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## ***DEROCHEILOCARIS HESSLERI***

### **A NEW MYSTACOCARIDA (CRUSTACEA) FROM THE GULF OF MEXICO**

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#### **ABSTRACT**

From the northwestern coast of Florida, the known distribution of *Derocheilocaris hessleri* n. sp. extends to Ship Island, Mississippi (Mississippi Sound) in the northern Gulf of Mexico. Like other species of the genus, *D. hessleri* demonstrates plesiomorphic conservatism in its subtle differentiation. The distinguishing characters of the known species are described in a key. *D. hessleri*, like *D. ingens*, shows a closer relationship to *D. remanei* and the west African complex of species than to *D. typica* with respect to the acute supra-anal spine. Considering the low vagility of the Mystacocarida, along with the fact that all developmental stages are meiobenthic, the probability is suggested that continental drift has played a part in their biogeographical evolution.

#### **INTRODUCTION**

Until the present discovery, the monogeneric subclass Mystacocarida had included the following taxa : *Derocheilocaris typica* Pennak & Zinn, 1943 (just north of Cape Cod, Massachusetts to Miami, Florida, U.S.A.) ; *D. remanei remanei* Delamare Deboutteville & Chappuis, 1951 (middle of Portugal into the Mediterranean and northwest Africa) ; *D. galvarini* Dahl, 1952 (Chile and Peru



and possibly other localities along the Pacific coast of South America) ; *D. remanei biscoyensis* Delamare Deboutteville, 1953 (Bay of Biscay to the mid-part of Portugal) ; *D. remanei katesae* Noodt, 1954 (Durban, South Africa) ; *D. ingens* Hessler, 1969 (Reid State Park, Maine, U.S.A.) ; *D. tehiyae* Masry & Por, 1970 (Nahariyya, Israel) ; *D. remanei akhzivi* Masry & Por, 1970 (Akhziv and Nahariyya, Israel) ; *D. angolensis* Hessler, 1972 (Luanda, Angola, Africa) ; and *D. delamarei* Hessler, 1972 (Swakopmund and Cape Cross, Southwest Africa).

It is very gratifying for us to name this third species from the shorelines of North America in honor of Robert R. Hessler, Scripps Institution of Oceanography, La Jolla, California, U.S.A. who has done so much to further our knowledge of *Derocheilocaris*. In addition to his descriptions of new species, he (1971) and others (HALL & HESSLER, 1971) have reviewed the biology of the Mystacocarida.

#### ACKNOWLEDGMENTS

Although a few specimens of this species previously had been found at scattered localities from Pensacola Beach, Florida to Dauphin Island, Alabama, the large populations on Horn and Ship Islands in the Mississippi Sound were discovered and studied ecologically by the junior author during the summer of 1971. Several collections were made by Thomas Levensailor, a student at Vanderbilt University, from Dauphin Island during November and December, 1972, and we are indebted to him for these specimens. The senior author made additional collections from various locations on Horn and Ship Islands during the summer of 1973 with generous help from Dr. Robin M. Overstreet and Richard Heard of the Gulf Coast Research Laboratory, Ocean Springs, Mississippi. We are particularly indebted to Dr. Robert R. Hessler for many favors, especially the gift of specimens of *D. typica* from Woods, Hole, Massachusetts, and *D. remanei remanei* from Carthage, Tunisia.

#### SYSTEMATIC DESCRIPTION

*Derocheilocaris hessleri* n. sp.

Holotype. — U.S. National Museum no. 150249, adult male.

Allotype. — U.S. National Museum no. 150250, adult female.

Paratypes. — U.S. National Museum nos. 150251-150265, 15 adults, both sexes.



Type locality. — Ship Island (Mississippi Sound), Mississippi, U.S.A. Approximately 30° 12.5' north and 88° 58' west on the Gulf of Mexico side of this island about 1,700 meters east of the west end. From 20-25 cm in depth from the sand surface near the high water line on a moderately steep-sloping beach; sand about .30 mm median grain size.

*Distribution.* Populations of this species have been found at Pensacola Beach, Florida, Dauphin Island, Alabama and in clean sand beaches of the other barrier islands in the Mississippi Sound westward to the type locality. At present, the complete range of the species is not known.

*Diagnosis.* This species differs from *D. typica*, as do all other species thus far described, in having the median supra-anal process of the telson terminating in a stout, acute spine-like projection rather than a short, blunt process (fig. 2). However, both sexes of *D. hessleri* differ from all other species of the genus in having the hair-like seta, which projects mediodorsally from the dorsal process of each furca near the middle major seta, originating subterminally from the process rather than terminally (figs. 1, 2). Usually two strong spines on the anterior border of the basal segment of the antennules. Terminal segment of the maxillipedal endopod with either one or two setae.

*Description of male type.* Length of body from anterior tip of cephalon to base of median supra-anal process of the telson .525 mm. All general characteristics of the genus present, including those of the cephalon, appendages, lateral toothed furrows, ventral telsonic combs, supra-anal process and terminal projection, and furcal claws with their major setae.

Antennular portion of cephalon .047 mm in length and .052 mm in width at the widest point (fig. 3). Anteromedial and lateral lobes broadly rounded; median notch of anteromedial lobes widest posteriorly and evenly ovoid elongate (triangular when seen ventrally) with no medially directed spines; anteromedial and lateral lobes each with two marginal setae. Lateral lobes with four or five spines on their anteromedial margins. No eye lenses or pigment spots visible. Posterolateral corners of antennular portion of cephalon right-angled but narrowly rounded; constriction separating antennular portion from antennary portion of cephalon forming a narrowly rounded, moderately deep notch; sides of cephalon immediately posterior to notch very slightly converging before expanding into the remainder of the cephalon (fig. 3).

Labrum normal, with posterior portion strongly and abruptly expanded into a nearly circular plate (fig. 4).



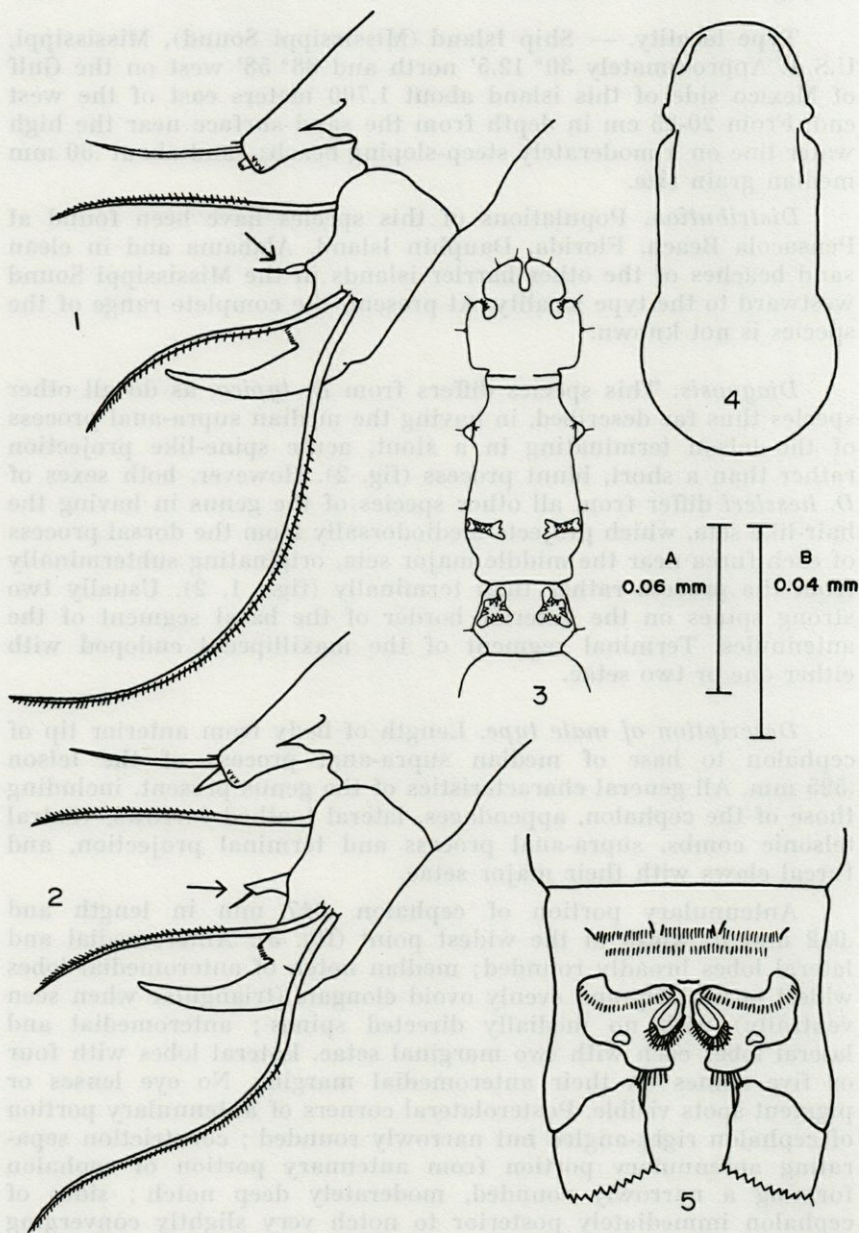


FIG. 1. — *Derocheilocaris typica*, Woods Hole, Massachusetts: furcal claw showing dorsal process and terminal origin of seta (arrow). Scale B.

FIG. 2-5. — *Derocheilocaris hessleri* n.sp.: 2, furcal claw showing dorsal process and subterminal origin of seta (arrow); 3, cephalon, dorsal; 4, labrum, ventral; 5, ventral telsonic combs. Figure 3, scale A; figures 2, 4, 5, scale B.

Lateral toothed furrows well developed and with strong dentations. Both the second maxillary and maxillipedal furrows bifid dorsally, the anterior and posterior extensions about equal; the second maxillary furrow with twelve teeth, the maxillipedal furrow with eleven teeth.

Antennules .192 mm in length, the setal number for segments from the base distally : 1, 4, 10, 6, 8, 5, 6, 5; distribution of five setal types the same as for *D. ingens* (Hessler, 1972); basal segments each with two strong spines on the anterior border, one dorsomedian, the other dorsolateral; second segment from base with large, medial, anteriorly directed, spur-like spine.

Antennae and all other appendages developed normally as in other species. Setal formulae for these appendages from the base distally as follows : antennal protopod one large, two small setae, exopod 1, 1, 0, 1, 1, 1, 1, 3; mandibular protopod with one short, one long seta, exopod 0, 0, 0, 1, 1, 1, 1, 3 and endopod 1, 2, 3; maxillular endites 6, 1, 2, 3, 2, 2, 1, 8; maxillary endites 9, 4, 4, 4, 4, 5, 2, 2, 2, 5; maxilliped with protopodal endites 3, 4, 3, 4, 2, exopod with two setae, endopod 0, 2, 1; first thoracoabdominal appendage with typical single terminal and one subterminal, ventrally directed seta; second and third thoracoabdominal appendages each with two terminal and one, ventrally directed seta; fourth thoracoabdominal appendage typical for the male with two terminal setae and a large, bladeliike, curved seta ventrobasally and two straight, less thickened, ventrally directed setae located midlength of the appendage.

Supra-anal process of telson terminating in an acute projection; major seta from base of projection approximately .030 mm, not extending to tip of furcal claws; base of projection surrounded ventrally and laterally with about five or six small, posteriorly directed spines.

Furcal claws each with a dorsal process at about the basal level of the middle and ventral major setae; from each process there originates subterminally (unlike the terminal origin in all other species) a hair-like seta; dorsal furcal seta .044 mm, middle furcal seta .054 mm, and ventral furcal seta .070 mm in length (fig. 2).

Posterior pair of telsonic combs (HESSLER, 1972) slightly coarser than anterior pair and with about six teeth; anterior pair of combs more convex posteriorly with about 15-18 teeth (fig. 5).

*Description of allotypic female.* Agrees with holotypic male except as follows : body length .562 mm; two eye lenses and pigment spots on posterolateral area of right anteromedial lobe of



cephalon ; antennular length .212 mm, the setal number and spines on segments the same as in the male ; fourth thoracoabdominal appendage with two terminal and one subterminal, ventrally directed seta typical of females of other species.

*Variation.* Variations in the morphological characters measured are shown in Figures 6 and 7. Considerable variation is evident in living and formalin preserved specimens with regard to eye lenses and pigmented eye spots. Located lateral to the median notch of the antennular portion of the cephalon, there may be one or two pairs ; bilateral differences also were noted in which two or three could be seen on one side, while none, one or two could be seen on the other side. Although very difficult to determine for every specimen, because of small size, orientation, breakage or poor staining, it appears that in some specimens, segment three from the base of the antennule has 9 setae instead of 10 as in the type (4 out of 30 specimens examined critically). There is a definite variation in the number of spines on the anterior border of the basal antennular segment ; of 21 specimens, 14 (including the type and allotype) had two spines, while seven, without regard to sexual differentiation, had one spine. Of particular interest is the variation in the presence of either one or two setae on the distal segment of the maxillipedal endopod. Although both the holotype and allotype have only one such seta, approximately one-half of all specimens examined, both male and female, had two setae.

#### KEY TO THE KNOWN SPECIES OF THE GENUS *DEROCHEILOCARIS*

- |                                                                                                                                                                                                                                                                            |                     |   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|---|
| 1 - Median supra-anal process of telson terminating in a short, blunt process .....                                                                                                                                                                                        | <i>D. typica</i>    | 7 |
| 1' - Median supra-anal process of telson terminating in a well developed, stout, acute spine-like projection ..                                                                                                                                                            | 2                   |   |
| 2 - Short, dorsal process of furca, near the middle major furcal seta, with a fine, hair-like seta projecting medioposteriorly and originating subterminally from the process; usually with two dorsal spines on anterior border of the basal segment of the antennules .. | <i>D. hessleri</i>  |   |
| 2' - This process of the furca with a terminally originating seta from the process; only one dorsal spine on anterior border of basal segment of antennules ....                                                                                                           | 3                   |   |
| 3 - No exopod on the maxilliped; only two segments to endopod .....                                                                                                                                                                                                        | <i>D. galvarini</i> |   |



- 3' - Exopod of maxilliped consisting of one segment; endopod with three segments ..... 4
- 4 - Very large, 0.76-1.01 mm in length; with spinous tubercles on lateral lobes of antennular portion of cephalon ..... *D. ingens*
- 4' - Smaller, never reaching 0.76 mm in length; cephalon not as above ..... 5
- 5 - Two dorsal major setae, one  $1/5$ , the other  $2/5$  from the base, on each furca; only one major seta originating laterally on the furca ..... *D. tehiyae*
- 5' - One dorsal major seta, about  $1/5$  from base, on furca; two more distal major setae originate laterally (so-called middle and ventral setae) ..... 6
- 6 - Only seven setae on distal segment of maxillule; only four setae on distal endite of the protopod of maxilla. *D. angolensis*
- 6' - Eight setae on distal segment of maxillule; five setae on distal endite of the protopod of maxilla ..... 7
- 7 - Extremely long ventral furcal setae (2.9-5.4 times furcal length), with the setules on this seta unusually long and sparsely distributed; very large and usually stalked posterior combs on the ventral surface of the telson ..... *D. delamarei*
- 7' - Ventral furcal setae only slightly longer than furcal length, with setules on this seta short and coming off from only one side; posterior combs on ventral surface of telson fine, short, and never stalked ..... *D. remanei*

## DISCUSSION

While closest to *D. remanei* with regard to the median, acute, posterior projection from the supra-anal process of the telson, *D. hessleri* approaches many of the morphometric parameters indicated in *D. typica* (Figures 6 et 7). *D. hessleri* is larger than all of the subspecies of *D. remanei* in total length, length of cephalon, length of antennules and length of labrum with the exception of *D. remanei akhziyi*, but the latter is distinguished in part (as pointed out in drawings by Masry & Por, 1970) by irregular median margins of the median notch in the anteromedial lobes of the cephalon. In addition to its known distribution, *D. hessleri* is most easily distinguished from all other species of the genus by a combination of the characters given in the diagnosis: the subterminal origin of the seta from the dorsal process on the furcal claws, usually two spines on the basal segment of the antennules, and either one or



	<i>D. hessleri</i> Ship Is., Miss.			<i>D. r. remanei</i> Carthage, Tunisia			<i>D. typica</i> Woods Hole, Mass.		
	N	R	X $\pm$ s	N	R	X $\pm$ s	N	R	X $\pm$ s
Total length	36	.444-.608	.518 $\pm$ .038	16	.380-.450	.419 $\pm$ .022	12	.470-.560	.506 $\pm$ .029
Length cephalon	36	.112-.132	.122 $\pm$ .005	17	.098-.108	.102 $\pm$ .003	11	.114-.126	.122 $\pm$ .011
Length antennule	34	.152-.218	.191 $\pm$ .016	18	.140-.161	.152 $\pm$ .006	11	.166-.200	.182 $\pm$ .010
Length furca	31	.048-.068	.057 $\pm$ .004	17	.043-.052	.049 $\pm$ .003	11	.042-.052	.046 $\pm$ .004
Dorsal furcal seta	16	.040-.058	.047 $\pm$ .006	10	.034-.042	.039 $\pm$ .003	6	.036-.056	.047 $\pm$ .007
Middle furcal seta	30	.038-.056	.048 $\pm$ .005	18	.038-.044	.041 $\pm$ .002	11	.040-.050	.048 $\pm$ .005
Ventral furcal seta	29	.062-.080	.072 $\pm$ .007	18	.054-.067	.060 $\pm$ .003	13	.066-.084	.076 $\pm$ .005
Labrum length	35	.072-.084	.083 $\pm$ .002	14	.070-.076	.073 $\pm$ .002	11	.078-.088	.081 $\pm$ .003
Supra-anal seta	15	.023-.030	.026 $\pm$ .002	11	.030-.036	.033 $\pm$ .002	9	.020-.028	.024 $\pm$ .004

FIG. 6. — Measurements in mm for *Derocheilocaris hessleri*, n. sp. from the type locality, with comparable measurements for *D. remanei remanei* (Carthage, Tunisia) and *D. typica* (Woods Hole, Massachusetts, U.S.A.). N = number of specimens measured; R = range of measurements; X  $\pm$  s = mean and standard deviation.

		SSe/F	D/F	M/F	V/F	SSp/F
<i>D. hessleri</i> Ship Is., Miss.	N	17	21	36	32	35
	R	.33-.56	.68-1.08	.80-1.00	1.07-1.58	.08-.15
	X $\pm$ s	.43 $\pm$ .05	.81 $\pm$ .11	.84 $\pm$ .10	1.27 $\pm$ .12	.11 $\pm$ .02
<i>D. r. remanei</i> Carthage, Tunisia	N	9	11	14	14	11
	R	.62-.71	.71-.87	.79-1.00	1.13-1.42	.10-.14
	X $\pm$ s	.65 $\pm$ .03	.79 $\pm$ .05	.85 $\pm$ .05	1.24 $\pm$ .05	.12 $\pm$ .02
<i>D. typica</i> Woods Hole, Mass.	N	7	4	10	11	— — —
	R	.42-.57	.75-1.33	.83-1.09	1.26-1.86	— — —
	X $\pm$ s	.49 $\pm$ .06	.98 $\pm$ .25	.97 $\pm$ .08	1.66 $\pm$ .15	— — —

FIG. 7. — Ratio of the length of the supra-anal seta, major furcal setae, and supra-anal spine to the length of the furcal claws (proportional relationships developed by Hessler, 1972). N = number of specimens measured; R = range of ratios; X  $\pm$  s = mean ratio and standard deviation; SSe = supra-anal seta; D = dorsal furcal seta; M = middle furcal seta; V = ventral furcal seta; SSp = supra-anal spine; F = furcal claw.

two setae on the terminal segment of the maxillipedal endopod. A summary of distinguishing features of the known species of *Derocheilocaris* are pointed out in the key to species.

*D. hessleri* is clearly another example of the plesiomorphic conservatism shown by species of this genus and discussed most

recently by HESSLER, 1972. The closer affinity of *D. hessleri* to *D. ingens* from the northeastern coast of the U.S.A. and to the Mediterranean-African complex of taxa with respect to the configurations of the supra-anal process rather than to *D. typica*, which is in closer distributional proximity, further complicates a true understanding of mystacocarid biogeographical evolution. It seems probable, considering especially the low vagility of these animals and the fact that all developmental stages are meiobenthic, that continental drift, in some measure, can be invoked in any ultimate solution to this problem.

### RÉSUMÉ

De la côte nord-ouest de la Floride, la distribution connue de *Derocheilocaris hessleri* n.sp. s'étend à Ship Island, Mississippi (détroit du Mississippi) dans le nord du Golfe du Mexique. Comme d'autres espèces du genre, *D. hessleri* manifeste un conservatisme plésiomorphe dans sa différenciation. Les caractères distinctifs des espèces connues sont données dans une clef. *D. hessleri*, comme *D. ingens*, montre une affinité plus proche pour *D. remanei* et pour le complexe des espèces de l'Afrique Occidentale que pour *D. typica* en ce qui concerne l'épine dorsale suranale aiguë.

Etant donné la faible aptitude des Mystacocarides au déplacement et le fait que toutes les étapes de leur développement sont méiobenthiques, on peut estimer que la dérive des continents a joué un rôle dans leur évolution biogéographique.

### ZUSAMMENFASSUNG

Der Raum, in welchem *Derocheilocaris hessleri* n.sp. nachgewiesen ist, erstreckt sich von der Nord-West-Küste Floridas bis nach Ship Island, Mississippi (Mississippi Sound) im Norden des Golfes von Mexico. Wie andere Vertreter dieser Gattung weist *D. hessleri* einen plesiomorphen Konservatismus in seiner allmählichen Differenzierung auf. Die Unterscheidungsmerkmale der bekannten Arten sind in einem Schlüssel beschrieben. *D. hessleri* wie auch *D. ingens* zeigt in bezug auf den spitzen dorsalen, supraanal gelegenen Stachel eine grössere Ähnlichkeit mit *D. remanei* und der Gruppe der Arten Westafrikas als mit *D. typica*.



Im Hinblick auf die geringe Beweglichkeit der Mystacocarida wie auch die Tatsache, dass alle Entwicklungsstadien meiobenthisch verlaufen, wird die Vermutung aufgestellt, dass die Kontinentalverschiebung in ihrer geographischen Verbreitung eine Rolle gespielt hat.

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