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#### CASE REPORT

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## ***PSEUDODIAPTOMUS ANNANDALEI* (COPEPODA: PSEUDODIAPTOMIDAE) FROM COASTAL WATERS OF SRI LANKA**

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#### ABSTRACT

The demersal copepod, *Pseudodiaptomus annandalei* Sewell, 1919 is reported for the first time from the plankton samples collected from coastal waters of southern Sri Lanka during August 2004 to January 2005. These new data together with existing data on distribution of the *P. annandalei* indicate that it has the largest geographical ranges for Indo-Pacific pseudodiaptomids.

#### KEYWORDS

Calanoid copepod, illustrations, new record, *Pseudodiaptomus annandalei*, Sri Lanka

#### ABBREVIATIONS

P5 - fifth swimming leg; Pr - prosome; Ur - urosome; Ur1-5 - urosome segments 1-5; MS1-5 - mesosome segment 1-5; CR - caudal ramus.

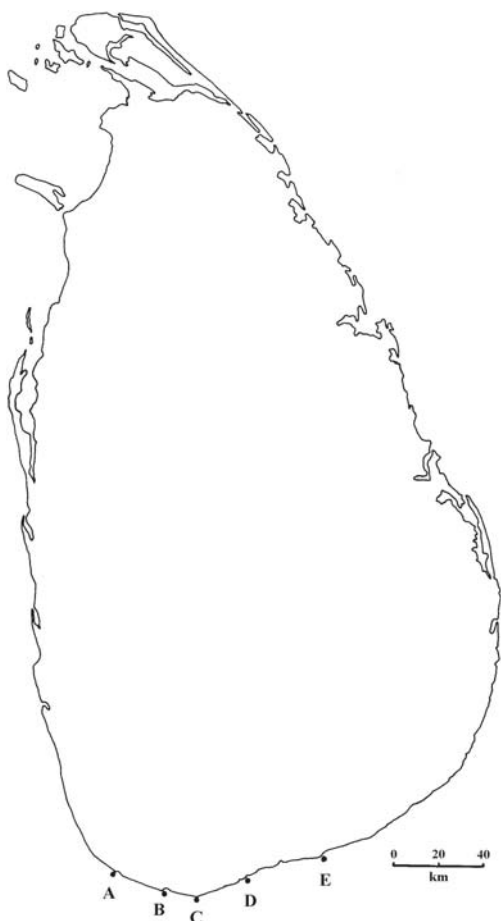
The demersal copepods of the genus *Pseudodiaptomus* Herrick (1884) for *P. pelagicus* from specimens collected near the mouth of the Mississippi river are circumglobal in tropical and temperate regions, mostly in estuaries and near shore environments. Typically, pseudodiaptomids are found in shallow coastal waters (0.5-15m) over sand or grass flats, coral reefs and rubble, and mud bottoms of river mouths. Unlike other planktonic copepods, the shallow-water demersal nature of *Pseudodiaptomus* has rather restricted distribution of species and has conducive to geographical isolation of species that makes the genus as an ideal group for a zoogeographic study

(Walter, 1987; Mulyadi, 2001). With the intension to confirm the occurrence of demersal *Pseudodiaptomus* species, the authors examined more than 20 samples from five sites (Fig. 1) along the southern coastal waters of Sri Lanka. The present paper deals with the occurrence of *P. annandalei* Sewell, 1919 from coastal waters of Sri Lanka.

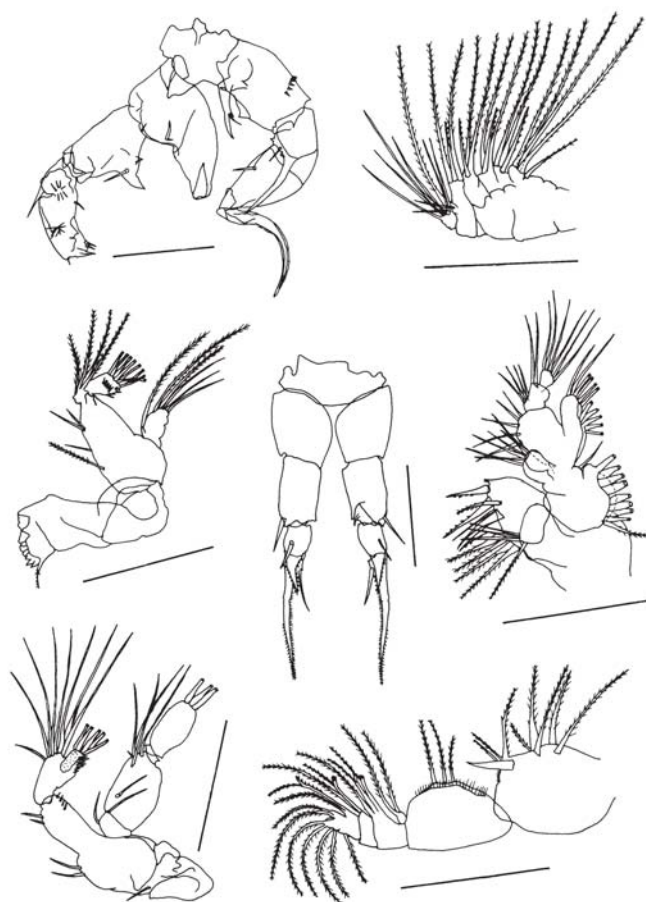
#### MATERIALS AND METHODS

The material was sorted from plankton samples collected from five sites, i.e., Galle, Weligama, Matara, Tangalle and Hambantota, along the southern coastal belt of Sri Lanka from surface and subsurface layers, using hand-towed conical plankton net (aperture diameter 30cm, mesh size 300µm) during the August 2004 to January 2005. All samples were preserved immediately in buffered 4% formaldehyde before transfer to 70% ethanol. Two or more males and females of *P. annandalei* were dissected in pure dehydrated glycerin medium under stereomicroscope (Wild 3MB) and mounted in glycerin medium as temporary slide preparation. Measurements were made with an ocular micrometer and drawings were made with the aid of camera lucida (Olympus 1.25x) on an Olympus CH2 microscope (10x, 40x or 100x objective lens, 10x ocular lens). Total lengths were taken dorsally from anterior margin of head to distal end of CR (excluding caudal setae). Length of the prosome and urosome were taken dorsally from the anterior

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**Figure 1.** Map of Sri Lanka, showing the five sampling sites. A - Galle; B - Weligama; C - Matara; D - Tangalle; E - Hambantota



**Figure 2.** *Pseudodiaptomus annandalei*. Scale = 0.1mm. A - Adult male leg 5; B - Adult female antenna; C - Mandible; D - Maxillule; E - Maxilla; F - Maxilliped; G - Leg 5

margin of head to the posterior corner of MS5, and from anterior margin of Ur1 to posterior end of CR. Identification was carried out using consultation of original descriptions and illustrations in the primary literature and keys given in Wellershaus (1969), Harding & Smith (1974), Reddy & Radhakrishna (1982), Walter (1987) and Mulyadi (2001). Line drawings were provided with a scale bar, which represents 0.1mm. All measurements, otherwise mentioned, are in millimeters (mm). Values are given as mean ± SD.

**RESULTS**

Of the plankton samples, the demersal copepod *P. annandalei* was encountered and never abundant in this study. Figure 2 shows the elements associated with the male and female P5, antenna, mandibule, maxilla, maxillule and maxilliped. Swimming legs 1 to 4 with all rami 3-segmented. Numbers of spine (Roman numerals) and setae (Arabic numerals) per segment of swimming legs 1 to 4 as follows;

	Coxa	Basis	Exopod	Endopod
Leg 1	0-1	0-0	I-1; 0-1; II-4	0-1; 0-1; 0-6
Leg 2	0-1	0-0	I-1; I-1; III-5	0-1; 0-2; 0-8
Leg 3	0-1	0-0	I-1; I-1; III-5	0-1; 0-2; 0-8
Leg 4	0-1	0-0	I-1; I-1; III-5	0-1; 0-2; 0-7

**Female:** Total length 1.12-1.17, mean length 1.14 (n=20). Left and right antennule symmetrical, 21-segmented and 0.96 ± 0.04 in length. Prosome 0.80 ± 0.01 in length. Head and MS1 fused. Posterolateral margin of the MS3 with a group of minute spines. MS4 and MS5 fused with double spine row. Posterolateral margin of the MS5 rounded with 6-8 ‘coarse curved teeth’ and has few dorsolateral spines arranged in two transverse rows. Ur 0.33 ± 0.03 in length. Ur1 with pair of large lateral spine, 0.06 ± 0.00 in length. Posterior margin of Ur4 with whorl of spinules. CR 0.08 ± 0.01 in length and 0.04 ± 0.01 in width. CR bears 6 caudal setae and longest 3<sup>rd</sup> setae 0.12 ± 0.02 in length with enlarged base. Outermost caudal setae quite characteristically being unjointed with spiniform setules along its inner margins only. The ovigerous female bears a pair of egg sacs, 0.34 ± 0.02 in length and 0.15 ± 0.03 in width, containing 7-9 eggs per sac. Ovigerous female carry a single spermatophore closely pressed to the undersurface of the left egg sac.

**Male:** Total length 1.02-1.06, mean length 1.05 (n=20). Left and right antennule asymmetrical. Geniculated right antennule 0.80 ± 0.06 in length and 20-segmented, modified with the knee joint occurring between segments 18 and 19. Segments 13-17 much swollen. Segment 10 bears a strong

spine which reaches up to the posterior margin of 13<sup>th</sup> segment. Segment 17 with an unarmed tooth plate. Segment 18 with a single curved serrated tooth-plate, segment 19 with two small tooth-plates, of which the proximal one is serrated. Pr  $0.70 \pm 0.02$  in length. MS1 fused with the head. Posterolateral margin of the MS2 and MS3 bears a group of spinules. MS4 and MS5 fused with double spine row. Ur  $0.34 \pm 0.02$  in length. Ur2 with two short rows of spinules laterally at the dorsal proximal region. Posterior margin of the Ur2 - Ur4 bears a whorl of spinules. CR  $0.07 \pm 0.01$  in length and  $0.03 \pm 0.01$  in width. Each CR bears six caudal setae and longest third setae  $0.20 \pm 0.01$  in length. The outermost caudal setae quite characteristically being unjointed and spiniform with setules along its inner margins only.

## DISCUSSION

The species of *Pseudodiaptomus* have been divided into seven species groups, eight sub groups and one unassigned group. These species groups were determined primarily on the structure of the male and female fifth leg and other morphological features and geographical distribution. Currently, the literature indicates 73 nominal species of *Pseudodiaptomus* as widely accepted taxa worldwide (Mulyadi, 2001). On the basis of previously described identical morphology especially on P5 and keys for the genus *Pseudodiaptomus* species provided to the species from Australian, Papua New Guinean, and Indonesian waters (Walter, 1987; Mulyadi, 2001), the material described here is identified as *P. annandalei*. *P. annandalei* belongs to the *Lobus* species group and *forbesi* subgroup due to the presence of key characters, i.e., enlarged female's third caudal setae, paired egg sacs, lack of barbed setae on antipenultimate of both male and female antennule and 20-segmented male antennule with non hooked elongate spine on tenth segment. However, *P. annandalei* can be easily identified from other species by the laterally directed spines on the females Ur1 and by its rounded MS5 corners. Though geographical distributions of species of the pseudodiaptomids are limited due to their demersal nature, some species shows unusual pattern and *P. annandalei* is most peculiar. This species has one of the largest geographical ranges for Indo-Pacific pseudodiaptomids and have been previously recorded from China, the Philippines, India, Indonesia and North Queensland, Australia (Mulyadi, 2001). Addition to the geographical distribution, morphology of P5 as well as other morphological features are basic characters to identify species of the genus, some morphological characters of the species with detailed figures are illustrated. *P. annandalei* was completely redescribed by Reddy & Radhakrishna (1982). The detailed illustrations of our material are nicely fit with that of the described Indonesian, the Philippines and Indian species (Mulyadi, 2001; Walter, 1987). Moreover, measurements ranges of redescribed male and female are too fit with our material. In all sampled examined, size as well as the existence of males were much fewer than the females. Though it is not a most reliable identification character for pseudodiaptomids, comparison of leg setation patterns of swimming legs 1 to 4 of our material with redescribed setation patterns (Reddy & Radhakrishna, 1982) were nicely fit with

our material except that of the first leg. The only apparent difference is the presence of one setae on second endopodial segment and six setae on third exopodial segment of leg 1 in our material from no setae on second endopodial segment and seven on third exopodial segment in illustrated Indian species. Due to the similarities between our material and previous descriptions, our material was conspecific with the original descriptions of *P. annandalei*. Additions to the existing data on the geographical distribution; occurrence of *P. annandalei* in coastal waters is new record to Sri Lanka.

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