3. GENERIC PARTITION IN THE AMPHIPOD FAMILY
CHELURIDAE, MARINE WOOD BORERS

4. LILJEBORGIID AMPHIPODS OF SOUTHERN CALIFORNIA
COASTAL BOTTOMS, WITH A REVISION OF THE FAMILY

BY J. LAURENS BARNARD
FOREWORD

THE BEAUDETTE FOUNDATION FOR BIOLOGICAL RESEARCH was incorporated as a non-profit research organization in June, 1958, and has proceeded to develop a program of inquiry into the systematics, distribution, ecology and utilization of marine, littoral and coastal organisms, particularly of the eastern tropical and subtropical Pacific. The PACIFIC NATURALIST is presented as a serial medium for the publication of the results of the Foundation’s research programs. It is intended to issue numbers at irregular intervals as the occasion arises. Copies are available for exchange with interested libraries, institutions and individuals. They may also be purchased by subscription at cost from the Foundation offices at Box 227, RFD 1, Solvang, California. The rate is presently set at $9.00 per volume (450-500 pages).

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The small family Cheluridae is composed of three species of wood-boring amphipods, at present assigned to the single genus Chelura Philippi. It is believed by the writer that the strongly contrasting morphological structures of the three species should be pointed out and that each species be relegated to a separate genus. The purpose of this paper is to describe these genera, and to discuss the distribution of each.

ACKNOWLEDGEMENTS.—Specimens have been examined through the courtesy of the following persons: Mr. Clarence R. Shoemaker, U.S. National Museum; Dr. Isabella Gordon, British Museum of Natural History; Dr. Th. Monod, Dakar, French West Africa; the W. F. Clapp Laboratories, Duxbury, Massachusetts; Professor M. Buljan, Oceanographic Institute Ribarstvo, Split, Jugoslavia; Dr. C. H. Edmondson, Bishop Museum, Honolulu; Dr. S. M. Shiino, Prefectural University of Mie, Japan; and Dr. Norman T. Mattox, Allan Hancock Foundation, University of Southern California, Los Angeles.

Family CHELURIDAE Allman

Diagnosis.—Gammaridean Amphipoda with the body depressed dorsoventrally; urosome (last 3 pleon segments) large, segments immovably fused together, marked ventrally by sutures, the third segment very large; uropod pairs 1, 2 and 3 dissimilar to each other in shape and size; telson foliate, entire; accessory flagellum present on antenna 1; flagellum of antenna 2 consisting mainly of a single large article in the adult.

Remarks.—The large urosome and peculiar uropods distinguish this group of amphipods.

The specific contrast in morphological features between each pair of the three known species in the family is of considerable magnitude, greater than found in most genera of other amphipod families. These features are discussed below.

Supra-antennal line.—This is a ridge which marks the boundary between the anterior face and dorsal surface of the head. It is common to almost all other gammaridean amphipods, including Chelura insulae, but it is absent in C. terebrans and C. brevicauda. The lack of this ridge appears to be of fundamental generic importance.

Gnathopods.—In general the gnathopods of amphipods are conservative at the generic level, so that each species in a genus has gnathopods...
of similar size and structure, except for minor ornamentations of specific value. Thus, the great contrast between the very large gnathopods of C. insulae and the very small ones of C. terebrans and C. brevicauda is a feature of generic importance.

Uropod 2.—The lack of rami on uropod 2 in C. brevicauda is a major qualitative difference separating it from C. terebrans and C. insulae.

Uropod 3.—The presence of a small inner ramus on uropod 3 in C. terebrans and its absence in C. insulae and C. brevicauda is of significance. This kind of qualitative difference has been used throughout the Amphipoda as a generic character.

This assortment of critical differences among the three species is useful for their generic separation.

KEY TO THE GENERA OF CHELURIDAE

1. Uropod 3, inner ramus small but distinct  
   1. Uropod 3 lacks inner ramus  
   2. Uropod 2 with 2 rami  
   2. Uropod 2 lacks rami  

Chelura Philippi

Chelura Philippi 1839, p. 120; Allman 1847, p. 362; Sars 1895, p. 626; Stebbing 1906, p. 693.

Diagnosis.—Supra-antennal line absent except to define lateral eye lobes; gnathopods small; uropod 2 bears 2 rami; uropod 3 bears a small inner ramus.

Chelura terebrans Philippi

(Figs. 1, 4 F, G)

Chelura terebrans Philippi 1839, p. 120, pl. 3, fig. 5; Allman 1847, p. 363, pls. 13, 14; Sars 1895, p. 627, pl. 225; Stebbing 1906, p. 693, fig. 119; Barnard 1950, p. 90, pls. 32, 33 (with references)

Diagnosis.—With the characters of the genus. Segment 3 of the pleon bears a large dorsal process, directed backwards and slightly deflexed.

Remarks. More than 65 important references to this species have been made in the literature since the description of the species, most of them in regard to additional distributional records or sparse notes on its ecology. This species was studied by Barnard (1955a) in Los Angeles Harbor where it was found to occur with two species of the isopod Limnoria. It was determined that Chelura is a woodborer of minor importance, depending on Limnoria to dig burrows which are then invaded by Chelura. The chelurids are able to enlarge the burrows of Limnoria by a rasping action but are not able to burrow their own discrete tunnels. When placed on fresh wood in the absence of Limnoria the chelurids browse and erode surface furrows in the soft wood layers.
Fig. 1. *Chelura* *terebrans* Philippi. A male specimen 5 mm. long.
Genus **Tropichelura**, new genus

**Diagnosis.**—Supra-antennal line present; gnathopods large; uropod 2 bears 2 rami; uropod 3 lacks an inner ramus.

**Tropichelura insulae** (Calman), new combination

(Figs. 2, 4 C, D, E)

*Chelura insulae* Calman 1910, p. 182, pl. 5, figs. 1-6; Miller 1924, p. 159, pl. 12, figs. 1-2; Barnard 1935, p. 39.


**Distribution.**—**Pacific Ocean**: Hawaiian Islands at Honolulu; Caroline Islands at Yap and Palau; Mariana Islands at Saipan; Samoa; Caribbean Sea: Costa Rica at Limon; Trinidad at Gaspar Grande Island; Puerto Rico at Paraguera; **Indian Ocean** at Christmas Island.

Genus **Nippochelura**, new genus

**Diagnosis.**—Supra-antennal line apparently absent, dorsal front of head armed with a large process; gnathopods small; uropod 2 lacks rami; uropod 3 lacks an inner ramus.

**Nippochelura brevicauda** (Shiino) new combination

(Figs. 3, 4 A, B)


**Material Examined.**—Misaki, Japan, 3 specimens courtesy of Dr. S. M. Shiino; and 3 specimens from the same locality in the U.S. National Museum.

**Distribution.** Japan at Misaki, Onagaw and Kominato.
Fig. 2. Tropichelura insulæ (Calman). A male specimen 6 mm. long.
Fig. 3. *Nippochelura brevicauda* (Shiino). A male specimen 3 mm. long.
Fig. 4. Head structures of chelurids. A-B. *Nippochelura brevisans*, A, lateral; B, anterior, showing bases of antennae as cross-hatched areas. C-E *Tropichelura insulae*, C, lateral; D, oblique dorsal anterior to show supra-antennal line; E, anterior. F-G. *Chelura terebrans*, F, anterior; G, lateral.
ZOOGEOGRAPHY OF THE CHELURIDAE

The distribution of the three species of chelurids has been plotted on fig. 5. Marine isotherms were examined from Sverdrup, Johnson and Fleming (1942) in relation to the known distribution of the species. It was determined that the winter isotherm of 22° C in both hemispheres (February in the northern and August in the southern) provided an effective isolation between C. terebrans and T. insulae. Thus, C. terebrans is restricted to waters colder than 22° and T. insulae to waters warmer than 22°. These isotherms touch coastlines and islands of large geographic extent where chelurids have not been reported and where field collections should be made to determine the validity of this thermal barrier. For instance, the west coast of Africa lies within the temperature range of C. insulae. However, there is a probability that C. insulae does not live in this region because of the great discontinuity in distribution which would have to prevail. On the other hand, chelurids are easily transported by wooden ships, rafts, floats and other objects. This probably accounts for the wide geographic distribution of C. terebrans in the Atlantic and Pacific Oceans.

The eastern coast of the United States is of interest, between South Carolina and the southern tip of Florida, where the distributions of T. insulae and C. terebrans should either overlap or be discontinuous. Repeated efforts by zoologists to collect chelurids in Florida, at the request of the writer, have resulted only in the collection of corophiid amphipods which bear a distant resemblance to chelurids.

It must be pointed out that oceanic isotherms are less critical limits to the distribution of chelurids than specific shallow water thermal variables in the harbors and estuaries where the animals actually live.

LITERATURE CITED

Allman, G. J.

Barnard, J. L.

Calman, W. T.

Mawatari, S.
Fig. 5. World distribution of chelurids in relation to winter isotherms of 22° C.

Dots = *Chelura terebrans*; asterisks = *Tropichelura insulæ*; arrow = *Nippochelura brevitanda*. 
By J. Laurens Barnard

The benthic invertebrates of the coastal shelves of southern California have been sampled quantitatively by a continuing program at the Allan Hancock Foundation, since 1952 (Hartman 1955, 1956 and Hartman and Barnard 1957).

Much of the difficulty hampering the ecological analyses of these vast materials (amounting to more than 2,000 samples) has been the large number of undescribed species of polychaetes and crustaceans which comprise the largest share of the fauna. More than 75% of the species of the bottom belonging to these two large groups. Prior to 1952 less than 5% of the crustacean species were known. In order of numerical importance
the benthic crustaceans are amphipods, cumaceans, tanaids, isopods, ostracods, pinnixid crabs, followed by other groups of minor importance.

The cumaceans, tanaids and ostracods are virtually unknown. The pinnixid crabs probably have been largely described but need considerable revision. The isopods have been studied by Menzies and Barnard (in press, Hancock Foundation). Barnard has written a series of papers on the amphipods (Barnard 1954, 1955, 1955a, 1957, 1957a, 1958, 1958a) and has prepared a paper on the phoxocephalids (in press, Hancock Foundation). Dr. D. E. Hurley is preparing a paper on the Lysianassidae.

In order of specimen abundance amphipod families are ranked as follows: Phoxocephalidae, Ampeliscidae, Lysianassidae, Oedicerotidae, Liljeborgiidae, Pardaliscidae and Haustoriidae, followed by scattered specimens in 35 other families; systematics of the first three families and the eighth is either published or in press. The fifth family, the Liljeborgiidae, is the subject of the present paper.

The writer wishes to acknowledge Dr. Olga Hartman for her untiring concern to taxonomic problems of benthic invertebrates, and Dr. E. Yale Dawson and the Beaudette Foundation for providing support and publication of this paper.

Family LILJEBORGIIIDAE Stebbing

Diagnosis.—Rostrum of head small; antenna 1 shorter than second; accessory flagellum present; mandible with poorly developed molar; first article of palp elongated; palp geniculate between articles 1 and 2; fourth coxa with upper posterior margin excavated; lower lip lacks inner lobes; gnathopods well developed; telson split to its base.

Notes.—This diagnosis is considerably revised from Stebbing, 1906: 229. Several former diagnostic characters are no longer valid and have been omitted. The italicized portion provides the critical points for final determination.

Liljeborgiid amphipods are quite plain and "normal" in the sense that they represent the typical textbook definition and figures of generalized amphipods. In this respect they resemble the family Gammaridae, but differ from that family principally by the mandibular structure.

Remarks.—Nearly every modern amphipod systematist has commented on the identification difficulty in the Liljeborgiidae, and the writer has been no exception in the present researches. The difficulties in the five species described herein have centered on the close similarity of all the species, especially the difficulty of separating the juveniles and females of the species. At first, it was believed that only two species were represented. However, one of the "species" exhibited three contrasting color "phases." These were studied in considerable detail and qualitative (though subtle) morphological features were found to distinguish the species, especially in the males. The minute albino species was at first thought to be a recessive mutation correlated with early death, but after conducting a
sampling program in the middle of a bed of echiuroid worms a large number of minute sexually mature adults of this species were discovered in six of the twenty-two samples. Of particular confusion was the apparent hybridization or retardation of adults of one species which provided for a time a neat series of intergradations between two others. However, the large collections accumulated during the last 3 years have demonstrated the relatively low rate of hybridization or retardation. Because of the close relationship of the several species it is difficult to decide whether some species are hybridizing or whether these aberrant intergrades are simply mutations. In all of these "hybridization cases" sexually mature animals have been found. However, females with eggs have been found only in a few specimens. The lack of eggs in the other hybrids may be due to the washing processes of the sampling methods causing their loss. The presence of eggs, of course, does not mean that they are fertile.

In allocating the five southern California species to genera it became necessary to revise the family Liljeborgiidae as follows (see the original composition of the family in my Index to the Gammaridea, Barnard 1958):

**LILJEBORGIA** Bate (as in Barnard 1958)

**IDUNELLA** Sars (revised to include)
- *Idunella aequicorns* (Sars) (type species)
- *Idunella chilensis* (Chilton)
- *Idunella longirostris* (Chevreux) (ex Sextonia)

**LISTRIELLA**, new genus
- *Listriella dahli* (Schellenberg) (ex Idunella)
- *Listriella pieta* (Norman) (ex Idunella)
- *Listriella melanica* n.sp.
- *Listriella goleta* n.sp. (type species)
- *Listriella eriopis* n.sp.
- *Listriella albina* n.sp.
- *Listriella diffusa* n.sp.

**SEXTONIA** Chevreux → *Idunella*

**KEY TO THE GENERA OF LILJEBORGIIDAE**

1. Gnathopod 1 larger than gnathopod 2  → **IDUNELLA** (= Sextonia)
2. Gnathopod 1 smaller or equal to gnathopod 2
2. Article 5 of gnathopods 1-2 strongly produced, slender and elongate; outer ramus of uropod 3 simple  → **LILJEBORGIA**
2. Article 5 of gnathopods 1-2 weakly produced, thick and blunt, outer ramus of uropod 3 composed of 2 articles  → **LISTRIELLA** n.g.
### TABLE 1

Table of systematic criteria in *Listriella* from southern California

<table>
<thead>
<tr>
<th>Species</th>
<th>MALE</th>
<th>FEMALE</th>
<th>JUVENILE</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Listriella melanica</em></td>
<td>K O O X X X X O X X X</td>
<td>K O O X X X X O X X X</td>
<td></td>
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<tr>
<td><em>Listriella diffusa</em></td>
<td>D O O X X X X O X X X</td>
<td>D O O X X X X O X X X</td>
<td></td>
</tr>
<tr>
<td><em>Listriella golica</em></td>
<td>DS H X X X X X O X X X</td>
<td>DS H X O X X X X O X X X</td>
<td></td>
</tr>
<tr>
<td><em>Listriella eriopisa</em></td>
<td>S X O X O O O X O X O X</td>
<td>S X O X O O O X O X O X</td>
<td></td>
</tr>
<tr>
<td><em>Listriella albina</em></td>
<td>O O OX O X X O O X O X O X</td>
<td>O O OX O X X O O X O X</td>
<td></td>
</tr>
</tbody>
</table>

- **K** = dark
- **S** = striped
- **DS** = diffused-striped
- **X** = positive
- **O** = negative
- **OX** and **XO** = intermediate
- **H** = hourglass-shaped mark
Genus *Idunella* Sars

*Idunella* Sars; Stebbing, 1906: 234.

*Sextonia* Chevreux, 1920:76-77

**Remarks.**—Apparently Chevreux (1920) overlooked the fact that *Idunella aequicornis*, the type species of *Idunella*, has the first gnathopod considerably larger than the second gnathopod in both sexes, for in Chevreux and Fage (1925) the two genera are separated with the erroneous statement that the gnathopods of *Idunella* are coequal in size. By restricting liljeborgiids with large first gnathopods to *Idunella* and removing the type species of *Sextonia* to *Idunella* it becomes necessary to create a new genus for the reception of the other two species assigned to *Idunella* (*I. picta* and *I. dahl*) and the five species described herein, all of which have the second gnathopod as large or larger than the first.

Genus *Listriella*, new genus

**Diagnosis.**—Liljeborgiid with gnathopod 2 as large or larger than gnathopod 1; fifth articles of gnathopods 1-2 weakly produced, thick and blunt; uropod 3 with outer ramus composed of two articles, always in juveniles, occasionally fusing to a single article in adults.

**Type Species** — *Listriella goleta* n. sp.

*Listriella melanica*, new species

(Figs. 1, 2)

**Diagnosis.**—Darkly pigmented in a characteristic pattern as shown in figure 1; specimens bleached in alcohol with article 2 of antenna 1 retaining a band of dark pigment which is characteristic and can be used as a critical feature in the southern California area; eyes well developed.

![Image of Listriella melanica](https://example.com/figure1.jpg)

*Fig. 1. Listriella melanica* n. sp. A female specimen 2.75 mm long from sta. 4847.
enclosed in a distinct capsule; gnathopods 1-2 with the palms of article 6 slightly more blunt and more transverse than in other southern California species (except *L. diffusa*); anterior edge of article 6, gnathopod 1, slightly more convex than in other local species; gnathopods darkly pigmented; pereopod 5 with articles 6 and 7 slender, article 6 never tending to a paddle-shape; third pleonal epimera with convex posterior edge, sweeping ventrally to a notch at the lower corner; uropod 3 in both sexes bearing short, equal sized rami.

![Fig. 2. *Lislfiella melanica* n. sp. A-P. Female, 3 mm., sta. 4778. A, B, gnathopods 1, 2; C, upper lip; D, mandible; E, F, lower lip; G, H, maxillae 1, 2; I, J, K, maxilliped; L, part of antenna 1 and accessory flagellum; M, N, O, uropods, 1, 2, 3; P, telson. Q-R. Male, 4 mm., sta. 4853, gnathopods 1, 2.](image-url)
MALE.—The rami of uropod 3 are similar to those of the female, but the second gnathopod is quite enlarged with a very oblique and excavated palm.

Holotype.—AHF No. 573, female, 4 mm.

Type locality.—Station 5501, off Newport, California, 33-36-54 N, 117-56-48 W, December 16, 1957, 34 feet depth, coarse gray-brown sand.

Relationship.—This species is most easily confused with L. diffusa n. sp., but Table 1 and the key to the species may be used for their distinction.

In general, the species is easily recognized by its dark and characteristic pigment. Occasionally, preserved specimens become bleached, but the gnathopods retain a dark color, and the second article of antenna 1 carries a dark band.

Material examined.—Stations 4743 (1), 4758 (3), 4779 (5), 4810 (1), 4822 (1), 4847 (1), 4852 (2), 4853 (3), 4869 (1), 4875 (2), 4938 (1), 4953 (2), 5187 (3), 5270 (1), 5301 (1), 5507 (2), 5533 (5), 5564 (9), 5576 (1), 5606 (5), 5628 (3).

Ratio of males to females, 1:5.

Distribution.—Pt. Conception to the Mexican Border. Stations are scattered. The animal occurs on the Santa Barbara shelf at 3 stations which are marginal to the heavy concentrations of L. goleta and L. eriope. Closely spaced on shallower sandy sediments at the Mexican Border.

**Listriella diffusa**, new species

(Figs. 3-5)

Diagnosis.—Darkly pigmented in a diffused pattern; specimens bleached in alcohol with article 2 of antenna 1 lacking pigment; article 3 of antenna 1 usually retaining a very small amount of pigment; eyes well developed, enclosed in a distinct capsule; gnathopods 1-2 with the palms of article 6 slightly more blunt and transverse than in other southern California species (except L. melanica); anterior edge of article 6, gnathopod 1, slightly more convex than in other local species; gnathopods darkly pigmented; peraeopod 5 with article 6 tending slightly to a paddle shape; article 7 slender; third pleonal epimera with convex posterior edge sweeping ventrally to a notch at the lower corner; uropod 3 in females bearing short, equal sized rami.

Male.—The male bears large second gnathopods with a medial invaginated pocket on article 6; uropod 3 has a characteristically falcate outer ramus and a spiny inner ramus.

Holotype.—AHF No. 564, male, 3.5 mm.

Type locality.—Station 4769, SW of San Mateo Pt., Calif., 33-19-45 N, 117-33-25 W, December 9, 1956, 79 feet depth, green to black sand.

Relationship.—This species is easily confused with L. melanica n. sp. Occasional specimens bear a pigment pattern which resembles L.
melanica, though more diffuse. Most specimens, however, have the totally
diffuse pattern as illustrated. The lack of a pigment band on article 2 of
antenna 1 is the only characteristic by which I have been able to identify
the females and juveniles of this species.

Fig. 3. Listriella diffusa n. sp. The male, holotype specimen, 3.5 mm. long from sta.
4769.

Fig. 4. Listriella diffusa n. sp. A female specimen 3.5 mm. long from sta. 4769.
Material examined.—Stations 4720 (1), 4743 (2), 4759 (1), 4769 (3), 4777 (1), 4841 (6), 4853 (1), 4869 (2), 4870 (2), 4877 (1), 4917 (3), 4927 (2), 5043 (1), 5187 (1), 5500 (1), 5508 (1), 5534 (1), 5539 (1), 5564 (1), 5606 (2).

Ratio of males to females, 1.0:1.3.

Distribution.—Pt. Conception to the Mexican Border. Stations are scattered. The animals have not been found on the Santa Barbara shelf. Closely spaced on shallower sandy sediments at the Mexican border, similar to *L. melanica*.

**Listriella goleta**, new species

(Figs. 5, 6, 7)

Diagnosis.—Diffusely pigmented with characteristic bands; head with small hourglass-shaped pigment mark; eyes well developed, enclosed in a distinct capsule; gnathopods not darkly pigmented, with oblique palms; anterior edge of article 6 of gnathopod 1 nearly straight; pereopod 5 with slender sixth and seventh articles; third pleonal epimera with convex posterior edge and a notch at the lower corner; uropod 3 in both sexes with equal sized rami, the outer ramus tending to be slightly shortened in large adults.

Fig. 5. *Listriella diffusa* n. sp. A-C Male, 3.25 mm., sta. 4841. A, B, gnathopods 1, 2; C, uropod 3. D-G Female, 3.5 mm., sta. 4769. D, E, gnathopods 1, 2; F, uropod 3; G, telson.
Fig. 6. *Listriella goleta* n. sp. A male specimen 6 mm. long from sta. 5581.

Fig. 7. *Listriella goleta* n. sp. A-D. Male. 6 mm., sta. 5581. A, B, gnathopods 1, 2; C, uropod 3; D, telson. E-O. Female. 4.5 mm., sta. 5404. E, head; F, upper lip; G, H, mandible; I, lower lip; J, K, maxillae 1, 2; L, maxilliped; M, pereopod 1; N, O, uropods 1, 2.
MALE.—There are no apparent sexual differences except for the lack of brood plates.

HOLOTYPE.—AHF No. 572, male, 7.5 mm.

TYPE LOCALITY.—Station 5006, off Newport, Calif., 33-36-10 N, 117-56-00 W, April 23, 1957, 120 feet depth, fine black silty sand.

RELATIONSHIP.—The equal sized rami of the third uropods, the elongated second article of antenna 2, the lack of a head cap of pigment (just a small hourglass mark), the encapsulated eyes, and the presence of body pigment distinguish this species from the others. In general it resembles L. albina n. sp., but differs by the presence of pigment and eyes.

MATERIAL EXAMINED.—Stations 4765 (1), 4771 (2), 4774 (1), 4782 (2), 4785 (2), 4817 (2), 4822 (2), 4823 (4), 4824 (1), 4825 (14), 4845 (2), 4850 (1), 4860 (1), 4868 (2), 4869 (2), 4871 (7), 4874 (1), 4875 (1), 4881 (4), 4886 (1), 4922 (4), 4938 (1), 4954 (4), 4955 (1), 4956 (6), 4981 (2), 4982 (4), 4983 (2), 4984 (1), 5006 (2), 5092 (1), 5098 (1), 5105 (2), 5111 (3), 5161 (1), 5163 (1), 5165 (3), 5166 (6), 5176 (1), 5177 (1), 5193 (1), 5202 (2), 5206 (1), 5234 (6), 5259 (3), 5261 (8), 5262 (23), 5269 (1), 5270 (1), 5271 (2), 5330 (13), 5331 (13), 5337 (1), 5367 (10), 5368 (3), 5371 (1), 5400 (2), 5400 (7), 5401 (1), 5402 (7), 5403 (16), 5404 (8), 5405 (4), 5406 (1), 5408 (16), 5409 (5), 5410 (6), 5412 (10), 5414 (8), 5417 (10), 5418 (5), 5419 (16), 5420 (4), 5500 (1), 5509 (2), 5533 (2), 5538 (1), 5560 (8), 5563 (1), 5576 (1), 5579 (5), 5581 (7), 5583 (1), 5586 (1), 5594 (4), 5595 (2), 5616 (1), 5628 (3), 5710 (3), 5729 (12), 5730 (2), 5731 (1), 5732 (2).

Ratio of males to females, 1:1.

DISTRIBUTION.—Pt. Conception to the Mexican Border. Heavy populations of the species occur in the silt beds of the Santa Barbara shelf. Found in Newport Canyon and at Santa Catalina Island.

Listriella eriopisa, new species

(Figs. 8, 9, 10)

DIAGNOSIS.—Body with a series of bold stripes, as illustrated in figure 8; dorsal part of head bearing a cap of pigment; eyes poorly developed, composed of a few ommatidia widely scattered, not in a distinct capsule; gnathopods 1-2 with palms very oblique; gnathopod 2 much larger than 1; gnathopod 1 with anterior edge of article 1 nearly straight; gnathopods not darkly pigmented; peraeopod 5 moderately to strongly paddle-shaped, with article 7 quite short; third pleonal epimera with posterior edges nearly straight, the notch at the lower corner nearly obsolete in adults, better developed in juveniles; uropod 3 in both sexes with inner ramus elongated, outer ramus about one third as long as inner ramus, with second article nearly obsolete.

MALE.—In large males the second gnathopod has article 6 more elongated and the palm more differentiated.

HOLOTYPE.—AHF No. 572, male, 6.2 mm.
Fig. 8. *Listriella criopis* n. sp. A female specimen 5 mm. long from sta. 5579.

Fig. 9. *Listriella criopis* n. sp. A-Q. Female, 5 mm., sta. 5579. A, B, antennae 1, 2; C, upper lip; D, D', mandibles; E, lower lip; F, G, maxillae 1, 2; H, maxilliped; I, gnathopod 2; J, K, L, M, ends of peraeopods 2, 3, 4, 5; N, O, P, uropods 1, 2, 3; Q, telson
Type locality.—Station 5579, off Santa Barbara, California, 34°23'20" N, 119°39'10" W. January 29, 1958, 128 feet depth, olive green silt.

Relationship.—This species is most easily confused with *L. goleta* n. sp. Adults differ by the very distinctive third uropods, and juveniles are recognizable by the head cap of pigment. Juveniles also are easily confused with *L. albina*, but careful examination to demonstrate the presence of eyes is used to distinguish *L. eriopis*.

Material examined.—Stations 4723 (2), 4785 (2), 4822 (1), 4823 (2), 4824 (2), 4840 (1), 4846 (1), 4937 (1), 4954 (2), 4955 (1), 4983 (2), 5165 (6), 5331 (1), 5367 (1), 5374 (2), 5400 (3), 5401 (1), 5402 (21), 5403 (6), 5404 (1), 5408 (2), 5409 (2), 5410 (9), 5413 (1), 5417 (3), 5418 (6), 5506 (1), 5508 (4), 5538 (2), 5565 (1), 5576 (2), 5579 (7), 5581 (7), 5593 (1), 5594 (3), 5595 (1), 5596 (1), 5738 (1).

Aberrants, with equal sized ramus of uropod 3.—Stations 4764 (1), 4823 (1), 4826 (1), 5006 (1), 5168 (1), 5259 (2), 5372 (2), 5568 (2), 5580 (2), 5585 (3), 5590 (2).

Ratio of males to females (normal), 1:1.

Distribution.—Pt. Conception to Oceanside. Widely scattered, but the best developed animals and densest populations are concentrated in the silty beds of the Santa Barbara shelf. The aberrant form is located marginal to the normal form on the Santa Barbara shelf and in Newport Canyon.

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Fig. 10. *Listriella eriopis* n. sp. A-E. Juvenile, 2.5 mm, sta. 5508. A, B. Gnathopods 1, 2; C, pleopod 5; D, pleon segments 1-3; E, uropod 3. F. Juvenile, 4 mm, sta. 5736. Uropod 3. G. Male, 6 mm, sta. 5579, gnathopod 2. H. Female, 3 mm, sta. 5579, gnathopod 1.
Listriella albina, new species

(Figs. 11, 12)

Diagnosis.—Body colorless, without pigment; eyes absent; gnathopods 1-2 with oblique palms; article 6 of gnathopod 1 with strongly diverging margins, the anterior one straight; peraeopod 5 with article 6 slightly paddle-shaped, and article 7 long; third pleonal epimera with convex posterior edge and a notch at lower corner; uropod 3 in both sexes with outer ramus slightly shorter than inner.

Male.—Gnathopod 2 slightly larger than in female and with a slightly differentiated palm.

Holotype.—AHF No. 574, male, 3.5 mm.

Type locality.—Station 5402, off Santa Barbara, Calif., 34-24-15 N, 119-36-45 W, Nov. 21, 1957, 84 feet depth, olive green silt.

Relationship.—Closely related to L. goleta n. sp., but differs by the lack of pigment and eyes, the shape of the first gnathopod and the slightly shortened outer ramus of the third uropod.

Material examined.—Stations 4760 (1), 4763 (1), 4808 (1), 5046 (1), 5262 (2), 5330 (2), 5331 (3), 5402 (14), 5403 (5), 5404 (2), 5409 (1), 5410 (4), 5418 (1), 5505 (1), 5564 (2), 5579 (1), 5594 (2).

Ratio of males to females, 1:1.

Distribution.—Pt. Conception to Oceanside. Widely scattered except for some concentration at the shallow edge of the silt beds on the Santa Barbara shelf, with L. goleta and L. eriopisa.

Fig. 11. Listriella albina n. sp. A female specimen 3 mm. long from sta. 5418.
Fig. 12. *Listriella albius* n. sp. A-C. Male, 4 mm., sta. 5 163. A, B, gnathopods 1, 2; C, uropod 3. D-E. Female, 3 mm., sta. 5 118, gnathopods 1, 2. F-I. Female, 3 mm., sta. 1 703. F, G, H, uropods 1, 2, 3; I, telson. J. Female, 4 mm., sta. 4 760, uropod 3.

CHART 1.
Distribution of *Listriella goleta* n. sp. on Santa Barbara shelf, southern California. Contours in fathoms. Dots are stations.
CHART 2.
Distribution of _Listriella eriopisa_ n. sp. on Santa Barbara shelf, southern California. Contours in fathoms. Dots are stations.

LITERATURE CITED

Barnard, J. L

1955. A list of phoxocephalid Amphipoda identified from samples of the benthos of San Pedro Basin, California, pp. 159-163 in Hartman 1955, below.


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**CHART 3.**

Distribution of *Listriella albina* n. sp. and *L. melanica* n. sp. on Santa Barbara shelf, southern California. Contours in fathoms. Dots are stations.