SPEOCIROLANA THERMYDRONIS (CRUSTACEA: ISOPODA) FROM NORTHEAST MÉXICO, RE-DISCOVERY, HABITAT, AND SUPPLEMENTAL DESCRIPTION

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ABSTRACT

Speocirolana thermydronis, previously known from a single specimen, was rediscovered in interstices of travertines that rim large spring-fed pools near Cuatro Ciénegas Coahuila, México. The 29 new specimens differ little from the original description, but some variations are described.

Speocirolana thermydronis Cole and Minckley (1966) was described from a single, large female collected 12 April 1964 near Posos de la Becerra, 13.7 km southwest of Cuatro Ciénegas, central Coahuila, México. In August 1967, 29 additional specimens were caught, 22 from an unnamed poso (sinkhole) *ca.* 12 km southwest of Cuatro Ciénegas, and 7 specimens from the west laguna of El Mojarral, 11 km southwest of that town. Considerable time spent at a number of other places, including the area of original discovery, failed to obtain the isopod.

Habitats.—The unnamed poso is a spring tributary to the west laguna of El Mojarral. Its dimensions are about 10 by 12 m, by about 2 m deep. There was about 0.85 m of water in the pit, over a dark, flocculent bottom of silt, shells of the snails *Paludiscala caramba* Taylor and *Durangonella* sp., and travertine blocks and fragments. The banks are of gypsum, matted roots of desert plants, and travertine. The inflowing water was 34° C. This is the type-locality of *P. caramba*, the most distinctive of the freshwater snails of the Cuatro Ciénegas basin (Taylor, 1966: 207-8).

The second locality for *S. thermydronis*, the western limnocrene in the marshy area called El Mojarral, has been described by Taylor (1966:163, pls. 9-10). It is a large, clear pool, about 25 by 100 m and up to 5 m deep. Large springs enter at the northwest end and water leaves by a subsurface channel and by small surface outflows at the southeast. Water temperatures at the inflow are about 33° C, but some variations occur in places remote from the source. Much of the bottom is soft, gray, flocculent silt, stabilized locally by beds of waterlily, *Nymphaea* sp. Banks are undercut and mostly of gypsum and travertines.

All our new specimens of *S. thermydronis* were collected by manually breaking large, loosely-cemented, porous travertine blocks that were abundant around the margins of the pools. In some instances, individual isopods moved from interstices of a block as water drained from it, and could be picked from the surface. Minckley (1961:454) described similar habitats for a troglobitic asellid, *Asellus stygius* (Packard), in porous marls of Doe Run, Meade County, Kentucky. *S. thermydronis* was accompanied in its habitat by an undescribed species of aquatic isopod, by an aquatic mite, and by an oligochaete. The last three animals also lived in the softer sediments; however, *S. thermydronis* was consistently absent from such places. It seems unlikely that *S. thermydronis* moves extensively within the sediments that characterize most lagunas of the Cuatro Ciénegas area. Living specimens retained in the field soon became entangled with loose sediment particles on the bottoms of their containers, and were distinctly incapacitated. *A. stygius* is similarly affected under certain conditions (Minckley, 1961: 454). Life on the surface of the undisturbed sediments also is most likely limited to places where fishes are absent; as many as 12 species of fish, many of which are highly predaceous, occur in larger springs of the area.

Neil F. Hadley (personal communication), now of Arizona State University, was with Mary L. Allesio when she collected the holotype in 1964, and has provided additional data on the type-locality. The holotype was one of three, similarly-sized individuals observed in a small pit, about 0.5 m in diameter and one m deep, *ca.* 0.6 km south of the head-spring of Posos de la Becerra. The animals were in the shade and were moving about on the surface of gray, flocculent sediment beneath about 0.25 m of water. The pit was near extensive marshes that existed downflow from La Becerra prior to diversion of water by canalization in late 1964 (Cole and Minckley, 1966). The entire marsh-river-poso complex south and west of La Becerra now is dry, and during core-drilling operations in 1967 the water table was encountered about 3 m below the land surface—there is little doubt that the point of original capture also is destroyed.

Our failure to find *S. thermydronis* in the remaining habitats of Posos de la Becerra may be attributed, in part, to destruction by desiccation of most marginal deposits of suitable travertine. The sudden drying of the laguna decimated fish and endemic snail populations (Minckley, in Taylor, 1966: 162-3). In 1967, some of the snails were becoming re-established, as may *S. thermydronis*, as the habitat stabilizes. On the other hand, absence of the species from apparently suitable habitat in a number of other springs diminishes somewhat the importance of its apparent absence in La Becerra. This may result from the well-known vagaries of collecting such secretive organisms. Much of the basin floor has water within a meter of its surface; numerous large, subterranean channels are known, and interstitial habitat for *S. thermydronis*, as well as for other animals, must be exceedingly abundant. We have little doubt that additional specimens and habitats will be found.

Supplemental description.—Those features of *S. thermydronis* adequately described in our original paper are not elaborated here. We find that part of the description was in error, however, and reproduce that section (Cole and Minckley, 1966:18), with corrections in boldface type, as a footnote.[1]

In addition, the second and third pereonites of *S. thermydronis* bear epimera, as do other species of the genus—their absence in the holotype was due to an artifact of preparation, as was suspected.

Body shape and proportions in *S. thermydronis* are quite constant. The telson, broad and acutely tipped in both sexes, seems a good character separating the Coahuilan form from *S. pelaezi* (telson broadly rounded) and *S. bolivari* (telson truncate).

It appears that length and number of segments in the antennal flagella in the genus *Speocirolana* may vary considerably with size, with larger individuals tending to add length and segments. All specimens of *S. thermydronis* are small (the holotype at 15 mm is largest), whereas *S. pelaezi* ranges from 19 to 26 mm and *S. bolivari* from 15 to 35 mm (Bolivar y Peltain, 1950; Rioja, 1953). The second antenna of the 15-mm holotype of *S. thermydronis* reaches posteriad to the seventh pereonite (as in *S. pelaezi*). In the smaller, new specimens of *S. thermydronis,* the maximal extension is to the fifth pereonite. And, in the large *S. bolivari,* its extension is far past the seventh. Articles in the first antennal flagellum of *S. thermydronis* range from 6 to 14 (including the holotype, at the maximum). The second antenna is similarly variable, ranging from 25 to 35 (with the large holotype again bearing the maximum). *S. bolivari* has 22 to 28 segments in the first antennae, and 48 to 82 in the second, and *S. pelaezi* has 20 and 30 segments, respectively. The relative elongation of terminal segments in the second antennal flagellum is variable—the holotype has long terminal segments (as in *S. pelaezi*), yet some smaller specimens have shortened segments indistinguishable from those of *S. bolivari.*

The inner plate of the first maxilla of *S. thermydronis* is invariable in bearing three sparsely-plumose spines and two delicate setae. The outer plate, however, often has as many as 12 strong, distal spines (10 in the holotype).

The maxilliped of *S. thermydronis* seems highly diagnostic. Penultimate and ante-

[1] In *S. thermydronis* the mandibles (Fig. 6) are asymmetrical, with the **left** incisive process overlapping the **right** ventrally. The **pars molaris** of the mandible is sub-triangular, bearing on its margin about 34 short, cone-shaped teeth.

penultimate segments of the palp have only fine, hairlike setae on their outer surfaces, except for a strong spine at each of their distal corners. The ultimate segment is sometimes naked on its outer surface, as in the holotype, but in some specimens there are fine hairlike setae on the proximal half. The outer surfaces of the last three palp segments in *S. bolivari* are strongly setaceous, and such a condition also is found on the penultimate and antepenultimate segments in *S. pelaezi.* These species, however, lack the strong, isolated spines at the distal, outer corners of the last two segments. Such a spine is present only on the first segment of their palps (Bolivar y Peltain, 1950:Fig. 5; Rioja, 1953:Fig. 18).

All pereopods of *S. thermydronis* are essentially as described, except for variable armament on the subcheliform, first three pairs. The holotype has the palmar margins of the propodus armed with 2, 3, and 4 stout spines, respectively; many of the new specimens have 2, 4, and 4 such spines.

The exopod of the fifth pleopod of the new material (rather than the fourth, as erroneously given for the holotype) is only sparsely invested with plumose setae. We also find that both sexes of *S. thermydronis* lack distal setae on the endopodites of all pleopods. Presence of such setae on the first two pleopods, and their absence on the succeeding three, as in *S. bolivari* and *S. pelaezi,* is therefore not a character of generic rank as was tentatively suggested by Bowman (1964:233-4). Distribution of setae on the pleopods does, however, provide good specific characterization—*S. bolivari* has setae on endopods of at least the first and second pleopods in males (Rioja, 1953: Figs. 28, 30); *S. pelaezi* has setae on the endopod of the first pleopod in females and at least the second in males (Bolivar y Peltain, 1950:Figs. 9, 11); and, as given before, all pleopodal endopods of both sexes of *S. thermydronis* lack setae.

Except for the modified second pleopods of the male, no sexual dimorphism is obvious in the genus *Speocirolana.* The copulatory organ of *S. thermydronis* rises from the base of the pleopodal endopod. The organ is variable in length, ranging from slightly shorter to slightly longer than the endopod.

Living specimens of *S. thermydronis* have ivory-white exoskeletons, with dark-brown or black masticatory surfaces on the mandibles and terminal claws of the pereopods. In addition, the spines on the pereopods are straw-yellow. There is a variable amount of red-to-brownish pigment associated with internal organs, and this is visible through the dorsum of living animals, but fades rapidly to light-brown or yellow in alcoholic material.

Specimens of *S. thermydronis* from the 1967 collections are housed at the U. S. National Museum, Washington, D. C., the Instituto Nacional de Investigaciones Biológico Pesqueros, México, D. F., and the National Museum of Canada, Ottawa, Ontario. A permit for collection of aquatic animals in México was supplied by the Dirección General de Pesca e Industrias Conexas, México, D. F. Numerous personnel of Arizona State University deserve thanks for help in the field and in the laboratory. Studies were supported, in part, by Grants GB-2461 and GB-6477X from the National Science Foundation.

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A NEW CRAWFISH OF THE GENUS *PROCAMBARUS* FROM MISSISSIPPI (DECAPODA, ASTACIDAE)

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ABSTRACT

A new crawfish species of the Spiculifer Group, Blandingii Section, of the genus *Procambarus* is described from tributaries of the Tombigbee River in eastern Mississippi. *P.* **lagniappe**, new species, is related to *P. penni* and *P. spiculifer*.

The first specimens of the species described here were collected on June 16, 1955 by the late George H. Penn and me from two creeks in Kemper Co., Mississippi (Tombigbee River drainage). Dr. Penn first identified these specimens as *Procambarus penni* Hobbs (1951:273). Later he changed the labels to read "atypical *P. versutus*" (Hagen, 1870:51). In August, 1965, I collected in this area again, finding additional similar specimens recognizing them as an undescribed species.

This species belongs to the Spiculifer Group of the Blandingii Section of the genus *Procambarus* and is the fourth species, to date, of this group to be recorded from Mississippi. Other species are *P. penni* from the Pearl and Pascagoula River drainages, *P. ablusus* Penn (1963:121) from the Hatchie River drainage, and *P. vioscai* Penn (1946:27) from the Pearl, Amite, Tangipahoa, Homochitto, Big Black, Yazoo, Wolf, and Tombigbee River drainages.

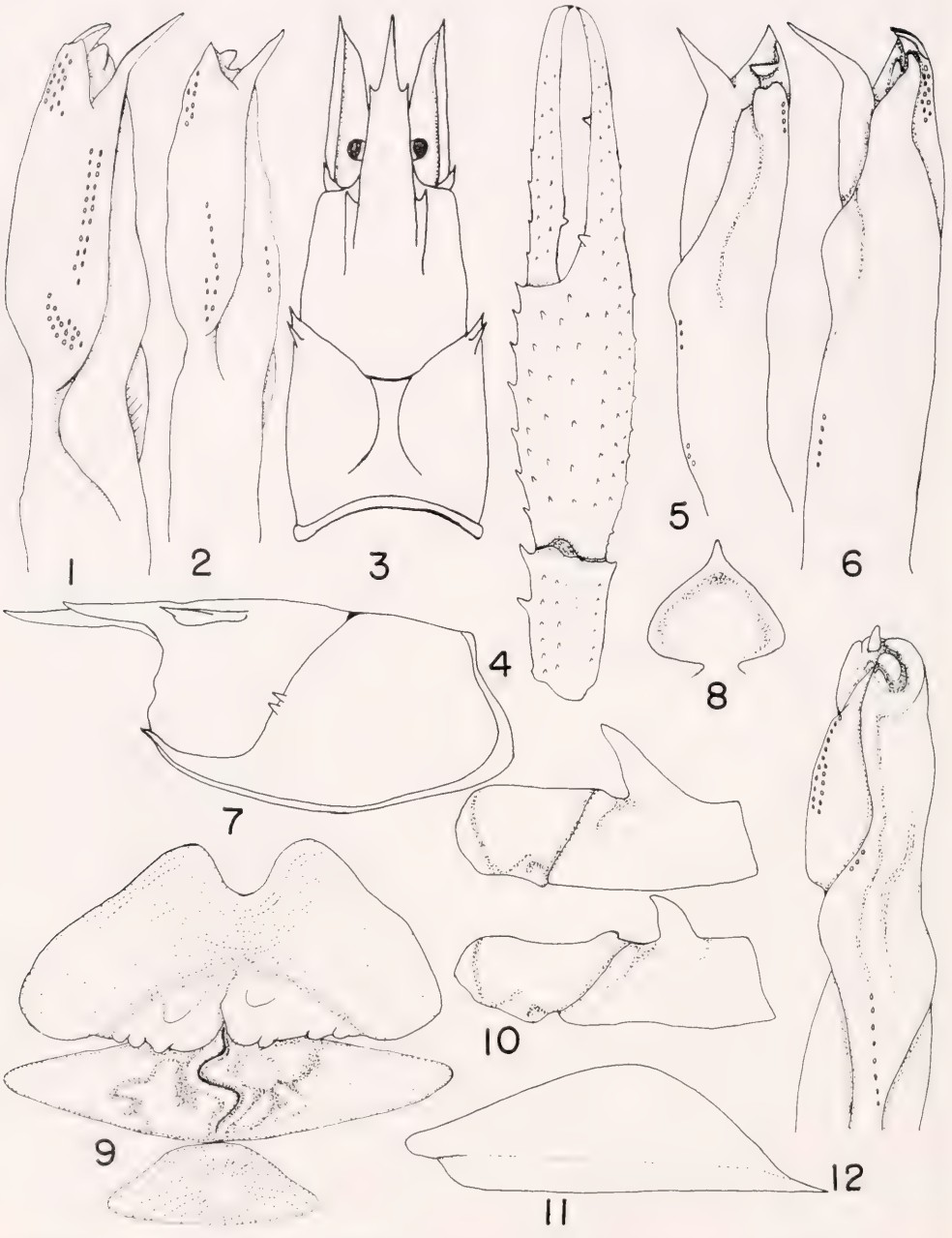
I wish to express my gratitude to Dr. Horton H. Hobbs, Jr., Senior Zoologist, Smithsonian Institution, for examination of specimens and confirmation of identification. Thanks are also due Dr. Alfred E. Smalley, Tulane University for the loan of specimens of this species from the Tulane University collections.

Procambarus **lagniappe**,[1] new species

Diagnosis.—Body pigmented; eyes normal. Rostrum with prominent marginal spines; acumen attenuate, constituting 43.3-44.5 per cent of total length of rostrum; postorbital ridges terminating in spines; suborbital angle much reduced; lateral surface of carapace with two cervical spines. Areola 5.0-6.2 times longer than wide, constituting 25.3-27.7 per cent of entire length of carapace. Simple hooks present on ischiopodites of third and fourth pereiopods; basipodites of fourth pereiopods bear an opposable tubercle on cephalic surface. First pleopod of first form male (Figs. 1, 6, 12) without shoulder on cephalic margin, terminating distally in three distinct elements; mesial process subspiculiform and directed caudodistally with only tip corneous; cephalic process lacking; caudal process represented by low hemi-disc arising from much reduced caudal knob; central projection corneous, subacute, extending caudodistad at about 60 degree angle to axis of pleopod shaft; fusion lines of its component elements clearly marked. Annulus ventralis as figured (Fig. 9).

Holotypic male, Form I.—Carapace (Figs. 3, 7) subovate, slightly compressed laterally; abdomen slightly longer than carapace (39.0 and 38.2 mm, respectively). Maximum height of carapace slightly more than maximum width (16.8, 15.4 mm). Areola relatively broad and short (constituting 25.6 per cent of entire length of carapace), about

[1] Creole French: in Louisiana, a little something extra given to customers by tradesmen.



Figures 1-12. *Procambarus lagniappe,* new species; 1. Mesial view of first pleopod of holotype; 2. Mesial view of first pleopod of morphotype; 3. Dorsal view of carapace of holotype; 4. Upper view of carpus and chela of holotype; 5. Lateral view of first pleopod of morphotype; 6. Lateral view of first pleopod of holotype; 7. Lateral view of carapace of holotype; 8. Epistome of holotype; 9. Annulus ventralis of allotype; 10. Basipodites and ischiopodites of third (upper) and fourth (lower) pereiopods of holotype; 11. Antennal scale of holotype; 12. Caudal view of first pleopod of holotype (pubescence removed from all structures illustrated).

five times as long as wide, with five fine punctations in narrowest part. Cephalic portion of carapace nearly three times as long as areola. Rostrum long, acumen extending cephalad beyond peduncle of antennule, excavate; with acute marginal spines. Rostrum widest at base, margins elevated and converging anteriorly; no median carina. Acumen long and thin. Postorbital ridges well developed, each terminating cephalad in acute spine; punctations along mesial surfaces of ridges, tubercles along lateral surfaces. Brachiostegal spine well developed. Suborbital angle much reduced. Cervical groove interrupted on each side by two conspicuous acute spines. Upper two-thirds of carapace punctate, lower one-third strongly granulate.

Epistome (Fig. 8) with raised lateral margins converging toward small cephalomedian spine. Cephalic section of telson with three spines in each corner.

Antennules of usual form, with prominent acute spine on ventral side of basal segment. Antennae not quite reaching tip of abdomen. Antennal scale (Fig. 11) long, tip extending beyond tip of acumen, widest slightly proximal of midlength, outer distal margin with strong spine.

Chela (Fig. 4) ovoid in cross-section, long, slender; single row of seven tubercles along inner margin of palm; smaller tubercles in six irregular longitudinal rows on upper surface of palm. Both fingers terminating in short, corneous tips bent toward each other. Movable finger with one prominent tooth on opposable margin near base. Immovable finger with two prominent, widely spaced teeth on opposable margin. Fingers long; dactyl about 53 per cent of total length of outer margin of chela. Carpus (Fig. 4) ovoid in cross-section; with two prominent, acute tubercles in distal half of inner margin; few squamous tubercles arranged in two rows between inner margin and longitudinal groove. Basipodite of first pereiopod without spines. Ischiopodites of first pereiopods each with four spines on inner margin.

Hooks on ischiopodites (Fig. 10) of third and fourth pereiopods simple, subequal in length; basipodites of fourth pereiopods each bearing small tubercle on distal cephalic surface opposite hook. Apophyses on coxopodites of fourth and fifth pereiopods with caudomesial projections; that on fourth knoblike, that on fifth compressed and acute.

First pleopod (Figs. 1, 6, 12) extending to middle of coxopodite of third pereiopod when abdomen flexed. Pleopod essentially straight; terminating in three distinct elements; mesial process subspiculiform and directed caudodistally at about 55 degree angle to axis of main shaft, tip corneous; cephalic process lacking; caudal process low, flattened corneous hemi-disc; caudal knob low, reduced; central projection corneous, subacute, extending caudodistad at 60 degree angle to axis of main shaft, fusion lines of component parts clearly defined. Pleopods asymmetrical with base of left displaced in plane posterior to right.

Allotypic female.—Differs from holotype in following respects: rostrum more slender, acumen proportionately longer; areola proportionately narrower; rostrum widest slightly cephalad of base; tip of antennal scale reaching tip of acumen; chela proportionately wider, thicker; antennae extend caudad to middle of fifth abdominal segment. Annulus ventralis (Fig. 9) movable; spindle-shaped, widest in transverse axis; cephalic margin partially obscured by several tuberculate prominences extending caudad from sternum immediately cephalic to it; sinus originating near midcephalic margin and forming sinuous line to near midcaudal margin of annulus. Area adjacent to sinus raised, smooth.

Morphotypic male, Form II.—Differs from holotype in following respects; carapace less compressed laterally; height and width of carapace subequal; areola proportionately wider (4.5 times as long as wide); antennae extending caudad to caudal margin of telson; chela and hooks on ischiopodites reduced; caudomesial processes on coxopodites of fourth and fifth pereiopods less well developed; ischiopodites of each first pereiopod with three spines. First pleopods (Figs. 2, 5) asymmetrical, right pleopod reaching almost to anterior edge of coxopodite of third pereiopod when abdomen flexed, left displaced posteriorly reaching to middle of coxa of third pereiopod. All terminal elements present but less acute and noncorneous; caudal knob more prominent.

Type Locality.—Pawticfaw Creek (tributary to Sucarnoochee Creek, in turn a tributary of Tombigbee River) 6.0 miles south of DeKalb, Kemper County, Mississippi, at

Measurements (in mm).—

	Holotype	Allotype	Morphotype
Carapace:			
length	38.2	48.0	34.8
width (max.)	15.4	19.6	14.5
height (max.)	16.8	20.6	14.5
Abdomen length	39.0	49.7	36.5
Areola:			
length	9.8	12.5	9.0
width (min.)	1.8	2.0	1.8
Rostrum:			
length	14.8	19.0	13.3
width	5.2	6.8	4.9
length of acumen	6.6	9.1	6.1
Antennal scale:			
length	13.3	15.5	11.5
width	4.1	5.0	3.8
First pleopod length	9.5	--	7.9
Right chela:			
length, outer margin	30.3	31.5	21.0
length, dactyl	15.8	16.8	11.8
width, palm	7.4	8.9	5.1
thickness of palm (max.)	5.6	6.2	3.5

Mississippi Highway 39. Here the stream varies in width from 10 to 30 feet, with a bottom of white sand and plant debris. The water is clear, with good current, suggestive of a spring-fed stream. Other crawfishes present include an unidentified species of *Orconectes* (no first form males collected), which was predominant and was only found in piles of plant debris. All specimens of *P. lagniappe* were taken from scattered growths of *Vallisneria* in the swifter parts of the stream.

Disposition of types.—The holotypic male, Form I, the allotypic female and the morphotypic male, Form II, all from the type locality, are deposited in the United States National Museum (nos. 119088, 119089, 119090, respectively). The following paratypes are retained in my personal collection at McNeese State College: JBB 108 (type locality)—one ♂ I, five ♂♂ II, two ♀♀; JBB 206 (type locality)—one ♂ II. Paratypes in the Tulane University Collections are: TU 3174, Blackwater Creek, 7.8 miles south of DeKalb—one ♂ I, three ♀♀, GHP and JBB coll.; TU 3613 (type locality)—one ♂ I, one ♂ II, one ♀, JBB coll.

Color notes.—Background color of most of the dorsal part of the carapace is medium brown. The sides of the cephalic and thoracic region are marked by an incomplete (in the mid-dorsal area of the areola) U-shaped yoke of olive brown. The yoke increases in width caudally and is widest at caudal edge of carapace where the base of the U almost meets in the median line. A large cream colored area is below the "yoke" on the cephalic portion, which area darkens to light olive-tan on the thoracic portion of the carapace. The mid-dorsal portion of the abdomen is marked by a lightly-defined stripe of medium brown. On either side of this stripe, the background color is cream. The caudal portion of each abdominal segment is deep olive brown. A deep, olive brown, lateral "V" connects the caudal portions of adjacent segments. A pair of small, rectangular, deep olive brown blotches mark the cephalolateral portion of each segment. Between the transverse caudal stripes and above the "V" on either side is a rust-colored blotch on the second through fifth abdominal segments. The cephalic section of the telson is marked by an inverted cream colored crescent surrounded by olive brown, the caudal section is uniformly medium brown. The bases of the uropods are cream, with mesial rectangular stripes of dark brown surrounded by a large area of rust brown. The palms of the chelae are medium brown with dark olive brown tubercles. The dactyl and immovable finger are dark olive brown, except for cream colored tips.

Variations.—There are few variations of import in observed specimens. The annuli ventrales of smaller adult females are significantly different. Smaller females do not possess tuberculate prominences on the sternum just cephalic to the annulus ventralis. Also the median sinus on the annulus ventralis of smaller females is less deeply sculptured and shows less lateral twisting.

Relationships.—On the basis of the structures of the first pleopod of Form I males, *P. lagniappe* is most closely related to *P. spiculifer* (LeConte, 1856:401), resembling it in lacking a distinct cephalic process, but differing from it in having a much reduced caudal knob. This resemblance may be more superficial than actual. Geographically, its closest Spiculifer Group relative is *P. penni* Hobbs (1951:273). Second form males show a closer resemblance to *P. penni* than

to *P. spiculifer;* also the annuli ventrales of females of *P. penni* and *P. lagniappe* are markedly similar.

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