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**A REVISED KEY TO *Leptocaris* (COPEPODA:  
HARPACTICOIDA), INCLUDING A NEW SPECIES  
FROM A SHALLOW ESTUARINE LAKE IN LOUISIANA, USA**

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**ABSTRACT:** During ecological research of benthic and fouling assemblages in a shallow estuarine lake in central Louisiana receiving thermal effluent, a new species of harpacticoid copepod was discovered. Approximately 700 specimens of *Leptocaris kunzi* n. sp. were collected on artificial substrate plates from August, 1977 - January, 1978. This new species is herein described and illustrated. *Leptocaris kunzi* n. sp. differs from other members of the nominal genus in the setation of the P<sub>2</sub> - P<sub>4</sub> endopods and by having a female P<sub>5</sub> not fused into a single plate. The most closely related species to *L. kunzi* n. sp. appear to be *L. elishevae* (Por) and *L. canariensis* Lang. A revised key to the genus is presented.

The marine and estuarine harpacticoid copepod fauna of Louisiana is numerically abundant (Day *et al.*, 1973; Fleeger, 1978) but poorly known taxonomically. Gonzalez (1957) has identified 8 widely distributed species of planktonic harpacticoids; however, much less is known of the benthic species. Day *et al.* (1973) summarized estuarine densities at the major taxon level, but only Hiegel (1971) who collected 12 harpacticoids from Airplane Lake, Clark (unpublished) who collected 13 species from Lake Peigneur, and Fleeger (1980) who, in the process of examining harpacticoid community structure, discovered and described a new species of *Cletocamptus*, have identified Louisiana benthic harpacticoids to species. In all, 27 harpacticoids in 22 genera and 13 families are known from Louisiana.

In Lake Peigneur, Louisiana, a study of the possible effects of heated discharge

on benthic and fouling invertebrate assemblages was conducted from March, 1977 - February, 1978 (Clark, unpublished). In the course of these studies, another new Louisiana harpacticoid, *Leptocaris kunzi*, was collected in large numbers on artificial substrate samplers. The samplers (designed after Hester and Dendy, 1962) which contained *L. kunzi* n. sp. have a total area of 961.1 cm<sup>2</sup> and were located near the mouth of the thermal effluent canal. Additional harpacticoids associated with the artificial samplers were *Nitocra lacustris* (Schmankewitsch), *Onychocamptus mohammed* (Blanchard and Richard), and *Scottolana canadensis* (Willey). Surrounding the samplers, the common benthic harpacticoids were *Scottolana canadensis*, *Microarthridion littorale* (Pope), *Nitocra lacustris* and *Pseudostenhelium wellsi* (Coull and Fleeger). Herewith, we describe this new

species of *Leptocaris* and compare it to other species within the genus. Additionally, a revised key to *Leptocaris* is presented.

The nomenclature and descriptive terminology are adopted from Lang (1948, 1965). All figures have been drawn to scale using a camera lucida. The examination procedure of Coull (1977) was followed. Abbreviations used are:  $A_1$  = antennule,  $A_2$  = antenna, Benp = baseopodite, Cr = caudal ramus, Enp = endopodite, Exp = exopodite, Md = mandible, Mx = maxilla, Mxl = maxillula, Mxp = maxilliped,  $P_1 - P_6$  = leg 1-leg 6, and R = rostrum. Length measurements do not include the rostrum, antennules, and caudal setae.

## SYSTEMATIC ACCOUNT

Family Darcythompsoniidae Lang 1936

Genus *Leptocaris* T. Scott 1899

*Leptocaris kunzi* n. sp.

(Figs. 1-14)

Material: 273 ♀♀, 338 ♂♂, 98 copepodites. Holotype, 1 ♀ USNM No. 173241; paratypes 25 ♀♀, 31 ♂♂ and 9 copepodites, USNM No. 173242.

Type Locality: Lake Peigneur, Iberia Parish, Louisiana (29° 58' 44" N; 91° 58' 29" W) on artificial substrate samplers at a water depth of 1-2 m, approximately 2 m from shore.

Other locations collected: Intertidal zone of mud flats associated with *Spartina alterniflora* marshes, Bayou Fourchon, Lafourche Parish, Louisiana (29°10'N; 90° 10' W), 5 ♀♀, 1 ♂.

## DESCRIPTION

**Female:** Based on a mature female, 550

µm in length. Body rounded at cephalothorax but linear posteriorly with a slight tapering of the last two body somites. Cephalothorax and first leg somite completely fused. Rostrum small, spade-like with the tip slightly rounded, and with two small sensory setae (Fig. 1). Caudal rami about 1.5 times long as wide with two principal setae (the innermost is largest), one dorsal and 3 lateral setae (Figs. 1 and 2). Anal operculum rounded, lacking dentiform projections (Fig. 2).

$A_1$  (Fig. 3). 7-segmented, aesthetasc on segment 4. Setation as figured.

$A_2$  (Fig. 4) Enp 2-segmented, first segment with a slender, fine seta, bifid at the tip. Second segment anterior edge with 4 setae, distal edge with 4 setae, the middle 2 of which are fused near the base. Exp represented only by 2 juxtaposed setae which are fused near their base, however this character is very difficult to see under the light microscope and is probably variable (see Variability section).

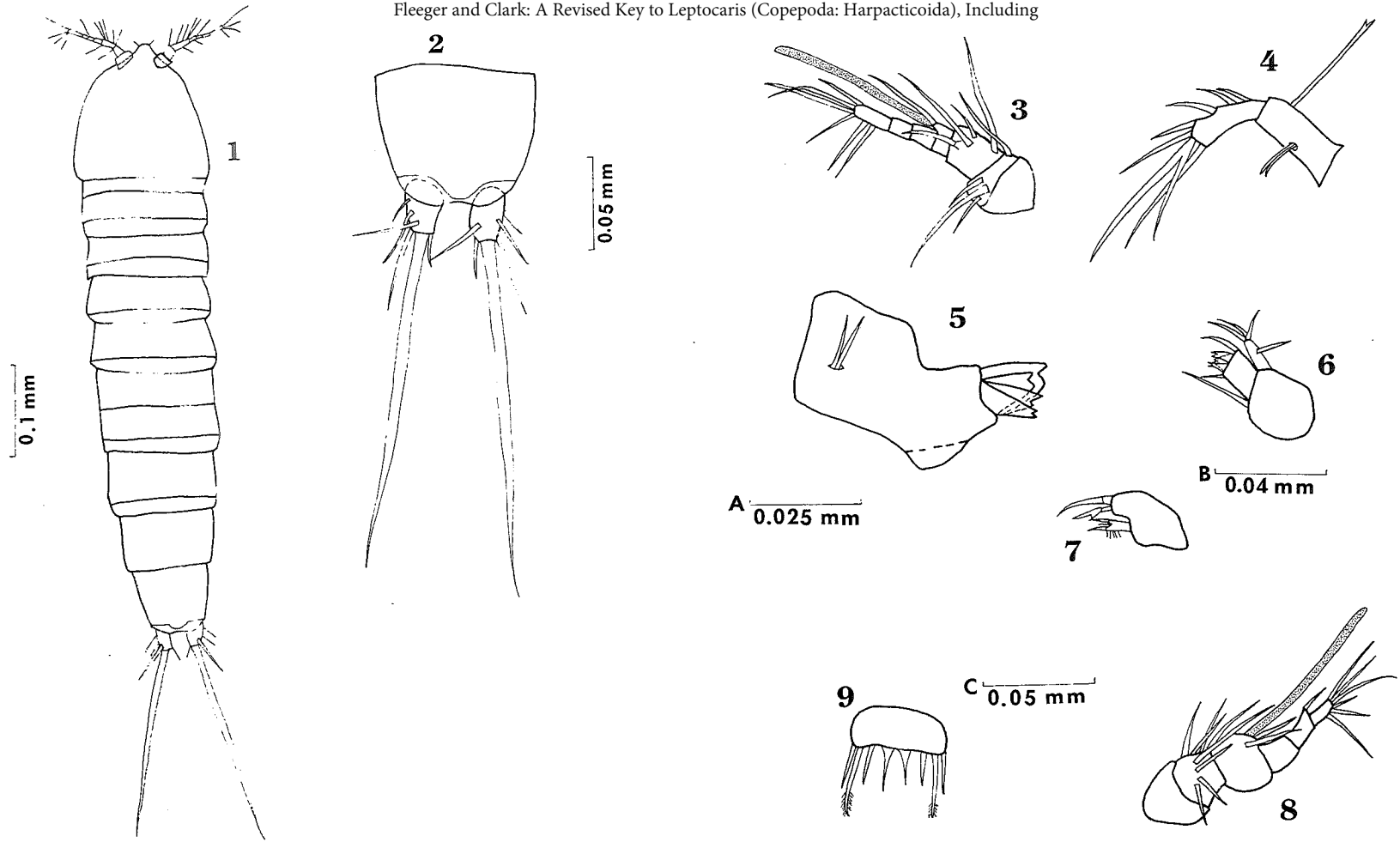
Md (Fig. 5). Praecoxa with bidentate pars incisiva. Palp is represented by 2 setae.

Mxl (Fig. 6). Praecoxal arthrite with 3 strong serrated spines and 2 setae distally. Coxa and basis confluent with 1 lateral and 3 terminal setae.

Mx (Fig. 7). Syncoxa with 2 endites. Proximal endite with 2 setae, distal endite with 1 spine. Basis with stout, claw-like spine.

Mxp. Absent.

$P_1 - P_4$  (Fig. 10-13). All with 3-segmented Exp. and 2 segmented Enp. Setation as figured and listed below.



**Figures 1-2.** *Leptocaris kunzi* n. sp., female. **Figure 1.** Habitus, dorsal. **Figure 2.** Caudal rami, dorsal.

**Figures 3-9.** *Leptocaris kunzi* n. sp. **Figure 3.** A<sub>1</sub>, female (C). **Figure 4.** A<sub>2</sub>, female (C). **Figure 5.** Md, female (A). **Figure 6.** Mxl, female (B). **Figure 7.** Mx, female (B). **Figure 8.** A<sub>1</sub>, male (C). **Figure 9.** P<sub>5</sub>, male (C).

	Exp.	Enp.
P <sub>1</sub>	0.0.022	1.020
P <sub>2</sub>	0.0.121	0.122
P <sub>3</sub>	0.0.121	0.120
P <sub>4</sub>	0.0.121	0.120

P<sub>5</sub> (Fig. 14). Exp segment present with 2 setae; left and right Benp fused into a single plate with a total of 2 setae.

Genital Field (Fig. 14). Medial, unpaired. Hyaline area oval with 2 curved, semi-circular setae.

**Male:** Based on a mature male, 415  $\mu\text{m}$  in length. The male differs from the female only in size, A<sub>1</sub> and P<sub>5</sub>.

A<sub>1</sub> (Fig. 8). 6-segmented and haplocer. Aesthetasc on segment 3.

P<sub>5</sub> (Fig. 9). Baseoendopodite and exopodite fused, each with 4 setae.

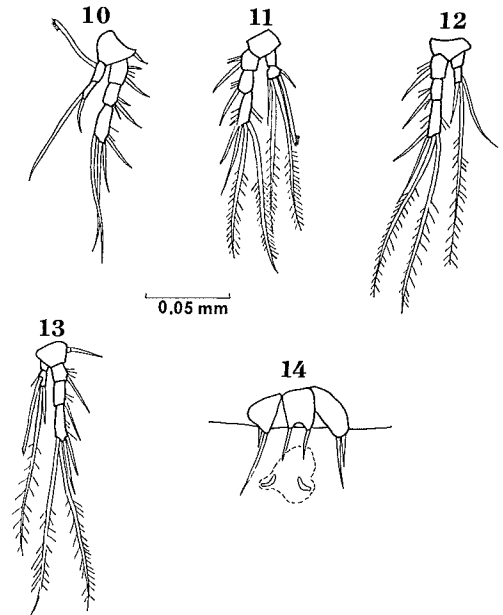
**Etymology:** The specific epithet, *kunzi*, is in honor of Professor Helmut Kunz (Geographisches Institut der Universität des Saarlandes, Federal Republic of Germany) who described *L. trisetosus*, reviewed the genus twice and extended distributional ranges (see Kunz, 1961 and 1978).

**Variability:** No variation in leg setation has been observed among the approximately 25 dissected specimens. The A<sub>2</sub> exopod is variable, however. The 2 setae which form the exopod are fused but the position of this fusion ranges from 1/3 of the length of the setae to being just at their base. Scanning electron microscopy was used to better identify this character and the variability was confirmed. The fusion near the base is the most commonly occurring morphotype, and was found in 10 of the 14 specimens which could be properly observed.

**Habitat:** Lake Peigneur is a shallow (0.5 - 1.5 m), brackish (0.0 - 6.0 ‰) estuarine lake in south central Louisiana. It is connected to Vermilion Bay by Bayou Carlin, and the Diamond Crystal Salt Company discharges approximately 23,500 m<sup>3</sup> of heated (37°C) water into the lake daily. The salinity in the location where *L. kunzi* n. sp. was found ranges from 0.2 - 1.1 ‰; the substrate below the artificial samplers ranged from sandy to clayey-mud to coarse *Phragmites communis* detritus. *L. kunzi* n. sp. was present at the intake and discharge canals of a thermal effluent and was collected from August, 1977 - January, 1978.

## DISCUSSION

*Leptocaris kunzi* n. sp. is described here as a new species because its setal formula and female P<sub>5</sub> are unique. It is the only member of the genus to have 5 setae on the terminal segment of the



Figures 10-14. *Leptocaris kunzi* n. sp., female. Figure 10. P<sub>1</sub>, Figure 11. P<sub>2</sub>, Figure 12. P<sub>3</sub>, Figure 13. P<sub>4</sub>, Figure 14. P<sub>5</sub> and genital field.

endopod of the  $P_2$ , and the only species to have a female  $P_5$ , when present, which is not fused into a single plate. The setal formula of *L. kunzi* n. sp. is most similar to *L. pori* Lang, differing only in the  $P_2$  and  $P_3$  endopod, *L. elishevae* (Por), differing only in the  $P_2$ - $P_4$  endopods and *L. canariensis* Lang, differing only in the endopods of the  $P_2$ - $P_4$  (see Kunz, 1978, Table 1). *L. kunzi* n. sp. also differs from each in the nature of the  $P_5$ , when known, of both sexes. Based on the similarity in genital field (although genital field has been described only in *L. elishevae*, (Por 1968) and in *L. kunzi* n. sp.) and on setal formulae, the most closely related species to *L. kunzi* appear to be *L. elishevae* and *L. canariensis*.

Kunz (1978) presents a table listing several morphological character states of *Leptocaris*. Few trends in setal formula for *Leptocaris* are apparent, and the genus seems to be rather conservative in the number of  $P_1$ - $P_4$  setae. Lang (1965) and Kunz (1978) have, however, pointed out similarities among certain species. Kunz (1978) defined the *minimus*-Group, consisting of *L. minimus* (Jakobi), *L. armatus* Lang and *L. marinus* (Por), in which each species displays reduced setation on the terminal segment of the  $P_3$  and  $P_4$  exopod; 3 setae are present in the *minimus*-Group while all other species have from 4-5 setae. Throughout the genus, setal numbers range from 3-4 and 3-5 on the terminal segment of the  $P_1$ - $P_2$  and  $P_3$ - $P_4$  exopods, respectively. For the endopods, setal formulae range from 2-3, 2-5 and 2-4 on the  $P_1$ ,  $P_2$  and  $P_3$ - $P_4$ , respectively. Furthermore, a great variety of combinations and arrangements of setae exist within the genus.

Lang (1965), however, suggests another possible relationship among the species of *Leptocaris* may be based on the structure of the male  $P_5$ . In some

species, notably *L. pori*, *L. minutus* T. Scott and *L. ignavus* (Noodt); the innermost seta is greatly enlarged to a stout spine. The tendency for enlargement of the innermost setae is also present in *L. insularis* (Noodt), and *L. trisetosus* (Kunz). It is difficult to use this character to indicate relationships because the male is unknown for several species, i.e., *L. gurneyi* (Nicholls), *L. marinus* (Por), *L. armatus* Lang, *L. sibiricus* (Borutzky) and *L. elishevae* (Por). Because of the unknown males and the variety of setal formulae, phylogenetic relationships within *Leptocaris* are tenuous at best and must await further studies.

Since the publication of the last dichotomous key to *Leptocaris* (Lang, 1965), *L. elishevae* and *L. kunzi* n. sp. have been added. Wells' (1977) tabular key lists all species except *L. kunzi* n. sp. A new key to the species is given below.

### KEY TO THE SPECIES OF *Leptocaris* (modified from Lang, 1965)

1. Distal segment Exp  $P_2$  and  $P_3$  with setae; first segment  $A_1$  with a row of strong spines . . . . . 2
- Distal segment Exp  $P_2$  and  $P_3$  with 4 or 5 setae; first segment  $A_1$  lacking a strong spine row . . . . . 3
2.  $P_5$  ♀ with 6 setae; distal segment Exp  $P_1$  with 4 setae; distal segment Enp  $P_4$  with 3 setae . . . . . *L. armatus* (Lang)
- $P_5$  ♀ with 4 setae; distal segment Exp  $P_1$  with 4 setae; distal segment Enp  $P_4$  with 2 setae . . . *L. minimus* (Jakobi)
- $P_5$  ♀ with 4 setae; distal segment Exp  $P_1$  with 3 setae; distal segment Enp  $P_4$  with 2 setae . . . *L. marinus* (Por)

3. Proximal segment Enp P<sub>1</sub> without inner seta..... 4  
 Proximal segment Enp P<sub>1</sub> with inner seta..... 5
4. P<sub>5</sub> ♀ with 4 setae; proximal segment Enp P<sub>4</sub> with inner seta.....  
 ..... *L. vermicularis* (Oliveira)  
 P<sub>5</sub> ♀ with 2 setae; proximal segment Enp P<sub>4</sub> without inner seta .....  
 ..... *L. sibiricus* (Borutzky)
5. Distal segment Enp P<sub>1</sub> with 2 seta ..... 6  
 Distal segment Enp P<sub>1</sub> with 3 seta ..... 9
6. Proximal segment Enp P<sub>1</sub> and P<sub>2</sub> each with an inner seta ..... 7  
 Proximal segment Enp P<sub>1</sub> with an inner seta; proximal segment Enp P<sub>2</sub> without inner seta ..... 8
7. Distal segment Enp P<sub>3</sub> and P<sub>4</sub> each with 4 setae; Exp A<sub>2</sub> with 1 segment and 2 setae ..... *L. elishevae* (Por)  
 Distal segment Enp P<sub>3</sub> and P<sub>4</sub> with 4 and 3 setae, respectively; Exp A<sub>2</sub> represented by only 2 setae *L. port* (Lang)
8. Distal segment Enp P<sub>2</sub> with 2 setae ..... *L. canartensis* (Lang)  
 Distal segment Enp P<sub>2</sub> with 4 setae ..... *L. gurneyi* (Nicholls)  
 Distal segment Enp P<sub>2</sub> with 5 setae ..... *L. kunzi* n. sp.
9. Distal segment Enp P<sub>4</sub> with 4 setae ..... 10  
 Distal segment Enp P<sub>4</sub> with 3 setae ..... 13  
 Distal segment Enp P<sub>4</sub> with 2 setae ..... *L. doughertyi* (Lang)
10. Distal segment Exp P<sub>3</sub> and P<sub>4</sub> with 5 setae..... 11  
 Distal segment Exp P<sub>3</sub> and P<sub>4</sub> with 4 setae..... 12
11. P<sub>5</sub> ♀ with 3 setae; P<sub>5</sub> ♂ with 6 setae ..... *L. trisetosus* (Kunz)  
 P<sub>5</sub> ♀ with 2 setae; P<sub>5</sub> ♂ with 4 setae ..... *L. brevicornis* (Douwe)
12. Proximal segment Enp P<sub>2</sub> with inner seta; P<sub>5</sub> ♂ with 6 setae.....  
 ..... *L. insularis* (Noodt)  
 Proximal segment Enp P<sub>2</sub> without inner seta; P<sub>5</sub> ♂ with 5 setae.....  
 ..... *L. ignavus* (Noodt)
13. Proximal segment Enp P<sub>4</sub> with an inner seta....., *L. minutus* (T. Scott)  
 Proximal segment Enp P<sub>4</sub> without an inner seta ..... *L. biscayensis* (Noodt)

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