

# THREE NEW INTERSTITIAL GASTROTRICHS FROM ANDHRA COAST, INDIA

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## Résumé

Trois Gastrotriches nouveaux de la côte d'Andhra, Golfe du Bengale.

L'auteur décrit trois nouvelles espèces de Gastrotriches interstitiels Macrodasyoïdes, récoltés pendant l'hiver 1968, dans les sables intertidaux de la côte d'Andhra (Golfe du Bengale) : *Macrodasys hexadactylus* n. sp., *Paraturbanella mesoptera* n. sp. et *Pseudostomella indica* n. sp. La distribution de ces formes, en rapport avec la nature du substrat, est également étudiée.

## Introduction

Studies on marine interstitial fauna in the beach sands of Waltair coast during the years 1960-1963, have revealed the occurrence of several interesting gastrotrichs (Ganapati and Chandrasekhara Rao, 1967; Chandrasekhara Rao and Ganapati, 1968 a, b). During a brief faunistic survey undertaken by the Zoological Survey of India in November-December 1968, the author had an opportunity of a further study of the intertidal sands on Waltair coast and its environs. Three previously undescribed species of Gastrotricha were encountered in the collections and are described in the present paper. All the specimens have been examined in living condition.

Order: MACRODASYOIDEA (1)

Family: Macrodasyidae

Genus: *MACRODASY* Remane, 1924

*MACRODASY* *HEXADACTYLUS* n. sp. (Fig. 1, 1-5)

## Description:

Adult specimens of the species have a maximum length of 1.0 mm including the tail. A maximum width of 85  $\mu$  is seen about half-way

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(1) The name connotes a superfamily taxon within the meaning of Art. 29 A of The International Code of Zoological Nomenclature (1961 : 29); it is preferable to emend it as *Macrodasyida* and the other order *Chaetonotoidea* as *Chaetonotida*.

from the anterior end. The body is fairly transparent, with an elevated dorsal surface and a flattened ventral surface. The anterior end is bluntly rounded while the posterior end tapers into a tail which reaches about  $150\ \mu$  long. The body sides are not parallel and show superficial segmentation, the number of segments varying between 16 and 18.

The anterior adhesive organ consists of six pairs of tubules  $7-8\ \mu$  long, disposed in an arc on the ventral surface of the head, just behind the mouth. The lateral tubules, numbering 14-16 pairs, measure about  $12\ \mu$  long. In addition to these normal lateral tubules, two pairs of lengthened lateral tubules occur near the posterior end of pharynx. The lengthened tubules are separate at their base; the anterior tubule reaches  $25\ \mu$  long while the posterior one is about  $40\ \mu$  long. The lateral tubules are disposed a pair on each body segment. The two pairs of lengthened tubules seem modified lateral tubules and the absence of any tubule on the body segment preceding the lengthened tubules, is significant. The tail bears two lateral and six terminal tubules reaching  $12-15\ \mu$  in length. The designation of the species is derived from the 6 terminal tubules characteristic of the tail.

The mouth is terminal and the buccal cavity is small, with a velum seen in other species of the genus. The pharynx is about  $350\ \mu$  long and occupies slightly less than half the total gut length. The pharyngeal pores are conspicuous, opening between the lengthened lateral tubules and the hind end of pharynx. The gut, following pharynx, is undifferentiated and tapers to the posterior end. The anus is subterminal.

The ciliation is known imperfectly. It appears to form a continuous field on the ventral surface of the animal, although the lateral sides show a pronounced growth. The anterior margin of head and the sides of trunk bear lateral sensory hairs  $12-16\ \mu$  long. A pair of lateral pestle organs is present on the head. Numerous epidermal glands  $3-8\ \mu$  in size occur on the dorsal surface, the bulk of them being disposed on the lateral sides of the body.

The reproductive system follows the usual pattern. A paired testis lies on either side in the anterior region of intestine. The pear-shaped penis is about  $55\ \mu$  long and opens on the ventral surface of the body about half way from the anterior end. The spermatozoa are  $20\ \mu$  long, stumpy and lanceolate. An adult specimen of the species was seen to carry three oocytes having a maximum diameter of  $55\ \mu$ . The muscular bursa copulatrix is about  $100\ \mu$  long and opens on the ventral surface close to anus. No antrum feminum could be distinguished.

#### **Holotype:**

Specimen 1.0 mm long, with ova and sperm, collected by the author on 4 December 1968. Deposited in the Zoological Survey of India, Calcutta. Regd. No. P 794/1.

#### **Type locality:**

Medium sand, depth 30-40 cm, intertidal zone, Pudimadaka beach (Lat.  $17^{\circ} 30' 20''$  N and Long.  $83^{\circ} 20' 10''$  E), Andhra Pradesh, India.

**Paratype:**

One specimen 1.0 mm long, with the same collection data given for the holotype. Personal collection.

**Remarks:**

In the genus *Macrodasys* Remane, the general organization of *M. hexadactylus* n. sp. approaches *M. remanei* Boaden (1963), the only

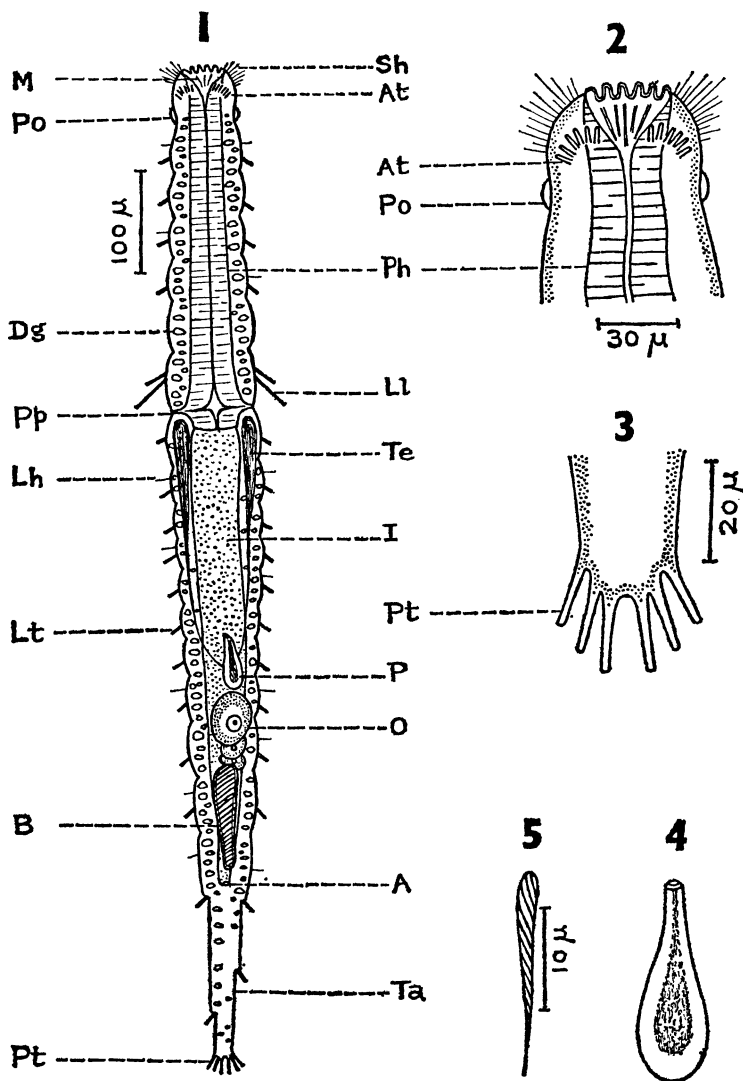


FIG. 1  
*Macrodasys hexadactylus* n. sp.

1: adult, ventral view; 2: anterior region, ventral view; 3: posterior end, ventral view; 4: penis; 5: spermatozoon.

A - anus; At - anterior tubule; B - bursa; Dg - dorsal gland; I - intestine; Lh - lateral hair; Ll - lengthened lateral tubule; Lt - normal lateral tubule; M - mouth; O - oocyte; P - penis; Ph - pharynx; Po - pestle organ; Pp - pharyngeal pore; Pt - posterior tubule; Sh - sensory hair; Ta - Tail; Te - testis.

other species hitherto known to bear two pairs of lengthened lateral tubules close to the posterior end of pharynx. However, *M. hexadactylus* can be readily distinguished from *M. remanei* and all other species of *Macrodasys* by the superficial segmentation of the body and the characteristic tail, ending with six adhesory tubules.

#### Diagnostic features:

Body up to 1.0 mm long. Maximum width/length ratio about 1/12. Anterior end bluntly rounded. Posterior end tapers into a tail. Body shows superficial segmentation, the number of segments varying between 16 and 18. Six pairs of anterior tubules and 14-16 pairs of lateral tubules present. Two pairs of lengthened lateral tubules occur close to the hind end of pharynx. Tail with two lateral and six posterior tubules. Numerous epidermal glands occur on dorsal surface. Pharynx occupies slightly less than half the total gut length. Pharyngeal pores situated close to the hind end of pharynx. Testis paired.

#### Ecology:

Three specimens of *Macrodasys hexadactylus* were collected in medium sands with a grain size of 300-500  $\mu$  in mean diameter and at a depth of 30-40 cm below surface between the low and half-tide levels of the intertidal zone. The temperature in the habitat varied from 26 °C to 27 °C, while the salinity of the interstitial water measured about 28 p. 1000. The sands appeared sufficiently rich in organic detritus. The gastrotrich is sluggish and appears to feed on fine particles of detritus.

Other interstitial species collected in the same biotope are the Turbellarian *Monocelis* sp., the Nematodes *Enoploides* sp., *Platycoma africana* Gerlach, *Chronogaster alatum* Gerlach and *Metepsilonema* sp., the Gastrotrichs *Thaumastoderma heideri* Remane, *Dactylopodalia indica* Rao and Ganapati, *Xenotrichula velox* Remane and *Chaetonotus* sp., the Polychaete *Hesionides gohari* Hartmann-Schröder, the Oligochaete *Enchytraeus* sp., the Copepods *Leptosyllus* sp., *Arenopontia indica* Rao and *Paramesochra wilsoni* Krishnaswamy, the Isopods *Microcerberus predatoris* (Gnanamuthu) and *Angeliara phreaticola* Chappuis and Delamare, and the Halacarid *Copidognathus* sp.

#### Family: Turbanellidae

Genus: *PARATURBANELLA* Remane, 1927

*PARATURBANELLA MESOPTERA* n. sp. (Fig. 2, 6-8)

#### Description:

Individuals of the species reach a length of 360-380  $\mu$  and a maximum width of 50  $\mu$ . The body is transparent and ribbon like; widest in the middle and slightly tapers towards the posterior end. The

head is clearly demarcated from the rest of the body by a deep constriction and measures about  $46\mu$  at its widest part between the two prominent lateral lobes. On the dorsal surface of the head occur three pairs of marginal hairs  $10-20\mu$  long and two groups of sensory

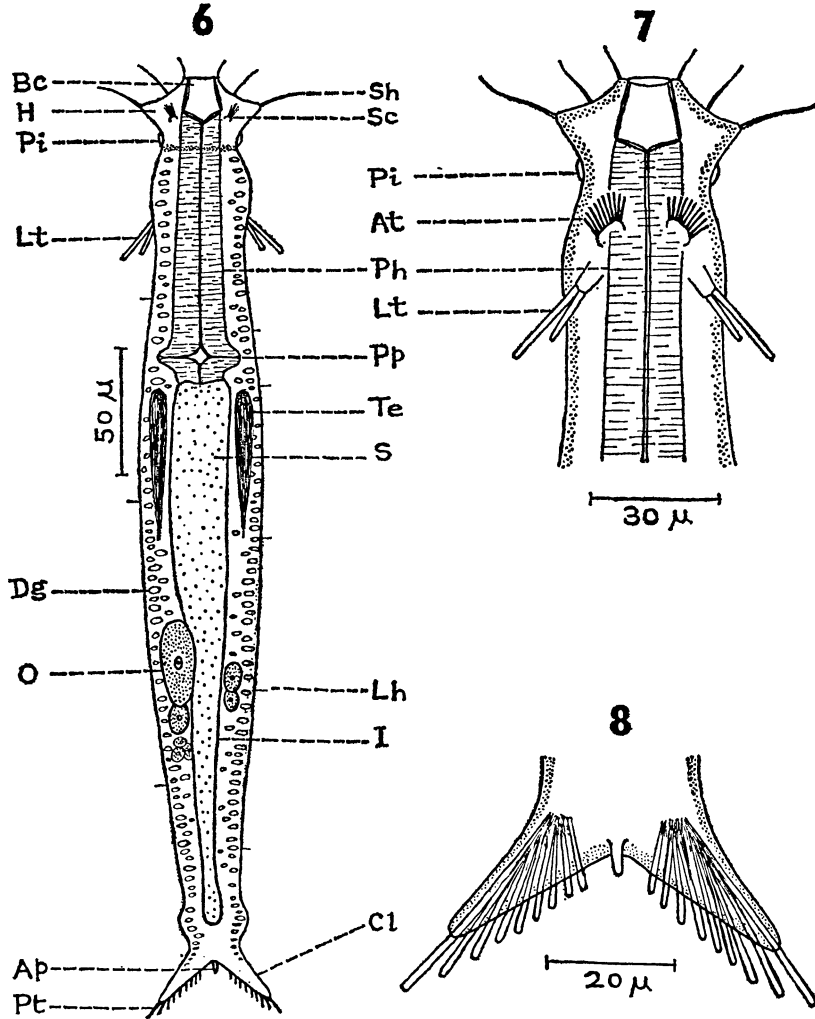


FIG. 2  
*Paraturbanella mesoptera* n. sp.

6: adult, dorsal view; 7: anterior region, ventral view; 8: posterior end, ventral view.

Ap - anal papilla; At - anterior tubule; Bc - buccal cavity; Cl - caudal lobe; Dg - dorsal gland; H - head; I - intestine; Lh - lateral hair; Lt - lateral tubule; O - oocyte; Ph - pharynx; Pi - piston; Pp - pharyngeal pore; Pt - posterior tubule; S - stomach; Sc - sensory cilia; Sh - sensory hair; Te - testis.

cilia  $8\mu$  long, situated just behind the buccal cavity. Two piston pits are present on the sides of the head, close to the constriction demarcating the head from trunk.

Very few sensory hairs 4-5  $\mu$  long occur along the sides of the body. The epidermis is finely granular. Numerous epidermal glands about 3  $\mu$  in diameter are present on the dorsal surface, excepting the head region, and the majority of the glands are disposed laterally. The ventral ciliation is typical, arranged in two longitudinal bands.

The two groups of anterior adhesory tubules are arranged as usual and resemble those of *P. intermedia* Wieser (1957). Each group consists of 8-10 thin tubules about 8  $\mu$  long, inserted on a protuberance of the cuticle. The characteristic paired lateral adhesive organ occurs just behind the anterior adhesive feet, with the tubules implanted on a mobile protuberance of the cuticle and directed backwards. The longer tubule reaches 22  $\mu$  long while the short one is about 12  $\mu$  long. Each caudal lobe bears 8-10 posterior tubules reaching 5-10  $\mu$  long. Between the two caudal lobes occurs a median finger-like papilla 6  $\mu$  long.

The mouth is 10  $\mu$  wide, terminal, but slightly inclined to the ventral surface. The buccal cavity is spacious, measures  $20 \times 15 \mu$ ; lined with cuticularized walls, and occupies  $3/5$  of the head length. The pharynx is about 100  $\mu$  long and nearly forms  $1/3$  of the total gut length. The pharyngeal pores are well-developed and occur close to the posterior end of pharynx. The pharynx is followed by a broad stomach and a slender intestine. The anus is subterminal. The reproductive system follows the usual pattern, with paired testis and ovary situated lateral to the intestine.

#### Holotype:

Specimen 370  $\mu$  long, with ova and sperm, collected by the author on 26 November, 1968. Deposited in the Zoological Survey of India, Calcutta. Regd. No. P 795/1.

#### Type locality:

Coarse sand, depth 30 cm, intertidal zone, Waltair beach (Lat.  $17^{\circ} 43' 30''$  N and Long.  $83^{\circ} 20' 30''$  E), Andhra Pradesh, India.

#### Paratype:

One specimen 380  $\mu$  long, with the same collection data given for the holotype. Personal collection.

#### Remarks:

In the shape of body and disposition of adhesory tubules, *Paraturbanella mesoptera* n. sp. is closely related to *P. microptera* Wilke (1954) and *P. teissieri* Swedmark (1954). However, the new species is distinguished from *P. microptera* by the size of body, presence of piston pits, greater number of anterior and posterior adhesory tubules and the absence of numerous regular groups of sensory hairs on the sides of the body. *P. mesoptera* differs from *P. teissieri* by the shape of head with pronounced lateral lobes, the buccal cavity/head length ratio of  $3/5$ , the presence of conspicuous piston pits and the structure of anterior adhesive foot.

**Diagnostic features:**

Body up to 0.38 mm long. Maximum width/length ratio about 1/8. Distinct head with lateral lobes and two groups of sensory cilia on dorsal surface just behind the buccal cavity. Piston pits present. Adhesive foot with 8-10 thin anterior tubules and caudal lobe with 8-10 posterior tubules. Lateral tubules reduced to two pairs. Finger-like anal papilla present between the two caudal lobes. Numerous epidermal glands occur laterally on dorsal surface. Buccal cavity with cuticularized walls. Pharynx forms 1/3 of the total gut length. Pharyngeal pores situated close to the hind end of pharynx. Gonads paired.

**Ecology:**

A few specimens of *Paraturbanella mesoptera* were collected in medium and coarse sands with a grain size of 300-600  $\mu$  in mean diameter and at a depth of 20-40 cm below surface between the low and half-tide levels of the intertidal zone. The amount of organic detritus of the sands appeared sufficiently low, due to the wave-washed nature of the beach. The temperature in the habitat varied from 26 °C to 28 °C, while the salinity of the interstitial water ranged between 29 and 31 p. 1 000. The animal glides slowly on the surface of sand grains and also swims in interstitial water by the undulating movements of body. The gastrotrich browses about the substrate, feeding on fine particles of detritus, bacteria and smaller protozoans.

Some of the common interstitial animals occurring in the same habitat are the Hydrozoan *Halammohydra octopodides* Remane, the Turbellarians *Otoplana* sp., and *Diascorhynchus* sp., the Nematodes *Anticoma arctica* Steiner, *Oncholaimus brachycercus* de Man, and *Theristus* sp., the Gastrotrichs *Turbanella bengalensis* Rao and Ganapati, *Tetranchyroderma swedmarki* Rao and Ganapati and *Xenotrichula tentaculatus* Rao and Ganapati, the Archiannelids *Protodrilus pierantonii* Aiyar and Alikunhi, and *Trilobodrilus* sp., the Polychaetes *Hesionides arenaria* Friedrich and *Petitia amphophthalma* Siewing, the Copepods *Arenosetella noodti* Rao and Ganapati, *Psammastacus spinicaudatus* Rao and Ganapati, and *Paramesochra pseudogracilis* (Krishnaswamy), and the Nudibranch *Pseudovermis salamandrops* B.-R. Marcus.

**Family: Thaumastodermatidae**

Genus: *PSEUDOSTOMELLA* Swedmark, 1956

*PSEUDOSTOMELLA INDICA* n. sp. (Fig. 3, 9-11)

**Description:**

The mature specimens of the species attain a length of 180  $\mu$  and maximum width of 46  $\mu$  in the extended condition. The body is dorso-ventrally flattened; the anterior one-fourth has been demarcated by a constriction from the rest of the posterior part, which is

somewhat elliptical. There is a dorsal covering of four-pronged dermal scales, excepting some part of the anterior region. The size and disposition of scales somewhat resemble that of *P. malayica* Renaud-Mornant (1967). The tetrancres are 2-3  $\mu$  in size, arranged in 11-13 longitudinal rows, with a distance of about 2  $\mu$  between two adjoining rows. No scales could be distinguished on the ventral surface.

The general organization of the jaw-like cephalic appendages forming a "cephalic net" in the prebuccal region, resembles that of the type species *P. roscovita* Swedmark (1956). However, there is variation in the number and disposition of sensory papillae, borne on the cephalic appendages. The type species bears a total of seven dorsal and seven ventral papillae while the new species has five dorsal and eight ventral papillae. Each papilla is tipped with a vibratile bristle. The dorsal papillae reach 8-10  $\mu$  long while the ventral papillae are 3-5  $\mu$  long. The cephalic appendages attain a length of 40  $\mu$  and each appendage bears two pairs of sensory cilia on the outer surface. On the dorsal surface of the head occurs a pair of rod-like sensory cirri 18-20  $\mu$  long, implanted on small nipples of the cuticle. The cirri seem analogous with tentacles of other animals. On the ventral surface of the head occur three pairs of vibratile cilia 2  $\mu$  long, disposed in an arc and mounted on tiny apophyses of the cuticle.

The disposition of adhesory tubules shows variation from the two hitherto known species, especially in the larger number of lateral tubules. Two pairs of anterior tubules 3-4  $\mu$  long occur on the ventral surface of the head just behind the mouth. There are 22-24 pairs of lateral tubules 3-4  $\mu$  long, disposed more or less at equal distances from each other. The lateral tubules start close to the anterior end, leaving a gap from the anterior tubules. Three pairs of ventro-lateral tubules occur in the last quarter of the body at the level of the *bursa copulatrix*. The tubules are 8-11  $\mu$  long, their size increasing from the anterior tubule to the posterior tubule; and they could also be seen from the dorsal view of the animal. Two pedicles of the usual shape occur on the posterior border, each bearing three apical tubules 5-8  $\mu$  long and an inner tubule 4  $\mu$  long situated at its base. Two adhesory tubules 4  $\mu$  long occur on the posterior border between the two pedicles.

The epidermis contains three pairs of well-developed dorsal glands, measuring about 8  $\mu$  in diameter. The glands are light-yellow in colour and are disposed on the lateral sides of the body. The ventral glands are not well-developed. The ventral surface of the body appears to have a complete and uniform covering of cilia.

The mouth is spacious and terminal, but slightly inclined to the ventral surface. The pharynx is about 60  $\mu$  long and nearly occupies 2/5 of the total gut length. The pharyngeal pores occur close to the posterior end of pharynx. The gut, following pharynx, is undifferentiated and tapers to the posterior end. The anus is subterminal.

The reproductive system is of the usual type characteristic of the family. The unpaired testis is situated in the second half of the body, lying lateral to the stomach. The ovary lies on the opposite side of the testis. A single oocyte of 32  $\mu$  in size, situated on the dorsal side, has been observed in an adult specimen. The seminal receptacle and *bursa copulatrix* lie in the last quarter of the body. The yolk gland



occurs along the passage of the *vas deferens*. The male and female pores are situated close to the anus.

**Holotype:**

Specimen 180  $\mu$  long, with ova and sperm, collected by the author on 28 November 1968. Deposited in the Zoological Survey of India, Calcutta. Redg. No. P 796/1.

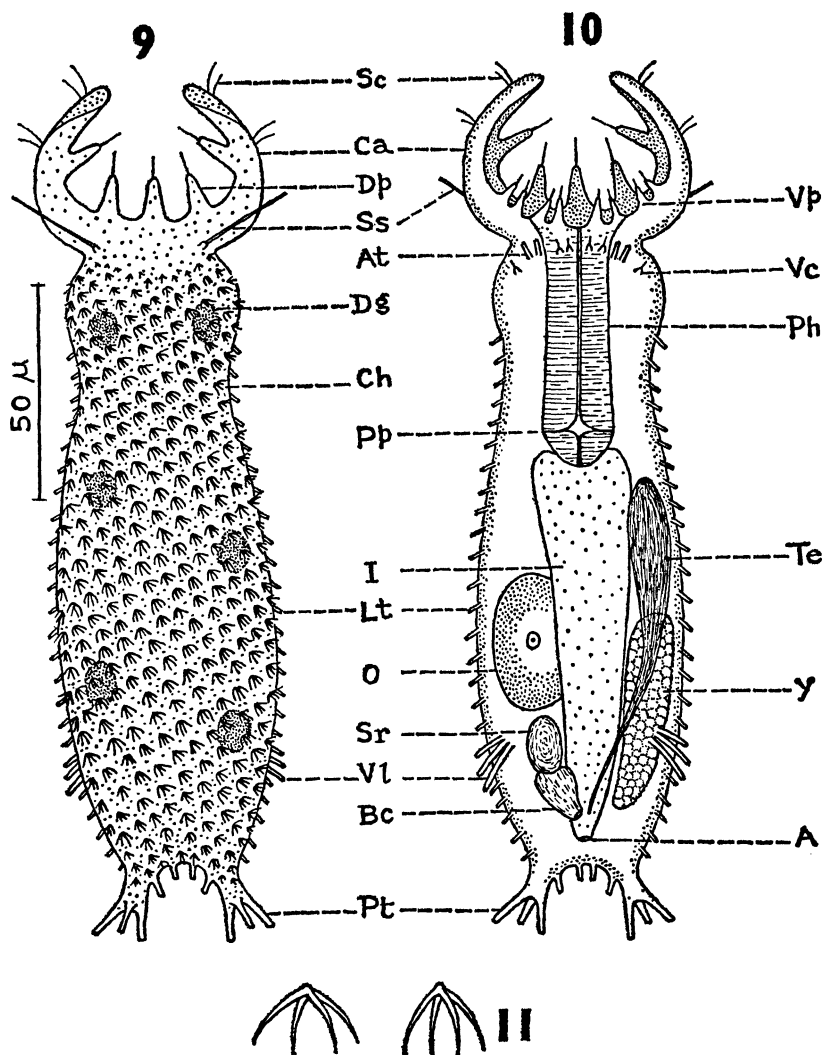


FIG. 3

*Pseudostomella indica* n. sp.

9: adult, dorsal view; 10: adult, ventral view; 11: cuticular hooks.

A - anus; At - anterior tubule; Bc - bursa copulatrix - Ca - cephalic appendage; Ch - cuticular hook; Dg - dorsal gland; Dp - dorsal papilla; I - intestine; Lt - lateral tubule; O - oocyte; Ph - pharynx; Pp - pharyngeal pore; Pt - posterior tubule; Sc - sensory cilia; Sr - seminal receptacle; Ss - sensory cirrus; Te - testis; Vc - vibratile cilium; Vl - ventro-lateral tubule; Vp - ventral papilla; Y - yolk gland.

**Type locality:**

Medium sand, depth 30 cm, intertidal zone, Waltair beach (Lat. 17° 43' 30" N and Long. 83° 20' 30"E), Andhra Pradesh, India.

**Paratype:**

One specimen 176  $\mu$  long, with the same collection data given for the holotype. Personal collection.

**Remarks:**

Three species are now assigned to the genus *Pseudostomella* Swedmark. They are *P. roscovita* Swedmark (1956), *P. malayica* Renaud-Mornant (1967) and *P. indica* n. sp. The first two species have a narrow body, with a limited number of lateral tubules showing a definite pattern of distribution, whereas the new species is stumpy and bears numerous lateral tubules, arranged more or less at regular intervals. The new species is further distinguished from the two known species by the number of sensory papillae comprising the "cephalic net"; the number and disposition of vibratile cilia on the ventral surface of head; and the presence of three pairs of ventro-lateral tubules and one pair of tubules on the posterior border between the two pedicles.

**Diagnostic features:**

Body up to 0.18 mm long. Width/length ratio about 1/4. Dorsal covering of tetrancres 2-3  $\mu$  in size, arranged in 11-13 longitudinal rows. The "cephalic net" comprises five dorsal and eight ventral sensory papillae. Three pairs of vibratile cilia occur in an arc on the ventral surface of head. Two pairs of anterior tubules, 22-24 pairs of lateral tubules and three pairs of ventro-lateral tubules present. Two tubules occur on posterior border between the two pedicles. Three pairs of dermal glands occur on the dorsal surface. Pharynx occupies 2/5 of the total gut length. Pharyngeal pores situated close to the hind end of pharynx. Testis unpaired.

**Ecology:**

*Pseudostomella indica* was occasionally encountered in medium sands, with a grain size of 300-400  $\mu$  in mean diameter and at a depth of 15-40 cm below surface, near the half-tide level. The organic content, temperature and salinity in the habitat are similar to those given for *Paraturbanella mesoptera* n. sp. The gastrotrich is agile, sensitive to disturbances and rapidly glides over the surfaces of sand grains. During its progression, the animal is frequently seen to move its prebuccal jaws alternatively, closer and farther to each other. The species is highly thigmotactic and feeds on fine particles of detritus. The two groups of ventro-lateral tubules give the animal a better grip in the unstable environment as suggested by Boaden (1965) that "possession of these extra adhesive organs is associated with life in a substrate prone to disturbance and redeposition of particles."

Among the associated interstitial fauna occurring in the habitat are the Turbellarians *Baltoplana magna* Karling and *Promesostoma* sp., the Nematodes *Desmoscolex bengalensis* Timm, *Metepsilonema* sp. and *Rhynchonema cinctum* Cobb, the Gastrotrichs *Dactylopodalia indica* Rao and Ganapati, *Tetranchyroderma swedmarki* Rao and Ganapati and *Xenotrichula velox* Remane, the Kinorhynch *Cateria gerlachi* Higgins, the Archiannelid *Diurodrilus benazzii* Gerlach, the Polychaete *Hesionides gohari* Hartmann-Schröder, the Copepods *Aregrade Stygarctus bradypus* Schulz and the Halacarid *Halacarus ano nopontia indica* Rao and *Sewellina reductus* Krishnaswamy, the Tardigrade *Stygarctus bradypus* Schulz and the Halacarid *Halacarus anomalus* Trouessart.

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### Summary

The paper describes three new species of interstitial Gastrotrichs of the order Macrodasyoidea, collected in winter 1968 from the intertidal sands on Andhra coast (Bay of Bengal). They are *Macrodasys hexadactylus* n. sp., *Paraturbanella mesoptera* n. sp., and *Pseudostomella indica* n. sp. The distribution of these forms in relation to the nature of the substratum, has also been reported.

### Zusammenfassung

Drei neue Gastrotricha der Küste von Andhra, im Golf von Bengali.

Der Autor beschreibt drei neue Arten von interstitiellen Gastrotricha Macrodasyoidea, die im Winter 1968 in den Gezeitensanden der Küste von Andhra (Golf von Bengali) gesammelt wurden: *Macrodasys hexadactylus* n. sp., *Paraturbanella mesoptera* n. sp. und *Pseudostomella indica* n. sp. Die Verbreitung dieser Arten in Bezug auf die Natur des Substrats ist ebenfalls untersucht worden.

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