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LABIDOCERA PSEUDACUTA, A NEW PONTELLID COPEPOD FROM THE INDIAN OCEAN, WITH REMARKS ON THE RELATED SPECIES *LABIDOCERA ACUTA* (DANA)*

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INTRODUCTION

IN recent years, attention has been drawn to the importance of species of Pontellidae as possible biological indicators of water masses (Fleminger, 1957; Heinrich, 1960; Voronina, 1962; and Sherman, 1963). The Senior author while participating in the Vth cruise of the U.S. Research Vessel *ANTON BRUUN* in the Indian Ocean from January to May, 1964, made a series of surface plankton collections using a rectangular frame net of mouth dimension 76 cm.×45 cm. The conical bag attached to the frame was of perlon monodur No. 0.333 μ mesh size (3 meshes to the mm.). The net was kept buoyant with floats attached to the outer sides of the frame, allowing only part of the aperture (25 cm.) to remain below water at any time. Two bridle ropes attached to the sides of the frame and an additional guide rope tied to the lower beam of the frame helped to keep the net opening in the desired position while it was allowed to drift at each station for about thirty minutes. In the samples collected thus, pelagic copepods, especially Pontellidae is well represented. The following 13 species of Pontellidae, namely *Calanopia minor* A. Scott, *Pontella atlantica* Milne-Edwards, *P. diagonalis* Wilson (=*P. andersoni* Sewell?), *P. fera* Dana, *P. spinipes* Giesbrecht, *P. princeps* Dana, *Pontellopsis armata* (Giesbr.), *P. regalis* (Dana), *P. villosa* Brady, *Pontellina plumata* (Dana), *Labidocera acutifrons* (Dana), *L. detruncata* (Dana), *L. minuta* Giesbrecht, and an undescribed species of *Labidocera* were obtained from 18 stations on two transects on 55°E, and 75°E longitudes, and between latitudes 15°42'N and 35°42'S. The undescribed species of *Labidocera* which appears to be a cognate of the neritic species *Labidocera acuta* (Dana) is described here as *Labidocera pseudacuta* sp. nov. The differential characters of *L. acuta* from the new species are also included in this account and the two species illustrated. Details of the temperature-salinity-pontellid relation of the new species is also dealt with here. The material of *L. acuta* was obtained from off the south-west coast of India during the cruises of R.V. *VARUNA*.

From these collections, we are able to confirm the occurrence of *Pontella atlantica* from the south-western part of the Indian Ocean. This species was given as a doubtful record by Voronina (1962). The descriptions of the species of Pontellidae from the different oceans clearly indicate that many of the widely distributed species show geographical variations in size and morphological characters. Even conventional characters used in taxonomy to separate species of Pontellidae are

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found to evince variations when good series of material are examined, the significance and status of which need evaluation. Thus, there is an urgent need for proper redescriptions of species of Pontellidae taking into consideration variability in characters such as nature of fifth legs, last metasomal segment, genital segment, and geniculate antenna hitherto considered dependable in species diagnosis. The desirability of examining additional characters, such as nature of mandibles, maxilla, caudal furca, spermatophore and coupler sheath has been stressed in recent works (Fleminger, 1957, 1964). These aspects have been given due consideration in the present study.

Labidocera pseudacuta sp. nov.

(Text-figs. 1-8)

Material : R. V. *ANTON BRUUN* Stn. 283 : 15°42′ N, 60°52′ E from 08.00 to 08.30 hrs. on 30-1-'64, depth 3859 m. (2-F) ; Stn. 284 : 15°22′ N, 58°12′ E from 08.15 to 08.30 hrs. on 31-1-'64, depth 3722 m. (1-M, 1-F) ; Stn. 285 : 14°22′ N, 54°18′ E from 09.15 to 09.45 hrs. on 1-2' 64, depth 1994 m. (1-F) ; Stn. 287 : 13°11′ N, 50°22′ E from 08.00 to 08.30 hrs. on 3-2-64, depth 3148 m. (2-M, 1-F) ; Stn. 288 : 09°28′ N, 54°52′ E from 06.45 to 07.15 hrs. on 5-2-'64, depth 4648 m. (399-M, 250-F, and several copepodites) ; Stn. 290 : 05°02′ N, 55°01′ E from 09.15 to 09.45 hrs. on 7-2-'64, depth 4956 m. (18-M, 6-F, and few copepodites) ; Stn. 291 : 02°31′ N, 55°04′ E from 10.10 to 10.30 hrs. on 8-2-'64, depth 4861 m. (4-M, 1-F) ; Stn. 294 : 02°51′ S, 54°58′ E from 08.15 to 08.40 hrs. on 11-2-'64, depth 3180 m. (1-M) ; and Stn. 297 : 10°47′ S, 55°15′ E from 08.30 to 09.00 hrs. on 18-2-'64, depth 3935 m. (1-F).

Type Material : *Holotype* Reg. No.-C.M.F.R.I. No. 99, Female 3.35 mm., and *Allotype* Reg. No.-C.M.F.R.I. No. 100, Male 3.24 mm., both from R. V. *ANTON BRUUN* Stn. 288 at 09°28′ N, 54°52′ E. *Paratypes* Reg. No.-C.M.F.R.I. No. 101, include 429 adults (318 males and 111 females) from Stations 283 (2-F) ; 284 (1-M, 1-F) ; 285 (1-F) ; 287 (2-M, 1-F) ; 288 (300-M, 100-F) ; 290 (14-M, 5-F) ; 294 (1-M) ; and 297 (1-F) listed above under ' Material '.

Measurements : The total lengths (less caudal setae) of 30 each of mature males and females taken at random from Stn. 288 and measured under the monocular microscope were as follows : females 3.26 to 3.54 mm., and males 3.22 to 3.37 mm.

This is apparently an oceanic species of fairly widespread distribution in the north-western Indian Ocean and Arabian Sea, having the following generic characters of *Labidocera* : a pair of dorsal subcuticular eye lenses ; deeply bifurcate rostrum with elongate prongs which are stout at base and slightly divergent towards tip ; well developed medio-ventral eye ; first pair of swimming legs with two-segmented endopod ; maxillipeds with six segments ; and male geniculate antenna with four distinct segments distal to hinge.

Diagnosis : *Adult female*—with a well developed rostral hook ; two distinct spine-like processes present dorso-laterally on fourth metasomal segment ; enlarged genital segment more than 50% length of urosome and drawn out into a conspicuous lobe at right posterior corner ; second urosomal segment distinctly longer than third ; caudal rami short, stout ; right ramus less than twice as broad as long ; third and fourth caudal setae from outer margin with enlarged bases ; terminal spine of exopod

of fifth leg (left and right) with two minute subterminal spinules on either side ; *Adult Male*—with spine of distal end of second free segment from hinge of geniculate antenna long, extending to middle of distal segment ; distal segment of left fifth leg with a conspicuous stout outer spine of one-third its length ; and third urosomal segment distinctly longer than second segment.

Description :

Adult Female : (Figures 1 *a-g* ; 2 *a-e, g-h* & *m* & 4 *a* ; and 5). Cephalosome anteriorly broadly rounded with a conspicuous rostral hook ; dorsal cuticular lenses moderately large, separated by about 1.5 times diameter of lens. (In *L. acuta*, lenses are wider apart and separated by about twice lens diameter). Rostrum deeply bifurcate, prongs elongate and slightly divergent distally. Lateral hooks absent ; first four metasomal segments well defined ; segmentation between fourth and fifth metasomal segments indistinct ; posterior corners of fifth metasomal segment triangular in shape, appearing almost symmetrical, and extending backwards to level of proximal margin of second urosomal segment. Fourth metasomal segment with two short dorsolateral spine-like processes symmetrically placed on either half of segment closer to mid-dorsal line.

Urosome three segmented, its length about 4.3 times in total length; genital segment greatly enlarged, its mid-dorsal length distinctly more than half length of urosome ; a well developed right postero-lateral lobe ending in a rudimentary spine-like process present ; width at base of postero-lateral lobe more than one-third width of genital segment. (In *L. acuta*, urosome is four times in total length ; genital segment less than half length of urosome ; a stout postero-lateral conical process present ; width at base of postero-lateral process one-fifth width of genital segment. Fig. 1 *h*). Genital pores ventro-lateral, situated at middle of segment, but more towards left half. (In *L. acuta*, genital pores mid-ventral, situated in anterior half of segment. Fig. 4*f*). A short stout and pointed spine present mid-ventrally at posterior margin of genital segment. Second urosomal segment distinctly broader than long, its length equalling half length of genital segment. (In *L. acuta*, second urosomal segment is about as long as broad, its length equalling three-fourths length of genital segment. Fig. 1 *h*). Anal segment short, hardly one-third length of genital segment ; anal lamina rudimentary. (In *L. acuta*, anal segment is well developed, and more than half length of genital segment. Fig. 1 *h*).

Caudal furca asymmetrical, right ramus being slightly larger ; latter 1.5 to 1.75 times longer than broad and more than one-fourth length of urosome. (In *L. acuta*, right caudal ramus is 1.6 to 1.8 times longer than broad). Asymmetry and size differences in caudal furcae of *L. pseudacuta* and *L. acuta* are shown in Fig. 5.

Variations seen typically in enlarged basal part of third and fourth caudal setae from outer margin are shown in Fig. 2 *a-e*. Setae of right furcal ramus show more pronounced modifications ; enlarged portion from furcal margin to base of seta (fourth from outer margin showing maximum modification) hardly as long as furca and thickened basal half of seta asymmetrically lobate distally, seta appearing to arise from it as a flagellum. (In *L. acuta*, basal halves of third and fourth setae from outer margin only slightly thickened without distal lobes ; enlarged portions of setae distinctly longer than caudal furca. Fig. 2 f). Disposition of caudal setae characteristically latero-posteriorly spread out, unlike in *L. acuta* where they are directed posteriad.

Antenna 23-segmented with the following proportions in the two species :

L. pseudacuta	Seg.		1	2	3	4	5	6	7	8	9	10
	%		6.1	7.2	1.4	0.8	1.1	1.7	1.7	2.2	2.5	2.8
11	12	13	14	15	16	17	18	19	20	21	22	23
3.3	5.0	5.5	6.1	7.2	7.2	8.3	8.3	5.0	5.3	4.4	3.9	3.0 =100

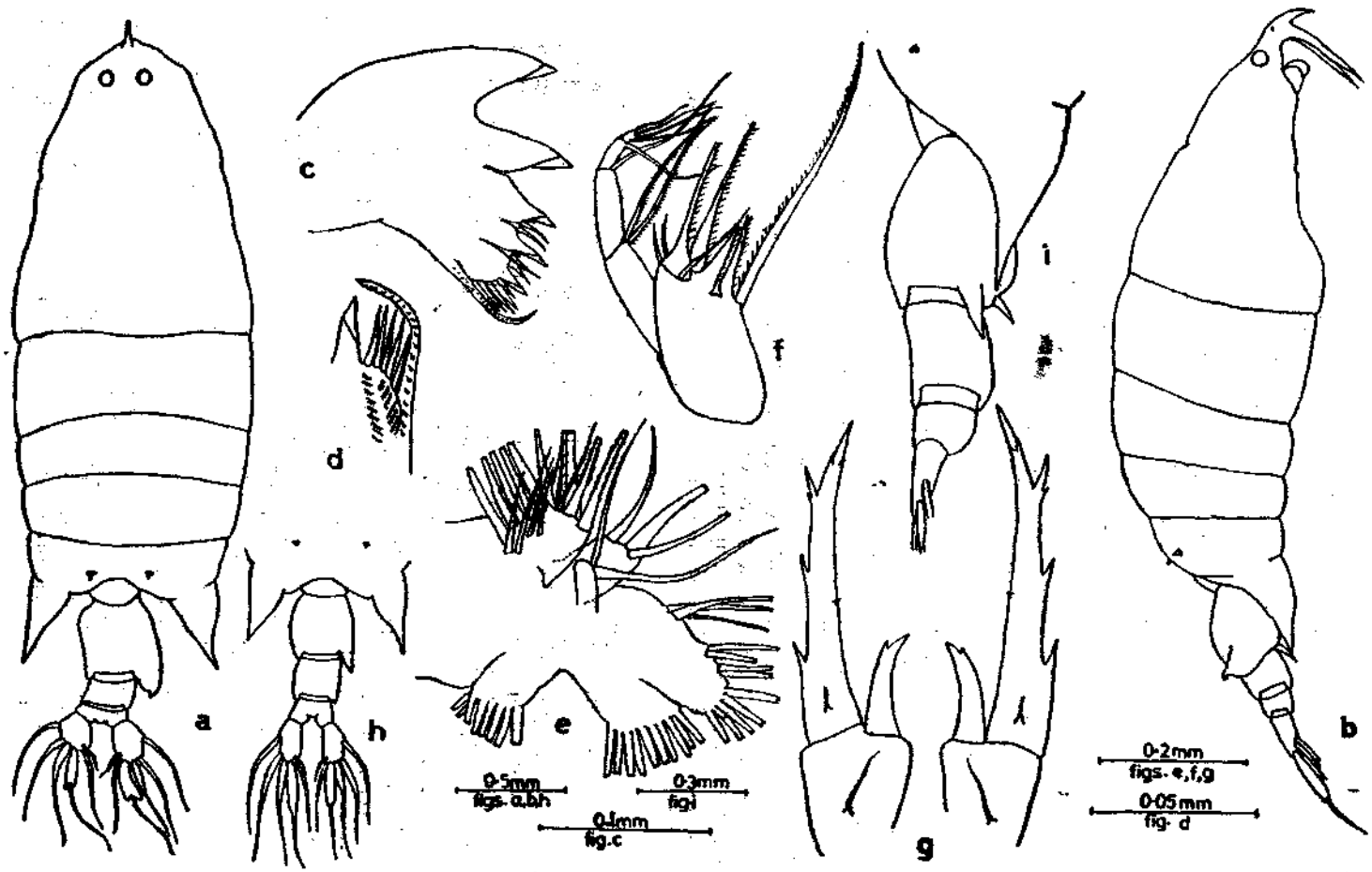
L. acuta	Seg.	1	2	3	4	5	6	7	8	9	10	11	12
		6.1	7.5	1.1	0.8	0.8	1.4	1.4	2.2	2.2	2.5	3.6	5.0
		13	14	15	16	17	18	19	20	21	22	23	
		5.6	5.9	7.2	7.5	8.4	8.4	5.6	5.3	4.5	3.9	3.1	=100

Antennae measured for segmental lengths are 2.88 and 2.87 mm. respectively for *L. pseudacuta* and *L. acuta*. Slight differences in relative lengths of segments 3, 6, 7, and 19 are noticeable.

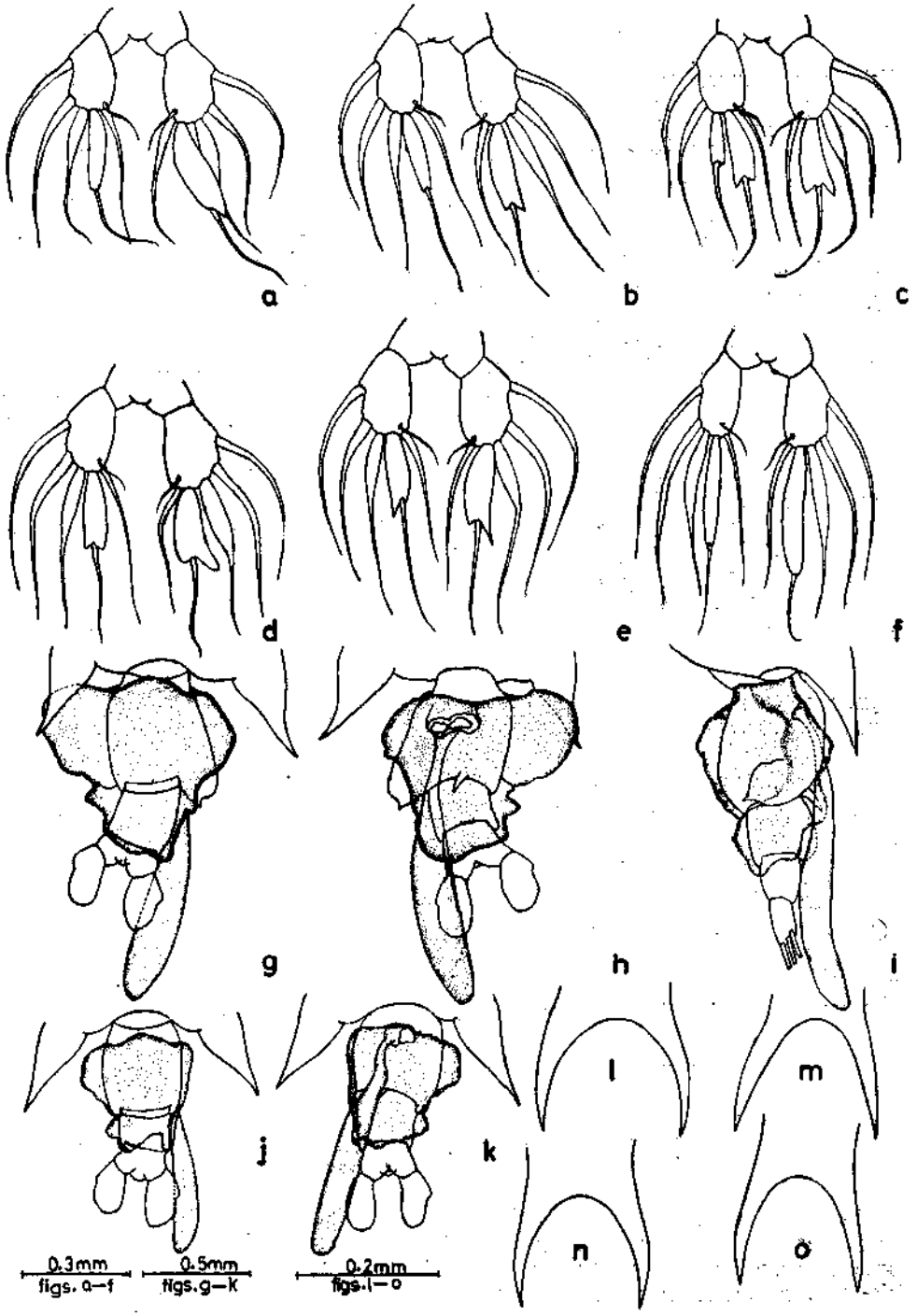
Mandibular gnathal lobe with five teeth, all bicuspidate ; toothed cutting edge with rows of stout spine-like setae in grooves between 3rd, 4th, and 5th teeth in addition to inner side of base of 5th ; flagellum moderately long and bent in its distal half. First maxilla with basipod large, more than twice size of endites. Maxilliped six-segmented.

Fifth legs.—exopods asymmetrical, right being slightly longer ; both basally stout, more or less straight and each terminate in a pointed spine-like prong bearing two minute subequal prongs subterminally, longer of which does not exceed 4.5 per cent length of exopod ; three distinct spines of variable lengths present along outer margin of exopod spaced equidistant ; distal of these, with a rudimentary basal process ; exopod has basally on its dorsal side a rudimentary seta on a small protruberance ; a similar, but smaller seta present at mid-length of exopod on its inner margin. Endopods appear almost symmetrical, each terminating in two subequal prongs ; lengths of endopod 3.5 times in length of right exopod, and about 3.25 times in length of left exopod. (In *L. acuta*, fifth legs markedly asymmetrical, left leg being relatively stouter and longer ; two subterminal prongs on terminal process of exopods conspicuously long, length of longer prong being about 12.5 per cent length of exopod ; asymmetry in endopods more marked, left being slender and longer ; length of latter about 2.4 times in length of left exopod and 2.3 times in length of right exopod ; right endopod 2.7 and 2.5 times in lengths of left and right exopods respectively. Fig. 4 *c-d*).

Spermatophore with coupler ensheathing almost completely genital segment, second urosomal segment and part of anal segment, and expanded as prominent wing-like expansions laterally on both sides of genital segment ; expansion on left side extending to below posterior lobe of last metasomal segment ; sheath above genital segment modified into an irregular elevated ridge. Neck of spermatophore sac short ; sac ventro-lateral to urosome extending to hardly one-third its length beyond tip of caudal furca ; sac broadest at its mid-length, its greatest width being



TEXT-FIG. 1. *Labidocera pseudacuta* sp. nov. *Female*. *a*. dorsal view ; *b*. lateral view ; *c*. right mandibular gnathobase ; *d*. part of mandibular gnathobase enlarged to show nature of flagellum ; *e*. first maxilla ; *f*. maxilliped ; *g*. fifth legs. *Labidocera acuta* (Dana). *Female*. *h*. last metasloma segment and abdomen ; *i*. same, lateral view.



TEXT-FIG. 2. *Labidocera pseudacuta* sp. nov. *Female*. *a-e*. variability in caudal setae and furca in five adults; *g-i*. urosome (dorsal, ventral and lateral views respectively) with spermatophore; *m*. rostrum. *Male*. *l*. rostrum. *Labidocera acuta* (Dana). *Female*. *f*. nature of caudal furca and caudal setae; *j-k*. dorsal and ventral views of urosome with spermatophore; *O*. rostrum. *Male*. *n*. rostrum.

about one-sixth its length including neck portion. (In *L. acuta*, coupler sheath less extensive, covering only part of genital segment and second urosomal segment ; slight lateral expansions do not reach to beneath posterior lobes of last metasomal segment ; dorsal surface of coupler sheath smooth. Spermatophore sac cylindrical, its width about one-eighth of its length including neck portion ; sac extends to about one-sixth its length beyond tip of caudal furca. Figs. (2 *j-k*, 4 *e*).

Adult Male : (Figures 2 *l* ; 3 *a-f* ; 4 *b* ; and 5). Cephalosome as in female, except that dorsal cuticular lenses are conspicuously large and placed close together. First four metasomal segments well defined, but segmentation between 4th and 5th indistinct. Posterior corners of 5th metasomal segment modified into an acutely pointed lobe on left side and a lobe with a postero-laterally curved elongate process on right side ; tip of latter extending to opposite middle of third urosomal segment and outer and inner margins of process provided with few rudimentary hairs. (In *L. acuta*, curved process of right side of last metasomal segment short, not extending beyond second urosomal segment. Fig. 3 *g*).

Urosome five-segmented, stout, and genital segment distinctly broader than long, asymmetrical, right postero-lateral margin bearing a conspicuous stout conical process (more than half length of genital segment) which bears on its outer margin a short spine. (In *L. acuta* right posterior corner of genital segment bears a short spine inner to which is present a conical process which is less than half length of genital segment. Fig. 4 *g*). Second urosomal segment two-thirds as long as wide ; third segment longest, as long as wide and about one-fourth longer than second segment ; fourth urosomal segment short, hardly 40% length of third segment; anal segment short, bifurcate posteriorly. (In *L. acuta*, second and third urosomal segments of more or less same size and each about three-fourths as long as wide ; fourth segment more than 50% length of third segment. Fig. 4 *g*).

Caudal furca asymmetrical, right ramus being larger ; each ramus about twice as long as wide. (In *L. acuta*, caudal furca asymmetrical, right ramus much longer, being distinctly more than twice as long as wide ; left ramus about two times as long as wide. Fig. 4 *g*). Asymmetry and size differences in the caudal furca of males of *L. pseudacuta* and *L. acuta* are shown in Fig. 5.

Caudal setae well developed and spread out ; thickening of basal part of setae as in female is not present. (In *L. acuta*, caudal setae relatively slender, elongate and directed posterad. Fig. 3 *g*).

Geniculate antenna with 23 segments ; segmentation indistinct between segments 7-9, 17-18, and 19-20. Nature and disposition of denticulations of two plates on segments 17-20 are shown in fig. 3 *c*. Number of teeth on plates vary as shown in Table I. The condition in *L. acuta* is shown in Fig. 3 *h*.

One characteristic feature is the presence of an enlarged spine-like process at the distal anterior margin of segment 21 of the geniculate antenna. This process extends to two-thirds the length of the distal segment (23), and has along its outer margin fine backwardly directed serrations (Fig. 3*c*). (In *L. acuta*, this spine-like process is shorter and hardly reaches base of segment 23. Fig. 3 *h*).

TABLE I

Frequency of occurrence of teeth on plates of geniculate antenna

Labidocera pseudacuta sp. nov.			*Labidocera acuta* (Dana)		
Length of metasome (mm.)	No. of teeth on proximal plate	No. of teeth on distal plate	Length of metasome (mm.)	No. of teeth on proximal plate	No. of teeth on distal plate
2.54	46	37	2.46	50	42
2.51	47	37	2.29	50	—
2.53	51	—	2.41	49	40
2.57	44	37	2.28	50	39
2.53	—	38	2.35	51	45
2.55	46	34	2.25	49	44
2.52	46	38	—	—	—
2.47	47	37	—	—	—
2.50	44	27	—	—	—
Mean	46.37	36.87	Mean	51.5	42.0

L. pseudacuta shows fewer teeth on plates than *L. acuta*

The proportions of the segments of the geniculate antenna in the two species are as follows :

L.pseudacuta			Seg.	1	2	3	4	5	6	(7, 8, 9)		10	11
			%	5.61	6.38	0.77	0.77	0.77	1.79	4.85		2.03	2.55
12	13	14	15	16	(17, 18)			(19, 20)		21	22	23	
2.03	6.38	7.14	6.89	6.37	17.09			17.86		4.59	3.32	2.81	=100
			Seg.	1	2	3	4	5	6	(7, 8, 9)		10	11
L. acuta			%	5.93	6.74	1.08	0.81	0.81	1.62	4.58		2.43	2.43
12	13	14	15	16	(17, 18)			(19, 20)		21	22	23	=100
2.43	5.66	6.74	7.28	6.46	16.17			17.52		4.85	3.50	2.96	=100

The length of the antenna in relation to total length is greater in *L. acuta* than

in *L. pseudacuta* as can be seen from the measurements of mature specimens of both sexes given below :

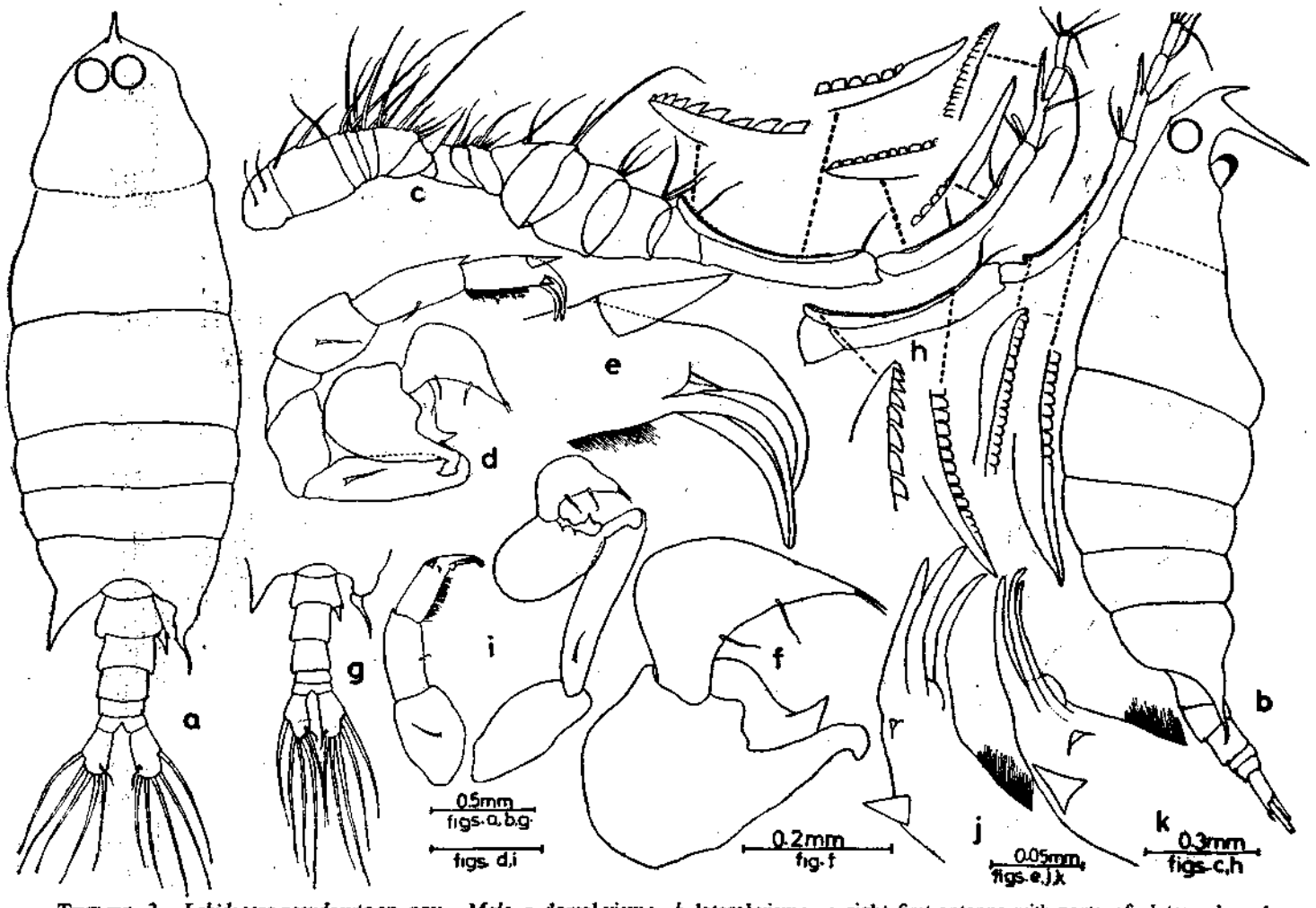
Species	*Sex*	*Total length* (mm.)	*L. of antenna* (mm.)	*% of L. of antenna in total length*
1. *L. pseudacuta :*				
	F	3.61	2.74 (right)	76.05
	M	3.49	2.69 (right)	77.06
			2.73 (left)	78.21
2. *L. acuta :*				
	F	3.42	2.72 (right)	79.53
	M	3.22	2.66 (right)	82.36

Fifth legs.—highly modified ; second basipodal segment of right leg distinctly shorter than combined length of first and second basipodal segments of left leg ; hand of right leg large and orbicular ; finger short, broadest at middle, with two widely spaced setae along its inner margin and two distally. Second basipodal segment of left leg distinctly longer than first, with a stout spine-like process at distal outer margin ; distal segment of left leg terminating in three finger-like inwardly bent processes, outermost of which is stouter basally and bears a short conical spine-like process ; a conspicuous prong, about one-third length of second basipodal segment of left leg present distally on outer margin of terminal segment ; inner margin of terminal segment with a fringe of marginal hairs. (In *L. acuta*, length of second basipodal segment of right leg is distinctly greater than combined length of first two basipodal segments of left leg ; latter two segments of more or less equal length ; outer marginal spine of second basipodal segment of left leg short ; finger-like processes at distal end of terminal segment relatively slender ; short spine-like process at base of finger very rudimentary ; similarly, outer marginal prong of terminal segment minute, being hardly one-eighth length of second basipodal segment of left leg ; a bluntly elevated process present basally between fingers of terminal segment of left leg ; latter not discernible in *L. pseudacuta*. Fig. 3 *i*, *j* & *k*).

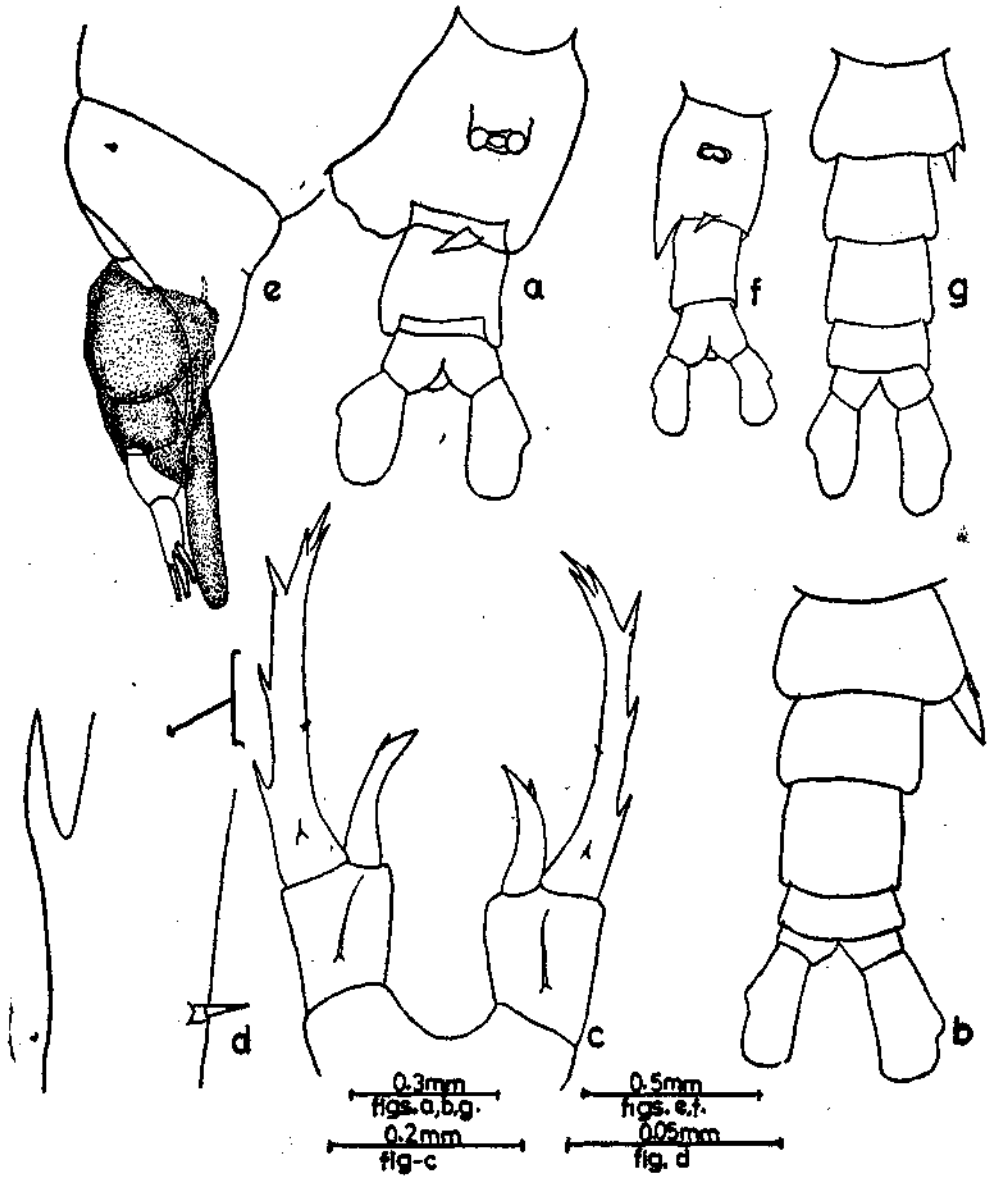
The specific name *L. pseudacuta* would draw attention to the close similarity of the new species to *L. acuta*.

The temperature-salinity relation of *L. pseudacuta* is shown in Fig. 6. It may be seen that the species was obtained over a wide temperature range, from 23.89°C. to 28.87°C. However, the salinity range is 34.53 to 36.11 $^{0}/_{00}$, indicating that *L. pseudacuta* shows preference to high-salinity waters (>34.5 $^{0}/_{00}$). The largest number of specimens were taken at station 288, with surface temperature 26.01°C., and salinity 35.63 $^{0}/_{00}$. As compared to this, the number of specimens of this species shows abrupt reduction in areas of lower as well as higher salinity. As the collections were made during daylight hours, the number of specimens obtained at the different stations could be closer to the minimal estimates of occurrence.

Species of Pontellidae closely associated with *L. pseudacuta* are *Labidocera detruncata, L. minuta, Pontellopsis regalis,* and *Pontellina plumata.* Of these, *L. detruncata* and *P. plumata* were collected from 7 out of 9 stations from which the new species was obtained.

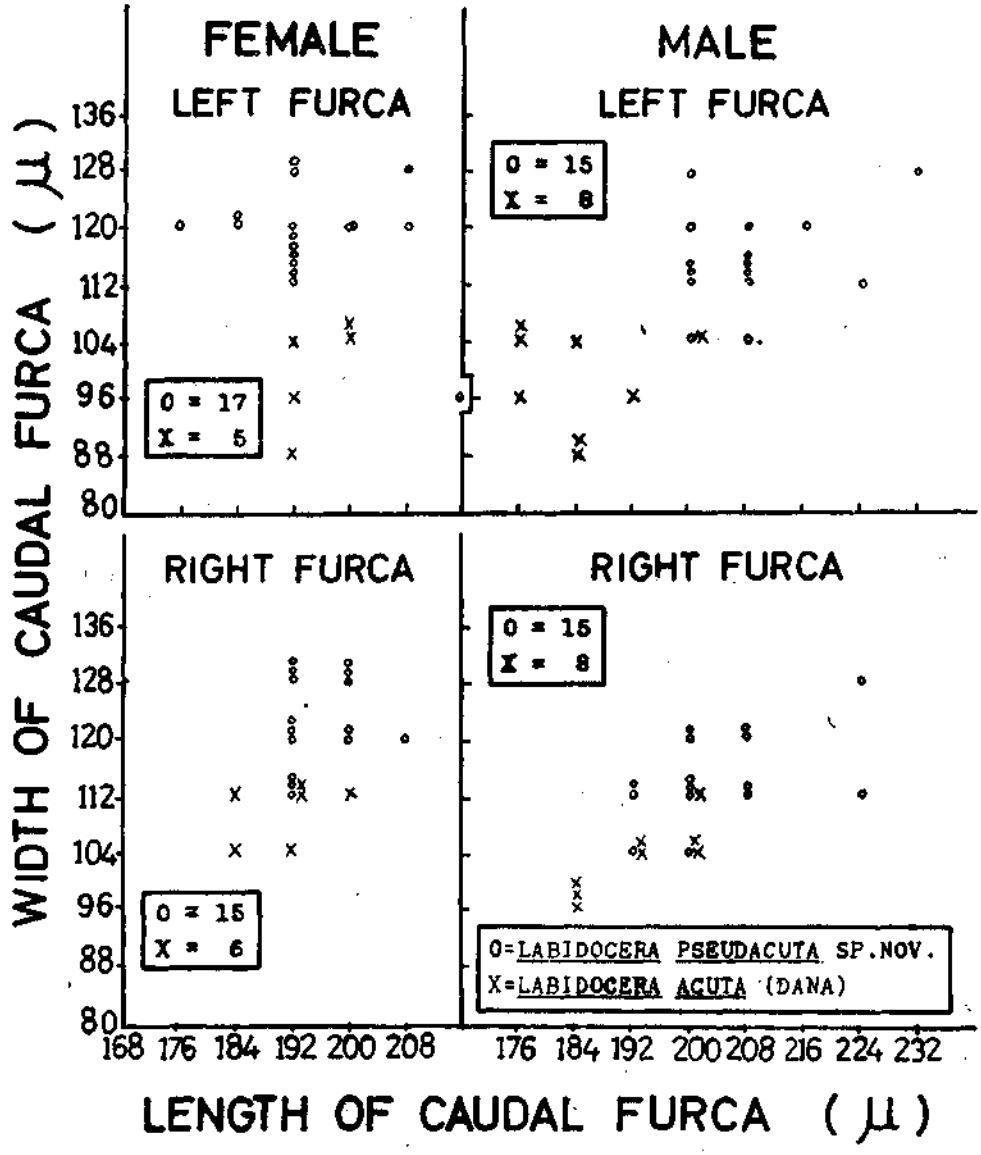


TEXT-FIG. 3. *Labidocera pseudacuta* sp. nov. *Male*, *a*. dorsal view ; *b*. lateral view ; *c*. right first antenna with parts of plates enlarged ; *d*. fifth legs ; *e*. terminal part of left fifth leg ; *f*. chela of right fifth leg. *Labidocera acuta* (Dana). *Male*. *g*. posterior segment of metasome and urosome, dorsal view ; *h*. 16-23 segments of right antenna with parts of plates enlarged ; *i*. fifth legs ; *j-k*. terminal part of left fifth leg in two specimens.



TEXTF-IG. 4. *Labidocera pseudacuta* sp. nov. *Female*. *a*. urosome, ventral view ; *Male*. *b*. urosome, dorsal view. *Labidocera acuta* (Dana). *Female*. *c*. fifth legs ; *d*. part of exopod of left fifth leg, enlarged ; *e*. lateral view of urosome with spermatophore ; *f*. urosome, ventral view. *Male*. *g*. urosome, dorsal view.

As indicated elsewhere (*vide infra* p. 361), *L. acuta* is a neritic species, also reported from some oceanic areas around islands. Sherman (1963) classed *L. acuta*

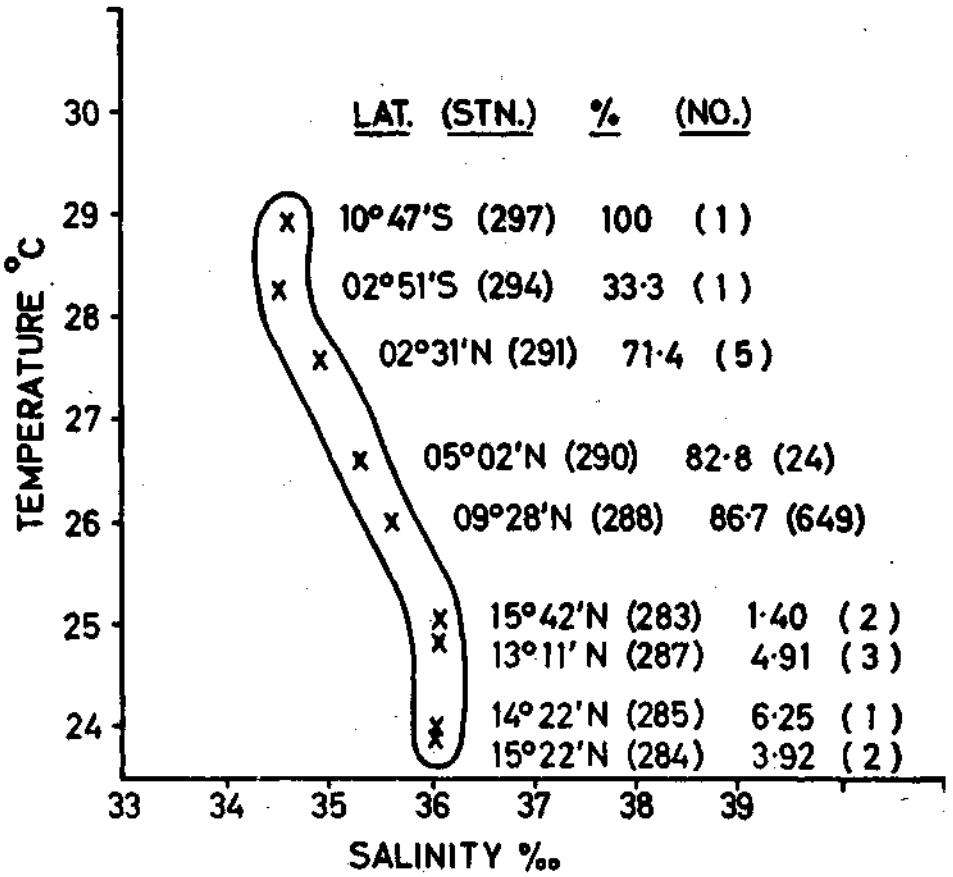


TEXT-FIG. 5. Length-width of caudal furca in both sexes of *Labidocera pseudacuta* sp. nov., and *L. acuta* (Dana).

along with *L. bataviae*, *L. pavo*, *Pontella denticauda*, and *Pontellopsis macronyx* as present in 'island associated waters'. This habitat of *L. acuta* as well as its occurrence in coastal waters have been noted earlier by Sewell (1948), Heinrich (1960), and Voronina (1962).

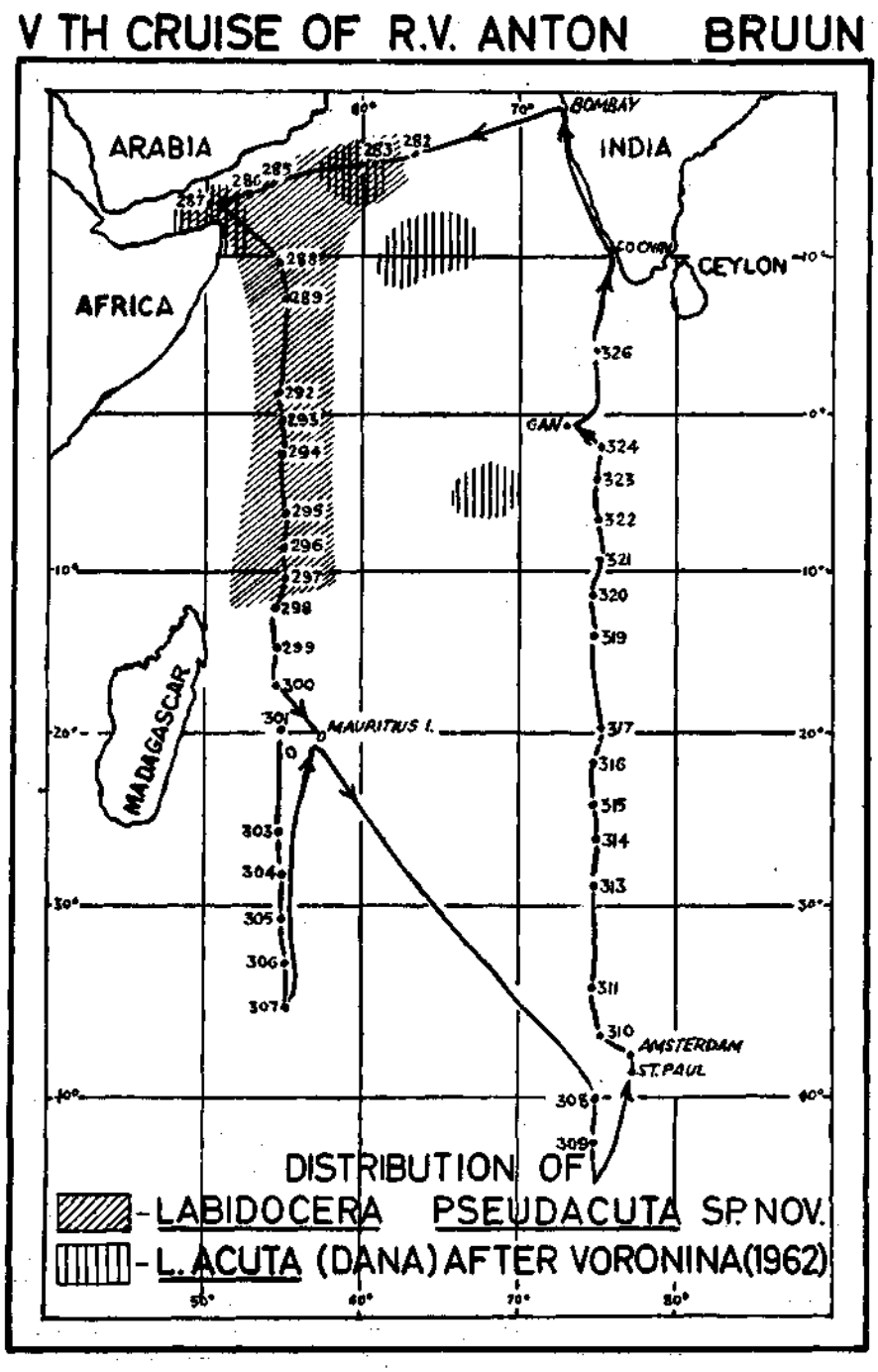
Discussion

Dana (1849) briefly described *Pontella acuta* from a male one-tenth of an inch long from ' Prope Insulam " Mindoro " ; dect die 24 Jan., 1842. In mari Sinensi ; lect die 15 Feb., 1842.' Later, in 1852, while adding a few more remarks to the



Text-fig. 6. Temperature-salinity-pontellid relation of *Labidocera pseudacuta* sp. nov. The latitude (LAT.) ; R.V. *ANTON BRUUN* station number (STN) ; the percentage of *L. pseudacuta* in the total number of all species of pontellidae of each station (%) ; and the actual number of specimens of the new species (NO.) collected at each station are also indicated.

description, he mentions that *Pontellina acuta* is ' abundant in the East Indies off the South East of Mindoro ' . . . ' also in China Sea. . . . Latitude 6°40'N, Longitude 111°E.' But Dana's description of the species only refer to the male. The salient characters of Dana's *Pontella acuta*, such as the rostral hook ; the nature of the posterior lobes of the fifth metasomal segment ; nature and disposition of the caudal setae ; structure of the fifth legs, especially first and second segments of basipod of left leg being of almost the same length ; and second basipodal segment of the right fifth leg being elongate, its length being distinctly greater than the combined lengths of first and second segments of left leg clearly show that this species has been subsequently described by several authors from the Indo-Pacific



TEXT-FIG. 7. Map showing the distribution of *Labidocera pseudacuta* sp. nov. obtained during the Vth cruise of *ANTON BRUUN* (cruise track also indicated). Areas in the Arabian Sea and Central Indian Ocean from where material believed to be *Labidocera acuta* obtained during R.V. *VITYAZ* cruise as shown by Voronina (1962) are also indicated. The oceanic distribution of the new species may be noted.

and Atlantic Oceans mainly from coastal waters under the genus *Labidocera* Lubbock as *L. acuta* or *L. acutum*.

Brady (1883) was the first to describe the female of *Pontella acuta*, and add further to the description of the male obtained from off Port Jackson, Australia ; Off Sibago Islands; and other places in the Philippine Islands ; and the Arafura Sea.

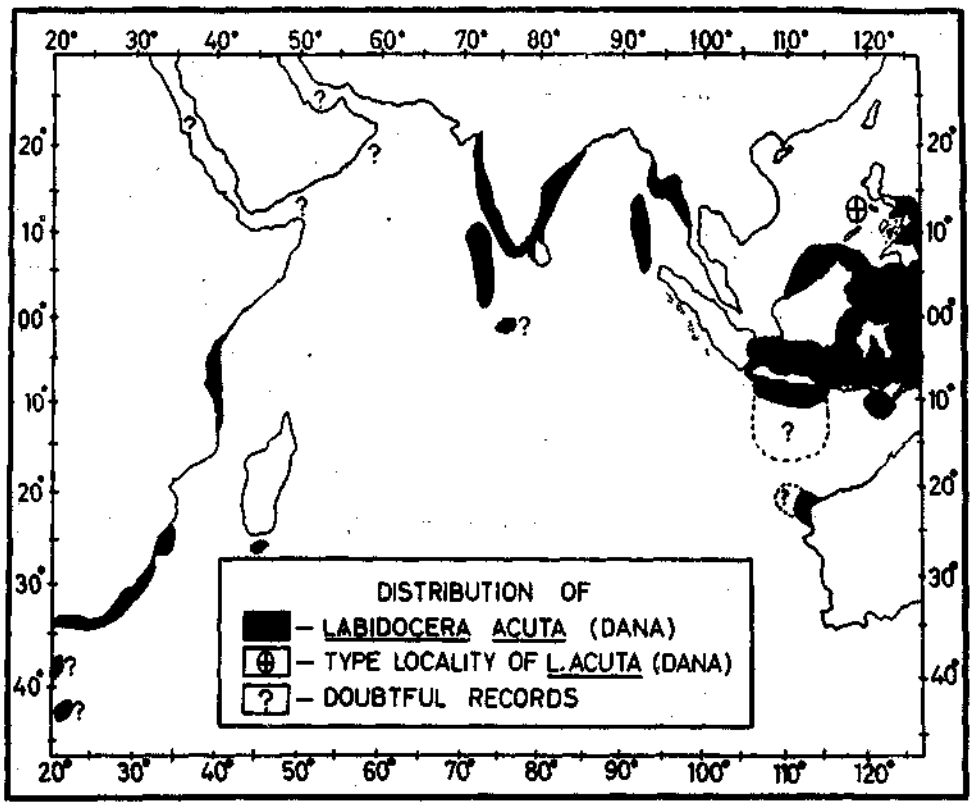
Giesbrecht (1892) described and illustrated two types of variants as *Labidocera acuta* (Dana), from the Indian Ocean, Arabian Sea, Red Sea, Hong Kong, and the Philippines. To the first type (Giesbrecht : Plate 41, figs. 10, 19, & 28) may be referred the typical *L. acuta* described by Dana and Brady. The second type (Giesbrecht : Plate 41, fig. 29) obtained from the Arabian Sea and the Red Sea, though showing the salient characters of the rostral hook, modifications of the last metasomal segment, etc., show marked differences in the nature of the abdomen, especially genital segment ; caudal furcae ; disposition of the caudal setae and the structure of the inner second and third setae ; and fifth legs. It is significant that Giesbrecht (1892) was able to note some differences in his material from the Arabian Sea and the Red Sea from the typical *L. acuta*, though he did not give a name for this variant. Breeman (1908) has reproduced Giesbrecht's drawings of the right and left fifth legs of the variant of *L. acuta* (s. str.) and called it '*Labidocera acuta* var.'

The new species *Labidocera pseudacuta* described herein, shows the characteristics indicated by Giesbrecht (1892) for the variant of *L. acuta* (Dana) (Giesbrecht 1892 : Pl. 41, fig. 29). However, Figure 20 on plate 41 given by Giesbrecht represents an intermediate condition between these two, the urosome showing the characters of the typical *L. acuta* female, and the caudal setae as seen in *L. pseudacuta* female. Our material of the new species obtained over a fairly wide area of Western Indian Ocean and Arabian Sea (Fig. 7) does not contain a single specimen showing such a combination. Neither, is such a combination seen among the late copepodites of *L. pseudacuta*, large numbers of which we have examined. We feel that the habitat of *L. pseudacuta* in the Arabian Sea and Indian Ocean is oceanic, while *L. acuta* is typically a neritic species. However, as shall be presently discussed, *L. pseudacuta* may also be present in the Red Sea and the Gulf of Aden.

Among the species of *Labidocera*, *L. acuta* and *L. pseudacuta* constitute a closely knit species-group. The distinct and well developed rostral hook easily separates this *L. acuta*-group from the other species of the genus.

There are a few records of *L. acuta* unaccompanied by descriptions from the oceanic area of the Arabian Sea, the Gulf of Aden and the Red Sea (Giesbrecht, 1896 : Red Sea ; Thompson, 1900 : E. African waters, Red Sea ; Cleve, 1901 : 13°N, 52°E ; A. Scott, 1902 : 0°40′ west of Aden ; Cleve, 1904 : Red Sea at 28°N, 33°E, Gulf of Aden 13°-14°N and 47°-50°E, and 12°N 44°E, and Arabian Sea from 14°-16°N and 54°-71°E ; Pesta, 1912-1913 : Arabian Sea and Persian Gulf ; Sewell, 1947 : John Murray Exped. Stns. 45, 56, and 58 from South Arabian Coast ; Stn. 76 from Gulf of Oman ; and Stn. 172 from Central Arabian Sea and Voronina, 1962 : Indian Ocean). It is highly doubtful whether all these refer to the typical *L. acuta* (Dana). The distributional pattern of *L. pseudacuta* (Fig. 7) in the north-western Indian Ocean and the Arabian Sea and Giesbrecht's (1892) first reference of this type from the Red Sea suggest that this may be more widely present in this area than *L. acuta*. The distribution of *L. acuta* based on material obtained during the R.V. *VITYAZ* Cruise given by Voronina (1962) for the Central, and northern Indian Ocean including the Arabian Sea is also included in Fig. 7 as it closely

approximates with the distribution of *L. pseudacuta* obtained during the Vth cruise of R.V. *ANTON BRUUN*. From the distributional pattern we feel that what Voronina (1962) considers as *L. acuta* from this area may in all probability be what we have described here as *L. pseudacuta*. If a re-examination of the R.V. *VITYAZ* material confirms this, it would indicate the fairly widespread occurrence of *L. pseudacuta* in this area.



TEXT-FIG. 8. Map showing the distribution of *Labidocera acuta* in the Indian Ocean. It may be noted that most of the records are from coastal waters.

References to *L. acuta* (Dana) from the Indian Ocean are as follows : Thompson (1900 : Bay of Bengal) ; Thompson and Scott (1903 : Ceylon Pearl Banks, Gulf of Mannar) ; Wolfenden (1906 : Laccadive and Maldive Archipelagoes) ; *Id.*, (1911 ; Port Natal, S. Africa) ; Sewell (1912 : Bay of Bengal) ; *Id.*, (1914 : Gulf of Mannar) ; Brady (1914 : Durban Bay, S. Africa) ; Menon (1931 : Madras coast) ; Sewell (1932 : Bay of Bengal) ; Krishnaswamy (1953 : Madras Coast) ; Ganapathi and Rao (1954 : Vizakapatnam Coast) ; Ganapathi and Santhakumari (1961 : Lawson's Bay, Waltair) ; Kasturirangan (1963 : Indian coastal waters) ; Seno *et al.* (1963 : South-western Indian Ocean) ; Tsuruta (1963 : Central Indian Ocean and Greater Sunda Islands) ; Decker (1964 : East coast of Union of South Africa between Durban and Port Elizabeth) ; Decker and Mombeck (1964 : Off Lourenco Marques on Mozambique Coast, and also about 10 miles south of Madagascar) ; and Saraswathy (1966 : Trivandrum, Kerala Coast). Seno's record of this species (Seno,

et al. 1963) from two stations at 43° 33′ S 21° 52′E, and 39°00′S 20°06′E if confirmed by further collections from this area will be most interesting. Tsuruta's (1963) record of this species from the Central Indian Ocean around 70°E just south of the Equator may perhaps refer to the oceanic cognate of *L. acuta*. Voronina's (1962) record of *L. acuta* from three areas in the Eastern Indian Ocean, one from off the west coast of Australia about 23°S, and two from between Indonesia and Australian Coasts should be mentioned here. The distributional pattern of this species in the Indian Ocean is shown in Fig. 8.

Important references to *L. acuta* from the Pacific and Atlantic Oceans and their contiguous seas are as follows :

Pacific Ocean : Dana (1849, 1853, 1855) ; Brady (1883) ; Giesbrecht (1895) ; A. Scott (1909) ; Fruchtl (1924) ; Mori (1929, 1937) ; Farran (1936) ; Dakin and Colefax (1940) ; Wilson (1942, 1950) ; Anraku (1954) ; Heinrich (1960) ; Sherman (1963) ; and Tanaka (1964).

Atlantic Ocean : T. Scott (1894) ; Thompson (1900) ; and Breeman (1908). Dr. A. Fleminger informs us that the records of *L. acuta* from the Atlantic are based on misidentification. *L. acuta* is thus known at present from both neritic as well as island associated waters in the Pacific Ocean and the Indian Ocean.

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