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### A NEW SPECIES OF *Leptocaris* (CRUSTACEA, COPEPODA, HARPACTICOIDA) FROM INLAND WATERS OF MEXICO \*

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#### ABSTRACT

A new species of *Leptocaris* (Crustacea, Copepoda, Harpacticoida) was collected from stromatolites in two evaporitic lakes and a marsh in the Cuatro Ciénegas basin, in central Coahuila, México. This is the second record of the genus from inland waters of the Americas. The species is distinguished from most congeners by having the endopod of leg I composed of a single article in both sexes, and from *L. mangalis* by the setation of the swimming legs.  
Key words: Crustacea, Copepoda, Harpacticoida, Taxonomy, Cuatro Ciénegas, Mexico.

#### RESUMEN

Una nueva especie del género *Leptocaris* (Crustacea, Copepoda, Harpacticoida) fué colectada dentro de estromatolitos en dos lagos evaporíticos y un pantano en el valle de Cuatro Ciénegas, en la parte central del estado de Coahuila, México. Este es el segundo reporte de el género en aguas continentales de América. Esta nueva especie se distingue de la mayoría de sus congéneres por poseer el endópodo de la pata I compuesto por un solo artejo en los dos sexos; se distingue además de *L. mangalis* en la setación de las patas ambulatorias.  
Palabras claves: Crustacea, Copepoda, Harpacticoida, Taxonomía, Cuatro Ciénegas, México.

#### INTRODUCTION

The arid basin of Cuatro Ciénegas in the Chihuahuan desert of central Coahuila, México, contains a wide range of aquatic habitats, including closed evaporitic lakes. The fauna of the basin is characterized by a high degree of endemism (Minckley, 1969; Mickley and Cole, 1968). Few species of crustaceans have yet been recorded from Cuatro Ciénegas waters, but scrutiny of the wide range of microhabitats could reveal additional species (Cole, 1984).

Spring waters are dominated by the ions  $SO_4^{=}$  and  $Ca^{++}$ ; as a result of evaporation and  $CaCO_3$

deposition,  $SO_4^{=}$  and  $Mg^{++}$  come to predominate and there is a shift from a sulfato-carbonate water to a sulfato-chloride type (Minkley and Cole, 1968). In both fresh and saline waters, stromatolites are common (Winsborough and Seeler, 1984). From stromatolites in two saline lakes, Laguna La Puente Zumbadora (La Playita) and Laguna Grande, there were collected several individuals of a previously undescribed species of the harpacticoid copepod genus *Leptocaris*. A single additional specimen was collected from a marsh.

#### DESCRIPTION OF HABITATS

Laguna La Puente Zumbadora (La Playita) is a shallow evaporitic lake, maximum depth 1.8 m and area 15.2 ha, located at 26°54'42"N 102°00'51"W. Electrical conductivity of the water is 3650  $\mu$ Siemens,

salinity 13 ‰, pH 7.5 (Winsborough and Seeler, 1984); temperature ranges from 23° to 28°C.

Laguna Grande is also a shallow evaporitic lake, its depth not exceeding 1 m and area 30.5 ha,

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located at 26°50'54" N 102°08'54" W. The bottom is firm sand, almost without vegetation. Water conductivity is 7000  $\mu$ S, salinity 70.0 ‰, pH 7.2 (Winsborough and Seeler, 1984). Dominant ions are  $\text{Ca}^{++}$  (560-620 mg/l) and  $\text{SO}_4^-$  (2700-3100 mg/l), followed by  $\text{Na}^+$  (350-395 mg/l),  $\text{Cl}^-$  (291-322 mg/l),  $\text{Mg}^{++}$  (225-299 mg/l), and  $\text{CO}_3^-$  (121-125 mg/l), and total dissolved solids are 4-5 g/l

(Minckley, 1969; Minckley and Cole, 1968). Temperature ranges from 24° to 29°C.

The unnamed marsh where one specimen of the new species was collected is located between 26°48'12" and 26°49'17"N, and 102°01'05" and 102°02'20"W. The marsh is characterized by dense algal beds and deposition of salts on the grass stems.

## MATERIALS AND METHODS

Copepods were collected from stromatolites using a plastic corer of 4.6 cm inner diameter; the corer was pushed into a stromatolite to a depth of 8 cm. Core samples were sieved through 1000  $\mu$ m and 44  $\mu$ m sieves, stained with rose bengal and fixed with 4% formalin buffered to neutral pH. Specimens were sorted and transferred to a solution of 70% ethanol- 30% water with 1% glycerine added for permanent storage. Whole specimens were examined in glycerine; dissected specimens were mounted in glycerine jelly or commercial polyvinyl lactophenol mediums with a little chlorazol black E added. Drawings were made at magnifications of 600X and 1000X using a microscope fitted with a camera lucida, and from photomicrographs taken at 400X and 1000X. Figures are from several specimens<sup>1</sup>.

Family Darcythompsoniidae Lang, 1936  
Genus *Leptocaris* T. Scott, 1899  
*Leptocaris stromatolicolus*, sp. nov.  
(Figs. 1-21)

**Material.**- Holotype "H", Laguna La Puente Zumbadora (La Playita), 28 Jul 1988, United States National Museum of Natural History-USNM 242378; allotype "M", Laguna La Puente Zumbadora, 18 Oct 1988, USNM 242379; paratypes: 1 "H", Laguna La Puente Zumbadora, 28 Jul 1988, USNM 242380; 1 "H", mounted whole on slide, unnamed marsh, 22 Apr 1988, USNM 242381; 2 "H", each dissected and mounted on slide, Laguna La Puente Zumbadora, 25 Feb 1989, USNM 242382; 2 "M", undissected, and 1 "M", dissected and mounted on slide, Laguna La Puente Zumbadora, 18 Oct 1988, USNM 242383. All collected by J. A. Zamudio V. and L. I. Palomo de la R. Unmounted specimens preserved

in 70% ethanol. Additional paratype material in personal collection of J. A. Zamudio V.

**Female.**- Range of lengths, excluding caudal setae, 420-628  $\mu$ m. Body shape (Figs. 1, 2) cylindrical, anal somite tapering posteriorly and nearly twice length of preceding somite. Prosomite 1 with few scattered hairs; succeeding somites with one to three pairs of small papillae, some papillae irregularly sculptured. Genital field (Fig. 3) with small sclerotized area on anterior part of segment, and group of internal rounded refringent vesicles on each side of segment ventrally. Anal operculum (Fig. 4) subtriangular, with smooth margin; anal somite with single dorsal row of hairs under operculum. Caudal rami (Fig. 4) about twice longer than broad, with single stout terminal seta broadened at proximal third, three lateral setae, one medial seta inserted at level of distalmost lateral seta, and dorsal seta inserted at midlength of ramus.

Rostrum (Figs. 2, 5) fused with somite, with two long subterminal sensory hairs. Antennule (Figs. 5, 6) short, of five articles, with short row of spinules on article 1 and esthetasc on article 3. Antenna (Fig. 7) with allobasis bearing long slender seta on outer margin and having exopod represented as two small setae. Labrum (Fig. 8) with anterior horizontal row of hairs and posterior row of teeth, these flanked by three or four spines of which innermost spine is largest. Mandible (Fig. 9) with palp represented by single smooth seta. Maxillule (Fig. 10), arthrite with four clawlike bifid spines and two short plumose setae; coxa-basis with three apical and two marginal setae. Maxilla (Fig. 11) with two endites, proximal endite with single short, stout terminal seta set with row of stiff setules; distal endite with two slender setae and longer, stout seta with few setules near tip; basis bearing two setae and prolonged as claw with few setules near tip; syncoxa with row of spinules. Maxilliped absent.

1 ) The symbols for male and female are not in our word processor. They are changed with "M" for males and "H" for females.

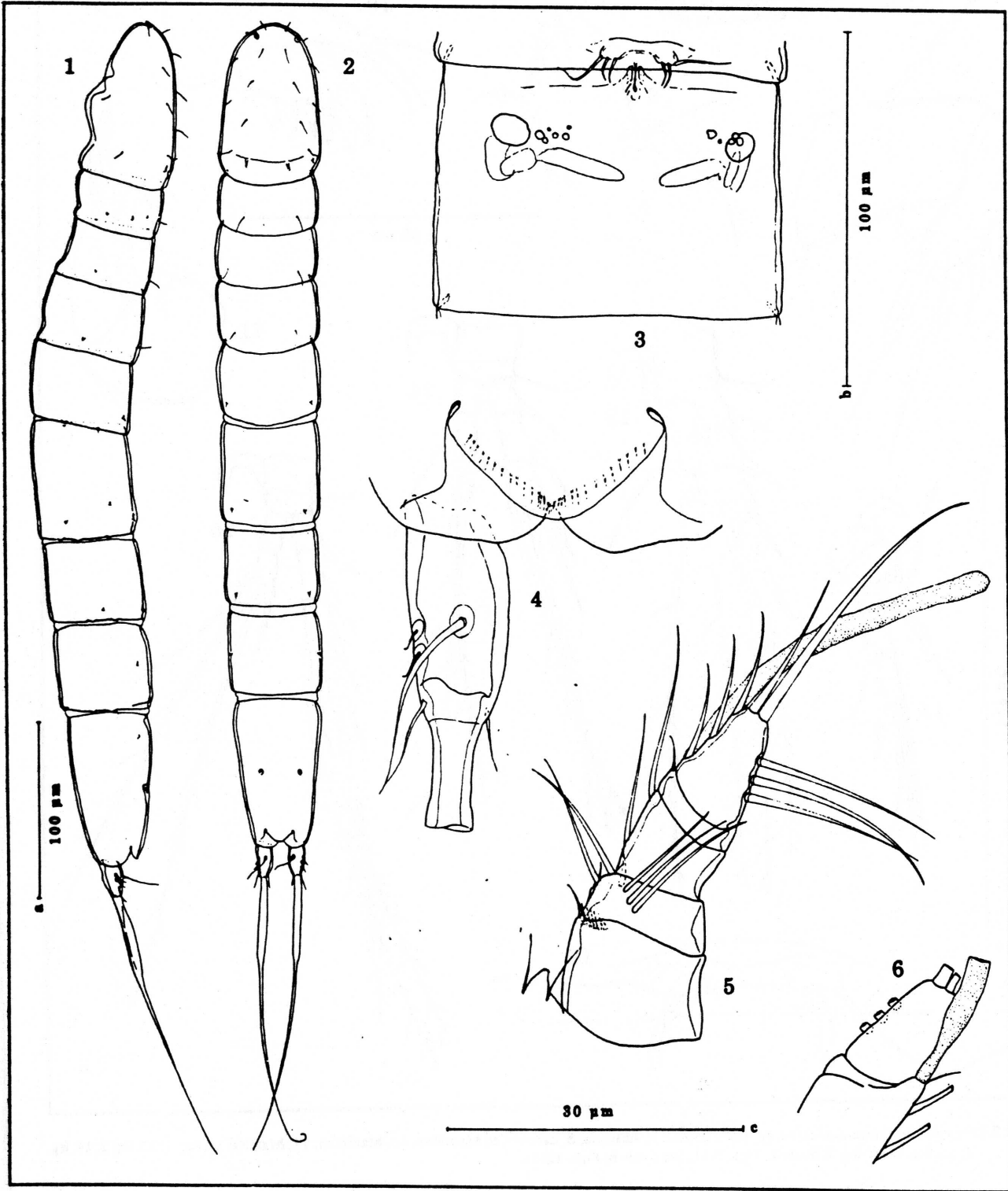


Figure 1-6. *Leptocaris stromatolicolus*, sp. nov., female: 1, Habitus, lateral; 2, Habitus, dorsal; 3, Genital segment, ventral; 4, Caudal ramus, dorsal; 5, Antennule, dorsal; 6, Antennule, distal articles, ventral. Scale a, Figs. 1,2; Scale b, Fig. 3, Scale c, Figs. 4-6.

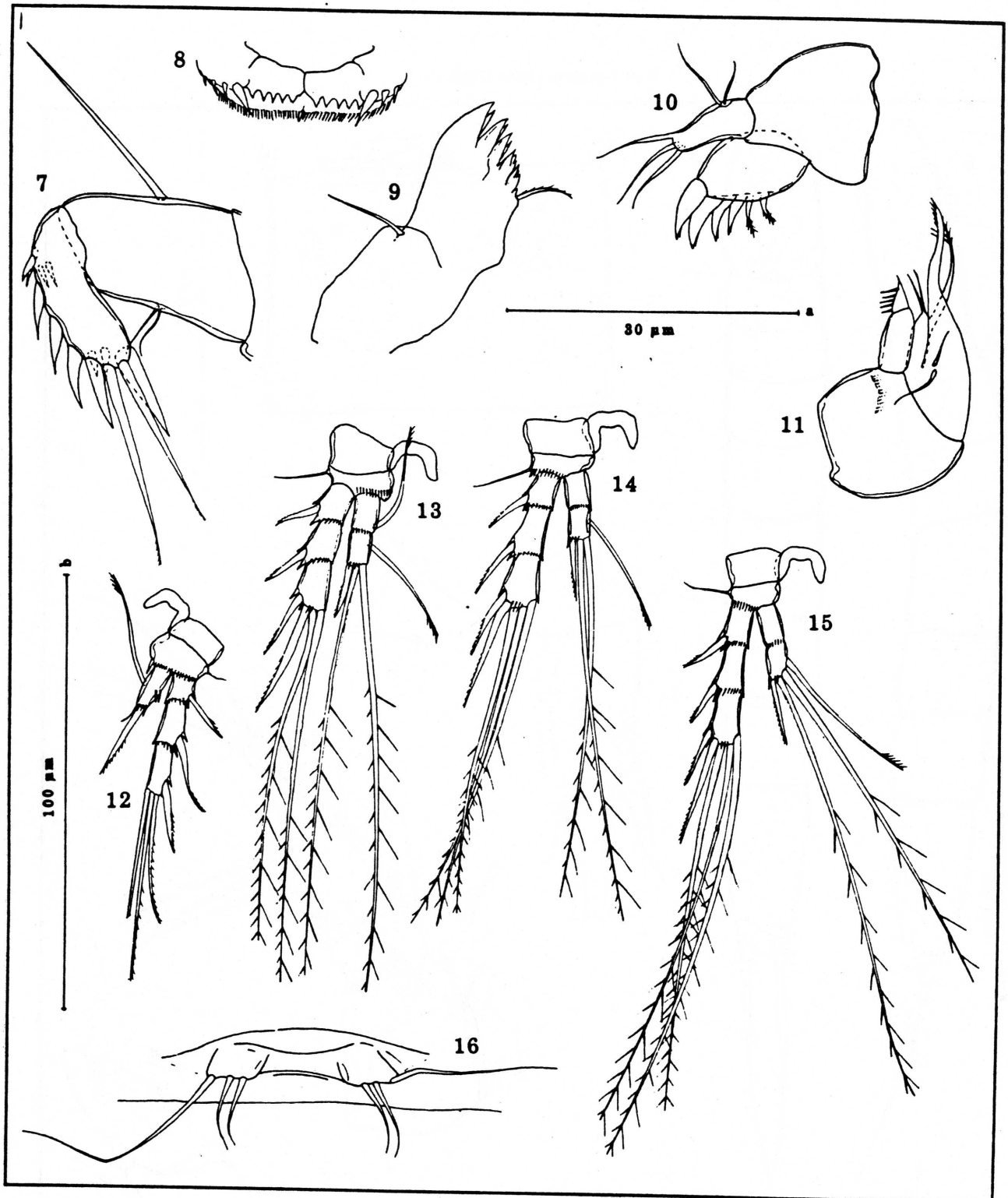


Figure 7-16. *Leptocaris stromatolicolus*, sp. nov., female: 7, Antenna; 8, Labrum; 9, Mandible; 10, Maxillule; 11, Maxilla; 12, leg 1; 13, leg 2; 14, leg 3; 15, leg 4; 16, leg 5. Scale a, Figs. 7-11, 16; Scale b, Figs. 12-15.



Ambulatory legs 1-4 (Figs. 12-15) each with exopod of three articles; endopod of leg 1 of single article, endopods of legs 2-4 each of two articles. Setal formula as follows :

Leg 1	basis 1 - 1	exp 0 - 1; 0 - 1; 0, 2, 2 enp 1, 2, 0
Leg 2	basis 0 - 1	exp 0 - 1; 0 - 1; 0, 2, 2 enp 1 - 0; 2, 2, 0
Leg 3	basis 0 - 1	exp 0 - 1; 0 - 1; 1, 2, 2 enp 0 - 0; 2, 2, 0
Leg 4	basis 0 - 1	exp 0 - 1; 0 - 1; 1, 2, 2 enp 0 - 0; 2, 2, 0

Setae on inner surface of leg 1 endopod and leg 2 endopod 1 directed medioanteriorly. These and proximal inner setae of legs 2-4 endopods 2 each bearing comb of setae at tip.

Leg 5 (Figs. 3, 16) consisting of single plate indistinctly separated from somite, each side bearing three smooth setae of which outermost is longest.

Male.- Range of lengths 440-500  $\mu$ m. Habitus (Fig. 17) as female, except somitic setae and papillae more numerous, and dorsal papillae, especially those on prosomites 4 and 5, more prominent and complexly sculptured.

Antennule (Fig. 18) geniculate, of six articles, articles 3-5 forming strong hook; article 1 with comb of spinules and spatulate spine; articles 3 and 6 each with esthetasc.

#### ROSTRUM, ANTENNA, AND MOUTH PARTS AS IN FEMALE

Articulation and major setation of ambulatory legs 1 and 4 as in female. Inner margins of basipods more heavily sclerotized and more produced than in female. Setae of endopods 2 of legs 2 and 3 (Figs. 19, 20) modified, shorter and stouter than those of female and bent laterally at proximal third, each having tapered tip set with comb of setules.

Leg 5 (Fig. 21) as single fused plate distinct from somite, each side with slender, normally tapered outer seta and three inner setae, these stout proximally with long whiplike ends. Leg 6 consisting of trapezoidal protrusion, most developed and ornamented with few rows of spinules on left side of somite.

#### ETYMOLOGY.- NAMED FOR THE SITE OF COLLECTION OF MOST SPECIMENS

Discussion.- *Leptocaris stromatolicolus* is distinguished from most congeners by the unarticulate endopod of leg 1, the usual condition being two articles (Kunz, 1978). Por (1983) described a species, *L. mangalis*, having the endopod of leg 1 of a single article, but among other differences, in *L. mangalis* exopod 3 of leg 1 bears only three setae and spines in all, and exopods 3 of legs 3 and 4 bear only four setae and spines. Females of *L. mangalis* have the antennule of only four articles, while males show a tendency toward fusion of the endopods of legs 2 and 3, with the endopod of leg 2 bearing only one seta on the inner margin.

*Leptocaris stromatolicolus* belongs to the *brevicornis*-group of Kunz (1983), which includes species having a total of five setae and spines on exopods 3 of legs 3 and 4, and four setae on endopods 2 of legs 2 and 3. Kunz considered this to be the most primitive group; recently, however, Fiers (1986) described *L. echinatus*, a species combining the "primitive" setal formula with derived characters such as tegumental sculpturing on the somites. Similarly, *L. stromatolicolus* possesses some characters which may be considered derived, chiefly the subtriangular anal operculum and the spinule rows on the first article of the antennule, and, in the male, rudimentarily sculptured hyaline papillae on some prosomites. Partly because of lack of knowledge of males of several species, proposed arrangements of species-groups within the genus *Leptocaris* are at present problematic (Fleeger and Clark, 1980).

Ten species of *Leptocaris* have been recorded from the Americas, most from marine or brackish coastal habitats. The single exception is the broadly distributed *L. brevicornis* (Douwe, 1905), which occurs in the freshwater caldera Lake Ilopango, El Salvador (Noodt, 1958), as well as in brackish coastal lagoons and estuaries in Brazil (Noodt, 1955) and along the east coast of the United States (Coull, 1977), although Por (1983) suggested that some of these records may refer to the similar species *L. mangalis*, known from mangrove regions in Sinai, Brazil, and Florida. Jakobi (1954) and Oliveira (1957) described *L. minimus* and *L. vermicularis* respectively from brackish coastal lagoons in Brazil. Chappuis and Delamare Deboutteville (1956) recorded *L. trisetosus* (Kunz, 1935) from a sandy beach in Bimini; this species is otherwise known from European and South African brackish coastal waters. Lang (1965) described *L. doughertyi*, *L. pori*, and *L. armatus* from marine tidal pools and sandy beaches

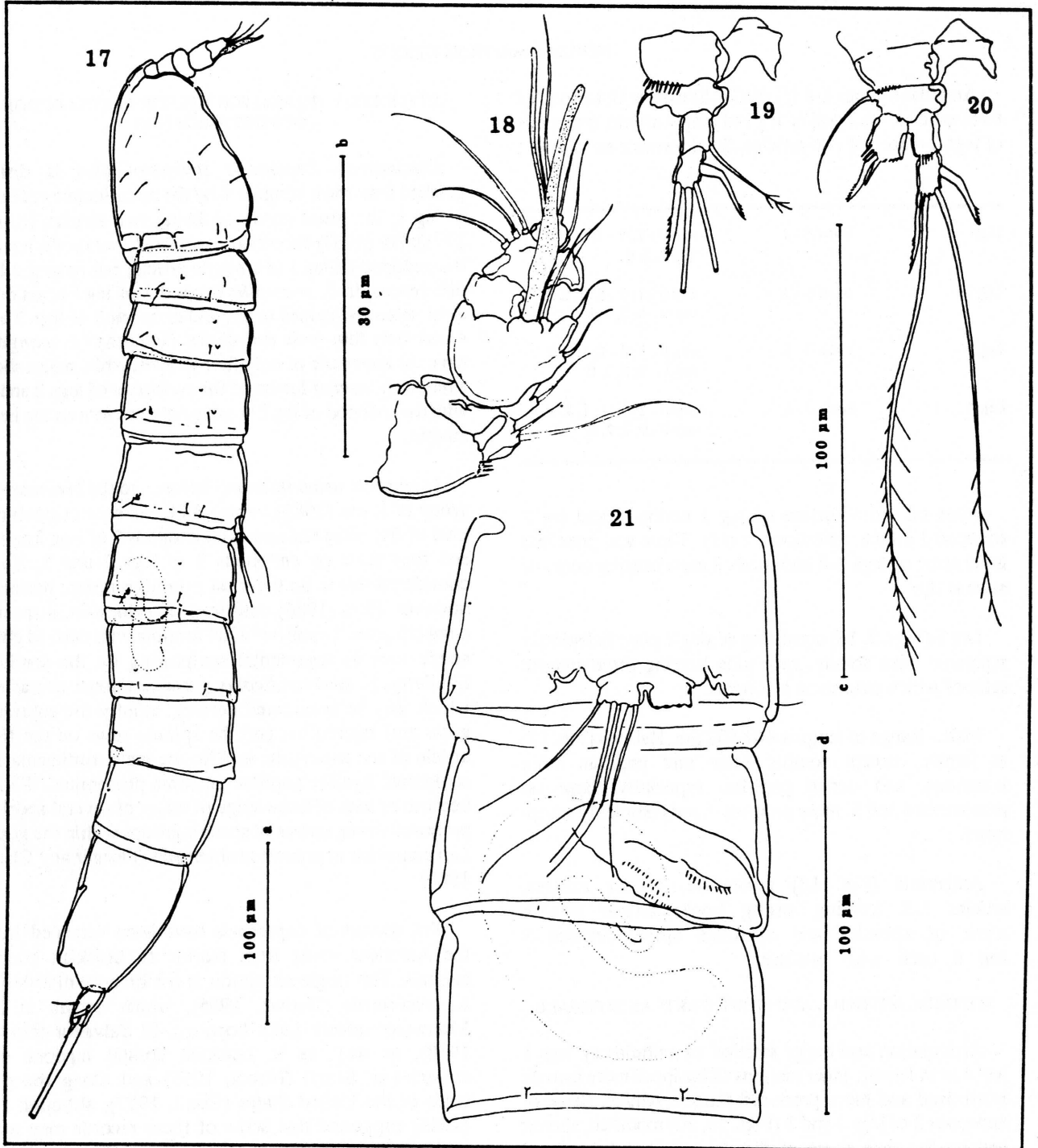


Figure 17-21. *Leptocaris stromatolicus*, sp. nov., male: 17, Habitus, lateral; 18, Antennule; 19, Leg 2 endopod; 20, Leg 3 endopod; 21, Middle somites showing legs 5 and 6, ventral. Scale a, Fig. 17; Scale b, Fig. 18; Scale c, Figs. 19, 20; Scale d, Fig. 21.

in California; Fiers (1986) described *L. glaber* from a similar habitat in St. Martin, West Indies. *Leptocaris kunzi* Fleeger and Clark, 1980, was described from a

shallow estuarine lake in Louisiana, USA. *Leptocaris stromatolicus*, then, is the second member of the genus recorded from an inland habitat in the Americas.

Two congeners, *L. brevicornis* (Douwe, 1905) and *L. sibirica* (Borutskii, 1952), have been found in Eurasian continental fresh as well as brackish waters. Most members of the genus occur in "difficult" euryhaline and eurythermal habitats, sometimes as members of a typically estuarine species assemblage (Fleeger and Clark, 1980), but most often in isolated brackish pools or beach sands (Kunz, 1978). Most records are from sand

substrates, but some are from mud and phytal substrates including decomposing mangrove leaves, a niche to which members of the genus seem preadapted but certainly not limited as implied by Por (1983). The stromatolite habitat apparently provides an appropriate interstitial situation. The authors are not aware of records from waters having the peculiar ionic proportions of the lakes in Cuatro Ciénegas.

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