 basal article, but differs in other respects. Operculum formation is not mentioned for other genera in the *Cerapus* clade.

The tube of *N. sp A* is typically dark brown, and is banded with lighter brown bands (often with reddish tinges – Barnard called this the rusty tube). It is relatively short, not much longer than the animal itself. Notes on *sp. B* are mislaid, and I took them long ago (and have relinquished the specimens to others), but I remember their tubes as lighter in color and both narrower and a bit longer than those of *N. sp A*. There are differences in the ornamentation of the urosome in *sp B*, but I can’t recall the details unfortunately.

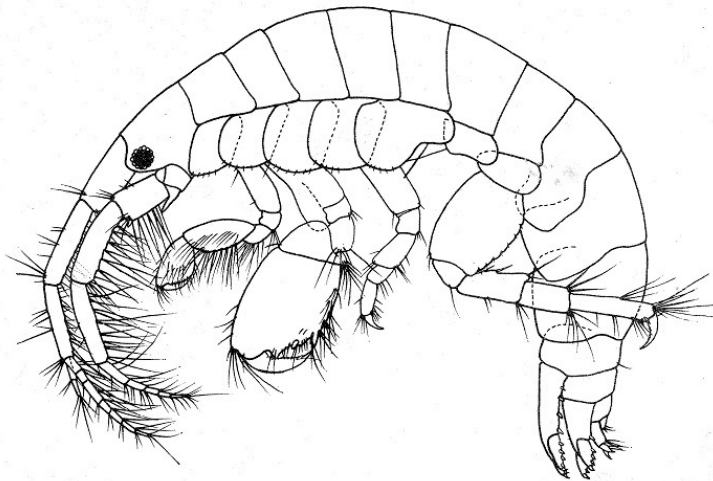
Diagnosis: “*Antenna 1: peduncular article 1 with dorsodistal flange partially overlapping article 2 and produced medially to form an operculum; without accessory flagellum. Mandibles: left incisor with 4-5 teeth; left lacinia mobilis with 4 teeth; left accessory setal row with 3-4 broad robust setae and 0-3 intermediate plumose setae; right incisor with 4-5 teeth; right lacinia mobilis with 1 large tooth and a minutely denticulate margin; right accessory setal row with 2 robust setae and 2 plumose setae; mandibular palp short, broad. Maxilla 1: outer plates each with 7-10 setal-teeth. Gnathopod 2: carpochelate in male, subchelate in female. Peraeopods 3 to 7; dactyli all directed posteriorly. Peraeopod 4: merus short, not expanded posteriorly. Peraeopod 5: coxa in female subequal or larger than in male, without fringe of long setae; dactylus with large unguis and 1-2 small accessory spines. Peraeopod 6 dactylus with large unguis and 2 small accessory spines. Peraeopod 7: dactylus with large unguis and 1-2 small accessory spines. Pleopod 2: inner ramus reduced, 1-articulate or pleopod uniramous. Pleopod 3: one reduced 1-articulate ramus or pleopod absent. Uropod 2 with one ramus. Uropod 3 with one vestigial ramus bearing small recurved spines.*” (from Lowry & Barents 1996)



*Ruffojassa angularis* (from J. L. Barnard 1970)

**Ruffojassa** – There is a single species in this genus in the NEP, *R. angularis*. It is a shallow water algal associate. It is not uncommon in the SCB, but we don't sample the habitat during monitoring. It is well described and figured in Barnard 1962. Lowry (2015a,b), while retaining both *Parajassa* and *Ruffojassa* as valid genera, completely revises the treatment of Vader and Myers (1996). He does not include *R. angularis*, designated as type by Vader and Myers, in the genus, returning it instead to *Parajassa* along with all but one of the species allocated to *Ruffojassa* by Vader and Myers in 1996. Their intent was to restrict *Parajassa* to only its type *P. pelagica*, transferring all other taxa previously placed in *Parajassa* to their newly created genus. No rationale is provided by Lowry for this action, which, since it fails to include the type of *Ruffojassa* within the genus, is on the face of it incorrect. This position is disregarded here (it is not a nomenclaturally available action anyway, not being officially published), with *Ruffojassa* construed as designed by Vader & Myers 1996.

Diagnosis: “Accessory flagellum absent; coxae relatively shallow; coxa 1 not obscured by coxa 2; coxa 2 in male, broader than deep; coxa 4 unexcavate posteriorly; coxa 5 anterior lobe very large, as deep as coxa 4, posterior lobe very small; uropod 3 peduncle with several long wire-setae on outer margin, outer ramus straight with single distal unhooked spine or lacking spine; telson lacking cusps.” (from Vader and Myers 1996)



*Ventojassa ventosa* (from J. L. Barnard 1962)

**Ventojassa** - Another monotypic genus in our area. The type was originally described as *Eurystheus ventosa* by Barnard 1962. He later created the genus *Ventojassa* for it (Barnard 1970). This is an intertidal species associated with sponges and algae

Diagnosis: “Ischyrocerid with normal-sized overlapping coxae, coxa 1 not reduced, coxa 5 as long as 4 and much longer than coxa 6; gnathopod 2 larger than 1; pereopods 3-5 simple, second articles ovate, trapezoidal or slightly broadened, not narrowly linear; fourth articles of approximately equal breadth; palp articles 5 and 6 gnathopod 1 subequal in length; outer plate of maxilla 1 with 9 or more spines; accessory flagellum elongate, 2 or 3-articulate; gnathopod 2 similar in both sexes with oblique palm defined by a cusp and with 1-2 other palmar teeth, and 2 large palmar spines, but not like that of *Jassa* male with enormous proximal palmar tooth; outer ramus of uropod 3 in adults with 1-3 mediomarginal setae, apex slightly hooked, and bearing 2 (occasionally 3) immersed setules.” (from J. L. Barnard 1970)

**Family Kamakidae** – While the family is divided into two subfamilies, Aorchinae and Kamakinae, by Myers and Lowry (2003), only a single member of the Aorchinae occurs in the NEP.

Diagnosis: “Head lateral cephalic lobe weakly extended, or strongly extended, eye, if present, situated proximal to lobe or completely or partially enclosed in extended lobe; anteroventral margin moderately to strongly recessed and moderately excavate. Mandible palp article 3 asymmetrical, distally rounded, setae extending along most of posterodistal margin, or subsymmetrical with setae mostly distal. Gnathopod 2 in male larger than gnathopod 1, merus not enlarged. Pereopods 5-7 not subchelate. Pereopod 7 slightly longer than pereopod 6. Urosomites not coalesced. Uropod 3 peduncle short, parallel-sided; outer ramus without recurved spines. Telson without hooks or denticles.” (Myers and Lowry 2003).

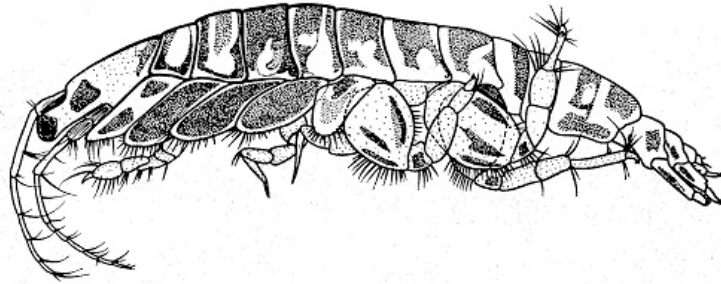


*Amphideutopus oculatus* (photo: SCCWRP from [www.boldsystems.org](http://www.boldsystems.org))

**Amphideutopus** - Although Conlan (1983) includes this genus in her key, she does not treat it in the species accounts (or in the Atlas). There is a single species locally, *A. oculatus*, one of a geminate pair with the second in the Caribbean (*A. dolichocephala*). Because its distribution is essentially restricted to the SCB it does not appear in Light’s Manual, or other works dealing with the northern fauna. It is quite common, and easily recognized based on the configuration of the head and eyes (both sexes very similar). The male gnathopods are also helpful, much more so than the female gnathopods. There is some similarity to the appearance of *Ampelisciphotis*, but the eyes, rather than being borne on long anterior protrusions of the anterior head lobe and thus running alongside the antennal peduncles, are borne on a short lobe which is defined by a deeply incised insertion of the second antenna. Erection of the genus and description of the species is in Barnard 1959, but see Barnard 1961 for a whole animal illustration.

Diagnosis: “Base of antenna 2 attached to lower surface of head well behind the eyes ; article 3 of mandibular palp stout, shorter than article 2, truncated; mandibular processes of lower lip acute, slightly attenuated; first gnathopod of male larger than second, complexly chelate ; gnathopod 2 subchelate, in the male article 5 slightly shorter than 6; female gnathopods like those of the genus *Ailicrodeutopus* Costa; uropod 3 with two subequal rami ; telson simple.” (from J. L. Barnard & Reish 1959)

**Family Photidae** – Diagnosis: “Head lateral cephalic lobe weakly extended or strongly extended, eye, if present, situated proximal to lobe or completely or partially enclosed in extended lobe; anteroventral margin moderately to strongly recessed and moderately excavate. Mandible palp article 3 asymmetrical, distally rounded, setae extending along most of posterodistal margin, or subsymmetrical with setae mostly distal. Gnathopod 2 in male larger than gnathopod 1, merus not enlarged. Pereopods 5-7 not subchelate. Pereopod 7 slightly longer than pereopod 6. Urosomites not coalesced. Uropod 3 peduncle short, with sides expanded, or long, parallel-sided or narrowing distally. Telson without hooks or denticles.” (Myers and Lowry 2003).



*Ampelisciphotis podophthalma* (from J. L. Barnard 1958)

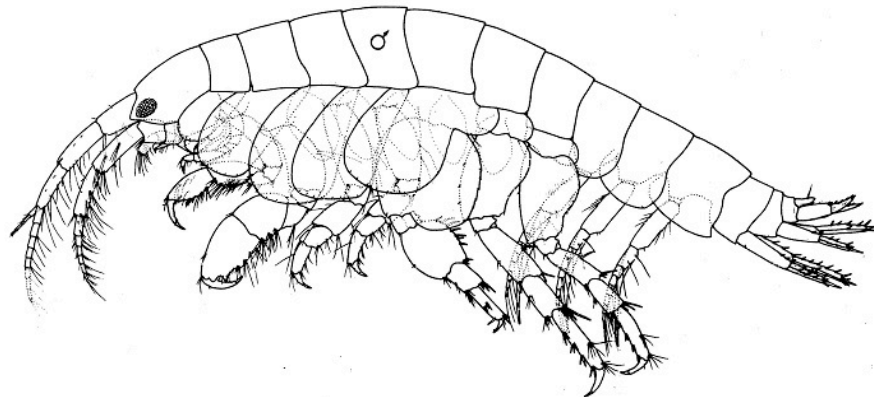
**Ampelisciphotis** – a single species, *A. podophthalma*, is found locally. It was described as type of a new genus *Gaviota* by J. L. Barnard (1958). This later proved synonymous with Pirlot’s *Ampelisciphotis*. Too bad, it was a great name. This animal, with its elongate “eyestalks” and compact photis-like body is immediately recognizable. Consult the original description for details, or Conlan in the Atlas (1995).

Diagnosis: “Female. Body cylindrical, slightly depressed, smooth, urosomites free, urosomite 1 ordinary. Head as long as pereonites 1-2 together. Rostrum vestigial, supra-antennal line present, ocular lobes elongate, very produced forward, blunt; antennal sinus deep. Eyes medium, on apex of ocular stalks. Antennae subequal, short, both very slender, peduncular article 3 of antenna 1 as long as or longer than 1, article 2 longest, accessory flagellum absent. Antenna 2 peduncular article 3 scarcely to moderately elongate. Epistome unproduced anteriorly. Labrum subrounded, incised. Mandible normal, palp long, very slender, article 3 thinly clavate, shorter than 2. Labium with entire outer lobes, with well-developed inner lobes, mandibular lobes short or long, pointed or blunt. Inner plate of maxilla 1 tiny, mammilliform, with 2 apical setae, outer plate with 7 spines, palp 2-articulate. Plates of maxilla 2 rather broad, inner plate with mediofacial row of setae. Inner plate of maxilliped with distal spines, outer plate normal, not reaching apex of palp article 2, with spines on medial margin, palp with 4 articles, article 2 long, article 3 unlobed, article 4 very short, with long setae. Coxae relatively long, contiguous or overlapping, of various shapes, progressively shorter from 1 to 4,



*coxa 1 not dilated but produced forward sharply, often coxa 4 shorter than coxa 1, not lobed, coxa-5 nearly as long as 4, coxae 6-7 much smaller than anterior coxae!*  
*Gnathopods 1-2 scarcely diverse, of subequal size, feeble, gnathopod 1 poorly subchelate, article 5 long (type), unlobed, palm oblique. Gnathopod 2 slightly enlarged, weakly subchelate, with article 2 slightly dilated, article 4 slightly enlarged, article 5 slightly shorter than 6, barely lobed, article 6 weakly dilated, dactyl ordinary.*  
*Pereopods 3-4 similar, with weakly inflated article 2, article 4 slightly dilated, article 6 elongate and tapering, almost naked, dactyls short. Pereopods 5-7 similar to each other, progressively longer, with broad article 2, or occasionally narrow in male pereopod 7, dactyls geniculate, very small on 5 or 6, longer on 7, with accessory spines on inner margin. Sternal processes of thorax absent. Coxal gills [undescribed]. Pleopods [undescribed]. Epimeron 3 not bisinuate. Uropods 1- 2 biramous, stout, rami slightly unequal, much shorter than peduncle, not hooked, peduncles lacking ventrodistal process. Uropod 3 very short, uniramous, single ramus short, obtuse and setose distally, peduncle barely dilated medially. Telson entire, short, broader than long, pentagonal, pointed, with cusp and lateral patch of setules on each side. Oostegites narrow, present on segments[?2-5].*

**Male.** *Gnathopods small, gnathopod 2 .larger than 1, subchelate; article 2 of pereopod 6 with 2-3 posteroventral cusps not present in female.” (from J. L. Barnard & Karaman 1991)*



*Gammaropsis spinosa* (from Conlan 1983)

**Gammaropsis** – There has been disagreement as to the generic bounds of *Gammaropsis*. Some treat *Podoceropsis* as a subgenus of *Gammaropsis* (as did Conlan in 1995), others elevate it to generic rank. I prefer the latter course (as does Conlan 1983), and follow it here. Souza-Filho & Serejo (2014) did not take a position on the issue, but Lowry (2015d) treats the two as separate genera. The provisional species *Gammaropsis* sp A from the Cascadia Abyssal Plain remains without indication; no illustrations, no description, only the ecological information provided by Dickinson (1976). It is included as an indication of regional diversity in the genus.

We encounter several species of *Gammaropsis* in the SCB, but *G. thompsoni* is by far the most common, the others are only occasionally seen and usually in association with infrequently sampled habitats. Conlan provides a key to the genus which contains species we may encounter as well as several species now placed in other genera. Absent from her key are *G. martesia*, and *G. effrena*, *G. ociosa*, *G. ocellatus*, and *G. miri*. According to Conlan (1995) *ociosa* and *ocellatus* are *Podoceropsis* species so we need

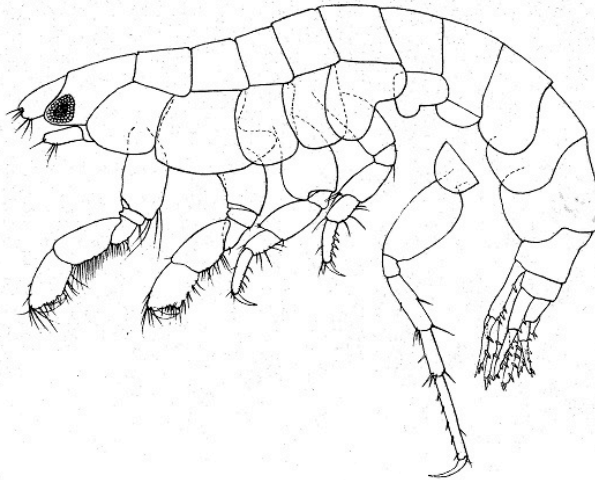
not worry about their absence from the key. Her key is thus comprehensive except for *G. miri*, *G. martesia* and *G. effrena*. (Note: in the second part of the first couplet, the character should be “article 5  $\frac{1}{2}$  to  $\frac{3}{4}$  the length of article 4, not the reverse).

*Gammaropsis miri* need not concern us unless we are examining material from abyssal hydrothermal vents.

*Gammaropsis effrena* would fall out in couplet 6, where it would form part of a triplet. The additional description would be “Gnathopod 2 (male) not greatly heavier than gnathopod 1, segment 5 as long as segment 6, posterior margin half the length of the anterior margin and not lobate; Uropods 1 and 2, rami subequal or shorter than the peduncle; Uropod 2 lacking a peduncular spinous process. Uropod 3, outer ramus both laterally and terminal setose.....*G. effrena*.”

*Gammaropsis martesia* would also fall into couplet 6, and its accommodation there would create a quartlet rather than a couplet. Removal of *G. ventosa* from the key, as it is now *Ventojassa* rather than *Gammaropsis*, would return 6 to a triplet. The added text would be: “Gnathopod 2 (both sexes) greatly heavier than gnathopod 1, segment 5 shorter than segment 5 and bearing a posterior lobe; Uropods 1 and 2, longest ramus longer than peduncle; Uropod 2 lacking peduncular spinous process; Uropod 3, outer ramus setose both medially and laterally.....*G. martesia*”

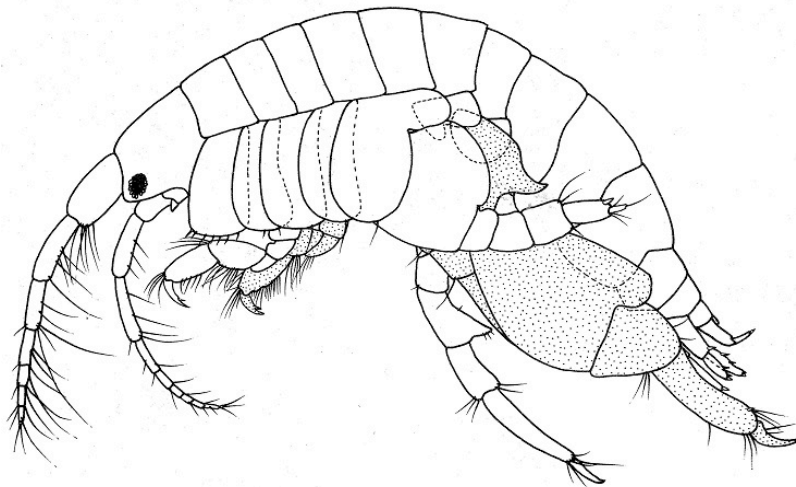
Diagnosis: “*Body not dorsoventrally depressed. Head lobe acute, antenna 1 sinus deep. Eye medium to large, oval, lenticular or reniform. Antenna 1, peduncular segment 3 as long as segment 1, accessory flagellum multisegmented; flagellum 1 longer than flagellum 2. Upper lip, epistome usually produced. Mandibular palp quite broad, segment 3 often clavate; molar with up to 6 raker spines. Maxilla 1 inner plate usually setose. Maxilla 2 bearing facial setae. Coxae often short, lower margins not setose, not shallowing posteriorly. Coxa 1 not produced forward; coxae 1 and 2 (0) usually not shallower than coxae 3-5; coxa 3 (a) lacking stridulation ridges. Gnathopod 1, segment 5 not produced into a posterior lobe; palm and dactyl variable. Gnathopod 2 (♂), segment 2 lacking stridulation ridges; segment 5 usually shorter than Segment 6, length of posterior margin variable; palm not incised. Peraeopods 3 and 4, length of segment 4 variable; dactyl short. Peraeopod 5 (a), segment 2 not posterodistally notched; segment 4 normal; dactyl lacking an accessory tooth. Peraeopods 6 and 7 similar in form to but generally longer than peraeopod 5; segment 2, hind margin not setose; segment 5 bearing comb spines. Pleopods normal. Epimera 1-3 sometimes posterodistally notched and bearing a lateral ridge, this occurring in conjunction with dorsal cusping of the urosome. Uropod 1 bearing a peduncular spinous process; uropods 1 and 2 terminating in a group of spines. Uropod 3 ordinary or with peduncle elongate; outer ramus one-segmented, terminating in spines or setae (outer ramus two segmented in some Hawaiian species (Barnard, 1970), but not in regional species); inner ramus half or more the length of the outer. Telson bearing a pair of small apical cusps or strong spines. Brood plates medium, oval or leaf-shaped; setae dense, hook-tipped.” (from Conlan 1983)*



Male *Megamphopus mamola* (from J. L. Barnard 1962). Note the distinctive posterior lobe of the second coxa, which is lacking in the female.

**Megamphopus** – Several regional photids were first described in this genus, or were placed in it at one time or another as the generic concepts within the family were reinterpreted. There is currently only a single species in the genus in the NEP, *M. mamola* (Lowry & De Broyer 2015b).

**Diagnosis:** “Head with lateral lobes strongly produced, subocular cephalic margin very strongly recessed. Mandibular palp art 2 > 3 ; A 1 art 3 > 1 ; accessory flagellum composed of one long and one rudimentary terminal art ; coxa 2 largest, coxae 3-7 relatively shallow ; male Gn 1-2 subchelate ; male Gn 2 greatly enlarged ; female Gn 2 differing little from Gn 1 ; U3 rami longer than peduncle.” (from Myers 1989)



*Photis elephantis*. The enlarged P6 is indicated by stipple. Only seen in mature adults, this condition is often not symmetrical, with only one of the two legs enlarged (from J. L. Barnard 1962)

**Photis** – A large genus of sixty-nine described species distributed worldwide (Lowry & De Broyer 2015a), one of the most annoyingly abundant and diverse genera of amphipods on the coast. Diversity in the genus in NEP is under-represented in the refereed literature, and many provisional species exist. Conlan (1983) does a good job with the more northern representatives, a number of which also occur here in the SCB.

Her keys (both male and female) are, however, deficient in not including all described members of the genus from the NEP, and in lacking provisionals. They also include extralimitals, such as the type species *P. reinhardi* from the Atlantic. She lists this among the untreated “regional species” in error, although Gurjanova (1951) does report it from the NWP. It has not been reported from the NEP by anyone else, and she also typifies it as “Atlantic” in a dendrogram later in the paper. McLaughlin et al (2005) list it as questionably occurring on the Pacific Coast of North America. This could be either in response to the records of Gurjanova from the NWP, or the inaccurate listing by Conlan (1983). It is not here considered part of the NEP fauna as no definite records of its occurrence could not be located. Fortunately Dean Pasko has produced keys to the genus from our area (available in the taxonomic toolbox at SCAMIT.org) which includes the provisionals (or nearly all of them) as well as all species which have been taken to date in the area. They provide information on developmental forms as well as adults (juvenile males, for instance, at several different levels of maturity). This is quite valuable because the sexually dimorphic gnathopods of the male and female are subject to anamorphic growth. Thus the gnathopodal characters (particularly G2) exhibited by large sexually mature forms may (females) or will definitely (males) differ from those observed in juveniles and subadults prior to their first sexually active molt. This same sort of developmental change is also prevalent in the Ischyroceridae, and has been reported on extensively by Conlan, and was discussed earlier.

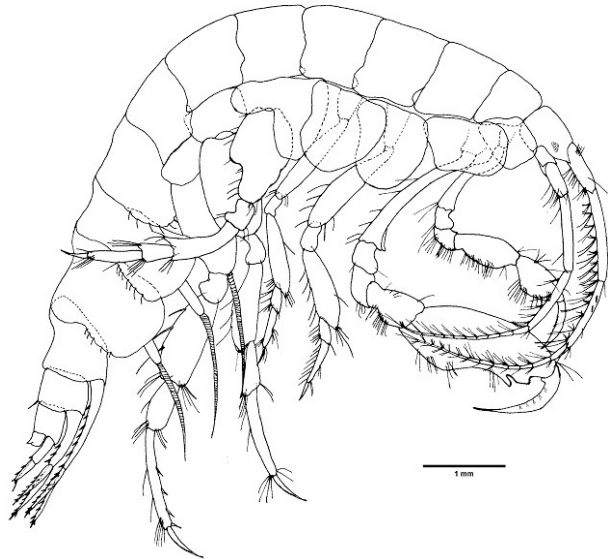
Pigmentation is frequently of value in separating local species of *Photis*. Areas of pigment concentration vary between taxa more than between sexes. While intensity may vary with sex, pattern generally does not. Morphological differences between taxa are concentrated in the antennae (density and length of setae, relative length of peduncular segments), head (shape and size of anterior lobe; position, shape and size of eyes), coxae (shape, size and setation), and gnathopods (shape, size, palmar spination, and size differential between G1 and G2). Local species also fall into three fairly discrete classes in terms of overall size: large, intermediate and small.

Deeper water species from further north include *P. chiconola* (included in Conlan’s 1983 key [and incorrectly attributed to J. L. Barnard 1962 rather than 1964]) and *P. typhlops* which she described in 1994. J. L. Barnard erected the subgenus *Cedrophotis* for his *Photis malinalco*, from deep water off Baja California, but we do not use it here. Although not including it in her key to *Photis*, Conlan (1983) does include *Cedrophotis* as a separate genus in her key to NEP isaeid genera, and *P. malinalco*, the type of *Cedrophotis*, is retained in *Photis* in WoRMS (Lowry & De Broyer 2015a).

*Photis elephantis* (above) is one of two geminate “elephantine” species, the other being *P. trapherus* which is widespread in the Caribbean (Thomas & J. L. Barnard 1991). When he erected *P. elephantis* J. L. Barnard surmised that the gross enlargement of the sixth pereopod might be the result of an infestation, and signal the parasitic castration of the individual. This was later refuted by investigations on *P. trapherus*. The cause for the overdevelopment of this limb in mature males remains unknown.

Diagnosis: “Body smooth, robust; urosome small. Coxal plates 1-4 elongate; plate 5 anterior lobe only slightly shorter than 4. Head with lateral lobes strongly produced; eyes close to apex of lobes. Antennae 1 and 2 subequal, slender, moderately elongate, setose; antenna 1 peduncle articles 1 and 3 about equal length; accessory flagellum absent or rudimentary. Gnathopods subchelate; gnathopod 2 larger than 1,

especially in male. Uropods 1-2 biramous; uropod 3 peduncle elongate, inner ramus very small and much less than half length of outer ramus; outer ramus 2-articulate. Telson small, triangular, entire. Sexes similar, except gnathopod 2.” (from Lincoln 1979)



*Podoceropsis grasslei*, a deep-water hydrothermal vent associated crab commensal of *Neolithodes diomedae* in the Gulf of California (from Soto & Corona 2007)

**Podoceropsis** – as mentioned above under *Gammaropsis*, the issue of appropriate level for *Podoceropsis* spp is contentious. I opt for keeping it at generic level and not submerging it as a subgenus as is done by Conlan in the Atlas (1995), a path also followed by Lowry (2015d) on WoRMS. Almost all specimens of *Podoceropsis* are taken in the trawls rather than in the benthos. These animals seem strongly associated with decapod crustaceans as commensals (although *P. ociosa* may be an exception). We have taken a single *P. chionoecetophila* from a specimen of *Chionoecetes tanneri* taken off Palos Verdes. Except for a few *P. ociosa* taken in benthos, all other *Podoceropsis* we encounter are on the box crab *Lopholithodes foraminatus*, where *P. sp A* is often found abundantly in tubes under the carapace edge and along the median faces of the chelae and legs.

The presence of *Podoceropsis barnardi* in the NEP, recorded in all editions of the SCAMIT listing, is almost certainly an identification error. The species is known only from the NWP, and from a single occurrence on Vancouver Id. Pending verification of the occurrence in the SCB, this record is being expunged. It is likely that the animal so identified was actually *P. ociosa*, which resembles *P. barnardi* in some respects, and was not included in Conlan’s key.

The key in Conlan is not complete for *Podoceropsis*. She does not treat (or list) *P. ociosa* as within the genus. In her key to genera she footnotes that *Podoceropsis* includes *Kermystheus*, of which *P. ociosa* is the type, so that species should have been included in her discussion of the genus regionally. Since her publication *P. grasslei* has been described (Soto & Corona 2007), and a provisional has been created. A revised and more inclusive key to the genus in the NEP is presented below:

**Key to the NEP representatives of the genus *Podoceropsis*\***  
(modified from Conlan 1983) dbcadien – 21 May 2015

1. Antenna 1 flagellum first article subequal or slightly longer than 2<sup>nd</sup> .....2  
    Antenna 1 flagellum first article 2x or more longer than 2<sup>nd</sup> .....4
2. Eye white, diffuse, appearing absent in preserved specimens.....*P. grasslei*  
    Eye dark, concentrated, elongate oval, filling much of anterior head lobe.....3
3. P5 basis (♂) with large posterior notch; epistome acute, produced.....  
    .....*P. angustimana*  
    P5 basis (♂) with slight posterior notch; epistome subacute, produced.....  
    .....*P. chionoecetiphila*
4. Epistome blunt.....*P. amchitcana*  
    Epistome acute, produced.....5
5. G2 coxa (♀) bearing setose lobe posteroventrally.....*P. ociosa*  
    G2 coxa (♀) lacking setose lobe posteroventrally.....6
6. G2 palm (♀) weakly excavate.....*P. setosa*  
    G2 palm (♀) strongly excavate.....*P. barnardi*

\*- the provisional *P. sp A* can be recognized by its obligate relationship with the box crab, *Lopholithodes foraminatus* at present

Diagnosis: “*Body not dorsoventrally depressed. Head lobe acute, antennal sinus deep. Eye lenticular or oval. Antenna 1, peduncular segment 3 as long as segment 1, accessory flagellum microscopic; flagellum 1 subequal to flagellum 2. Upper lip, epistome produced. Mandibular palp quite broad, segment 3 clavate; molar with up to 8 raker spines. Maxilla 1 inner plate bearing a single terminal seta. Maxilla 2 bearing facial setae. Coxae short, lower margins not setose, not shallowing posteriorly. Coxa 1 not produced forward; coxae 1 and 2 (0) hardly shallower than coxae 3-5, coxa 3 (0) lacking stridulation ridges. Gnathopod 1, segment 5 not produced into a posterior lobe; segment 6 slender, palm transverse or indistinct, dactyl extending far beyond the palm. Gnathopod 2 (o), segment 2 lacking stridulation ridges; segment 5 much shorter than segment 6 and narrowed posteriorly, although usually not into a lobe; palm not incised. Peraeopod 3, segment 4 twice as long or more than segment 5 and anterodistally produced. Peraeopod 5 (♂), segment 2 usually posterodistally notched; segment 4, hind margin concave; dactyl lacking an accessory tooth. Peraeopods 6 and 7 similar in form to but generally longer than peraeopod 5; segment 2, hind corner not setose; segment 5 bearing comb spines. Pleopods normal. Epimera not posterodistally notched and lacking a lateral ridge. Urosome dorsally bearing setae but not cusped. Uropod 1 bearing a peduncular spinous process; uropods 1 and 2 terminating in a group of spines. Uropod 3 ordinary, rami subequal, outer ramus terminating in setae, inner ramus terminating in a single spine. Telson bearing a pair of small apical cusps. Brood plates medium, oval or leaf-shaped; setae dense, hook-tipped.*” (from Conlan 1983)

**Posophotis** – The genus is monotypic, erected by J. L. Barnard (1979) to house his new species *P. seri*. It differs from *Photis* in lacking article 2 of the outer ramus of uropod 3, the presence of an accessory flagellum, and the length of the maxillipedal dactyl.

Diagnosis: “Article 3 of antenna 1 as long as article 1; accessory flagellum 2-3 articulate (possibly with tiny additional article). Head deeply recessed for reception of antenna 2. Coxae 1-5 elongate, large, and overlapping. Mandible with 3-articulate palp, article 3 shorter than article 2, clavate, strongly setose. Dactyl of maxilliped short, stubby, multisetose apically. Gnathopod 1 small, weakly subchelate, article 5 about 1.1 times longer than article 6. Gnathopod 2 of both sexes slightly larger than gnathopod 1, wrist of moderate length, broadly but weakly lobate, hand slightly longer than wrist, broad, subchelate, palm oblique, sculptured. Peduncle of uropod 3 elongate, rami styliform, slightly shorter than peduncle, outer ramus 1- articulate, inner ramus as long as outer or occasionally in male shortened, about 60 percent as long as outer ramus. Telson ordinary, with small posterior recessment.” (from J. L. Barnard 1979)

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