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Note on the Species of Palaemonetes
(Crustacea Decapoda) found in the
United States of America

BY

L. B. HOLTHUIS

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Zoology. — *Note on the Species of Palaemonetes (Crustacea Decapoda) found in the United States of America.* By L. B. HOLTHUIS. (Communicated by Prof. H. BOSCHMA.)

(Communicated at the meeting of December 18, 1948.)

During a year's stay at the U.S. National Museum, Washington, D.C., the American Palaemonid material of this institute as well as that of the Allan Hancock Foundation at Los Angeles, Calif. was studied for a revision of the American species of this family. As it probably will be some time before this revision is published, it was thought advisable to give a preliminary account of the species of the genus *Palaemonetes* occurring in the U.S.A. Up till now namely a large confusion existed in the conception of the taxonomic status of the various American species of this genus, while these species are very common in fresh, brackish, and salt waters of the U.S.A. and often are studied for their life history or mentioned in connection with faunistic or ecological studies.

Of all species dealt with here a short diagnosis is given, accompanied by some figures and an indication of the range of distribution. A key to the forms precedes the treatment of the separate species. More extensive descriptions and more detailed information as to the occurrence will be given in the forthcoming revision of the American Palaemonidae.

The first species of *Palaemonetes* described from the U.S.A. is *Palaemon vulgaris* of SAY (1818). SAY's description leaves no doubt whatsoever as to the identity of his material. In 1850 GIBBES described a species of prawn from freshwater of S. Carolina under the name *Hippolyte paludosa*, which species was recognized as late as 1878 by KINGSLEY to be a *Palaemonetes*, identical with *Palaemonetes exilipes*, a species described as new by STIMPSON (1871) also from fresh water of S. Carolina. In the same publication in which he described *P. exilipes*, STIMPSON gave a description of another new species of *Palaemonetes*, namely *P. carolinus*. An aberrant form, *Palaemonetes antrorum*, was found in an artesian well in Texas and described by BENEDICT (1896) as new. In 1902 RATHBUN described *Palaemonetes kadiakensis* from Alaska, and in 1921 *Palaemonetes hiltoni* was described by SCHMITT.

When KEMP (1925, Rec. Indian Mus., vol. 27, p. 315) gave his key to all species of the genus *Palaemonetes* he included the following species from the U.S.A.: *P. exilipes* (KEMP did not use the older name *paludosus*), from which he was not able to separate *P. kadiakensis*, *P. carolinus*, between which species and *P. hiltoni* he could not find good differences, *P. vulgaris*, and *P. antrorum*.

The study of the large material of the various species of the genus

represented in the collection of the U.S. National Museum resulted in the following changes in KEMP's arrangement:

1. *Palaemonetes antrorum* is found to be so strongly different from the other species, that a separate subgenus is created for it.

2. *Palaemonetes paludosus* (the older name of GIBBES has to be used instead of the name *exilipes* of STIMPSON) was found to be restricted to that part of the U.S.A. which lies east of the Alleghenies. West of this mountain range it is replaced by a species, which shows to be identical with *Palaemonetes kadiakensis* Rathbun; it even becomes very improbable that the type specimens of RATHBUN's species really originate from Alaska, they probably are incorrectly labelled.

3. It was found that *Palaemonetes carolinus* Stimpson is based on specimens of *Palaemonetes vulgaris*, so that the former name becomes a synonym of the latter and has to disappear.

4. The form named by KEMP *Palaemonetes carolinus* shows to consist of two good species. As no name is available for either of these species, they are given new names here.

5. *Palaemonetes hiltoni* is a good species, different from *P. vulgaris*.

At present thus 7 species of *Palaemonetes* are known from the U.S.A. These species may be distinguished as follows:

1. Eyes without pigment, cornea degenerated. First and second pairs of pereopods not very different in shape and size. Exopod of uropod with outer margin ending in a single immovable tooth. Subterranean fresh waters of Texas. Subgenus *Alaacaris*. Only species: *antrorum*
- Eyes with dark pigment, cornea well developed, globular. Second pereopods much stronger and longer than first pair. Exopod of uropod with outer margin ending in a tooth, which at its inner side is provided with a movable spine. Fresh, brackish or salt surface waters, only accidentally subterranean. Subgenus *Palaemonetes* s.s. 2.
2. Fused part of the two rami of upper antennular flagellum distinctly longer than free part. Carpus of second legs longer than chela. Fresh water 3.
- Fused part of the two rami of upper antennular flagellum shorter than free part. Carpus of second legs shorter than chela. Brackish or salt water 4.
3. Branchiostegal spine situated on anterior margin of carapace, just below branchiostegal groove. Posterior pair of dorsal spines of telson placed midway between anterior pair and posterior margin of telson. East of Alleghenies. *paludosus*
- Branchiostegal spine distinctly removed from anterior margin of carapace and situated some distance below branchiostegal groove. Posterior pair of dorsal spines of telson placed very close near posterior margin, and more close to that margin than to anterior pair of spines, often lying in one row with spines of posterior margin. Central U.S.A. west of Alleghenies, southern part of Central Canada, N.E. Mexico. *kadiakensis*
4. Anterior margin of basal segment of antennula strongly produced forwards and far overreaching anterolateral spine of basal segment. S. California, N.W. Mexico *hiltoni*
- Anterior margin of basal segment of antennula, though being convex, not overreaching anterolateral spine of basal segment. Atlantic coast of U.S.A. 5.

5. Carpus of second leg in adult female shorter than palm, in males carpus being only very slightly (1.1 times) longer or shorter than palm. Dactylus of second leg with 2, fixed finger with 1 tooth on cutting edge. Rostrum with first two teeth of dorsal margin behind orbit. Dorsal rostral teeth reaching up to apex. Lower margin of rostrum with 3 to 5 teeth *vulgaris*
- Carpus of second leg in adult female much longer than palm (1.3 to 1.5 times), in males carpus almost as long as whole chela. Dactylus of second leg with one or without teeth, fixed finger without teeth on cutting edge. Rostrum with only one dorsal tooth behind orbit. 6.
6. Dorsal teeth of rostrum reaching up to apex, which often is bifid. Lower margin of rostrum with 4 or 5, seldom 3 teeth. Dactylus of second leg with one distinct tooth on cutting edge, no teeth on cutting edge of fixed finger. *intermedius*
- Dorsal and ventral margins of rostrum with an unarmed stretch before tip; the latter thereby dagger shaped. Lower margin of rostrum with 2 to 4, generally 3 teeth. Dactylus as well as fixed finger of second leg without teeth on cutting edge. *pugio*

Alaocaris new subgenus

Diagnosis: The rostrum is compressed, serrate on the upper margin. The carapace bears an antennal and a branchiostegal spine, a branchiostegal groove is present. The telson bears two dorsal and two posterior pairs of spines, between the latter two feathered setae are present.

The eyes are strongly degenerated and have no pigment.

The mandible bears no palp, also the other mouthparts and the branchial formula are like in *Palaemonetes* s.s.

The first and second pereopods are very similar in shape and size. The last three legs have a shape similar to those of *Palaemonetes* s.s.

The pleopods, except the first pair, each are provided with an appendix interna, while in the male moreover an appendix masculina is present in the second pair. The uropods differ from those of *Palaemonetes* s.s. by missing the movable spine at the inner side of the final tooth of the external margin of the exopod.

Type is the only species contained at present in the subgenus, *Palaemonetes antrorum* Benedict.

Palaemonetes (Alaocaris) antrorum Benedict (fig. 1a—e)

Palaemonetes antrorum Benedict, 1896, Proc. U.S. Nat. Mus., vol. 18, p. 615.

Diagnosis: Rostrum (fig. 1a) reaching about to base of last segment of antennular peduncle, apex pointed. Rostral formula: $\frac{3) 8-12}{0}$. Branchiostegal spine removed from anterior margin of carapace.

Telson (fig. 1b) with anterior pair of dorsal spines placed slightly behind the middle, posterior pair situated close near posterior margin of telson.

Eyes bullet shaped, cornea degenerated, without pigment.

Antennular peduncle (fig. 1c) with rounded anterior margin of basal

segment reaching about as far forwards as anterolateral spine. Upper antennular flagellum with free part of shorter ramus much longer than fused part.

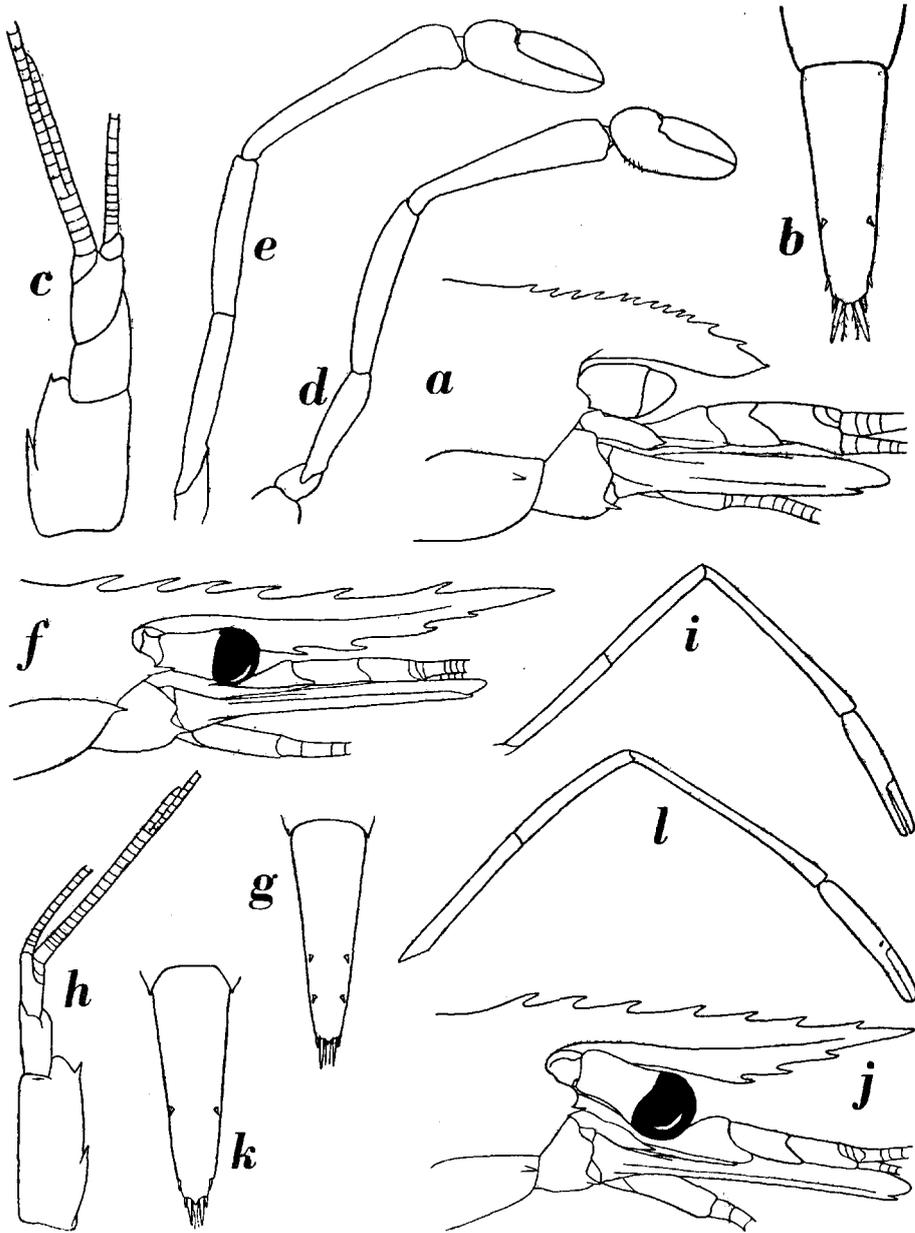


Fig. 1. a—e, *Palaemonetes (Alaocaris) antrorum* Benedict, paratype. a, anterior part of body in lateral view; b, telson in dorsal view; c, antennula; d, first pereiopod; e, second pereiopod. f—i, *Palaemonetes (Palaemonetes) paludosus* (Gibbes). f, anterior part of body in lateral view; g, telson in dorsal view; h, antennula; i, second pereiopod. j—l, *Palaemonetes (Palaemonetes) kadiakensis* Rathbun. j, anterior part of body in lateral view; k, telson in dorsal view; l, second pereiopod. a—e, $\times 15$; f—l, $\times 6$.

Fingers of first pereopod (fig. 1d) about twice as long as palm. Second leg (fig. 1e) differing only slightly from first, being somewhat longer. Carpus half again as long as chela.

Uropods with outer margin of exopod ending in a tooth, which bears no movable spinule at its inner side.

Size: Up to 18 mm.

Distribution: The species is known only from subterranean waters near San Marcos, Texas, where it occurs in considerable numbers.

Palaemonetes antrorum differs from all other species by the absence of pigment in the eyes, and by the degenerate cornea. The blind prawns from Cuban caves, described in literature as *Palaemonetes eigenmanni* Hay, *P. calcis* Rathbun, *P. inermis* Chace and *P. gibarensis* Chace on examination proved to be no *Palaemonetes* at all as no branchiostegal spine is present. A new genus **Troglocubanus** is erected for them (type species: *Palaemonetes eigenmanni* Hay, 1903, Proc. U.S. Nat. Mus., vol. 26, p. 431, fig. 2). This genus is characterized by the compressed rostrum, the absence of hepatic and branchiostegal spines, by the unpigmented eyes, which have the cornea degenerated, and by the absence of a mandibular palp.

Subgenus *Palaemonetes* Heller, 1869 s.s.

***Palaemonetes (Palaemonetes) paludosus* (Gibbes) (fig. 1f—i)**

Hippolyte paludosa Gibbes, 1850, Proc. Amer. Ass. Adv. Sci., vol. 3, p. 197.

Palaemonetes exilipes Stimpson, 1871, Ann. Lyc. nat. Hist. New York, vol. 10, p. 130.

Diagnosis: Rostrum (fig. 1f) reaching about to the end of the scaphocerite. Rostral formula: $\frac{1-2}{1-4} \frac{5-9}{1-4}$, generally $\frac{1}{3-4} \frac{6-8}{3-4}$. Branchiostegal spine situated on anterior margin of carapace just below branchiostegal groove; this spine sometimes slightly removed from anterior margin, but always reaching beyond the margin with larger part of its length.

Telson (fig. 1g) with anterior dorsal pair of spines placed slightly behind middle, posterior pair about midway between anterior pair and posterior margin of telson.

Eyes with cornea well developed, globular and well pigmented.

Basal segment of antennular peduncle (fig. 1h) with rounded anterior margin reaching slightly beyond anterolateral spine. Upper antennular flagellum with free part of shorter ramus about $\frac{1}{3}$ of length of fused part.

First legs with fingers about as long as palm. Second legs (fig. 1i) much stronger and longer than first. Fingers $\frac{3}{4}$ of length of palm, cutting edges without teeth. Carpus about 1.5 times as long as chela.

Exopod of uropod with outer margin ending in an immovable tooth, which bears at its inner side a movable spine.

Size: Up to 46 mm.

Distribution: Fresh waters east of the Alleghenies, from New Jersey to Florida. Occasionally in localities west of the Alleghenies (Mississippi, Louisiana, Oklahoma, Texas), possibly introduced there.

Palaemonetes (Palaemonetes) kadiakensis Rathbun (fig. 1j—l)

Palaemonetes kadiakensis Rathbun, 1902, Proc. U.S. Nat. Mus., vol. 24, p. 93.

Diagnosis: Rostrum (fig. 1j) straight, reaching about end of scaphocerite. Rostral formula: $\frac{1) 5-10}{0-4}$, generally $\frac{1) 7}{2}$. Branchiostegal spine placed some distance behind anterior margin of carapace, at most reaching with the tip beyond the margin. Branchiostegal groove touching anterior margin of carapace distinctly dorsally of branchiostegal spine.

Telson (fig. 1k) with anterior pair of dorsal spines behind middle of telson, posterior pair placed very close to posterior margin of telson, lying far closer to this margin than to anterior pair of spines.

Eyes as in *P. paludosus*. Antennula with anterior margin of basal segment sometimes much produced anteriorly. Upper flagellum with fused part more than thrice as long as free part of shorter ramus.

Pereiopods and uropods as in previous species.

Size: Up to 53 mm.

Distribution: Fresh waters of Central U.S.A. west of the Alleghenies from the Great Lakes to the Gulf coast, also in S. Ontario (Canada) and N.E. Mexico.

Palaemonetes (Palaemonetes) hiltoni Schmitt (fig. 2a—d)

Palaemonetes hiltoni Schmitt, 1921, Univ. Calif. Publ. Zool., vol. 23, p. 36, pl. 12 fig. 5.

Diagnosis: Rostrum (fig. 2a) reaching end of scaphocerite. Rostral formula $\frac{1) 8-11}{2-3}$. Dorsal teeth of rostrum generally regularly divided over upper margin. Branchiostegal spine on anterior margin of carapace, just below branchiostegal groove.

Telson with anterior pair of dorsal spines situated in its middle, posterior pair about halfway between anterior pair and posterior margin of telson.

Eyes like in *P. paludosus*.

Antennular peduncle (fig. 2b) with anterior margin of basal segment strongly produced anteriorly and distinctly overreaching the anterolateral spine. Free part of shorter ramus of upper antennular flagellum about 1.5 times as long as fused part.

First pereiopod with fingers as long as palm. Second leg (fig. 2c) much stronger than first. Dactylus (fig. 2d) in ovigerous females with two teeth, fixed finger with one tooth on cutting edge. Palm 1.3 to 1.4 times as long as fingers, carpus as long as palm and half the length of the fingers.

Uropods as in *P. paludosus*.

Size: Up to 24 mm long.

Distribution: S. California and N.W. Mexico (Sonora and Sinaloa States). Living probably in brackish water.

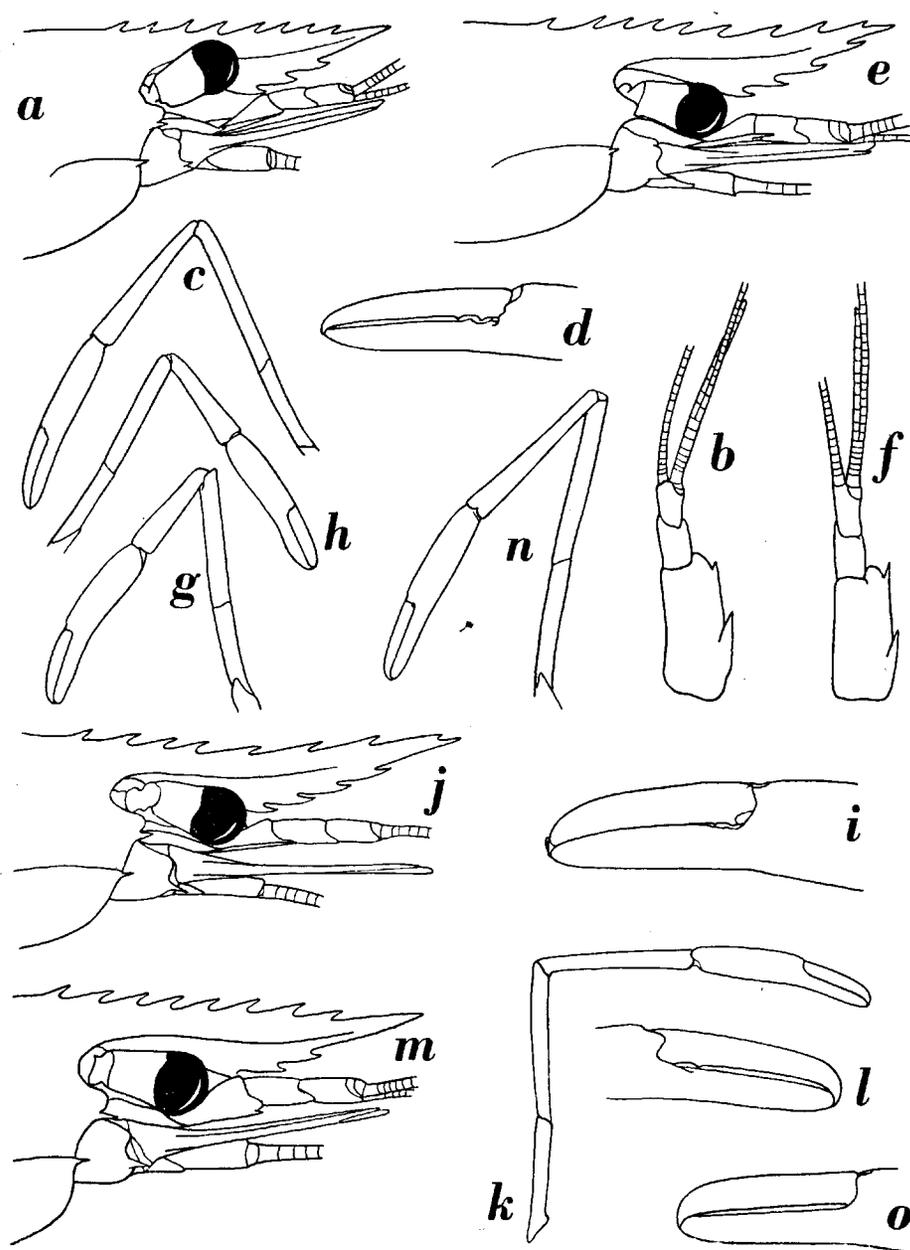


Fig. 2. a—d, *Palaemonetes (Palaemonetes) hiltoni* Schmitt. a, anterior part of body in lateral view; b, antennula; c, second pereiopod of female; d, fingers of second pereiopod. e—i, *Palaemonetes (Palaemonetes) vulgaris* (Say). e, anterior part of body in lateral view; f, antennula; g, second pereiopod of female; h, second pereiopod of male; i, fingers of second pereiopod of female. j—l, *Palaemonetes (Palaemonetes) intermedius* new species. j, anterior part of body in lateral view; k, second pereiopod of female; l, fingers of second pereiopod of female. m—o, *Palaemonetes (Palaemonetes) pugio* new species. m, anterior part of body in lateral view; n, second pereiopod of female; o, fingers of second pereiopod of female. a—c, e—h, j, k, m, n, $\times 6$; d, i, l, o, $\times 15$.

***Palaemonetes (Palaemonetes) vulgaris* (Say) (fig. 2e—i)**

Palaemon vulgaris Say, 1818, Journ. Acad. nat. Sci. Phila., vol. 2, p. 248.

Palaemonetes carolinus Stimpson, 1871, Ann. Lyc. nat. Hist. New York, vol. 10, p. 129.

Diagnosis: Rostrum (fig. 2e) reaching about to end of scaphocerite.

Rostral formula: $\frac{2) 8-11}{3-5}$. Teeth placed regularly over upper margin of rostrum, tip never dagger shaped, often bifid. Branchiostegal spine situated on anterior margin of carapace, just below branchiostegal groove.

Pleura of fifth abdominal segment with the tip rectangular or slightly acute. Telson as in *P. paludosus*.

Eyes as in *P. paludosus*.

Antennular peduncle (fig. 2f) with the anterior margin of basal segment not reaching beyond anterolateral spine. Free part of shorter ramus of upper antennular flagellum 1.5 times as long as fused part.

First pereopod with fingers as long as palm. Second legs (fig. 2g, h) much stronger and longer than first. Fingers 0.6 to 0.75 times as long as palm. Dactylus (fig. 2i) with two, fixed finger with one tooth on cutting edge. Carpus distinctly shorter than palm in female, as long as or slightly (1.1 times) longer than palm in males.

Uropods as in *P. paludosus*.

Size: Up to 42 mm in length.

Distribution: In salt or brackish water of the Atlantic coast of the U.S.A., from Massachusetts to Texas.

***Palaemonetes (Palaemonetes) intermedius* new species (fig. 2j—l)**

Diagnosis: Rostrum (fig. 2j) reaching about end of scaphocerite, tip directed upwards. Rostral formula: $\frac{1) 7-10}{3-5}$, generally $\frac{1) 8-9}{4-5}$. The teeth are regularly divided over the upper margin of rostrum, tip often bifid. Branchiostegal spine situated on anterior margin of carapace, just below branchiostegal groove.

Pleura of fifth abdominal segment with apex rounded. Telson as in previous species.

Eyes and antennular peduncle as in *P. vulgaris*. Shorter ramus of upper antennular flagellum with free part 1.2 to 1.7 times as long as fused part.

First leg with fingers as long as palm. Second leg (fig. 2k) longer and stronger than first. Fingers (fig. 2l) 0.6 to 0.8 times as long as palm. Dactylus with one tooth on cutting edge, cutting edge of fixed finger unarmed. Carpus 1.2 to 1.5 times as long as palm.

Uropods as in *P. vulgaris*.

Size: Up to 37 mm in length.

Distribution: Brackish water of the Atlantic coast of the U.S.A. from Massachusetts to Texas.

***Palaemonetes (Palaemonetes) pugio* new species (fig. 2m—o)**

Diagnosis: Rostrum (fig. 2m) reaching about to the end of scaphocerite, straight, with the top sometimes curved upwards. Rostral formula: $\frac{1) 7-10}{2-4}$, generally $\frac{1) 8-9}{3}$. Distal part of both upper and lower margin unarmed, tip thereby becoming dagger shaped. Branchiostegal spine situated on anterior margin of carapace, just below branchiostegal groove.

Fifth abdominal segment with the pleura ending in a small acute tooth, which sometimes is very small. Telson as in *P. vulgaris*.

Eyes and antennular peduncle as in *P. vulgaris*. Upper antennular flagellum with the free part of shorter ramus 1.1 times to twice as long as the fused part.

First leg with fingers as long as palm. Second legs (fig. 2n) stronger and longer than first. Fingers (fig. 2o) 0.6 to 0.8 times as long as palm, no teeth present on the cutting edges of dactylus and fixed finger. Carpus 1.3 to 1.5 times as long as palm in females, in males carpus being about as long as whole chela.

Uropods as in *P. vulgaris*.

Size: Up to 50 mm in length.

Distribution: Brackish to almost fresh water of the Atlantic coast of the U.S.A. from Massachusetts to Texas.

Palaemonetes vulgaris, *P. intermedius* and *P. pugio* have the same range of geographic distribution, but probably their ecological habitats are different. *P. pugio* at least prefers water of a much lower salinity than *P. vulgaris*.

