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*The grass shrimps of the genus Hippolyte from the west coast of North America*

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ZOOLOGY.—*The grass shrimps of the genus Hippolyte from the west coast of North America.*<sup>1</sup> FENNER A. CHACE, JR., U. S. National Museum.

Two species of *Hippolyte* have been described from the Pacific coast of North America. One, *Hippolyte californiensis*, has been recorded from several localities between Sitka, Alaska, and Santa Inez Bay, Baja California. The other, *H. mexicana*, was described by me from a series of mutilated specimens from the latter locality. I am now convinced that *H. mexicana* represents the previously undescribed male of *H. californiensis*. Examination of material in the collections of the U. S. National Museum indicates, however, that specimens from the northern part of the recorded range of *H. californiensis* are very distinct from those from the southern part and that they belong to a hitherto undescribed species.

It is a pleasure to name this species after Austin H. Clark, retiring curator of echinoderms, U. S. National Museum, in recognition not only of his outstanding contributions to our knowledge of many groups of animals but, especially, of his even broader influence on natural history through the assistance and encouragement he always has ready for biologists whose major goals still lie ahead.

***Hippolyte californiensis* Holmes**

Figs. 1, *a-e*

*Hippolyte californiensis* Holmes, 1895, p. 576, pl. 20, figs. 21-26 (type locality, Bodega Bay, Calif.; cotypes, U.S.N.M. no. 18697); 1900, p. 193. —Rathbun, 1904, p. 56 (part). —Schmitt, 1921, p. 48 (part), figs. 26, *a-b* (not fig. 26, *c*); 1924a, p. 165 (part); 1924b, p. 387. —Chace, 1937, p. 126. *Hippolyte mexicana* Chace, 1937, p. 127, fig. 6 (type locality, Santa Inez Bay, Baja California, Mexico; holotype, no. 361076, Department of Tropical Research, New York Zoological Society).

*Female*.—Carapace not inflated. Four pairs of subequally spaced tufts of plumose setae on dorsal part of carapace. Supraorbital spine reaching forward about as far as, or slightly beyond, hind margin of orbit. Antennal spine small, separated by a U-shaped notch from suborbital angle; the latter is blunt, but produced nearly or quite as

far as the antennal spine. Branchiostegal spine prominent and set far back from anterior margin of carapace, the tip falling short of the margin by at least half the length of the spine.

Rostrum reaching not quite as far as, or a little beyond, end of antennal scale. Upper margin straight, or a little concave, and armed with three or four teeth behind the tip. The tip is usually bifid, the upper tooth overreaching the lower. Lower margin set on a very narrow crest, slightly wider than the dorsal one, and armed with three to five teeth behind the tip. Supporting ridge on each lateral face of rostrum very sharp posteriorly, becoming blunt and finally indistinct on the anterior half.

Third somite of abdomen produced in a very low, rounded cap over anterior portion of fourth somite. There is a tuft of plumose setae on each side of the cap near the margin, and another pair near the middle. Fifth somite unarmed. Sixth somite one and three-fourths times as long as fifth. Telson as long as sixth somite, flattened dorsoventrally, and armed with two pairs of lateral spines, the anterior pair inserted not quite half way from the base to the tip of the telson, and the posterior pair about midway between the first pair and the tip; there are six or seven terminal spinules, the two submedian pairs about subequal in length and longer than the lateral pair.

Cornea of eye wider than stalk and not reaching as far forward as tip of stylocerite. Stylocerite slender, sharp, and separated from main portion of segment by a narrow emargination. First antennular segment armed with an outer distal spine (and sometimes a smaller spine medially to the first). Second segment about twice as long as third. Inner flagellum made up of 18 to 22 segments, the outer one of 9 to 11 segments the first 6 to 8 of which are somewhat inflated. Antenna with a lower spine on basis. Scale narrow with subparallel sides, the inner angle of the blade strongly produced far beyond the outer spine.

External maxillipeds rather stout and reaching somewhat beyond the tip of the spine on the basis of the antenna. The exopod is well developed. First legs robust, unarmed; carpus distinctly longer than palm. First joint of carpus of second legs a little over twice as long as second,

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which is about three-fourths as long as third (one specimen examined has the second joint fully as long as the third); chela usually shorter than combined lengths of second and third joints of carpus. Third leg reaching forward nearly as far as end of antennular peduncle; merus with three to five lateral spines; carpus with one; propodus very slender, armed ventrally with about seven spines, increasing in size distally; dactyl long and slender, with three stout spines at tip and ten to thirteen on lower margin, increasing in size distally. Fourth leg extending forward about as far as end of antennal peduncle; merus armed with three lateral spines; carpus

with one; propodus and dactyl as in third leg. Fifth leg reaching forward to terminal third of basis of antenna; merus and carpus armed with one spine each; propodus and dactyl as in leg 3.

*Male.* - Rostrum slender, reaching about to middle of second antennular segment, and straight or slightly downcurved throughout its length. Rostral margins subparallel, armed dorsally with two to four, usually three, teeth, and ventrally with one to three, usually two, teeth near the tip.

Sixth abdominal somite about one and three-fourths times as long as fifth, as in female, but telson is slightly longer than the sixth somite.

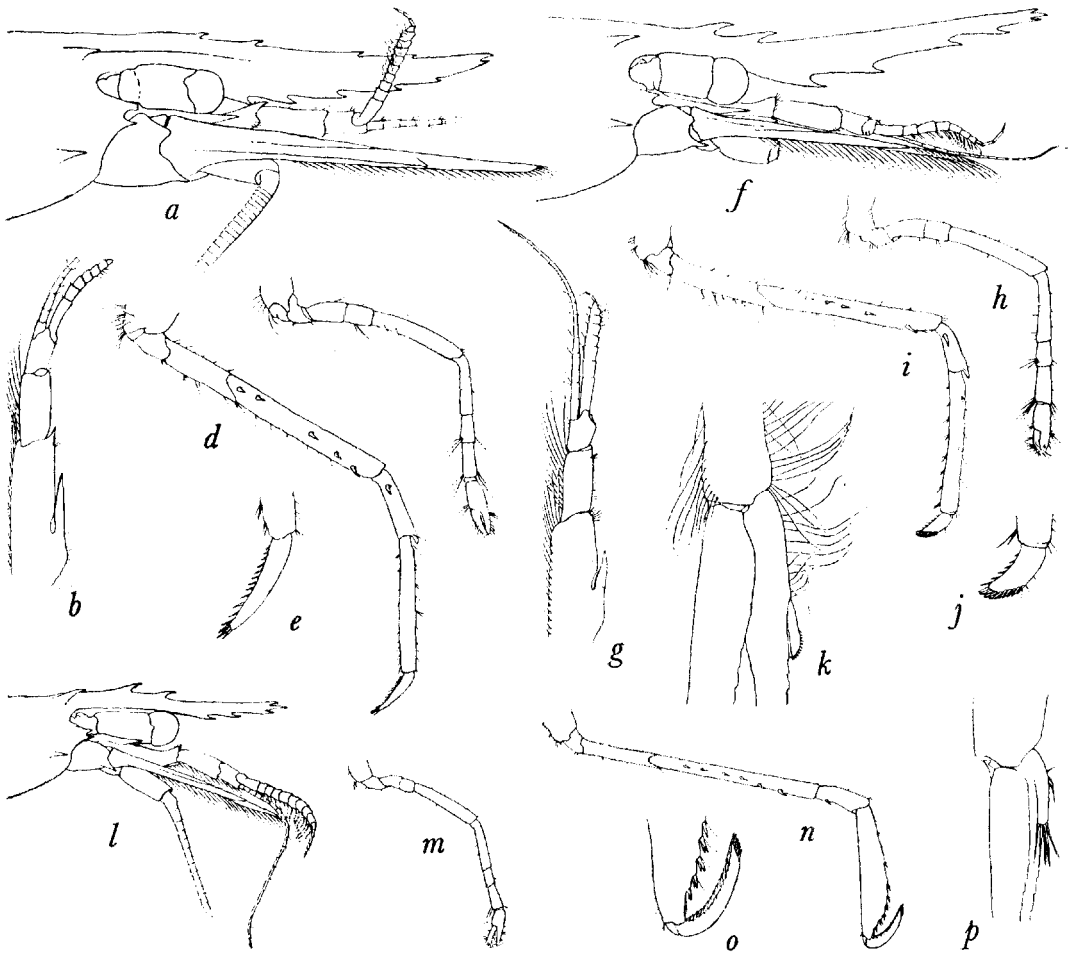


FIG. 1.—*a*, *Hippolyte californiensis*, frontal part of female from Dillon Beach, Calif.,  $\times 8.3$ ; *b*, dorsal view of right antennule of female cotype,  $\times 8.3$ ; *c*, second right leg of same specimen,  $\times 8.3$ ; *d*, third right leg of same specimen,  $\times 8.3$ ; *e*, dactyl of same,  $\times 17.4$ ; *f*, *Hippolyte clarki*, n. sp., frontal part of female holotype,  $\times 8.3$ ; *g*, dorsal view of right antennule of holotype,  $\times 8.3$ ; *h*, second right leg of holotype,  $\times 8.3$ ; *i*, third right leg of holotype,  $\times 8.3$ ; *j*, dactyl of same,  $\times 17.4$ ; *k*, anterior view of second right pleopod of holotype,  $\times 17.4$ ; *l*, frontal part of male paratype from Friday Harbor, Wash.,  $\times 8.3$ ; *m*, second right leg of same specimen,  $\times 8.3$ ; *n*, third right leg of same specimen,  $\times 8.3$ ; *o*, dactyl of same,  $\times 17.4$ ; *p*, anterior view of second right pleopod of same specimen,  $\times 17.4$ .

Eyes reaching forward about to end of stylocerite. First antennular segment armed with row of three spines on distal margin. Outer antennular flagellum composed of about 16 segments, the proximal 10 of which are inflated.

External maxillipeds reaching beyond tip of antennal scale. Legs proportionately longer than in female; third legs reach well beyond end of antennal scale. Propodi of last three pairs very broad and flat in distal half. Daetyls of these legs armed with about 16 spines on lower margin and two large apical spines, which are followed on the distal end of the upper margin by a row of five spines which become progressively smaller proximally.

*Color.*—Green (Holmes); green with pink margins (Hilton).

*Measurements.*—Carapace lengths of smallest ovigerous female and largest female examined, 1.9 and 6.8 mm, respectively. Carapace lengths of males, 2.7 to 3.8 mm.

*Range.*—West coast of North America from Bodega Bay, Calif., to the Gulf of California.

*Material examined.*—Bodega Bay, Calif.; from University of California; 2 females (1 ovigerous), cotypes (U.S.N.M. no. 18697).

Dillon Beach, Marin County, Calif. (tide flats in eel-grass area); June 8, 1941; G. M. Scheibner; 1 female (U.S.N.M. no. 89716).

Mugu Bay, Ventura County, Calif.; May 31, 1923; E. P. Chace; 5 females (3 ovigerous) (U.S.N.M. no. 89710).

Balboa, Calif. (in eel grass); December 26, 1917; W. A. Hilton; from Pomona College; 2 females (1 ovigerous) (U.S.N.M. no. 50659).

San Diego, Calif.; March 9, 1898; *Albatross*; 5 females (2 ovigerous) (U.S.N.M. no. 23403).

Ensenada, Baja California, Mexico; November 28, 1936; S. A. Glassell; 1 female (U.S.N.M. no. 89678).

Off Cape San Lazaro, Baja California, Mexico (in kelp); March 28, 1936; *Zaca* Expedition; 1 specimen (D.T.R., N.Y.Z.S. no. 361072).

Santa Inez Bay, Baja California, Mexico (in stomach of American eared grebe); April 9, 1936; *Zaca* Expedition; 27 specimens (D.T.R., N.Y.Z.S. nos. 361073, 361077). Same (in stomach of American eared grebe); April 11, 1936; 105 specimens (D.T.R., N.Y.Z.S. nos. 361074, 361078, and M.C.Z. no. 9501). Same; 1 fathom; April 15, 1936; 1 male (holotype of *H. mexicana*, D.T.R., N.Y.Z.S. no. 361076). Same; 3 fathoms; April 15, 1936; 1 female (D.T.R., N.Y.Z.S. no. 361075).

### *Hippolyte clarki*, n. sp.

Figs. 1, f-p

*Hippolyte californiensis* Rathbun, 1904, p. 56 (part).—Schmitt, 1921, p. 48 (part), fig. 26, c; 1924a, p. 165 (part). Not *H. californiensis* Holmes, 1895.

*Female.*—Carapace not inflated. A pair of tufts of plumose setae on cardiac region and another on anterior gastric region. Supraorbital spine not large, reaching forward slightly beyond hind margin of orbit. Antennal spine small, separated by a U-shaped notch from suborbital angle; the latter is blunt, but produced about as far as the antennal spine. Branchiostegal spine prominent and set well back from anterior margin of carapace, the tip falling short of the margin by nearly half the length of the spine.

Rostrum extending well beyond end of antennal scale. Upper margin concave in the proximal third and straight and ascending distally, or concave throughout, and usually armed with two teeth above the eye; occasional specimens are found with one or three teeth on the dorsal margin behind the tip. The tip is usually trifid, a small tooth being placed on each margin just back of the apex; occasionally either the dorsal or ventral subapical tooth may be absent (one specimen examined has two subapical teeth on the upper margin, causing the tip of the rostrum to appear quadridentate). Lower margin with a narrow crest, deepest at about the end of the proximal third, and armed with one to five teeth. Supporting ridge on each lateral face of rostrum blunt, not sharply carinate, although prominent proximally.

Abdomen with a pair of tufts of plumose setae on posterior parts of first and second somites and two pairs of such tufts on third. Third somite produced in a low, blunt cap over anterior part of fourth somite. Fifth somite unarmed. Sixth somite nearly twice as long as fifth. Telson slightly shorter than sixth somite, flattened dorsoventrally, and armed with two pairs of lateral spines, the anterior spine inserted at a point not quite halfway from the base to the tip of the telson, and the posterior one about midway between the first pair and the tip; there are from six to eight terminal spines, of which the submedian pair is the longest.

Cornea of eye wider than stalk, forming a rather bulbous tip to the stalk, and reaching forward about to the end of the stylocerite. Stylocerite sharp, separated from first segment of

antennular peduncle by a narrow emargination. First antennular segment unarmed distally. Second and third segments slender, the second segment fully twice as long as the third. Inner flagellum made up of 16 to 22 segments, the outer one of 8 to 11, of which the first is usually very long and all but the last three or four moderately inflated. Antenna with a lower spine on basis. Scale narrow with subparallel sides, the inner angle of the blade angular and produced far beyond the level of the outer spine.

External maxillipeds rather slender, reaching nearly as far as end of antennal peduncle. There is a fairly well developed exopod. First legs robust, unarmed; carpus distinctly longer than palm. First joint of carpus of second legs nearly three times as long as second, which is slightly shorter than the third; chela a little shorter than the combined lengths of the second and third joints of the carpus. Third leg reaching forward about to end of antennal scale; merus with two to five lateral spines; carpus with one; propodus slender with subparallel sides and armed ventrally with five to seven pairs of spinules increasing in length distally, the inner spine of each pair being much shorter than the outer; dactyl broad and short, armed with six to eight ventral spines and a double row of eight longer ones crowded onto the distal half of the upper margin. Fourth leg extending forward nearly to end of second segment of antennular peduncle; merus armed with up to five lateral spines; carpus with one; propodus and dactyl as in third leg. Fifth leg reaching forward about to end of first antennular segment; merus armed with up to four lateral spines; carpus with one; propodus and dactyl as in third leg.

*Male.*—Rostrum slender, reaching about to end of antennular peduncles, and somewhat up-curved distally. Rostral margins subparallel. Rostral armature roughly as in females (one male examined has no ventral tooth); the tip is often more obscurely trifid than in the female, because either the dorsal or ventral subapical tooth may be placed farther from the tip.

Third segment of abdomen lower than in the female, the cap over the proximal portion of the fourth somite less pronounced.

Eyes reaching forward well beyond end of stylocerite. Outer antennular flagellum composed of 8 to 16 segments, all but the terminal 3 to 5

of which are somewhat more noticeably inflated than in the female.

External maxillipeds reaching well beyond end of antennal peduncle. All of the legs are longer than in the female; third legs overreach antennal scale by length of dactyl and most of propodus. Propodi of last three pairs very broad and flat in distal half, the inflated portion being armed with seven pairs of large spines. Dactyls of these legs elongate, ending in a strong spine, with a row of about 14 spines on lower margin and five or six pairs of close-set spines on distal third of upper margin.

There is but one appendix on the endopod of the second pleopods, but that is strongly setose, unlike the stylambys in the female.

*Age variation.*—In small specimens the rostrum is shorter, reaching just to the tip of the antennal scales in females, and the cornea is no wider than the eyestalk. As in other species of the genus, the younger the specimen, the fewer are the segments in the antennular flagella.

*Measurements.*—Carapace lengths of smallest ovigerous female and largest female examined 3.0 and 6.0 mm, respectively. Carapace lengths of males 1.7 to 3.2 mm.

*Range.*—West coast of North America from Sitka, Alaska, to Puget Sound. A lot of 47 specimens collected by the *Anton Dohrn* is labeled "Southern California," but this locality seems doubtful.

*Material examined.*—Sitka, Alaska; 10 fathoms; June 15, 1899; station 1; Harriman Expedition, W. E. Ritter; 1 female (U.S.N.M. no. 25846).

Barclay Sound, British Columbia; September 27, 1888; *Albatross*; 1 ovigerous female (U.S.N.M. no. 28330).

Nanaimo, British Columbia; C. H. O'Donoghue; 2 males, 1 female (U.S.N.M. no. 54720).

Friday Harbor, Wash.; in eel grass; August 5, 1928; K. L. Hobbs; 1 ovigerous female holotype (U.S.N.M. no. 91089); 18 males, 13 females (7 ovigerous) (U.S.N.M. no. 63089).

Quarantine Rock, Port Townsend, Wash.; June 27, 1903; *Albatross*; 2 males, 1 ovigerous female (U.S.N.M. no. 31866).

Puget Sound; 1895; T. Kincaid; 7 ovigerous females (U.S.N.M. no. 25835).

"Southern California"; *Anton Dohrn*; from Venice Marine Biological Station; 1 male, 46 females (28 ovigerous) (U.S.N.M. no. 50428).

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TABLE 1.—DISTINGUISHING CHARACTERS OF THE WESTERN NORTH AMERICAN SPECIES OF HIPPOLYTE

<i>Hippolyte californiensis</i>		<i>Hippolyte clarki</i>	
Female	Male	Female	Male
<b>ROSTRUM:</b>			
Reaching not quite as far as, or a little beyond, end of antennal scale.	Falling short of end of second segment of antennular peduncle.	Reaching well beyond end of antennal scale in adults.	Reaching about to end of antennular peduncle.
Nearly horizontal or faintly upcurved.	Horizontal or slightly down-curved.	Distinctly upcurved or ascending.	Slightly upcurved distally.
Armed with 3-4 dorsal and 3-5 ventral teeth in back of terminal set, tip usually bifid.	Armed with 2-4 dorsal and 1-3 ventral teeth in back of terminal set, tip usually bifid.	Armed with 1-3 (usually 2) teeth above eye and 1-5 ventral teeth in back of terminal set; tip usually trifid.	Same.
Lateral supporting ridge sharp above eye, becoming blunt distally.	Same.	Lateral supporting ridge blunt throughout its length.	Same.
<b>ABDOMEN:</b>			
Cap on third somite very low.	Same.	Cap on third somite slightly higher and more prominent.	Same.
Sixth somite about 1½ times as long as fifth.	Same.	Sixth somite nearly twice as long as fifth.	Same.
<b>EYE:</b>			
Not reaching forward as far as tip of stylocerite.	Reaching forward about to tip of stylocerite.	Reaching forward about to tip of stylocerite.	Reaching forward nearly to end of first antennular segment.
<b>ANTENNULAR PEDUNCLE:</b>			
First segment armed with 1-2 outer distal spines.	First segment armed with 3 outer distal spines.	First segment unarmed distally.	Same.
<b>SECOND LEG:</b>			
First joint of carpus little more than twice as long as second.	First joint of carpus barely twice as long as second.	First joint of carpus nearly three times as long as second.	Same.
<b>THIRD LEG:</b>			
Reaching forward nearly as far as end of antennular peduncle.	Reaching forward well beyond end of antennal scale.	Reaching forward about to end of antennal scale.	Overreaching antennal scale by length of dactyl and most of propodus.
Dactyl slender, nearly half as long as propodus, and armed with 10-13 ventral and 3 distal spines.	Dactyl moderately slender, about half as long as propodus, and armed with about 16 ventral and 7 distal spines extending onto dorsal margin.	Dactyl very stout, less than a third as long as propodus, and armed with 6-8 ventral and 8-9 distal spines extending nearly to midpoint of dorsal margin.	Dactyl slender, less than half as long as propodus, and armed with about 11 ventral and 5-6 distal spines extending a short distance on dorsal margin.







