

A CHECKLIST OF THE SPECIES OF PELAGIC SHRIMPS (PENAEOIDEA AND CARIDEA) FROM THE EASTERN PACIFIC, WITH NOTES ON THEIR GEOGRAPHIC AND DEPTH DISTRIBUTION

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ABSTRACT

A checklist of the species of pelagic shrimps (Penaeoidea and Caridea) of the eastern Pacific based on published information and collections made off the coast of Mexico is presented. The list includes all species known from this region, including some records on seamounts 1250 km offshore. In total, 86 species have been considered (39 Penaeoidea and 47 Caridea). For each species, references to the original description and to more recent records and illustrations of the species are provided. Other information on geographic and bathymetric distribution is included. The zoogeographic affinities of the pelagic shrimps of the eastern Pacific are briefly discussed, with emphasis on the Mexican fauna. In total, 22 species (9 Penaeoidea and 13 Caridea) are endemic to the eastern Pacific; 24 species (8 Penaeoidea and 16 Caridea) are considered cosmopolitan; and 34 species (20 Penaeoidea and 14 Caridea) are also found in one or more geographical regions but are not cosmopolitan. Twenty-four species are found in the Pacific (throughout the Pacific, in the central Pacific, or in the western Pacific); 11 species are found in the Atlantic (6 are not found elsewhere); and 14 species are found in the Indian Ocean (2 are not found elsewhere). Four species extend their distribution to Japan (3) or to the Sea of Okhotsk (1). A small group of 2 species presents a peculiar distribution.

Of the 86 species reported, 51 (29 Penaeoidea and 22 Caridea) have been collected at least once off the coast of Mexico.

RESUMEN

Se presenta una lista de especies de camarones pelágicos (Penaeoidea y Caridea) del Pacífico oriental sobre la base de informaciones publicadas y recolecciones realizadas frente a las costas de México. Esta lista comprende todas las especies conocidas para esta región, incluyendo algunas recolectadas en montes marinos, aproximadamente

1250 Km mar afuera. Se consideran 86 especies (39 Penaeoidea y 47 Caridea) y para cada una de ellas se hace referencia a la descripción original y a citas adicionales que incluyen observaciones recientes e ilustraciones de las mismas. Otros datos incluidos hacen referencia a la distribución geográfica y batimétrica de cada especie, tal como se conoce actualmente. Se discuten brevemente las afinidades zoogeográficas de los camarones pelágicos del Pacífico oriental con énfasis en la fauna mexicana. En total, 22 especies (9 Penaeoidea y 13 Caridea) son endémicas al Pacífico oriental, 24 (8 Penaeoidea y 16 Caridea) son consideradas cosmopolitas y 34 (20 Penaeoidea y 14 Caridea) han sido encontradas en una o mas regiones zoogeográficas, pero sin ser cosmopolitas. Se encuentran 24 especies en el Pacífico (en todo el Pacífico, en el Pacífico central o en el Pacífico oriental), 11 se encuentran en el Atlántico (de las cuales 6 no se encuentran en ninguna otra región) y 14 se encuentran en el Océano Indico (de las cuales 2 no se encuentran en ninguna otra región). Cuatro especies extienden su distribución hasta el Japón (3) o el Mar de Okhotsk (1). Un pequeño grupo de 2 especies presenta una distribución peculiar.

De las 86 especies reportadas, 51 (29 Penaeoidea y 22 Caridea) han sido recolectadas al menos una vez frente a las costas de México.

INTRODUCTION

The pelagic decapod crustaceans of the Pacific coast of America have been little studied. This is particularly true in tropical and subtropical waters where local institutions have done little or no sampling of the fauna because, in most cases, it does not represent a readily available source of food.

The complex taxonomy of most genera of pelagic decapod crustaceans is another obstacle to their study. In particular, the identification of caridean shrimps and of certain groups of penaeoidean shrimps like *Sergestes* or *Gennadas* can be difficult because of the lack of comprehensive works on local fauna (the literature is widely dispersed and often

not available in countries where the species actually occur) or because of geographic variation of some morphologic features that only experts can evaluate by comparing large series of specimens from many localities.

As a general rule, pelagic or semipelagic species belonging to the Brachyura—e.g., *Portunus xantusii* (Stimpson), *Euphyllax dovii* Stimpson—and Anomura—e.g., *Pleuroncodes planipes* Stimpson—are well known. Their distribution and behavior (seasonal benthic and pelagic phases) are well understood because only a few species are involved (Jerde 1970; Mathews et al. 1974; Alvariño 1976; Blackburn 1977).

The biology of pelagic shrimps in the ocean was reviewed by Omori (1974), who also emphasized the importance for some countries of species of the genera *Acetes* H. Milne Edwards and *Sergia* Stimpson, which can be used as food (Omori 1978). It should be clearly understood, however, that in many cases the capture of pelagic shrimps for food is not worth the tremendous fishing effort necessary to obtain catches of commercial size.

One of the basic limitations to understanding the biology of pelagic shrimps is the lack of accurate sampling data regarding their vertical distribution in the water column. Although some species migrate diurnally over distances of up to 800 m (Omori 1974), a detailed study of this movement is available for only a few Pacific species. Many authors have emphasized the necessity of using automatic opening-closing nets to capture large planktonic or micronektonic species (see Omori 1974; Kensley 1981), but these expensive and sometimes difficult-to-operate instruments (see for example Roe and Shale 1979) are not as common as they should be, especially in countries with economic problems.

The study of the fauna of a given geographic area is made easier if a checklist of the species known for the region is available. In fact, a regional checklist for any given group of species is generally the first step toward a more detailed monographic study. During our study of pelagic shrimps available in the collections of various institutions in Mexico or recently collected by the R/V *El Puma* of the Instituto de Ciencias del Mar y Limnología, UNAM, we compiled a list of all species of pelagic shrimps that have ever been reported in the eastern Pacific. In this paper we present this list, with up-to-date information related to the geographic and depth distribution of each species, with the hope that it will serve as a basic tool for the study of the pelagic shrimps of the region.

METHOD OF STUDY

The information in this paper was obtained from the literature on pelagic shrimps of the Pacific coast of America and of the world oceans. Indeed, many species of pelagic shrimps have a cosmopolitan distribution, and students of western American species often have to refer to literature dealing with other geographic regions in order to find adequate descriptions and illustrations.

Some original data regarding geographic and depth distribution were obtained during the revision of recent material obtained by the R/V *El Puma* (SIPCO, CORTES, and CICIMAR cruises); by the R/V *Antonio Alzate* (PESCA, México); or during CalCOFI cruises. These data are included in the text.

RESULTS

This paper includes all species collected to date in the eastern Pacific, including the species reported by Hanamura (1983) on seamounts located 800 to 1500 km off the coast of Mexico and not previously known for the region—*Bentheogennema intermedia* (Bate), *Gennadas capensis* Calman, *Acanthephyra eximia* Smith, *Eupasiphae gilesii* (Wood-Mason). It should be clearly understood, however, that no original taxonomic considerations are included in this paper, and readers must therefore refer to the literature cited in the text in order to fully understand the viewpoints of some authors regarding the taxonomy of the genera and the synonymies.

Although there is still much to be learned on this particular point, it would seem that some benthic shrimps—e.g., *Hymenopenaeus doris* (Faxon)—are occasionally caught during midwater trawls and must therefore be included in a checklist such as the one presented here. Regarding depth distribution, however, it clearly appears that the most common problem is with pelagic shrimps that are captured during the descent or ascent of epibenthic trawls or sledges, because no residence depth can be determined. Many of the species included in the list are undoubtedly strictly pelagic (they have been captured repeatedly in midwater trawls), but some might have to be excluded in the future when more is learned about their biology.

A total of 86 species (39 Penaeoidea and 47 Caridea) have so far been reported for the eastern Pacific. They are all included in the following taxonomic list. The classification of the genera into families was made according to de Freitas (1984), Crosnier (1985), and Abele and Kim (1986). Within each genus, species have been ordered alphabetically. The restricted synonymy includes the origi-

nal description and often one or more references that include a good description of the species, with illustrations.

PENAEOIDEA

Family Benthescymidae

Genus *Bentheogennema* Burkenroad 1937

1. *Bentheogennema borealis* (Rathbun 1902).
Gennadas borealis Rathbun 1902: 887; 1904: 147, figs. 88–89.
Bentheogennema borealis. Butler 1980: 41 (illustrated).

Geographic distribution: From Japan and the Bering Sea to Isla Coronado, Baja California (Hanamura 1979; Butler 1980).

Depth distribution: Mostly from 200 to 1500 m and to 2560 m (Butler 1980). Krygier and Pearcy (1981) reported this species from 100 to 1000 m off Oregon, with maximal density from 600- to 1000-m depth.

2. *Bentheogennema burkenroadi* Krygier and Wasmer 1975.

Bentheogennema burkenroadi Krygier and Wasmer 1975: 737, figs. 1–3. Butler 1980: 43 (illustrated).

Geographic distribution: From the northeastern Pacific (52°N–142°W) south to Seamount 350, off Baja California (23°05'N–124°57'W) (Hanamura 1983).

Depth distribution: Mostly between 100 and 500 m, and down to about 1200 m (Butler 1980; Hanamura 1983). From surface to 2000 m off Oregon, with a population maximum between 300 and 1000 m (Krygier and Pearcy 1981).

3. *Bentheogennema intermedia* (Bate 1888).
Gennadas intermedius Bate 1888: 343, pl. 58, fig. 3.
Bentheogennema intermedium. Tirmizi 1960: 368, figs. 36–38.
Bentheogennema intermedia. Crosnier 1978: 30, figs. 13a–b, 14a–c.

Geographic distribution: Recorded off Baja California (13°29'N–119°54'W and 23°05'N–124°57'W) by Hanamura (1983). Also recorded in the Atlantic Ocean (east and west), the Pacific Ocean (Japan and Hawaii), and the Indian Ocean (Crosnier 1978, 1985; Hanamura 1983).

Depth distribution: Probably only below 800 m and to 4000 m (Crosnier 1978). Records along the coasts of America are from about 500–950 m, 1000–1200 m, and 3386 m (Foxton 1970b; Hanamura 1983;

Abele and Kim 1986); from 1000- to 2020-m depth (Kensley 1981).

4. *Bentheogennema pasithea* (de Man 1907).
Gennadas pasithea de Man 1907: 146.
Bentheogennema pasithea. Crosnier 1978: 31, figs. 13c–d.

Geographic distribution: Southern California and off Baja California (13°29'N–119°48'W) (Hanamura 1983). Indo-Pacific (Crosnier 1978, 1985).

Depth distribution: The upper bathymetric limit is ill-defined. It probably occurs below 1000 m (Crosnier 1978; Hanamura 1983).

5. *Bentheogennema stephensoni* Burkenroad 1940.
Bentheogennema stephensoni Burkenroad 1940: 37. Crosnier 1985: 859, figs. 9h, 11a.
Bentheogennema stephenseni. Hanamura 1983: 55, fig. 3c–e.

Geographic distribution: Off Baja California (13°29'N–119°54'W) and New Zealand (Hanamura 1983). Indian Ocean (1°43'N–87°08'E) (Crosnier 1985).

Depth distribution: The depth of capture of the unique specimen reported by Hanamura (1983) is unprecise (0–1617 m). The unique specimen cited by Crosnier (1985) was obtained with a nonclosing beam trawl operating at a depth of 4360 m.

Genus *Gennadas* Bate 1881

6. *Gennadas capensis* Calman 1925.
Gennadas capensis Calman 1925: 5, pl. 1, figs. 1–2. Kensley 1972: 14, figs. 5c, 5g. Crosnier 1978: 36, fig. 18c.

Geographic distribution: Off Baja California (23°00'N–125°02'W); Atlantic Ocean (east and west) and Indo-Pacific (Crosnier 1978, 1985; Hanamura 1983).

Depth distribution: Varies considerably from as little as 250 m (Kensley 1981) to 3517 m (Gore 1985). In midwater trawls, the depth ranges from 250 to 630 m (Kensley et al. 1987).

7. *Gennadas bouvieri* Kemp 1909.
Gennadas bouvieri Kemp 1909: 726, pl. 74, figs. 1–4, pl. figs. 6–7. Crosnier 1978: 34, figs. 15a, 18a–b.

Geographic distribution: Recorded off Baja California (23°05'N–125°02'W) by Hanamura (1983). Also found in the Indo-Pacific, and in the South and West Atlantic Ocean (Kensley 1981; Gore 1985).

Depth distribution: From 250 to 3400 m (Kensley 1981). According to a study of the vertical distribution of *G. bouvieri* in the Gulf of Mexico, Hefferman and Hopkins (1981) found a range of 250 to 475 m at night and 750 to 875 m by day. In midwater trawls, from 250 to 630 m (Kensley et al. 1987).

8. *Gennadas incertus* (Balss 1927).
Amalopenaeus incertus Balss 1927: 265, figs. 24–29.
Gennadas incertus. Kensley 1972: 12, 14, figs. 4i, 5j. Crosnier 1978: 37, figs. 15b, 19a.

Geographic distribution: Off Oregon (Krygier and Percy 1981) and Baja California (23°05'N–125°02'W) (Hanamura 1983). Indo-Pacific (Kensley 1972; Crosnier 1978).

Depth distribution: Maximal range is provided by Aizawa (1974), who observed this species in samples taken at night between 100 and 200 m and in samples taken by day between 400 and 900 m.

9. *Gennadas propinquus* Rathbun 1906.
Gennadas propinquus Rathbun 1906: 907, fig. 61a–b. Crosnier 1978: 38, figs. 16b, 18d–e.

Geographic distribution: Off Oregon and California (Krygier and Percy 1981), off Baja California (23°05'N–125°02'W) (Hanamura 1983), and in the Indo-Pacific (Crosnier 1978; Kensley 1981).

Depth distribution: Kensley (1981) gives a range of 200 to 3400 m, and Krygier and Percy (1981) reported this species between 50 and 700 m, with the highest night catches obtained below 500 m and the highest day catches obtained above 100 m. Pelagic, from surface to 1200-m depth (Kensley et al. 1987).

10. *Gennadas scutatus* Bouvier 1906.
Gennadas scutatus Bouvier 1905 (1906): 748; 1908: 42, pl. 8. Kensley 1972: 12, 16, figs. 4d, 6g. Crosnier 1978: 43, figs. 17a, 19c.

Geographic distribution: *Gennadas scutatus* was reported from Isla Clarion by Burkenroad (1938) and later considered a cosmopolitan species (Indo-Pacific, from Africa to America; East and West Atlantic) (Crosnier 1978). Méndez (1981) found the species off Peru. It also occurs off the southeastern part of Baja California (pers. obs.).

Depth distribution: From 200 to 3400 m (Kensley 1981), in midwater tows at 130–2000 m (Crosnier and Forest 1973), and occasionally collected at the surface (Crosnier 1978). Méndez (1981) reports one sample of this species taken in tows made in the depth range of 0–50 m. Pelagic, from surface to 600-m depth (Kensley et al. 1987).

11. *Gennadas sordidus* Kemp 1910.
Gennadas sordidus Kemp 1910: 177, pl. 13, figs. 1–3. Tirmizi 1960: 349, figs. 40b, 48, 52–57. Hanamura 1983: 57, figs. 4d–f.

Geographic distribution: Gulf of California, off Baja California and Islas Revillagigedo (Burkenroad 1938; Hanamura 1983). Throughout the Indian Ocean (Hanamura 1983). In the Gulf of California, the species occurs south of Isla Tiburón (28°25'N–112°44'W) (pers. obs.).

Depth distribution: Burkenroad (1938) gives a range of about 550–915 m, and the species possibly occurs in deeper waters (Hanamura 1983). In the Gulf of California, *G. sordidus* has been obtained in plankton samples between 0 and 300 m (pers. obs.).

12. *Gennadas tinayrei* Bouvier 1906.
Gennadas tinayrei Bouvier 1906: 10, figs. 2–4, 14. Kensley 1972: 12, figs. 4b, 5c. Crosnier 1978: 44, figs. 17b, 19d.

Geographic distribution: Off Oregon and Baja California (Krygier and Percy 1981; Hanamura 1983). In the Indo-Pacific and the Atlantic Ocean (east and west) (Crosnier 1978; Kensley 1981).

Depth distribution: From 600 to 1400 m (Kensley 1981). It has been reported occasionally between 400 and 600 m (Crosnier 1978; Krygier and Percy 1981) and at a depth of 90 m (Kensley et al. 1987).

Family Penaeidae Genus *Funchalia* Johnson 1867

13. *Funchalia balboae* (Faxon 1893).
Penaeus balboae Faxon 1893: 211; 1895: 181, pl. 47, figs. 1, 1a–c.
Funchalia balboae. Crosnier and Forest 1973: 297, fig. 100.

Geographic distribution: Isla Cocos and Gulf of Panama; western Indian Ocean and Atlantic Ocean (east and west) (Crosnier and Forest 1973).

Depth distribution: Pelagic, from surface to 1609 m (Burkenroad 1936; Crosnier and Forest 1973).

Family Solenoceridae Genus *Hymenopenaeus* Smith 1882

14. *Hymenopenaeus doris* (Faxon 1893).
Haliporus doris Faxon 1893: 214; 1895: 191, pl. 49, figs. 1, 1a–c.
Hymenopenaeus doris. Pérez-Farfante 1977: 283, figs. 9, 17, 18a, 19–20. Hanamura 1983: 54, fig. 2.

Geographic distribution: From the southern tip of the Gulf of California to Costa Rica (Isla del Coco) (Burkenroad 1938; Pérez-Farfante 1977). Also re-

ported off Baja California (between 13°25'N–120°04'W and 13°27'N–120°07'W) (Hanamura 1983).

Depth distribution: Pelagic between 550 and 915 m; also captured in trawls operating at about 3600 m (Burkenroad 1938; Hanamura 1983) and at 4082 m (Faxon 1893).

Family Sergestidae

Genus *Sergestes* H. Milne Edwards 1830

15. *Sergestes arcticus* Kroyer 1859.

Sergestes arcticus Kroyer 1859: 240. Hansen 1922: 62, pl. 1, figs. 1–2, pl. 3, figs. 3–5, pl. 4, figs. 1–2. Holthuis 1952: 8, fig. 1. Kensley 1971: 232, figs. 7a–f.

Geographic distribution: Off southern Chile; East and North Atlantic and Mediterranean; southern oceans, from Uruguay to Australia (Holthuis 1952; Kensley 1981; Astporssen and Hallgrimssen 1983).

Depth distribution: From about 100 to 366 m (Holthuis 1952; Omori 1974). Kensley (1981) reports the species from surface to 820 m.

16. *Sergestes brevispinatus* Judkins 1978.

Sergestes brevispinatus Judkins 1978: 13, figs. 2d, 5d–f, h, k, 6–8. Méndez 1981: 60, figs. 177, 177a–b, 182, 189.

Geographic distribution: Central tropical eastern Pacific, from about 10°N to 18°S (Judkins 1978).

Depth distribution: Ill-defined; the species has been caught in as little as 55 m (Méndez 1981) and probably occurs to 200 m (Judkins 1978).

17. *Sergestes consobrinus* Milne 1968.

Sergestes (Sergestes) consobrinus Milne 1968: 26, figs. 5–9.

Sergestes consobrinus. Judkins 1978: 16, figs. 9–11, 21b. Hanamura 1983: 67, fig. 9.

Geographic distribution: California Current and central Pacific between about 41°N and 17°N (Judkins 1978).

Depth distribution: From 20 to 400 m, with a maximal abundance at 120 m (Milne 1968).

18. *Sergestes erectus* Burkenroad 1940.

Sergestes (Sergestes) erectus Burkenroad 1940: 38.

Sergestes erectus. Hanamura 1983: 62, fig. 6.

Geographic distribution: Off Baja California (23°05'N–124°57'W) and in Pacific Ocean (Hawaii and Raratonga) (Hanamura 1983).

Depth distribution: Reported by Hanamura (1983) in plankton samples obtained in the range of 0–1236 m.

19. *Sergestes extensus* Hanamura 1983.

Sergestes extensus Hanamura 1983: 64, figs. 7–8.

Geographic distribution: Off Baja California (23°05'N–124°57'W, 23°01'N–125°02'W, and 23°10'N–124°51'W) (type material; Hanamura 1983).

Depth distribution: Collected in the water column between 0 and 1236 m (Hanamura 1983).

20. *Sergestes geminus* Judkins 1978.

Sergestes geminus Judkins 1978: 25, figs. 2a–c, 7, 16f–j, 17, 18, 21a.

Geographic distribution: Eastern tropical Pacific, from about 12°N to 8°S (Judkins 1978).

Depth distribution: Taken in plankton samples between 0 and 200 m (Judkins 1978).

21. *Sergestes gibbilobatus* Judkins 1978.

Sergestes gibbilobatus Judkins 1978: 27, figs. 2g, 4c, 7, 19a–h, 20, 21a.

Geographic distribution: Throughout the central Pacific, from about 6°N to 20°S (Judkins 1978).

Depth distribution: All type material came from micronekton samples obtained at an unknown depth (Judkins 1978).

22. *Sergestes halia* Faxon 1893.

Sergestes halia Faxon 1893: 217. Burkenroad 1937: 320, figs. 4, 5. Hanamura 1983: 64, fig. 6d–g.

Sergestes edwardsii. Faxon 1895: 212, pl. 51, fig. 1 (in part, not *S. edwardsii* Kroyer).

Geographic distribution: Off California, southwestern Baja California (near and offshore), at the entrance to the Gulf of California, and in the Gulf of Panama (Burkenroad 1937; Hanamura 1983; Krygier and Wasmer 1988).

Depth distribution: Collected in trawls and dredges operating between 428 and 1000 m (Burkenroad 1937) and in midwater trawls at 240–256 m and between 0 and 1617 m (Hanamura 1983). Also taken in tows between surface and 200 m (pers. obs.).

23. *Sergestes pectinatus* Sund 1920.

Sergestes pectinatus Sund 1920: 24, figs. 42–43. Kensley 1971: 240, figs. 13a–g; 1972: 16, figs. 11h–j.

Geographic distribution: Off Baja California (23°05'N–124°57'W) (Hanamura 1983). Atlantic and Indo-Pacific (Kensley 1981; Hanamura 1983).

Depth distribution: From surface to 1170 m (Kensley

1981). Foxton (1970b) reported day catches at 580–700 m and night catches at 100 m or less.

24. *Sergestes pestafer* Burkenroad 1937.
Sergestes pestafer Burkenroad 1937: 318, figs. 1–3.

Geographic distribution: Eastern Pacific, from Baja California (24°N–112°22'W and 31°30'N–16°10'W) to Islas Galápagos (Burkenroad 1937).

Depth distribution: The upper limit is ill-defined; the deepest record is about 1100 m (Burkenroad 1937).

25. *Sergestes sargassi* Ortmann 1893.
Sergestes sargassi Ortmann 1893: 34, pl. 3, fig. 1.
Hansen 1922: 148, pl. 9, fig. 2. Kensley 1972: 26, fig. 11k–m.

Geographic distribution: Off Baja California (23°05'N–124°57'W) (Hanamura 1983). Atlantic, Mediterranean, and Indo-Pacific (Kensley 1981; Hanamura 1983).

Depth distribution: From surface to 600 m (Kensley 1971); 75 to 750 m (Abele and Kim 1986). Taken at depths between 110 and 435 m (maxima at 150–200 m) at night, and between 300 and 950 m (maxima at 650 m) by day (Foxton 1970b).

26. *Sergestes similis* Hansen 1903.
Sergestes similis Hansen 1903: 60, pl. 11, figs. 6a–d. Butler 1980: 47 (illustrated).
Sergestes (Sergestes) similis. Milne 1968: 22, figs. 1–4.

Geographic distribution: From the Bering Sea to the Gulf of California, where it seems to be very common (pers. obs.). Also in Japan (Hanamura 1979; Krygier and Percy 1981).

Depth distribution: From about 50 to 2400 m. This species, however, is rarely found below 1000 m and has a maximal population density between 50 and 200 m at night and between 200 and 600 m by day (Omori and Gluck 1979; Krygier and Percy 1981).

27. *Sergestes tantillus* Burkenroad 1940.
Sergestes (Sergestes) tantillus Burkenroad 1940: 42.
Sergestes tantillus. Judkins 1978: 19, figs. 7, 12, 13b, 21b.

Geographic distribution: Central equatorial Pacific (20°N to about 5°S) and eastern Pacific, off Costa Rica to Ecuador (Judkins 1978). Méndez (1981) reports this species off Peru (10°54'S).

Depth distribution: The vertical distribution is ill-defined. It occurs between 0 and 200 m (Burkenroad 1940; Judkins 1978).

Genus *Sergia* Stimpson 1860

28. *Sergia bigemnea* (Burkenroad 1940).
Sergestes (Sergia) bigemneus Burkenroad 1940: 49.
Sergia bigemnea. Hanamura 1979: 167; 1983: 68, figs. 10c–d.

Geographic distribution: Off Baja California (23°05'N–124°57'W), Tahiti, Hawaii, southwestern Japan, and northeastern Pacific (Hanamura 1983).

Depth distribution: Collected in tows made in the range of 0–1236 m (Hanamura 1983).

29. *Sergia filicta* (Burkenroad 1940).
Sergestes (Sergia) filictum Burkenroad 1940: 52.
Sergia filicta. Hanamura 1983: 71, figs. 11a–e.

Geographic distribution: Off Baja California (13°29'N–120°07'W) and in the Gulf of Panama (Burkenroad 1940; Hanamura 1983).

Depth distribution: Collected at 734–845 m with a closing net; also present in samples obtained between surface and 1632 m (Hanamura 1983).

30. *Sergia inoa* (Faxon 1893).
Sergestes inous Faxon 1893: 216; 1895: 208, pl. 51, fig. 2. Hansen 1919: 8, pl. 1, figs. 1a–c.

Geographic distribution: Off Isla Malpelo, Colombia (4°03'N–81°31'W) (Faxon 1893) and in the central Pacific (Hansen 1919).

Depth distribution: Faxon (1893) reported specimens taken in a trawl operated at a depth of about 1650 m.

31. *Sergia laminata* (Burkenroad 1940)
Sergestes (Sergia) laminatus Burkenroad 1940: 53. Kensley 1971: 251, figs. 18a–f; 1972: 28, figs. 12a–b.
Sergia laminata. Hanamura 1979: 169; 1983: 72, fig. 11f.

Geographic distribution: Off southern California and Baja California (23°05'N–124°57'W) (Hanamura 1983). Indo-Pacific, including Japan (Kensley 1981; Hanamura 1983).

Depth distribution: The species has been collected between the surface and 1416 m, without further bathymetric precision (Kensley 1981; Hanamura 1983).

32. *Sergia maxima* (Burkenroad 1940).
Sergestes (Sergia) maximus Burkenroad 1940: 47.
Sergia maxima. Hanamura 1983: 70, figs. 10e–g.

Geographic distribution: Off Baja California (32°52'N–132°30'W) and in the Indo-Pacific (Hanamura 1983).

Depth distribution: At 717 m (bottom trawl) (Hanamura 1983).

33. *Sergia phorca* (Faxon 1893).
Sergestes phorcus Faxon 1893: 217. Burkenroad 1937: 323, figs. 6–7.
Sergestes bisulcatus. Faxon 1895: 210, pl. 52 (not *S. bisulcatus* Wood-Mason).

Geographic distribution: From the central Gulf of California and Baja California (about 22°30'N) south to Peru and Islas Galápagos, Ecuador (Burkenroad 1937; Méndez 1981).

Depth distribution: Recorded in tows made from surface to about 1100 m and in bottom trawls between 549 and 1000 m (Burkenroad 1937; Méndez 1981).

34. *Sergia profunda* (Bate 1888).
Sergestes profundus Bate 1888: 428. Hansen 1903: 69, pl. fig. 3.

Geographic distribution: Off Valparaiso (33°42'S–78°18'W), Chile, and possibly in the Gulf of Guinea (eastern Atlantic) (Holthuis 1952).

Depth distribution: This species has been reported at 2516 m by Faxon (1895).

35. *Sergia scintillans* (Burkenroad 1940).
Sergestes (Sergia) scintillans Burkenroad 1940: 43. Kensley 1971: 257, figs. 22a–f; 1972: 28, figs. 12f–h.
Sergia scintillans. Hanamura 1979: 169; 1983: 67, figs. 10a–b.

Geographic distribution: Off Baja California (23°N–125°W), southeastern Africa, and in Pacific Ocean (Kensley 1981; Hanamura 1983).

Depth distribution: Collected between surface and 1236 m (Hanamura 1983). It has been reported by Omori (1974) in the depth range of 100–300 m at night and in the range of 500–700 m by day.

36. *Sergia kroyeri* (Bate 1881).
Sergestes kroyeri Bate 1881: 193; 1888: 421, pl. 70, figs. 3, 4. Krygier and Wasmer 1988: 72.
Sergestes tenuiremis Kroyer 1855: 10; 1859: 255, 278, 285, pl. 4, figs. 11a–b (established on a mastigopus stage of development).
Sergia tenuiremis. Butler 1980: 49 (illustrated).

Geographic distribution: North central Pacific to Canada and Oregon, North Atlantic (Krygier and Percy 1981), Indian and Pacific oceans (Krygier and Wasmer 1988).

Depth distribution: From depths between 300 and 1500 m, with maximal density between 300 and 700 m at night and around 800–950 m by day (Krygier and Percy 1981, as *S. tenuiremis*).

Genus *Petalidium* Bate 1881

37. *Petalidium suspiriosum* Burkenroad 1937.
Petalidium suspiriosum Burkenroad 1937: 325, figs. 8–12. Wasmer 1974: 160, figs. 1–8. Word and Charwat 1976: 27–28 (illustrated).

Geographic distribution: Off Baja California (13°28'N–120°07'W and 23°N–125°W) and Oregon, Clarion and the Hawaiian islands, and northeastern Pacific (Krygier and Percy 1981; Hanamura 1983).

Depth distribution: Collected in the ranges of 734–845 m and 1117–1233 m with midwater trawl (Hanamura 1983). This species is also reported between 150 and 1750 m off Oregon, with maximum population density between 600- and 1000-m depth (Krygier and Percy 1981).

Genus *Acetes* H. Milne Edwards 1830

38. *Acetes binghami* Burkenroad 1934.
Acetes binghami Burkenroad 1934: 101, fig. 39. Omori 1977: 515, fig. 4.

Geographic distribution: Gulf of Panama and the Bay of Guayaquil, Ecuador (Burkenroad 1937; Omori 1977).

Depth distribution: Unknown.

Family Luciferidae

Genus *Lucifer* Thompson 1830

39. *Lucifer typus* H. Milne Edwards 1837.
Lucifer typus H. Milne Edwards 1837: 469. Hansen 1919: 53, pl. 38, fig. 6.

Geographic distribution: Northeastern Pacific to Gulf of California (up to the northern gulf) and in Atlantic Ocean (Burkenroad 1937; pers. obs.).

Depth distribution: This species has been taken in tows made between surface and 200 m. (pers. obs.) and down to 730 m (Burkenroad 1937).

CARIDEA

Family Pasiphaeidae

Genus *Pasiphaea* Savigny 1816

40. *Pasiphaea acutifrons* Bate 1888.
Pasiphaea acutifrons Bate 1888: 871, pl. 141, fig.

3. Boschma 1949: 302, figs. 12–16, pl. 1, figs. 3–4. Holthuis 1952: 10, fig. 2.

Geographic distribution: From southern Chile (Valparaiso) and around southern South America to Patagonia (48°41'S); Japan (Holthuis 1952; Vinuesa 1977).

Depth distribution: Recorded between 300 and 1400 m (Holthuis 1952). No indication of the methods of capture was provided.

41. *Pasiphaea affinis* Rathbun 1902.
Pasiphaea affinis Rathbun 1902: 905; 1904: 24, fig. 6.

Geographic distribution: Known only from southern California (Schmitt 1921).

Depth distribution: Captured at 1800 m (Schmitt 1921).

42. *Pasiphaea americana* Faxon 1893.
Pasiphaeia cristata americana Faxon 1893: 208.
Pasiphaeia americana. Faxon 1895: 173, pl. 45, fig. 1–1d.
Pasiphaea americana. Méndez 1981: 64, figs. 193–196.

Geographic distribution: Off Baja California (24°30'N) and in the northern Gulf of California (30°11'N) (pers. obs.), south to Isla Lobos de Tierra, Peru, including Islas Galápagos (Méndez 1981).

Depth distribution: This species has been collected from 150 to 576 m in bottom trawls off Peru (Méndez 1981). It is also reported in depths to 1000 m by Faxon (1893) and was taken in plankton samples from the surface to 225 m (total depth from 277 to 645 m in the Gulf of California and from 350 to 1700 m off Baja California) during this study.

43. *Pasiphaea chacei* Yaldwyn 1962.
Pasiphaea chacei Yaldwin 1962: 18, figs. 1–19.
Hanamura 1983: 77, fig. 15.

Geographic distribution: Off Oregon and southern California to Baja California (23°05'N–125°W) (Word and Charwat 1976; Krygier and Pearcy 1981; Hanamura 1983).

Depth distribution: In samples collected between 100 and 850 m (Krygier and Pearcy 1981). Hanamura (1983) reports the species between 0 and 1236 m.

44. *Pasiphaea corteziana* Rathbun 1902.
Pasiphaea corteziana Rathbun 1902: 905; 1904: 24, fig. 5.

Geographic distribution: Known only off southern California (Schmitt 1921).

Depth distribution: Captured in the range of 1400–1630 m (Schmitt 1921).

45. *Pasiphaea dofleini* Schmitt 1932.
Pasiphaea dofleini Schmitt 1932: 333, fig. 1. Holthuis 1952: 14.

Geographic distribution: Known only from the type locality (Punta Arenas, Strait of Magellan) (Schmitt 1932).

Depth distribution: Unknown (Holthuis 1952).

46. *Pasiphaea emarginata* Rathbun 1902.
Pasiphaea emarginata Rathbun 1902: 905; 1904: 22, fig. 4. Word and Charwat 1976: 205–206 (illustrated).

Geographic distribution: Southern California to the Gulf of California (up to Bahía Concepción) (Chace 1937).

Depth distribution: Taken in bottom trawl samples made in the depth range of 395–1600 m (Chace 1937). In plankton samples between surface and 200 m (pers. obs.).

47. *Pasiphaea faxoni* Rathbun 1904.
Pasiphaea faxoni Rathbun 1902: 905 (*nomen nudum*); 1904: 22.
Pasiphaea acutifrons. Faxon 1895: 175 (not *P. acutifrons* Bate).

Geographic distribution: Galápagos Islands.

Depth distribution: Unknown. The material reported by Faxon (1895) under *P. acutifrons* was obtained in trawls operating at about 85 to 1400 m and at 1900 m.

48. *Pasiphaea magna* Faxon 1893.
Pasiphaeia magna Faxon 1893: 24; 1895: 176, pl. 45, fig. 2.
Pasiphaea magna. Méndez 1981: 64, figs. 190–192.

Geographic distribution: Off Peru (17°08'S); Gulf of Panama (Faxon 1893; Méndez 1981) to Oregon (Krygier and Pearcy 1981).

Depth distribution: Abundant in bottom trawls (off Oregon and Peru) and collected once in an oblique tow from 0 to 1000 m (Méndez 1981; Krygier and Pearcy 1981).

49. *Pasiphaea pacifica* Rathbun 1902.
Pasiphaea pacifica Rathbun 1902: 905; 1904: 20, figs. 2–3. Word and Charwat 1976: 209–210 (illustrated). Butler, 1980: 55 (illustrated).

Geographic distribution: From Alaska (Butler 1980) to the Gulf of California (northern part only in this study); also in Australia, South Africa, and the eastern seas of the USSR (Krygier and Wasmer 1988).

Depth distribution: Known from depths between 96 and 730 m (mostly in bottom trawls) and between 75 and 500 m (in midwater trawls) (Rathbun 1904; Krygier and Percy 1981). Also taken in oblique tows from surface to 225 m at stations with a total depth of 295–628 m (pers. obs.).

50. *Pasiphaea tarda* Kroyer 1845.
Pasiphaea tarda Kroyer 1845: 434. Sivertsen and Holthuis 1956: 23, fig. 17. Butler 1980: 56 (illustrated). Krygier and Wasmer 1988: 76.
Pasiphaea princeps Smith 1884: 381, pl. 5, fig. 2.–Rathbun 1904: 23.

Geographic distribution: From Unalaska to Ecuador and in Atlantic Ocean (east and west) (Butler 1980).

Depth distribution: Taken in midwater trawls in the depth range of 640–730 m (Butler 1980); 200–850 m, 1750–2000 m, and 0–2400 m (Krygier and Percy 1981). The species has also been taken in bottom trawls operating between 251 and 3000 m.

Genus *Parapasiphae* Smith 1884

51. *Parapasiphae cristata* Smith 1884.
Parapasiphae cristata Smith 1884: 388, pl. V, fig. 3.

Geographic distribution: Known only from Oregon and in the North Atlantic (Krygier and Percy 1981).

Depth distribution: Taken in midwater tows made between 1250 and 1500 m and in tows made in the water column between 0 and 2870 m. It probably never occurs above 400 m (Krygier and Percy 1981).

52. *Parapasiphae sulcatifrons* Smith 1884.
Parapasiphae sulcatifrons Smith 1884: 384, pl. 5, fig. 4, pl. 6, figs. 1–7. Kensley 1972: 34, fig. 15f. Butler 1980: 58 (illustrated).

Geographic distribution: From Canada and Oregon to Baja California (23°N–125°W); Atlantic and Indo-Pacific oceans (Hanamura 1983).

Depth distribution: Between 500 and 1250 m off Oregon (Krygier and Percy 1981); at 1300 m (Kensley 1981). Taken in midwater trawls made in the range of 540–630 m (Kensley et al. 1987), also taken at a depth of 1300 m (Kensley 1981).

Genus *Eupasiphae* Wood-Mason and Alcock 1893

53. *Eupasiphae serrata* (Rathbun 1902).
Parapasiphae serrata Rathbun 1902: 904; 1904: 25, fig. 7.
Eupasiphae serrata. Burukovsky and Romensky 1979: 328.

Geographic distribution: Southern California (Schmitt 1921) and southeast Atlantic (Burukovsky and Romensky 1979).

Depth distribution: Collected at about 1800 m (bottom trawl) (Rathbun 1904) and reported from a range of 970–1050 m (Burukovsky and Romensky 1979).

54. *Eupasiphae gilesii* (Wood-Mason 1892).
Parapasiphae gilesii Wood-Mason 1892: pl. 3, fig. 8.
Parapasiphae (Eupasiphae) gilesii. Wood-Mason (in Wood-Mason and Alcock) 1893: 166.
Eupasiphae gilesii. Tirmizi 1969: 214, figs. 1–4. Hanamura 1983: 78, fig. 16a–b. Crosnier, 1988: 786, fig. 1, 5a.
Eupasiphae gilesii. Crosnier and Forest 1973: 150, fig. 44.

Geographic distribution: Off Baja California (23°05'N–125°W) (Hanamura 1983). Indian Ocean and northeastern Atlantic (Kensley 1981). The record of Bermuda needs to be confirmed (Chace 1940; Foxton 1970a), although the species is reported for the western Atlantic by Crosnier (1988). Also in northwest Pacific (Crosnier 1988).

Depth distribution: Found in depths ranging between 340 and 770 m (Kensley 1981). Foxton (1970a) reported specimens collected at 800 and 925 m. It has also been captured between 2000 m and surface (Crosnier and Forest 1973), and in midwater trawls between 0–600 m and 391–630 m (Kensley et al. 1987).

Genus *Psathyrocaris* Wood-Mason 1893

55. *Psathyrocaris fragilis* Wood-Mason 1893.
Psathyrocaris fragilis Wood-Mason (in Wood-Mason and Alcock) 1893: 171, pl. 10–11. Crosnier and Forest 1973: 138, fig. 40a–d. Méndez 1981: 68, pl. 25, figs. 203, 204, 205a–c.

Geographic distribution: Off Peru (06°13'S–81°17'W to 8°43'S–80°03'W) (Méndez 1981). Indo-Pacific and eastern Atlantic, between 44°N and 18°S (Crosnier and Forest 1973).

Depth distribution: Taken in midwater tows at a depth of 1000–1100 m (total depth, 4000 m) (Méndez 1981); from depths between 600 and 800 m; and in bottom trawls between 498 and 900 m (Crosnier and Forest 1973).

Family Oplophoridae

Genus *AcanthePHYRA* A. Milne Edwards 1881

56. *AcanthePHYRA brevicarinata* Hanamura 1984.
AcanthePHYRA brevicarinata Hanamura 1984: 65, figs. 1–2. Chace 1986, 18 (key and under *A. curtirostris*), figs. 2d, 4d, 6c, 8c.

Geographic distribution: Off Baja California (13°28'N–119°49'W) (Hanamura 1984). Hanamura (1984) suggests that *A. brevicarinata* might occur from the Gulf of Panama to the Gulf of California (reported as *A. curtirostris* by Faxon 1895). See Chace (1986) for discussion.

Depth distribution: Between 600 and 900 m; possibly down to 1600 m (Hanamura 1984).

57. *AcanthePHYRA brevirostris* Smith 1885.
AcanthePHYRA brevirostris Smith 1885: 504; 1887: 670, pl. 14, fig. 2, pl. 15, figs. 2, 8, pl. 16, figs. 1, 6. Kensley 1972: 38, fig. 17m. Crosnier and Forest 1973: 41, figs. 8c–d. Chace 1986: 8 (key), figs. 2e, 4e, 5e, 6d, 8d.

Geographic distribution: Off Baja California (13°28'N–119°49'W) (Hanamura 1983) and south to Ecuador (Faxon 1895). Indo-Pacific and Atlantic (east and west) (Méndez 1981).

Depth distribution: Reported from a range of 1280–5394 m, mostly in bottom trawls (Méndez 1981; Kensley 1981).

58. *AcanthePHYRA carinata* Bate 1888.
AcanthePHYRA carinata Bate 1888: 748, pl. 126, fig. 2. Chace 1986: 13, figs. 2f, 4f, 5f, 6e, 8e (and key).
AcanthePHYRA approxima Bate 1888: 755, pl. 126, fig. 8.

Geographic distribution: Southern Chile (51°27'S–74°03'W), Indonesia, and the Philippines (Chace 1986).

Depth distribution: Chace (1986) reports the species from a range of 315–1469 m and considers it a benthic species. *A. carinata* has apparently never been caught in mid-water, and it is a large species (up to 120 mm total length; Bate 1888). *A. eximia*, an even larger species (up to 140 mm), however, has been caught in the water column (see text), hence our decision to include *A. carinata* in this list.

59. *AcanthePHYRA chacei* Krygier and Forss 1981.
AcanthePHYRA chacei Krygier and Forss 1981: 96, figs. 1–2. Chace 1986: 9 (key), figs. 2g, 4g, 5g, 6f, 8f.

Geographic distribution: Off Oregon (44°22'N to 52°53'N) (Krygier and Forss 1981).

Depth distribution: Taken in midwater trawls made in the depth range of 1500–2400 m and fished by bottom trawls in depths of up to 3900 m (Krygier and Percy 1981).

60. *AcanthePHYRA cucullata* Faxon 1893.
AcanthePHYRA cucullata Faxon 1893: 206; 1895: 167, pl. 44, fig. 1. Chace 1986: 15, figs. 2h, 4h, 5h, 8g (and key).

Geographic distribution: Pacific coast, from Baja California (13°25'N–120°04'W and 13°28'N–119°54'W) (Hanamura 1983) to Isla Malpelo, Colombia (Chace 1986). Indo-Pacific.

Depth distribution: Taken in midwater trawls at a depth of 1307 m and between 0 and 1617 m (Hanamura 1983). Also captured in bottom trawls, from a depth range of 1266–3342 m (Faxon 1893; Chace 1986).

61. *AcanthePHYRA curtirostris* Wood-Mason 1891.
AcanthePHYRA curtirostris Wood-Mason (*in*: Wood-Mason and Alcock) 1891: 195. Wood-Mason and Alcock 1893: 364, fig. 5. Crosnier and Forest 1973: 39, fig. 8a. Hanamura 1983: 74, fig. 13. Chace 1986: 17, figs. 2i, 4i, 5i, 6g, 8h (and key).

Geographic distribution: From Vancouver Island to Peru; Indo-Pacific and Atlantic oceans (northeast and Caribbean) (Butler 1980; Kensley 1981).

Depth distribution: Reported from depths of 300–1500 m in midwater tows, with greatest catches between 600–900 m (Krygier and Percy 1981) and 1000–1250 m (Butler 1980). Captured between 735 and 865 m off Baja California (Hanamura 1983). Also found in nonclosing bottom trawl samples taken between 660 and 4970 m (Méndez 1981), between 800 and 3700 m, and in a vertical tow from a depth of 2000 m to the surface (Crosnier 1987a).

62. *AcanthePHYRA eximia* Smith 1884.
AcanthePHYRA eximea Smith 1884: 376 (as *eximea* p. 376 and *eximia* p. 377); 1887: 667, pl. 14, fig. 1 (as *eximea*).
AcanthePHYRA eximia. Crosnier and Forest 1973: 34, figs. 7c–d. Chace 1986: 18, figs. 2j, 4j, 5j, 6h, 9a (and key).

Geographic distribution: Off California (32°52'N–132°30'W) (Hanamura 1983). Indo-Pacific and Atlantic oceans (Chace 1986).

Depth distribution: Reported from depths between 700 and 1200 m (Kensley 1981). According to Chace (1986), only juveniles seem to be pelagic, while adults of *A. eximia* probably live on or near the bottom at depths of 200–4700 m. Crosnier (1987a) reports captures of this species from a depth of 680–700 m in bottom trawls, and from 720 to 760 m in bottom traps.

63. *Acantheephyra faxoni* Calman 1939.
Acantheephyra faxoni Calman 1939: 191, fig. 1.
Méndez 1981: 87, figs. 269, 270, 270a. Chace 1986: 9 (key), figs. 2k, 4k, 5k, 6i, 9b.

Geographic distribution: Indo-Pacific; in the eastern Pacific, it is known from the Gulf of Panama to Peru (Méndez 1981).

Depth distribution: Ill-defined; *Acantheephyra faxoni* has been found in bottom trawl samples from depth ranges of 45–4000 m and has occasionally been captured in the water column at 1000–1100-m depth (total depth, 4000 m) (Méndez 1981).

64. *Acantheephyra pelagica* (Risso 1816).
Alpheus pelagicus Risso 1816: 91, pl. 2, fig. 7.
Acantheephyra pelagica. Chace 1986: 8 (key), figs. 3e, 4q, 5q, 7d, 9g, and 21 (under *A. eximia*).
Wasmer 1986: 41, fig. 7. Crosnier 1987a: 702.

Geographic distribution: Off Chile and in subantarctic waters of the South Pacific (Wasmer 1986). According to Chace (1986), *A. pelagica* could be a synonym of *A. eximia* Smith, although it has generally been recognized as a valid species occurring in the North Atlantic and the Mediterranean (and possibly also panantarctic) (Holthuis 1977; Crosnier 1987a). Kensley (1981) reports this species for the Indo-Pacific. Takeda and Tanaka (1984) report *A. pelagica* off Uruguay (40°S).

Depth distribution: Reported from a range of 800–2166 m (Kensley 1981), this species probably never occurs above 350 m (Crosnier and Forest 1973). Roe (1984) reports small catches from depths of 450 and 600 m at night and between 700 and 800 m during the day.

65. *Acantheephyra prionota* Foxton 1971.
Acantheephyra prionota Foxton 1971: 35, figs. 1–2. Crosnier and Forest 1973: 28, figs. 6b–c. Chace 1986: 10 (key), figs. 3f, 4r, 5r, 6e, 10a.

Geographic distribution: Off Baja California

(23°05'N–125°W) (Hanamura 1983). Indo-Pacific and northeastern Atlantic (Kensley 1981).

Depth distribution: The species is distributed from 750 to 1750 m (Kensley 1981). It has also been recorded in a vertical tow between 2000 m and the surface (Crosnier 1987a).

66. *Acantheephyra quadrispinosa* Kemp 1939.
Acantheephyra quadrispinosa Kemp 1939: 571.
Chace 1986: 26, figs. 3h, 4t, 5t, 7g, 10c, 14 (and key). Wasmer 1986: 39, fig. 5.

Geographic distribution: Oregon (Krygier and Pearcy 1981). Indo-Pacific and Atlantic oceans (Chace 1986).

Depth distribution: Known from depths between 250 and 1700 m (Kensley 1981). Krygier and Pearcy (1981) report a single specimen at 400–500 m; Chace (1986), referring to the material of the *Albatross*, notes that this species probably migrates between 180 and 1500 m and has been collected once at 27 m. Also taken in bottom trawls between 3700 and 5040 m and in a vertical tow between 2000 m and the surface (Crosnier 1987a).

67. *Acantheephyra trispinosa* Kemp 1939.
Acantheephyra trispinosa Kemp 1939: 577. Chace 1986: 9 (key), figs. 3m, 4y, 5y, 6l, 10h.

Geographic distribution: Eastern Pacific (7°N to 4°S) and westward to 116°W (Chace 1986).

Depth distribution: “Mesopelagic” (Chace 1986).

Genus *Ephyrina* Smith 1885

68. *Ephyrina hoskynii* Wood-Mason 1891.
Ephyrina hoskynii Wood-Mason (*in*: Wood-Mason and Alcock) 1891: 194. Crosnier and Forest 1973: 79, figs. 24a–b. Chace 1986: 33 (key).

Geographic distribution: Indian Ocean (Chace 1986). Eastern Pacific (Hanamura, *in litt.*).

Depth distribution: Taken between 900 and 950 m (Foxton 1970a).

Genus *Hymenodora* Sars 1972

69. *Hymenodora acanthitelsonis* Wasmer 1972.
Hymenodora acanthitelsonis Wasmer 1972: 87, figs. 1–8. Chace 1986: 42 (key), figs. 21a–e.

Geographic distribution: North Pacific off Oregon and Japan; northeast Atlantic (Krygier and Wasmer 1988).

Depth distribution: Below 2400 m and probably to 3000 m (Krygier and Pearcy 1981). Reported from a depth range of 2400–5440 m by Krygier and Wasmer (1988).

70. *Hymenodora frontalis* Rathbun 1902.
Hymenodora frontalis Rathbun 1902: 904; 1904: 28, fig. 8. Butler 1980: 70 (illustrated). Chace 1986: 42 (key), figs. 21f–j.

Geographic distribution: From the Sea of Okhotsk and the Bering Sea to southern California (Chace 1986).

Depth distribution: Reported from a range of 200–2400 m, with maximal abundance between 600 and 1300 m (Krygier and Pearcy 1981).

71. *Hymenodora glacialis* (Buchholz 1874).
Pasiphae glacialis Buchholz 1874: 279, pl. 1, fig. 2.
Hymenodora glacialis. Butler 1980: 72 (illustrated). Chace 1986: 42 (key), figs. 21k–o. Wasmer 1986: 48, fig. 10a.

Geographic distribution: From the Sea of Okhotsk and the Bering Sea to the Gulf of Panama (Butler 1980). Gulf of California (Rathbun 1904). Arctic region, North Atlantic to 30°N, and South Atlantic (west part) (Chace 1986). Off Chile and in subantarctic waters in the South Pacific (Wasmer 1986). Southwestern Indian Ocean (Crosnier 1987a).

Depth distribution: Rare above 2000 m and abundant in midwater trawls between 2000 and 2400 m; also in bottom trawls at a depth of 2800–3000 m (Krygier and Pearcy 1981). Taken in depths to 3900 m (Butler 1980) and in bottom trawls at 5610–5595 m (Crosnier 1987a).

72. *Hymenodora gracilis* Smith 1887.
Hymenodora gracilis Smith 1887: 680, pl. 12, fig. 6. Crosnier and Forest 1973: 83, fig. 25a. Chace 1986: 43 (key), figs. 21p–t. Wasmer 1986: 49, figs. 10b–c.

Geographic distribution: From Oregon to Baja California (Hanamura 1983). Indian and Atlantic oceans (Chace 1986). Off Chile and in subantarctic waters of the South Pacific (Wasmer 1986).

Depth distribution: The species is distributed from 600 to 2400 m (one capture at 300–400 m), with a maximal abundance between 1250 and 2000 m (Krygier and Pearcy 1981). It is also reported from a depth of 2200–3000 m (Kensley 1981) and in bottom trawls at a depth of 4730–4589 m (Crosnier 1987a).

Genus *Meningodora* Smith 1882

73. *Meningodora mollis* Smith 1882.
Meningodora mollis Smith 1882: 74, pl. 11, figs. 8, 8a, 9, pl. 12, figs. 5, 5a, 6–9. Crosnier and Forest 1973: 44, fig. 10c. Chace 1986: 50, figs. 26a–k.
Notostomus fragilis Faxon 1893: 207; 1895: 170, pl. 44, figs. 2, 2a–b.

Geographic distribution: Islas Galápagos and Panama to Oregon; Indian and Atlantic oceans (east and west) (Chace 1986).

Depth distribution: Recorded from depths between 500 and 1150 m (Krygier and Pearcy 1981), from 1400 m (Faxon 1893; *N. fragilis*), and in vertical tows between 2000 m and the surface (Crosnier 1987a).

Genus *Notostomus* A. Milne Edwards 1881

74. *Notostomus japonicus* Bate 1888.
Notostomus japonicus Bate 1888: 830, pl. 135, fig. 1. Stevens and Chace 1965: 277, figs. 1–4. Butler 1980: 63 (illustrated). Chace 1986: 53 (key), figs. 28j–l, 29h–i.

Geographic distribution: Off Oregon, Hawaii, and Japan (Krygier and Pearcy 1981).

Depth distribution: It has been taken in the range of 200–850 m (Krygier and Pearcy 1981).

75. *Notostomus elegans* A. Milne Edwards 1881.
Notostomus elegans A. Milne Edwards 1881: 8. Crosnier and Forest 1973: 56, figs. 15, 16a–b. Chace 1986: 56, figs. 28d–f, 29c–e, 30 (and key).
Notostomus westergreni Faxon 1893: 208; 1895: pl. f. Crosnier and Forest 1973: 60, fig. 17. Méndez 1981: 87, figs. 263–268.

Geographic distribution: Pacific and Atlantic (east and west) oceans; off Ecuador, Chile, and Peru (Méndez 1981; Chace 1986).

Depth distribution: Between 750 and 1170 m (Kensley 1981). Also taken in trawls between 1417 and 3931 m (Chace 1986) and between 450 and 5380 m (Crosnier and Forest 1973).

Genus *Oplophorus* H. Milne Edwards 1837

76. *Oplophorus novaezeelandiae* de Man 1931.
Hoplophorus novae-zeelandiae de Man 1931: 369, figs. 1–20.
Oplophorus novaezeelandiae. Crosnier and Forest 1973: 26, fig. 5. Chace 1986: 59 (key), figs. 32f–j. Wasmer 1986: 37, figs. 3a–c.

Geographic distribution: Off Chile; in the South Pacific, and East Pacific. Atlantic Ocean, New Zealand, and southwestern Australia (Chace 1986; Wasmer 1986). Southwest Indian Ocean (Kensley et al. 1987).

Depth distribution: Mesopelagic (Chace 1986), the species is distributed from 90 to 725 m; it is reported in pelagic trawls between 630 m and the surface (Kensley et al. 1987).

77. *Oplophorus spinosus* (Brullé 1839).
Palaemon spinosus Brullé 1839: 18 (illustrated).
Oplophorus spinosus. Sivertsen and Holthuis 1956: 19, fig. 15, pl. 3, figs. 1–2. Chace 1986: 59 (key).

Geographic distribution: Off Baja California (23°N–125°W and 32°57'N–127°44'W) (Hanamura 1983). Indo-Pacific and Atlantic oceans (east and west) (Chace 1986).

Depth distribution: It has been recorded from depths between 400–500 and 1117–1233 m (Hanamura 1983), at a depth of 150 m (Abele and Kim 1986), and in bottom trawls at a depth of 2700 m (Crosnier 1987a). Also reported in midwater trawls operating from 90 m to the surface and between 60 and 630 m (Kensley et al. 1987).

Genus *Systellaspis* Bate 1888

78. *Systellaspis braueri paucispinosa* Crosnier 1988.
Systellaspis braueri paucispinosa Crosnier 1987b (1988): 953, fig. 3–b (and key).
Systellaspis braueri. Butler 1980: 65 (illustrated).
Krygier and Percy 1981: 87, fig. 2.

Geographic distribution: Oregon and Central America (13°28'N–119°54'W) (Hanamura 1983). North and South Pacific, Indonesia (Crosnier 1987b).

Depth distribution: From 500 to 2000 m, with a maximum recorded in depths ranging between 900 and 2000 m (Krygier and Percy 1981).

79. *Systellaspis cristata* (Faxon 1893).
Acanthephyra cristata Faxon 1893: 206; 1895: 162, pl. 43, fig. 1.
Systellaspis cristata. Crosnier and Forest 1973: 94, figs. 26d, 27d. Butler 1980: 67 (illustrated), pl. 1, fig. e. Chace 1986: 64, figs. 34d–f, 35c. Crosnier 1987a: 711, figs. 6c–g, 7, 8c–d.

Geographic distribution: Off Canada, Oregon, and Baja California, and south to Central America (13°28'N–120°07'W). Indo-Pacific and Atlantic oceans (east and west) (Hanamura 1983).

Depth distribution: It has been captured from depths

of 200–300 m and 600–700 m (Krygier and Percy 1981) and from 250 to 900 m (Kensley 1981). In bottom trawls between 600 and 3241 m, in midwater tows between 700 and 930 m, and from the surface to a depth of 2500 m (Foxton 1970a, 1970b; Crosnier and Forest 1973).

80. *Systellaspis debilis* (A. Milne Edwards 1881).
Acanthephyra debilis A. Milne Edwards 1881: 13.
Systellaspis debilis. Crosnier and Forest 1973: 87, figs. 26b, 27b. Crosnier 1987a: 715, figs. 9a–h, 10. Chace 1986: 65, figs. 34g–i, 35e, f.

Geographic distribution: Off Oregon (Krygier and Percy 1981). Indo-Pacific and Atlantic oceans (east and west coast) (Chace 1986). Chace does not include the records for Oregon; these are, however, confirmed by Krygier and Wasmer (1988).

Depth distribution: The species has been reported from a range of 150–1500 m (Kensley 1981) and was captured at 80 m during a night haul (Krygier and Percy 1981). It concentrates between 650 and 800 m by day and at 150 m at night (Foxton 1970a). Other information obtained by Roe (1984) indicates that *S. debilis* concentrates at 450–600 m by day and at 100–250 m at night. Also taken in midwater tows in depths ranging between 0 and 1200 m (Kensley et al. 1987).

81. *Systellaspis eltanini* Wasmer 1986.
Systellaspis eltanini Wasmer 1986: 52, figs. 13–15.

Geographic distribution: Off Chile (33°S), south to the subantarctic waters around South America, and in the western Atlantic (Wasmer 1986).

Depth distribution: Captured in midwater trawls between the surface and 1550–2330 m (never found in shallowest trawls) (Wasmer 1986).

Family Pandalidae Genus *Plesionika* Bate 1888

82. *Plesionika beebei* Chace 1937.
Plesionika beebei Chace 1937: 114, fig. 2. Wicksten 1978: 84 (key).

Geographic distribution: From Punta Tosca, Baja California, to Mancora, Peru.¹

Depth distribution: Captured between surface and 200 m, and in the water column between 549 and 914 m; also taken in bottom trawls from depths between 73 and 738 m.²

¹Hendrickx, M. E., and M. K. Wicksten. MS. Los Pandalidae (Crustacea, Caridea) del Pacífico mexicano, con una clave para su identificación.

²Ibid.

83. *Plesionika* aff. *P. rossignoli* Crosnier and Forest 1968.

Aff. *Plesionika rossignoli* Crosnier and Forest 1968: 113, fig. 6b; 1973: 218, figs. 67a, 68a–b.

Plesionika aff. *rossignoli* Hanamura 1983: 79, fig. 17.

Geographic distribution: Off Central America (13°29'N–13°25'N and 120°W) (Hanamura 1983).

Plesionika rossignoli is known from the eastern tropical Atlantic (Crosnier and Forest 1973).

Depth distribution: Between 734 and 845 m, and also recorded between the surface and 1617 m (Hanamura 1983). *Plesionika rossignoli* is known to occur between the surface and at least 650 m (Crosnier and Forest 1973).

84. *Plesionika sanctaecatalinae* Wicksten 1983.

Plesionika sanctaecatalinae Wicksten 1983: 138, figs. 1–3.

Plesionika martia semilaevis. Wicksten 1978: 85, fig. 1. Méndez 1981: 104, figs. 316–317.

Geographic distribution: From southern California (33°38'N) to Peru (12° to 18°S) (Wicksten 1983).

Depth distribution: Captured by Isaacs-Kid midwater trawls between 812 and 3877 m (Wicksten 1983).

Genus *Stylopandalus* Coutière 1905

85. *Stylopandalus richardi* (Coutière 1905).

Pandalus (*Stylopandalus*) *richardi* Coutière 1905a: 1115; 1905b: 18, fig. 6.

Parapandalus richardi. Chace 1940: 192, figs. 58–61. Crosnier and Forest 1973: 224, fig. 69b.

Stylopandalus richardi. Richard 1905: 11–13. Chace 1985: 136, fig. 62.

Geographic distribution: Isla Guadalupe and Baja California (23°N–24°42'N and 125°W) (Hanamura 1983). Indo-Pacific and Atlantic oceans (east and west) (Kensley 1981).

Depth distribution: Between 460 and 980 m (Kensley 1981). Also reported from depths of 30–490 m and 735–865 m (Hanamura 1983); from subsurface to 3600 m, but below 500 m at night (Crosnier and Forest 1973). Taken in midwater trawls between 60 m and the surface and between 216 and 630 m (Kensley et al. 1987).

Family Processidae

Genus *Processa* Leach 1815

86. *Processa pippinae* Wicksten and Méndez 1985.

Processa pippinae Wicksten and Méndez 1985: 16, figs. 1–4.

Geographic distribution: Gulf of California (north and central parts) (Hendrickx and Estrada-Navarrete 1989).

Depth distribution: In plankton samples collected between surface and 300 m (Hendrickx and Estrada-Navarrete 1989). The type material was obtained in bottom trawls (265–644 m) (Wicksten and Méndez 1985).

DISCUSSION

First of all, it seems necessary to remember that among the 86 species reported herein, some might not be regular members of the pelagic realm. This is probably the case of *Hymenopenaeus doris*, *Acanthephyra carinata*, and *A. eximia*, three species that have occasionally been caught in midwater trawls and must, therefore, be included in the checklist. In turn, species like *Plesionika mexicana* Chace and *P. trispinus* Squires and Barragan, two species of Pandalidae commonly found in bottom trawl catches in the Gulf of California and off the coast of Colombia/Peru, have never been recognized as pelagic species³ although they are similar in size and morphology to *P. beebei*, a species found both in midwater and bottom trawls.

Some species, like *Benthesicymus tanneri* Faxon known from the Gulf of California to Peru, have sometimes been considered benthopelagic (Méndez 1981), although there is no precise record of their pelagic phase.

Caution should also be taken when considering species for which a single record (sometimes of a single specimen) is available for the eastern Pacific. *Bentheogennema stephensoni*, for instance, a species apparently never illustrated properly before 1985 (Crosnier 1985), was found by Hanamura (1983) off the coast of Baja California in only one sample with only one specimen (a male). Some species included in the checklist might also represent undescribed species (e.g., *Plesionika* aff. *P. rossignoli*).

Of the 86 species included in the checklist, 39 (45%) are members of the Penaeoidea and 47 (55%) of the Caridea. Five families of Penaeoidea with 9 genera, and four families of Caridea with 14 genera are present. The number of species per genus and family is quite variable, however, and as many as 12 species of Benthesicymidae, 24 species of Sergestidae, 16 species of Pasiphaeidae, and 26 species of Ophrophoridae are included in the checklist, totaling 90% of the species in just four families (table 1).

³Hendrickx, M. E., and M. K. Wicksten. MS. Los Pandalidae (Crustacea, Caridea) del Pacífico mexicano, con una clave para su identificación.

TABLE 1
 Repartition of the 86 Species of Pelagic Shrimps from
 the Eastern Pacific in Families and Genera of Penaeoidea
 and Caridea

PENAEOIDEA (39)	CARIDEA (47)
Benthescymidae (12)	Pasiphaeidae (16)
<i>Bentheogennema</i> (5)	<i>Pasiphaea</i> (11)
<i>Gennadas</i> (7)	<i>Parapasiphaea</i> (2)
Penaeidae (1)	<i>Eupasiphae</i> (2)
<i>Funchalia</i> (1)	<i>Psathyrocaris</i> (1)
Solenoceridae (1)	Oplophoridae (26)
<i>Hymenopenaeus</i> (1)	<i>Acanthephyra</i> (12)
Sergestidae (24)	<i>Ephyrina</i> (1)
<i>Sergestes</i> (13)	<i>Hymenodora</i> (4)
<i>Sergia</i> (9)	<i>Meningodora</i> (1)
<i>Petalidium</i> (1)	<i>Notostomus</i> (2)
<i>Acetes</i> (1)	<i>Oplophorus</i> (2)
Luciferidae (1)	<i>Systellaspis</i> (4)
<i>Lucifer</i> (1)	Pandalidae (4)
	<i>Plesionika</i> (3)
	<i>Stylopandalus</i> (1)
	Processidae (1)
	<i>Processa</i> (1)

The analysis of the currently known distribution of pelagic shrimps reported herein permits division of the 86 species into three major groups according to their zoogeographic affinities (table 2). The first group comprises species endemic to the eastern Pacific, with 22 species and a majority of Caridea (9 species of Penaeoidea versus 13 species of Caridea). The 3 species of pelagic *Plesionika*, most species of *Pasiphaea* (7 out of 10), and a fair proportion of Sergestidae (7 out of 24 species) known from the eastern Pacific are endemic. But there are no endemic species of *Gennadas*, a genus well represented in the region (7 species).

A second group of 25 species comprises pelagic shrimps with a cosmopolitan distribution. Here again, a strong majority of Caridea is to be found, with 17 species versus only 8 species of Penaeoidea, the former including 12 species of Oplophoridae of a total of 23 known for the entire zoogeographic region (table 2).

The third major group of shrimps comprises species found elsewhere (e.g., in the Atlantic, in the Indo-Pacific) but not cosmopolitan. Of the 34 species with such geographic distribution, 20 belong to the Penaeoidea and only 14 to the Caridea. Noteworthy is the high proportion of Sergestidae in this group (14 out of 24 species known for the area; table 2).

Four species are found along the west coast of America but extend their distribution limits to Japan (3 species) or to the Okhotsk Sea (1 species). All 4 species are considered by Krygier and Wasmer (1988) as part of the subarctic-transitional species

(subarctic species with ranges extending southward along the Pacific coast to Baja California) (table 2).

Two species are not included in the major groups cited above. *Pasiphaea acutifrons* presents a bipolar distribution limited to the northern Pacific and around South America; *Pasiphaea dofleini* is known only from the Strait of Magellan.

As many as 51 of the 86 species of pelagic shrimps occurring in the eastern Pacific are found in Mexican coastal and offshore waters, including 29 species of Penaeoidea and 22 species of Caridea (table 2).

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TABLE 2
 Zoogeographic Affinities of Pelagic Shrimps Reported from the Eastern Pacific

Species endemic to the eastern Pacific	Species with cosmopolitan distribution	Species also present in other regions but not cosmopolitan	Species extending their distribution to	
			Japan	Okhotsk Sea
* <i>Bentheogennema burkenroadi</i>	* <i>Bentheogennema intermedia</i>	* <i>Bentheogennema pasithea</i> (I-WP)	* <i>Bentheogennema borealis</i>	<i>Hymenodora frontalis</i>
* <i>Hymenopenaeus doris</i>	* <i>Gennadas capensis</i>	* <i>Bentheogennema stephensoni</i> (I-WP)	* <i>Sergestes similis</i>	
* <i>Sergestes extensus</i>	* <i>Gennadas bouvieri</i>	* <i>Gennadas incertus</i> (I-WP)	<i>Notostomus japonicus</i>	
<i>Sergestes geminus</i>	* <i>Gennadas scutatus</i>	* <i>Gennadas propinquus</i> (I-P)	(+ Hawaii)	
* <i>Sergestes halia</i>	* <i>Gennadas tinayrei</i>	* <i>Gennadas sordidus</i> (I)		
* <i>Sergestes pestafer</i>	* <i>Sergestes pectinatus</i>	<i>Funchalia balboae</i> (I-A)		
* <i>Sergia filicta</i>	* <i>Sergestes sargassi</i>	<i>Sergestes brevispinatus</i> (CP)		
* <i>Sergia phorca</i>	<i>Sergia kroyeri</i>	* <i>Sergestes erectus</i> (CP)		
<i>Acetes binghami</i>	* <i>Parapasiphaea sulcatifrons</i>	* <i>Sergestes consobrinus</i> (CP)		
<i>Pasiphaea affinis</i>	* <i>Eupasiphae gilesii</i>	<i>Sergestes gibbilobatus</i> (CP)		
* <i>Pasiphaea americana</i>	<i>Psathyrocaris fragilis</i>	<i>Sergestes tantillus</i> (CP)		
* <i>Pasiphaea chacei</i>	* <i>Acanthephyra brevispinata</i>	<i>Sergestes arcticus</i> (P-A)		
<i>Pasiphaea corteziana</i>	* <i>Acanthephyra curtirostris</i>	<i>Sergia inoa</i> (CP)		
* <i>Pasiphaea emarginata</i>	<i>Acanthephyra eximia</i>	* <i>Sergia laminata</i> (I-WP)		
<i>Pasiphaea faxoni</i>	<i>Acanthephyra pelagica</i>	* <i>Sergia bigemina</i> (P)		
* <i>Acanthephyra brevicarinata</i>	* <i>Acanthephyra prionota</i>	* <i>Sergia maxima</i> (I-WP)		
<i>Acanthephyra chacei</i>	<i>Acanthephyra quadrispinosa</i>	<i>Sergia profunda</i> (A)		
* <i>Plesionika beebeyi</i>	* <i>Hymenodora glacialis</i>	* <i>Sergia scintillans</i> (I-WP)		
<i>Plesionika aff. P. rossignoli</i>	* <i>Hymenodora gracilis</i>	* <i>Petalidium suspirosum</i> (CP)		
<i>Plesionika santaecatalinae</i>	<i>Oplophorus novaezeelandiae</i>	* <i>Lucifer typus</i> (A)		
* <i>Processa pippinae</i>	* <i>Oplophorus spinosus</i>	* <i>Pasiphaea pacifica</i> (I-P)		
	* <i>Systellaspis cristata</i>	* <i>Pasiphaea tarda</i> (A)		
	<i>Systellaspis debilis</i>	<i>Parapasiphaea cristata</i> (A)		
	* <i>Stylopandalus richardi</i>	<i>Eupasiphae serrata</i> (A)		
		<i>Acanthephyra carinata</i> (WP)		
		* <i>Acanthephyra cucullata</i> (I-P)		
		<i>Acanthephyra faxoni</i> (I-WP)		
		<i>Acanthephyra trispinosa</i> (CP)		
		<i>Ephyrina hoskynii</i> (I)		
		<i>Hymenodora acanthitelsonis</i> (P-A)		
		* <i>Meningodora mollis</i> (I-A)		
		<i>Notostomus elegans</i> (P-A)		
		<i>Systellaspis eltanini</i> (A)		
		* <i>Systellaspis braueri paucispinosa</i> (P)		

A = Atlantic Ocean; I = Indian Ocean; P = Pacific Ocean; CP = central Pacific; WP = west Pacific; * indicates species reported off the coast of Mexico. Two species are not included in this table (see text).

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