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TWO NEW CRAYFISHES OF THE GENUS *PROCAMBARUS* FROM GEORGIA, WITH NOTES ON *PROCAMBARUS PUBESCENS* (FAXON)

(Decapoda, Astacidae)

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In *The Crayfishes of Florida* (Hobbs 1942b: 129-130) I pointed out the relationships existing between *Procambarus pictus* (Hobbs)[1], *P. pubescens* (Faxon)[2], and *P. youngi* Hobbs[3], and assigned them along with "two undescribed forms from Georgia" to the Pictus Subgroup. Since that time no additional references to the subgroup have appeared in the literature.

In the text below I am describing the two new species mentioned above, and since the first form male of *P. pubescens* has not been previously known I am including its description along with notes on its range.

Procambarus pubescens (Faxon)

Figures 1, 6, 7, 8, 14, 17, 22, 27, 28, 31[4]

Cambarus pubescens Faxon 1884, Proc. Amer. Acad. Arts and Sci. 20:109-110, 137.

Procambarus pubescens Hobbs 1942a: 341-342, by implication.

Diagnosis.—Rostrum with lateral spines; upper surface heavily pubescent; acumen long and slender; areola broad with seven or eight punctations in narrowest part; male with hooks on ischipodites of third and fourth pereiopods; palm of chela of first form male not bearded but bearing a row of seven to ten small tubercles; postorbital ridges terminating in sharp spines; one

[1]Hobbs 1940: 419
[2]Faxon 1884: 109
[3]Hobbs 1942b: 131
[4]In addition, see Faxon 1885: Pl. I, fig. 3, and Pl. VIII, figs. 1a and 1a'

acute lateral spine on each side of carapace. First pleopod of first form male reaching coxopodite of third pereiopod, with a rounded hump on cephalic surface, and terminating in four distinct parts: *mesial and cephalic processes* subspiculiform and directed caudodistad and distad respectively; *caudal element* consisting of a distally grooved *caudal knob*, a mesially convex, corneous, ridge-like *adventitious process*, and a broad, triangular (viewed caudally), corneous, tooth-like *caudal process*; *central projection* corneous, elongate, and subtriangular, and directed caudodistad. Sternum just cephalad of annulus ventralis with a swelling on either side of midventral line; however, they do not extend beneath the annulus ventralis.

Male, Form I.—Body subovate, compressed laterally. Abdomen narrower than thorax (13.6 - 14.3 mm in widest parts respectively). Width of carapace less than depth in region of caudodorsal margin of cervical groove (14.3 - 16.1 mm).

Areola broad (three times longer than broad) with seven or eight punctations in narrowest part (punctations crowded); cephalic section of carapace about 2.8 times as long as areola (length of areola about 26.1% of entire length of carapace).

Rostrum with gently convergent margins, excavate above, almost reaching end of peduncle of antennule; margins slightly elevated, not swollen, and provided with acute spines at base of acumen; acumen subspiculiform; upper surface of rostrum heavily pubescent, especially so on acumen —plumose setae hiding contour of acumen.

Postorbital ridges prominent, shallowly grooved laterad, and terminating cephalad in acute spines; suborbital angle present but not acute; branchiostegal spine strong. Strong acute lateral spine present on either side of carapace. Surface of carapace punctate dorsad and granulate laterad.

Abdomen longer than carapace (35.8 - 32.6 mm).

Cephalic section of telson with three spines in each caudolateral corner.

Epistome bearded along cephalic margins, subtriangular, and provided with a prominent cephalomedian projection.

Antennules of the usual form with a strong acute spine on ventral surface of basal segment.

Antennae extend caudad a little beyond cephalic margin of telson. Antennal scale broad with a strong acute spine on outer distal margin; lamellar portion with no distinct angles (see Fig. 27).

Right chela elongate, hand slightly inflated, and covered with dark squamous setiferous tubercles. Inner margin of palm with a row of eight tubercles which are a little larger than others on upper surface of palm. Lower surface of palm with no strong tubercle at base of movable finger. Fingers not gaping. Upper surface of opposable margin of dactyl with a row of eight small knob-like tubercles along proximal half of finger; lower opposable margin with three small knob-like tubercles along proximal end of middle third of finger, a broad band of crowded minute denticles running entire length of finger; lateral margin of dactyl with a longitudinal row of three tubercles at base, otherwise with setiferous punctations; opposable margin of immovable finger with a row of seven small knob-like tubercles along proximal half, and one more prominent tubercle

at base of distal third, otherwise the entire opposable margin covered with crowded minute denticles; lateral margin of immovable finger with a row of setiferous punctations; upper and lower surfaces of both fingers with a weak submedian ridge flanked by setiferous punctations; extreme proximal portions of upper and lower surfaces of both fingers with a few small tubercles flanking the submedian ridge.

Carpus of first right pereiopod about 1.5 times longer than broad with a broad shallow oblique furrow above; surface laterad of furrow punctate, mesiad of it tuberculate; tubercles of mesial upper surface with only one somewhat distinct row, others are scattered. Mesial surface in addition to several small tubercles with two prominent spines—one just distad of midlength and the other on distal border; cephaloventral margin with only one large acute spine (left carpus, however, with the usual two).

Merus of first right pereiopod with a row of 15 tubercles on upper margin, the distal two of which are large and spiniform; mesial surface punctate proximad and tuberculate laterad; lateral surface punctate; lower surface with two rows of tubercles—an outer one consisting of 12-14, only two of which are large, and an inner one of 13 which for the most part are progressively larger distad; additional small tubercles present on either side and between these two rows.

Ischiopodites of third and fourth pereiopods bearing hooks; hooks simple; basiopodite of fourth pereiopod with a prominent simple knob-like swelling extending toward terminal end of hook on ischiopodite.

Coxopodites of fourth and fifth pereiopods with ventrally projecting prominences—those on fourth heavy and rounded, and directed caudomesiad; those on fifth more compressed, and directed caudolaterad.

First pleopod reaching coxopodite of third pereiopod when abdomen is flexed (left pleopod reaching not quite so far cephalad as right one). Mesial process spiculiform and directed caudodistad; cephalic process spiculiform and directed distad, there being a wide gap between it and the central projection; caudal element consisting of three parts, (1) the caudal knob is subangular with an oblique subtransverse furrow distad, (2) the adventitious process is a high corneous ridge, convex mesiad, lying along the mesial side of the caudal element, and (3) the caudal process is a broad short triangular corneous tooth, compressed cephalocaudad situated just mesiad of the caudal margin of the central projection; central projection, a corneous, elongate, triangular tooth, extending mesiad and caudodistad. Cephalic margin of appendage with a rounded hump.

Measurements.—Male, form I: carapace, height 16.1, width 14.3, length 32.6 mm; areola, width 2.8, length 8.5 mm; rostrum, width 5.2, length 10.8 mm; abdomen, length 35.8 mm; right chela, length of inner margin of palm 10.2, width of palm 8.5, length of outer margin of hand 36.3, length of dactyl 13.5 mm.

The second form male and the female have been adequately described; however, I am including figures of the first pleopod of the second form male (Fig. 6, 7) and the annulus ventralis of the female (Fig. 31).

The specimen on which the above description is based was collected from Boggy Gut Creek about 11 miles northeast of Waynesboro, Burke County, Georgia, and is deposited in the U. S. Nat. Mus.

Throughout the known range of *P. pubescens*, little variation has been noted.

Range.—The type specimens, one male form II, and one female (U.S.N.M. No. 3181) were collected in McBean Creek, Richmond County, Georgia, "a little south of Augusta." Only two additional published locality records have come to my attention: (1) "There are two young female specimens from . . . . , Richmond Co. [Georgia] in the Museum of Comparative Zoology" (Faxon 1884:110); (2) "Buckhead Creek, Millen, Burke County, Georgia"[5] (Faxon 1898:646). In my own collection I have 175 specimens from the following counties in Georgia: 17 localities in Burke County, one each in Bryan, McDuffie, Screven, and Wilkes counties. Since *P. pubescens* is so widespread in Burke County, having been found in all the principal drainage streams in the County, I am not listing any of the localities; however, since so little is known of its occurrence in the other four mentioned counties I am citing the exact localities. Bryan County—3.7 miles southwest of Blitchton on U. S. Hy. 280, December 18, 1939, 1 male, form I, 4 males, form II, 8 females, 2 immature females; McDuffie County—3.5 miles southeast of Thomson on U. S. Hy. 78, June 21, 1940, 2 males, form II, 1 female; Screven County—Beaver Dam Creek, three miles north of Sylvania, September 7, 1938, 1 male, form I, 6 males, form II, 4 females, 7 immature females; Wilkes County—Beaver Dam Creek, 13 miles west of Washington on U. S. Hy. 78, September 6, 1938, 1 male, form II. All of these localities are in the drainage system of either the Savannah or Ogeechee rivers.

My finding *Procambarus pubescens* in Bryan County was a little surprising for it seemed probable that, since *P. litosternum* is found in Jenkins and Bulloch counties and that there are no records of the occurrence of *P. pubescens* from the latter, *litosternum* was vicariating for *pubescens* in the lower Ogeechee.

I have examined these Bryan County *pubescens* carefully, and except for their being somewhat smaller than the specimens from the Savannah and Ogeechee drainages in Burke County I can detect no outstanding differences. Considerable collecting in Jenkins, Effingham, Bullock, Bryan, and Chatham counties needs to be done in order to determine more accurately the southern limit of the range of this species.

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[5]This should be Jenkins County, Georgia. Since the publication of this record Burke County has been divided, and Millen made the county seat of Jenkins County.

Probably *P. pubescens* will be found to occur in the Savannah River drainage in South Carolina as well as farther north in Georgia.

Habits.—Procambarus pubescens is a stream dweller of the northeastern Coastal Plain and Piedmont in Georgia. The size of the stream apparently is not one of the determining factors affecting distribution, for I have found it in small streams only a few inches deep and hardly more than a foot wide. Here the crayfish were found in accumulated debris consisting of twigs and fallen leaves. On other occasions I have taken it from much deeper water in what might be termed rivers in some sections of the country. Briar Creek, one of the larger streams in Burke County, is a large stream which fluctuates greatly with the rainy seasons. At times it spreads, in some places as much as a quarter of a mile, over its broad flood plain. In this stream *P. pubescens* is abundant and I have found it in large numbers around inundated stumps and fallen tree trunks. When the water is too deep or muddy to conveniently use a dipnet I have found that specimens may be taken by using earthworms tied on a string and dropped along the side of a submerged log; the crayfish will hold onto the worms even after they have been lifted from the water. Although many of the specimens I have taken were collected in streams which were choked with vegetation, others have come from shaded streams in which no aquatic plants were in sight. Some of the streams from which this species was taken were very sluggish, and the water reddish or grayish in color; in others the water was clear and flowed over a sandy or rocky bottom. In some streams which had clay banks specimens were collected by running a dipnet under the edge of the bank. Only at night have I seen *P. pubescens* in open water; during the daylight hours, like most crayfishes, it is found in the aquatic vegetation, under rocks or in piles of debris in the stream.

Life History Notes.—First form males have been collected on: April 15, May 20, August 21, September 1, 7, 12, and December 18.

A single female with eggs was collected on September 1. Two females with young were taken on August 21, and September 4.

Procambarus enoplosternum sp. nov.

Figures 2, 5, 10, 12, 13, 18, 20, 23, 24, 25, 32.

Diagnosis.—Rostrum with lateral spines; acumen long and slender; areola broad with five or six punctations in narrowest

part; male with hooks on ischiopodites of third and fourth pereiopods; palm of chela of first form male not bearded but bearing a row of seven to 10 small tubercles; postorbital ridges terminating in sharp spines; one acute lateral spine on each side of carapace. First pleopod of first form male reaching coxopodite of third pereiopod, with a rounded hump on cephalic surface, and terminating in four distinct parts: *mesial process* spiculiform and extending caudolaterad; *cephalic process* spiniform, directed caudodistad; *caudal element* consisting of a rounded knob-like *caudal knob*, a mesially convex, corneous, ridge-like *adventitious process*, and a corneous, laterally projecting spiniform *caudal process*; *central projection* corneous, compressed laterally, and directed caudad. Sternum of female just cephalad of annulus ventralis with a pair of caudally projecting prominences which partially obscure annulus ventralis in ventral aspect.

Holotypic Male, Form I.—Body subovate, compressed laterally. Abdomen narrower than thorax (12.8-13.7 mm in widest parts respectively). Width of carapace slightly less than depth in region of caudodorsal margin of cervical groove (13.9-14.1 mm).

Areola broad (3.3 times longer than broad) with five punctations in narrowest part (punctations shallow and widely spaced); cephalic section of carapace about 2.5 times as long as areola (length of areola about 28.6% of entire length of carapace).

Rostrum with convergent margins, excavate above, reaching distal end of peduncle of antennule; margins only slightly raised, not swollen, and provided with acute lateral spines at base of acumen; acumen long and slender; upper surface of rostrum with scattered setiferous punctations and a row of similar ones along inner sides of marginal ridges; setae very dense on margins of acumen, present almost to its tip. Subrostral ridges well defined but not evident in dorsal aspect.

Postorbital ridges prominent, not grooved, and terminating cephalad in acute spines; suborbital angle small (slightly obtuse), not spiniform; branchiostegal spine strong. A well defined acute lateral spine present on either side of carapace. Surface of carapace punctate dorsad and granulate laterad.

Abdomen longer than carapace (34.6-31.7 mm).

Cephalic section of telson with four spines in each caudolateral corner.

Epistome, bearded cephalad, subtriangular with cephalolateral borders bearing long plumose setae; margins almost smooth and no well defined cephalomedian projection.

Antennules of the usual form with a strong acute spine on ventral surface of basal segment.

Antennae extend caudad slightly beyond caudal margin of telson. Antennal scale of moderate width with a strong acute spine on outer distal margin; lamellar portion with no distinct angles (see Fig. 24).

Right chela elongate, moderately slender, and covered with dark brown or black squamous tubercles. Inner margin of palm with a row of ten tubercles none of which are conspicuously larger than others on upper surface of palm. Lower surface of palm with a strong tubercle at base of movable finger. Fingers not gaping. Upper opposable margin of dactyl

with a row of six very small rounded tubercles on basal half, a much stronger one below above-mentioned row at distal end of basal third, and two very small ones distad of the large tubercle; crowded minute denticles between and distad of these tubercles. Lateral margin of dactyl with a row of six tubercles on basal two-fifths, distad of which is a row of setiferous punctations. Proximal three-fifths of opposable margin of immovable finger with a row of seven tubercles, the second from base the largest; another prominent tubercle present on lower opposable margin at base of distal third of finger; crowded minute denticles present along entire opposable margin. Lateral margin of immovable finger with a row of three or four squamous tubercles at base, distad of which is a row of setiferous punctations. Upper and lower surfaces of both fingers with a submedian ridge flanked proximad by setiferous tubercles and distad by setiferous punctations.

Carpus of first right pereiopod about 1.7 times longer than broad with a broad shallow oblique furrow above; surface laterad of the furrow punctate, mesiad of it tuberculate, tubercles of mesial upper surface arranged roughly in two rows. Mesial surface with two prominent acute spines—one just distad of midlength and the other on upper border; cephaloventral margin with two large acute spines.

Merus of first right pereiopod with an irregular row of about 13 tubercles on upper margin and near distal margin two very prominent acute spines; mesial and lateral surfaces punctate proximad and tuberculate distad; lower surface with two rows of tubercles—an outer row of 12, two of which are acute and spike-like, and an inner row of about 14, only three or four of the distal ones could be termed spiniform or spike-like; additional small tubercles present on either side and between these two rows.

Ischiopodites of third and fourth pereiopods bearing hooks; hooks simple; basiopodite of fourth pereiopod with a prominent, simple knob-like swelling extending toward terminal end of hook on ischiopodite.

Coxopodites of fourth and fifth pereiopods with ventrally projecting prominences—those on fourth heavy and rounded, and directed caudomesiad; those on fifth compressed, plate-like, and directed caudolaterad.

First pleopod reaching coxopodite of third pereiopod when the abdomen is flexed (left pleopod not reaching as far cephalad as right one). Tip terminating in four distinct parts. Mesial process long and spiculiform, and bent caudad and slightly laterad; cephalic process spiniform and extending caudodistad from the cephalomesial distal end of the appendage and partially hooding the central projection; caudal element consisting of three parts—a swollen lateral knob, a mesial rim-like ridge (adventitious process), and the caudal process which is a corneous laterally projecting spine; central projection corneous and tooth-like and compressed laterally and directed caudad. Mesial process, central projection and caudal process all directed at approximately the same angle (75°-80°) to the main shaft of the appendage. A rounded hump on cephalic surface.

Paratypic Male, Form II.—Differs only slightly from the holotype except in proportions (see measurements). Inner margin of palm of chela with eight or nine tubercles. Caudosinistral margin of cephalic section of telson with only three spines. Hooks on ischiopodites of third and fourth pereiopods reduced; basiopodite of fourth with only a very slight swollen portion; projections on coxopodites of fourth and fifth pereiopods not so prominent as in holotype. First pleopod with all processes reduced; adventitious process not evident.

Allotypic Female.—Differs from the holotype in the following respects. Antennae extend caudad to fourth abdominal segment. Caudolateral margins of cephalic section of telson, with three spines. Inner margin of palm of chela with a row of eight tubercles; opposable margin of dactyl with a row of 13 knob-like tubercles; opposable margin of immovable finger with a row of seven similar ones; opposable margins of both fingers with fewer minute denticles.

Annulus ventralis subtriangular with apex extending cephalad. Ventral cephalodextral margin with two rounded tubercles. Sinus begins on median line just caudad of cephalic margin of annulus, makes a broad S-curve—turning first sinistrad then dextrad across the median line and finally sinistrad terminating just cephalad and slightly dextrad of the midcaudal margin of the annulus. Sternum just cephalad of annulus with a prominence extending caudad on either side of the median line partially covering the annulus in ventral aspect. Caudal margins of prominences emarginate so that each appears to be trituberculate.

Measurements.—Holotype: carapace, height 14.1, width 13.7, length 31.7 mm; areola, width 2.7, length 9.1 mm; rostrum, width 5.0, length 10.1 mm; abdomen, length 34.6 mm; right chela, length of inner margin of palm 9.2, width of palm 7.8, length of outer margin of hand 24.6, length of dactyl 13.4 mm. Allotype: carapace, height 16.8, width 17.2, length 36.6 mm; areola, width 3.7, length 10.0 mm; rostrum, width 5.7, length 10.5 mm; abdomen, length 40.0 mm; right chela, length of inner margin of palm 7.6, width of palm 7.8, length of outer margin of hand 23.1, length of dactyl 13.8 mm. Paratypic Male, Form II: carapace, height 13.0, width 13.7, length 31.9 mm; areola, width 2.8, length 8.3 mm; rostrum, width 4.4, length 10.2 mm; abdomen, length 35.0 mm; right chela, length of inner margin of palm 6.4, width of palm 5.3, length of outer margin of hand 18.0, length of dactyl 10.4 mm.

Type Locality.—"Rocky Creek," a small moderately flowing, clear, sand bottomed stream flowing between red hills six miles south of Lyons, Toombs County, Georgia, on U. S. Highway 1. The crayfishes were taken from beneath debris and in the submerged parts of the marginal vegetation. *Procambarus enoplosternum* was the only species collected at this locality.

Disposition of Types.—The male holotype, the female allotype, and a second form male paratype are deposited in the United States National Museum (No. 82263). Of the remaining paratypes one male, form I, one male form II, and one female are deposited in the University of Michigan Museum of Zoology and a similar series in the Museum of Comparative Zoology; four males, form I, eight males, form II, five females, five immature males, and five immature females are in my personal collection at the University of Virginia.

Relationships.—*Procambarus enoplosternum* is a member of the Pictus Subgroup (Hobbs 1942b: 129), and has its closest affinities with *Procambarus pictus* (Hobbs), *P. pubescens* (Faxon) and *P. litosternum* (herein described).

Specimens Examined.—Georgia: Emanuel County—Jacks Creek at Lexsy on U. S. Hy. 1, August 23, 1937, 1 male, form II, 1 female, 1 immature female; same locality, January 2, 1938, 7 males, form II, 7 females; same locality, May 2, 1946, 4 males, form II, 3 females. Toombs County—Rocky Creek, six miles south of Lyons on U. S. Hy. 1 (Type Locality), January 2, 1938, 1 male, form II, 1 female, 1 immature male, 1 immature female; same locality, August 28, 1938, 4 males, form I, 6 males, form II, 4 females, 2 immature males, 1 immature female; same locality, June 9, 1946, 3 males, form I, 4 males, form II, 3 females, 2 immature males, 3 immature females. Both of these localities are stream tributaries of the Ohoopee River (Altamaha River drainage).

Variation.—The only variation, other than those mentioned above, which to me seems significant is in the rostra of specimens collected at Jack's Creek. In these specimens it appears to be broader at base, and the margins are distinctly more strongly convergent than in specimens from the type locality.

Procambarus litosternum sp. nov.

Figures 3, 4, 9, 11, 15, 16, 19, 21, 26, 29, 30.

Diagnosis.—Rostrum with or without lateral spines, margins always interrupted at base of acumen; acumen long and slender or short and triangular; areola broad with five or six punctations in narrowest part; male with hooks on ischipodites of third and fourth pereiopods; palm of chela of first form male not bearded but bearing a row of eight or nine tubercles; postorbital ridges terminating in sharp spines; one acute lateral spine present on each side of carapace. First pleopod of first form male reaching coxopodite of third pereiopod, with an angular hump on cephalic surface (See Fig. 15), and terminating in four distinct parts: *mesial process* spiculiform and extending caudodistad; *cephalic process* spiniform and directed caudodistad; *caudal element* consisting of a thumb-like *caudal knob*, a corneous elongate tooth-like *caudal process*, and a mesially convex corneous ridge-like *adventitious process*; *central projection* corneous, compressed laterally, and directed caudodistad. Sternum of female just cephalad of annulus ventralis trough-like or concave with no caudally projecting prominences.

Holotypic Male, Form I.—Body subovate, compressed laterally. Abdomen narrower than thorax (13.1-15.3 mm in widest part respectively). Width and depth of carapace in region of caudodorsal margin of cervical groove subequal.

Areola broad (4.2 times longer than broad) with five or six punctations in narrowest part (punctations moderately crowded); cephalic section of carapace about 2.6 times as long as areola (length of areola about 27.6% of entire length of carapace).

Rostrum with strongly convergent margins, excavate above, almost reaching distal end of peduncle of antennule; margins slightly raised, not swollen, and provided with small acute lateral teeth at base of acumen; acumen long and slender; upper surface of rostrum with scattered setiferous punctations, and a row of similar ones along inner sides of margins; setae very dense on base and upper surface of acumen; setae long, extending cephalad beyond tip of acumen. Subrostral ridges well defined but not evident in dorsal aspect.

Postorbital ridges prominent, very shallowly grooved laterad, and terminating in acute spines; suborbital angle small, acute, but not spiniform; branchiostegal spine strong. Strong acute lateral spine present on either side of carapace. Surface of carapace punctate dorsad and strongly granulate laterad.

Abdomen longer than carapace (36.0-33.3 mm).

Cephalic section of telson with four spines in each caudolateral corner.

Epistome bearded cephalad with rounded cephalolateral margins, and provided with a small cephalomedian projection.

Antennules of the usual form with a strong acute spine on ventral surface of basal segment.

Antennae extend caudad a little beyond caudal margin of telson. Antennal scale of moderate width with a strong acute spine on outer distal margin; lamellar portion with no distinct angles (see Fig. 26).

Right chela elongate, moderately slender, and covered with dark squamous tubercles. Inner margin of palm with a row of eight tubercles which are slightly larger than others on upper surface of palm. Lower surface of palm with a strong tubercle at base of movable finger. Fingers not gaping. Opposable margin of dactyl with ten small rounded tubercles on basal three-fourths of finger—third from base largest; crowded minute denticles between and distad of these tubercles. Lateral margin of dactyl with a row of seven tubercles on basal half, distad of which is a row of setiferous punctations; proximal three fifths of opposable margin of immovable finger with a row of seven tubercles, the second from base the largest; another prominent tubercle present on lower opposable margin at base of distal third of finger; crowded minute denticles present along entire opposable margin. Lateral margin of immovable finger with a row of five or six inconspicuous squamous tubercles at base, distad of which is a row of setiferous punctations. Upper and lower surfaces of both fingers with a submedian ridge flanked proximad by setiferous tubercles and distad by setiferous punctations.

Carpus of first right pereiopod about 1.5 times longer than broad with a broad shallow oblique furrow above; surface laterad of furrow punctate, mesiad of it tuberculate; tubercles of mesial upper surface arranged roughly in two rows. Mesial surface in addition to several small tubercles with two prominent acute spines—one just cephalad of midlength and the other on cephalic border (the latter on the right carpus in the holotype is truncate); cephaloventral margin with two large acute spines.

Merus of first right pereiopod with an irregular row of about 12-14 tubercles on upper margin, and near distal margin two very large acute spines; mesial surface punctate proximad and tuberculate laterad; lateral surface punctate except on upper distal end; lower surface with two rows

of tubercles—an outer poorly defined row of about 13, two of which are acute and spike-like, and an inner row of about 18, only the distal one of which is spiniform; additional small tubercles present on either side and between these two rows.

Ischiopodites of third and fourth pereiopods bearing hooks; hooks simple; basiopodite of fourth pereiopod with a prominent bituberculate knob-like swelling extending toward terminal end of hook on ischiopodite.

Coxopodites of fourth and fifth pereiopods with ventrally projecting prominences—those on fourth heavy and rounded, and directed caudomesiad; those on fifth compressed, plate-like, and directed caudolaterad.

First pleopod reaching coxopodite of third pereiopod when abdomen is flexed (left pleopod not reaching quite so far cephalad as right one). Mesial process spiculiform and directed caudodistad at about 50° angle to the main shaft of the appendage; cephalic process spiniform and directed caudodistad caudal element consisting of (1) the caudal knob, in lateral view, a thumb-like process which extends across the distal caudolateral portion of the appendage, (2) the adventitious process a prominent corneous ridge which extends along the caudomesial and mesial part of the caudal element, and (3) the caudal process, a corneous elongate tooth which projects caudodistad between the caudal knob and the adventitious process; central projection corneous, tooth-like, compressed cephalocaudad, and directed caudodistad parallel to the cephalic process. A prominent hump present on cephalic margin of appendage at base of cephalic process.

Paratypic Male, Form II.—Differs from the holotype in the following respects; upper surface of acumen naked except for a row of setae along each margin; suborbital angle obtuse; cephalic section of telson with only three spines in the dextral caudolateral corner; inner margin of palm of right chela with a row of nine tubercles; lateral margin of dactyl with a row of five tubercles on basal half; only one or two small tubercles on basal portion of lateral margin of immovable finger; ventral margin of merus with fewer tubercles in both rows; ischiopodites of third and fourth pereiopods with much reduced hooks; basiopodite of fourth pereiopod with no indication of bituberculate swelling. First pleopod with no corneous elements, and only mesial process spiniform; central projection and cephalic process much reduced; caudal element with only one recognizable division, the thumb-like caudal knob forming a continuous rounded ridge with the adventitious process, and the caudal process represented by a very slight swelling.

Allotypic Female.—Differs from the holotype in the following respects: cephalic section of telson with three spines in each caudolateral corner; right chela shorter in proportion (see measurments); basal three-fourths of inner margin of dactyl with 12 knob-like tubercles, fourth from base largest; lateral margin of dactyl with a row of nine tubercles on basal half; proximal three-fifths of opposable margin of immovable finger with a row of nine tubercles, fourth from base largest; tubercles on lateral side of basal portion of movable finger scarcely evident—only two or three; three spiniform tubercles on inner row of lower side of merus of first pereiopod. Annulus ventralis bell shaped in profile with a ridge on either side running obliquely from near the cephalomedian margin caudolaterad; sinus originates on median line about one-third of the length of the annulus from the cephalic margin, runs a short distance caudosinistrad and turns caudodextrad to cross the median line, then almost makes a hairpin curve back to the median line where it curves gently caudodextrad terminating just cephalodextrad of the midcaudal margin of annulus. Sternum just cephalad of annulus trough-like with no caudally projecting prominences.

Measurements.—Holotype: carapace, height 15.7, width 15.3, length 33.3 mm; areola, width 2.2, length 9.2 mm; rostrum, width 5.3, length 1.1 mm; abdomen, length 36.0 mm; right chela, length of inner margin of palm 1.2, width of palm 9.4, length of outer margin of hand 26.7, length of dactyl 14.4 mm. Allotype: carapace, height, 19.8, width 20.0, length 42.3 mm; areola, width 3.1, length 11.5 mm; rostrum, width 7.1, length 12.3 mm; abdomen, length 46.2 mm; right chela, length of inner margin of palm 8.6, width of palm 9.9, length of outer margin of hand 24.8, length of dactyl 14.5 mm. Paratypic Male, Form II: carapace, height 13.9, width 14.1, length 31.5 mm; areola, width 2.8, length 9.0 mm; rostrum, width 4.7, length 9.2 mm; abdomen, length 33.0 mm; right chela, length of inner margin of palm 6.4, width of palm 5.7, length of outer margin of hand 18.1, length of dactyl 1.3 mm.

Type Locality.—A sandbottomed stream flowing through swampy terrain five miles northeast of Swainsboro, Emanuel County, Georgia on U. S. Hy. 25. The type specimens were taken at night with the aid of a headlight, and were found in open water along the sandy bottom. This stream is a tributary to the Canoochee River. No other crayfishes were taken along with this species in the type locality.

Disposition of Types.—The male holotype, the female allotype, and a second form male paratype are deposited in the United States National Museum (No. 82261). The remaining paratypes, one male, form I, two males, form II, five females, and one immature male, are in my personal collection at the University of Virginia.

Relationships.—*Procambarus litosternum* is a member of the Pictus Subgroup (Hobbs 1942b: 129), and has its closest affinities with *P. pictus,* and *P. enoplosternum,* and *P. pubescens.*

Specimens examined.—Georgia: Bulloch County—5.8 miles south of Statesboro, U. S. Hy. 25, March 27, 1939, 1 male, form II; 14.2 miles south of Millen, U. S. Hy. 25, April 17, 1944, 2 males, form I, 1 male, form II, 1 female, 2 immature males, 2 immature females; 13 miles north of Claxton, U. S. Hy. 25, April 17, 1944, 2 immature males, 5 immature females. Jenkins County—9.6 miles north of Millen, U. S. Hy. 25, March 27, 1939, 2 males, form I, 1 female, 2 immature males and 3 immature females; 10.4 miles south of Millen on U. S. Hy. 25, 2 males, form I, 9 males, form II, 9 females, 1 immature male, 8 immature females; 11.6 miles south of Millen on U. S. Hy. 25, 3 males, form II, 1 female. Emanuel County—5 miles N. E. of Swainsboro, St. Hy. 56, (Type locality) September 8, 1942, 1 male, form II, 2 females; same locality, April 13, 1944, 2 males, form I, 1 male, form II, 3 females, 1 immature male. All of these localities are stream tributaries to the Canoochee and Ogeechee Rivers.

Variation.—Specimens collected from 14.2 miles south of Millen, Bulloch County, and 11.6 miles south of Millen, Jenkins County, show several striking differences from the type series. The rostrum is shorter—the acumen scarcely reaching distal end of penultimate segment of peduncle of antennule; the spines on the rostrum at base of acumen either much reduced or absent, although the margins are always interrupted; spines on lateral sides of carapace much reduced—in one or two specimens represented by rounded tubercles; the annuli ventrali of the females are subovate and the surface contour is not broken by ridges; the sternum just cephalad of the annulus is concave with only the slightest suggestion of the trough-like condition in the allotype. Specimens from 10.4 miles north of Millen agree with the above except the annulus ventralis of the female is more like that of the allotype, and the rostrum in a few specimens is almost as long as that of the holotype. Specimens from 9.6 miles south of Millen, Jenkins County, are typical. Specimens from the other localities mentioned are immature, and as in most Procambarids the spiny condition is accentuated in the immature stages.

Key to the species of the Pictus Subgroup[6]

1. Length of inner margin of palm of chela greater than length of dactyl; acumen of rostrum as long as or longer than rest of rostrum ..... *Procambarus youngi* Hobbs[7]

1′ Length of inner margin of palm of chela less than length of dactyl; acumen of rostrum not as long as rest of rostrum 2

2(1′) Cephalic surface of first pleopod with an angular hump at base of cephalic process; caudal knob extending almost as far distad as central projection ..... *Procambarus litosternum* sp. nov.

2′ Cephalic surface of first pleopod with a rounded shoulder; caudal knob not extending almost as far distad as central projection 3

3(2′) Central projection directed caudad; viewed laterally no distinct gap between bases on the central projection and cephalic process ..... *Procambarus enoplosternum* sp. nov.

3′ Central projection directed caudodistad; viewed laterally a distinct gap between bases of the central projection and cephalic process 4

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[6]Hobbs 1942b: 129

[7]Range—Gulf County, Florida.

4(3′) Caudal knob, knob-like; caudal process viewed caudally a subacute spine; cephalic process directed caudodistad..... ..... *Procambarus pictus* (Hobbs)[8]

4′ Caudal knob in the form of a ridge; caudal process viewed caudally a broad triangular tooth, cephalic process directed distad..... *Procambarus pubescens* (Faxon)

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[8]Range—Clay County, Florida.

Plate I

Pubescence removed from all structures illustrated

Fig. 1. Mesial view of first pleopod of male, form I, *P. pubescens.*
Fig. 2. Mesial view of first pleopod of male, form I, *P. enoplosternum.*
Fig. 3. Mesial view of first pleopod of male, form II, *P. litosternum.*
Fig. 4. Lateral view of first pleopod of male, form II, *P. litosternum.*
Fig. 5. Lateral view of first pleopod of male, form I, *P. enoplosternum.*
Fig. 6. Lateral view of first pleopod of male, form I, *P. pubescens.*
Fig. 7. Mesial view of first pleopod of male, form II, *P. pubescens.*
Fig. 8. Lateral view of first pleopod of male, form II, *P. pubescens.*
Fig. 9. Mesial view of first pleopod of male, form I, *P. litosternum.*
Fig. 10. Mesial view of first pleopod of male, form II, *P. enoplosternum.*
Fig. 11. Basidiopodites and ischiopodites of fourth and third pereiopods of *P. litosternum.*
Fig. 12. Lateral view of first pleopod of male, form II, *P. enoplosternum.*
Fig. 13. Basiopodites and ischiopodites of fourth and third pereiopods of *P. enoplosternum.*
Fig. 14. Basiopodites and ischiopodites of fourth and third pereiopods of *P. pubescens.*
Fig. 15. Lateral view of first pleopod of male, form I, *P. litosternum.*

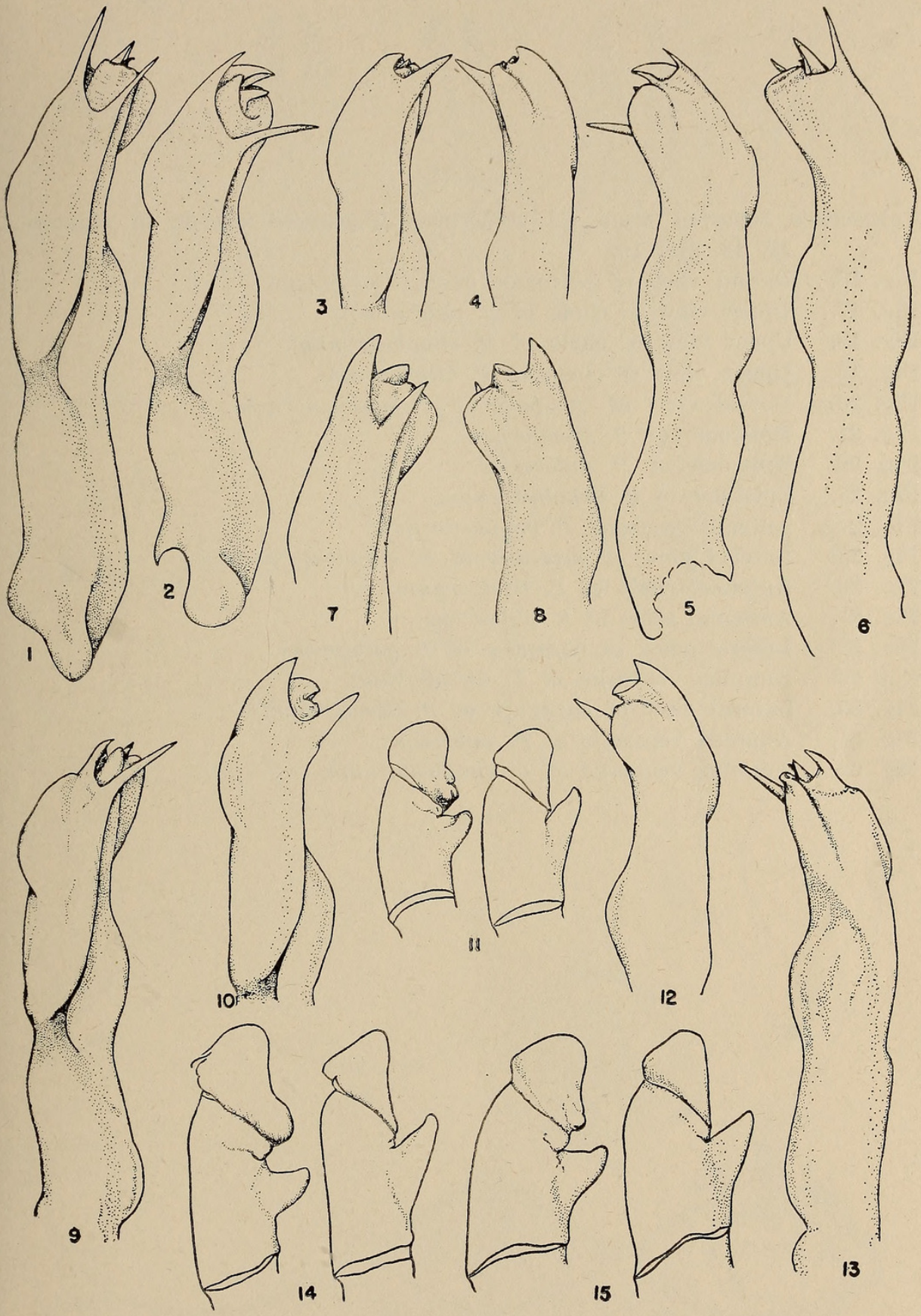

Plate I

Plate II

Pubescence removed from all structures illustrated except in figures 17, 18, and 19.

Fig. 16. Dorsal view of carapace of *P. litosternum.*
Fig. 17. Upper view of chela of *P. pubescens.*
Fig. 18. Upper view of chela of *P. enoplosternum.*
Fig. 19. Upper view of chela of *P. litosternum.*
Fig. 20. Dorsal view of carapace of *P. enoplosternum.*
Fig. 21. Epistome of *P. litosternum.*
Fig. 22. Epistome of *P. pubescens.*
Fig. 23. Epistome of *P. enoplosternum.*
Fig. 24. Antennal scale of *P. enoplosternum.*
Fig. 25. Lateral view of carapace of *P. enoplosternum.*
Fig. 26. Antennal scale of *P. litosternum.*
Fig. 27. Antennal scale of *P. pubescens.*
Fig. 28. Lateral view of carapace of *P. pubescens.*
Fig. 29. Annulus ventralis of *P. litosternum.*
Fig. 30. Lateral view of carapace of *P. litosternum.*
Fig. 31. Annulus ventralis of *P. pubescens.*
Fig. 32. Annulus ventralis of *P. enoplosternum.*

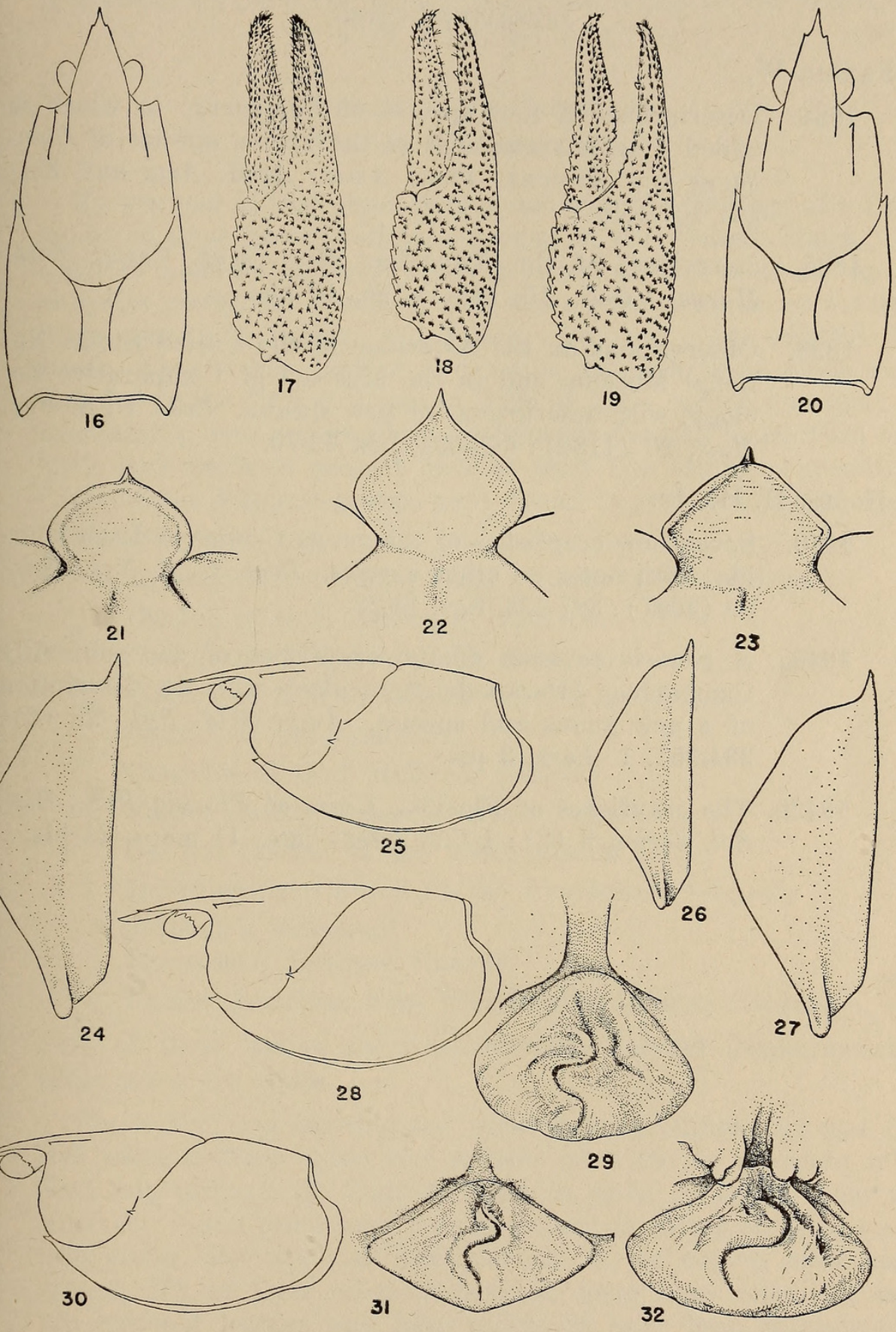

Plate II

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