Key to the Hippolytid Shrimp of the Eastern Pacific Ocean

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Abstract.– Seventy-two species of hippolytid shrimp (Decapoda: Crustacea: Hippolytidae) have been reported from the eastern Pacific (the Aleutians to Cape Horn). There are more species to the north of Magdalena Bay, Baja California, than in tropical or temperate waters to the south. Most species of *Eualus*, *Lebbeus*, *Heptacarpus*, and *Spirontocaris* live along the temperate coasts of North America; species of *Thor*, *Trachycaris*, and *Lysmata* are most common in warm-temperate to tropical areas, and species of *Hippolyte* range from cool to tropical regions. In the eastern Pacific, species of *Nauticaris* and *Leontocaris* have been found only in the Southern Hemisphere. An annotated key to the species, with geographic and depth range and selected synonyms, is provided.

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Members of the family Hippolytidae are among the most abundant and diverse carideans of the eastern Pacific. Hippolytids are eaten by birds and fishes, and serve as cleaners for fishes such as moray eels (Chace 1937, Limbaugh 1961, Hobson and Chess 1976, Reynolds 1977). They are common inhabitants of tidepools, kelp beds, seagrass flats, and other nearshore areas, but also range into the deeper parts of the continental shelf and slope.

The greatest diversity of species of hippolytids in the eastern Pacific is in boreal to temperate waters of the northern hemisphere (Table 1). Forty-seven species live from the Aleutian Islands to Baja California, Mexico. Among these, *Lebbeus vicinus* has the greatest range, from the Aleutians to the Gulf of California. *Hippolyte californiensis* lives from the coast of Alaska to the Gulf of California. Eighteen other species range from the Aleutians or the mainland of Alaska south to southern California, USA, or Baja California, Mexico. Twenty-one species range from the Bering Sea or the Aleutians to British Columbia, Washington, or Oregon. Two species have been reported only from Puget Sound, and four species range from the Bering Sea or the Aleutians to northern or central California. An additional six species range from central California to Baja California or the Gulf of California, Mexico.

In the Northern Hemisphere, species of *Spirontocaris*, *Heptacarpus*, *Eualus*, and *Lebbeus* are diverse. Species of the first two genera are not found in the Southern Hemisphere, while species of the latter are more diverse in the northern than in the southern hemispheres. Although no species of these genera are found off both North and South America, *Lebbeus washingtonianus* and *L. bidentatus*, and *Eualus pusiolus* and *E. dozei* are very similar and may represent pairs of disjunct sibling species.

Tropical areas of the eastern Pacific are poor in hippolytid species. *Lysmata californica* ranges from central California to the Galapagos, while *Latreutes antiborealis* ranges from the Gulf of California to Chile. *Thor algicola* and *L. antiborealis* are sibling species of *T. manningi* and *L. parvulus* of the Caribbean and warm-temperate western Atlantic. *Hippolyte zostericola*, *Trachycaris restrictus*, and *Lysmata intermedia* occur both in the eastern Pacific and in the Caribbean and tropical Atlantic. *Thor spinosus* and *Lysmata trisetacea* range from the eastern Pacific to the Indo-West Pacific, and *Thor amboinensis* is circumtropical. Only *Hippolyte williamsi*, *Heptacarpus yaldwyni*, and *Lysmata galapagensis* are endemic and distinct.

The hippolytid fauna of temperate South America is depauperate compared with that of North America. Except for *Leontocaris pacificus*, the only representative of this genus in the eastern Pacific, all of the species belong to genera present in tropical or temperate areas of the northern hemisphere. Four species of *Lebbeus* live on the continental slopes.

Hippolytids of the eastern Pacific inhabit a wide range of depths and habitats. Species of *Spirontocaris*, *Lebbeus*, and *Eualus* prefer habitats from the lowest intertidal zone to the

Table 1
Ranges of Hippolytid species in the eastern Pacific.

Bering Sea, Aleutian Island or Alaskan Mainland to Southern California, USA, or Baja California, Mexico

Eualus avinus
E. barbatus
E. berkeleyorum
E. biunguis
E. fabricii
E. lineatus
E. macrophthalmus
E. pusiolus
E. suckleyi
E. townsendi
Hippolyte californiensis
H. clarki
Lebbeus brandti
L. catalepsis
L. grandimanus
L. groenlandicus
L. polaris
L. possjeticus
L. schrenki
L. vicinus
L. washingtonianus
L. zebra
Heptacarpus brevirostris
H. camtschaticus
H. carinatus
H. decorus
H. flexus
H. herdmani
H. kincaidi
H. littoralis
H. moseri
H. paludicola
H. pugettensis
H. sitchensis
H. stimpsoni
H. stylus
H. taylori
H. tenuissimus
H. tridens
Spirontocaris arcuata
S. holmesi
S. lamellicornis
S. ochotensis
S. prionota
S. sica
S. snyderi
S. truncata

Central California to Baja California

Heptacarpus brachydactylus
H. franciscanus
H. fuscimaculatus
H. palpator
H. pictus
Lebbeus lagunae
Lysmata californica (south to Galapagos)

Gulf of California to Northern Peru

Heptacarpus yalduyni
Hippolyte williamsi
H. zostericola
Latreutes antiborealis (south to Chile)
Lysmata galapagensis
L. intermedia
L. trisetacea
Thor algicola
T. amboinensis
T. spinosus
Trachycaris restrictus

Peru–Chile

Lebbeus bidentatus
L. carinatus
L. scrippsi
L. splendidus
Eualus dozei
Leontocaris pacificus
Lysmata porteri

continental slopes. Species of *Lebbeus* are the deepest eastern Pacific hippolytids, living as deep as 2824 m. Except for *Heptacarpus yalduyni*, species of *Heptacarpus* usually range from the upper intertidal zone to the continental shelf. Species of *Hippolyte* live in shallow water with sea grasses or beds of algae. Species of *Lysmata* live in tidepools or in cracks and caves among coral or rocks from the intertidal zone to shallow subtidal areas. *Thor amboiensis* tends to associate with subtidal cnidarians. *Thor algicola*, *Thor spinosus*, *Trachycaris restrictus*, and *Latreutes antiborealis* live among algae or on subtidal bottoms of sand, rock, coral, or rubble. *Leontocaris pacificus* lives on the continental slope.

Classification of the hippolytid shrimp is in flux. According to Williams (1984), species of the family are characterized by having the first two pairs of legs chelate, the first pair not much stronger than the rest, the carpus of the second pair of legs subdivided, the eyes well developed and not covered by the carapace, and the mandibles usually deeply cleft. A recent cladistic analysis by Christoffersen (1988) splits the Hippolytidae into at least seven families and divides them among two superfamilies, the Crangonoidea and the Alpheoidea. However, this analysis did not provide familial placement for all of the genera considered to belong to the traditional family Hippolytidae and provided no key to the groups. Reinterpretation of some of the genera of hippolytids, such as *Eualus*, also is being considered by Christofferson and others.

Despite the confusion surrounding the systematic relationships among hippolytids, it seems useful to provide a key to the species. The last comprehensive key to the species of the northeastern Pacific was prepared by Rathbun (1904); the most recent extensive synonymy and list of species was included in the work of Holthuis (1947). More recent keys are available for British Columbia (Butler 1980), the Gulf of California (Wicksten 1983), and Peru (Mendez 1981). Illustrations and keys to intertidal species have been provided in accounts of the fauna of Puget Sound and adjacent areas (Kozloff 1974), California (Ricketts et al. 1985; Smith and Carlton 1975; Chace and Abbott 1980) and the Gulf of California (Brusca 1980; Kerstitch 1989). Fourteen new species have been described since 1947 (Butler 1971, 1980; Jensen 1983, 1987; Kobyakova 1967; Wicksten and Butler 1983; Wicksten and Mendez 1982; Wicksten 1984, 1986, 1987a; Zarenkov 1976).

The following key includes all hippolytid species reported from the Aleutian Islands (south of the Bering Sea) to Cape Horn, excluding the Straits of Magellan. The arrangement in the key is artificial. Geographic and depth ranges are provided. Superscript numbers in parentheses at the ends of couplets refer to notes following the key, where further information on ranges, synonyms, and species of uncertain classification can be found.

Key to the Hippolytidae

1 Lateral surface of carapace with many scattered spines. Carpus of second pereopods with 2 segments ..... ***Trachycaris restrictus* (A. Milne-Edwards)**
Eastern Atlantic from Canary Islands to St. Helena Island, Bermudas, to Brazil, Gulf of California, Panama; 0–100 m (Wicksten 1983).

Lateral surface of carapace with at most three spines. Carpus of second pereopods with 3 or more segments 2

2 Carpus of second pereopods with 3 segments. (Often associated with sea grasses or brown algae) 3

Carpus of second pereopods with 4 or more segments. (Size and associations various) 7

3 Rostrum deep, lamellate. Anterior margin of carapace with 10 spines. No hepatic spine ..... ***Latreutes antiborealis* Holthuis**
Gulf of California to Chile, 4–46 m (Wicksten 1983).[1]

Rostrum elongate. Anterior margin of carapace with 2 spines. One hepatic spine 4

4 First antennular segment without outer distal spines 5

First antennular segment with one or more outer distal spines 6

5 Tip of rostrum trifid. (Usually found among giant kelp, *Macrocystis* spp.) ..... ***Hippolyte clarki* Chace**
Sheep Bay, Alaska to Cedros Island, Baja California, 0–10 m (Wicksten 1983).

Tip of rostrum bifid. (Usually found among sea grasses) ..... ***Hippolyte zostericola* (Smith)**
Massachusetts to Curacao, western Colombia, shallow subtidal (Wicksten 1989).

6 First segment of antennular peduncle with one (rarely 2) spines, rostrum of female reaching nearly as far as tip of scaphocerite ..... ***Hippolyte californiensis* Holmes**
Sitka, Alaska to Baja California; rare in Gulf of California, 0–10 m, usually among eelgrass (*Zostera* sp.) (Wicksten 1983).

First segment of antennular peduncle with 3 spines, rostrum of female reaching about to distal 1/3 of scaphocerite ..... ***Hippolyte williamsi* Schmitt**
Gulf of California to Chile, 0–10 m, among rocks and brown algae (*Sargassum* sp.) (Wicksten 1983).[2]

7 Carpus of second pereopod with 4 segments. Left second pereopod longer and stronger than right ..... ***Leontocaris pacificus* Zarenkov**
Off Chile, 600–700 m (Zarenkov 1976).

Carpus of second pereopod with 6 or more segments. Left and right second pereopods equal or nearly so 8

8 Carpus of second pereopod with 6 segments. (Rostrum reaching at most to end of eye. Ranging from Gulf of California to Panama) 9

Carpus of second pereopod with 7 or more segments. (Rostrum reaching end of eye or beyond, found north of Gulf of California to Chile) 11

9 Supraorbital spine present. Finely striped, with large bluish-red eyespots on third abdominal tergite ..... ***Thor spinosus* Boone**
Indo-Pacific to Gulf of California, subtidal (Bruce 1976, Wicksten 1983).

Supraorbital spine absent. Translucent, mottled or spotted, without eyespots 10

10 Brightly colored with pattern of bold white spots on dark background. Anterolateral margin of carapace angular. (Symbiotic with sea anemones or corals) ..... ***Thor amboinensis*** **Heller**
Tropical Atlantic and Indo-Pacific, Cocos Island and Panama. Subtidal (Chace 1972; Abele and Patton 1976).[3]

Camouflaged, translucent to mottled like algae. Anterolateral margin of carapace rounded. (Not symbiotic with sea anemones or corals) ..... ***Thor algicola*** **Wicksten**
Gulf of California to Panama, 0–20 m (Wicksten 1987a).[4]

11 Carpus of second pereopod with 7 segments. Flagellum of antennae not as long as body. (Color in life various, often camouflaged) **12**

Carpus of second pereopod with more than 7 segments. Flagellum of antenna as long as body. (Color in life often red striped) **69**

12 More than 1 supraorbital spine **13**

One or no supraorbital spines **20**

13 Rostrum with 3–4 supraorbital spines **14**

Rostrum with 2 supraorbital spines **15**

14 Rostrum deep, subcircular; with 10–26 mostly small dorsal spines on rostrum proper and 3–4 dorsal carapace spines, ventral margin of third pleuron acute or bluntly pointed ..... ***Spirontocaris prionota*** **(Stimpson)**
Bering Sea to SW of San Carlos Point, Baja California, 4–163 m (Butler 1980).[5]

Rostrum moderately deep, with 1–3 large dorsal spines, truncate apex; pleuron of third somite rounded ..... ***Spirontocaris truncata*** **Rathbun**
Strait of Georgia to SW of San Carlos Point, Baja California, 37–92 m (Wicksten 1984).

15 Rostrum with styliform distal projection, no process on inner surface of eyestalk. (Usually found on offshore soft bottoms) **16**

Rostrum without styliform distal projection, process present on inner surface of eyestalk. (Found among rocks or soft bottoms) **17**

16 Distal projection of rostrum with 1 ventral spine; epipods on first and second pereopods. (Usually living at 150 m or less) ..... ***Spirontocaris holmesi*** **Holthuis**
Yes Bay, Alaska to San Diego, California, 24–386 m (Butler 1980).[6]

Distal projection of rostrum without ventral spine; epipods on first pereopods only. (Usually living at 150 m and deeper) ..... ***Spirontocaris sica*** **Rathbun**
Restoration Bay, British Columbia to between San Benito Islands and Cedros Island, Baja California; 88–849 m (Butler 1980, Wicksten 1987b).

17 Pleura of first to third somites ventrally acute or bluntly pointed, dactyls of third to fifth pereopods long, slender, with acute tips ..... ***Spirontocaris lamellicornis*** **(Dana)**
Bering Sea to Santa Monica Bay, California, 3–192 m (Butler 1980, Standing 1981).

Pleura of first to third somites broadly rounded ventrally, dactyls of third to fifth pereopods short and stout with bifid tips **18**

18 Body slender to moderately stout, shell thin; epipods on first and second pereopods ..... ***Spirontocaris snyderi*** **Rathbun**
Queen Charlotte Islands to San Cristobal Bay, Baja California, 4–141 m (Butler 1980).[7]

Body moderately stout to stout, shell thick; epipods on first to third pereopods **19**

19 Rostrum more or less ovoid; posterior dorsal spine on carapace located near middle of carapace ..... ***Spirontocaris ochotensis*** **(Brandt)**
Bering Sea to Vancouver Island, Japan, coast of Siberia; 0–247 m (Butler 1980).

Rostrum with lower limb broader than upper; posterior dorsal spine of carapace located on posterior third of carapace ..... ***Spirontocaris arcuata*** **Rathbun**
Arctic to Sea of Japan and Strait of Juan de Fuca, 5–641 m (Butler 1980).

20 (12) One supraorbital spine **21**

No supraorbital spine **36**

21 Epipods on only first pereopods **22**

Epipods on at least first and second pereopods **23**

22 Rostrum with 6–8 dorsal spines, stylocerite not reaching end of first segment of antennular peduncle ..... ***Lebbeus vicinus vicinus*** **(Rathbun)**
North of Unalaska, Aleutian Islands, 570–750 m (Rathbun 1904).

Rostrum with 3–4 dorsal spines, stylocerite reaching end of first segment of antennular peduncle ..... ***Lebbeus vicinus montereyensis*** **Wicksten and Mendez**
Monterey Bay to Gulf of California, 954–2824 m (Wicksten and Mendez 1982).

23 Epipods on first and second pereopods **24**

Epipods on at least first to third pereopods **28**

24 Carapace with 4 large dorsal spines posterior to orbit. (Often associated with sea anemones) ..... ***Lebbeus grandimanus*** **(Brazhnikov)**
Bering Sea to Sea of Japan and Puget Sound, Washington, 6–180 m (Butler 1980, Wicksten and Mendez 1982).

Carapace with 1–2 dorsal spines posterior to orbit. (Associations various or not known) **25**

25 Dactyl of third pereopod simple, without spines ..... ***Lebbeus scrippsi*** **Wicksten and Mendez**
Southern Peru to off Arica, Chile, 768–1164 m (Wicksten and Mendez 1982).

Dactyl of third pereopod with spines **26**

26 First segment of antennular peduncle with 2 anteroexternal spines. Rostrum with 5–9 ventral spines ..... ***Lebbeus splendidus*** **Wicksten and Mendez**
Off Lobos de Tierra, Peru, 712–1100 m (Wicksten and Mendez 1982).

First segment of antennular peduncle with 1 anteroexternal spine. Rostrum with 4 or less ventral spines **27**

27 Rostrum overreaching antennular peduncle, with 3–4 ventral spines ..... ***Lebbeus polaris*** **(Sabine)**
Arctic to Sea of Okhotsk, Cape Cod and northern Europe, Aleutian Islands to Alice Arm, British Columbia, 0–930 m (Green and Butler 1988).

Rostrum barely reaching end to first segment of antennular peduncle, with 1–no ventral spines ..... ***Lebbeus brandti*** **(Brazhnikov)**
Japan and Sea of Okhotsk to Wilson Bay, Alaska, 10–172 m (Wicksten and Mendez 1982).

28 (23) Epipods on first to fourth pereopods ..... ***Lebbeus carinatus*** **Zarenkov**
Off Peru and Chile, 1860 m (Zarenkov 1976).

Epipods on first to third pereopods **29**

29 Pleura of first to fifth abdominal segments ending in 1–3 spines. Four large spines on dorsal midline of carapace ..... ***Lebbeus groenlandicus* (Fabricius)**
Arctic to Cape Cod, Sea of Okhotsk, Puget Sound, 11–518 m (Butler 1980).

Pleura of at least first to third abdominal segments pointed to rounded, but not ending in 1–3 spines. One to 3 spines on dorsal midline of carapace **30**

30 Rostrum reduced to spine on frontal margin of carapace. Three spines on anterior dorsal midline of carapace **31**

Rostrum prominent, not reduced to spine. 1–2 spines on anterior dorsal midline of carapace..... **32**

31 Telson with 2 pair dorsal pines. No large, decurved spines below articular knobs of posterolateral margin of fourth and fifth abdominal somites..... ***Lebbeus catalepsis* Jensen**
Strait of Juan de Fuca, low intertidal zone (Jensen 1987).

Telson with 3 pair dorsal spines. Large, decurved spines present below articular knobs of posterolateral margin of fourth and fifth abdominal somites ..... ***Lebbeus lagunae* (Schmitt)**
Pacific Grove, California to Cedros Island, Baja California, 0–74 m (Wicksten 1978, 1988).

32 Antennular peduncle extending to near middle of scaphocerite. Small subtidal species **33**

Antennular peduncle extending nearly to end of scaphocerite. Large species of continental slopes ... **35**

33 Dorsal surface of second abdominal segment without transverse furrow and fold. Rostrum not overreaching eye ..... ***Lebbeus zebra* (Leim)**
East coast of Canada, Bering Sea, Kamchatka, British Columbia, off Santa Rosa Island, California, subtidal–140 m (Wicksten and Mendez 1982).

Dorsal surface of second abdominal segment with transverse furrow and fold. Rostrum overreaching eye **34**

34 Rostrum short, not reaching end of first segment of antennular peduncle, with 2–5 dorsal spines and 1 ventral spine ..... ***Lebbeus schrencki* (Brazhnikov)**
Pribilof Islands to Sea of Japan to Passage Island, Strait of Georgia; 12–183 m (Butler 1980, Jensen and Armstrong 1987).

Rostrum reaching end of scaphocerite, with 5–7 dorsal spines and 3–4 ventral spines .....
..... ***Lebbeus possjeticus* Kobyakova**
Possjet Bay, USSR, Bering Island and off San Nicolas Island, California; 3–57 m (Wicksten and Mendez 1982).

35 First segment of antennular peduncle with 1 spine, bi- or trifurcated. Northern hemisphere ...
..... ***Lebbeus washingtonianus* (Rathbun)**
Anthony Island, Queen Charlotte Islands to off San Clemente Island, California; 820–1808 m (Butler 1980).

First segment of antennular peduncle with 3 spines. Southern hemisphere .....
..... ***Lebbeus bidentatus* Zarenkov**
Peru and Chile, 1680 m (Zarenkov 1976).

36 (20) Third maxilliped with exopod..... **37**

Third maxilliped without exopod **47**

37 No epipod on any pereopod **38**

Epipod on at least on first pereopod..... **40**

38 Rostrum deep, shorter than carapace, eyes large ..... ***Eualus macrophthalmus*** **(Rathbun)**
Unalaska to Point Sur, California, 110–1163 m (Butler 1980).

Rostrum slender, as long as or longer than carapace, eyes smaller **39**

39 Posterior margin of third to sixth abdominal segments armed with median dorsal spine .....
..... ***Eualus barbatus*** **(Rathbun)**
Pribilof Islands to Santa Monica Bay, California, 82–507 m (Butler 1980, Wicksten 1984).

Posterior margin of third to sixth abdominal segments unarmed ..... ***Eualus biunguis*** **(Rathbun)**
Bering Sea to Sea of Japan and Oregon, 90–2090 m (Butler 1980).

40 (37) Epipods on all 3 pereopods **41**

Epipods on first and sometimes second pereopods **45**

41 Rostrum with dorsal margin markedly convex over eye, 7–14 spines ..... ***Eualus avinus*** **(Rathbun)**
Pribilof Islands to Oregon, 46–642 m (Butler 1980).

Rostrum nearly straight over eye, fewer (2–9) spines **42**

42 Rostrum not reaching second segment of antennular peduncle **43**

Rostrum reaching second segment of antennular peduncle **44**

43 Rostrum with 2–5 dorsal teeth, telson with 3–4 pair dorsolateral spines. First pereopod slender, merus about 5× as long as wide ..... ***Eualus pusiolus*** **(Krøyer)**
Bering Sea to British Columbia and Sea of Japan, Gulf of St. Lawrence to Cape Cod, northern Europe to Spain, 0–1381 m (Butler 1980).

Rostrum with 1–3 dorsal teeth, telson with 3 pair dorsolateral spines. First pereopod stout, merus about 1.6× as long as wide ..... ***Eualus dozei*** **(A. Milne-Edwards)**
Chile-Cape Horn, 13–300 m (Holthuis 1952).

44 Pleuron of fourth abdominal segment with ventral spine ..... ***Eualus lineatus*** **Wicksten and Butler**
Sitka, Alaska to Gulf of California, 18–232 m (Wicksten and Butler 1983, Wicksten 1988).[8]

Pleuron of fourth abdominal segment without spine ..... ***Eualus berkeleyorum*** **Butler**
Pribilof Islands to off Trinidad Harbor, California, 46–384 m (Butler 1980, Wicksten 1984, Jensen and Armstrong 1987).

45 (40) Normal size epipods on first and second pereopods ..... ***Eualus townsendi*** **(Rathbun)**
Pribilof Islands to Sea of Japan and Puget Sound, 38–630 m (Butler 1980).

Normal or reduced epipods on first pereopods, second pereopods with reduced epipods if present.... **46**

46 Most of distal part of rostrum lacking spines on dorsal margin ..... ***Eualus fabricii*** **(Krøyer)**
Bering Sea to Sea of Japan and British Columbia, northwest Atlantic Ocean south to Massachusetts Bay, 4–255 m (Butler 1980).

Distal half of rostrum with dorsal spines ..... ***Eualus suckleyi*** **(Stimpson)**
Bering Sea to Sea of Okhotsk and Grays Harbor, Washington, 11–1025 m (Butler 1980).

47 (36) Ventral margin of fourth pleuron without spine **48**

Ventral margin of fourth pleuron with spine **59**

48 Epipod absent on third maxilliped ..... ***Heptacarpus tenuissimus*** **Holmes**
Bird Island, Alaska to Santa Catalina Island, California, 2–137 m (Butler 1980).[9]

Epipod present on third maxilliped **49**

49 Epipods present on first and second or first to third pereopods **50**

Epipods absent from all pereopods **52**

50 Epipods present on first to third pereopods ..... ***Heptacarpus carinatus*** **Holmes**
Dixon Harbor, Alaska, to Point Loma, California, 0–27 m (Butler 1980).

Epipods present on first and second pereopods **51**

51 Posterior margin of third abdominal segment produced, forming rounded carina. Rostrum at least as long as carapace, with 5–8 ventral teeth ..... ***Heptacarpus flexus*** **Rathbun**
Bering Sea to Farallon Islands, California, 37–172 m (Schmitt 1921).[10]

Posterior margin of third abdominal segment not produced. Rostrum shorter, not reaching end of scaphocerite, with 1 ventral tooth ..... ***Heptacarpus herdmani*** **(Walker)**
"Puget Sound" (Wicksten and Butler 1983).

52 (49) Pterygostomian spine absent **53**

Pterygostomian spine present **55**

53 Rostrum shorter than carapace, distal ventral half convex .... ***Heptacarpus brachydactylus*** **(Rathbun)**
Monterey Bay to off Santa Cruz Island, California, 486–763 m (Standing 1981).

Rostrum longer than carapace, distal ventral half not convex or only slightly so **54**

54 Rostrum overreaching scaphocerite, without dorsal teeth on distal half .....
..... ***Heptacarpus stylus*** **(Stimpson)**
Chichagof Island, Alaska to Puget Sound, 0–439 m (Butler 1980).

Rostrum barely exceeding scaphocerite, with dorsal teeth on distal half .....
..... ***Heptacarpus franciscanus*** **(Schmitt)**
San Francisco Bay, California, to Todos Santos Bay, Baja California, 5–14 m (Schmitt 1921, Carvacho and Olson 1984).

55 (52) Rostrum with tiny lateral spinule on each side, located laterally near base.....
..... ***Heptacarpus yaldwyni*** **Wicksten**
Off Salina Cruz, Mexico, 1052–1145 m (Wicksten 1984).

Rostrum without tiny lateral spinule on each side **56**

56 Scaphocerite shorter than carapace; sixth abdominal somite longer than telson.....
..... ***Heptacarpus decorus*** **(Rathbun)**
Gabriola Island, Strait of Georgia to San Diego, California, 22–313 m (Butler 1980).

Scaphocerite as long as or longer than carapace; sixth abdominal somite shorter than telson **57**

57 Three spines on carapace and rostrum; none anterior to eye..... ***Heptacarpus tridens*** **(Rathbun)**
Aleutian Islands to Cape Flattery, Washington, 0–110 m (Butler 1980).

Five to six spines on carapace and rostrum, extending anterior to eye..... **58**

58 Dorsal posterior margin of third abdominal somite prominent; third maxilliped extending to middle of scaphocerite ..... ***Heptacarpus camtschaticus*** **(Stimpson)**
Bering Sea to Tokyo Bay and Strait of Georgia, 0–108 m (Butler 1980).

Dorsal posterior margin of third abdominal somite flattened, third maxilliped extending almost to end of scaphocerite ..... ***Heptacarpus kincaidi*** **(Rathbun)**
East coast of Vancouver Island to San Pedro, California, 10–183 m (Butler 1980).

59 (47) Epipod only on first pereopod **60**

Epipods on first and second, or first to third pereopods **62**

60 Pterygostomian spine absent ..... ***Heptacarpus littoralis* Butler**
Baranof Island, Alaska to Seattle, Washington, 0–18 m (Butler 1980, Jensen and Armstrong 1987).

Pterygostomian spine present **61**

61 Outer antennular flagellum extending beyond scaphocerite by about half length of former; lower limb of rostrum broader than upper ..... ***Heptacarpus moseri* (Rathbun)**
Bering Sea to Destruction Island, Washington; 0–1100 m (Butler 1980).

Outer antennular flagellum barely extending beyond scaphocerite; lower limb of rostrum scarcely broader than upper ..... ***Heptacarpus sitchensis* (Brandt)**
Resurrection Bay, Alaska, to Yaquina Bay, Oregon, 0–12 m (Butler 1980).

62 (59) Epipods on first and second pereopods **63**

Epipods on first to third pereopods **65**

63 Rostrum barely reaching end of first segment of antennular peduncle .....
..... ***Heptacarpus pugettensis* Jensen**
Seattle, Washington to near Morro Bay, California, intertidal (Jensen 1983, Wicksten 1988).

Rostrum exceeding end of first segment of antennular peduncle, reaching to end of entire antennular peduncle or beyond **64**

64 Rostrum usually reaching to end of scaphocerite but at least to base of antennular flagellum, ventral teeth of rostrum widely spaced ..... ***Heptacarpus paludicola* Holmes**
Tava Island, Alaska, to San Diego, California, 0–10 m (Butler 1980).

Rostrum reaching end of or barely exceeding antennular peduncle, ventral teeth of rostrum crowded
..... ***Heptacarpus pictus* (Stimpson)**
San Francisco Bay, California, to off Thurloe Head, Baja California, 0–19 m (Wicksten 1988).

65 (62) Dactyls of pereopods 3–5 simple and falcate, rostrum slightly ascending over eye and with dorsal teeth most thickly set in proximal half ..... ***Heptacarpus stimpsoni* Holthuis**
Sheep Bay, Alaska, to WSW of Punta Abreojos, Baja California, 0–73 m (Butler 1980, Wicksten 1988).[11]

Dactyls of pereopods 3–5 bifid and with small spines on flexor margin, rostrum not slightly ascending over eye and with dorsal teeth more widely spaced **66**

66 Rostrum not reaching as far as cornea of eye, with series of teeth angled downward from anterior margin of carapace to tip ..... ***Heptacarpus taylori* (Stimpson)**
Queen Charlotte Sound, British Columbia, to Magdalena Bay, Baja California, 0–13 m (Green and Butler 1988).

Rostrum exceeding cornea of eye, rostral teeth more widely spaced and not as clearly angled downward **67**

67 Spine on distal ventral flexor margin of merus of first pereopod .....
..... ***Heptacarpus fuscimaculatus* Wicksten**
Santa Rosa Island, California, to Guadalupe Island, Mexico, 0–295 m (Wicksten 1986, 1988).

No spine on distal ventral flexor margin of merus of first pereopod **68**

68 Rostrum usually with bifid or trifid tip, exceeding cornea, merus of third and fourth pereopods with 2 spines ..... ***Heptacarpus palpator*** **(Owen)**
Monterey Bay, California, to Isla Espiritu Santo, Gulf of California, 0–37 m (Wicksten 1986).

Rostrum usually with simple tip, not exceeding cornea, merus of third and fourth pereopods with 1 spine ..... ***Heptacarpus brevirostris*** **(Dana)**
Attu, Aleutian Islands, to Santa Cruz, California, 0–128 m (Butler 1980, Wicksten 1986).

69 (11) Dorsolateral antennular flagellum with accessory branch (may be free or partially fused with flagellum) **70**

Dorsolateral antennular flagellum without accessory branch (may be completely fused with flagellum) **72**

70 Rostrum with 12 ventral teeth. (Rostrum with 4 dorsal teeth, 23 segments in carpus of second pereopod) ..... ***Lysmata trisetacea*** **(Heller)**
Red Sea to Hawaiian Islands, Gulf of California to Malpelo Island, 0–150 m (Wicksten 1983).

Rostrum with 1–5 ventral teeth. (Rostrum with 5–8 dorsal teeth, 17–30 segments in carpus of second pereopods) **71**

71 17 Segments in carpus of second pereopods. Rostrum with 1 ventral tooth. In life, with white vertical stripes on abdomen ..... ***Lysmata galapagensis*** **Schmitt**
Magdalena Bay, Baja California, and Gulf of California to Galapagos Islands, 0–10 m (Wicksten 1983).

Carpus of second pereopod with 23–30 segments. Rostrum with 4–5 ventral teeth. In life, without white vertical stripes on abdomen ..... ***Lysmata intermedia*** **(Kingsley)**
Florida Keys to Tobago and Curacao, Azores, Gulf of California to Galapagos Islands and Peru (Wicksten 1983).

72 26–32 segments in carpus of second pereopods. Pterygostomian spine present .....
..... ***Lysmata californica*** **(Stimpson)**
Tomales Bay, California, to Panama, 0–10 m (Wicksten 1983).

21–22 segments in carpus of second pereopods. Pterygostomian spine absent .....
..... ***Lysmata porteri*** **(Rathbun)**
Chile, Juan Fernandez Islands (Holthuis 1952).[12]

Notes

[1]Rios and Carvacho (1982) reported *L. parvulus* (Stimpson) from the Gulf of California, and stated that *L. antiborealis* could be a synonym of the former species. However, they gave no justification for the synonymy. The two species are treated here as amphipanamic sibling species.

[2]*Hippolyte mexicana* Chace, 1937 is a synonym (Wicksten 1983).

[3]*Thor algicola* is a sibling species of *T. manningi* Chace, 1972. It was misidentified as *T. paschalis* (Heller) in previous works.

[4]*Thor amboinensis* has been collected at Isla Manuelita, Cocos Island, 20 m, among coral slabs and rock, 16–25 November 1989, Alex Kerstitch, 1 ovigerous female, University of Southern California collections (USC).

[5]The southernmost record of *S. prionota* is 6.5 mi. SW of San Carlos Point, Baja California (29°33′13″N, 115°36′07″W–29°33′30″N, 115°33′38″W), 37 m, rock dredge, 25 April 1950, *Velero IV* sta. 1944-50, 2 specimens, USC.

[6]*Spirontocaris bispinosa* Holmes is a synonym of *S. holmesi* Holthuis, 1947.

[7]The southernmost record of *S. snyderi* is San Cristobal Bay, Baja California (27°24′28″N, 114°39′40″W–27°26′00″N, 114°37′30″W), 75 m, 27 April 1950, *Velero IV* sta. 1949-50, 1 specimen, USC.

[8]*Eualus lineatus* has been given the name *E. herdmani* in the past due to confusion with *Heptacarpus herdmani* (Walker) (Wicksten and Butler 1983). *Eualus subtilis* Carvacho and Olson, 1984 also is a synonym (Wicksten 1988).

[9]*Spirontocaris gracilis* (Stimpson) and *Hippolyte amabilis* Lenz are synonyms of *Heptacarpus tenuissimus* (Holthuis 1947, 1969).

[10]The southernmost record of *H. flexus* is 3.2 miles from Farallon Light (37°48′N, 122°59′W), 52 m, rock, 24 Sept. 1961, *Velero III* sta. 7422, 1 specimen, USC.

[11]The southernmost record of *H. stimpsoni* is 7 mi. WSW of Point Abreojos, Baja California (26°41′ 13″N, 113°42′01″W–26°39′48″N, 113°40′43″W), 37–44 m, 29 April 1950, *Velero IV* sta. 1053–50, 1 specimen, USC. *Spirontocaris cristata* (Stimpson) is a synonym (Holthuis 1947).

[12]The revision by Chace (1972) places *Hippolysmata* in synonymy with *Lysmata*, so the species now should be called *L. porteri*.

Note: Two additional species of hippolytids have been described from Monterey Bay, California: *Hippolyte affinis* Owen, 1839 and *H. layi* (Owen 1839, in Schmitt 1921). The former species has not been found again; the latter was reported off British Columbia by Bate (1866, in Schmitt 1921). From the illustrations, the former probably should be assigned to *Spirontocaris*, the latter probably is a species of *Heptacarpus*. The type material seems to have been lost. New specimens are needed in order to resolve the relationships of these two species.

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