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Inland-water *Gastrotricha* from Brazil

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[With 1 map, 131 figures and 69 tables]

Abstract. 59 species are described from inland waters, mangrove and Amazonian estuary in Brazil, including 26 new species and two new subspecies. Three new genera and a new subgenus are established for some new species. Sixteen new species and two new genera belong to the family *Chaetonotidae*, eight new species, a new genus and a new subgenus to the *Dasydytidae* and two new species to the *Neogosseidae*. The division of the family *Chaetonotidae* into two subfamilies, viz. *Chaetonotinae* and *Undulinae*, is introduced to include new semipelagic Amazonian genus *Undula* in the latter. New genus *Lepidochaetus* (*Chaetonotinae*) is established to group new and previously-known species. The system of the family *Dasydytidae* is modified with establishing new genus *Ornamentula* for a new species and new subgenus *Dasydytes* (*Prodasydytes*) for four new species, and with elevating previous subgenera *Setopus*, *Haltidytes* and *Anacanthoderma* to the generic level. Phylogeny of the *Dasydytidae* is discussed and new morphological terminology is established. Diagnoses of the families *Chaetonotidae*, *Dasydytidae* and *Neogosseidae* as well as all generic diagnoses in two latter families are emended on the basis of new morphological data. Habitat preference for Brazilian species is summarized. A zoogeographic discussion is included, basing mainly on comparison with European fauna.

INTRODUCTION

The inland-water *Gastrotricha* of the South America have been poorly known in comparison with those of Europe, North America and Asia. The first study of gastrotrichs on this continent was that of DADAY (1905) in Paraguay. It resulted in describing, among others, of two new species (i. e. *Chaetonotus pusillus* and *Ch. dubius*) which have been found in borderland of Bolivia and Brazil. MURRAY (1913) recorded three species from Rio de Janeiro, viz. *Polymerurus* sp. [reported as *Chaetonotus ? entzi* (DADAY)], *Chaetonotus ? heideri* BREHM [reported as *Ch.* sp. (p. 277, fig. 34)] and *Chaetonotus* sp. (p. 226, fig. 30). Further research of South American gastrotrichs was conducted by CORDERO (1918) in Uruguay as well as GROSSO (1973a, 1973b, 1975, 1976, 1982) and GROSSO and DRAHG (1983, 1984, 1986) in Argentina. All these works have provided data on the occurrence of 31 identified species and 10 genera.

Most of the above findings dealt with the fauna of temperate zone, and only the observations by DADAY were from tropical regions. Besides, the tropical fauna of *Gastrotricha* is extremely poorly known throughout the world. Only the papers by DADAY (1910) and BEAUCHAMP (1932) on the African fauna, that by DADAY (1901) from New Guinea as well as those by ANNANDALE (1908), NAIDU (1962), VISVESVARA (1964 and 1965), KAMESWARA RAO and CHANDRA MOHAN (1977) and SHARMA (1980) from India may be listed here. Only 37 species of *Gastrotricha* representing 7 genera and 3 families have been found in the intertropical zone throughout the world so far, of 234 species belonging to 19 genera and 5 families described from the inland waters of the world.

The aim of the present paper is to describe the inland-water fauna of *Gastrotricha* found in diverse regions and environments of Brazil during the study carried out by the author in 1984—85. Two new freshwater psammic species, both belonging to new genera, i. e. *Redudasys fornerise* (*Macrodasyida*, incertae sedis) and *Arenotus strixinoi* (*Chaetonotida*, *Chaetonotidae*) were already described separately (KISIELEWSKI 1987).

The paper includes descriptions of 59 species which belong to 15 genera and three families (*Chaetonotidae*, *Neogosseidae* and *Dasydytidae*). Of that number, 24 species were known previously and then recognized in Brazil without doubt, further 7 were considered close to previously known, whereas 2 subspecies and 26 species are described as new taxa. *Undula paraënsis* gen. et sp. nov. shows affinity with the family *Chaetonotidae*, it represents however a distinct radiation toward the semipelagic mode of life. A set of peculiar features of *Undula* justifies establishment of a separate subfamily, i. e. *Undulinae*. All the genera of *Chaeteonotidae* known so far were assembled in newly-created subfamily *Chaetonotinae*. Moreover, the new genus of *Chaetonotinae* recently-described from Brazil, i. e. *Arenotus* KISIELEWSKI, 1987, exhibits cuticular covering type unknown within the family. Therefore, the diagnosis of *Chaetonotidae* is emended in the present paper to include the above taxa. The discovery of *Lepidochaetus brasilense* sp. nov. has made it possible to understand the relationships between some older evolutionary lines of *Chaetonotinae*, which has resulted in establishing the *Lepidochaetus* gen. nov. Like in the case of the family *Chaetonotidae*, the diagnoses of the *Neogosseidae* and *Dasydytidae* are emended since new important morphological characters have been discovered both in the *Neogossea* and *Kijanebalola* (*Neogosseidae*) and among diverse lines of *Dasydytidae*. Basing mainly on well-developed cuticular armature of some new species, phylogenic relationships within the *Dasydytidae* are discussed and new division of the family into six genera, including unknown so far genus *Ornamentula*, is postulated.

MATERIAL AND METHODS

The study was carried out in different regions of the state São Paulo since June 1984 to January 1985 with exception of two weeks on the turn of October 1984 when the research was continued in the state Mato Grosso do Sul, the region of Corumbá. From January to May 1985, i. e. during the rainy season, the study was conducted on the state of Pará (Amazonia), the region of Belém. The stations examined (Map 1) are as follows (number of species given includes also taxa omitted in the paper as insufficiently studied).

A. The state of São Paulo (marked as "SP" wherever the material of particular species is presented)
   a. City of São Paulo, Cidade Universitária
      1. The largest pond at the campus. Eutrophic, water surface free, shores with rush vegetation, 1 sample, 4 species of *Gastrotricha*.
      2. The pond called "the Japanese lake" at the botanical garden. Eutrophic, thick shore vegetation, including *Sphagnum* sp. 3 samples, 10 species.
      3. A concrete-made reservoir at the Department of Zoology. Thick floating vegetation consisting mainly of *Salvinia natans*. 2 samples, 5 species.
   b. 4. Represa Billings. Large dam reservoir situated 16—35 km S of São Paulo city center. The sampling station was located on the CETESP experimental area, where a thick vegetation of *Pistia stratiotes* and *Eichhornia crossipes* occurred. 6 samples, 22 species.
   c. The region of town São Carlos, about 210 km NW of São Paulo city. Subtropical zone with a natural vegetation of the savanna-type ("cerrado").
      5. A pond at the University campus. Samples taken from a peaty shore. 2 samples, 8 species.
      6. Dam reservoir Represa do Lobo, about 16 km S of the town São Carlos. For more details on the reservoir see KISIELEWSKI (1987). 12 samples, 17 species.
      7. Natural pond Quinta da Felicidade. Rush vegetation with *Typha* sp. and, locally, *Sphagnum* bog. 3 samples, 4 species.

Map. 1. Distribution of localities studied.

8. Pond near Fazenda do Urso, region of Valparaiso. The pond with sandy shores, bordering on the savanna. 1 sample, 5 species.
9. Pond near Fazenda Canchim. Situated in the forest; surface vegetation of *Nymphaeaceae*. 1 sample, 5 species.

d. The Juréia Ecological Reserve. Situated about 210 km SW of São Paulo city at the tropical rain forest of the subatlantic type. The area includes Precambrian mountains which border on the sea. Rivers show well-developed mangrove zones. For more details see POR and IMPERATRIZ-FONSECA (1984).

10. Rio Guaraú, the mouth region. Typical mangrove with *Rhizophora mangle*. 2 samples, 3 species.
11. Forest near to the village Guaraú. The sample taken from *Bromeliaceae* growing up to 1 m high. 1 sample, 1 species.
12. River Ribeirão Casqueiro, a left tributary of Canela that is the left branch of Rio Una. Banks with *Cyperaceae*, water surface with *Eichhornia* sp. and *Salvinia natans*. 3 samples, 12 species.
13. Rio Verde, the mouth region. Mangrove formation with *Rhizophora mangle*. 1 sample, 2 species.
14. Atlantic coast at the Rio Verde mouth, near to dwelling-houses. *Bromeliaceae* growing on the sand. 1 sample, 4 species.
15. Two right tributaries of Rio Verde, above the mangrove zone and the Ecological Station. 2 samples, 4 species.
16. The forest at different places. Rain puddles. 2 samples, 7 species.

B. The state Mato Grosso do Sul (hereafter referred to as "MS"), the region of town Corumbá. Marshes called "Pantanal Matogrossense", being annually inundated with the Rio Paraguay and then partially drying out. The sampling period just preceded overflow.

17. A channel located several km W of the town, near to the boundary between Brazil and Bolivia. Banks with grass vegetation. 1 sample, 10 species.
18. A small astatic pond located about 15 km E of the town. Thick surface vegetation of *Salvinia natans* and *Eichhornia* sp. as well as sparser one of *Pistia stratiotes;* shores with *Cyperaceae*. 2 samples, 13 species.
19. A pond in the region Nhecolândia, Fazenda Nhumirim. A permanent highly eutrophic pond, thickly grown with *Salvinia natans*. 1 sample, 3 species.
20. Two lakes on the region Nhecolândia, Fazenda Nhumirim. Relict salt water bodies. 3 samples, 1 species.

C. The state Pará (hereafter referred to as "PA"). The sampling area was placed within the tropical zone, on the eastern portion of the Amazonian delta and was mostly overgrown with Amazonian rain forest.

a. City of Belém.

21. A reservoir at the park of the Museu Paraense Emilio Goeldi (MPEG). Floating vegetation with *Eichhornia* sp. 1 sample, 2 species.
22. A pond situated between city center and the campus of MPEG, on left side of the road. Eutrophic water body having its shores overgrown with rush vegetation and the water surface covered with duckweed. 1 sample, 1 species.
23. A pond situated at the entrance to the campus of MPEG, on left side. Small astatic water body showing diverse vascular vegetation. 4 samples, 8 species.
24. Flood waters near to the campus of MPEG, on the opposite side of the road. Rich vascular vegetation, water surface entirely covered with duckweed. 3 samples, 4 species.
25. The pond naer Faculdade de Ciência Agraria do Pará (FCAP). Large water body with diverse vascular vegetation. Water surface partly free, but in some places thickly covered with *Salvinia natans*. The majority of samples taken at the road border. 13 samples, 22 species.

b. The region of Belém.

26. Flood waters at the road Coqueiro, between roads from Belém to Icoaraci and BR 316. Palm and rush vegetation. 1 sample, 2 species.
27. A small river (Igarape) da Barragem. Minicipio de Benevides, Fazenda Morelândia. Slow-flowing water with *Nymphaeaceae*. 1 sample, 6 species.
28. A small river in Municipio de Benevides, near the villages Benefica and Muruni. Slow-flowing water with *Nymphaeaceae* and *Salvinia natans*. 5 samples, 7 species.
29. Rio Apeu, Municipio de Castanhal, Fazenda Boa Vista. Slowly flowing water with *Nymphaeaceae* and *Cyperaceae*. 2 samples, 4 species.

c. 30. The eastern part of Amazon estuary. Baia de Marajó, the beach (Praia) do Trapiche at Mosqueiro village, the right sandy bank. The water was completely fresh during the sampling period, however, the salinity may reach 3 per mille or even more occasionally (M. Leal CARVALHO — pers. comm.). 5 samples, 3 species.

A total of 86 samples have been taken from 30 stations.

The richness of *Gastrotricha* species and studying exclusively live material caused me to limit the study to some selected taxa. It was in particular the case during two-week stay in the Mato Grosso and four-month study in the Amazonia. At the last place, I have decided to almost abandon studies of *Chaetonotinae* since highly diversified fauna of *Dasydytidae* and *Neogosseidae* seemed to be of greater phylogenetic interest. The above reasons have caused the common cosmopolitan species to be usually studied on the basis of few specimens. Many new species that I had not studied enough are excluded from the paper or just mentioned.

The samples, sometimes consisting of several subsamples, were taken by hand to small bags 0.5—1 dcm^3 of volume. A substratum was collected usually near the shore and only occasionally far from it, using a boat, never from a bottom being deeper than 1 m. It consisted mainly of a detritus which was collected from a bottom sediment, decaying leaves and root systems of floating vascular plants. Also water accumulating within the leaf rosettes of *Bromeliaceae* and sand were sampled. The samples were examined at the earliest possible time, starting 0.5—24 hours after collecting and finishing maximum in five days. The gastrotrichs were selected by means of a dissecting microscope and then examined alive under a microscope using bright field optics, usually after narcotizing them with crystalline novocaine. Also drawings were made and measurements taken from living animals. All the type specimens and some further individuals have been fixed in 4% formalin neutral and salt, prior to mounting them in 1:2 10% formalin-glyceryn and sealing with glyceel. All the mounted specimens have been examined again under the Nomarski differential interference contrast microscope. Some of them have been also used for taking microphotographs and supplementary measurements of cuticular armature, using the latter equipment.

In the present paper, the way of measuring morphometrical features in *Chaetonotidae* is arranged as described in the introduction to this family and shown in Fig. 2. Many such characters are measured in the same way in *Neogosseidae* and *Dasydytidae*. As far as the last family is concerned, a quite new system of spination pattern description is proposed as presented in the introduction to that family and Fig. 107.

Abbreviations used (for abbreviations of metrical parameters as applied in Figs 2—4 see introduction to the *Chaetonotidae*):

ac — anterior ciliary area separated from main ventral series;
al — anterolateral tuft of cephalic cilia;
an — large anterior cephalic spined scales;
at — naked portion of adhesive tube;
ba — anterior interrupted band of ventral cephalic cilia;
bb — antero-trunk sensory bristle;
bc — cephalic dorsal sensory bristle;
bn — neck dorsal sensory bristle;
bp — posterior interrupted band of ventral cephalic cilia;
br — neck "brush" of spines;
bs — two median pharyngeal bulbs;
bt — trunk dorsal sensory bristle;
ca and cb — cephalic and neck lateral spines of *Dasydytidae* (see introduction to that family);
ce — cephalion;
ci — limit of main paired ventral ciliary band;
ck — large cephalic keeled scales;
cl — club-shaped modified spine;

cp — caudal protuberance;
cs — longer spines covering cilia band;
ct — cephalic cilia tuft (tufts);
d — dorsal trunk conspicuous spines of *Dasydytidae* (see introduction to that family);
db — dorsal band of cephalic cilia;
dk — double keel or double-keeled scale of the posterior dorsal sensory bristle;
dl — double-spined scale of dorsal sensory bristle;
ds — dorsal cephalic spines;
ex — external adhesive tube plate;
fo — cuticle folds;
fs — furca spine;
gu — gut;
hf — hypostomion transverse furrow;
hp — anterolateral hypostomion protuberance;
hy — hypostomion;
kd — dorsal cephalic keeled scales;
kl — lateral cephalic keeled scales;
mb — two median paired bands of trunk cilia;
mc — median tufts of ventral cephalic cilia;
me — median series of cilia;
mo — mouth ring;
ms — median group of spines;
mt — mouth ring tooth;
mv — median tuft of trunk ventral cilia;
nt — anterolateral cephalic plate;
oc — "ocellar" granule;
pa — anterior pleura;
pd — pedunculated scale;
pe — pleurae;
ph — pharynx;
pi — antero-dorsal cephalic papilla with tactile cilia;
pl — paired ventral plate neighboring hypostomion;
po — spineless polygonal scale on furca base;
pp — posterior pleura;
pr — protonefridium;
ps — posterior series of cilia;
pt — posterolateral cephalic plate;
rb — rear band of trunk cilia;
rd — three subsequent spined scales from one of dorsal longitudinal alternating rows;
ri — adhesive tube ring;
rl — three subsequent spined scales from lateral row;
ro — pharyngeal cuticular rod;
rs — one of four trunk rear narrow scales;
rv — three subsequent spined scales from last ventrolateral row;
sa — two large anteriormost paired cephalic spines;
sc — one of conspicuous postero-trunk scales;
sd — postero-dorsal spine;
sf — additional keeled furcal scale;
si — spines;
sl — lateral spine;
sn — one of ventrolateral spines;
sp — paired ventral spot of unclear function;
sr — rearmost lateral spine;
ss — ventral spined scales at td-spine level;
st — dorsal trunk spined scales;

ta-tg — trunk lateral spines of *Dasydytidae* (see introduction to this family);
th — mouth ring ventral thickening;
tn — tentacle;
to — pharyngeal tooth;
tr — triangular mouth;
ts — one of terminal spines;
tt — terminal cilia tuft;
tu — lateral tuft of caudal spines with "bisacer"-type bases;
un — undulated band of cephalic cilia;
uo — unusually placed "ocellar" granule;
v — ventral trunk conspicuous spines of *Dasydytidae* (see introduction to that family);
va — ventral field elongated plate transversal in arrangement;
vd — doubled paired terminal scales of ventral field;
ve — ventral spined scales anterior to v spines;
vi — intestinal portion of ventral field;
vk — ventral field terminal keel;
vl — ventrolateral lamella;
vp — pharyngeal portion of ventral field;
vt — ventral field terminal spined (or keeled) scale;
vs — ventral field terminal scale.

The pharynx (and usually also gut) shape is shown on drawings with dashed lines. As far as the body ciliature is concerned, it is represented in two different ways. In *Chaetonotinae,* lateral tufts of cephalic cilia are shown on every drawing, whereas the limits of ventral ciliary areas are marked with plotted points. In *Undulinae, Neogosseidae* and *Dasydytidae,* these cilia which project laterally are shown in natural way only on drawing of dorsal side, while any other cilium is marked as point. Wherever the material studied is presented, the numbers of stations, as listed above, are given in brackets. In one of drawings of each dasydytid, the spines of left body side are shown raised to facilitate designation of them.

Family ***Chaetonotidae*** ZELINKA, 1889

The morphological descriptions of members of the *Chaetonotidae* are chiefly based on characters as presented in Fig. 1, whereas the metric and meristic parameters used are taken as shown on Figs 2—4. Following measurements are taken in consideration [abbreviations used, being listed in order of presentation in the text tables (Tab. 1—54), are as given in Figs 2—4]:

lb — body length;
la — length of naked part of adhesive tube;
lp — pharynx length;
wpa — width of anterior pharynx thickening;
wpn — width of pharynx narrowing that follows anterior thickening;
wpm — width of pharynx at its middle length;
wpp — width of posterior pharynx thickening;
dm — diameter of mouth ring;
lc — cephalion length;
wc — cephalion width;
lh — hypostomion length;
lsc — scale length;
lsp — spine length;
lspb — length of basal spine part (that between lateral denticle and spine base);
lspd — length of distal spine part (that between lateral denticle and spine top).

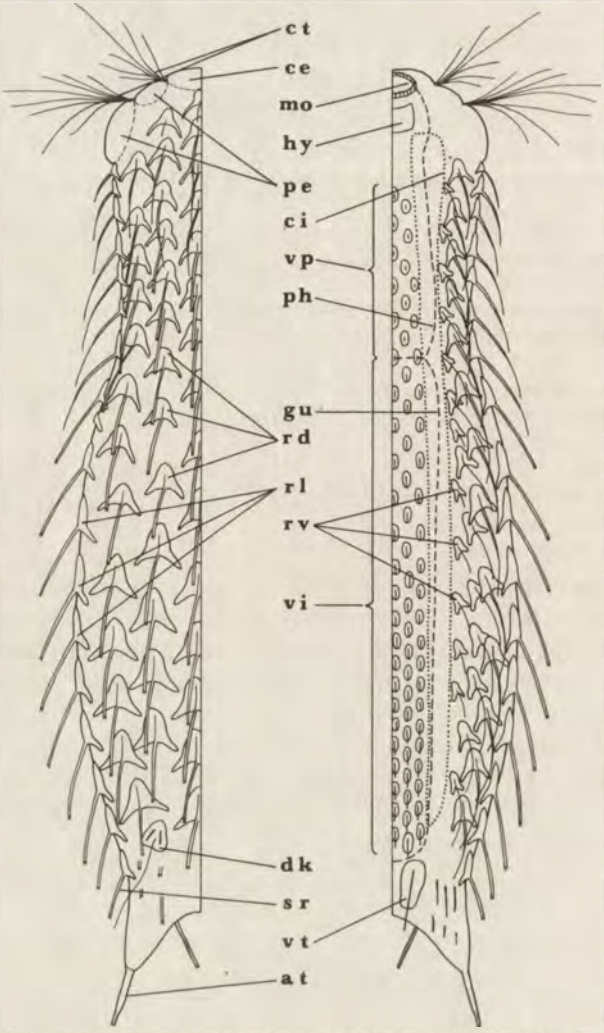


Fig. 1. Morphological characters in *Chaetonitidae*. Left part of drawing represents dorsal body side and right one ventral body side.

Moreover, two meristic features are used, viz.:

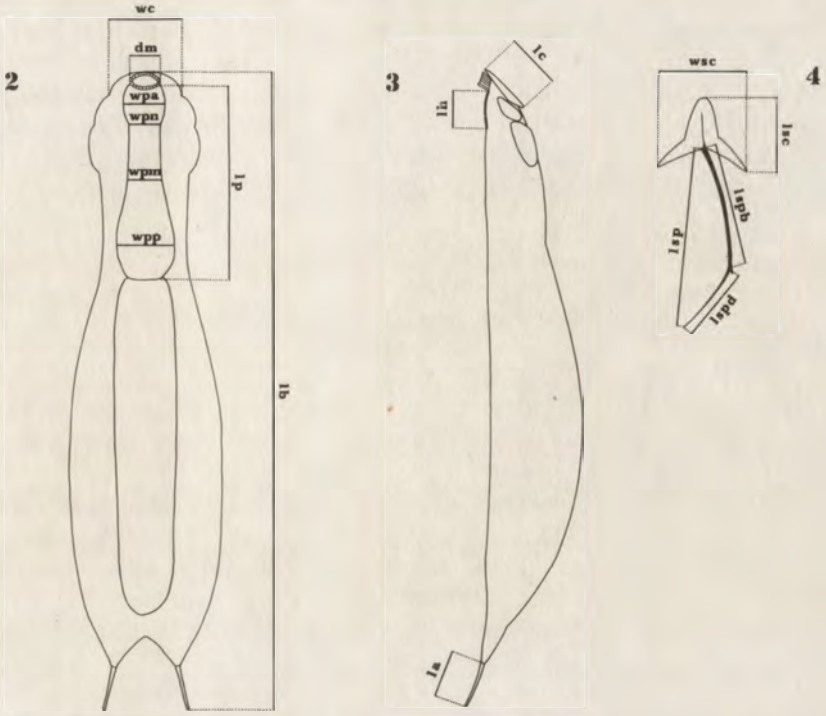
nl — total number of longitudinal alternating rows of scales, counted from the ventral ciliary band through lateral body side, dorsum, other body side to the other ciliary band;

nr — number of scales in a longitudinal row, preferably counted in the median dorsal row.

The tables of measurement given in the text include the following ratios (according to KISIELEWSKI 1981, slightly modified:

pharynx formula — four ratios that describe the pharynx shape, each of them expressed in per cent and counted as follows:

a = wpa : lp
n = wpn : lp
m = wpm : lp
p = wpp : lp;



Figs 2—4. Mode of measuring the *Chaetonotidae*. Fig. 2 — from dorsal and/or ventral body side, Fig. 3 — from lateral body side, Fig. 4 — measurements of scale and spine.

ratio of scale distribution (nl : nr, in per cent);
length ratio of terminal spines (lsp of rearmost lateral spine: lb, in per cent);

localization of spine lateral denticle ($\frac{\text{lspd}}{\text{lspd + lspb}}$, in per cent).

Emended diagnosis of the family *Chaetonotidae* ZELINKA, 1889.

Paucitubulatina having body 60—770 μm long. Head rounded, furnished dorso-frontally with cephalion, laterally with one or two pairs of pleurae and ventrally with hypostomion, or drawn out into a muzzle, in the latter case without cephalic shields. Head tentacles lacking but small cephalic papillae occasionally present. Body end in form of caudal furca that bears terminally a pair of adhesive tubes; the tubes occasionally absent. Cephalic ciliature in form of one or two paired lateral tufts, or, occasionally, a paired undulated transverse row, or (when a muzzle occurs) an ciliary area which covers the muzzle. Ventral locomotory ciliature consists of a paired band of cilia extending along the whole body and being parallel to body axis. The bands tend occasionally to be interrupted. Dorsal sensory bristles in number of 1—3 (usually 2) pairs, the rearmost ones set on scales with double keel or (rarely) double spine. Body covered, at least partly, with simple scales, spined scales, pedunculated scales or scales bearing lamellae, or, occasionally, with a layer of soft and uniform cuticle. Scales tend often to reduce their size or fuse with the basal cuticle layer. Ventral area between ciliary bands co-

vered with simple, spined or pedunculated scales, or naked, however, at least a pair of terminal scales always present. Oral opening terminal or subterminal, in form of a ring that consists of simple or articulated rods. Parthenogenic, usually (? always) with hermaphroditic phase at the end of lifespan. Eggs maturing dorsally. Freshwater, marine and brackishwater. Benthic, periphytic and (occasionally) semipelagic.

Two subfamilies: *Chaetonotinae* (type-subfamily) and *Undulinae* subfam. nov.

Subfamily ***Chaetonotinae*** ZELINKA, 1889 (stat. nov.)

Diagnosis. *Chaetonotidae* with cephalic ciliature in form of one or two paired lateral tufts, or (when the head is drawn out into a muzzle) of a ciliary area covering the muzzle. Cephalic papillae absent.

Ten genera: *Chaetonotus* EHRENBERG, 1830 (type-genus), *Ichthydium* EHRENBERG, 1830, *Aspidiophorus* VOIGT, 1902, *Heterolepidoderma* REMANE, 1927, *Polymerurus* REMANE, 1927, *Lepidodermella* BLAKE, 1933, *Halichaetonotus* REMANE, 1936, *Musellifer* HUMMON, 1969, *Arenotus* KISIELEWSKI, 1987 and *Lepidochaetus* gen. nov.

For the discussion of both subfamilies see the subsection of *Undula paraënsis* gen. et sp. nov.

Genus ***Lepidochaetus*** gen. nov.

Etymology. From the Greek "lepis" — scale and "khaite" — long hair, referring to the presence of spined scales, also a name combination of two closest genera, i. e. *Lepidodermella* and *Chaetonotus*.

Diagnosis. *Chaetonotinae* having body 166—311 μm long. Adhesive tubes nonsegmented and well-developed; caudal furca forms an acute arch. Head with large cephalion being caudally free and one to two pairs of pleurae. Hypostomion with weak transverse furrow. With a paired continuous band of ventral locomotory cilia. Body covered with round-rectangular (occasionally hexagonal?) scales having anterior edges extraverted ("double") and posterior ones with at most small depth. Some dorsal and lateral rear scales with long and almost straight spines having (occasionally lacking) lateral denticle. The rearmost lateral spines extend beyond adhesive tube tops. Cephalic, neck and mid-trunk scales with or without spines. If such spines present, they are considerably shorter than those from trunk rear. Total number of longitudinal rows of scales much lower than the number of scales in a row. Ventral field covering agrees in number and character of structures with that of dorsal and lateral body sides. Mouth ring subterminal, with nonsegmented units. Pharynx neither with conspicuous cuticular reinforcements nor teeth. Freshwater, benthic and periphytic.

Five species: *L. brasilense* sp. nov. (type-species), *L. ornatus* (DADAY, 1901) n. comb., *L. pusillus* (DADAY, 1905) n. comb., *L. zelinkai* (GRÜNSPAN, 1908) n. comb. and *L. carpaticus* (RUDESCU, 1967) n. comb. (all transfers from *Chaetonotus*).

For the discussion see subsection of *L. brasilense*.

Lepidochaetus brasilense sp. nov.

(Figs 5—8, Tab. 1)

Etymology. From the Portuguese "Brasil", referring to the country where the species has been discovered.

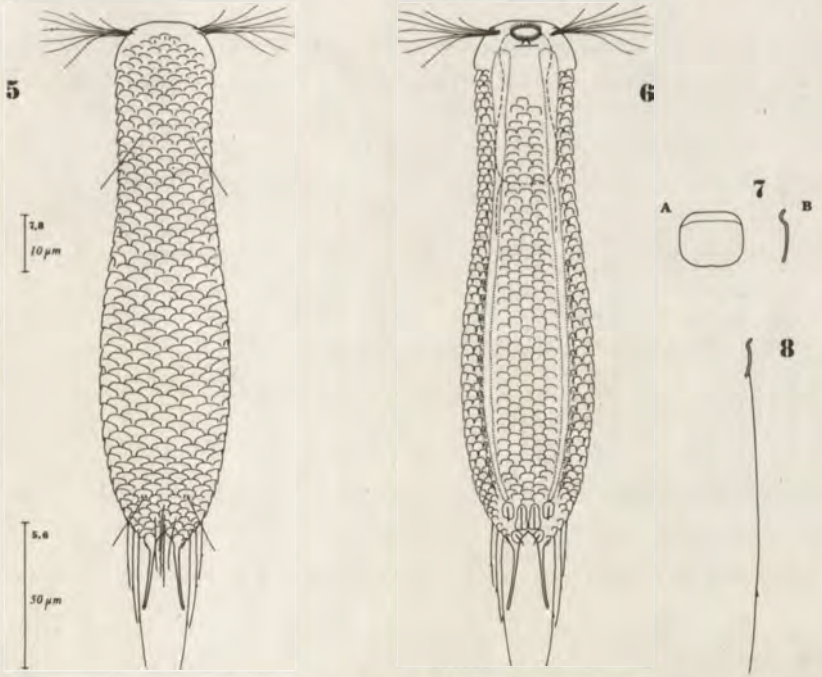
Material. 3 stations, 5 samples, 10 specimens. SP: region of São Carlos — a reservoir (6), a pond (7) and a bog (7); 9 specimens. PA: a river (27); 1 specimen. Among a silt (6, 7, 27), sand (6) and *Sphagnum* (7).

Type specimens. Holotype, a specimen collected at the station no. 6 on 25.9.1984, will be deposited in the Department of Zoology, University of São Paulo. Two paratypes that derive from the same sample are kept in the author's collection.

Diagnosis. *Lepidochaetus* with body 183—218 μm long. Head outline three-lobed. Scales unspined except for trunk rear where a dorsal group of long barbed spines and several pairs of such lateral spines occur. Scales distributed in 14—17 longitudinal alternating rows, 34—36 in each.

Description

Body is 183—218 μm long or 200—254 μm long when caudally extending spines are included. Head is three-lobed having cephalion which is frontally adjacent and caudally free. There is only a pair of tufts of cephalic cilia which originates ventrolaterally. Hypostomion shows in its posterior portion a weak transverse furrow. Adhesive tubes are thin and long. The ventral locomotory ciliation consists of a paired band that extends along the whole body. There are two paired sensory bristles, the frontal one originating between neck scales and the caudal one from double-keeled scales.



Figs 5—8. *Lepidochaetus brasilense* gen. et sp. nov. Fig. 5 — dorsal view, Fig. 6 — ventral view, Fig. 7 — mid-trunk scales (A — from above, B — lateral view), Fig. 8 — rearmost lateral spined scale, lateral view.

Dorsal and lateral body sides are covered with scales being distributed in 14—17 longitudinal alternating rows, 34—36 in each. The scales are in form of rectangles with rounded-off angles, and show "double" anterior edges. The impression of "double" edge is given by frontal scale portion which is extraverted and it seems that only this scale part adheres to basal cuticle layer. The majority of scales is simple, however, some of them, being placed dorsally and laterally at trunk rear, are provided with thin and straight barbed spines. There are usually five such spines on dorsum, being 31—54 μm in length, and three (occasionally four) pairs on lateral body sides, the first 15.5—22 μm long, the second 23—36 μm and the rearmost one 44—60 μm. The last lateral spines always extend behind the caudal tube tops. A lateral denticle is fine and placed at about ⅓ of spine length from spine end. The dorsal and lateral scales, those bearing spines in particular, tend to be lost even under normal life conditions. The ventral field ends with a paired keeled scale being about 10 μm long. Along its whole length, the field is covered with scales which are similar to those from dorsal and lateral body sides, showing also "double" anterior edges. Along intestinal field portion, they are distributed in 5 longitudinal alternating rows, 21—22 in each.

The mouth ring, being 10.5—11.5 μm in diameter, is short and has its every unit furnished with a rigid bristle. Pharynx is 48—56 μm in length. It has a weak anterior and strong posterior dilations, the former provided with a paired fine cuticular rod. Apart from parthenogenic specimens, I have found an animal having bilobed organ x and a cluster of long-rod spermatozoa (about 25 μm in length).

Discussion. *L. brasilense* gen. et sp. nov. is of special phylogenic interest. As far as the structure of cephalic, neck and mid-trunk scales is concerned, the species is reminiscent of the genus *Lepidodermella* BLAKE. Moreover, the character in common of *L. brasilense* and the genus *Lepidodermella* is the ratio of scale distribution value as low as approximately 50% (compare respective data on *L. squamata* and *L. minus* in KISIE-

Table 1. Morphometrical features of *Lepidochaetus brasilense* sp. nov.

Feature	Range	X	N
Body length (terminal spines excluded)	183—218 μm	202.7	3
Body length (terminal spines included)	200—254 μm	228.7	3
Length of adhesive tubes	24—27.5 μm	25.7	3
Pharynx length	48—56 μm	52.0	3
Pharynx formula a	33.5—38.1%	35.5	3
n	27.5—32.1%	30.0	3
m	32.3—35.2%	33.3	3
p	39.2—47.5%	43.1	3
Diameter of mouth ring	10.5—11.5 μm	11.0	3
Cephalion length	29.5 μm		1
Cephalion width	28—32.5 μm	30.7	3
Total number of longitudinal rows of scales	14—17	16.0	3
Number of scales in a single longitudinal row	34—36	35.0	3
Ratio of scale distribution	41—49%	45.7	3
Length of neck scales	7.5μm		1
Length of trunk scales	7—11.5 μm	9.3	3
Length of rearmost lateral spines	44—60 μm	52.8	4
Localization of lateral denticle on terminal spines	29—35%	32.3	3
Length ratio of terminal spines	24.0—27.5%	26.3	3

LEWSKI 1981 and the present paper). However, the spined scales of the trunk rear are identical with those of *"Chaetonotus" zelinkai* GRÜNSPAN, both in respect of their structure (compare Fig. 10) and spination pattern. Paradoxically, if caudal body portion of *L. brasilense* is shaded, there is no doubt that the gastrotrich belongs to the genus *Lepidodermella*, however, if the whole body except for caudal portion is shaded, the worm may be easily mistaken for *"Ch." zelinkai*. Similarities between *L. brasilense* and *"Ch." zelinkai* are however not restricted to trunk rear spination. The ratio of scale distribution values, which are usually much higher within the *Chaetonotus*, are very close (41—49% and 47—64% respectively). Both the species have similar habitus and body size, and their scales are identically shaped (compare Fig. 9). In both cases, the adhesive tubes are long and thin, the furca forms acute arch, cephalion is unusually large and free caudally, the hypostomion exhibits weak transverse furrow as well as the covering of ventral field corresponding in shape and number of scales within a longitudinal row with those of respective portion of dorsal body side. The only substantial differences between both species are lack of spines on scales of anterior and middle body portions in *L. brasilense* as well as the occurrence of a single pair of large pleurae instead of two pairs of smaller ones which cover the same head portion in the case of *"Ch." zelinkai*. All the above joint characters make it evident that the two species in question are closely related and should be considered congeneric.

The presence or lack of spines become less and less useful criterion in distinguishing between the genus *Chaetonotus* EHRENBERG and the other genera of *Chaetonotinae*. Spines are frequently found on caudal trunk portion in *Aspidiophorus* VOIGT, e. g. in *A. squamulosus* ROSZCZAK, 1935 — see ROSZCZAK 1969, *A. heterodermus* SAITO, 1937, *A. tetrachaetus* and *A. longichaetus* KISIELEWSKI, 1986a. The Brazilian subspecies of *Lepidodermella minus* shows terminal spines and tends to develop fine ventrolateral spines (see description of *L. m. chaetifer* ssp. nov.). Also *Heterolepidoderma majus* REMANE tends in both Brazilian and European representatives to transform ventrolateral keels into short spines (see respective subsection of the present paper). The spined scales cover almost whole body of members of the marine genus *Musellifer* HUMMON and in most species of *Polymerurus* REMANE. It seems that body covering with spined scales may be regarded as an ancestral condition in *Chaetonotidae*. This assumption is in accordance with one of sequences of cuticular structure evolution proposed by REMANE (1936, Fig. 24). However, which type of spined scales is the most primitive within *Chaetonotidae* remains an open question. As it will be shown below, the spined scales of *L. brasilense* and *"Ch." zelinkai* likely represent such an ancestral condition. This scale type is round-rectangular in shape, shows "double" anterior edge (as a result of edge extraversion) bears posteriorly long, straight and thin spine. The keelless, double-edged and more or less rectangular in shape scales occur also in the majority of species of *Lepidodermella*, in few species of *Chaetonotus*, e. g. *Ch. heideri* BREHM and *Ch. acanthodes* STOKES, and some species of *Polymerurus* (e. g. *P. nodicaudus*). Although the anterior scale extraversion was not described in this case, the spined scales of the marine genus *Musellifer* seem to be of the same kind having straight, long and thin spine and being one-lobed without posterior cutting. Phylogenic relationships between *Musellifer* and freshwater line of *Chaetonotinae* remain obscure, however, it is not the case with the other genera. Homology of spined scale structure in *"Ch." zelinkai* and *Polymerurus nodicaudus* becomes obvious after thorough comparison. Such a homology of *"Ch." ze-*

linkai and the *Lepidodermella* is proved by an intermediary position of *Lepidochaetus brasilense*. The body covering of the latter species proves that the reduction of spine on double-edged scale was possible and strongly suggests that it happened during evolution of *Lepidodermella*. Thorough morphological analysis of *L. brasilense* and *"Ch." zelinkai* reveals further interesting phylogenetic relationships. The three-lobed head with posteriorly free cephalion and hypostomion furrow of the former species corresponds well with that of all the members of *Polymerurus*. Moreover, the furca base of *Polymerurus*, being acute-arched, is more similar in shape to that of *L. brasilense* and *"Ch." zelinkai* than to any member of other genera. Although the ventral field covering in some species of *Polymerurus* differs from that of respective body portion of dorsal side (e. g. in *P. squamofurcatus*), in *P. nodicaudus* agrees in scale number and structure, like the cases of *L. brasilense* and *"Ch." zelinkai*. The spines in *Polymerurus* are often straight and thin and tend to become stronger and longer caudally, like in the compared species. The most important argument for plesiomorphic nature of above-discussed set of characters is homogeneity of cuticular structures between ventral and dorsal body sides. In most *Chaetonotinae*, the ventral field covering clearly differs from that of lateral and dorsal body sides in size and number of scales but sometimes also in kind of structures (e. g. in *Chaetonotus ? heteracanthus* — see the present paper, *Aspidiophorus ophiodermus* and many others). There is no doubt that homogeneous condition is plesiomorphic in this case. The more variable set of selecting factors was, the more probable cuticular modification towards heterogeneous condition. Therefore, the ventral field covering modified in comparison to dorsal body side in some species of *Lepidodermella* and *Polymerurus* and most species of *Chaetonotus* should be assumed apomorph. It seems that *Lepidochaetus brasilense* and *"Chaetonotus" zelinkai* represent an ancestral line which gave rise to genera *Polymerurus*, *Lepidodermella* and *Chaetonotus*. *Polymerurus* evolved then towards elongation of adhesive tubes and (partly) considerable modified cuticle (pedunculated scales, in *P. rhomboides*) or reduction of armatur (in *P. callosus*). *Lepidodermella* evolved towards reduction of spines whereas *Chaetonotus* towards variably modified spines and scales, giving probably also rise to some other genera with further modification of cuticle *(Aspidiophorus, Heterolepidoderma, Ichthydium* and *Arenotus)*.

Therefore and because of the following considerations, it seems reasonable to establish a new genus for the newly-described species and *"Chaetonotus" zelinkai*. Two alternative solutions might be to include them in the genus *Lepidodermella* or to include new Brazilian gastrotrich in the genus *Chaetonotus*. Considering homogeneity of *Lepidodermella* and clarity of its generic criteria, to incorporate wholly-spined worm in it is irrational. The other solution seems to be improper according to arguments that follow. The genus *Chaetonotus* is represented by 135 species described so far and hundreds further taxa remain surely undescribed. Moreover, it is much more diversified morphologically and adaptively than any other genus of *Chaetonotidae*. The incorporating *L. brasilense* sp. nov. in the *Chaetonotus* shall be followed by considerable widening of the generic criteria. On the contrary, the exclusion of *"Ch." zelinkai* and some close species from *Chaetonotus* makes the genus more uniform and its criteria clearer. The genus *Chaetonotus* sensu stricto comprises thus the worms having mostly the scales and always spines and adhesive tubes modified in comparison to ancestral condition as well as the ventral field covering more or less differing from that of dorsal body side.

The new genus *Lepidochaetus* includes, apart from *L. brasilense* sp. nov. and *L. zelinkai* (GRÜNSPAN, 1908) n. comb., three further species transferred from *Chaetonotus*,

viz. *L. ornatus* (DADAY, 1901) n. comb., *L. pusillus* (DADAY, 1905) n. comb. and *L. carpaticus* (RUDESCU, 1967). All the above species are characterized by similar spination pattern of trunk rear with several long and straight dorsal spines and a paired group of such lateral spines, the rearmost lateral pair (or two rearmost ones) extending beyond tops of adhesive tubes. *L. ornatus,* which has been described from New Guinea, has hexagonal (?) scales being spined along the posterior ⅓ of body length. As far as the latter character is concerned, the species is reminiscent of *L. brasilense.* However, it differs from it in scale shape and internally bent adhesive tubes as well as apparently in lacking spine lateral denticles since the author did not mention their occurrence. *L. pusillus,* which has been described from Paraguay and Brazil and found again in Africa (DADAY 1910) is close to *L. zelinkai,* however, it differs from it in showing round (?) scales and lacking spine lateral denticles. *L. carpaticus,* described from Romanian mountains, lacks pleurae, according to its author's description. However, the figure given by RUDESCU (1967, Fig. 108) suggests that a pair of large pleurae may actually occur. The scales of *L. carpaticus* are round (?), while simple spines occur along the whole body, those on the caudal trunk half becoming sparser and longer caudally.

Lepidochaetus zelinkai (GRÜNSPAN, 1908) n. comb.

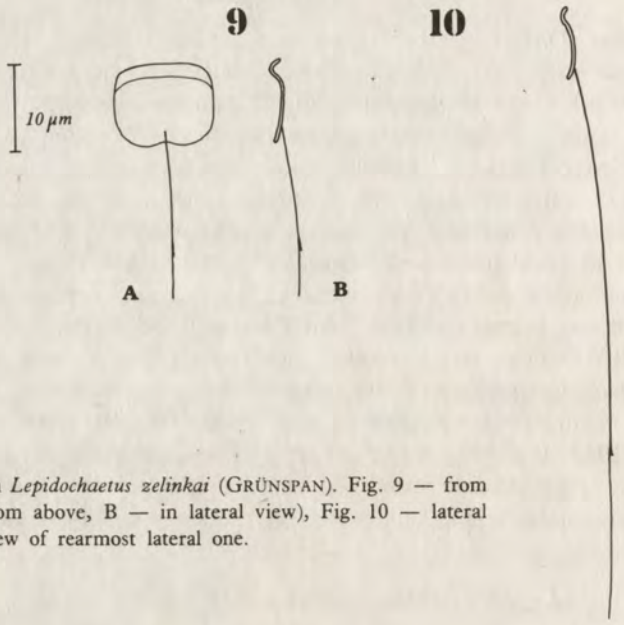
(Figs 9—10, Tab. 2)

Chaetonotus berissensis GROSSO, 1976, n. syn.

Material. 7 stations, 11 samples, 34 specimens. SP: region of São Paulo — a reservoir (4); region of São Carlos — a pond (5) and a reservoir (6); the Juréia Reserve — a river (12); 29 specimens. MS: a pond (18); 3 specimens. PA: a reservoir (21) and a river (28); 2 specimens. Among floating vegetation of *Pistia stratiotes* (4), *Eichhornia crassipes* (12, 21), *Salvinia natans* (12, 18) as well as among silt (5, 12, 18) and sand (6).

Comparative description. The animals from Brazil are in full conformity with European ones, including those known by myself from Poland (KISIELEWSKI 1981 and recent unpublished observations). In particular, they have the same habitus and scale shape as well as identical pattern of trunk rear spination, exhibiting three conspicuous lateral spines per side becoming longer and longer caudally. The spines of Brazilian and European worms are thin, straight, of similar length and finely barbed (at least on trunk), the lateral denticle being situated fairly far from spine end. It is worthy of mention, that all the scales clearly exhibit "double" anterior edges due to the edge extraversion. This feature reveals close relation of *L. zelinkai* with members of the genus *Lepidodermella* and most of all with *Lepidochaetus brasilense* sp. nov. (see preceding subsection). The observations on Brazilian specimens allow to supply the species description with details of ventral field covering. The field ends with a paired scale 13.5 μm long (in one of specimens from the region of São Paulo). The spined scales occurring along the whole field length are shaped as those from dorsal body side. On the intestinal field region, they are distributed in 5 longitudinal alternating rows, 19—20 in each, are 5.5—6 μm long and provided with 7—8 μm long spines.

GROSSO (1976) describes from Argentina the new species *Chaetonotus berissensis.* The body and scale shape as well as pattern of both dorsal and ventral body side covering well correspond to those of *L. zelinkai.* Also dimensions of both worms are similar (see Tab. 2). However, the head outline of the Argentinean gastrotrich is three-lobed, although GROSSO shows in Fig. 2 that there are actually two pleurae per side, one con-



Figs 9, 10. Spined scales in *Lepidochaetus zelinkai* (GRÜNSPAN). Fig. 9 — from mid-trunk region (A — from above, B — in lateral view), Fig. 10 — lateral view of rearmost lateral one.

Table 2. Morphometrical features of Brazilian specimens of *Lepidochaetus zelinkai* compared with data on *"Chaetonotus berissensis"* GROSSO, 1976 from Argentina and various literature data from Europe (considerably different data by PREOBRAZENSKAJA 1926 excluded)

Feature	Specimens from Brazil		*"Ch. berissensis"*	Literature data from Europe
	A specimen from São Paulo	A specimen from Belém		
Body length (terminal spines excluded)	243 μm	216 μm		166—311 μm
Total body length (terminal spines included)	271 μm	250 μm	229 μm	200—323 μm
Length of adhesive tubes	29 μm	27 μm		29—34 μm
Pharynx length	54 μm	51 μm	53 μm	38—62 μm
Pharynx formula a	33.3%	31.0%		32—37%
n	29.8%	30.0%		
m	35.0%	31.4%		32—41%
p	42.0%	37.3%		37—49%
Diameter of mouth ring	12 μm	10 μm		11—14 μm
Cephalion length	32.5 μm	29 μm		28—36 μm
Cephalion width	33 μm	32 μm		
Total number of longitudinal rows of scales	15	15		16—20
Number of scales in a single longitudinal row	30	28		30—34
Ratio of scale distribution	50.0%	53.6%		47—64%
Length of neck scales		6.7 μm		4—6.5 μm
Length of trunk scales	10.5 μm	9.5 μm		5—11.5 μm
Length of neck spines	14 μm	14 μm		8—21 μm
Length of mid-trunk spines	19—20 μm	19 μm		24—25 μm
Localization of lateral denticle of trunk spines	37%			25—40%
Length of rearmost lateral spines	66 μm	63 μm		54—86 μm
Localization of lateral denticle on terminal spines	29%			
Length ratio of terminal spines	27.2%	29.2%		23—30%

tacting the other. Consequently, the presence of one pair of cephalic cilia tufts is mentioned. Moreover, the spines, these of trunk rear included, are described as unbarbed. Although the head of *L. zelinkai* seen from above exhibits two pairs of pleurae, the edges of them are difficult to detect in lateral view. *L. zelinkai* has two pairs of cephalic cilia tufts, however, the anterior of them is small and withdrawn ventrally, which may result in misinterpreting it as a part of ventral ciliary band. The variable degree of development of spine lateral denticles in *L. zelinkai* has been described by myself on the basis of material from *Sphagnum* peat bogs in Poland (KISIELEWSKI 1981; *Chaetonotus zelinkai*). According to this evidence, all the forms of the species differing in that character have been synonymized with the type-form, including forms found to lack denticles altogether. In the quoted paper, the reported differences in degree of development of spine lateral denticles are also discussed as to some extent resulting from unequal resolution of microscopes used. Considering the identity of such character as body covering pattern in *"Ch. berissensis"* and *L. zelinkai*, the fact of finding the specimens of *L. zelinkai* well corresponding to those from Europe in Brazil as well as all above remarks, I synonymize *Chaetonotus berissensis* GROSSO, 1976 with *Lepidochaetus zelinkai* (GRÜNSPAN, 1908). It should be added, that large head in comparison to body size in GROSSO's worm suggests that the gastrotrich examined was subadult which explains why the spine denticles were not developed. Lacking or weaker than typical denticles have often been found in young specimens of denticle-bearing species of *Chaetonotus* and *Stylochaeta fusiformis* (own unpublished observations).

Genus ***Chaetonotus*** EHRENBERG, 1830

maximus Group

Chaetonotus heideri BREHM, 1917

(Tab. 3)

Chaetonotus sp.: MURRAY 1913 (p. 227, fig. 34).

Material. 5 stations, 6 samples, 7 specimens. SP: region of São Paulo — a pond (2); region of São Carlos — a pond (5), the Juréia Reserve — a river (12); 5 specimens. PA: rivers (27, 28); 2 specimens. Among silt (2, 5, 27, 28) and the floating vegetation of *Eichhornia* sp. and *Salvinia natans* (12).

Comparative description. As far as body shape and cuticular covering are concerned, the Brazilian specimens are in accordance with European members of the species. However, they have slender pharynx and fairly shorter spines, and never show tops of adhesive tubes thicker than remaining parts. The ventral field, which has not been described in detail for European animals, is covered in its intestinal portion with spined scales arranged in 7 longitudinal alternating rows. The scales are shaped as dorsal ones and are approximately 5 μm in length, whereas their spines are 8 μm long. Like in European specimens, the field terminates with a paired keeled scale having straight and very long spine. The later, measured in one of São Paulo region specimens, reached 30 μm.

Although the description of *Chaetonotus* sp. in MURRAY (1913, p. 227) is not complete, his fig. 34 suggests that the gastrotrich found in Rio de Janeiro is in fact *Ch. heideri* BREHM.

Table 3. Morphometrical features of Brazilian specimens of *Chaetonotus heideri* compared with various data from Europe

Feature	A specimen from region of São Paulo	A specimen from Belém (N = 1)	Literature data from Europe
Body length	188 μm	196 μm	106—220 μm
Length of adhesive tubes	22 μm	25 μm	21—32 μm
Pharynx length	48.5 μm	50 μm	45—56 μm
Pharynx formula a	38.8%	35.4%	43—46%
n	30.9%	34.8%	
m	36.5%	36.4%	44—46%
p	45.6%	40.0%	51—57%
Diameter of mouth ring	10 μm	11.5 μm	10.5—13 μm
Cephalion length	15 μm		
Cephalion width		20 μm	
Total number of longitudinal rows of scales	13	15	
Number of scales in a single longitudinal row	19		20
Ratio of scale distribution	68.4%		
Length of trunk scales	12 μm	10.5 μm	12 μm
Length of neck spines	23.5 μm	16.5 μm	25—33 μm
Length of trunk spines	35—37 μm	22 μm	46—68 μm
Localization of lateral denticle on trunk spines	67%	50%	
Length of rearmost lateral spines	19.5 μm	19 μm	22 μm
Length ratio of terminal spines	10.4%	9.7%	10%
Localization of lateral denticle on terminal spines	41—57%	45%	33%

Chaetonotus ?heteracanthus REMANE, 1927

(Tab. 4)

Material. 1 station, 3 samples, 4 specimens. SP: region of São Paulo — a reservoir (4). Among silt and vegetation of *Pistia stratiotes*.

Recorded for the first time from South America.

Comparative description. The specimens found were of the same habitus as those from Europe, showing, among other characters, identical trunk rear constriction and internally bent long adhesive tubes. Also the dorsal and lateral scale shapes as well as pattern of scale distribution are alike. Like in the European worms, the scales which cover dorsally posterior trunk portion are smaller than others and are provided with rudimentary spines. Few available metrical data on European material are in conformity with measurements of worms found in the Represa Billings, except for those concerning trunk and terminal spines which are fairly shorter in Brazilian gastrotrich. However, the ventral field armature in Brazilian specimens considerably differs from that of European ones. The field ends with a pair of wide and unkeeled scales, while the intestinal region and caudal part of pharyngeal region are covered with broad band of fine pedunculated scales. On the intestinal field portion, the scales are distributed in 13—18 longitudinal alternating rows, 33—34 in each and are 3—4.5 μm long. Thus, the ventral field scale distribution is similar but scale structure different from that of European animals since REMANE (1927) has described this body portion of *Ch. heteracanthus* as covered with simple scales. This difference makes it doubtful whether both forms are actually conspecific.

Table 4. Morphometrical features of *Ch. ?heteracanthus* compared with various literature data on type-form from Europe

Feature	*Ch. ?heteracanthus*			Literature data on *Ch. heteracanthus*
	Range	X	N	
Body length	158—217 μm	188.3	3	172—280 μm
Length of adhesive tubes	22.5—36.5 μm	31.8	3	
Pharynx length	38.5—43.5 μm	41.7	3	
Pharynx formula a	38.4—41.4%	39.6	3	
n	29.1—34.9%	32.1	3	
m	29.1—34.9%	32.2	3	
p	36.0—47.8%	41.2	3	
Diameter of mouth ring	8—9 μm	8.5	3	
Cephalion length	18 μm		1	
Cephalion width	12.5—15.5 μm	14.3	3	
Total number of longitudinal rows of scales	13		2	
Number of scales in a single logitudinal row	19		1	
Ratio of scale distribution	68.4%		1	
Length of trunk scales	11—13 μm		2	12 μm
Length of neck spines	17—22.5 μm	19.7	3	
Length of trunk spines	22.5—26 μm	24.1	3	28—35 μm
Length of rearmost lateral spines	26—28 μm	27.2	3	30—34 μm
Length ratio of terminal spines	12.9—17.4%	14.7	3	

Chaetonotus oculifer KISIELEWSKI, 1981

(Tab. 5)

Material. 1 sample, 3 specimens. SP: the Juréia Reserve — in the water recipients of *Bromeliaceae* (14).

Recorded for the first time from South America.

Comparative description. The Juréia specimens were the size of smaller individuals of the species from Poland. The body appearance was similar and the "ocellar" granules, being typically located (between anterior and posterior pleurae), were observed in all specimens studied. The worms from South America and Europe have their scales identically shaped and distributed, including dorsal covering pattern of caudal furca base (two pairs of spined scales and a median unpaired scale with longer spine). However, the spines of Brazilian gastrotrichs were somewhat shorter than the shortest spines observed in Polish animals. On the mid-trunk region, there was a transverse row of spines belonging to every other longitudinal row and consisting of two different sections. Basal section was as long and thick as neighboring "normal" spines and distal one, being of similar length to basal portion, was thinner. The total length of such conspicuous spines reached 7.5 μm. The transverse "band" of spines in question has not been observed among Polish representatives of *Ch. oculifer*. It resembles most "band" spines of *Heterolepidoderma ocellatum* f. *sphagnophilum* KISIELEWSKI, 1981 and, like this form, may be bristled up. The ventral field was terminated with a pair of large keeled scales while its remaining part was covered with keeled scales similar to those observed in material from Poland. However, the scales were smaller and occurred only along posterior half of intestinal field region instead of up to middle part of pharyngeal region. These insignificant differences do not give reason to consider a separate specific status of the Brazilian form.

Table 5. Morphometrical features of Brazilian specimens of *Chaetonotus oculifer* compared with data from Europe (KISIELEWSKI 1981)

Feature	Specimens from Brazil		Literature data from Poland
	Specimen I	Specimen II	
Body length	104 μm	106 μm	97—137 μm
Length of adhesive tubes		7.5 μm	6.5—9 μm
Pharynx length	28 μm	28.5 μm	27—38 μm
Pharynx formula a		26.3%	19—30%
n		23.2%	
m		25.3%	17—30%
p		31.6%	22—36%
Diameter of mouth ring	4.5 μm	4.5 μm	4.5—5.5 μm
Cephalion length		7.5 μm	
Cephalion width	12.5 μm	10 μm	
Total number of longitudinal rows of scales		about 23	17—26
Number of scales in a row		about 24	20—24
Ratio of scale distribution		about 96%	75—124%
Length of trunk scales		4 μm	2.5—5.5 μm
Length of trunk spines		3.5 μm	4—8 μm
Length of rearmost lateral spines		3 μm	2.5—5 μm
Length ratio of terminal spines		2.8%	2—4.5%

Chaetonotus polyspinosus GREUTER, 1917

(Figs 11, 15, 19, 23, Tab. 6)

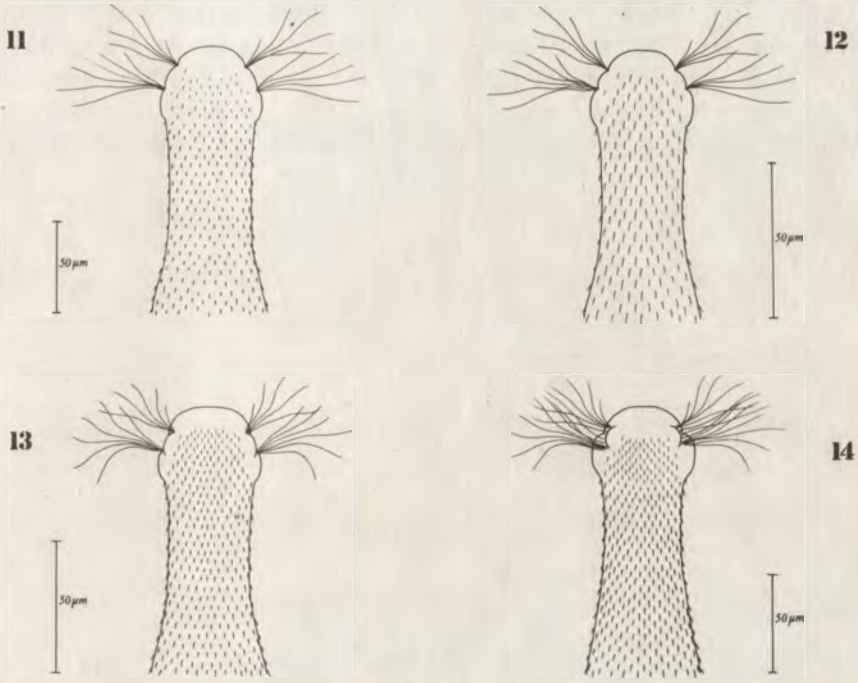
Material. 4 stations, 5 samples, 6 specimens. SP: region of São Carlos — ponds (5, 9); the Juréia Reserve — a rain puddle (16); 4 specimens. MS: a pond (18); 2 specimens. Among silt.

Recorded for the first time from South America.

Description

Body is 341 μm in length. Head is five-lobed having cephalion 21.5 μm long and 30.5 μm wide and anterior pleurae considerably longer than posterior ones. Hyposto-mion is 7 μm long, 15 μm wide and shows rostrally a weak paired tooth. Adhesive tubes are 25 μm in length.

Scales, being weakly three-lobed, are arranged in 45 longitudinal alternating rows, 38 in each. The dorsal rows are disposed slightly obliquely on posterior trunk portion. The trunk spines are 4—4.5 μm long on dorsum and 6.5 μm long on lateral body sides. The spined scales which belong to ventro-lateral longitudinal rows are of shape and size similar to those from dorsum and sides of respective body regions. The caudal furca base is provided dorsally with ten spines per side, four to five of them being thicker and longer than others, reaching length of 12.5 μm. Ventral covering of furca base consists of six pairs of smaller spined scales. The ventral field ends with 16.5 μm long paired keeled scale bearing 7 μm long spine. The intestinal field portion is covered with 7 μm long keeled scales with 2—2.5 μm long spines, distributed in 12 longitudinal alternating rows, 23 in each. The pharyngeal portion of ventral field shows similar structures, however, their number is lower and size smaller than in trunk region.



Figs 11—14. Anterior body portion of *Chaetonotus polyspinosus* and related forms, in dorsal view. Fig. 11 — type-form, Fig. 12 — *Ch.* aff. *polyspinosus* I, Fig. 13 — *Ch.* aff. *polyspinosus* II, Fig. 14 — *Ch.* aff. *polyspinosus* III.

The mouth ring is 14 µm in diameter. It is strong and furnished with bristles. Pharynx is slender, lacking anterior dilation and having weak posterior one. Anus is terminal.

Taxonomic remarks. The above-described specimens fully agree with European members of the species. Apart from this typical form, I have found in Brazil three others which differed from it in some features. For two of them, designated as *Ch.* aff. *polyspinosus* I and II, I give only characters in which they differ from the typical form; their morphometrical parameters are included in Tab. 6. The third form, designated as *Ch.* aff. *polyspinosus* III, exhibits more distinct characters and it is more probable that it represents a separate taxon. For the last form, thus, a complete description is given and its morphometrical parameters are presented in Tab. 7.

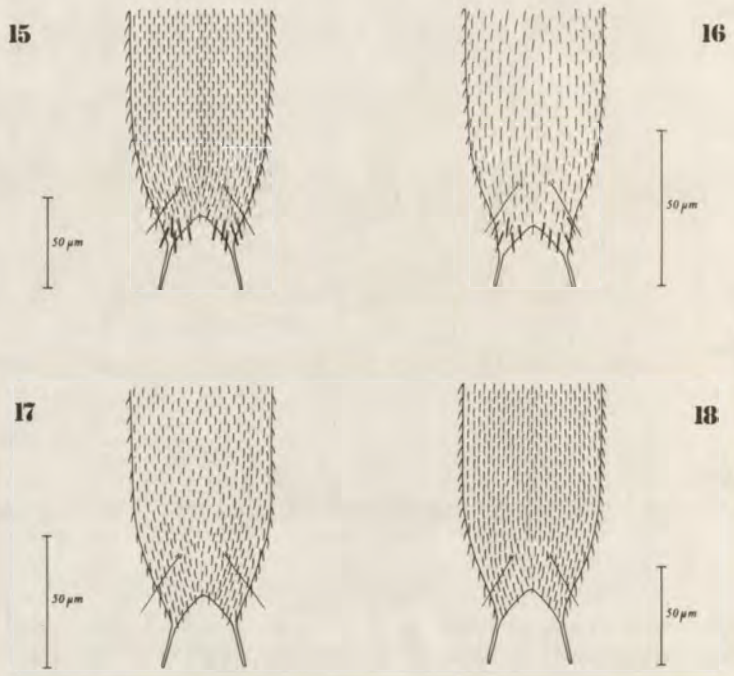
Chaetonotus aff. ***polyspinosus*** I

(Figs 12, 16, 20, 24, Tab. 6)

Material. 1 sample, 6 specimens. PA: a pond (23). Among silt.

The worm differs from the type-form from Brazil in having smaller body size, however, its body length is contained within a range reported from Europe (see KISIE-

LEWSKI 1981). The adhesive tubes are relatively shorter and pharynx thicker than in Brazilian specimens of the typical form. The number of longitudinal alternating rows of spined scales and, in particular, the number of scales in a row are lower, while the scales are considerably larger for its body size, being in addition clearly narrower and one--lobed. Lateral spines are very short reaching on trunk the length of only 1.5 μm.



Figs 15—18. Posterior body portion of *Chaetonotus polyspinosus* and related forms, in dorsal view. Fig. 15 — type-form, Fig. 16 — *Ch.* aff. *polyspinosus* I, Fig. 17 — *Ch.* aff. *polyspinosus* II, Fig. 18 — *Ch.* aff. *polyspinosus* III.

Dorsal spines are considerably longer than lateral ones (up to 5 μm), however, they are shorter and thinner than those of the typical form. Like in Brazilian specimens of the type-form, the anterior pleurae project laterally, however, in contrast to those in the gastrotrich compared, they are smaller than the posterior ones. The covering pattern of ventral field resembles that of the typical form. The intestinal field portion shows 10 longitudinal alternating rows of scales, each consisting of sixteen 6.5 μm long keeled scales with short (1.5 μm long) spines. The spines on terminal field scales are shorter than those of typical form reaching length of 1 μm. A hermaphroditic specimen had bilaterally placed clusters of thread-like sperm as well as bilobed organ x.

Chaetonotus aff. *polyspinosus* II

(Figs 13, 17, 21, 25, Tab. 6)

Material. 1 specimen. SP: region of São Carlos — a reservoir (6). Among sand.

The gastrotrich is smaller than the Brazilian member of the typical form. For its body size, the cephalion is larger, while the anterior pleurae smaller and slightly removed dorsally. Scales are shorter, one-lobed, deeply concave posteriorly and bear 3.5 μm long spines. In contrast to the type-form and like in *Ch.* aff. *polyspinosus* III, the caudal furca base does not exhibit dorsally any spines being longer and thicker than those from other body regions. The spines of that body portion are only 4 μm long. Unlike the typical form, ventral field terminates with a pair of keeled but spineless scales. The field proper is covered as in the typical *Ch. polyspinosus*, showing on its intestinal portion keeled and spined scales distributed in 14 longitudinal alternating rows, 20 in each. A hermaphroditic specimen bore a bilobed organ x as well as an unilateral cluster of thread-like sperm 38 μm in length.

Table 6. Morphometrical features of *Chaetonotus polyspinosus*, *Ch.* aff. *polyspinosus* I and *Ch.* aff. *polyspinosus* II. Measurements of all three forms taken from one specimen each.

Feature	*Ch. polyspinosus*	*Ch.* aff. *polyspinosus* I	*Ch.* aff. *polyspinosus* II
Body length	341 μm	206 μm	241 μm
Length of adhesive tubes	25 μm	12 μm	14 μm
Pharynx length	92 μm	59 μm	55 μm
Pharynx formula a	22.3%	24.9%	24.4%
n	22.3%	20.2%	23.6%
m	21.7%	20.8%	25.3%
p	25.5%	29.7%	32.4%
Diameter of mouth ring	14 μm	9 μm	8.5 μm
Cephalion length	21.5 μm	15 μm	
Cephalion width	30.5 μm	23 μm	27 μm
Total number of longitudinal rows of scales	45	39	63
Number of scales in a single longitudinal row	38	27	about 33
Ratio of scale distribution	118.4%	144.4%	about 190.9%
Length of neck scales	3.5 μm		
Length of trunk scales	7.5—8 μm	7.5 μm	4 μm
Length of neck spines	3 μm		
Length of trunk spines	4—6.5 μm	1.5 μm	3.5 μm
Maximum length of dorsal spines at furca base	12.5 μm	5 μm	4 μm

Chaetonotus aff. *polyspinosus* III

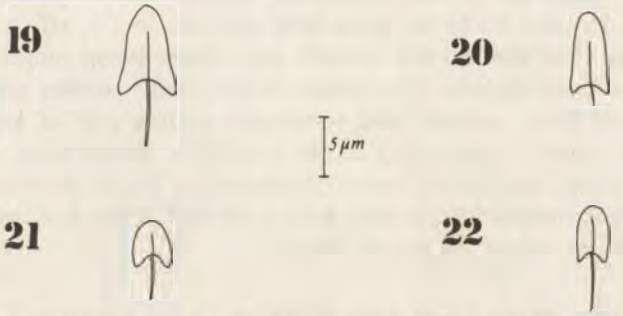
(Figs 14, 18, 22, 26, Tab. 7)

Material. 1 sample, 8 specimens. SP: region of São Carlos — a reservoir (6). Among sand.

Description

The body is slender being 294—346 μm long. Head is provided with five plates, however, only the cephalion and the posterior pleurae form its outline since the anterior

pleurae are withdrawn dorsally. The cephalion is long and unusually wide (33—37.5 μm in width). There are two pairs of tufts of cephalic tactile cilia. The ventral locomotory ciliature consists of a pair of ciliary bands which extend along the whole body, as well as of an unpaired transverse band which lies behind hypostomion and connects both main series. The adhesive tubes are thin, 19.5—25 μm long, blunt-ended and slightly bent internally.

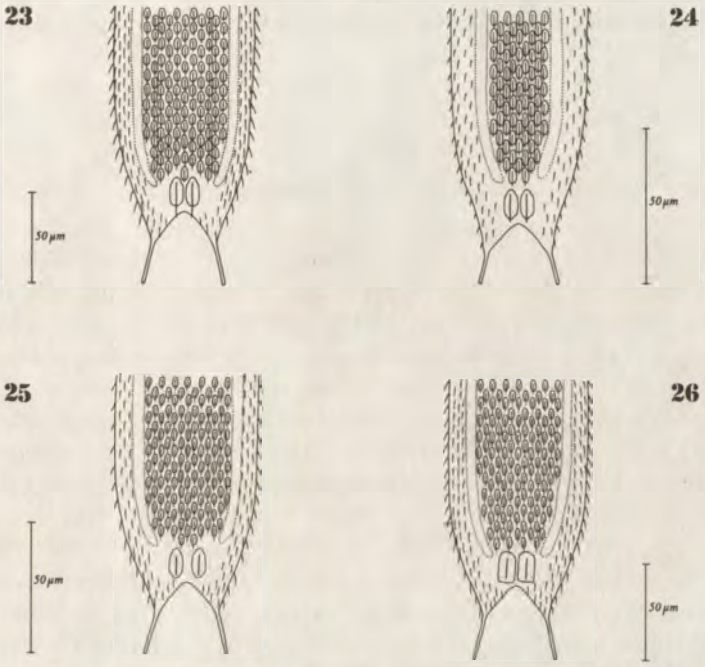


Figs 19—22. Trunk dorsal scales of *Chaetonotus polyspinosus* and related forms. Fig. 19 — type-form, Fig. 20 — *Ch.* aff. *polyspinosus* I, Fig. 21 — *Ch.* aff. *polyspinosus* II, Fig. 22 — *Ch.* aff. *polyspinosus* III.

The body exhibits a dense covering with spined scales being distributed in about 47 longitudinal alternating rows, 39 in each. The scales, being similarly shaped and sized on dorsal, lateral and ventro-lateral body sides, are rather narrow, show deeply concave posterior edges and bear long keels ending with rather thick spines. The scales are 4—5.5 μm long, while the spines are 4 μm long on neck and 4—5.5 μm long on trunk. The furca base is covered both dorsally and ventrally with spined scales of the same type as on the trunk. The dorsal furca scales are usually somewhat wider than the trunk ones while their spines are at most slightly longer (sometimes even shorter) and not thicker than trunk spines. The ventral field ends with a pair of wide keeled scales which have straight posterior edges, are devoid of spines and reach length of 12.5—16.5 μm. Both the intestinal and pharyngeal field portions are densely covered with elongate keeled and spined scales arranged in 13—15 longitudinal alternating rows.

The mouth ring is unusually wide, reaching diameter of 16.5—21 μm. Pharynx is of medium length and thickness. Only parthenogenic individuals were found.

Taxonomic remarks. The European population of *Ch. polyspinosus* shows wide variability with respect to body size, spine length and size proportion of head shields (REMANE 1927; KISIELEWSKI 1981). The last three forms, i. e. *Ch.* aff. *polyspinosus* I, II and III, differ from the Brazilian members of the type-form in the same features. However, the variable European population has a character in common, viz. the dorsal spines of furca base are always thicker and longer than those from middle of trunk. Also the presence of spines on the terminal keeled scales of ventral field seems to be a constant feature. Three Brazilian forms close to *Ch. polyspinosus* have their furca base dorsal spines thin, being in addition of a size similar to that of trunk ones in the forms II and III. The forms II and III lack spines on terminal ventral field scales. Moreover, the form II and most of all the form III, exhibit exceptionally large cephalion whereas the latter has also much wider mouth ring than the typical form. The



Figs 23—26. Posterior body portion of *Chaetonotus polyspinosus* and related forms, in ventral view. Fig. 23 — type-form, Fig. 24 — *Ch.* aff. *polyspinosus* I, Fig. 25 — *Ch.* aff. *polyspinosus* II, Fig. 26 — *Ch.* aff. *polyspinosus* III.

form III is reminiscent of *Ch. linguaeformis* VOIGT, 1902, as both gastrotrichs have similar body size and three-lobed head outline. However, the head of the Brazilian form is actually provided with five shields. Moreover, the pharynx of *Ch.* aff. *polyspinosus* III is somewhat shorter (73—82 μm compared with 96—99 μm) and spines much shorter (up to 5.5 μm compared with 19.8 μm; see VOIGT 1904).

Table 7. Morphometrical features of *Chaetonotus* aff. *polyspinosus* III

Feature	Range	X	N
Body length	294—346 μm	321.2	6
Length of adhesive tubes	19.5—25 μm	22.2	8
Pharynx length	73—82 μm	77.9	7
Diameter of mouth ring	16.5—21 μm	17.7	5
Cephalion width	33—37.5 μm	35.2	3
Total number of longitudinal rows of scales	47		1
Number of scales in a single longitudinal row	39		1
Length of trunk scales	4—5.5 μm	4.8	4
Length of neck spines	4 μm		1
Length of trunk spines	4—5.5 μm	4.9	7
Length of rearmost lateral spines	3; 5.5 μm		2
Length ratio of terminal spines	0.9; 1.7%		2

Chaetonotus aff. *silvaticus* (VARGA, 1963) n. comb.

(Tab. 8)

Aspidiophorus silvaticus VARGA, 1963.

Material. 1 sample, 2 specimens. SP: region of São Carlos — a bog (7). Among *Sphagnum*.

Recorded for the first time from South America.

Comparative description. Specimens found near São Carlos are without doubt close to those known by myself from peat bogs in Poland (KISIELEWSKI 1981). The Brazilian specimens had the same peculiar habitus, exhibiting slim body with narrow furca base, the latter forming a distinct body segment, as well as externally bent adhesive tubes. Like in specimens from Poland, the ventral field appeared to be naked. Contrary to European individuals, there occurs cephalion 15.5 μm wide and at least a pair of pleurae. However, it seems that these shields were overlooked rather than actually absent in European worms. The ventral ciliature extends along the whole body, however, it is very scarce, on the trunk in particular, where only a paired series of single cilia occurs. Body covering resembles very much that of *Aspidiophorus* VOIGT. The covering of head, seen from above as points elongated posteriorly in short lines, gives especially such an impression. Due to this similarity, the species was previously placed in the above genus. However, more thorough examination of trunk cuticular structures, in particular larger ones which cover furca base segment, reveals that the cuticle bears fine simple spines instead of pedunculated scales. Basal scales of these spines were however invisible. Therefore, the species should be affiliated with the genus *Chaetonotus* instead *Aspidiophorus*. Mouth ring is terminal, 2.5 μm in length, 6 μm in diameter and furnished with short bristles. The presence of distinct cuticular structures on furca base segment consists the most important difference between the South American and European forms, since the furca in the latter was found to be naked. This character needs reexamination in European worms. At the moment, the relationships between Brazilian and European forms of *Ch. silvaticus* remain unclear.

Table 8. Morphometrical features of a Brazilian specimen of *Chaetonotus* aff. *silvaticus* compared with literature data on type-form from Europe (VARGA 1963, KISIELEWSKI 1981)

Feature	*Ch.* aff. *silvaticus*	type-form from Europe
Body length	134 μm	85—139 μm
Head width	22.5 μm	17—23 μm
Trunk width	28 μm	16—29 μm
Length of adhesive tubes	11.5 μm	10.5—17 μm
Pharynx length	35 μm	25—39 μm
Pharynx formula a	28.3%	26—31%
n	22.0%	
m	20.3%	20-24%
p	28.3%	26—32%
Diameter of mouth ring	6 μm	4—8 μm
Cephalion width	15.5 μm	
Number of spines in a single longitudinal row	about 34	34—35

Chaetonotus similis ZELINKA, 1889

(Figs 27—30, Tab. 9)

Like European one, the Brazilian material shows wide intraspecific variability. It is likely that both Brazilian and European worms represent in fact some different but closely related species (compare REMANE 1927, KISIELEWSKI 1981). Therefore, I prefer to present the gastrotrichs found in separation to four forms, three of them having been found in the Juréia Reserve and the fourth at Belém. The form I corresponds well to that described by ZELINKA, while the forms II, III and IV differ from it in some characters, showing however similar head shape (with five clear lobes), scale shape, number and distribution, as well as presence of spine lateral denticle. Gastrotrichs which stand close to *Ch. similis* have been also found in a pond in the São Carlos region (SP: station 8) and in a pond near Corumbá (MS: station 18). However, they are not assigned to any form as they were not satisfactorily studied.

Form I (Fig. 27, Tab. 9) — type-form

Material. 1 specimen. SP: the Juréia Reserve — a river (12). Among root systems of *Eichhornia crassipes*.

Like in typical European members of *Ch. similis* and *Ch. maximus* EHRENBERG, the head is elongated. There is hypostomion having a paired tooth on its anterior edge. The dorsal and lateral spines are of medium thickness and have a lateral denticle inserted far from spine end. At the furca base dorsally, a paired thicker spine with stronger denticle

Table 9. Morphometrical features of four forms of *Ch. similis* found in Brazil

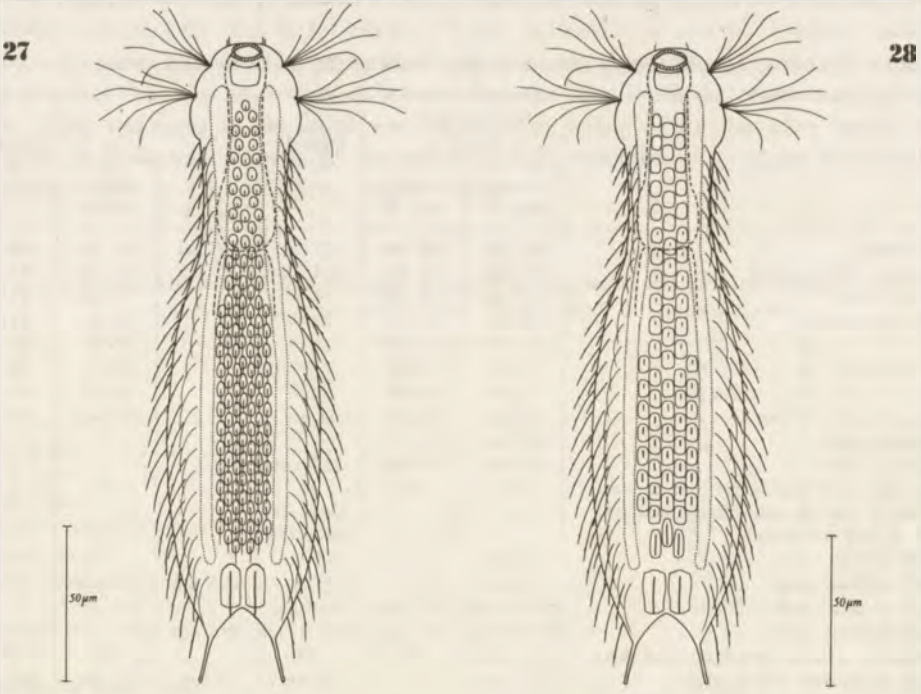
Feature	Typical form (Form I)		Form II (N=1)	Form III		Form IV (N=1)
	Specimen I	Specimen II		Specimen I	Specimen II	
Body length	203 μm	205 μm	212 μm	236 μm	243 μm	169 μm
Length of adhesive tubes	23.5 μm	21 μm	19.5 μm	27 μm	29 μm	19.5 μm
Pharynx length	63 μm	64 μm	64 μm		76 μm	53 μm
Pharynx formula a	20.5%	22.7%	22.7%		27.4%	24.2%
n	19.4%	19.5%	19.5%		23.7%	22.8%
m	21.1%	20.6%	23.0%		26.3%	28.3%
p	31.1%	25.8%	31.4%		35.8%	36.8%
Diameter of mouth ring	9.5 μm	9 μm	11 μm		13.5 μm	12 μm
Cephalion length	19.5 μm					
Cephalion width	21.5 μm	19.5 μm	23.5 μm			19.5 μm
Total number of longitudinal rows of scales	19	21	19		17	
Number of scales in a single longitudinal row			about 26			
Ratio of scale distribution			about 73%			
Length of neck scales	4.5 μm		5.5 μm			4.2 μm
Length of trunk scales	7.5 μm		9 μm	13.5 μm	13.5 μm	7.5 μm
Length of neck spines	12.5—13 μm	11.5 μm	8—9 μm		13 μm	
Length of trunk spines	16—16.5 μm	14.5 μm	12.5—15 μm	25.5 μm	22.5—27 μm	14.5—21.5 μm
Localization of lateral denticle on trunk spines	38—45%	39%	19%		13%	7%
Length of rearmost lateral spines	16.5 μm		14 μm	18 μm	18 μm	10.5 μm
Localization of lateral denticle on rearmost spines	25%		12%		8%	10%
Length ratio of terminal spines	8.1%		6.6%		7.4%	6.2%

arises. The ventro-lateral spines are at least as long as dorsal and lateral ones, however, they are thinner, probably lacking lateral denticles and usually bent. The ventral field terminates with a paired keeled scale being 14.5 μm long and furnished with 2.8 μm long spine. The intestinal field portion is covered with spined scales distributed in 8 longitudinal alternating rows, 15 in each, the spine being 3—4.5 μm long. The covering of pharyngeal field portion consists of round scales with rudimentary spines. Pharynx is very slender being thicker only posteriorly. Thus, the form I agrees well with that originally described by ZELINKA (1889) and the only differences are longer pharynx (63—64 μm compared with 50 μm) and lateral spine denticles located far from the spine end (38—45%) instead of "near to the end".

Form II (Fig. 28, Tab. 9)

Material. 1 sample, 9 specimens. SP: the Juréia Reserve — a rain puddle (16). Among mosses.

The form is similar to that described above as far as head shape, presence of postero-dorsal paired thicker spine, as well as occurrence of long and thin ventro-lateral simple spines are concerned. However, it differs from it in having dorsal and lateral spines with denticle located more distally and, most of all, in lacking spines on ventral field scales. Even the terminal field scales are spineless in spite of being keeled along their whole length. The scales of the intestinal field portion have keels restricted to anterior scale parts, the more anteriorly the scales are located, the shorter their keels. The pharyngeal field portion scales are quite naked.

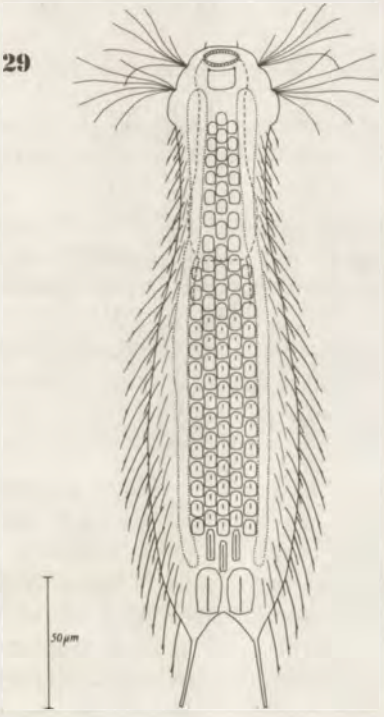


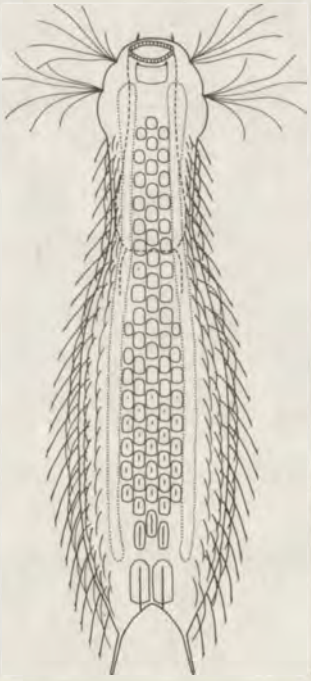
Figs 27, 28. Forms of *Chaetonotus similis*, ventral view. Fig. 27 — Form I, Fig. 28 — Form II.

Form III (Fig. 29, Tab. 9)

Material. 1 sample, 8 specimens. SP: the Juréia Reserve — a river (12). Among root systems of *Salvinia natans*.

The form is characterized by head shorter and body size fairly larger than in type-form. Dorsal and lateral spines are usually clearly longer, thicker and furnished with stronger lateral denticle, the latter being inserted more distally. Ventro-lateral spines are considerably shorter and thinner than those from dorsum and body sides. They are simple and, in contrast to the form I, straight. Like in the form II and contrary to the form I, the ventral field scales are spineless. The paired terminal field scale, being 18.5 μm in length, is keeled, similarly to three other scales which lie just rostral to it. The intestinal field portion is covered with 7 μm long scales distributed in 6 longitudinal alternating rows, 14 in each. The scales occurring on caudal field portion are keeled anteriorly whereas those from anterior part of intestinal field region are entirely naked. The pharyngeal field portion covering consists of shorter naked scales being distributed in 3—4 longitudinal alternating rows. Pharynx exhibits slight anterior and stronger posterior dilations.





Figs 29, 30. Forms of *Chaetonotus similis*, ventral view. Fig. 29 — Form III, Fig. 30 — Form IV.

Form IV (Fig. 30, Tab. 9)

Material. 1 specimen. PA: a river (28). Among root systems of *Salvinia natans*.

The body size is smaller than that of typical form. Head shape is similar to that of the forms I and II. Spines are of medium length and thickness whereas their lateral denticles are thick and inserted near spine end. The scales belonging to first paired ventral longitudinal row counting form lateral body side are furnished with thin spines being bent, longer than on dorsum (up to 21.5 μm) and probably entirely devoid of lateral denticles. The nearer to ciliary band a scale is placed, the shorter is its spine. The ventral field is like those of the forms II and III, showing its scales unspined and provided (only in caudal trunk region) with short keels. The pharynx is stronger than that of the typical form, in particular in its posterior part.

The studied specimens of all the four forms were parthenogenic.

Chaetonotus breviacanthus sp. nov.

(Figs 31—34, Tab. 10)

Etymology. From the Latin "brevis" — short and the Greek "akantha" — thorn, referring to the presence of very short spines.

Material. 1 sample, 12 specimens. SP: São Carlos town — a pond at the University campus (5). Among silt.

Type specimens. Holotype, a specimen collected on 21.8.1984, will be deposited in the Department of Zoology, University of São Paulo. Three paratypes which derive from the same sample are kept in the author's collection.

Diagnosis. *Chaetonotus* from *maximus* group having body 154—166 μm long. Head five-lobed with large cephalion. With elongate-oval keeled scales having concave posterior edges and very short (1.5—2 μm long on trunk) spines. Scales distributed in 31—35 longitudinal alternating rows, 21—25 in each. Spines borne dorsally on caudal furca base somewhat longer (up to 3 μm) than on middle of trunk. Ventral field with a pair of keeled scales caudally and many elongate-oval keeled and spined scales. Mouth ring wide (8.5—10 μm in diameter), almost terminal.

Description

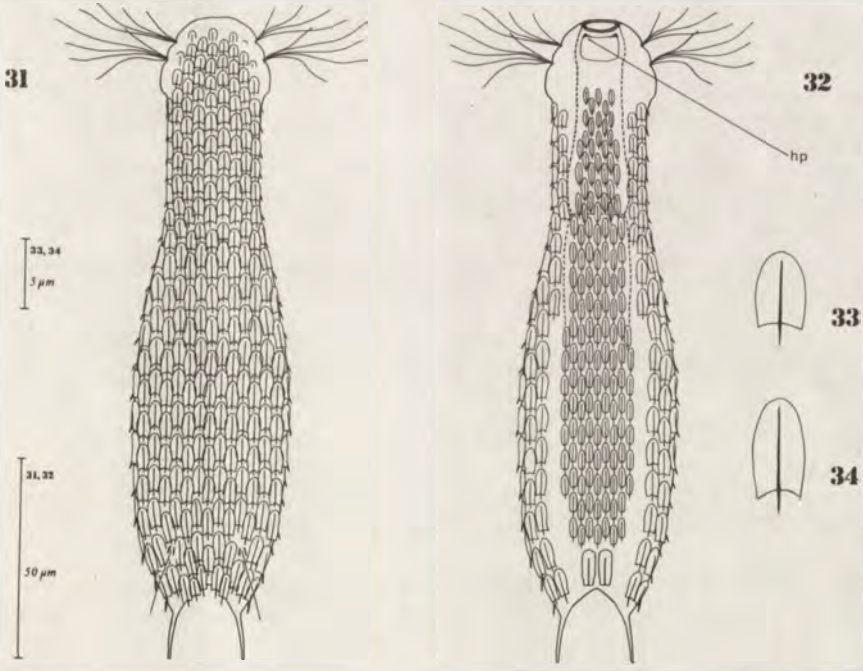
The body is 154—166 μm long and of medium width. Head outline is clearly five-lobed. Among its shields, cephalion is the largest (15—19.5 μm long and 18.5—19.5 μm wide) and entirely adheres to head, while the anterior pleurae are the smallest and usually slightly withdrawn dorsally. Two paired tufts of tactile cephalic cilia are well distinguishable. There occurs the hypostomion showing a paired anterior protuberance (Fig. 32 — hp). The adhesive tubes, being 11.5—12 μm long, are rather thin, not sharpened, and somewhat bent internally. The posterior paired sensory bristle arises from double-keeled scale. The ventral locomotory ciliation was not satisfactorily studied.

The body is covered with scales which are arranged in 31—35 longitudinal alternating rows, 21—25 in each. The scale rows are disposed parallel to one another except for caudal trunk region where their arrangement is somewhat disturbed. The scales are elongate-oval having concave posterior edges and showing along their whole length keels that are continued caudally as short spines, the latter reaching 2 μm on mid-trunk re-

gion and 3 μm at furca base. All the dorsal, lateral and ventrolateral scales are of the same shape irrespective of the body region on which they occur, reaching length of 7—8 μm and width of 3—4 μm on trunk and at furca base. Consecutive scales within a longitudinal row do not contact one another whereas those which belong to neighboring rows slightly overlap one another. The ventral field ends with a pair of wide keeled scales 10 μm long. The intestinal field portion is covered with elongate-oval 5.5 μm long keeled scales showing rudimentary (1.2—1.5 μm long) spines; the scales are arranged in 8—9 longitudinal alternating rows and differ from dorsal ones in having their posterior edges rounded. The pharyngeal field portion covering consists of keeled scales being smaller than more caudal ones.

The mouth ring is wide (8.5—10 μm in diameter) and placed almost terminally. Pharynx is slender except for its posterior portion that shows a pronounced dilation. The anteriormost gut portion in some worms was fine-grained, differing from remaining part but being reminiscent of respective gut region in *Ch. polyspinosus* GREUTER, *Heterolepidoderma majus* REMANE and *Aspidiophorus ophiodermus* BALSAMO. All the specimens studied were parthenogenic.

Taxonomic remarks. Like similar species *Ch. intermedius* sp. nov., *Ch. breviacanthus* sp. nov. shows intermediary characters between the genera *Heterolepidoderma*



Figs 31—34. *Chaetonotus breviacanthus* sp. nov. Fig. 31 — dorsal view, Fig. 32 — ventral view (ciliary bands omitted), Fig. 33 — neck spined scale, Fig. 34 — trunk spined scale.

REMANE and *Chaetonotus* EHRENBERG. Its scales are elongate-oval and keeled on their whole length which are the characters of *Heterolepidoderma*. However, the posterior scale edge is concave and terminal short spine is present as in *Chaetonotus*. *Ch. breviacanthus* differs from *Ch. intermedius* in having concave posterior scale edges and furca base spines shorter. Like the compared species, *Ch. breviacanthus* should be included in the *maximus* species group since its spines are uniformly developed along entire body, the head outline is five-lobed, and the hypostomion transverse furrow lacking. Among the species which belong to the group, it seems to be closely related also to *Ch. polyspinosus* GREUTER, *Ch. pseudopolyspinosus* sp. nov. and *Ch. ventrochaetus* sp. nov., which all show however long spines at furca base.

Table 10. Morphometrical features of *Chaetonotus breviacanthus* sp. nov.

Feature	Range	X	N
Body length	154—166 μm	159.2	6
Length of adhesive tubes	11.5—12 μm	11.7	5
Pharynx length	45—50 μm	47.2	6
Pharynx formula a	25.9—28.2%	27.3	4
n	23.1—25.1%	24.0	4
m	23.1—24.9%	23.9	4
p	31.8—35.1%	33.0	4
Diameter of mouth ring	8.5—10 μm	9.6	5
Cephalion length	15; 19.5 μm		2
Cephalion width	18.5—19.5 μm	19.2	4
Total number of longitudinal rows of scales	31; 35		2
Number of scales in a single longitudinal row	21; 25		2
Ratio of scale distribution	ca. 140%		2
Length of neck scales	4—7 μm	5.5	4
Length of trunk scales	7—8 μm	7.2	5
Length of neck spines	1.5 μm		4
Length of trunk spines	1.5—2 μm	1.6	5
Length of rearmost lateral spines	2—3 μm	2.5	3
Length ratio of terminal spines	1.3—1.9%	1.6	3

Chaetonotus furcatus sp. nov.

(Figs 35—39, Tab. 11)

Etymology. From the Latin "furca" — fork, referring to a distal spine bifurcation.

Material. 1 sample, 13 specimens. SP: the Juréia Reserve. In water recipients of the *Bromeliaceae* (14).

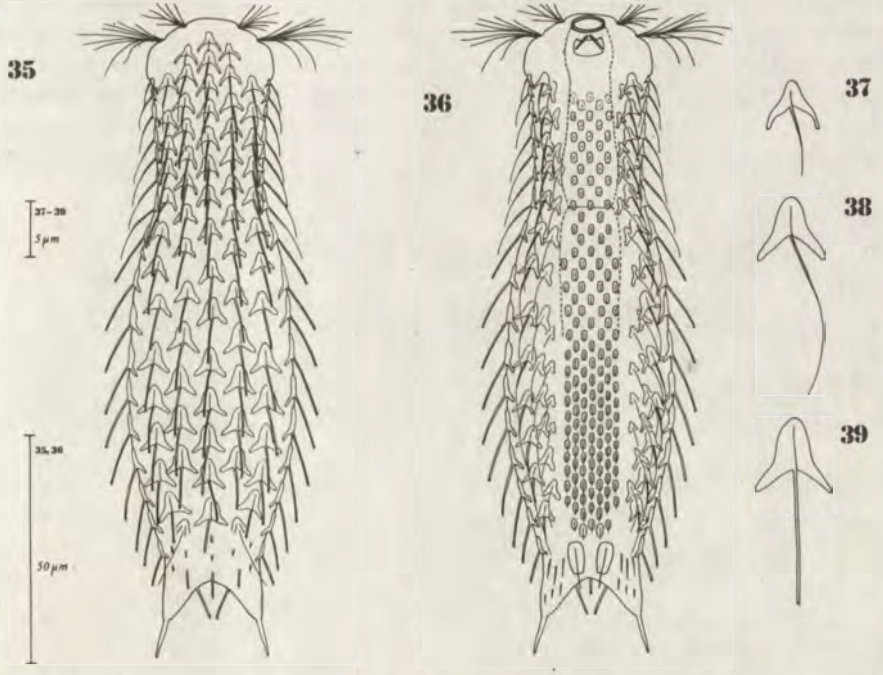
Type specimens. Holotype, a specimen collected on 30.8.1984, will be deposited in the Department of Zoology, University of São Paulo. Three paratypes that derive from the same sample are kept in the author's collection.

Diagnosis. *Chaetonotus* from *maximus* group having body 134—148 μm long. Spined tree-lobed scales distributed in 15—17 longitudinal alternating rows, 17—18 in each. Dorsal spines straight, of equal thickness on their whole length, distally furcated,

9.5—14 μm long on trunk. Ventrolateral spines long, thin and usually lacking furcation. The rearmost lateral spines shorter than those from mid-trunk. Ventral field entirely covered with fine keeled scales having rudimentary spines or lacking spines at all; a pair of large keeled and spined scales occurs at the field end. Pharynx with a pair of cuticular rods.

Description

The body, being of medium width, is 134—148 μm long. Head exhibits five distinct shields, the cephalion (10 μm long and 13 μm wide) and posterior pleurae being the largest and of similar size. The posterior cephalion portion is free. Two paired tufts of cephalic cilia are well separated from each other. There is a small hypostomion which shows anteriorly a paired fine protuberance. The neck constriction is well pronounced. The adhesive tubes are short (8.5—9.5 μm in length), straight and becoming slightly thinner and thinner distally. The ventral ciliature was not satisfactorily studied. There occurs at least the posterior paired dorsal sensory bristle which is borne on double-keeled scale.



Figs 35—39. *Chaetonotus furcatus* sp. nov. Fig. 35 — dorsal view, Fig. 36 — ventral view (ciliary bands omitted), Fig. 37 — dorsal spined scale from head, Fig. 38 — lateral spined scale from neck, Fig. 39 — dorsal spined scale from trunk.

Dorsal and lateral body sides are uniformly covered with spined scales which are arranged in 15—17 longitudinal alternating rows, 17—18 in each. All the scales are clearly three-lobed. The posterolateral lobes of cephalic scales are longer for scale size and lie farther away from each other than those from trunk scales. The spines vary in appearance along the body. The foremost scale of each longitudinal row is fine and furnished with short and thin spine. Such a scale is usually followed by two scales provided with 9.5—13 μm long spines, the latter having their proximal half straight and as thick as trunk spines while distal half is strongly bent and hairlike. All the following dorsal scales except for most caudal ones are shaped as trunk ones and bear spines which are straight, of medium length (up to 9.5—14 μm long), and without lateral denticle but with clear distal furcation. At the trunk rear, some dorsal spines are very short and devoid of furcation. Three dorsomedial spines from furca base are again furcated and of length similar to those from middle of trunk. The lateral trunk spines as well as neck spines belonging to first dorsolateral row are somewhat longer than those from dorsum. Trunk spines that form first ventrolateral row counting from body side and neck lateral spines show short and thick basal part whereas their remaining portion becomes thinner and thinner distally, is slightly bent and usually devoid of furcation. Further ventro-lateral rows, these bordering with ciliary bands in particular, consist of scales having shorter and thinner spines without furcation. Ventral side of furca base is provided with six paired spines, three more caudal of them being shorter than the others. The ventral field ends with a pair of keeled and spined scales, the scales being 6.5—7 μm and the spines 3.5—4.5 μm long. The intestinal field portion is covered with keeled and spined scales being distributed in 6—9 longitudinal alternating rows, 16—19

Table 11. Morphometrical features of *Chaetonotus furcatus* sp. nov.

Feature	Range	X	N
Body length	134—148 μm	140.8	4
Length of adhesive tubes	8.5—9.5 μm	8.8	5
Pharynx length	37.5—41 μm	38.8	4
Pharynx formula a	29.3—30.6%	29.8	3
n	21.1—22.1%	21.6	3
m	22.1—25.0%	23.9	2
p	31.7—33.3%	32.6	3
Diameter of mouth ring	6—6.5 μm	6.3	3
Cephalion length	10 μm		2
Cephalion width	13 μm		4
Total number of longitudinal rows of scales	15—17	16.0	3
Number of scales in a single longitudinal row	17—18	17.7	3
Ratio of scale distribution	88.2—94.4%	90.5	3
Length of neck scales	5 μm		1
Length of trunk scales	6.5—7 μm	6.8	3
Length of dorsal neck spines	8 μm		1
Length of lateral neck spines	14—14.5 μm		2
Length of dorsal trunk spines	9.5—14 μm	12.3	4
Length of lateral trunk spines	11—14 μm	12.7	3
Length of rearmost lateral spines	5.5—7 μm	6.3	3
Length ratio of terminal spines	3.8—5%	4.6	3

in each. The more caudal of them are 2 μm long and exhibit distinct spines, while more rostral ones bear only rudimentary process. The fine scales with rudimentary spines continue to occur also at least along posterior part of pharyngeal field portion.

Pharynx is 37.5—41 μm long. It is narrow in its median part and shows two terminal dilations, the anterior of them provided with a pair of short and thin cuticular rods. Apart from parthenogenic specimens, I have found a worm with hermaphroditic features, viz. bilobed organ x and threadlike spermatozoa.

Taxonomic remarks. *Ch. furcatus* sp. nov. is included into the *maximus* group since it shows uniform body covering with spined scales and five-lobed head outline, and lacks transverse hypostomion furrow. It resembles most of all *Ch. disiunctus* GREUTER, 1917 and *Ch. fluviatilis* BALSAMO et KISIELEWSKI, 1986, in having similar head and similar scales. However, it differs from them and all other known members of the *maximus* group in showing spines that are equally thick along their length and have distal furcation. The spines of a kind similar to those of *Ch. furcatus* have been only described in *Ch. bisacer* GREUTER, 1917, the latter species belonging to the subgenus *Ch.* (*Zonochaeta*) REMANE. However, this similarity could be identified as analogy since the spines of *Ch. furcatus* and *Ch. bisacer* arise from scales of quite different shape, and *Ch. furcatus* lacks main character of the subgenus *Zonochaeta*, viz. transverse "band" of trunk spines. Although the newly-described species is closely allied with the *maximus* group, it appears to be also related with the group *spinulosus*, which is characterized by the presence of three-lobed scales. Although dorsal spines of all the members of the *spinulosus* group are barbed, no species is known to show dorsal spines distally furcated and of equal thickness along their whole length.

Chaetonotus intermedius sp. nov.

(Figs 40—43, Tab. 12)

Etymology. From the Latin "inter" — between and "medius" — middle, referring to an intermediary taxonomic position between the genera *Chaetonotus* and *Heterolepidoderma*.

Material. 1 sample, 8 specimens. SP: the Juréia Reserve — mangrove of the Rio Guaraú (10). The salinity of water was 5 per mille when sampled. Among silt.

Type specimens. Holotype, a specimen collected on 19.7.1984, will be deposited in the Department od Zoology, University of São Paulo. Two paratypes which derive from the same sample are kept in the author's collection.

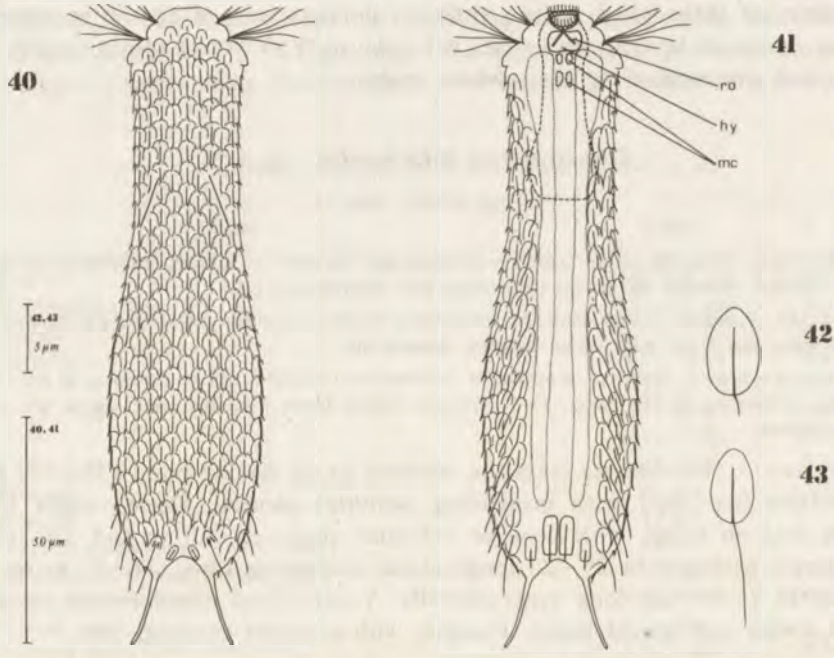
Diagnosis. *Chaetonotus* from the *maximus* group having body 131—153 μm long. Head outline five-lobed with protruding posterior pleurae. Keeled scales long-oval, 5—8 μm long on trunk, with none or indistinct posterior cutting and with short terminal spines, arranged in 25—28 longitudinal alternating rows, 24—27 in each. With spines up to 7—9.5 μm long ventrolaterally. Ventral field naked except for a pair of terminal keeled and spined scales. Pharynx with a paired cuticular rod.

Description

The body length ranges from 131—153 μm. The head is much narrower than trunk and bears very large and entirely adjacent cephalion, anterior pleurae which are placed somewhat dorsally and ather small posterior pleurae which clearly project laterally. There are two pairs of tufts of cephalic cilia. Hypostomion (Fig. 41 — hy) has neither

anterior teeth nor transverse furrow. Adhesive tubes are fairly long, thin, pointed, and bent externally. The ventral cilia bands run along the whole body and do not join anywhere, however, two paired small ciliary areas occur between them on the head (Fig. 41 — mc). There are two paired dorsal sensory bristles, the neck one inserted between scales and the trunk one on double-keeled scale.

The body is covered with keeled scales being distributed in 25—28 longitudinal alternating rows, 24—27 in each. The dorsal rows are disposed parallelly, except for posterior region, where the rows are slightly oblique and two median ones vanish. The scales, being 5—8 μm long on trunk, are long-oval and have their posterior edges either rounded-off or slightly cut. A low keel that is continued terminally as a short spine extends along posterior ¾ of scale length. The spines reach length of 1.5 μm. The last paired ventrolateral row consists of scales being (at least along caudal trunk half) of similar size and showing keels similar to those from dorsum. However, they are provided with pronounced simple spines of the length increasing from rostral to caudal and reaching 7—9.5 μm at the furca base. Some spines more caudal in position clearly project laterally. The caudal furca base bears at mid-dorsal line a pair of smaller keeled scales. The covering of ventral field is restricted to a pair of large terminal keeled scales which have usually short spine; the total scale-spine length is 10—12 μm.



Figs 40—43. *Chaetonotus intermedius* sp. nov. Fig. 40 — dorsal view, Fig. 41 — ventral view, Fig. 42 — trunk dorsal spined scale, Fig. 43 — trunk ventrolateral spined scale.

The mouth ring is nearly terminal and is 7—7.5 μm in diameter. It is a strong girdle armed with bristles, the latter being however kept inside when the mouth is inactive. The pharynx is of medium length and of peculiar shape. It begins with small but distinct bulb, passes to narrow middle region and ends with another bulb being much longer and wider than anterior one. A pair of cuticular pharyngeal rods occurs anteriorly (Fig. 41 — ro). All the specimens studied were parthenogenic.

Table 12. Morphometrical features of *Chaetonotus intermedius* sp. nov.

Feature	Range	X	N
Body length	131—153 μm	142.6	7
Length of adhesive tubes	13.5—16 μm	14.8	8
Pharynx length	38—42 μm	39.6	6
Pharynx formula a	27.4—32.1%	29.7	3
n	21.9—25.1%	23.7	3
m	23.3—27.7%	26.1	3
p	36.2—42.3%	39.3	3
Diameter of mouth ring	7—7.5 μm	7.4	4
Cephalion length	11 μm		2
Cephalion width	17 μm		1
Total number of longitudinal rows of scales	25—28	26.7	3
Number of scales in a single longitudinal row	24; 27		2
Ratio of scale distribution	100.0—104.2%		2
Length of neck scales	3.5; 4 μm		2
Length of trunk scales	5—8 μm	6.1	5
Length of rearmost lateral spines	7—9.5 μm	8.1	5
Length ratio of terminal spines	5.2—6.2%	5.8	4

Taxonomic remarks. *Ch. intermedius* sp. nov. is characterized by an interesting set of features placing it on border between the genera *Chaetonotus* and *Heterolepidoderma*. The character to link with *Heterolepidoderma* is presence of dorsal and lateral oval keeled scales with posterior edges rounded-off or at most slightly cut. Admittedly, the keels are continued as short spines, however, this condition, although rare, is known among typical members of the genus (e. g. in *H. multiseriatum* BALSAMO, 1978). It should be stressed here, that the scales of *Ch. intermedius* are larger in relation to body size and less numerous than usual amongst *Heterolepidoderma*. Moreover, the scales that belong to a paired ventro-lateral longitudinal row bear typical spines, which is clear feature linking new gastrotrich with the members of the genus *Chaetonotus*. Within the latter genus, *Ch. intermedius* should be placed in the most numerous group of species, viz. the *maximus* group. The case of *Ch. intermedius* sp. nov. proves again that phylogenetic relationship between genera *Chaetonotus* and *Heterolepidoderma* needs revision (see also discussion on *Heterolepidoderma ocellatum* f. *sphagnophilum* in KISIELEWSKI 1981 and the subsection of *H. majus* in the present paper). Therefore, the present affiliation of *Ch. intermedius* is provisional.

Chaetonotus lobo sp. nov.

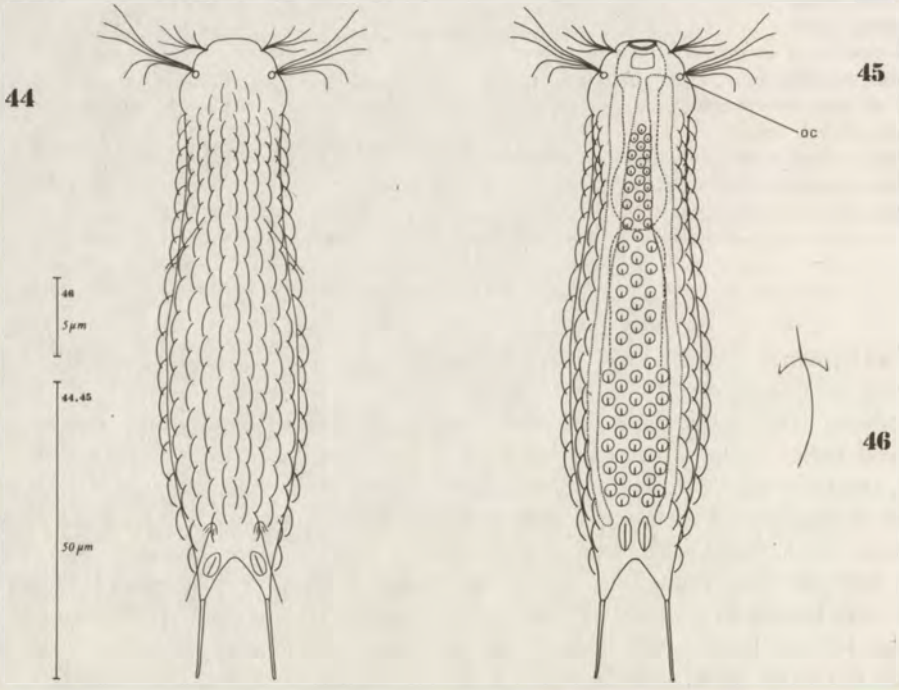
(Figs 44—46, Tab. 13)

Etymology. From the geographic name "Represa do Lobo", a reservoir where the species has been discovered.

Material. 1 sample, 9 specimens. SP: region of São Carlos — the reservoir Represa do Lobo (6). Among silt.

Type specimens. Holotype, a specimen collected on 22.8.1984, will be deposited in the Department od Zoology, University of São Paulo. Three paratypes which derive from the same sample are kept in the author's collection.

Diagnosis. *Chaetonotus* from the *maximus* group having slender body 104—113 μm in length, long adhesive tubes (11.5—14 μm) and a pair of "ocellar" granules. Scales probably one-lobed with concave posterior edges and with strongly curved simple spines (5.5—6 μm long on trunk), distributed in 17—19 longitudinal alternating rows, 15—18 in each. The rearmost lateral spines little shorter than those from mid-trunk. Whole ventral field covered with round keeled scales; a pair of larger keeled scales occurs terminally. Mouth ring almost terminal.



Figs 44—46. *Chaetonotus lobo* sp. nov. Fig. 44 — dorsal view, Fig. 45 — ventral view, Fig. 46 — discernible part of trunk spined scale.

Description

Body is slender being 104—113 μm in length. Head is elongated and covered with five distinct shields, cephalion being the largest of them (9—10 μm long and 11.5—12.5 μm wide) while the anterior pleurae the smallest. There are two pairs of well-separated tufts of cephalic cilia, the posterior ones consisting of cilia longer than those from anterior tufts. There is a small hypostomion showing a paired anterior protuberance. A large paired refracting "ocellar" granule is placed between anterior and posterior pleurae (Fig. 45 — oc). Trunk is constricted at its caudal region. The adhesive tubes are long (11.5—14 μm) and thin. They appear to be straight when observed from above, however, are in fact bent downwards. A paired band of ventral locomotory cilia extends along the whole body. There are two paired sensory bristles, the posterior of them being borne on double-keeled scale.

Dorsal and lateral body sides show uniform covering with spined scales which are arranged in 17—19 longitudinal alternating rows, 15—18 in each. Scale edges are only partly visible, however, a wide and slightly concave posterior edge suggests that the scale is one-lobed. The spines are of the same type and similar size on the whole body length and between dorsal and ventrolateral rows, except for somewhat shorter anteriormost and rearmost lateral spines. The spines are simple, rather thin and uniformly curved, so their tops almost contact cuticle. The spine length reaches 5.5—6 μm on trunk. Dorsal side of caudal trunk region does not bear spines and is presumably covered with scales whose edges are fused with basal cuticle layer. The furca base is provided dorsally with a pair of large keeled scales, while its ventral side is probably naked. The ventral field terminates with a pair of 7 μm long keeled scales. The intestinal field portion covering consists of keeled scales which are 2.5 μm in diameter, almost round, and arranged in approximately 5 longitudinal alternating rows, about 12 in each.

Table 13. Morphometrical features of *Chaetonotus lobo* sp. nov.

Feature	Range	X	N
Body length	104—113 μm	108.0	3
Length of adhesive tubes	11.5—14 μm	13.2	3
Pharynx length	27.5—32.5 μm	29.8	3
Pharynx formula a	25.5; 28.0%		2
n	18.8; 22.5%		2
m	21.2; 21.5%		2
p	31.1; 31.6%		2
Diameter of mouth ring	4—5.5 μm	4.7	3
Cephalion length	9; 10 μm		2
Cephalion width	11.5; 12.5 μm		2
Total number of longitudinal rows of scales	17—19	17.7	3
Number of scales in a single longitudinal row	15; 18		2
Ratio of scale distribution	94.4; 126.7%		2
Length of neck spines	3.5; 5 μm		2
Length of trunk spines	5.5—6 μm	5.7	3
Length of rearmost lateral spines	4.5 μm		1
Length ratio of terminal spines	4.2%		1

The scales which cover pharyngeal field portion are shaped as those from intestinal part, however, smaller (1.5 μm in diameter) and provided with shorter keels.

The mouth ring, being 4—5.5 μm in diameter, is almost terminal. Pharynx is 27.5—32.5 μm long. It is slender and shows two terminal dilations, the posterior one being stronger than the other. Only parthenogenic specimens have been collected.

Taxonomic remarks. *Ch. lobo* sp. nov. obviously belongs to the *maximus* group. Amongst 52 species hitherto known within the group, it is conspicuous in the following combination of features: small size and slender body, long adhesive tubes, presence of "ocellar" granules as well as simple and strongly curved spines.

Chaetonotus paucisquamatus sp. nov.

(Figs 47—50, Tab. 14)

Etymology. From the Latin "paucus" — few and "squama" — scale, referring to a small number of cuticular elements.

Material. 3 stations, 4 samples, 15 specimens. SP: region of São Paulo — reservoirs (3, 4); region of São Carlos — a pond (9). Among silt (3, 9) and aquatic vegetation (3, 4), *Pistia stratiotes* among others.

Type specimens. Holotype, a specimen collected on 28.6.1984 from the reservoir at the Department of Zoology, University of São Paulo, will be deposited in the same Department. Three paratypes that derive from the same sample are kept in the author's collection.

Diagnosis. *Chaetonotus* from *maximus* group having slender body 121—154 μm in length. Total number of longitudinal alternating rows of spined scales only nine; the number of scales in a row also nine, including only four along trunk. Scales large, one--lobed, with concave posterior edges. Trunk spines long (23—35 μm), singly barbed or barbed and distally furcated. Rearmost lateral spines shorter than those from mid-trunk. Adhesive tubes very long and thin, resembling spines. Ventral field naked or with several smooth scales caudally. Mouth ring long and narrow. "Semipelagic".

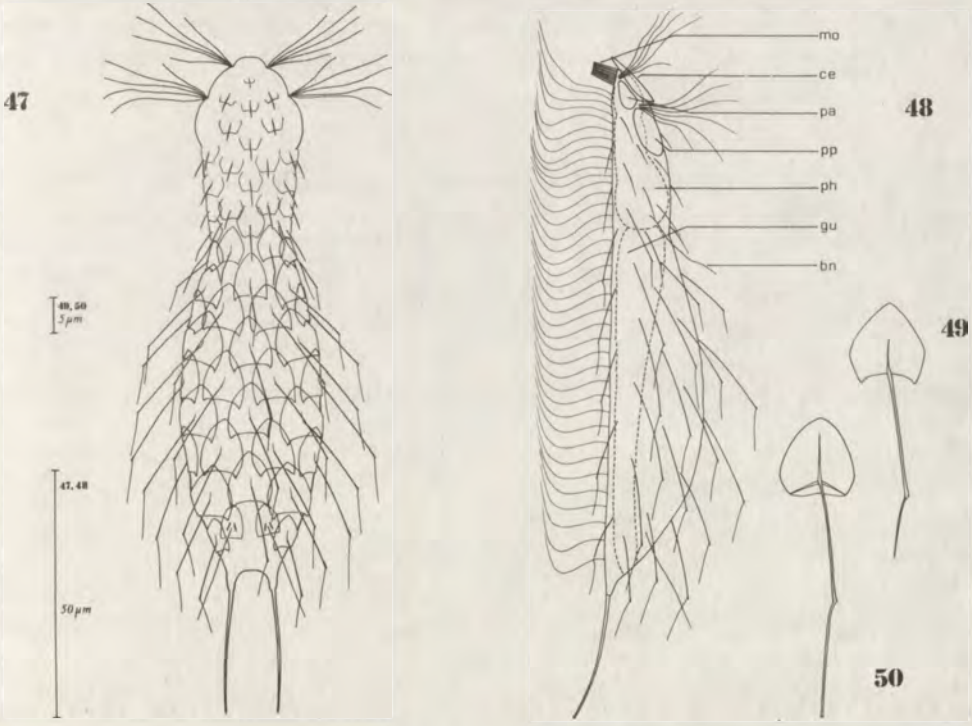
The specimens found in the São Paulo region were somewhat different from those collected near São Carlos, so they will be described separately.

Description of the São Paulo form (the type-form).

The animal viewed under lower magnification resembles a member of *Dasydytidae* rather than *Chaetonotidae* as it is "semipelagic", swimming over mud with raised trunk spines and doing various evolutions in water. The slender body is 121—141 μm long. Head is elongated and covered with cephalion that is narrow and rather short as well as two pairs of long pleurae. Two paired tufts of cephalic cilia are set far from each other. The cephalic "ocellar" granules are lacking. Body is clearly constricted at neck and posterior trunk regions. The furca base is short and narrow bearing unusually long adhesive tubes, the latter being very thin, tapered as well as bent downward and slightly inward. The tubes are almost as thin as trunk spines being in addition of similar length (25—27 μm compared with 23—27μm). Like those of spines, their form and function are apparently adapted to "semipelagic" mode of live since no adhesion of them has been observed. The locomotory ventral cilia are long (about 22 μm) and occur along the whole body being arranged in a paired band. Subsequent transverse cilia rows that form a band are lying on trunk far from one another. There are two pairs of long dorsal sensory bristles.

The body covering consists of spined scales being less numerous than in any scale-bearing *Chaetonotidae*. There are only nine longitudinal alternating rows of scales including five dorsal, two lateral and two ventrolateral ones. The median dorsal row consists also of nine scales. Five anterior small scales occur along pharyngeal body portion and bear short (up to 4.5 μm long) spines whereas four trunk ones are large (8—12.5 μm long and about 10 μm wide) and bear long spines. The scales are one-lobed showing wide and concave posterior edge. Spines exhibit single lateral denticles placed between ¼ and ⅓ of spine length from spine end, just at the place where the spines are bent. Lateral and ventrolateral spines are somewhat longer than those from dorsum, the ventrolateral ones being in addition clearly thinner than the others. The rearmost paired lateral spine is shorter than mid-trunk ones reaching length of 12—21.5 μm. The ventral field appears to be smooth.

The mouth ring is long and narrow being considerably wider proximally than distally and reaching diameter of only 3.5 μm at mid-length. The units that build the ring are nonsegmented. Pharynx is of medium length (27.5—34 μm) showing slight anterior dilation and strong posterior bulb. One of specimens studied had unilateral packet of spermatozoa which were rod-shaped and 4 μm long.



Figs 47—50. *Chaetonotus paucisquamatus* sp. nov. Fig. 47 — dorsal view, Fig. 48 — lateral view, Fig. 49 — trunk spined scale of the São Paulo form, Fig. 50 — trunk spined scale of the São Carlos form.

Comparative description of the São Carlos form. It differs from the type-form in having body somewhat larger (154 μm long) as well as furca base and adhesive tubes longer. The spines reach length of 35 μm and some of their tops are weakly furcated while their lateral denticles are located more basally, usually at mid-length of spines. The ventral field ends with a pair of 7.5 μm long keeled scales, whilst the posterior part of intestinal field portion is provided with some smooth scales 4 × 5.5 μm in dimensions. Lack of keels and spines on ventral field scales of the São Carlos form could explain why the cuticular structures were not detected at all in the type-form, being probably present but having less distinct edges. The form from São Carlos showed also short-rod-spermatozoa being 4 μm in length.

Taxonomic remarks. Five-lobed head outline, one-lobed scales, uniform trunk covering with spined scales and absence of transverse hypostomion furrow are the features that allow to include the new gastrotrich into the *maximus* group of species. As it was mentioned above, the total number of scales in *Ch. paucisquamatus* is lower than in any scale-bearing *Chaetonotidae*. Only *Ch. acanthocephalus* VALKANOV, 1937, which belongs to the *bogdanovii* grup, can have nine longitudinal rows of spined scales, however, its scale number in a row is twice larger than in *Ch. paucisquamatus* (VALKANOV 1937, KISIELEWSKI 1981). A reduction of scale number in comparison to ancestral condition apparently allowed scales and spines to increase in size. Such a modification could be explained, like presence of long ventral locomotory cilia as well as long and thin adhesive tubes which apparently are unable to adhere, as an adaptation to "semipelagic" mode of life.

Table 14. Morphometrical features of *Chaetonotus paucisquamatus* sp. nov.

Feature	Specimens from region of São Paulo			Specimen from São Carlos (N=1)
	Range	X	N	
Body length	121—141 μm	132.2	8	154 μm
Length of adhesive tubes	25—27 μm	26.1	9	40 μm
Pharynx length	27.5—34 μm	31.2	8	34 μm
Pharynx formula a	22.7; 25.9%		2	28.5%
n	18.2; 21.6%		2	20.6%
m	19.7; 23.8%		2	25.0%
p	35.9; 37.9%		2	41.5%
Diameter of mouth ring	3.2—3.5 μm	3.4	3	3.5 μm
Cephalion length	10.5 μm		1	
Cephalion width	8.5 μm		1	
Total number of longitudinal rows of scales	9		3	9
Number of scales in a single longitudinal row	9		2	
Ratio of scale distribution	100%		1	
Length of trunk scales	8; 12.5 μm		2	11 μm
Length of neck spines	4; 4.5 μm		2	
Length of trunk spines	23—27 μm	25.1	11	26.5—35 μm
Localization of lateral denticle on trunk spines	25—31%	28.8	9	44—58%
Length of rearmost lateral spines	12—21.5 μm	17.4	3	
Localization of lateral denticle on terminal spines	32%		1	
Length ratio of terminal spines	9.2; 13.8%		2	

Chaetonotus pseudopolyspinosus sp. nov.

(Figs 51—54, Tab. 15)

Etymology. From the Greek "pseudes" — false and the specific name of *Ch. polyspinosus*, referring to a close relationship between both species.

Material. 2 stations, 2 samples, 3 specimens. SP: region of São Carlos — a reservoir (6); the Juréia Reserve — the mangrove zone of the river Guaraú (10). The salinity of water in the latter station was 5 per mille when sampled. Among silt (10) and sand (6).

Type specimens. Holotype, a specimen collected from the river Guaraú on 19.7.1984 will be deposited in the Department of Zoology, University of São Paulo.

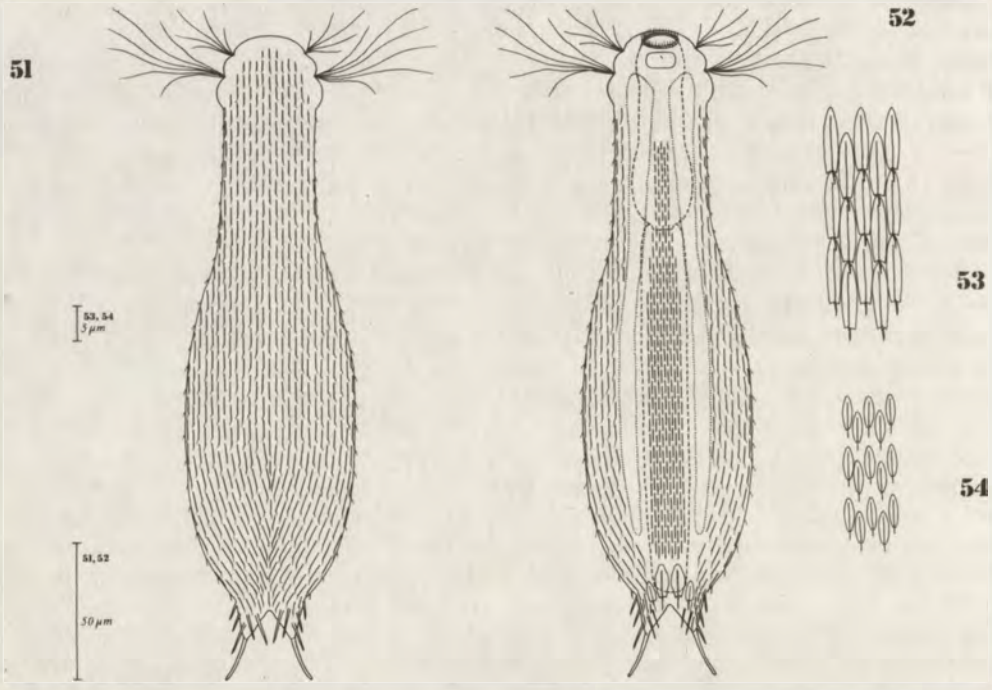
Diagnosis. *Chaetonotus* from *maximus* group having body 229—257 μm long. With small head of five-lobed outline. Trunk scales very slender (their width is at most ¼ length), 7—11 μm long, with slightly concave posterior edges, keeled along their whole length and with short (1—2.3 μm long) simple spines. Scales distributed in 43—61 longitudinal alternating rows, about 28 in each. Longitudinal rows of dorsal scales disposed clearly obliquely on posterior trunk region. Caudal furca base with thick and up to 15 μm long spines dorso-laterally, laterally and ventrally. Whole ventral field with narrow keeled and spined scales. Terminal paired field scale keeled, with or without spine.

Description

Body is 229—257 μm in length. The head is considerably narrower than trunk. Amongst cephalic shields, the cephalion, which is entirely adjacent to head, is the largest being 21 μm long and 28 μm wide. Two paired pleurae are well developed and of similar size. There are two paired tufts of cephalic cilia, the posterior one consisting of cilia twice as long as in anterior tuft. Hypostomion is a subtle rectangular plate being 3.5—7.5 μm long. The caudal furca base is narrow, while the adhesive tubes, 16.5—18 μm in length, vary in shape. They may be straight, slightly bent externally or considerably curved internally, whereas their tops may be dull or pointed. A paired band of ventral locomotory cilia extends along the whole body.

The body is covered with unusually narrow keeled and spined scales distributed in 43—61 longitudinal alternating rows, about 28 in each. Longitudinal rows of dorsal scales are disposed parallelly on head, neck and anterior trunk portion, while they are clearly oblique along caudal trunk half, where some median rows vanish. The scale posterior edges are slightly concave whereas the scales proper are very narrow being always on trunk and usually on other body regions four times as long as wide. The trunk scale length reaches 7—11 μm, and the trunk spine length only 1—2.3 μm. Edges of neighboring scales contact one another both laterally and from rostral to caudal. The last ventrolateral rows consist of scales shaped and sized as lateral and dorsal ones, however, being provided with slightly longer spines. The caudal furca base is covered dorsolaterally, laterally and ventrally with scales bearing considerably longer spines (up to 15 μm long). The spines are straight, very thick proximally and constricted distally. The ventral field ends with a pair of 11—15.5 μm long keeled scales furnished with approximately 5 μm long spines (the spines were not developed in one of specimens studied). The keeled scales of intestinal field portion are as narrow as dorsal and lateral ones, 4.5—7 μm long and usually furnished with short (1 μm long) spine. They are distributed in 11 longitudinal alternating rows, 21 in each. The covering of pharyngeal field portion is of the same kind, however, the number of scales is lower and size smaller.

Taxonomic remarks. The above taxon enriches the group of species closely related with *Ch. polyspinosus*. Apart from different body shape being characterized by very small head as well as narrow neck and caudal furca base regions, it differs from *Ch. polyspinosus* in scale shape and distribution of long posterior spines. The scales of *Ch. pseudopolyspinosus* are much narrower than those of the compared species and only slightly concave posteriorly. Its thick and long caudal spines are not only placed dorsally and laterally but also on ventral body side, while the respective spines of *Ch. polyspinosus* all are implanted dorsally and laterally. The cuticular covering of *Ch. pseudopolyspinosus* resembles that of the genus *Heterolepidoderma* mainly in showing long-oval scales being keeled along their whole length. Also clearly oblique disposition of longitudinal scale rows along posterior trunk region is reminiscent of the pattern frequently occurring among *Heterolepidoderma*. However, *Ch. pseudopolyspinosus* exhibits long caudal spines and slightly concave posterior scale edges with short spines, all the features linking it with the genus *Chaetonotus*. Therefore, a close phylogenetic relationship between the genera *Chaetonotus* and *Heterolepidoderma* through the forms similar to *Ch. polyspinosus* (compare also *Ch. intermedius* sp. nov.) is worth considering. I include the newly-described species into the group *maximus* since all the species close to *Ch. polyspinosus* are classified there.



Figs 51—54. *Chaetonotus pseudopolyspinosus* sp. nov. Fig. 51 — dorsal view, Fig. 52 — ventral view, Fig. 53 — trunk dorsal spined scales, Fig. 54 — spined scales from intestinal portion of ventral field.

Table 15. Morphometrical features of *Chaetonotus pseudopolyspinosus* sp. nov.

Feature	Range	X	N
Body length	229; 257 μm		2
Length of adhesive tubes	16.5—18 μm	17.1	3
Pharynx length	70 μm		2
Pharynx formula a	25.7%		1
n	23.6%		1
m	26.4%		1
p	33.6%		1
Diameter of mouth ring	16.5 μm		1
Cephalion length	21 μm		1
Cephalion width	28 μm		1
Total number of longitudinal rows of scales	43; 61		2
Number of scales in a single longitudinal row	ca. 28		1
Ratio of scale distribution	ca. 153%		1
Length of neck scales	7 μm		2
Length of trunk scales	7; 11 μm		2
Length of neck spines	1 μm		1
Length of trunk spines	1—2.3 μm	1.8	3
Maximum length of dorsal rear spines	15 μm		2

Chaetonotus sanctipauli sp. nov.

(Figs 55—59, Tab. 16)

Etymology. From the geographic name São Paulo, in which city the species has been discovered.

Material. 2 stations, 2 samples, 6 specimens. SP: region of São Paulo — a pond (2) and a reservoir (3). Among silt (3) and aquatic vegetation (2).

Type specimens. Holotype, a specimen collected on 28.6.1984 from the reservoir at the Department of Zoology, University of São Paulo (station 3), will be deposited in the same Department. A paratype that derives from the same sample is kept in the author's collection.

Diagnosis. *Chaetonotus* from *maximus* group having body 126—135 μm long. With large head showing five convex lobes of almost equal size. Scales one-lobed with concave posterior edges and short simple spines, arranged in 19—21 longitudinal alternating rows, 21—23 in each. Trunk scales 4—5.2 μm long, their spines 2—4 μm. Ventrolateral spines longer (9—12.5 μm in length). Ventral field bare except for a pair of terminal keeled and spined scales. Pharynx short, with two thick bulbs and an anterior tooth.

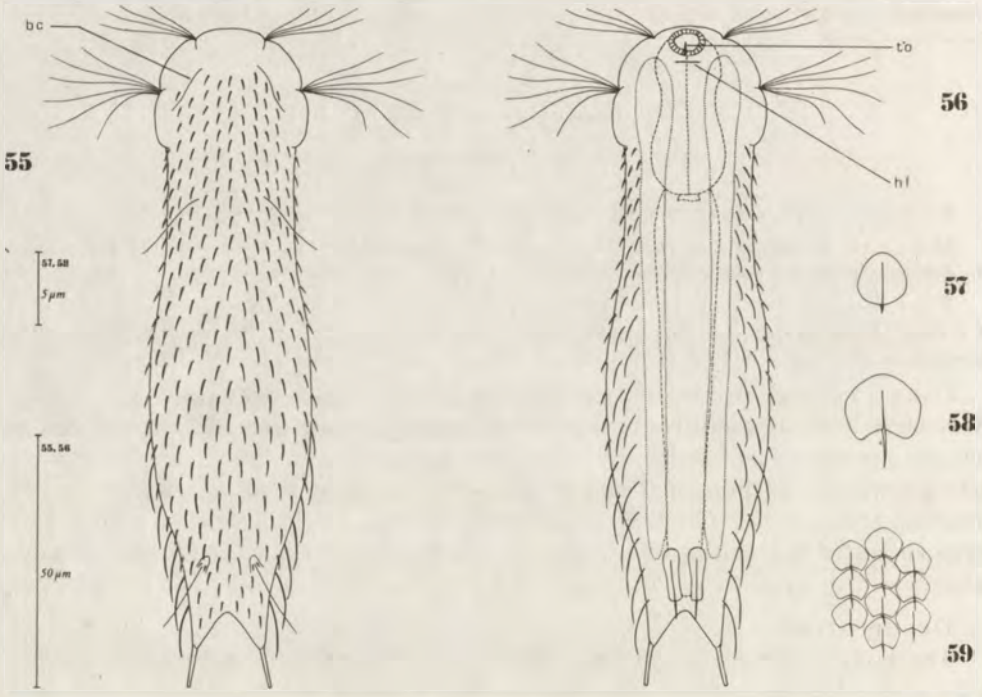
Description

The body is 126—135 μm long. The head of both young and mature animals is usually as wide as trunk or even wider. The cephalion which is entirely attached is 15.5 μm long and 14—16.5 μm wide. It is only slightly larger than two paired pleurae, the latter being well distinguished and convex. There are two pairs of tufts of cephalic tactile cilia. There is hypostomion with short and weak transverse furrow (Fig. 56 — hf). Posterior trunk portion is markedly constricted. Adhesive tubes, being 11—12.5 μm in length, are straight and distally only weakly narrower than basally. A paired band of ventral locomotory cilia extends along the whole body. There are three pairs of dorsal

sensory bristles being implanted on the head (Fig. 55 — bc), neck and posterior trunk portion. The bristles of the rearmost pair originate from double-keeled, or rather double--spined, scales.

The body is covered with one-lobed scales being concave-edged posteriorly and bearing short simple spines. They are arranged in 19—21 longitudinal alternating rows, 21—23 in each. The trunk scales are 4—5.2 μm long and their spines 2—4 μm. Ventrolateral trunk spines are longer than those from sides and dorsum. The longest and also thin and strongly bent are these spines which belong to two most ventrolateral paired rows. Some rearmost pairs of them, 9—12.5 μm in length, project laterally along the constricted caudal trunk portion. Caudal furca base is provided dorsally with several pairs of round spined scales being nearly smaller than trunk ones. The ventral field is smooth except for its rear where a pair of 8.5—13.5 μm long keeled scales with 4—6 μm long spines occur. Occasionally, a few supplementary small elliptic scales occur just rostral to them.

The mouth ring, 6—8 μm in diameter, is subterminal and directed clearly ventrally. It is thick-walled and distally furnished with long bristles. The pharynx is very short



Figs 55—59. *Chaetonotus sanctipauli* sp. nov. Fig. 55 — dorsal view, Fig. 56 — ventral view, Fig. 57 — cephalic spined scale, Fig. 58 — trunk spined scale, Fig. 59 — distribution of dorsal trunk spined scales.

(its length rarely exceeds ¼ of body length) and unusually thick. Both its ends are in form of strong bulbs, the posterior one being stronger than the other and at least as wide as ½ of pharynx length. I have occasionally observed a pharyngeal tooth being unpaired and rather weak (Fig. 56 — to). All the specimens studied were in parthenogenic phase of life.

Taxonomic remarks. *Ch. sanctipauli* sp. nov. is a typical member of the *maximus* species group. It seems to stand closest to *Ch. brevispinosus* ZELINKA, 1889. Both gastrotrichs have similar body covering with round one-lobed scales with concave posterior edges and short simple spines, thick-walled mouth ring directed ventrally (own observation of *Ch. brevispinosus* from Poland) as well as short and thick pharynx. However, *Ch. sanctipauli* differs from the compared species in having considerably larger head and still thicker pharyngeal bulbs. The posterior lateral spines are in both species longer than those on mid-trunk, however, those in *Ch. sanctipauli* are thinner and more numerous than in compared species (only two pairs of them occur in *Ch. brevispinosus*).

Table 16. Morphometrical features of *Chaetonotus sanctipauli* sp. nov.

Feature	Range	X	N
Body length	126—135 μm	131.2	5
Length of adhesive tubes	11—12.5 μm	11.6	6
Pharynx length	28—34.5 μm	29.9	6
Pharynx formula a	44.6—47.6%	46.2	4
n	38.9—44.1%	41.2	4
m	41.1—51.5%	45.8	4
p	50.4—59.3%	53.8	4
Diameter of mouth ring	6—8 μm	6.9	5
Cephalion length	15.5 μm		1
Cephalion width	14—16.5 μm	15.1	4
Total number of longitudinal rows of scales	19—21	20.3	3
Number of scales in a single longitudinal row	21—23	22.0	3
Ratio of scale distribution	82.6—100.0%	92.7	3
Length of trunk scales	4—5.2 μm	4.8	3
Length of neck spines	1.5—3 μm	2.2	4
Length of trunk spines	2—4 μm	2.8	6
Length of terminal spines of the "dorsal" type	2.8—4 μm	3.2	5
Length of terminal spines of the "ventrolateral" type	9—12.5 μm	10.5	4

Chaetonotus ventrochaetus sp. nov.

(Figs 60—62, Tab. 17)

Etymology. From the Latin "ventralis" — ventral and the Greek "khaite" — long hair, referring to the presence of conspicuous ventral spines at the furca base.

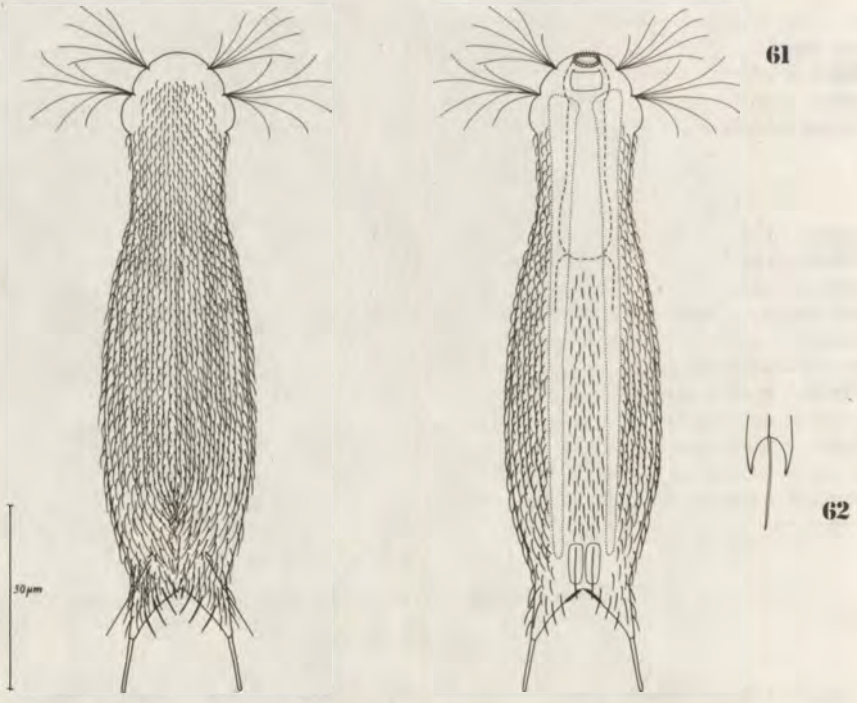
Material. 1 station, 2 samples, 10 specimens. SP: the Juréia Reserve — mangrove of the Rio Guaraú (10), the salinity of water was 5 per mille when sampled. Among silt and sand.

Type specimens. Holotype, a specimen collected on 19.7.1984, will be deposited in the Department of Zoology, University of São Paulo. Three paratypes from the same sample are kept in the author's collection.

Diagnosis. *Chaetonotus* from the *maximus* group having body 151—186 μm in length. Head outline distinctly five-lobed. Spined scales probably one-lobed and concave-edged posteriorly, distributed in 37 longitudinal alternating rows, 38—42 in each. Spines simple, 4—8 μm long on trunk. Dorsal scale rows obliquely disposed along caudal trunk portion. Furca base with several (typically three) pairs of thick-base and obliquely disposed spines 6.5—7.5 μm long dorsally and several pairs of similarly sized but thinner spines ventrally.

Description

The body is slender and 151—186 μm long. Like that of *Ch. maximus* EHRENBERG, the head is elongated and exhibits five distinct and similarly-sized lobes. The hyposto-mion is delicate showing a paired anterior protuberance and no transverse furrow. The adhesive tubes are 15—16.5 μm long, thick, straight, and dully-ended being disposed in parallel far away from each other or coming apart. There are two well-separated pairs of tufts of cephalic tactile cilia. The ventral locomotory ciliature consists of a paired band that extends along the whole body. There is a pair of trunk dorsal sensory bristles which arise from double-keeled scales.



Figs 60—62. *Chaetonotus ventrochaetus* sp. nov. Fig. 60 — dorsal view, Fig. 61 — ventral view, Fig. 62 — discernible portion of spined scale (enlarged).

The body is covered with spined scales being distributed in 37 longitudinal alternating rows, 38—42 in each. The rows are disposed parallelly except for dorsal side of posterior trunk portion where their arrangement is distinctly oblique. The shape of no entire scale was satisfactorily studied, however, the appearance of its concave posterior edge suggests that the scale is one-lobed. The spines are strongly bent, on head and neck in particular, becoming only slightly longer from rostral to caudal and reaching maximum length of 4—8 μm on mid-trunk region. At furca base, there are usually three pairs of 6.5—7.5 μm long dorsal spines which are directed obliquely to mid--dorsal line and show their basal portions much thicker than those of all the other spines. Ventral and lateral sides of furca base are also provided with spines which are either of the same length as dorsal furca spines or somewhat shorter, being however thinner. The ventral field ends with a pair of 11 μm long keeled scales with terminal spines 4 μm long. The intestinal field portion is covered with keeled and spined scales that are usually arranged in 8 longitudinal alternating rows. The spines become shorter and shorter from caudal to rostral. The pharyngeal field portion was found naked.

The mouth ring is 6.5—8 μm in diameter and exhibits distal bristles. For the body size, the pharynx is long reaching 49—56 μm. It is narrow and shows only weak terminal dilation. Apart from parthenogenic specimens, I have found two worms with hermaphroditic characters. They were provided with the bilobed organ x as well as rod--shaped spermatozoa approximately 12 μm in length.

Taxonomic remarks. The newly-described species appears to be close to *Ch. polyspinosus* GREUTER, exhibiting conspicuous dorsal furca spines, obliquely-disposed dorsal scale rows along posterior trunk portion (see the description of *Ch. polyspinosus* in the present paper) as well as spined scales on the ventral field. However, the difference in length between dorsal furca spines and mid-trunk ones is not substantial in *Ch. ventrochaetus*, in contrast to *Ch. polyspinosus*. Further character in which the newly-

Table 17. Morphometrical features of *Chaetonotus ventrochaetus* sp. nov.

Feature	Range	X	N
Body length	151—186 μm	172.5	8
Length of adhesive tubes	15—16.5 μm	15.4	8
Pharynx length	49—56 μm	52.4	8
Pharynx formula a	20.5—24.1%	22.1	5
n	16.8—21.2%	19.0	5
m	18.8—22.0%	20.8	5
p	25.2—28.9%	26.9	5
Diameter of mouth ring	6.5—8 μm	7.1	6
Cephalion width	15—21 μm	19.1	6
Total number of longitudinal rows of scales	37		2
Number of scales in a single longitudinal row	38; 42		2
Ratio of scale distribution	88.1; 97.4%		2
Length of neck spines	4—6.5 μm	5.2	7
Length of trunk spines	4—8 μm	6.1	8
Length of rearmost spines	6.5—7.5 μm	6.8	6
Length ratio of terminal spines	3.6—4.5%	4.0	6

-described worm differs from *Ch. polyspinosus* is the presence of long ventral furca spines in the former, which is a feature unknown within the genus *Chaetonotus* (except for *Ch. pseudopolyspinosus* sp. nov.). Moreover, *Ch. ventrochaetus* shows its spines, those from head and neck in particular, longer than respective spines in *Ch. polyspinosus*. Although the spine shape was not satisfactorily studied in *Ch. ventrochaetus*, it must be quite different from that of *Ch. pseudopolyspinosus*, since the scales of the latter are unusually narrow and only slightly cut posteriorly.

spinulosus Group

Chaetonotus hystrix MEČNIKOW, 1865

(Tab. 18)

Material. 1 specimen. SP: the Juréia Reserve — a river (15). Among moss.

Comparative description. The animal found showed no morphological difference from the members of the species which I have previously collected from many stations in Poland (KISIELEWSKI 1981 and 1986b). Like in the European specimens, the length of spines, both these from dorsum and body sides, increased gradually along the rostral body half, which is a character differing *Ch. hystrix* from *Ch. macrochaetus* ZELINKA and *Ch. persetosus* ZELINKA. The scales which are actually of the same shape in the Polish specimens of *Ch. hystrix, Ch. macrochaetus* and *Ch. persetosus*, were also similar in the case of the Brazilian worm. The spine lateral denticle was located near to the spine end. The ventrolateral spines were of the same length as those from remaining body sides, being however thinner and more bent. The ventral field ended with a pair of 7 μm long keeled scales, whereas on the intestinal field portion short and regularly distributed lines were visible, being either the scale margins, or weak spines. The pharyngeal field portion was found naked.

Table 18. Morphometrical features of a Brazilian specimen of *Chaetonotus hystrix* compared with various literature data from Europe

Feature	Value	Literature data
Body length	81 μm	80—130 μm
Pharynx length	26.5 μm	21—31 μm
Pharynx formula a	31.3%	26—30%
n	23.4%	
m	23.4%	21—23%
p	33.2%	35—37%
Total number of longitudinal rows of scales	15	11—13
Number of scales in a single longitudinal row	12	13—14
Ratio of scale distribution	125%	100%
Length of neck spines	5—6 μm	3—8 μm
Length of trunk spines	7.5 μm	10—21 μm
Length of rearmost lateral spines	8.5 μm	
Length ratio of terminal spines	10.5%	

Chaetonotus macrochaetus ZELINKA, 1889

(Tab. 19)

Material. 1 specimen. SP: region of São Carlos — a pond (9). Among silt.

Recorded for the first time from South America.

Comparative description. The specimen found was larger than typical European members of the species. It showed all mean specific features, i. e. sharp increase of spine length at the beginning of trunk as well as the presence of long, thick and strongly bent trunk rear lateral spines, those that preceded the rearmost pair in particular. All the ventrolateral spines were thin, strongly bent and simple, those belonging to the first longitudinal row counting from cilia bands being the shortest (7 μm long on trunk). The ventral field terminated with a paired keeled and spined scale, the total scale-spine length amounting to 7 μm. The covering of intestinal field portion consisted of round keeled scales distributed in 8 longitudinal alternating rows, 16 scales in a row and having diameter of 2.5 μm. At the end of pharyngeal field portion, three such scales occurred in every longitudinal row, while the anteriormost field region was smooth.

Table 19. Morphometrical features of a Brazilian specimen of *Chaetonotus macrochaetus* compared with various literature data from Europe (considerably different data by PREOBRAŽENSKAJA 1926 excluded)

Feature	Value	Literature data
Body length	151 μm	65—140 μm
Length of adhesive tubes	13 μm	9—11 μm
Pharynx length	41 μm	20—40 μm
Pharynx formula a	30.5%	26—28%
n	21.0%	
m	24.6%	18—21%
p	32.4%	32—33%
Diameter of mouth ring	6 μm	4.5—5 μm
Cephalion length	12 μm	
Cephalion width	15 μm	
Total number of longitudinal rows of scales	15	13—14
Number of scales in a single longitudinal row	15	14
Ratio of scale distribution	100%	93—100%
Length of trunk scales	10 μm	6—13 μm
Length of trunk spines	17—20 μm	8.5—23 μm
Localization of lateral denticle on trunk spines	15—18%	20—25%
Length of rearmost lateral spines	12.5 μm	9.5—20 μm
Localization of lateral denticle on terminal spines	21%	
Length ratio of terminal spines	8.3%	15—16%

Chaetonotus novenarius GREUTER, 1917 sensu BALSAMO 1983b

(Tab. 20)

Material. 2 stations, 2 samples, 3 specimens. SP: region of São Paulo — a pond (2); the Juréia Reserve — a river (12). Among silt (2) and root systems of *Salvinia natans* (2).

Recorded for the first time from South America.

Table 20. Morphometrical features of a Brazilian specimen of *Ch. novenarius* s. BALSAMO 1983b compared with literature data from Italy (BALSAMO 1983b) and Poland (KISIELEWSKI 1981 — as *Ch. anomalus*)

Feature	Value	Literature data from Italy	Literature data from Poland
Body length	163 μm	106—138 μm	154—172 μm
Length of adhesive tubes	23.5 μm		19—21 μm
Pharynx length	42 μm	27.5—32 μm	40—46 μm
Diameter of mouth ring	5.5 μm		4.5—5.5 μm
Length of dorsal trunk spines	32—79 μm		36—76 μm
Localization of more proximal lateral denticle	24—29%		23—31%
Localization of more distal lateral denticle	13—16%		12—14%
Length of ventrolateral trunk spines	15—16.5, μm		17—19 μm
Length of rearmost lateral spines	18 μm	26—33 μm	20—32 μm
Length ratio of terminal spines	11.0%		

Comparative description. As far as the body dimensions are concerned, the worm from Brazil was in accordance with the specimens found by myself in Poland (KISIELEWSKI 1981 — as *Ch. anomalus*) while it was larger than the gastrotrichs studied by BALSAMO (1983b) in Italy. The Brazilian worm showed conformity in all important diagnostic characters both with Italian and Polish specimens. Its body was covered with scales, the majority of dorsal ones being furnished with at most rudimentary spines. Long spines occurred only ventrolaterally (not dorsolaterally as BALSAMO has recorded) and on nine antero-dorsal trunk scales. The dorsal spines were provided with two subsequent lateral denticles, more distal of them being smaller than the other. Also the ventral field armature was in accordance with observations from Italy and Poland. The anterior field portion was covered with scales fused one with another, forming thus a single longitudinal row of short and wide "plates". The posterior field region covering consisted of numerous keeled scales, whereas the field terminated with a paired keeled scale provided with 14 μm long spine.

Chaetonotus persetosus ZELINKA, 1889

(Figs 63, 64, Tab. 21)

Material. 1 specimen. SP: region of São Paulo — a reservoir (4). Among root systems of *Pistia stratiotes*.

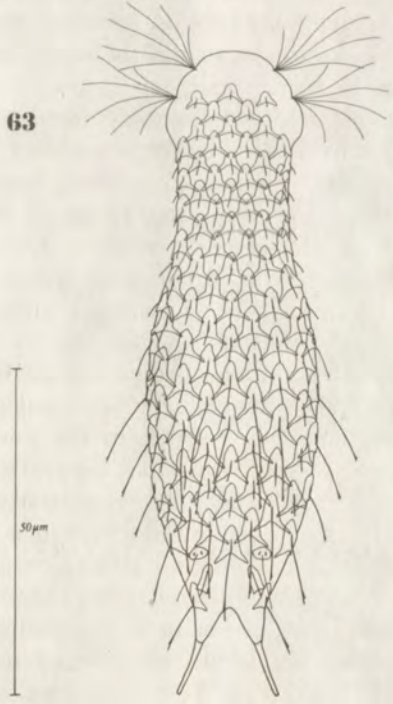
Recorded for the first time from South America.

Comparative description. The Brazilian worm corresponded to the original description as far as principal specific characters are concerned. The head spines were very short and probably simple. Short spines, being however somewhat longer that those from head, arised from the neck region, the anterior ⅓ portion of trunk and whole

Figs 63, 64. *Chaetonotus persetosus* ZELINKA. Fig. 63 — dorsal view, Fig. 64 — ventral view of caudal body half.

Table 21. Morphometrical features of a Brazilian specimen of *Chaetonotus persetosus* compared with various literature data from Europe and those from Japan (SAITO 1937)

Feature	Value	Literature data from Europe	Literature data from Japan
Body length	97 μm	72—113 μm	136 μm
Length of adhesive tubes	8.5 μm	7.5 μm	
Pharynx length	25 μm	20—37 μm	34 μm
Pharynx formula a	30.0%		
n	22.4%		
m	23.6%		
p	33.6%		
Diameter of mouth ring	4 μm		
Cephalion width	12.5 μm		
Total number of longitudinal rows of scales	13		
Number of scales in a single longitudinal row	13	12—14	
Ratio of scale distribution	100%		
Length of neck scales	2 μm		
Length of trunk scales	5—7 μm	5 μm	11.5 μm
Length of neck spines	1.5—2.5 μm	2.5—11 μm	5.5 μm
Length of trunk spines	up to 11 μm	12.5—23 μm	20.5—22 μm
Localization of lateral denticle on trunk spines	5—8%		
Length of rearmost lateral spines	10 μm		
Localization of lateral denticle on terminal spines	15%		
Length ratio of terminal spines	10.3%		



fourth paired longitudinal row, counting from mid-dorsal line. Thus, the occurrence of conspicuously longer spines was restricted to some longitudinal rows of the posterior ⅔ of the trunk, viz. the median row, two next paired ones (to a total of five dorsal rows therefore) as well as to a paired lateral row (the 5th one). All the conspicuous trunk spines were shorter (up to 10.5 μm long) and weaker than in the respective body portion of *Ch. macrochaetus* and *Ch. hystrix*. The scales in both paired ventrolateral rows were provided with thin and bent spines. The ventral field ended with a pair of 7 μm long keeled scales. The covering of the posterior portion of intestinal field region was honeycomb-like, consisting of elongate-hexagonal unkeeled scales ca. 1.3 μm long, distributed in 5 longitudinal alternating rows, 7 in each. Rostral to them, the field appeared to be free from scales.

bogdanovii Group

Chaetonotus acanthocephalus VALKANOV, 1937

(Figs 65—68, Tab. 22)

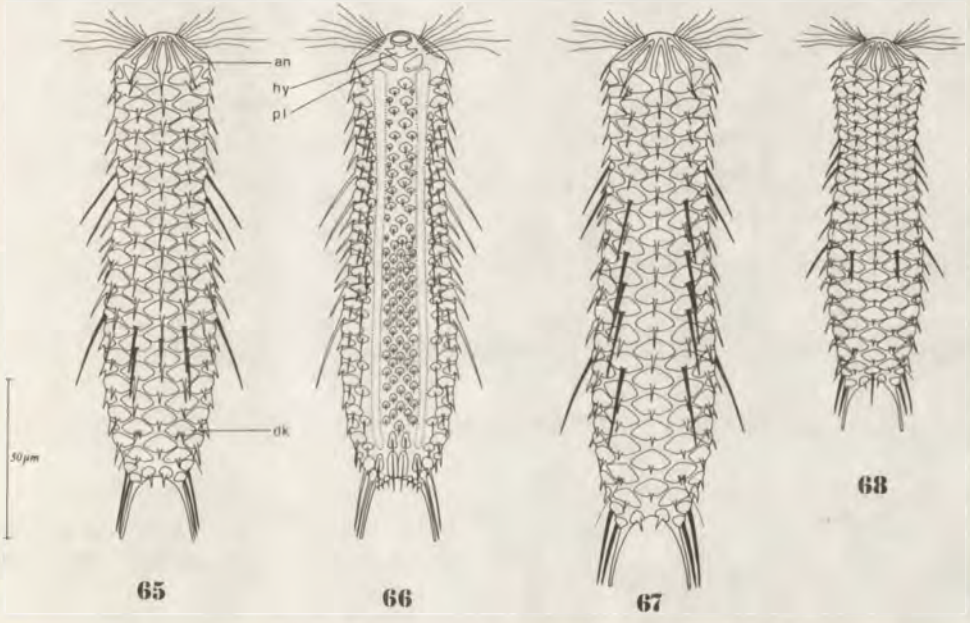
Ch. aff. *acanthocephalus*: KISIELEWSKI 1981.

Material. 5 stations, 6 samples, 6 specimens. SP: region of São Carlos — reservoir (6), a pond (9); the Juréia Reserve — a river (12), a rain puddle (16). MS: a pond (18). Among silt (9, 12, 16), sand (6) as well as root systems of *Eichhornia crassipes* (12) and *Salvinia natans* (18).

Recorded for the first time from South America.

Comparative description. Contrary to the European population showing amazingly invariable body armature (VALKANOV 1937, KISIELEWSKI 1981), the specimens found in Brazil exhibited some variability. The body habitus, presence of five peculiar cephalic scales and number of scales in a longitudinal row in the worms from the Juréia Reserve and São Carlos region were as in specimens from Europe. The body length of the Juréia specimen is within the range recorded for the European worms, whereas both measured São Carlos gastrotrichs were larger than reported from Europe. The general long-spine distribution pattern with 2—3 pairs of conspicuous lateral neck spines and a transversal "band" of the mid-trunk ones, is similar both within Brazilian population and between it and European material. However, the inserting place, number and relative length of the conspicuous spines vary in details even within a local population (compare data of both São Carlos specimens). For instance, a small gastrotrich from the Juréia had three pairs of lateral neck spines only slightly longer than the neighboring spines (Fig. 68), whereas the respective spines in larger worms from the São Carlos region had only two pairs of such spines but being proportionally much longer (Figs 65, 67). The occurrence of conspicuous trunk spines in the worm from Juréia and one of São Carlos specimens (Fig. 65) was restricted to a transverse row of spines which belonged to every other longitudinal row, while another gastrotrich from São Carlos (Fig. 67) showed additionally four paired conspicuous spines in a longitudinal row which is next to the median one, viz. 7th, 9th, 10th and 11th spines counting from rostral to caudal. At the furca base, two pairs of long lateral spines usually occur, however, the Juréia specimen showed also an unpaired long spine in the median longitudinal row. The ventral field in all the Brazilian specimens was covered in similar manner. It ended with a paired spined scale, the scale being 5—8.5 μm long, and the

spine 2—4 μm. The intestinal field portion bore smaller spined scales arranged in 5 longitudinal alternating rows, 12—17 in each, while in the pharyngeal portion the scales with short or rudimentary spines were arranged in 3—4 longitudinal alternating rows, 6—7 in each (Fig. 66). The paired smooth plate (Fig 66 — pl) which may be homologous to a similarly situated one in *Lepidodermella squamata* (DUJARDIN), occurred just caudal to hypostomion (hy). Although typical European specimens of *Ch. acanthocephalus* are very stable morphologically, a form which differs from them has been also described, i. e. *Ch.* aff. *acanthocephalus*: KISIELEWSKI 1981. The form is characterized by larger number of longitudinal alternating rows of scales (13 compared with 9 in the type-form). It should be remembered that all the specimens from Brazil showed an intermediary value, i. e. 11. The scale of *Ch.* aff. *acanthocephalus* is heart-shaped rather than rhomboid, which corresponds well with conditions observed in Brazilian worms. Thus, it is believed that in spite of discontinuous variability of European material (being besides very scarce), the form *Ch.* aff. *acanthocephalus*: KISIELEWSKI 1981 represents the same species as the type-form, like all the specimens found in Brazil.



Figs 65—68. *Chaetonotus acanthocephalus* VALKANOV. Fig. 65 — dorsal view of a specimen from São Carlos region, Fig. 66 — ventral view of the same specimen. Fig. 67 — dorsal view of the largest São Carlos specimen, Fig. 68 — dorsal view of the Juréia specimen. Conspicuous spines on Figs 65, 67 and 68 marked with black to facilitate comparison of their distribution.

Table 22. Morphometrical features of a Brazilian specimen of *Chaetonotus acanthocephalus*, compared with various European data on type-form and those on *Ch.* aff. *acanthocephalus*: KISIELEWSKI 1981

Feature	Specimens from Brazil			Literature data on *Ch. acantho-cephalus* from Europe	Literature data on *Ch.* aff. *acantho-cephalus* (N=1)
	A specimen from Juréia (N=1)	Specimens from São Carlos			
		Value	N		
Body length	123 μm	159; 175 μm	2	100—148 μm	157 μm
Length of adhesive tubes	11 μm	17 μm	2	14—16 μm	
Pharynx length	34 μm	43; 54 μm	2	37—49 μm	48 μm
Pharynx formula a	22.1%	25.8%	1	21—25%	21%
n	22.1%	25.8%	1		
m	28.4%	25.6%	1	22—25%	21%
p	31.0%	27.9%	1	24—28%	26%
Diameter of mouth ring	5 μm	5 μm	1	6.5—8 μm	7.5 μm
Total number of longitudinal rows of scales	11	11	2	9	13
Number of scales in a single longitudinal row	17	17	2	16—18	20
Ratio of scale distribution	64.7%	64.7%	2	50—53%	65%
Length of neck scales		6; 7 μm	2	4—7 μm	5 μm
Length of trunk scales	5.5—7 μm	7.5—9.5 μm	2	5.5—8 μm	6 μm
Length of dorsal neck spines	6 μm	4—5 μm	2	5 μm	6 μm
Maximum length of lateral neck spines	7.5 μm	19.5 μm	2	11—15 μm	11.5 μm
Length of shorter trunk spines	6 μm	5.5—8 μm	2	8—9 μm	6 μm
Maximum length of trunk spines	12.5 μm	23; 28 μm	2	16.5—22 μm	16 μm
Length of rearmost lateral spines	8 μm	19.5 μm	2		
Length ratio of terminal spines	6.5%	11.1; 12.3%	2		

Subgenus ***Chaetonotus* (*Zonochaeta*)** REMANE, 1927

Chaetonotus* (*Zonochaeta*) *acanthodes STOKES, 1887

(Fig. 69, Tab. 23)

Material. 2 stations, 2 samples, 2 specimens. SP: region of São Carlos — a pond (5); the Juréia Reserve — a ground vegetation of *Bromeliaceae* bordering the Atlantic beach (14). Among silt (5) and in water recipients of *Bromeliaceae* (14).

Recorded for the first time from South America.

Comparative description. Specimens from Brazil agree with individuals of the species collected by myself from *Sphagnum* peat bogs in Poland and Finland (KISIELEWSKI 1981). Like some worms from Poland, those from the Juréia Reserve and region of São Carlos did not show a "double" anterior scale edges as shown on STOKES' drawing (1887, Fig. 29). The scales that occur caudal to the mid-trunk transverse row of longer spines are of the same shape as the others but bear rudimentary spines. Many observations from Poland supplied with some consistent ones from Brazil allow to contribute new details to the species characteristics.

The body is stumpy. Head is covered with cephalion and two pairs of distinct pleurae. All the pleurae are of equal size being however smaller than cephalion. There is a hypostomion exhibiting occasionally a weak transverse furrow (Fig. 69 — hf). A peculiar character is the presence of two anteriormost lateral paired spines being longer than other cephalic and neck ones and having their proximal portions much thicker and distal portions hairlike and strongly bent (Fig. 69 — sa). Another peculiarity is a covering of ventral field end. The field terminates with four instead of two scales, being all of the same size, placed side by side and having keels continued as spines (Fig. 69 — vd). The scale and spine lengths which were measured in one of specimens from São Carlos, reached 7 μm and 3 μm respectively. The intestinal portion of ventral field was covered with round spined scales, which, in the same specimen, were arranged in 7 longitudinal alternating rows (9 in another animal from Juréia), 15 in a row. The scales were 2—2.5 μm long while the spines, measured near the field end, were 2.5 μm long and became shorter and shorter from caudal to rostral. The scales of the pharyngeal field portion were 1.5 μm long and provided with rudimentary spines. They were arranged in 7 longitudinal alternating rows, ca. 5 in each. An additional specific character is the appearance of mouth ring. The ring is thick-walled and directed ventrally, which makes it almost circular when observed from above.

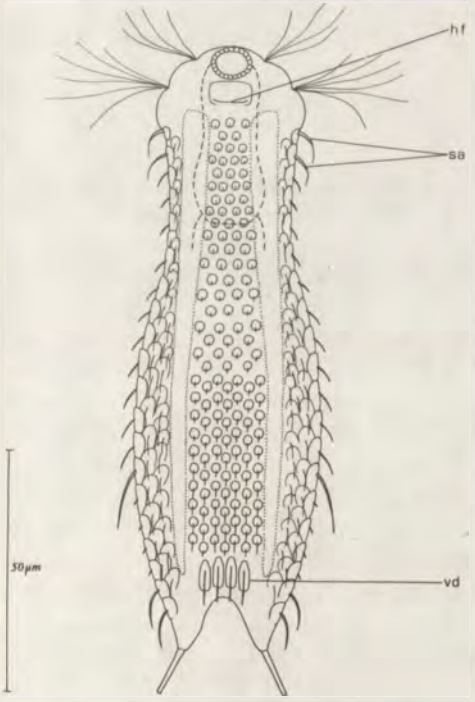


Fig. 69. *Chaetonotus acanthodes* STOKES, ventral view.

Table 23. Morphometrical features of Brazilian specimens of *Chaetonotus acanthodes* compared with literature data from Poland (KISIELEWSKI 1981)

Feature	A specimen from Juréia	A specimen from São Carlos	Literature data from Poland
Body length	125 μm	135 μm	124—159 μm
Length of adhesive tubes	9.5 μm		9—12.5 μm
Pharynx length	32 μm	34 μm	31—39 μm
Diameter of mouth ring	6.5 μm	7 μm	6.5—9 μm
Cephalion length	12.5 μm		
Cephalion width	13 μm	12.5 μm	
Total number of longitudinal rows of scales		18	13—20
Number of scales in a single longitudinal row	22	22	20—24
Ratio of scale distribution		81.8%	71—96%
Length of neck scales		4 μm	3—5.5 μm
Length of trunk scales		6.5—7 μm	5—8.5 μm
Length of trunk spines	3—5 μm	4 μm	2.5—9 μm
Length of "band" spines	12.5 μm	14—15.5 μm	10.5—16.5 μm
Length of rearmost lateral spines	7.5 μm	7 μm	6.5—16.5 μm
Length ratio of terminal spines	6.0%	5.2%	4—10%

Chaetonotus (Zonochaeta) bisacer GREUTER, 1917

(Fig. 70, Tab. 24)

Ch. guruguetoi GROSSO, 1973a, n. syn.
Ch. cfr. *truncatus*: BALSAMO 1981.

Material. 4 stations, 7 samples, 25 specimens. SP: region of São Paulo — a pond (1) and a reservoir (4); 23 specimens. PA: ponds (23, 25); 2 specimens. Among silt (1, 4, 23, 25) and root systems of *Pistia stratiotes* (4).

Comparative description. Specimens from the region of São Paulo and Belém were in conformity with European ones including those known by myself from Poland (KISIELEWSKI 1979 and 1981). The body habitus and scale shape were as in compared animals. On the middle-trunk, there occurred dorsally identical transverse "band" of long spines being all terminally bifurcated, of equal size and equal thickness along their whole length. Like European members of the species, the furca base was provided laterally with a paired long spine which extended beyond adhesive tube ends. Similarly to European population, a variability in number of transverse row ("band") spines was observed, however, its range was narrower than within the Polish population. The Belém specimens had eight such spines. The majority of twelve worms collected from the reservoir Billings (region of São Paulo) had seven but some also six, eight and nine spines and (a presumably juvenile one) five spines. It should be remembered that variability range of this character within European population is from 7 to 20 — compare KISIELEWSKI 1979 and BALSAMO 1981, *Ch.* cfr. *truncatus*). On the basis of new observations from Brazil, the species description may be supplied with some details. The scales of dorsal "band" spines belong to some subsequent longitudinal alternating rows. In spite of this, the "band" scale arrangement is linear, since every other of the scales is removed caudally compared with other scales of the same row (Fig. 70).

The intestinal section of ventral field was covered in its middle and caudal portions with keeled scales distributed in 10—15 longitudinal alternating rows, 9—10 in each. The 22—27 μm long foremost portion of intestinal field region as well as the whole pharyngeal field section were free from scales.

In one of my earlier papers (KISIELEWSKI 1979), the gastrotrich described by SAITO (1937) from Japan under the name *Ch. truncatus* was synonymized with *Ch. bisacer*. Also the names *Ch. guruguetoi* GROSSO, 1973a given for the gastrotrich from Argentina and *Ch.* cfr. *truncatus*: BALSAMO 1981 should be considered synonyms of the GREUTER's species basing on the same argumentation. Although the Argentinean gastrotrich exhibits the number of "band" spines as low as five, this cannot be an argument for its separate status since this feature varies both within European and South American populations.

Table 24. Morphometrical features of Brazilian specimens of *Chaetonotus bisacer* compared with literature data from Argentina (GROSSO 1973a — as *Ch. guruguetoi*), various literature data from Europe and those from Japan (SAITO 1937)

Feature	Specimens from São Paulo			A specimen from Belém	*Ch. "guruguetoi"*	Other literature data
	Range	X	N			
Body length, terminal spines excluded	180—207 μm	196.8	5	191 μm	164—203 μm	157—222 μm
Length of adhesive tubes	17—20.5 μm	18.6	7	19.5 μm		
Pharynx length	39—44 μm	41.5	7	42 μm	32—35 μm	44—57 μm
Pharynx formula a	28.9—32.1%	30.7	3	29.3%		31%
n	20.0—28.5%	23.0	3	19.3%		
m	20.5—28.5%	24.0	3	22.4%		22%
p	37.8—47.9%	41.3	3	35.7%		40%
Diameter of mouth ring	4.5—5 μm	4.8	3	5.5 μm		4 μm
Cephalion width	18 μm		1	17.5 μm		
Total number of longitudinal rows of scales	23—33	27.0	3			
Number of scales in a single longitudinal row	22—23	22.3	3			21—25
Ratio of scale distribution	100—150%	121.2	3			
Length of neck scales	6 μm		2			
Length of trunk scales behind "band" scales	7—12.5 μm	9.9	4			
Number of spines in a transverse "band"	6—9	7.2	12	8	7	7—20
Length of "band" spines	27.5—30.5 μm	29.3	9	27 μm	25 μm	19.5—41 μm
Length of rearmost lateral spines	39—47 μm	42.1	8	38 μm	35—38 μm	40—50 μm
Length ratio of terminal spines	19.3—24.2%	21.0	5	19.9%		

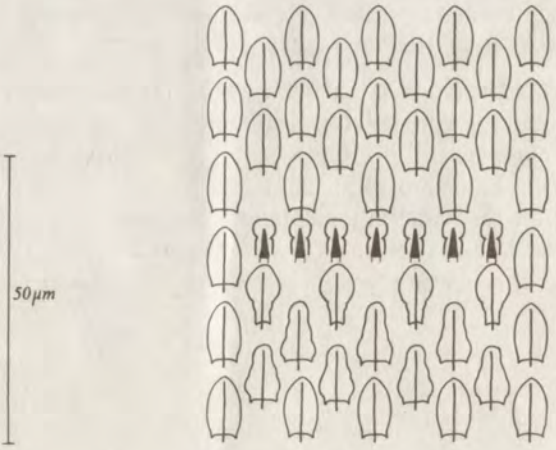


Fig. 70. *Chaetonotus bisacer* GREUTER — distribution of spined scales on the dorsal trunk region where a transverse "band" of long spines occurs. Long spines proper omitted, whereas their bases shown as black triangles.

Chaetonotus (*Zonochaeta*) *succinctus* VOIGT, 1904

Material. 1 specimen. PA: a pond (25). Among silt.

Recorded for the first time from South America.

Comparative description. Although the gastrotrich has not been examined in detail, it was in agreement with the specimens of the species known by myself from Poland (KISIELEWSKI 1981, 1986b) as far as the body size and habitus, number and appearance of "band" spines as well as both the dorsal and ventral cuticular covering are concerned.

Genus *Heterolepidoderma* REMANE, 1927

Heterolepidoderma gracile REMANE, 1927

(Tab. 25)

Ichthydium stokesi GROSSO, 1973b, n. syn.

Material. 2 stations, 2 samples, 3 specimens. MS: a river (17); 2 specimens. PA: a pond (25); 1 specimen. Among silt.

Comparative description. The specimens found are in every respect in conformity with those studied in great number by myself on the basis of material derived from diverse environments in Poland (KISIELEWSKI 1981 and 1986b). The body of Brazilian worms is as slender as in European members of the species being considerably constricted along trunk caudal portion. The adhesive tubes are rather short, straight and

directed almost parallelly. Like specimens from Poland, the scales are hardly noticeable, although weak keels are visible and the body margins are regularly undulated. The pharynx is very short and shows two clear terminal dilations. The animals from Brazil and Poland show even similar behavior moving rapidly and impetuously changing direction of swimming. The Belém specimen exhibited hermaphroditic structures which were in full conformity with those described by KISIELEWSKA (1981) from Poland. Like in the compared case, the bilobed organ x was much elongated and spermatozoa, that were arranged in an unilateral cluster, were in form of long rods. Considering full conformity in morphological, anatomical and behavioral features between specimens living in Brazil and Poland, *H. gracile* may be regarded as one of the best documented cases of intercontinental distribution of an inland-water *Gastrotricha* species.

GROSSO (1973b) has described from Argentina a new gastrotrich *Ichthydium stokesi* characterized by the presence of unusually slender body, in posterior trunk portion in particular, as well as by distinctly five-lobed head and folded scaleless cuticle. The worm habitus is identical to that of *H. gracile*; also the dimensions are in agreement both with those from Europe and the Mato Grosso (see Tab. 25). The cuticle surface of *H. gracile* is similarly folded while the scales proper, as was already mentioned, are actually hardly discernible. If one takes into account the above similarities and the fact that the typical form of *H. gracile* has been found by myself in South America, it becomes evident that the name *Ichthydium stokesi* GROSSO, 1973b should be synonymized with *H. gracile* REMANE, 1927.

Table 25. Morphometrical features of Brazilian specimens of *Heterolepidoderma gracile* compared with data from Argentina (GROSSO 1973b — as *Ichthydium stokesi*) and various literature data from Europe

Feature	A specimen from Pantanal	A specimen from Belém	*"Ichthydium stokesi"*	Other literature data
Body length	156 μm	about 170 μm	126—164 μm	140—180 μm
Length of adhesive tubes	14.5 μm	16 μm	14—18 μm	13 μm
Pharynx length	35 μm	33 μm	28—35 μm	32—38 μm
Pharynx formula a	32.0%			31%
n	23.4%			
m	23.4%			25%
p	36.3%			31%
Diameter of mouth ring	5 μm	5 μm		5.5—6 μm
Cephalion width	12 μm	15 μm		

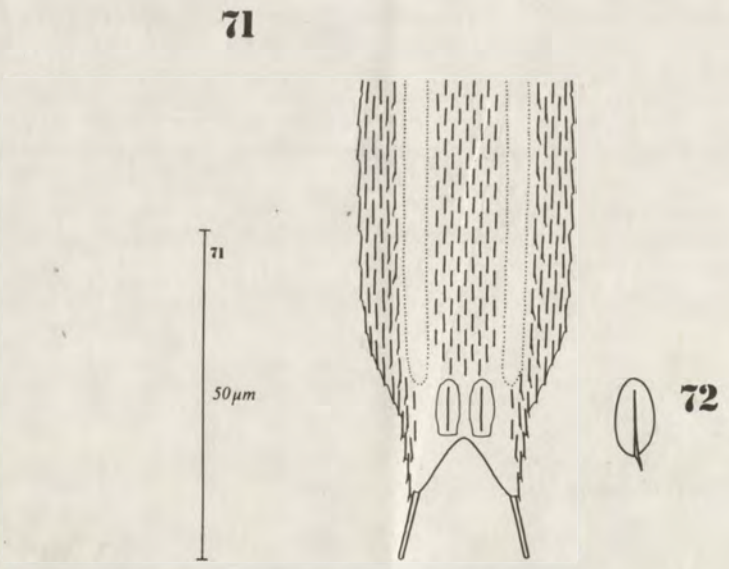
Heterolepidoderma majus REMANE, 1927

(Figs 71, 72, Tab. 26)

Material. 14 stations, 20 samples, 32 specimens. SP: region of São Paulo — ponds (1, 2) and reservoirs (3, 4); region of São Carlos — ponds (5, 8) and a reservoir (6); the Juréia Reserve — rivers (12, 15) and rain puddle (16); 27 specimens. MS: a pond (18); 1 specimen. PA: rivers (27, 28, 29); 4 specimens. Among silt (1, 2, 3, 4, 5, 6, 16, 18, 27, 28, 29), aquatic vegetation (of *Pistia stratiotes* — 4, *Salvinia natans* — 12, moss — 15, 16 and *Nymphaeaceae* — 28) as well as among sand (6, 8).

Table 26. Morphometrical features of Brazilian specimens of *Heterolepidoderma majus* compared with various literature data from Europe and those from Argentina (GROSSO and DRAHG 1984) and Japan (SAITO 1937)

Feature	Specimens from region of São Paulo			Specimens from Belém		Literature data
	Range	X	N	Spec. I	Spec. II	
Body length	130—155 μm	142.3	3	127 μm	143 μm	137—200 μm
Length of adhesive tubes	7—11 μm	9.2	3	9.5 μm	10 μm	7—11 μm
Pharynx length	34—40 μm	38.0	3	32.5 μm	34 μm	32—51 μm
Pharynx formula a	25.0—36.8%	32.7	3	25.8%	22.9%	22—33%
n	21.2—27.0%	24.8	3	20.6%	22.1%	
m	24.2—26.0%	25.2	3	21.8%	19.7%	19—24%
p	33.8—38.5%	36.4	3	31.4%	30.3%	24—31%
Diameter of mouth ring	6—7 μm	6.7	3	5 μm	4.5 μm	5.5—8 μm
Cephalion length	11; 14 μm		2	11 μm	12.5 μm	
Cephalion width	16—27.5 μm	22.8	3	15 μm	15.5 μm	
Total number of longitudinal rows of scales	45—49	47.0	3			46—63
Number of scales in a single longitudinal row	22		1			29—33
Ratio of scale distribution	223%		1			153—170%
Length of neck scales	2 μm		1			1.5—3 μm
Length of trunk scales	3.5—4.5 μm	3.9	3	2.5 μm	2.5 μm	2.3—7 μm



Figs 71, 72. *Heterolepidoderma majus* REMANE. Fig. 71 — ventral view of caudal body half, Fig. 72 — ventro-lateral keeled and spined scale.

Comparative description. The Brazilian specimens are morphologically in full accordance with the European members of the species including those studied by myself in Poland (KISIELEWSKI 1981 and 1986b). In particular, the worms from both continents show the same head outline which is three-lobed and is formed by large cephalion and posterior pleurae. Like in Polish animals (own unpublished data), the anterior pleurae are actually also present, however, they do not build head outline since they are placed more dorsally. Similarly to all Polish specimens, the caudal furca base is laterally thickened and covered dorsally and laterally with keeled scales that are larger and have more distinct edges than those from mid-trunk. The length of caudal furca base scales reaches in specimens from region of São Paulo 4.2—5.5 μm. Like in specimens from Poland (unpublished observations), but to greater extent, the keels of ventrolateral trunk scales tend to be transformed in short spines which project beyond posterior scale edges. The animals from Belém exhibit such scales also on lateral margins of caudal furca base. The ventral field covering in Brazilian, Polish and German (REMANE 1927) specimens is similar as well. The field terminates with a pair of keeled scales being 7.5—8.5 μm long. The intestinal field portion is mostly covered with 3μm-long keeled scales arranged in 9 longitudinal alternating rows, whereas the whole pharyngeal and beginning of intestinal field regions are naked.

Heterolepidoderma ocellatum (MEČNIKOW, 1865) sensu KISIELEWSKI 1981

(Tab. 27)

Material. 1 sample, 2 specimens. SP: the Juréia Reserve — in water recipients of the *Bromeliaceae* (14).

Recorded for the first time from South America.

Comparative description. The gastrotrichs found in the Juréia Reserve were somewhat smaller than the smallest specimens of the species collected from *Sphagnum* peat-bogs in Poland (KISIELEWSKI 1981). As far as the body shape and covering are concerned, they were in full accordance with Polish material. Among the

Table 27. Morphometrical features of Brazilian specimens of *Heterolepidoderma ocellatum* s. KISIELEWSKI 1981 compared with data from Poland (KISIELEWSKI 1981)

Feature	Specimens from Brazil		Literature data
	Specimen I	Specimen II	
Body length	91 μm	92 μm	95—127 μm
Length of adhesive tubes	6 μm		7—9.5 μm
Pharynx length	26.5 μm	26.5 μm	28—34 μm
Pharynx formula a	26.0%	30.6%	23—31%
n	23.4%	22.6%	
m	21.5%	22.6%	19—23%
p	30.9%	32.1%	23—35%
Diameter of mouth ring	4 μm	4 μm	4—5.5 μm
Cephalion width	8 μm	8.5 μm	
Number of scales in a single longitudinal row	about 25		15—24
Length of neck scales	3 μm	3 μm	1.5—4 μm
Length of trunk scales	4 μm	3 μm	3.5—6 μm

most important diagnostic characters, the parallel disposition of longitudinal alternating rows of scales has been observed both along pharyngeal and intestinal body region (only lateral neck rows were oriented slightly obliquely). The dorsal covering pattern of furca base was as in Polish worms and consisted of two large (4 μm in length) paired keeled scales being placed obliquely and median unpaired one provided with rudimentary spine (compare with Fig. 7 in the cited paper). The ventral field covering was also like that of Polish specimens, consisting of a pair of terminal keeled scales and several smaller keeled scales placed at the end of intestinal region. A paired "ocellar" granule was typically located, viz. between anterior and posterior pleurae. One of the specimens studied exhibited hermaphroditic structures, i. e. an unpaired packet of short-rod--spermatozoa.

Heterolepidoderma jureiense sp. nov.

(Figs 73, 74, Tab. 28)

Etymology. From the geographic name "Juréia", of the ecological reserve where the species has been discovered.

Material. 1 sample, 17 specimens. SP: the Juréia Reserve — the mangrove of Rio Verde. Among algae of *Bostrychia* sp.

Type specimens. Holotype, a specimen collected on 20.7.1984, will be deposited in the Department of Zoology, University of São Paulo. Three paratypes that derive from the same sample are kept in the author's collection.

Diagnosis. *Heterolepidoderma* having body 80—112 μm, with a paired ventrolateral row of delicate lamellae. Large posterior pleurae protrude laterally; anterior pleurae and "ocellar" granules absent. Cuticular structures distributed in 35 longitudinal alternating rows (including these with lamellae), 19—24 in a row. Rows of keels oriented clearly obliquely on neck and slightly oblique on posterior trunk portion. Trunk scale keels not raised. Furca base dorsally with several long keels. Ventral field with keels along posterior portion of intestinal region; a pair of larger terminal keeled scales present. Frontal pharynx dilation at least as wide as terminal one, with a pair of strong cuticular rods.

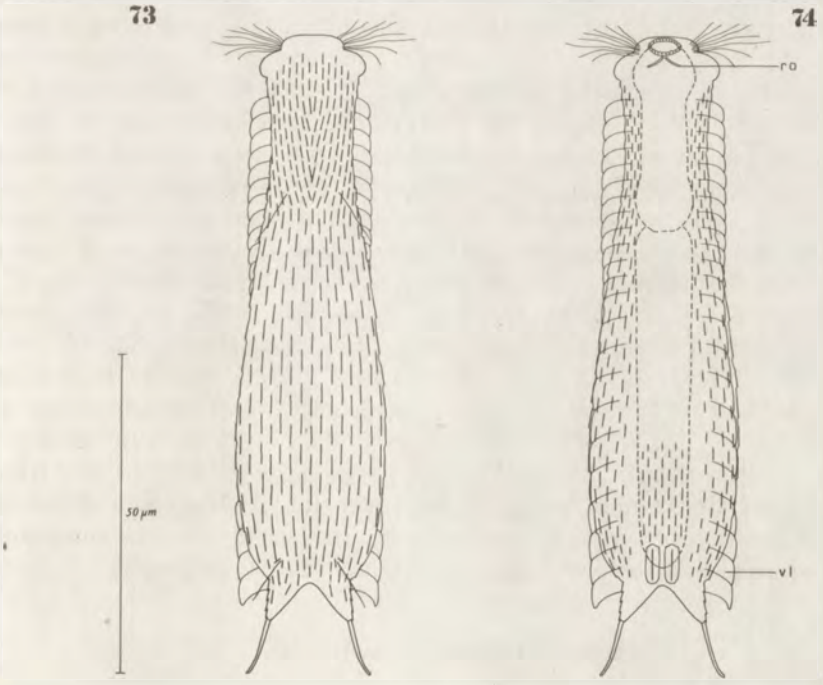
Description

The body, being 80—112 μm long, varies in shape from stumpy to fairly elongated. Head is short being covered with cephalion and a pair of pleurae. The cephalion adheres entirely to head surface and is 7—10.5 μm long and 10—12 μm wide. The large pleurae considerably project laterally. Cephalic cilia are fused into a pair of tufts. The hypostomion and cephalic "ocellar" granules were not noticeable. The neck region is constricted, while the trunk is the widest in its posterior portion. Adhesive tubes are rather long (9.5—11 μm in length), thin and straight or weakly bent externally. The ventral locomotory ciliature has not been satisfactorily studied. There are two paired dorsal sensory bristles, the posterior one arising from double-keeled scale.

Dorsal and lateral body sides are covered with keeled scales. The scale edges are hard to detect while the keels are flat except for head and neck where they are slightly raised. The total number of longitudinal alternating rows of cuticular structures amounts to 35, whereas the number of scales in a row to 19—24 including 8—10 along

the pharyngeal body region. The keel length varies from 2 to 3.5 μm on neck and from 3—4.5 μm on trunk. The scale arrangement is clearly oblique along neck region, parallel along almost whole trunk and slightly oblique at trunk end. The oblique disposition of neck longitudinal rows of scales results in vanishing of some median rows; for instance, the median rows at head front consist only of three keels. Dorsal side of furca base is covered with several scales that show long keels. The first ventrolateral row of cuticular formations consists of very delicate lamellae (Fig. 74 — vl) which can be noticed along the whole body, however, they are visible only at neck constriction and along posterior trunk region in dorsal view. Six next paired ventrolateral rows exhibit keels which are shorter than those from lateral and dorsal body sides. The ventral field ends with a pair of 7 μm long keeled scales. Its posterior portion is provided with short keels, whereas the anterior part of intestinal field portion and pharyngeal portion are naked.

The mouth ring is subterminal and rather wide. Pharynx is of medium length and has two clear terminal thickenings, the anterior being usually somewhat larger than the other and furnished with a pair of thick and long cuticular rods. I have observed only parthenogenic worms.



Figs 73, 74. *Heterolepidoderma jureiense* sp. nov. Fig. 73 — dorsal view. Fig. 74 — ventral view (ciliary bands not marked).

Table 28. Morphometrical features of *Heterolepidoderma jureiense* sp. nov.

Feature	Range	X	N
Body length	80—112 μm	98.8	9
Length of adhesive tubes	9.5—11 μm	10.0	8
Pharynx length	22—31 μm	27.9	9
Pharynx formula a	28.6—37.1%	33.9	5
n	21.7—30.0%	25.8	5
m	22.4—30.0%	26.5	5
p	27.9—39.3%	33.5	5
Diameter of mouth ring	4.3—5.5 μm	4.9	8
Cephalion length	7—10.5 μm	9.1	4
Cephalion width	10—12 μm	11.2	5
Total number of longitudinal rows of scales	35		1
Number of scales in a single longitudinal row	19—24	22.0	3
Ratio of scale distribution	145.8%		1
Length of neck scale keels	2—3.5 μm	2.5	3
Length of trunk scale keels	3—4.5 μm	3.7	6

Taxonomic remarks. The genus *Heterolepidoderma* comprises 24 hitherto described species, ten of them being dwellers of sea and brackish waters. In the mangrove zone where *H. jureiense* sp. nov. has been found, the fauna related both with marine and freshwater species may be expected. The presence of ventro-lateral lamellae clearly proves that *H. jureiense* derives from a marine line of *Heterolepidoderma* since this character occurs in two marine species, viz. *H. foliatum* RENAUD-MORNANT, 1967 and *H. axi* MOCK, 1979. Moreover, the ventrolateral lamellae characterize also the marine genus *Halichaetonotus* REMANE and some marine species in the genera *Chaetonotus* EHRENBERG (*Ch. variosquamatus* MOCK, 1979) and *Ichthydium* EHRENBERG (*I. supralitorale* MOCK, 1979), while they have never been detected among freshwater members of the *Chaetonotidae*. Other characters that support close relationship of *H. jureiense* with marine *Heterolepidoderma* species are strong anterior pharynx dilation (like *H. istrianum* SCHROM, 1972, *H. axi* MOCK, 1979, *H. grandiculum* MOCK, 1979, *H. arenosum* KISIELEWSKI, 1988) and posterior pleurae strongly projecting laterally (like *H. foliatum* RENAUD-MORNANT, 1967, *H. loricatum* SCHROM, 1972, *H. arenosum* KISIELEWSKI, 1988). *H. jureiense* differs from *H. axi* in having distinct posterior pleurae and more numerous longitudinal rows of cuticular structures (a total of 35 dorsally, laterally and ventrolaterally compared with 11 dorsally) and having lamellae without any trace of spine. Although the Brazilian gastrotrich much resembles *H. foliatum*, it differs from the latter in having larger lamellae which clearly project laterally on neck and posterior body portion as well as in lacking spines on terminal ventral field scales.

Genus ***Lepidodermella*** BLAKE, 1933

Lepidodermella minus (REMANE, 1936) ***chaetifer*** ssp. nov.

(Fig. 75, Tab. 29)

Etymology. From the Greek "khaite" — hair and the Latin "ferre" — to carry, referring to the presence of caudal ventrolateral spines.

Material. 3 stations, 4 samples, 19 specimens. SP: region of São Paulo — reservoirs (3, 4); the Juréia Reserve — a river (12). Among floating vegetation of *Salvinia natans* (3, 12) and *Pistia stratiotes* (4) as well as among silt (3).

Type specimens. Holotype, a specimen collected on 28.6.1984 from a reservoir at the Department of Zoology, University of São Paulo, will be deposited in the same department. Two paratypes that derive from the same sample are kept in the author's collection.

Description

Body length reaches 104—114 μm. Like in the nominotypical subspecies, the body is stocky and the head is clearly five-lobed. Adhesive tubes are short (8.5—11.5 μm in length), straight and of medium thickness.

The body is covered with unspined scales being of almost rectangular shape and reaching on trunk the length 4.5—6 μm. The scales are distributed in 13—15 longitudinal alternating rows, 30—31 in each. Like in the nominotypical subspecies and other members of the genus *Lepidodermella*, the anterior scale edges are extraverted which gives, under high magnification, an impression of a double edge. The rearmost lateral scale of every body side which belongs rather to ventrolateral longitudinal row, is always furnished with spine being usually strong, reaching 6.5—9 μm and projecting laterally at furca base. Shorter and weaker spines occasionally occur also on other ventrolateral trunk scales, however, this feature varies even within local population (specimens with and without such spines were found in the Juréia Reserve). The ventral field is naked except for a paired keeled scale being very narrow and provided with short (up to 2 μm long) spine.

The mouth ring is 5—5.5 μm in diameter. It is directed ventrally and looks quite round while observed from above. An unsymmetrical (left or right) strong tooth is inserted at anterior pharynx extremity. Pharynx is short and very thick. Only parthenogenic specimens have been observed.

Table 29. Morphometrical features of *Lepidodermella minus chaetifer* ssp. nov. compared with the present author's data (KISIELEWSKI 1981 and unpublished) on *L. minus minus* from Poland

Feature	*L. minus chaetifer* from Brazil			*L. minus minus* from Poland
	Range	X	N	
Body length	104—114 μm	110.2	6	118—125 μm
Length of adhesive tubes	8.5—11.5 μm	10.2	8	9—11 μm
Pharynx length	22.5—27.5 μm	25.0	7	24—28 μm
Pharynx formula a	42.9—47.9%	45.4	5	39—42%
n	38.4—41.5%	39.5	5	
m	39.7—45.1%	42.7	5	34—38%
p	53.1—56.1%	54.5	5	46—50%
Diameter of mouth ring	5—5.5 μm	5.3	6	6 μm
Total number of longitudinal rows of scales	13—15	13.7	3	18—24
Number of scales in a single longitudinal row	30—31	30.3	3	33—38
Ratio of scale distribution	43.3—48.4%	45.0	3	50—63%
Length of neck scales	2.5 μm		2	2.5 μm
Length of trunk scales	4.5—6 μm	5.1	5	3—5 μm

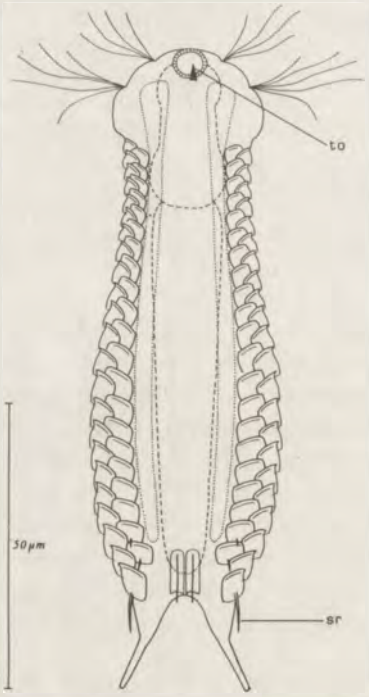


Fig. 75. *Lepidodermella minus chaetifer* ssp. nov. — ventral view.

Taxonomic remarks. The knowledge of European population of *L. minus* is still poor and based mainly on my uncompleted redescription (KISIELEWSKI 1981) as the original author (REMANE 1936) gave only a drawing of pharynx and mouth ring. The redescription and my unpublished observations made during recent studies in Poland (KISIELEWSKI 1986b) suggest, when compared with Brazilian gastrotrich, that both forms belong to the same species. They have similar body dimensions (the Brazilian form is fairly smaller), the same body habitus and head shape, ventrally directed mouth ring, short and very thick pharynx with an anterior tooth as well as a pair of very narrow terminal keeled scales of ventral field. However, the form from Brazil exhibits some distinct features. Unlike the European form, it has a paired lateral spine located at furca base and occasionally additional weaker spines on the ventrolateral trunk scales. Another important difference between Brazilian and European forms consists in lower number of longitudinal alternating rows of scales and number of scales in a row of the former (13—15 and 30—31 respectively compared with 18—24 and 33—38). The pharynx, being stumpy in both forms, is still thicker in Brazilian worm than in European one. The above differences suggest a separate status of Brazilian animal which I propose to consider a new subspecies, viz. *L. minus chaetifer* ssp. nov.

Lepidodermella squamata (DUJARDIN, 1841)

(Tab. 30)

Material. 11 stations, 15 samples, many specimens. SP: region of São Paulo — a pond (2) and reservoirs (3, 4); region of São Carlos — a pond (8) and a reservoir (6); the Juréia Reserve — a river (12) and in water recipients of *Bromeliaceae* (11); many specimens. MS: a pond (18); 1 specimen. PA: ponds (24, 25) and a river (28); 7 specimens. Among aquatic vegetation of *Salvinia natans* (3, 12, 28), *Pistia stratiotes* (4) and *Lemna* sp. (24) as well as a silt (2, 4, 18, 25, 28) and sand (6, 8).

Comparative description. The Brazilian population shows wide variability, whose range is similar to that observed on peat bogs in Poland (KISIELEWSKI 1981) as far as the majority of metrical features is concerned. There is considerable variability in number and size of posterodorsal trunk scales. However, the most important diagnostic features, viz. five-lobed and elongated head, scale shape, presence of a longitudinal row of wide plates on ventral field pharyngeal portion as well as long and slender pharynx are in full accordance with those from Europe (ZELINKA 1889) and North America (AMATO and WEISS 1982). It is worthy of mention that although a longitudinal row of short and wide ventral plates extends usually from hypostomion to anterior portion of intestinal region, I have observed in Belém some specimens with the row ending in front of pharynx-gut transition.

Table 30. Morphometrical features of Brazilian specimens of *Lepidodermella squamata* compared with various literature data from Europe, North America and South America

Feature	A specimen from São Paulo	A specimen from São Carlos	Specimens from Belém			Literature data
			Range	X	N	
Body length	160 μm	161 μm	139—195 μm	162.2	4	119—220 μm
Length of adhesive tubes	18 μm	14 μm	9.5—19 μm	13.7	4	14.5—17 μm
Pharynx length	54 μm	50 μm	44—58 μm	48.8	4	28—56 μm
Pharynx formula a	13.0%	22.2%	15.2—21.1%	17.8	3	16—20%
n	13.0%	17.4%	14.5—21.1%	17.2	3	
m	17.6%	16.6%	14.5—24.3%	19.0	3	17—24%
p	24.1%	28.2%	22.9—36.4%	28.6	3	22—33%
Diameter of mouth ring	5 μm	6 μm	4.5—6.5 μm	5.5	3	4—7 μm
Cephalion length			12 μm		1	
Cephalion width		15.5 μm	13.5; 14 μm		2	
Total number of longitudinal rows of scales	19	13	14; 15		2	18—19
Number of scales in a single longitudinal row	29	27	25—39	30.7	3	23—31
Ratio of scale distribution	65.5%	48.1%	53.6; 56.0%		2	58—66%
Length of neck scales		5 μm	4—5 μm		2	3.5—4 μm
Length of trunk scales		7 μm	8—11 μm		2	6—8.5 μm

Lepidodermella amazonica sp. nov.

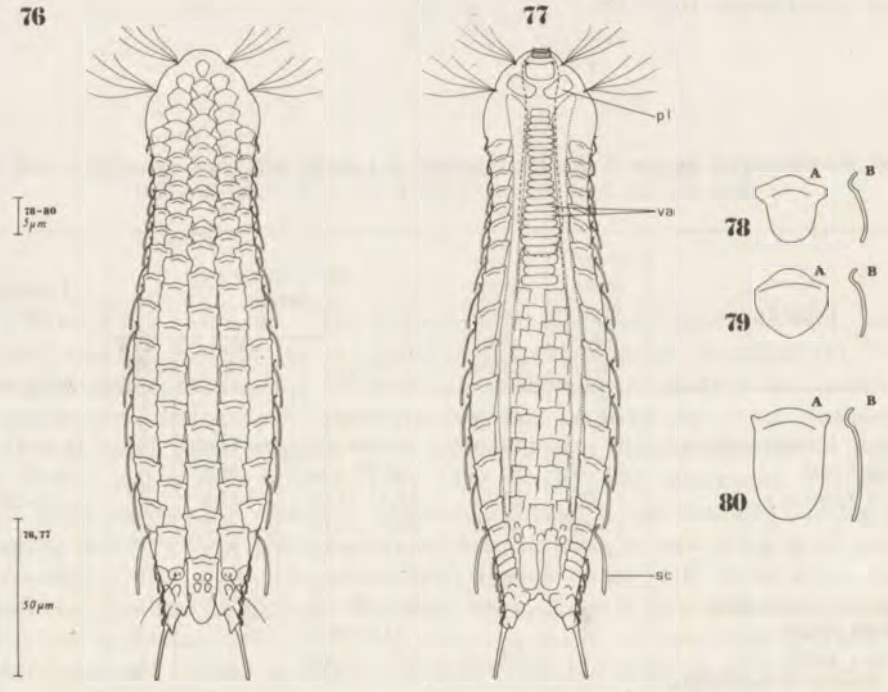
(Figs 76—80, Tab. 31)

Etymology. From the name of river Amazonas, in the estuary of which the species has been discovered.

Material. 1 sample, 8 specimens. PA: the Amazonian estuary (30). In 5-cm surface layer of clean sand, at high water level.

Type specimens. Holotype, a specimen collected on 24.2.1985, will be deposited in the Department of Zoology, University of São Paulo. Three paratypes that derive from the same sample are kept in the author's collection.

Diagnosis. Slender *Lepidodermella* with body 199—200 μm in length. Head five-lobed. Pharynx long (61—65 μm), slender, without teeth. Hypostomion without transverse furrow, it neighbors posterolaterally with a paired supplementary plate. Scales (except for neck ones) with antero-lateral horns. Scales distributed in 9 longitudinal alternating rows, 21—23 in each. Every dorsal and lateral longitudinal scale row with a longer scale at posterior trunk portion. Pharyngeal region of ventral field with single longitudinal series of short and wide plates.



Figs 76—80. *Lepidodermella amazonica* sp. nov. Fig. 76 — dorsal view, Fig. 77 — ventral view, Fig. 78—80 — various types of scales seen from above (A) and laterally (B); Fig. 78 — from head, Fig. 79 — from neck, Fig. 80 — from trunk.

Description

Body is slender and reaches length of 199—200 μm. Head is clearly five-lobed and has anterior pleurae smaller than cephalion (being 18—19 μm wide) and posterior pleurae. There are two pairs of tufts of cephalic cilia. Hypostomion, being 5.5—6 μm long and 9.5—10 μm wide, is in form of rectangle and has two small protuberances placed antero-laterally. Like *Chaetonotus acanthocephalus* VALKANOV, 1937, the hypostomion neighbors with a paired posterolateral plate being of similar size but less regular shape (Fig. 77 — pl). Adhesive tubes are straight, 17—19 μm in length and have tips rounded-off and only slightly narrower than basal portion. Ventral locomotory cilia bands extend along the whole body and do not join anywhere. At least posterior dorsal sensory bristles occur, being set on double-keeled scales.

The body is covered with scales that are devoid of spines or keels and are distributed in 9 longitudinal alternating rows, 21—23 in each. The scales whose anterior portions are extraverted, like in other species of *Lepidodermella*, exhibit peculiar shape. Their anterior edges are convex and provided laterally with a pair of hornlike protuberances (Figs 78, 80). Only neck scales tend to reduce these protrusions. Trunk scales are larger than those from head and neck, most of them reaching length 13.5—17.5 μm and width 10—11 μm. In every dorsal and lateral longitudinal scale row there is a larger postero-trunk scale 16—21 μm long (Fig. 77 — sc). Some (usually four) posterior scales from paired ventrolateral row are flat (without anterior extraversion) and considerably shorter than others. The trunk rear is covered dorsally with some smaller round scales. Entire caudal furca base is provided with scales, two pairs of the largest ones placed ventrally on inner furca margin. The ventral field ends with a paired unkeeled scale 15.5 μm long and 6.5—7.5 μm wide. The intestinal field portion is mostly covered with unkeeled scales distributed in 4 longitudinal alternating rows, 9 in each. Two outer longitudinal rows consist of small (3.5—4 μm long and 3 μm wide) scales, whereas two inner rows consist of larger square scales reaching dimensions of 8 μm. The whole pharyngeal and anterior portion of intestinal field region are covered with short and wide plates which are arranged in a single longitudinal row (Fig. 77 — va). There are 19 and 3—4 such plates respectively having dimensions from 2 μm × 5.5 μm to 5.5 μm × 16 μm.

Table 31. Morphometrical features of *Lepidodermella amazonica* sp. nov.

Feature	Range	X	N
Body length	199; 200 μm		2
Length of adhesive tubes	17—19 μm	17.8	6
Pharynx length	61—65 μm	63.5	4
Pharynx formula a	18.6; 9.7%		2
n	15.1; 16.0%		2
m	15.6; 16.3%		2
p	22.6; 24.2%		2
Diameter of mouth ring	6.5—7.5 μm	6.9	6
Cephalion width	18; 19 μm		2
Total number of longitudinal rows of scales	9		3
Number of scales in a single longitudinal row	21—23	22.0	3
Ratio of scale distribution	39.1—42.9%	41.0	3
Length of neck scales	10.5 μm		2
Length of mid-trunk scales	13.5—17.5 μm	15.0	3

The mouth ring, being short and having diameter of 6.5—7.5 μm, is almost terminal and furnished with long and thin bristles. Pharynx is long (61—65 μm) and unusually slender having even its posterior dilation only weakly marked. Only parthenogenic specimens have been found.

The worm is extraordinarily agile, resembling in motion a representative of *Xenotrichulidae* rather than *Chaetonotidae*.

Taxonomic remarks. *L. amazonica* sp. nov. seems to be closest related to *L. squamata* (DUJARDIN, 1841). Apart from less important features in common, both species have long and slender pharynx and similar covering of ventral field. However, *L. amazonica* differs from *L. squamata* in having less numerous cuticular structures both if number of longitudinal alternating scale rows and scale number in a row are counted (numbers of 13—19 and 23—39 respectively are reported for *L. squamata* — see Tab. 30 in the present paper). Specific characters of *L. amazonica* are also a peculiar scale shape, presence of larger postero-trunk scale in each dorsal and lateral row as well as occurrence of a paired posterolateral plate neighboring with hypostomion.

Lepidodermella broa sp. nov.

(Figs 81, 82, Tab. 32)

Etymology. From the "Broa" — a traditional name for "Represa do Lobo", the water body where the worm has been discovered.

Material. 1 sample, 12 specimens. SP: region of São Carlos — the reservoir Represa do Lobo (6). Among sand.

Type specimens. Holotype, a specimen collected on 24.9.1984, will be deposited in the Department of Zoology, University of São Paulo. Three paratypes that derive from the same sample are kept in the author's collection.

Diagnosis. *Lepidodermella* having body 116—137 μm in length. Head five-lobed. With large rectangle-oval scales distributed in 10—12 longitudinal alternating rows, 18—19 in each. Ventral field without cuticular formations except for a pair of terminal keeled scales. Pharynx 31—35 μm long, of medium thickness, without teeth. Inner margins of caudal furca base with a pair of convex keeled scales.

Description

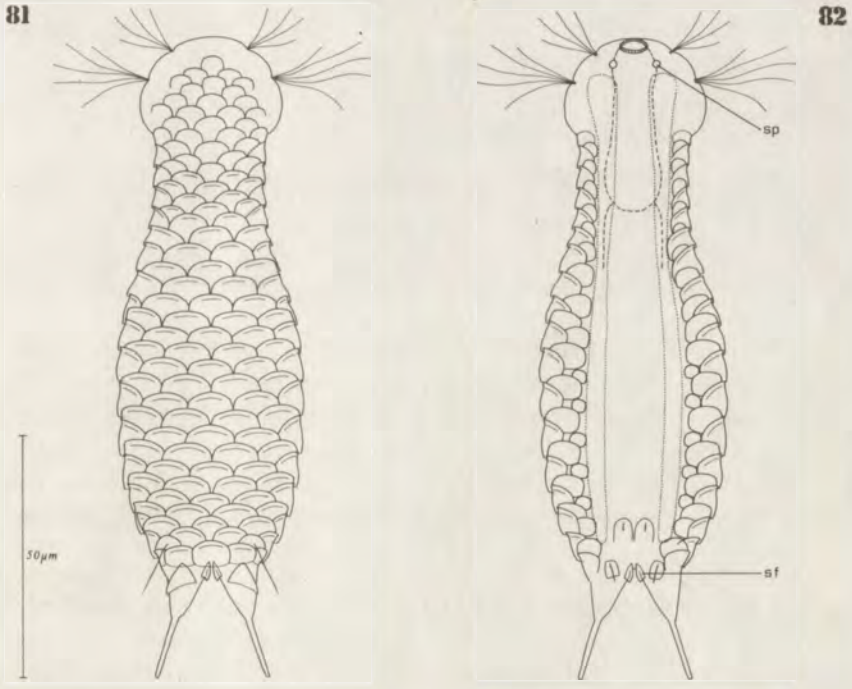
The body is 116—137 μm long and rather stumpy resembling that of a member of the marine genus *Halichaetonotus* REMANE rather than of *Lepidodermella*. Like in *Halichaetonotus*, the head is round, neck exhibits well-marked constriction and adhesive tubes are straight and rather thick. The head is furnished with five shields, the widest (16—17.5 μm wide) being the cephalion, while the smallest the anterior pleurae. There are two pairs of well-separated tufts of tactile cephalic cilia. The ventral head surface shows a pair of round light-refracting bodies which are placed behind the mouth ring (Fig. 82 — sp). Their function is unknown. The paired series of ventral locomotory cilia extends along the whole body.

The body is covered with relatively few large scales which exhibit rounded-off anterior edges. The largest trunk scales are 8—9 μm long and 9—12 μm wide. The scales overlap one another and are distributed in only 10—12 longitudinal alternating rows, 18—19 in each. The ventral field is naked except for its rear where a pair of rather

large and weakly-keeled scales occurs. The inner edges of the caudal furca base are covered with a paired 4 μm long scale which is convex and keeled, looking similar to the respective scales in the *Halichaetonotus* and apparently being homologous with them.

The mouth ring is fairly wide, reaching diameter of 5—6 μm. The pharynx shows a weak anterior and stronger posterior dilation. Neither mouth ring nor the pharynx are provided with teeth. One of specimens found bore rod-shaped spermatozoa 11.5 μm long.

Taxonomic remarks. The genus *Lepidodermella* BLAKE includes eleven species so far described, ten of them inhabiting inland waters. Among them, only *L. squamata* (DUJARDIN, 1841), *L. minus* (REMANE, 1936) and *L. macrocephala* D'HONDT, 1971 as well as *L. amazonica* sp. nov. show clearly five-lobed head and large scales which have well-marked edges and overlap one another. The French species *L. macrocephala* can be excluded from further comparison as it shows much larger head than that of *L. broa*. The last species differs from *L. squamata* and *L. minus* in having less numerous and relatively larger scales (the total number of longitudinal rows of scales 13—19 and 13—24 respectively are reported for compared species, and the number of scales in a row 23—31 and 30—38 respectively). Moreover, *L. broa* differs from *L. squamata* in showing shorter pharynx in relation to body length as well as in lacking cuticular formations on the ventral field, and from *L. minus* in showing longer pharynx in relation to body length as well as in lacking the pharynx teeth. The number of cuticular forma-



Figs 81, 82. *Lepidodermella broa* sp. nov. Fig. 81 — dorsal view, Fig. 82 — ventral view.

Table 32. Morphometrical features of *Lepidodermella broa* sp. nov.

Feature	Range	X	N
Body length	116—137 μm	129.4	5
Length of adhesive tubes	13.5—15 μm	14.0	4
Pharynx length	31—35 μm	32.7	5
Pharynx formula a	26.1—31.9%	29.5	3
n	23.3—30.6%	26.8	3
m	25.8—33.1%	29.5	3
p	31.7—40.3%	35.0	3
Diameter of mouth ring	5—6 μm	5.5	5
Cephalion width	16—17.5 μm	16.8	4
Total number of longitudinal rows of scales	10—12	11.0	5
Number of scales in a single longitudinal row	18—19	18.6	5
Ratio of scale distribution	55.6—63.2%	59.1	5
Length of neck scales	3.5—4.5 μm	4.2	5
Width of neck scales	5.5—7 μm	5.9	5
Length of trunk scales	8—9 μm	8.5	5
Width of trunk scales	9—12 μm	10.1	5

tions in *L. broa* is only slightly larger than that of *L. amazonica*. However, the former species can be easily distinguished from the latter in having smaller body size, thicker and much shorter pharynx and different scale shape. In addition, *L. broa* exhibits on ventral head side a pair of light-refracting bodies which have never been observed among other species of *Lepidodermella*. The diagnostic value of this character may be however hardly evaluated since the function of the bodies is unknown, and its occurrence restricted to a local population is possible.

Genus ***Aspidiophorus*** VOIGT, 1904

Aspidiophorus ? oculifer KISIELEWSKI, 1981

(Tab. 33)

Material. 3 stations, 3 samples, 4 specimens. SP: region of São Paulo — a reservoir (4); the Juréia Reserve — a river (12) and a rain puddle (16). Among root systems of *Pistia stratiotes* (4) and *Eichhornia crassipes* (12) and among organic remains (16).

Comparative description. The morphology of animals found in Brazil agreed mostly with that of specimens originally described by myself from *Sphagnum* peatbogs in Poland (KISIELEWSKI 1981). In particular, adhesive tubes showed similar distal dilation, ventral field bore keeled scales on its intestinal portion and a pair of larger keeled scales with or without short spines terminally. Also the majority of metrical features was in conformity. As far as the presence of "ocellar" granules is concerned, the Brazilian population was variable, being represented by specimens having either a pair of typical light-refracting bodies placed near posterior pleurae, or small dark spots placed uni- or bilaterally, or lacking any bodies at all. It should be stressed that such a variability was also observed among Polish populations of *A. oculifer* inhabiting other habitats than *Sphagnum* peat bogs (own unpublished data). The character distinguishing Brazilian animals from Polish ones is the size of caudal base pedunculated scales. The scales became smaller and smaller from rostral to caudal in the former,

whereas all were as large as trunk ones in the latter. Like in Polish worms, the anterior edges of pedunculated scales seemed to be semioval under low microscope magnifications, however, they were found rhomboid while observed using immersion objective. Apart from parthenogenic specimens, an animal having unpaired packet of ca. 3 μm long spindle-shaped spermatozoa was found.

The differences between Brazilian and Polish specimens do not permit to classify them with certainty within the same species.

Table 33. Morphometrical features of *Aspidiophorus ? oculifer* compared with Polish data on *A. oculifer* KISIELEWSKI, 1981

Feature	*A. ? oculifer* from Brazil			Literature data on type-form
	Range	X	N	
Body length	94—132 μm	108.8	3	115—135 μm
Length of adhesive tubes	8.3—10 μm	9.2	4	8—10.5 μm
Pharynx length	26.5—32 μm	29.9	4	33—36 μm
Pharynx formula a	22.5—30.2%	27.1	4	25—28%
n	19.2—20.3%	19.8	4	
m	20.6—21.7%	21.4	4	20—22%
p	25.9—36.6%	32.0	4	26—32%
Diameter of mouth ring	3—4 μm	3.6	3	4—5 μm
Cephalion length	9.5; 11 μm		2	
Cephalion width	10—11 μm	10.5	3	
Total number of longitudinal rows of scales	37		1	33—40
Number of scales in a single longitudinal row	31; 36		2	36—41
Ratio of scale distribution	102.8%		1	90—111%
Length of trunk scales	3—4 μm		2	2.5—4 μm

Aspidiophorus ophiodermus BALSAMO, 1983

(Tab. 34)

Material. 2 stations, 2 samples, 3 specimens. SP: region of São Carlos — ponds (5, 8). Among silt (5) and sand (8).

Recorded for the first time from South America.

Comparative description. The São Carlos specimens were of size similar to those found in Poland (KISIELEWSKI 1986a) while their morphology was in accordance both with animals from Poland and Italy (BALSAMO 1983a). The head was covered with five shields, however, the anterior pleurae were withdrawn dorsally which, like in specimens from Europe, made the head outline formed only of cephalion and posterior pleurae. The cuticular armature consisted of elongated pedunculated scales being finely keeled, as given from Italy by BALSAMO. Like in specimens from Poland, the furca base was covered with elliptical nonpedunculated scales being larger than those from trunk and having more pronounced keels. The keels were occasionally prolonged in spines up to 2.5 μm long. In accordance with both descriptions from Europe, the ventral field covering consisted of elongated keeled scales and terminated with a pair of larger (up to 9 μm long) keeled scales. Anterior gut portion showed appearance of one-lobed distinct organ with fine granulation. This character is in full accordance with my own observation from Poland.

Table 34. Morphometrical features of a Brazilian specimen of *Aspidiophorus ophiodermus* compared with data from Italy (BALSAMO 1983a) and Poland (KISIELEWSKI 1986a)

Feature	A specimen from São Carlos	Literature data from Italy	Literature data from Poland
Body length	175 μm	92—154 μm	152—173 μm
Length of adhesive tubes	12.5 μm		7.5—10.5 μm
Pharynx length	42.5 μm	?	38—42 μm
Pharynx formula a	23.3%		22—28%
n	19.8%		
m	23.3%		21—29%
p	32.9%		28—35%
Diameter of mouth ring	5.5 μm		5—8 μm
Cephalion width	18.5 μm		

Aspidiophorus slovinensis KISIELEWSKI, 1986

Material. 1 specimen, SP: region of São Carlos — a pond (5). Among silt.

Recorded for the first time from South America.

Comparative description. The morphology of the specimen found answered fully the description of animals found by myself in Poland (KISIELEWSKI 1986a). The hypostomion and pharyngeal cuticular rods which are the most characteristic of the species, were built as in Polish specimens. The body covering was also similar, consisting of pedunculated scales of similar number and size in respective body regions, those located at furca base being smaller than trunk ones. Like in *A. slovinensis* from Europe, the ventral field of São Carlos specimen was covered with pedunculated scales. Only some measurements were taken from a single animal studied. The body length was ca. 150 μm, pharynx length 36 μm, length of adhesive tubes 11 μm, hypostomion width 12.5 μm, while values a, n, m and p of pharynx formula amounted to 44.2, 23.0, 25.0 and 43.1% respectively. All these measurements either agree with those taken in Poland or are close to them.

Aspidiophorus aff. *tetrachaetus* KISIELEWSKI, 1986

(Figs 83, 84, Tab. 35)

Material. 1 sample, 5 specimens. SP: the Juréia Reserve — a river (12). Among root systems of *Salvinia natans*.

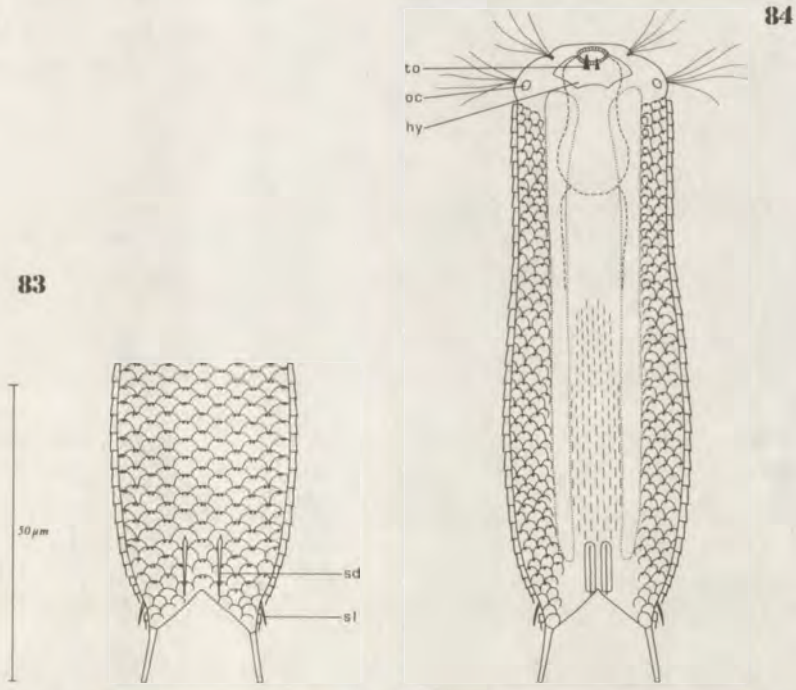
Recorded for the first time from South America.

Description

Body is stumpy and reaches length of 98—112 μm. There are five cephalic plates, however, the head outline is formed only by cephalion and posterior pleurae since the anterior pleurae are moved dorsally. There occur two pairs of tufts of well-separated cephalic cilia. A large hypostomion being in form of polygon does not show any anterior protuberances or posterior furrow (Fig. 84 — hy). Some of specimens exhibited a pair of large "ocellar" granules which were placed near posterior pleurae (Fig. 84 — oc), however, some other animals did not bear even trace of them. There are three pairs of dorsal sensory bristles, two posterior ones being typically inserted (on neck and

caudal trunk portion) whilst the supplementary pair is placed on the head. Ventral paired locomotory cilia band extends along the whole body and does not join anywhere.

Dorsal and lateral body sides are covered with pedunculated scales that are distributed in 31 longitudinal alternating rows, 32—34 in each. The scales, reaching length of 4 μm on trunk, exhibit semicircular anterior edges. Their peduncles are short (1 μm long) and apparently flat and wide since in some specimens they were seen as two points located close side by side (Fig. 83). Lateral pedunculated scales are slightly smaller than those from dorsum and the ventrolateral ones are still smaller. The furca base is dorsally, laterally and ventrally covered with scales whose peduncles were detected with certainty only on lateral scales. On the mid-posterior trunk portion within the longitudinal rows that neighbour with the median one, a paired spined scale is present. The spines are straight, 8—10.5 μm long and become narrower and narrower distally (Fig. 83 — sd). Another paired spine occurs laterally at furca base (sl), however, it is shorter than the other and appears to be rudimentary in some specimens. The ventral field terminates with paired very narrow keeled scales 8.5 μm long. The intestinal field portion is entirely or at least in posterior ⅔ covered with keels which are distributed in approximately 10 longitudinal alternating rows. The pharyngeal portion of ventral field was found bare.



Figs 83, 84. *Aspidiophorus* aff. *tetrachaetus*. Fig. 83 — dorsal view of caudal body half, Fig. 84 — ventral view.

The mouth ring is subterminal and 4.5—5 μm in diameter. Pharynx is short for body length (reaching only 21% of body length on average) and unusually thick. Its both ends form prominent bulbs, the posterior one being stronger than the other. The anterior pharynx extremity is furnished with thick teeth. The teeth are rarely of equal size since either right or left one tends to be reduced.

Taxonomic remarks. Most of important diagnostic features of the Brazilian specimens correspond to the description of *A. tetrachaetus* KISIELEWSKI, 1986a, the species having been originally found in the mountains Sudety in Poland. Both gastrotrichs show the same number of longitudinal alternating rows of pedunculated scales and scale number in a row as well as the number, appearance and location of trunk spines, relative pharynx length and covering of ventral field. In addition, the body dimensions are similar (see Tab. 35). However, the bodies of the Brazilian worms were slightly more stumpy, and their pharynges still stronger (e. g. the "p" value of pharynx formula ranged in the Juréia and Polish specimens from 48.4—60 and 45—53% respectively). The essential difference between South American and European specimens is however the presence of strong pharyngeal teeth in the former while this feature has not been recorded for the latter. The occasional occurrence of "ocellar" granules in Brazilian worms could not be regarded as diagnostically important since the character is variable even within local population. Furthermore, it appears useless within whole genus *Aspidiophorus* (see discussion on *A. marinus* in KISIELEWSKI 1988 and on *A. oculifer* in this paper). Taking above differences into account, the Brazilian specimens cannot be affiliated with certainty with *A. tetrachaetus*.

Table 35. Morphometrical features of *Aspidiophorus* aff. *tetrachaetus* compared with data on type-form from Poland (KISIELEWSKI 1986a)

Feature	*A.* aff. *tetrachaetus*			*A. tetrachaetus* from Poland
	Range	X	N	
Body length	98—112 μm	106.2	4	110—137 μm
Length of adhesive tubes	8.5—9.5 μm	9.0	4	9—10 μm
Pharynx length	22—23.5 μm	22.4	5	25.5—30 μm
Pharynx formula a	43.2—45.5%	44.4	4	35—41%
n	33.6—39.1%	36.8	4	
m	40.0—46.4%	43.2	4	33—38%
p	48.4—60.0%	57.0	4	45—53%
Diameter of mouth ring	4.5—5 μm	4.8	4	4.5—6 μm
Cephalion length	11; 12.5 μm		2	
Cephalion width	12.5—14.5 μm	13.4	3	
Total number of longitudinal rows of scales	31		3	25—31
Number of scales in a single longitudinal row	32; 34		2	33—41
Ratio of scale distribution	91.2; 96.9%		2	76—89%
Length of neck pedunculated scales	2.5; 3 μm		2	2—3.5 μm
Length of trunk pedunculated scales	4 μm		3	3—5 μm
Peduncle length	1 μm		1	
Length of dorsal spines	8—10.5 μm	9.2	3	8—10 μm

Aspidiophorus pleustonicus sp. nov.

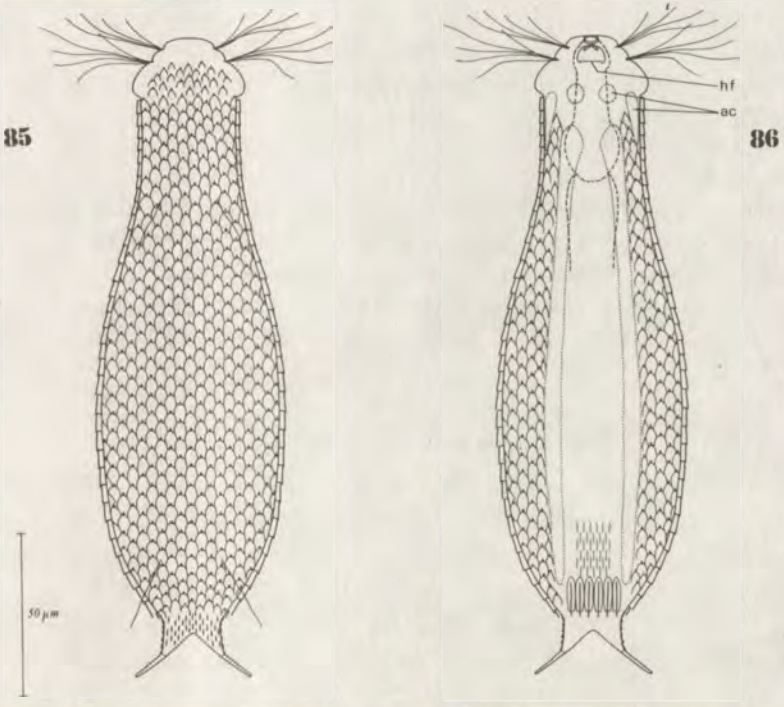
(Figs 85, 86, Tab. 36)

Etymology. From the pleuston — an aquatic plant formation, in which the species has been found.

Material. 1 sample, 5 specimens. SP: region of São Paulo — the reservoir Represa Billings (4). Among root systems of *Pistia stratiotes*.

Type specimens. Holotype, a specimen collected on 16.10.1984, will be deposited in the Department of Zoology, University of São Paulo.

Diagnosis. *Aspidiophorus* having body 191—208 μm long. Head small with five--lobed outline. Pedunculated scales up to 5—7 μm in length, with semi oval anterior edges, distributed in 45—53 longitudinal alternating rows, 29—32 of scales in a row. Furca base covered dorsally and laterally with short nonpedunculated scales having keels or short spines. Ventral field with several keeled and spined terminal scales distributed in a transverse row and with some smaller keeled scales in its posterior portion. Mouth ring very short and delicate. Pharynx small (43 μm long), with strong posterior bulb and a pair of cuticular rods frontally. Hypostomion with weak transverse furrow.



Figs 85, 86. *Aspidiophorus pleustonicus* sp. nov. Fig. 85 — dorsal view, Fig. 86 — ventral view.

Description

The body is 191—208 μm in length. The head and caudal appendages are small whereas the trunk is long and wide. The head outline is formed by five shields, viz. cephalion, which is flattened frontally, small anterior pleurae and posterior pleurae which are very large and project laterally. There are two pairs of well-separated cephalic cilia tufts. The hypostomion is weakly developed and exhibits a fine transverse furrow seen as thin line (Fig. 86 — hf). The main paired longitudinal series of cilia begins far from anterior body end and extends up to trunk rear. Apart from main ciliary series, there occur two pairs of supplementary ventral ciliary areas. One of paired areas is round and located rostral to beginning of main series while the other is elongated and extends ventrolaterally along anterior portion of neck region (Fig. 86 — ac).

Dorsal and lateral body sides are covered with pedunculated scales which are arranged in 45—53 longitudinal alternating rows, 29—32 in each. The anteriormost cephalic pedunculated scales are very small, whereas those occurring at mid-trunk region are large (up to 5—7 μm long). The scales are unkeeled and not rhomboid in shape, having their anterior portions rather oval and dilating gradually, thus, resembling most of all the pedunculated scales of *Polymerurus rhomboides* (STOKES). The posterior scale portions are more delicate and harder to notice while observed from above. The furca base dorsal and lateral scales are minute, keeled and nonpedunculated. The keels of rearmost lateral scales, and sometimes some others, tend to protrude in short spines. The furca base ventral side is free from cuticular armature. Ventral field ends with several (usually six) terminal scales distributed in a transverse row. At the posterior portion of intestinal field region, there occur the 4—4.5 μm long keels distributed in 10—12 longitudinal alternating rows, 3 in each. Both the remaining portion of intestinal region and pharyngeal field region are devoid of any cuticular formations.

The mouth ring is very short and 5 μm in diameter. It exhibits unusually fine structure as its longitudinal ribs are only just marked. Like whole anterior body region, the pharynx is small since its length reaches only 23% of total body length. The anterior half of pharynx is narrow and shows only slight dilation, while the posterior half

Table 36. Morphometrical features of *Aspidiophorus pleustonicus* sp. nov.

Feature	Range	X	N
Body length	191—208 μm	196.8	4
Length of adhesive tubes	9.5—11.5 μm	10.2	4
Pharynx length	43 μm		4
Pharynx formula a	22.6—27.2%	24.8	3
n	18.8—20.9%	19.8	3
m	23.0—25.6%	24.3	3
p	35.1—43.5%	39.1	3
Diameter of mouth ring	5 μm		3
Cephalion width	16 μm		1
Total number of longitudinal rows of scales	45; 53		2
Number of scales in a single longitudinal row	29; 32		2
Ratio of scale distribution	155%		1
Length of trunk pedunculated scales	5; 7 μm		2

has strong bulb. At the front of pharynx, a pair of thick cuticular rods arranged in form of an acute angle occurs. The anterior gut portion is very wide and does not differ in structure from its remaining part. Apart from parthenogenic specimens, I have found a hermaphrodite with spindle-shaped spermatozoa up to 4.5 μm long.

Taxonomic remarks. Of 23 species of *Aspidiophorus* known so far, 14 species do not show conspicuous posterior spines or spine-like elongated pedunculated scales, which is also the case of *A. pleustonicus* sp. nov. Within this group, only *A. ophiodermus* BALSAMO, 1983a is characterized by the presence of keeled nonpedunculated scales on dorsal side of furca base which is joint character with *A. pleustonicus*. However, the new Brazilian gastrotrich can be easily distinguished from BALSAMO's species by its five-lobed head outline instead of three-lobed, smaller head as well as shorter pharynx.

Genus *Ichthydium* EHRENBERG, 1830

Ichthydium forficula REMANE, 1927

Material. 4 stations, 5 samples, 7 specimens. SP: region of São Paulo — a reservoir (3); region of São Carlos — a pond (7) and a reservoir (6); the Juréia Reserve — a river (12). Among root systems of *Salvinia natans* (3) and *Eichhornia crassipes* (12) as well as diverse submerged vascular plants (7) and silt (6).

Recorded for the first time from South America.

Comparative description. The specimens from Brazil were in full accordance with those numerously found by myself on *Sphagnum* peat bogs in Poland (KISIELEWSKI 1981). The measurements taken from a single specimen are as follows: body length 136 μm, length of adhesive tubes 22—23 μm (N = 2), pharynx length 36 μm, mouth diameter 7 μm. Like in specimens from Poland, and contrary to the animal figured in REMANE (1927), the pharynx was strong and had two prominent terminal dilations. The cuticle was quite smooth except for the ventral field end, where a paired keeled scale occurred, and for the base of posterior of two paired dorsal sensory bristles, where double-keeled scale was present.

Ichthydium chaetiferum sp. nov.

(Figs 87—89, Tab. 37)

Etymology. From the Greek "khaite" — long hair and the Latin "fero" — to bear, referring to the presence of long ventrolateral spines.

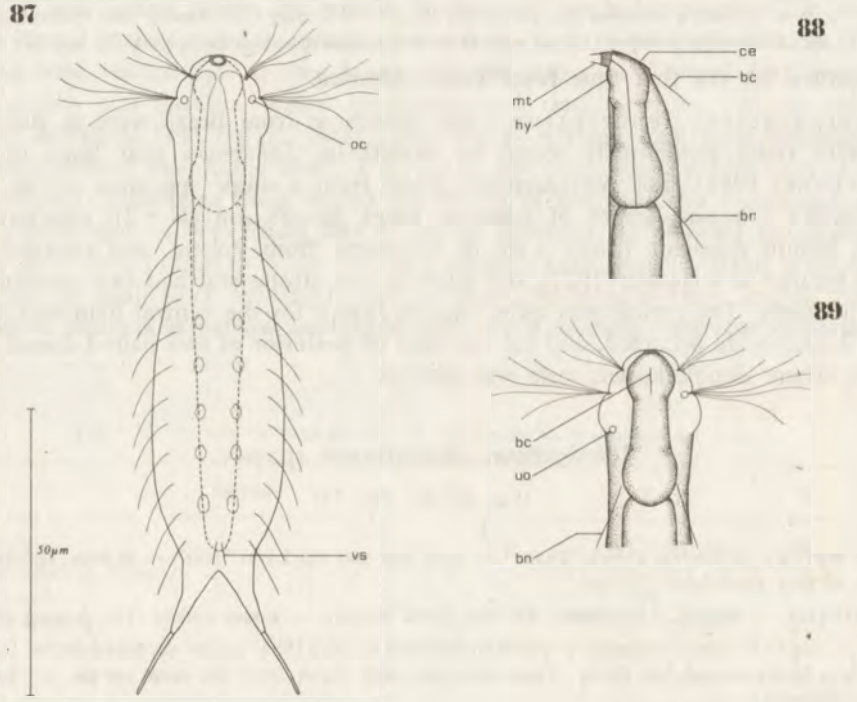
Material. 1 sample, 6 specimens. SP: the Juréia Reserve — a rain puddle (16). Among mosses.

Type specimens. Holotype, a specimen collected on 30.9.1984, will be deposited in the Department of Zoology, University of São Paulo. Three paratypes that derive from the same sample are kept in the author's collection.

Diagnosis. *Ichthydium* having body 107—117 μm long. Head five-lobed with a pair of large "ocellar" granules. Cuticle smooth except for ventrolateral trunk portion where a paired longitudinal row of hairlike spines occurs and ventral field rear where a pair of terminal scales is present. Caudal furca long and narrow with long adhesive tubes. Mouth ring narrow with distal teeth. Pharynx with two terminal bulbs.

Description

The body is 107—117 μm long, slender and constricted at neck region. Head is long and covered with five large plates, the smallest of them being anterior pleurae. Cephalion which is entirely attached to head (Fig. 88 — ce) is 8.5—9 μm long and 11 μm wide. There are two pairs of well-separated tufts of long cephalic tactile cilia. There occurs a paired large and round "ocellar" granule usually placed on the boundary between anterior and posterior pleurae (Fig. 87 — oc). In one of specimens studied, I have observed a granule dislocated behind posterior pleura (Fig. 89 — uo) while the other granule was located as usual. The trunk rear is very narrow. Furca branches are long and slender, each being provided with long and thin adhesive tube. The tubes are bent ventrally and somewhat internally. Ventral locomotory ciliature consists of paired series of long cilia. The series extend the whole body length and are narrow except for their anterior portion, where they lie close to each other. The trunk cilia are much sparser than those from head and neck, sometimes tending to form small tufts isolated one from another. There usually occur two pairs of typically-placed dorsal sensory bristles, however, an additional unpaired bristle may be also inserted just behind cephalion (Fig. 88 — bc).



Figs 87—89. *Ichthydium chaetiferum* sp. nov. Fig. 87 — ventral view, Fig. 88 — lateral view of anterior body portion (cilia not marked), Fig. 89 — general view of anterior body portion of a specimen with unusually placed "ocellar" granule.

The cuticle is smooth except for ventrolateral body side where a paired longitudinal row of spines occurs. There are twelve spines per side distributed along the body region between pharyngeointestinal junction and furca base. The spines are slightly bent except for the rearmost one. All of them project laterally and can be also detected when observed from dorsal side. Their basal scales were not noticed. The only cuticular structure detected on ventral field is a paired terminal scale which is 4—4.5 μm long, apparently lacks keel and is easier to detect when observed from lateral than from ventral side (Fig. 87 — vs).

The mouth ring is unusually narrow (3 μm in diameter) and directed ventrally. It is furnished with external teeth (Fig. 88 — mt). Pharynx exhibits both terminal bulbs, the posterior one being considerably stronger than the other. Apart from parthenogenic animals, I have found two specimens with bilobed organ x and short-rod spermatozoa ca. 4 μm in length.

Taxonomic remarks. Although REMANE (1936) considered the genus *Ichthydium* only probably polyphyletic, more recent evidence proves its obvious polyphyly. The taxon comprises the species which exhibit characters based on a negative criterion, viz. lacking well-developed cuticular structures. One should agree with REMANE (1936) that the lack of clear cuticular structures in *Ichthydium* is not a primitive character and that the genus has derived from a form with differentiated cuticle. Only some species, e. g. *I. forficula* REMANE, have dorsal and lateral body sides completely naked, while the others show the presence of fine keels or folds which proves the body covering with many structures fused or not with basal cuticle (e. g. *I. fossae* D'HONDT, 1971, *I.* cfr. *podura* — BALSAMO 1980). The majority of members of the genus lacks ventrolateral cuticular formations, however, one of marine species, viz. *I. rupperti* MOCK, 1979, exhibits a paired longitudinal row of lamellae. Of 28 species of *Ichthydium* described sofar, *I. chaetiferum* sp. nov. resembles most of all *I. forficula* REMANE, 1927. Both species show similar body habitus, presence of slender furca with long adhesive tubes, lacking dorsal and lateral cuticular structures as well as similar pharynx shape (see discussion of *I. forficula* in KISIELEWSKI 1981). All the above joint characters suggest that both species represent the same evolutionary line within *Ichthydium*. The occurrence of ventrolateral spines in *I. chaetiferum* has phylogenic significance since it

Table 37. Morphometrical features of *Ichthydium chaetiferum* sp. nov.

Feature	Range	X	N
Body length	107—117 μm	113.4	5
Length of adhesive tubes	12.5—14 μm	13.2	5
Pharynx length	25—29 μm	26.8	4
Pharynx formula a	27.6; 30.4%		2
n	20.7; 23.8%		2
m	25.7; 26.2%		2
p	37.1; 37.9%		2
Diameter of mouth ring	3 μm		3
Cephalion length	8.5; 9 μm		2
Cephalion width	11 μm		2
Maximum length of ventro-lateral spines	11; 12 μm		2

allows to specify some ancestral conditions of that line. The number of hairlike spines along trunk (twelve per side) proves that the line has derived from an ancestor having the body covered with scarce scales, apparently not more numerous than 20 per whole longitudinal row. It is not the case of majority of *Ichthydium* species which show usually rudimentary covering with abundant and densely packed scales. Moreover, the presence of long ventrolateral spines in *I. chaetiferum* suggests that the line ancestor was a gastrotrich of the genus *Chaetonotus*. By contrast, finely keeled or folded cuticle of other *Ichthydium* species proves that these taxa are descendants of *Heterolepidoderma*. Although the revision of the genus *Ichthydium* is needed, it is premature before more species are re-examined using high-resolution microscopes.

Genus ***Polymerurus*** REMANE, 1927

Polymerurus nodicaudus (VOIGT, 1901)

(Tab. 38)

Material. 2 stations, 2 samples, 11 specimens. SP: region of São Paulo — a pond (1) and a reservoir (4). Among silt.

Recorded for the first time from South America.

Comparative description. Dimensions of most specimens from Brazil agree with those recorded from Europe except for the largest Brazilian animal whose total

Table 38. Morphometrical features of Brazilian specimens of *Polymerurus nodicaudus* compared with various literature data from Europe and those from Japan (SAITO 1937)

Feature	Specimens from Brazil			Literature data from Europe	Literature data from Japan
	Range	X	N		
Body length	443—671 μm	509.0	4	330—544 μm	300—318 μm
Length of caudal appendages	137; 143 μm		2	105—148 μm	65—75 μm
Length of adhesive tubes	116—153 μm	125.2	4		
Pharynx length	85—96 μm	89.8	4	85—89 μm	38—55 μm
Pharynx formula a	30.2; 34.1%		2		
n	25.9; 26.9%		2		
m	27.3; 27.5%		2		
p	30.2; 31.0%		2		
Diameter of mouth ring	16.5 μm		1		
Cephalion length	48—51 μm	49.7	3		
Cephalion width	50 μm		1		
Number of scales in a single longitudinal row	23		1		
Length of trunk scales	11 μm		1	7.8 μm	
Length of neck spines	9—12.5 μm		2		
Length of trunk spines	9.5—14 μm		2	15.6 μm	8—11 μm
Length of rearmost lateral spines	20 μm		1		
Length ratio of terminal spines	3.0%		1		
Number of adhesive tube segments per side	23—26	24.5	5	19—25	12—14

body length was the largest ever reported for this species reaching 671 μm. The scales had well-visible edges and were shaped as in specimens from Europe. Also spines were similar being of similar length, rather thin, slightly bent and tending to become longer and thicker on caudal trunk portion, posterodorsally in particular. The ventral field covering consisted of numerous spined scales which were somewhat smaller but shaped like dorsal ones. It ended with a pair of 15 μm long scales being provided with 6.5 μm long spines.

Polymerurus rhomboides (STOKES, 1887)

(Tab. 39)

P. marcolongoae GROSSO, 1975, n. syn.

Material. 6 stations, 12 samples, 25 specimens. SP: region of São Paulo — a reservoir (4); 11 specimens. MS: a river (17) and a pond (18); 5 specimens. PA: ponds (23, 25) and a river (26); 9 specimens. Among silt (4, 17, 18, 23, 25, 26) and root systems of *Pistia stratiotes* (4).

Comparative description. As far as the body dimensions are concerned, the Brazilian specimens varied to extent wider than the European individuals of the species.

Table 39. Morphometrical features of Brazilian specimens of *Polymerurus rhomboides* compared with various literature data from Europe

Feature	Specimens from region of São Paulo		Specimens from Belém		Literature data
	Specimen I	Specimen II	Specimen I	Specimen II	
Body length	400 μm	415 μm	321 μm	500 μm[1]	286—400 μm
Length of caudal appendages	116 μm				68—150 μm
Length of adhesive tubes	103 μm	108 μm	96 μm	125 μm	
Pharynx length	64 μm	64 μm	50 μm	81 μm	35—80 μm
Pharynx formula a	36.7%	34.4%	32.0%	33.3%	
n	28.1%	30.0%	28.0%	33.3%	
m	31.4%	34.4%	31.0%	36.4%	
p	41.4%	44.7%	33.4%	39.0%	
Diameter of mouth ring	10.5 μm		9 μm	17.5 μm	
Cephalion width	47 μm		36 μm	58 μm	22 μm
Total number of longitudinal rows of scales	33	31		33	
Number of scales in a single longitudinal row	46			45	50
Ratio of scale distribution	71.7%			73.3%	
Length of neck scales	4.5 μm	7 μm		7 μm	
Length of trunk scales	9.5 μm	9 μm	6 μm	11 μm	5—8 μm
Number of adhesive tube segments per side	19; 20	20	19	22; 23	18—23

[1] The body length of two other mature specimens from Belém was 270 μm and 560 μm

Although the smallest worm found in Belém was of size similar to that of the smallest specimen reported from Europe (total body length 270 μm compared with 286 μm), the largest Brazilian specimen, found in Belém as well, was considerably larger than the largest European one (560 μm compared with 400 μm). Also two further metrical features of Brazilian specimens which can be compared with incomplete data from Europe, viz. pharynx and scale length, show wider variability range. The feature in common of Brazilian and European populations is the number of adhesive tube segments amounting to 19—23 and 18—23 respectively. It seems that this character may be diagnostically useful within the whole genus *Polymerurus*. The dorsal and lateral cuticular covering as well as the ventral field armature consist of oval scales with short peduncles which fully agrees with observation by REMANE (1927 — as *P. oligotrichus*) from Germany and my own from Poland (KISIELEWSKI 1979 and unpublished). Like specimens from Poland, the worms found in Brazil showed well-developed paired series of ventral cilia extending along the whole body as well as an additional transverse band which consisted of several rows of cilia and was situated just caudal to strong transverse hypostomion furrow.

GROSSO (1975) has stated that the *P. rhomboides* from Argentina has its body covered with pedunculated scales instead of simple ones as given by STOKES (1887) in its original description. GROSSO considered the European *P. rhomboides* a separate species which he named *P. marcolongoae*. In one of my earlier papers (KISIELEWSKI 1979), I have shown that the cuticular covering of *P. rhomboides* from Europe also consists of pedunculated scales, synonymizing *P. oligotrichus* REMANE, 1927 with the former name. Therefore, also the name *P. marcolongoae* GROSSO, 1975 should be synonymized with *P. rhomboides* (STOKES, 1887).

Polymerurus squamofurcatus PREOBRAŽENSKAJA, 1926 ***matogrossensis*** ssp. nov.

(Fig. 90, Tab. 40)

Etymology. From the geographic name "Mato Grosso", referring to the Brazilian region where the subspecies has been discovered.

Material. 2 stations, 2 samples, 3 specimens. MS: a channel (17) and a pond (18). Among silt.

Type specimen. Holotype, a specimen collected from the channel located several km W of the town Corumbá, near the boundary between Brazil and Bolivia on 31.10.1984, will be deposited in the Department of Zoology, University of São Paulo.

Species recorded for the first time from South America.

Description. The body is 333—340 μm in length. Three-lobed head exhibits ventrally a large hypostomion with posterior transverse furrow. The neck constriction is better marked than in other congeneric species. Trunk becomes narrow at its rear, while furca base is wider again. The adhesive tubes are 52—69 μm long and segmented along their posterior $^3/_5$. There occur 11—14 complete tube segments per side, which may be discernible as constrictions of both inner and outer tube edges (Fig. 90 — ri). The inner edge of basal $^2/_5$ of tube is smooth while the outer one is covered with 4—6 scales arranged in a longitudinal row (ex). The ventral ciliature consists of a paired longitudinal band of cilia which extends along the whole body and of a transverse band that is located between hypostomion and the anteriormost ventral field scales. Dorsal and lateral body sides are covered with rectangular spined scales having their anterior

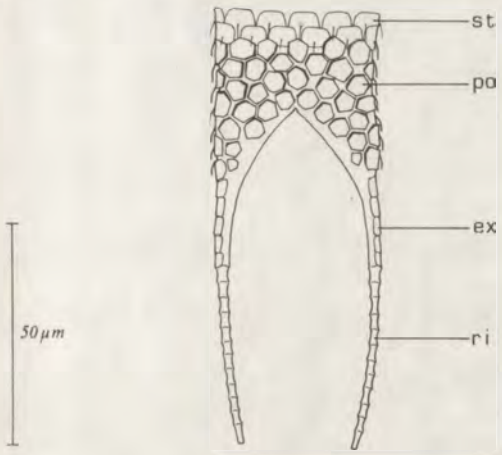


Fig. 90. *Polymerurus squamofurcatus matogrossensis* ssp. nov., dorsal view of caudal region.

portion extraverted and being distributed in approximately 23 longitudinal alternating rows, 32 in each (st). The spines, 10 μm long on trunk sides, are thin and almost straight. Dorsal spines become shorter and shorter from rostral to caudal at the rear trunk portion, while the furca base is dorsally covered with some polygonal spineless scales with well-visible edges (po). The ventral field armature is peculiar. Its pharyngeal portion consists of 12—15 short and wide (2.5—6 μm × 16—20 μm) plates arranged in a single longitudinal series. The frontal part of intestinal field region is covered with further 6—7 such plates being similarly arranged, while its remaining part is provided with rectangular spined scales distributed in 5 longitudinal alternating rows, 20—21 in each. The scale length amounts to 5—5.5 μm, scale width 5—6.5 μm, and spine length to 4.5—5 μm. The field ends with a pair of keeled scales only 8 μm long.

Taxonomic remarks. Almost all characters of the gastrotrich from the Mato Grosso agree with the description of European specimens of *P. squamofurcatus*. Both forms exhibit pronounced neck constriction, constriction between trunk and dilated furca base, dorsal armature of furca base with unspined polygonal scales as well as covering of pharyngeal portion of ventral field with short and wide scales arranged in a single longitudinal row. All the above characters are unusual among the genus *Polymerurus* and their occurrence is restricted only to two forms in question. Contrary to PREOBRAŻENSKAJA's (1926) description but in agreement with my observations from Poland, the head is three-lobed which is a generic feature. It should be mentioned here that hypostomion of Polish specimen of *P. squamofurcatus* was mistakenly interpreted in my earlier paper (KISIELEWSKI 1979) as the first plate of ventral field. However, the Mato Grosso worm differs from its European relative in showing full segmentation along more than a half of adhesive tube instead of having the tube inner margin smooth and outer margin covered with scales arranged in a longitudinal series. Con-

Table 40. Morphometrical features of *Polymerurus squamofurcatus matogrossensis* ssp. nov.

Feature	Specimen I	Specimen II
Body length	340 μm	333 μm
Length of caudal appendages	66 μm	91 μm
Length of adhesive tubes	52 μm	69 μm
Pharynx length	69 μm	78 μm
Pharynx formula a		22.1%
n		15.3%
m		18.2%
p		27.6%
Diameter of mouth ring	6 μm	6.5 μm
Cephalion width	31.5 μm	36 μm
Total number of longitudinal rows of scales		ca. 23
Number of scales in a single longitudinal row		32
Ratio of scale distribution		ca. 72%
Length of neck scales		6.5 μm
Length of trunk scales		9.5 μm
Length of trunk spines	10 μm	5.5 μm
Number of full adhesive tube segments per side	11	13; 14

sidering the above-listed joint characters, a single but conspicuous difference existing and the fact that both forms inhabit two continents distant one from another, it appears reasonable to classify them as two subspecies. The difference in covering of adhesive tubes between both subspecies is of phylogenetic significance. The genus *Polymerurus* derives undoubtedly from an ancestor having unsegmented furca. Although the furca of *P. s. squamofurcatus* is unsegmented, this character cannot be regarded as plesiomorphic due to the following assumption. The armature of pharyngeal portion of ventral field, clearly different from cuticular covering of remaining body regions, suggests that *P. squamofurcatus* is an evolutionarily advanced rather than primitive species within *Polymerurus* (compare discussion of the genus *Lepidochaetus* gen. nov.). Fully segmented adhesive tubes occurred in ancestral condition since most *Polymerurus* with homogeneity of ventral and dorsal cuticular covering have them, e. g. *P. nodicaudus* (VOIGT). Therefore, the rectangular plates on outer tube margins in *P. squamofurcatus* represent apomorphy. Very close relationship between *P. s. matogrossensis* and *P. s. squamofurcatus* supports hypothesis that the tube segment transformation into naked tube with external scale was a simple and single-step change. In any case, the naked tube portions with rectangular external scales in *P. s. squamofurcatus* and fully-developed tube segments in *P. s. matogrossensis* are homologous.

Polymerurus corumbensis sp. nov.

(Figs 91—94, Tab. 41)

Etymology. From the geographic name "Corumbá", referring to the town, in region of which the species has been discovered.

Material. 1 sample, 4 specimens. MS: a channel located several km W of the town Corumbá, near the boundary between Brazil and Bolivia (17). Among silt.

Type specimens. Holotype, a specimen collected on 31.10.1984, will be deposited in the Department of Zoology, University of São Paulo. A paratype that derives from the same sample is kept in the author's collection.

Diagnosis. *Polymerurus* with total body length 700—760 μm. Adhesive tubes very long (194—220 μm), with very numerous segments (37—43 per side). Body covered with spined scales; spines 16—19 μm in length at mid-trunk and 35—42 μm at trunk rear dorsally. Scale shape unknown. Dorsal cuticle with few irregular transverse lines (? folds). Ventral field spined. Pharynx very short (108—122 μm).

Description

The body, being 700—760 μm in length, does not show distinct neck and trunk rear constrictions. The head is three-lobed having cephalion 50—57 μm long and 50 μm wide, with its posterior portion free and highly raised. The hypostomion is rather short and shows conspicuous transverse furrow (Fig. 92 — hf). Adhesive tubes are thick and very long (194—220 μm), constituting more than ¼ of total body length. The tube segments are rather short and unusually numerous, reaching number of 37—43 per side, 3—4 preceding depressions occurring only on outer tube margin excluded. Ventral locomotory ciliature consists of narrow paired band which extends along the whole body and a wide transverse connection which runs across cephalic region (Fig. 92). The dorsal sensory bristles have not been detected, instead, I have observed a pair of posterotrunk double-keeled scales.

The body is covered with many spined scales. The anterior scale portions are set on basal cuticle layer and anterior edges apparently fused with cuticle since I was unable to observe the scale shape. There are 39 longitudinal alternating rows of scales, the ventral field covering excluded, and 41 scales in a row. The spines are rather thick and bent basally, reaching length of 16—19 μm at mid-trunk and 35—42 μm at trunk rear dorsally. Some specimens tend to show dorsally in diverse body regions transverse lines which are probably cuticle folds. The ventral field ends with a pair of spined scales, the

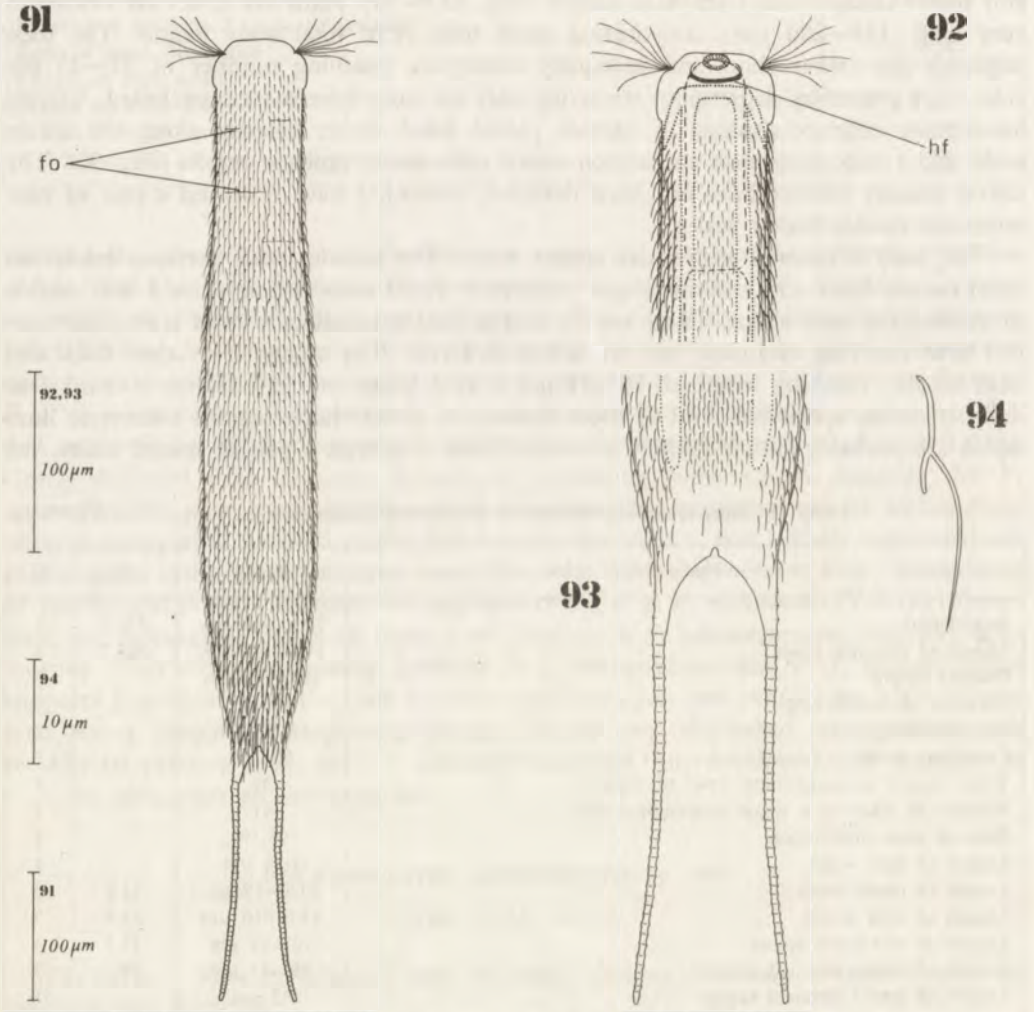
Table 41. Morphometrical features of *Polymerurus corumbensis* sp. nov.

Feature	Range	X	N
Body length	700—760 μm	738.5	4
Length of adhesive tubes	194—220 μm	207.7	3
Pharynx length	108; 122 μm		2
Diameter of mouth ring	13 μm		1
Cephalion length	50; 57 μm		2
Cephalion width	50 μm		1
Total number of longitudinal rows of scales	39		1
Number of scales in a single longitudinal row	41		1
Ratio of scale distribution	95.1%		1
Length of neck scales	10.5 μm		1
Length of trunk scales	10.5—12 μm	11.0	3
Length of neck spines	15.5—16 μm	15.8	3
Length of mid-trunk spines	16—19 μm	17.5	3
Length of dorsal terminal spines	35—42 μm	39.3	3
Length of lateral terminal spines	12 μm		1
Length ratio of terminal spines	1.6%		1
Number of adhesive tube segments per side	37—43	40.2	3

scales and spines being 18 μm long each. The intestinal field portion bears 14 μm long spines. The pharyngeal field portion is also spined, however, the spines are much finer than those from intestinal region. Like on dorsal body side, the shape of scales placed on ventral field was not detected.

Pharynx is unusually short (108—122 μm in length), reaching only $^1/_5$ of body length (the adhesive tubes excluded). It is thick and does not exhibit any terminal dilation. Only parthenogenic specimens have been collected.

Taxonomic remarks. The genus *Polymerurus* includes the largest gastrotrichs within the *Paucitubulatina*. As recorded in literature, total body length ranges from 267 μm to 770 μm, the latter value being given by DADAY (1905) for its South American species *P. elongatus*. The body length of *P. corumbensis* sp. nov. varies from 700 to



Figs 91—94. *Polymerurus corumbensis* sp. nov. Fig. 91 — dorsal view, Fig. 92 — ventral view of anterior body portion, Fig. 93 — ventral view of caudal body portion, Fig. 94 — lateral view of trunk spined scale.

760 μm, the largest specimen being therefore almost as large as the largest known member of *Paucitubulatina*. Of 16 species of *Polymerurus* so far described, only five reach 510 μm in total body length, i. e. *P. elongatus* (DADAY, 1905), *P. nodicaudus* (VOIGT, 1901) (body length up to 671 μm, see Tab. 38 in this paper), *P. magnus* VISVESVARA, 1964 (up to 625 μm), *P. rhomboides* (STOKES, 1887) (up to 560 μm, see Tab. 39 in this paper) and *P. serraticaudus* (VOIGT, 1901) (up to 544 μm). The last two species can be obviously excluded from comparison as the body of *P. rhomboides* is covered with pedunculated scales instead of spined scales or spines whilst the furca of *P. serraticaudus* is shaped differently than in any other congeneric species. Although *P. elongatus* exhibits terminally some spines, its dorsal body surface lacks them, which is not the case of *P. corumbensis*. Between the remaining two of above-listed species, the new Brazilian gastrotrich resembles more *P. magnus* than *P. nodicaudus* having closer (although usually still larger) number of furca segments (37—43 per side compared with 22—38 and 12—17 respectively) and considerably longer furca in relation to body length than *P. nodicaudus*. However, the spines of *P. magnus* are much longer in proportion to body size.

Subfamily ***Undulinae*** subfam. nov.

Diagnosis. *Chaetonotidae* having body length ca. 180 μm (terminal spines excluded). Head cone-shaped, neck well defined, adhesive tubes lacking but furca with a pair (occasionally two pairs) of distal spines. With a pair of anterodorsal small cephalic papillae. Cephalic ciliation in form of a paired undulated transverse band extending from ventral to dorsolateral and a paired anteroventral tuft. Trunk ciliation in form of two paired longitudinal short series of single cilia separated one from the other. With several posterolateral trunk simple spines. Body covered at least partly with fine scales which bear posterodorsally on trunk and partly dorsally on furca short spines. Mouth ring terminal. Pharynx large, with two terminal bulbs. Male reproductive organs not detected. Freshwater, semipelagic.

One genus:

Genus ***Undula*** gen. nov.

Etymology. From the Latin "undula" — wave, referring to undulated course of main cephalic series of cilia. Feminine gender.

Diagnosis same as subfamily.

One species:

Undula paraënsis sp. nov.

(Figs 95—97, Tab. 42)

Etymology. From the geographic name Pará, of the Brazilian state where the gastrotrich has been discovered.

Material. 1 station, 3 samples, 3 specimens. PA: the pond at Belém, near the Faculdade de Ciência Agraria do Pará (FCAP) (25). Above silt.

Type specimens. Holotype, a specimen collected on 24.4.1985, will be deposited in the Department of Zoology, University of São Paulo. Two paratypes, that derive from the same water body and were collected on 20.3.1985 and 18.4.1985, are kept in the author's collection.

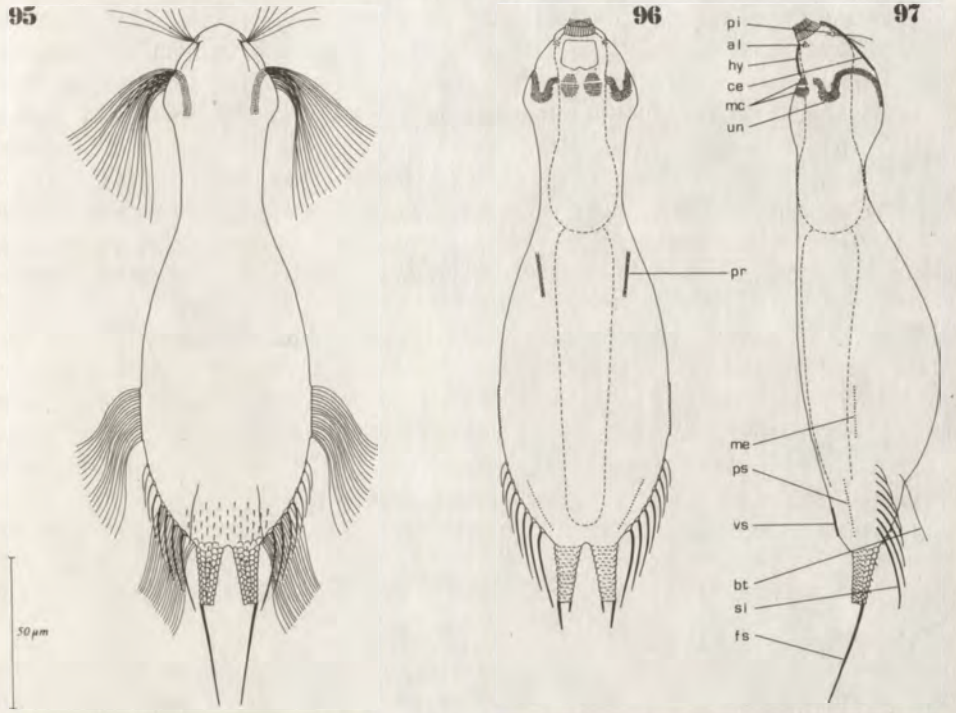
Diagnosis same as subfamily and genus.

Description

The gastrotrich resembles in its body shape a member of the genus *Setopus* GRÜNSPAN (*Dasydytidae*) rather than any representative of the *Chaetonotidae*, being however larger than any *Setopus*. The body, having been measured only in the smallest animal studied, was 179 μm long, or, including terminal spines, 210 μm long. Two other specimens were presumably larger as their pharynges were about 15 μm longer than in the first one (81 and 82 μm in length compared with 66 μm). The body consists of a distinct cone-shaped head, much narrower neck region, the trunk which exhibits its widest portion at its mid-length as well as the furca that is truncate distally and does not bear any adhesive tubes. The head is provided with cephalion, whose anteriormost portion is perpendicular to body axis, which gives appearance of "a gable", like in *Dasydytidae*, whereas its posterior portion is very wide and extends far from head front. The length of cephalion, measured from lateral, amounts to 24 μm. Lateral head margins exhibit two large lobes each. The lobe shapes are unchanging which suggests occurrence of pleurae. There is a clear hypostomion being 10.5 μm long and located posteroventrally to the mouth ring. Its shape is reminiscent of trapezium with medially depressed posterior edge. A paired small papilla occurs on the dorsal head side, just behind the cephalion top (Figs 95, 97 — pi). There is a pair of sensory bristles located dorsally on the posterior trunk region (Figs 95, 97 — bt). It is uncertain whether their basal scales are developed.

The cephalic ciliation consists of a paired anteroventral tuft (Figs 95—97 — al), two paired cilia borne on the anterodorsal papillae, paired ciliary area located ventrally at mid-head (Figs 96, 97 — mc) as well as a peculiar undulated transverse band of cilia which extends from ventral through lateral to dorsal head side (Figs 95—97 — un). The last band consists of four rows of cilia dorsally, whereas some supplementary rows appear on lateral head side. It is clearly undulate while running through ventral and lateral head sides, and it turns backward reaching dorsal side. Apart from above-mentioned middle-head ciliary area (mc), the ventral ciliation of every body side consists of two short longitudinal series of single cilia (Figs 95—97 — me, ps). The first paired series (me) extends almost laterally along the middle trunk portion, while the other (ps) is located ventrolaterally at the trunk rear. The cuticle which bears the cilia of the anterior series appears more rigid than anywhere on the body, except for cephalic shields.

The body surface seems to be mostly naked at first glance, however, the thorough observation by means of an immersion objective reveals the presence of many fine unkeeled and unspined scales that occur at least on the dorsal and lateral sides of neck and trunk. More pronounced cuticular structures are located laterally along the posterior trunk portion where several spines occur, on the furca tops where there are up to two pairs of spines, as well as dorsally at the trunk rear and on the furca where small and delicate scales and spined scales are inserted. The posterolateral trunk spines (Figs 95—97 — sl) occur in number of four to eight pairs. They are all unbarbed, regularly curved and inserted on basal scales whose edges were hardly discernible. The an-



Figs 95—97. *Undula paraënsis* gen. et sp. nov. Fig. 95 — dorsal view, Fig. 96 — ventral view of the specimen with two pairs of caudal spines, Fig. 97 — lateral view.

Table 42. Morphometrical features of *Undula paraënsis* gen. et sp. nov.

Feature	Range	X	N
Body length (spines excluded)	179 µm		1
Total body length (spines included)	210 µm		1
Head maximum width	36 µm		1
Neck minimum width	25 µm		1
Trunk maximum width	57 µm		1
Length of furca base	23; 31 µm		2
Pharynx length	66—82 µm	76.3	3
Pharynx formula a	27.0%		1
n	24.1%		1
m	23.3%		1
p	32.6%		1
Diameter of mouth ring	11; 15.5 µm		2
Cephalion length	24 µm		1
Cephalion width	43 µm		1
Length of longer of two (or single) paired caudal spine	8.5—40 µm	27.3	3
Length of rearmost trunk spines	22; 27 µm		2

teriormost spines are 7.5 μm in length. The spines become thicker and thicker as well as longer and longer from rostral to caudal, so the rearmost ones are 22—27 μm long and reach the tops of caudal furca. The tops of each furca branch in all three specimens studied bore a dorso-external spine which was straight and simple (Figs 95—97 — fs). Its length varied widely, amounting in particular specimens to 8.5, 33.5 and 40 μm. That of animals which had the external spines the shortest, exhibited also a supplementary furca paired spine 3.5 μm long and inserted internally (Fig. 96). The dorsal side of trunk rear is provided with many 2 μm long spines distributed in 13 longitudinal alternating rows, up to 3 in each. At the trunk end ventrally, a paired large (9.5 μm in length) unspined and unkeeled scale occurs (Fig. 97 — vs). The whole surface of caudal furca is covered with round scales about 2 μm in diameter; some of dorsal scales exhibit spines like those observed at the trunk rear dorsally.

The mouth ring is almost terminal. It consists of rods provided distally with long bristle each. The pharynx is strong and shows two prominent terminal bulbs, the posterior one being larger than the other. The pharyngeal cuticular reinforcements and the mouth teeth are absent. A pair of protonephridia occurs lateral to the anterior gut portion. Neither male nor accessory sexual organs were detected.

Apart from morphological similarity to the members of *Setopus*, the new gastrotrich shows also mode of life reminiscent of *Dasydytidae*, being a worm that swims above the detritus particles instead of among them. The swimming of *U. paraënsis* is very rapid.

Discussion

The affiliation of *Undula paraënsis* gen. et sp. nov. to any existing high-level taxon presents difficulties. The occurrence of distinct caudal furca which lacks adhesive tubes suggests that the newly-described gastrotrich derives from an ancestor having adhesive organs. It seems that the loss of adhesive tubes might happen relatively recently due to the change of mode of life, from benthic to semipelagic. A possible phylogenetic relationship between *Undula* and the families *Chaetonotidae* or *Dasydytidae* should be discussed first. Like *Undula*, at least some members of both families exhibit cephalion, hypostomion, posterior pair of sensory bristles as well as a pair of ventral field terminal scales. The body shape of *Undula* is similar to that of *Dasydytidae*; also absence of adhesive tubes, clearly interrupted ventral trunk ciliature, a cephalic ciliature in form of a transverse band as well as similar appearance of the cephalion top are the characters that suggest a close relation with *Dasydytidae*. The similarity between *Undula* and the above family is best manifested while comparing the former with the genus *Setopus*, whose some members (*S. bisetosus, S. primus* and *S. iunctus*) show on trunk a short paired terminal lobe provided with a spine and swim using mainly two posterior pairs of trunk cilia tufts (or rather short cilia band sections separated one from another). The characters of *Undula* which suggest its relation to *Chaetonotidae* are the presence of distinct caudal furca (not rudimentary lobes), similar cuticular covering as well as the disposition of the trunk cilia series in parallel to longitudinal body axis. Some body regions of *U. paraënsis* are covered with fine scales which are reminiscent of those in many *Chaetonotidae* (i. e. *Heterolepidoderma* and some members of *Ichthydium*). By contrast, such fine scales were never described in *Dasydytidae* since their cuticle shows either large and well-visible scales or structures fused with the basal cuticular layer, whereas trend to miniaturize scales was never reported. The ventrolateral spines of *Undula* do not resemble any structures of the respective body region in *Dasydytidae*. On

the contrary, the members of *Lepidochaetus* gen. nov. and some of the group of *Chaetonotus maximus* (*Chaetonotidae*) tend to elongate their ventrolateral spines which, especially in *Ch. disiunctus* GREUTER and *Ch. brevispinosus* GREUTER, have appearance similar to that of *U. paraënsis*. The ventral trunk ciliature of *Undula* which is reduced to two paired sections of ciliary band separated one from the other, is oriented in parallel to longitudinal body axis. This condition corresponds to that of *Chaetonotidae*, while among *Dasydytidae* short sections of ciliature are oriented obliquely (see description of *Dasydytes elongatus* sp. nov. and other *Dasydytidae* in the present paper). Moreover, the long and movable trunk spines that characterize *Dasydytidae* (except for the genus *Anacanthoderma* MARCOLONGO) are lacking in *U. paraënsis*.

Amongst other freshwater families belonging to the order *Chaetonotida*, the *Proichthydidae* and the *Dichaeturidae* do not seem to be connected with the *Undula*. *Proichthydidae* lack cuticular formations and show different pattern of head ciliation (either uniform ventral area and straight transverse series of cilia — *Proichthydium* CORDERO, 1918 — or ventral longitudinal series and anterior rigid bristles — *Proichthydioides* SUDZUKI, 1971a). *Dichaeturidae* have two pairs of caudal adhesive tubes and exhibit their cephalic cilia dispersed instead of grouped into any formations. Although the present knowledge of the family *Neogosseidae* and the newly-described taxon does not suggest a close relationship between them, this possibility cannot be quite rejected. All the members of *Neogosseidae* known so far exhibit cephalic tentacles and lack caudal furca, both characters being contrary to *Undula*. However, *U. paraënsis* has a pair of anterodorsal papillae that may be sensory in function. Moreover, the pharynx musculature is very strong, the mouth ring consists of well-developed rods, and most cephalic cilia are distributed across the head both in the case of *Neogosseidae* and *Undula*.

The characters of *U. paraënsis* do not correspond with those of any other freshwater member of *Chaetonotida* are the presence of a single undulated ciliary band extending across every side of head, the uniform covering of caudal furca with scales as well as the occurrence of antero-dorsal cephalic papillae.

To evaluate phylogenetic significance of particular features of *U. paraënsis*, the circumstances of their derivation should be understood first. The *Undula*, being a semipelagic gastrotrich, represents an evolutionary line which derives undoubtedly from a benthic ancestor, the latter having been characterized, as most *Paucitubulatina*, by the presence of caudal furca with a pair of adhesive tubes and continuous paired band of ventral cilia. Two other semipelagic lines which derive from benthic ancestors (likely very distant ones), are these of *Neogosseidae* and *Dasydytidae*. Considerable differences in cuticular covering, the presence or absence of cephalic tentacles as well as different appearance of pharynx suggest that the above families have evolved independently for a long time, if they have at all a direct common ancestor. The conversion from benthic to semipelagic mode of life apparently caused both in the *Neogosseidae* and *Dasydytidae* vanishing of caudal furca with adhesive tubes, reduction of locomotory trunk ciliature to some tufts or short band sections isolated one from another, terminal location of mouth as well as modification of cephalic ciliature into transverse bands that offers better conditions of food influx while swimming above bottom. All these features apparently evolved convergently in the two families in question. The same modification can be also seen in *Undula*. Other similarities between *Dasydytidae* and *Undula* seem however to be originated independently and those between *Neogosseidae* and *Undula* are very

poor. Thus, it appears that the *Undula* represents a distinct line of semipelagic gastrotrichs, while its set of "semipelagic" features may be regarded as an excellent example of convergence.

The presence of caudal furca, still clear trace of paired band of ventral cilia as well as appearance of posterolateral spines and cuticular trunk armature, that on the trunk rear in particular, suggest close relationship between *Undula* and the family *Chaetonotidae*. A case of complete lack of adhesive tubes is already known within the family, i. e. in *Chaetonotus brachyurus* BALSAMO, 1981. Moreover, *Ch. paucisquamatus* sp. nov. is an interesting example of an independent conversion to semipelagic mode of life; the characters having been modified due to this change are the reduction in number and elongation of ventral cilia, elongation of trunk spines and caudal tubes as well as probably also the loss of adhesive function of the latter. The body shape, and most of all, the presence of a peculiar undulate transverse band of cephalic cilia as well as the occurrence of anterodorsal papillae, the latter being unique within *Chaetonotidae*, do not permit to affiliate *Undula* with any genus hitherto established, or even indicate any genus closely related with it. A set of characters rare within *Chaetonotidae*, i. e. lack of adhesive tubes and presence of clearly interrupted series of long ventral cilia, stresses special position of the new gastrotrich. Therefore, I propose to establish within the family *Chaetonotidae* a separate subfamily to include *Undula* gen. nov., namely *Undulinae* subfam. nov. All the other genera of *Chaetonotidae* remain assembled within the subfamily *Chaetonotinae*.

Family ***Neogosseidae*** REMANE, 1927

In the course of present study three species of the *Neogosseidae* have been found, two of them representing the genus *Neogossea* REMANE and the other genus *Kijanebalola* BEAUCHAMP. Two species are new to science, viz. *Neogossea acanthocolla* and *Kijanebalola canina* whereas the third, having been poorly studied, belongs to the genus *Neogossea* and shows affinities with *N. fasciculata* DADAY, 1905. The cuticular armature of *N. acanthocolla* is unique within the *Neogosseidae*. Excluding the finding of an undetermined species in the U.S.A. (KRIVANEK and KRIVANEK 1958), *K. canina* is the first member of its genus thoroughly examined alive, since the only undoubted species of *Kijanebalola* hitherto known, i. e. *K. dubia* BEAUCHAMP, 1932, was described on the basis of two fixed and contracted specimens. The above makes it necessary to emend both generic diagnoses. Because of insufficient knowledge of the genus *Kijanebalola*, also the diagnosis of the *Neogosseidae* remained incomplete and will be emended in this paper.

Emended diagnosis of the family *Neogosseidae* REMANE, 1927

Paucitubulatina having weakly flattened body 90—210 μm long (tentacles and posterior spines excluded). With a pair of club-shaped cephalic tentacles. Caudal furca and adhesive tubes absent, instead a paired posterolateral projection may occur. Cephalic ciliature consists of one dorsal and two ventral interrupted transverse bands. Trunk ciliation consists of several pairs of tufts or short obliquely-running bands separated one from another. Cephalion and hypostomion present or absent. Body covered with spined scales, or (rarely and only partly) with pedunculated scales. Spines simple, occasionally barbed. Trunk end with long spines distributed in paired lateral or unpaired median

group. Mouth ring large and terminal, with one- or two-segment units. Pharynx strong, with one to four bulbs. With a pair of protonefridia in anterior trunk portion. With paired ovary; testicles not detected. Freshwater, semipelagic and/or planktonic.

Genus *Neogossea* REMANE, 1927

Emended diagnosis. *Neogosseidae* with body 90—200 μm in length. Body rear truncate, with a pair of posterolateral projections, each provided with a tuft of long simple (occasionally barbed) spines, occasionally also with short claw-like structure. Cephalion and hypostomion not detected. Body covered with fine spined scales, scale edges being often fused with basal cuticle; occasionally and only partly with pedunculated scales. Spines short and simple, occasionally partly long and barbed. Mouth units two-segmented, with distal segments joined one with another and furnished with bristles. Anterior pharynx half consists of terminal bulb and two smaller dilations, the posterior half in form of large bulb. Cuticular pharyngeal reinforcements lacking. Ability to partial retracting the head not developed.

Six species: *N. antennigera* (GOSSE, 1851) — type-species, *N. fasciculata* (DADAY, 1905), *N. pauciseta* (DADAY, 1905), *N. voigti* (DADAY, 1905), *N. sexiseta* KRIVANEK et KRIVANEK, 1959 and *N. acanthocolla* sp. nov.

Neogossea acanthocolla sp. nov.

(Figs 98—101, Tab. 43)

Etymology. From the Greek "akantha" — thorn and the Latin "collum" — neck, referring to the presence of long neck spines.

Material. 2 stations, 3 samples, 11 specimens. MS: a channel located several km W from the town Corumbá, near to the boundary between Brazil and Bolivia (17); 9 specimens. PA: the pond at Belém, near the Faculdade de Ciência Agraria do Pará (FCAP) (25); 2 specimens. Above silt.

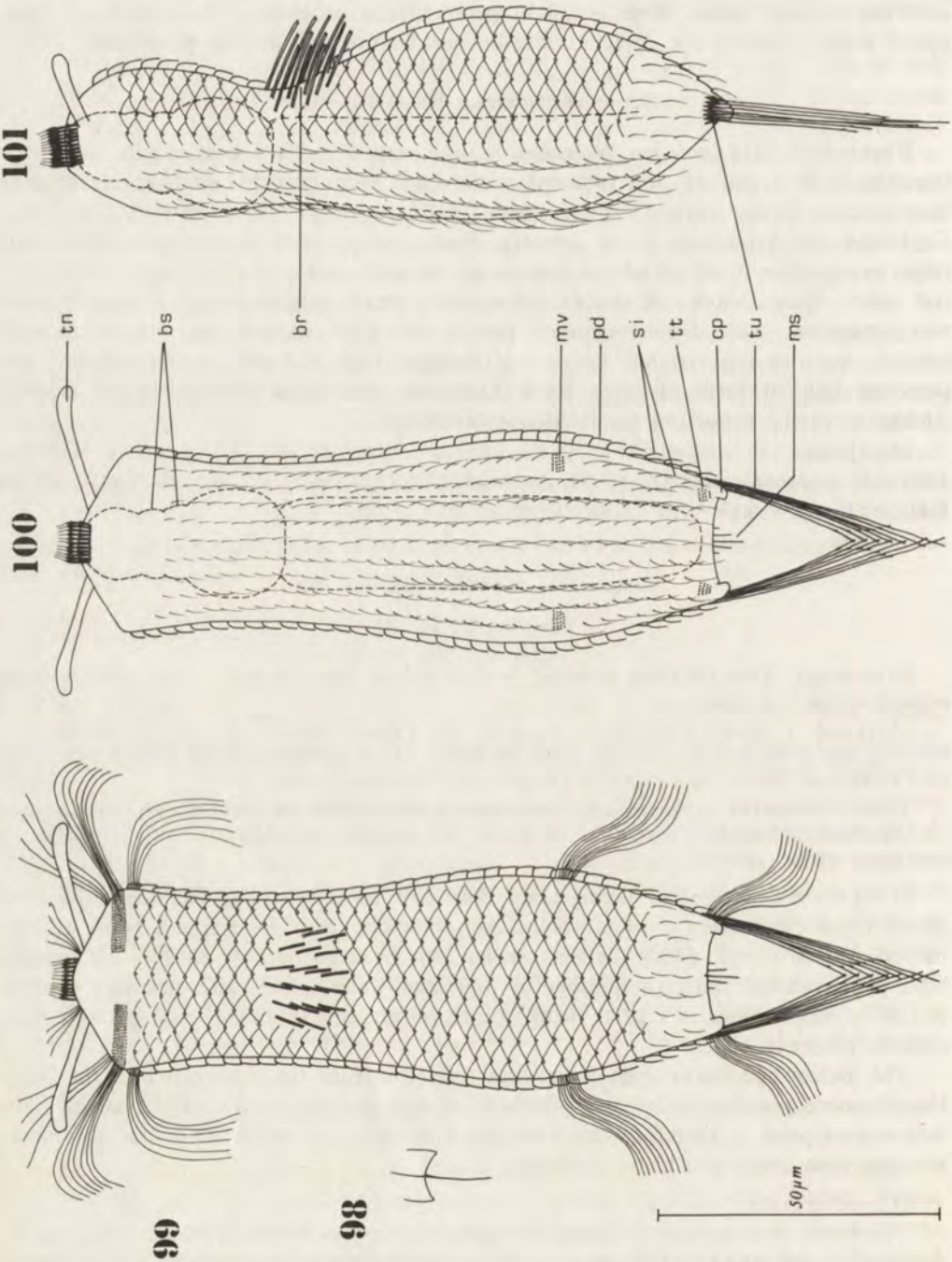
Type specimens. Holotype, a specimen collected on 31.10.1984 near Corumbá, will be deposited in the Department of Zoology, University of São Paulo. Two paratypes that derive from the same sample are kept in the author's collection.

Diagnosis. *Neogossea* having body 104—139 μm long (spines excluded). Posterolateral trunk projections without claws, each provided with 7—9 spines being usually barbed. Dorsal cuticle partly (at least on anterior head portion) or entirely with rhomboid pedunculated scales; a number of long and thick spines with terminal denticle occurs on neck dorsally. Dorsal trunk spines, if present, originate from scales having concave posterior edges.

The Belém specimens were somewhat different from those collected in the Mato Grosso, moreover, they were unsatisfactorily studied due to poor material available. The below description is therefore based on the Corumbá specimens while the differences between both forms are given thereafter.

Description

The body of a mature specimen is rather stumpy and 104—139 μm long, caudal spines excluded, or 142—178 μm long, the spines included. Head, whose rostral portion is in form of a short cone, is only slightly narrower than the trunk. There is a pair of cephalic tentacles that project anterolaterally, are 20—21.5 μm long, 2,5 μm thick



basally and 3.5 μm thick distally (Figs 99—101 — tn). Neck is weakly constricted whereas the body posterior margin is truncate and provided laterally with a pair of small projections, the latter lacking claws (Figs 99, 100 — cp). Dorsal cephalic ciliation is in form of a transverse band which consists of six series of cilia and shows 10 μm-long median interruption. Ventral cephalic ciliature has not been studied (see the description of the Belém form). The ventral locomotory trunk cilia are distributed in two paired tufts, the caudal of them being inserted only several μm from the trunk end (Fig. 100 — tt), while the rostral one 24—28 μm from the other (Fig. 100 — mv).

Dorsum and body sides are provided with pedunculated scales (Figs 99—101 — pd). Such a covering extends from posterior head portion to either trunk end or posterior trunk portion where it is replaced by usual spined scales (Figs 98—101 — si). The pedunculated scales are clearly rhomboid while their peduncles are long, spaced 2.5 μm within a longitudinal row and join with the scales forming the right angle. The anterior edges of spined scales (if the latter present) are not discernible; the posterior ones clearly concave. Their spines are simple, thin and weakly bent. The most unusual feature of cuticular armature is the presence of "a brush" that consists of at least fifteen raised spines being densely inserted within a small dorsal area on the neck (Figs 99, 101 — br). The spines are 13—14 μm long, quite straight, fairly thick along their whole length and distally bifurcated, in other words, each distally showing pronounced lateral denticle. The whole ventral body side is covered with thin and somewhat bent simple spines which are up to 9 μm long and originate from scales having unknown shape. A paired tuft of caudal trunk spines consists of 7—9 spines, seven of them being long and of medium length while possible one or two additional being considerably shorter. The longest are usually outer but occasionally middle spines, reaching maximum length of 44—50 μm. The shortest of main seven spines (15—29 μm long) is always the innermost one. Although sometimes it is hard to detect, all the main caudal spines are barbed, the lateral denticle being placed 30% of spine length from spine end on outer spines and about 15% on inner ones (see the measurement method given in the introduction to the family *Chaetonotidae*). The spine bases exhibit the same rhomboid shape (Fig. 101 — tu) as in the transverse "band" spines of *Chaetonotus bisacer* GREUTER. The middle of posterior trunk margin is provided with some simple spines approximately 6 μm long (Figs 99, 100 — ms).

The mouth ring is terminal, 4.5 μm long and 7.5—8.5 μm in diameter. It consists of two-segmented rods, the distal segments being thicker than the others, joined one to another and terminally furnished with rigid bristles. Pharynx is 34—41.5 μm long and shows, like in other congeneric species, anterior and posterior bulbs, the posterior being much stronger than the other, and two weaker median dilations (Figs 100, 101 — bs).

The Belém form exhibits all the peculiar features of the newly-described species, namely the occurrence of dorsal pedunculated scales, the neck "brush" of straight and thick raised spines being distally bifurcated, concave posterior edges of "ordinary" spined scales as well as the "*bisacer*"-type bases and lateral denticles on posterolateral

Figs 98—101. *Neogossea acanthocolla* sp. nov., type-form from Corumbá. Fig. 98 — enlarged spined scale, Fig. 99 — dorsal view, Fig. 100 — ventral view, Fig. 101 — lateral view.

spines. Although the measurements of the Belém form are not complete, these available are in accordance with respective data for the Mato Grosso form. The essential character in which the worm from Amazonia differs from the type-form is the occurrence of dorsal pedunculated scales restricted to the head whereas all the other body portions are covered with usual spined scales. It also seems that the number of raised "brush" spines is larger in the case of the Belém form, reaching at least 23. In one of Amazonian specimens details of the ventral cephalic ciliature were thoroughly studied. It consists of two interrupted transverse series of cilia, each formed by two paired short bands, every band consisting of four rows of cilia.

Taxonomic remarks. Although the body shape, presence of paired tuft of long caudal spines and anatomy of digestive tract permit to readily classify the new gastrotrich in the genus *Neogossea*, the cuticular armature drastically distinguishes it from all congeneric species hitherto known. First of all, the dorsum is at least partly covered with pedunculated scales which has never been recorded within the whole family *Neogosseidae*. Such characters are known within the *Chaetonotidae*, mostly in the genus *Aspidiophorus* VOIGT. If one considers the fact that a body portions of representatives of two different populations or even of different members of a local population (viz. that from Mato Grosso) may be either covered with pedunculated scales or with ordinary spined scales, it becomes evident that the genetic programme to control scale structures is not too much complicated. Surprisingly, the programme appears in this case to be universal for both types of scales and the observed variability is likely a result of simple modifications, genetical or environmental. Another peculiarity of the cuticular armature of *N. acanthocolla* is the presence of neck "brush" with long and thick spines, the latter being furnished with terminal lateral denticles. Although spines are common among *Neogossea*, they are short and thin in all the other species. The peculiar spines of *N. acanthocolla* correspond only with those of several species of the genus *Chaetonotus* EHRENBERG (*Chaetonotidae*), i. e. some members of the species group *Ch. maximus* (*Ch. furcatus* sp. nov. for instance). Also the presence of lateral denticles on caudal spines is a new feature for the *Neogosseidae*, while it is a quite common character within

Table 43. Morphometrical features of *Neogossea acanthocolla* sp. nov.

Feature	Specimens from Corumbá			Specimens from Belém	
	Range	X	N	Range	N
Body length, spines excluded	104—139 μm	117.0	3		
Total body length, spines included	142—178 μm	156.3	3		
Tentacle length	20—21.5 μm	21.0	5	18; 19 μm	2
Pharynx length	34—41.5 μm	36.5	3	40.5 μm	1
Diameter of mouth ring	7.5—8.5 μm	7.8	3	8.5 μm	1
Distance between subsequent pedunculated scales in a longitudinal row	2.5 μm		1		
Length of raised neck spines	13—14 μm	13.8	3	11.5—12 μm	1
Number of caudal spines per side	7—9	7.6	5	8	1
Maximum length of caudal spines	44—50 μm	47.5	4	47 μm	1

the families *Chaetonotidae* (the genus *Lepidochaetus* gen. nov. and partly the genus *Chaetonotus*) and, in particular, *Dasydytidae*. Thus, the newly-described gastrotrich occupies a special place within the genus *Neogossea*, whereas its above features well support notion about a close phylogenetic relationship between the families *Chaetonotidae* and *Neogosseidae*.

Genus ***Kijanebalola*** BEAUCHAMP, 1932

Emended diagnosis. *Neogosseidae* having body 135—210 μm in length (caudal spines excluded). Trunk rear rounded-off, with median group of spines and without lateral protrusions. Cephalion and hypostomion present. Body covered with convex scales with median keels and rudimentary spines; the latter tend to prolong in some trunk portions. Pharynx consists of at most two bulbs. Anterior pharynx portion at least as thick as posterior one and provided with strong and complex system of cuticular reinforcements. Mouth ring units simple, flattened, without distal bristles, do not join one with another. Ability of partial retracting head more or less developed.

Two species: *K. dubia* BEAUCHAMP, 1932 (type-species) and *K. canina* sp. nov. Belonging of *"Eretmia" cubeutes* GOSSE in HUDSON and GOSSE, 1886 to the genus as the third species is not unlikely (see BEAUCHAMP 1932 and REMANE 1936).

Kijanebalola canina sp. nov.

(Figs 102—106, Tab. 44)

Etymology. From the Latin "canis" — dog, referring to circumstances of the species discovery.

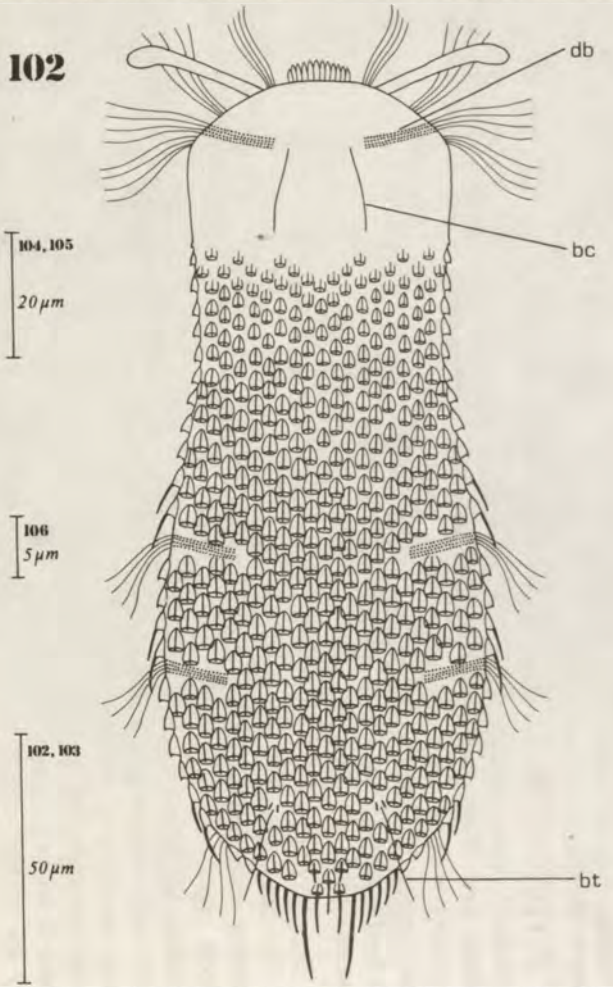
Material. 1 station, 2 samples, 10 specimens. PA: the pond at Belém, near the Faculdade de Ciência Agraria do Pará (FCAP) (25). Above silt.

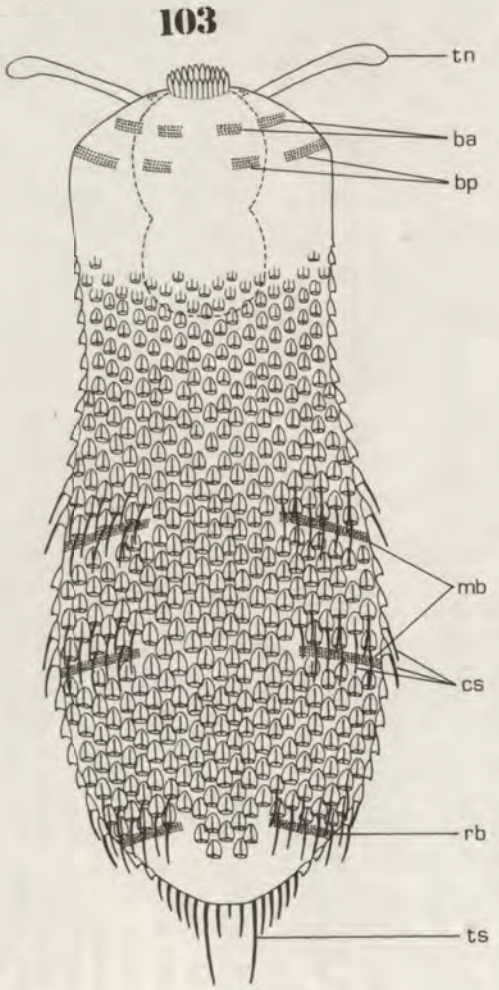
Type specimens. Holotype, a specimen collected on 20.3.1985, will be deposited in the Department of Zoology, University of São Paulo. Three paratypes that derive from the same sample are kept in the author's collection.

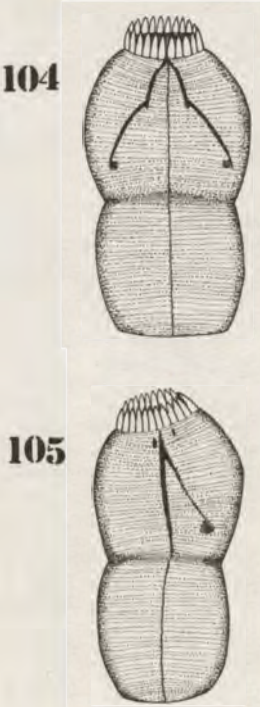
Diagnosis. *Kijanebalola* having body 135—210 μm in length (caudal spines excluded). Scales maximum 5.5—6.7 μm long, in number of 23 in median dorsal longitudinal row. With three oblique paired bands of trunk locomotory cilia, each covered anteriorly with two rows of spines being longer than others on trunk. Trunk rear median spines in number of about fifteen, including a pair of conspicuous length (16.5—19 μm). Pharynx 44—46 μm long, with two bulbs, the anterior being stronger than the other.

Description

The body length of mature and freely-swimming animals ranges from 135—210 μm (anterior tentacles and posterior spines excluded) which is a particularly wide range for a local population of a freshwater gastrotrich. If the tentacles and caudal spines are included, the length reaches 185—235 μm. Head is weakly separated from the trunk by slight neck constriction which condition resembles, apart from similar mode of swimming, members of the genus *Neogossea*. However, unlike *Neogossea*, the trunk end is medially rounded-off and lacks paired lateral projection. Head is provided frontally with a pair of tentacles which project anterolaterally in normally-swimming animal, whereas they are parallel one to the other and directed forward when head is partly retracted.







The tentacles are 20.5—28.5 μm long, 3 μm thick basally and 4 μm thick near their ends. It should be stressed that the ability to retract head is not as developed in *K. canina* as reported by BEAUCHAMP (1932) for *K. dubia*. The cephalic ciliation consists of a pair of anterolateral tufts, two interrupted transverse ventral bands (Fig. 103 — ba, bp) as well as of a transverse dorsal band being discontinuous medially (Fig. 102 — db). One of ventral bands (ba) lies in front of and the other (bp) behind the dorsal band, both usually consisting of two pairs of short isolated series. The outer ventral series as well as the dorsal band reach the lateral head margin, so each of them projects laterally as a cilia tuft (Fig. 102). The trunk ciliature (Figs 102, 103), clearly locomotory in function, consists of three pairs of oblique short bands, anterior and median of them (mb) being inserted dorso-latero-ventrally, while the posterior one (rb) lateroventrally. The anteriormost band is located at ⅓ of the trunk length whereas the rearmost one almost terminally. The cilia of every band are usually arranged in 4—5 series and are about 20 μm long. There are two paired dorsal sensory bristles, the anterior (Fig. 102 — bc) being inserted at the level of dorsal cephalic band of cilia and the other (Fig. 102 — bt), set on a double-keeled scale, on the posterior trunk portion.

The only cuticular formations that cover the head are weak 13 μm long cephalion and strong 9 μm long hypostomion. The main cuticular structure extends from the beginning of neck region to the trunk end, being continuous and undifferentiated through all the body sides. It consists of scales which are the largest (5.5—6.7 μm long) on the midtrunk and much smaller on neck. The scales (Figs 102, 103, 106) are one-lobed, triangular-oval and strongly concave, so the keeled ridges of the largest scales are about 2.7 μm raised above the scale base. The keel of every scale is posteriorly continued as rudimentary spine. Such a form of scales gives a saw-like appearance to the lateral body margin. Longer spines which originate from scales like those above-described, occur in three pairs of short oblique bands placed ventrolaterally (Fig. 103 — cs) as well as in a median group at the trunk rear (Figs 102, 103 — ts). All the trunk ciliary series are accompanied by ventrolateral long spines distributed in two oblique rows just in front of cilia, the spines from posterior row being slightly longer than the others (9—9.5 μm long compared with ca. 7.5 μm). The above spines are simple, bent and rather thick, the most lateral of them standing out beyond the lateral body margins. The rounded-off trunk end is medially provided with approximately fifteen spines. The spines are also rather straight, thick, on their basis in particular, and vary in length within the group. There is a pair of spines which are considerably longer than the others (16.5—19 μm long compared with length of up to 9 μm of those arising from between them). Number of longitudinal alternating rows of scales was counted only for these rows from the most ventral one that bear longer cilia-accompanied spines through lateral margins and dorsum to the respective row of the opposite body side, amounting to 34. The median dorsal row consists of 23 scales, the smallest neck ones and that bearing terminal trunk spine included.

Figs 102—106. *Kijanebalola canina* sp. nov. Fig. 102 — dorsal view, Fig. 103 — ventral view, Fig. 104 — dorsal view of pharynx, Fig. 105 — lateral view of pharynx, Fig. 106 — trunk scales (A — from above, B — from lateral).

Mouth ring is terminal and consists of units which are flattened, not joined one with another and lacking distal bristles. It is 5 μm long and 12.5—14 μm in diameter. Pharynx, being 44—46 μm in length, exhibits two bulbs that contact one the other, the anterior bulb being always stronger than the posterior. The relative thickness of anterior bulb, median constriction and posterior bulb amounts to 58.0—61.4%, 43.2—47.0% and 49.4—56.1% respectively (see method of calculating the pharynx formula in the introduction to *Chaetonotidae*). Almost the whole lumen of anterior pharyngeal bulb is provided with very strong cuticular reinforcements (Figs 104, 105). Except for its terminal portion, the gut is as wide as the maximum pharynx width. There is a paired protonefridium located lateral to the gut on anterior trunk portion. There is paired ovary with oocytes maturing from caudal to rostral. No traces of hermaphroditic features have been detected.

Taxonomic remarks

BEAUCHAMP (1932) described the genus *Kijanebalola* and the species *K. dubia* on the basis of two fixed specimens coming from a lake in Uganda. He presumed that the "*Eretmia*" *cubeutes*, described as a rotifer by GOSSE (in HUDSON and GOSSE 1886), was the other species congeneric with *Kijanebalola*. The latter worm which was known by GOSSE also only from fixed material, did not contribute the generic characteristic, moreover, its systematic position is still doubtful. Thus, my own finding of more numerous specimens of *K. canina* sp. nov., being in addition examined alive, supplies our knowledge on the *Kijanebalola* with many new details.

The general organization of *K. canina* supports the affiliation of *Kijanebalola* to *Neogosseidae* but outside the genus *Neogossea*. What needs to be emphasized is the accuracy of BEAUCHAMP's taxonomic decision based on analysis of so scarce and deformed material. The ability of partial retracting of head, which is unique within the suborder *Paucitubulatina*, does not seem as developed in *K. canina* as reported for *K. dubia*. The drawn-out head which has not been studied in detail by BEAUCHAMP, shows in *K. canina*, like the *Neogossea*, the presence of a paired tentacle as well as transverse ciliary bands which extend both on its dorsal and ventral surface. The mouth ring clearly differs from that of *Neogossea* in having simple and flattened units not joined one with another instead of two-segmented and joined rods. The mouth structure of *Kijanebalola* resembles most of all that of members of the species group *Chaetonotus simrothi* (*Chaetonotidae*). The pharynx, which was reported as consisting of single vesicle in *K. dubia*, exhibits in *K. canina* two bulbs that contact one with the other. Therefore, the pharynx of *Kijanebalola* differs from that of *Neogossea* in lacking two small intermediary dilations and in having its anterior half at least as wide as the posterior (compare Figs 103, 104). Like in *K. dubia* and contrary to all the species of *Neogossea*, the pharynx of *K. canina* is provided with a complex system of cuticular reinforcements. The scales of the Brazilian gastrotrich have distinct edges, whereas those of *K. dubia* were reported as fused with the basal cuticle. Both compared species have median scale portion highly raised whereas most keels end with rudimentary spines. Such a scale structure, being compared by BEAUCHAMP with pyramid, could be treated as generic feature. It should be stressed however that the typical spined scales in *Neogossea* derive from the same scale type while their rhomboid shape (reported for *N. antennigera*) is doubtful and appears to reflect more the scale surface sculpture than its outline. The joint characters of both *Kijanebalola* species, likely being universal within the whole genus, are the absence of

scales in the cephalic body region, and the trunk cilia covering with spines of conspicuous length. Three paired oblique bands of trunk cilia that extend ventrolaterally in *K. canina* correspond with the tufts of cilia which accompany trunk protrusions in *K. dubia*. However, I can not agree with BEAUCHAMP's assumption that the above structures are sensory in function, since the function of trunk ciliary bands in my gastrotrichs was obviously locomotory, like that of similar bands or tufts in the genus *Neogossea* and the family *Dasydytidae*. It seems by analogy to the better-studied Brazilian animal, that the body sides of *K. dubia* have been misinterpreted in BEAUCHAMP's description. Therefore, his Fig. 4A represents actually dorsal and 4B ventral body side, the anterior and posterior tufts of trunk cilia are disposed ventrolaterally and oocytes mature dorsally.

The first thorough examination of living members of the genus *Kijanebalola* supplies the characteristic of the whole family *Neogosseidae* with interesting data, some of them being of phylogenetic interest. Contrary to all the members of *Neogosseidae* known till now, *K. canina* sp. nov. has obvious (although weak) cephalion as well as strong hypostomion, both shields occurring regularly within the families *Chaetonotidae* and *Dasydytidae* (compare with new data on the genera *Dasydytes, Setopus, Haltidytes* and *Ornamentula* in this paper). The presence of those features strongly supports the view on a common origin of the three above families. The cephalic ciliation pattern in *K. canina* sp. nov. and *Neogossea acanthocolla* sp. nov. (the Belém form) is identical, consisting in the presence of a transversal dorsal band medially interrupted and two transversal ventral bands which are disrupted into short sections, the first ventral band occurring in front of and the other behind the dorsal one. This character has been provisorily included into the family diagnosis, however, its common occurrence within the *Neogosseidae* could be confirmed in further taxa.

Although descriptions of *K. dubia* and *K. canina* are not fully comparable because of deformation of available material of the former, some specific-level differences between them are obvious. They are the number of scales, being higher in *K. canina* than in *K. dubia*, both when longitudinal alternating rows and scales in a row are counted, the scale size, being considerably larger in *K. dubia* as well as the number and distribution of terminal trunk spines, the latter being more numerous in *K. canina* and extending more laterally. Further specific characters of diagnostic importance are probably body size, pharynx shape and structure of pharyngeal cuticular formations, however, they remain useless before living specimens of *K. dubia* are examined.

Table 44. Morphometrical features of *Kijanebalola canina* sp. nov.

Feature	Range	X	N
Body length, tentacles and spines excluded	135—210 μm	163.2	5
Total body length, tentacles and spines included	185—235 μm	198.2	5
Tentacle length	20.5—28.5 μm	26.6	4
Pharynx length	44—46 μm	45.0	4
Diameter of mouth ring	12.5—14 μm	13.4	4
Cephalion length	13 μm		1
Scale length	5.5—6.7 μm	6.1	3
Length of terminal spines	16.5; 19 μm		2

Family *Dasydytidae* DADAY, 1905

In course of the present study, I have found 12 species belonging to the family. One of them, viz. *Haltidytes festinans* has been originally described from Europe (VOIGT 1909) and then found in Argentina (GROSSO 1973b, as *Dasydytes crassus*), whereas another one, i. e. *Stylochaeta fusiformis* (SPENCER, 1890) has been known from Europe and North America. Ten other species are new to science, eight of them being in detail described in this paper and two others (a species of the subgenus *Dasydytes* s. str. and a species of the genus *Haltidytes*) are omitted here as they have been insufficiently studied to give their adequate descriptions. In the subtropical zone of Brazil, I have found only *Haltidytes festinans,* while all the taxa including *H. festinans* were sampled in the tropics, eleven of them in Amazonia, in the region of Belém.

The character in common of most new tropical taxa of *Dasydytidae* are scales much better developed than those in the species known sofar, so scale edges are usually discernible even under moderate quality microscope. The family comprises 23 species described so far, 17 of them being known from Europe, 5 from North America and one from South America and Asia each. The genus *Dasydytes* GOSSE which has been divided into five subgenera by REMANE (1936) comprises 17 species, whereas 6 other species belong to the genus *Stylochaeta* HLAVA. With exception of *Dasydytes* (*Setopus*) *tongiorgii* BALSAMO, 1983a which exhibits many fine scales and *Stylochaeta* aff. *fusiformis* REMANE, 1927 whose cuticle is differentiated into large plate-like formations, all the *Dasydytidae* known so far show smooth cuticle with spines growing directly from it. A recent discovery of scales in *D.* (*S.*) *tongiorgii* as well as present evidence on scale occurrence among many Brazilian *Dasydytidae* shed a new light on the family phylogeny. Since more complete evidence on cuticle differentiation was lacking, the systematics of *Dasydytidae* has been mainly based on spine character and distribution. The scale differentiation is one of fundamental characters for phylogeny and taxonomy of *Chaetonotidae* and is also useful in *Neogosseidae*, both families being closest to *Dasydytidae*. From the analysis of cuticular covering in ten species of *Dasydytidae*, viz. nine described here ones and "*Dasydytes* (*Setopus*)" *tongiorgii* BALSAMO, 1983a, it is obvious that scale character is not only useful diagnostically but the generic- and subgeneric-level revision based on this criterion in needed. Being in agreement with former views on separate generic status of *Stylochaeta* HLAVA, I propose to exclude the subgenera *Setopus* GRÜNSPAN, 1908, *Haltidytes* REMANE, 1936 and *Anacanthoderma* MARCOLONGO, 1910 from the genus *Dasydytes* raising them to the generic level. This taxonomic decision I hope to justify in the respective subsections of this paper and at the end of the chapter on *Dasydytidae* where main phylogenetic relationships within the family are summarized. Moreover, such a system is in accordance with GRÜNSPAN's (1908) intention as far as *Setopus* is concerned and with MARCOLONGO's (1910) view concerning the *Anacanthoderma.* A new genus, viz. *Ornamentula* which is characterized by the presence of unique type of cuticular structures among *Gastrotricha*, is described also in this paper. As far as the genus *Dasydytes* in new sense is concerned, it seems proper to maintain the division into other subgenera as established by REMANE, i. e. into *Dasydytes* s. str. and *D.* (*Chitonodytes*) REMANE, adding to them the new subgenus *D.* (*Prodasydytes*) which is described below on the basis of four new species. The recognition of principal types of cuticular covering including that of the new genus *Ornamentula*, makes it necessary to emend the family diagnosis. With the use of new generic and subgeneric criteria, emendations to respective diagnoses are also introduced.

In the descriptions given below, some morphological designations and methods of measurements are used as described in the introduction to the family *Chaetonotidae*, e. g. mode of spine length measurement, calculation way of lateral denticle localization on spine, pharynx formula expression etc. (see also Figs 1—4). However, a peculiarity of morphological organization of *Dasydytidae* requires many new designations, that are presented below and in Fig. 107.

Among lateral spines, three categories are distinguished: cephalic and neck spines (c), trunk spines (t) and rear spines (r).

Cephalic and neck lateral spines

The foremost paired group of conspicuous lateral cephalic spines (or paired spine) is designated as ca, the next group or single spine as cb etc., according to the rule that first letter (c) is in common for all conspicuous lateral cephalic and neck spines, while the other, given in alphabetical order, corresponds to subsequent spine group, counting from anterior to posterior. In the case of a single spine, designation remains composed of two letters, whereas in the case of spine group, usually arranged in a series extending from anterodorsal to posteroventral, the first dorsal spine is additionally designed with number $_1$ (e. g. ca_1), the next one with number $_2$ (ca_2) etc. The spine group which extends from the end of head or neck region to the trunk front is included in the trunk lateral spines.

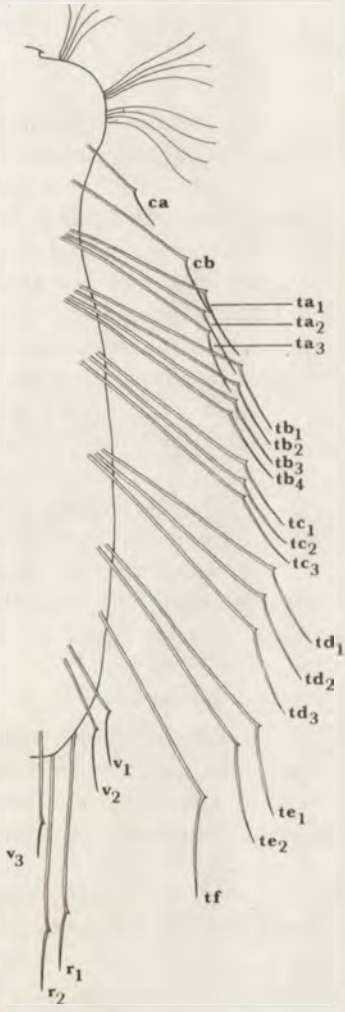


Fig. 107. Designation of spines in *Dasydytidae*, ventral view.

Trunk lateral spines

The first paired group of spines (or single spine) which occurs laterally at the front of trunk dilation, even if it begins still on the neck region or head end, is designated as ta, the next one as tb etc., according to the rule that the first letter (t) is in common for all lateral trunk spines, while the other, given in alphabetical order, corresponds to subsequent spine group (or single spines) on the trunk. An additional number is given for every spine in a spine group following principle used for cephalic lateral spines (e. g. ta_1, ta_2 etc.). These trunk lateral spines which are clearly connected with trunk rear are included in the category that follows.

Lateral spines of trunk rear

At most two paired spines which are inserted clearly near to trunk rear but neither ventrally nor dorsally are included into this category. The only pair of such spines is designated as r, whereas in the case of two pairs the more frontal one is designated as r_1 and more caudal as r_2.

Dorsal trunk spines

The spines of conspicuous length which arise clearly dorsally, both paired and unpaired, are marked with d letter and, if necessary, with subsequent numbers (e. g. d_1, d_2, etc.), starting from the foremost one.

Ventral trunk spines

The foremost conspicuous paired trunk spine which is inserted ventrally clearly out of longitudinal series of lateral spine groups is designated as v_1 and the next one as v_2 etc., according to the rule that the letter v is in common for all conspicuous ventral spines, while the number corresponds to subsequent spine.

Covering spined and/or simple scales

The covering scales which lie in more or less complete longitudinal alternating rows and either bear short spines or are devoid of them have no special designation. They will be only distinguished between dorso-lateral ones and the ventral field, the former to cover body portion from ventral trunk cilia through body sides and dorsum to the trunk cilia of the other body side, while the latter to occur between ventral cilia of every body side. The term "ventral field" is used in accordance with that proposed by myself for respective portion of cuticular armature in the *Chaetonotidae*.

To facilitate comparing the spination and scale-covering pattern between particular taxa, short tables (i. e. Tabs 55—64) are given at the end of this chapter. They include list of spine groups, number of spines in a group, mean spine length within a group, number of lateral denticles in a spine and data on scale covering. The letter "b" placed in a column "number of lateral denticles" in these tables denotes distal spine bifurcation, e. g. a note "2+b" means that two lateral denticles and distal bifurcation occur on a spine. The letter "L" placed in headline of tables with measurements (Tabs 45—54) denotes localization of single lateral denticle, whereas "L_1", "L_2" etc. denotes localization of subsequent lateral denticles on spine, counting from spine base. The value 0% in one of "L" columns means that the denticle forms distal bifurcation (is placed 0% from the spine end).

Emended diagnosis of the family *Dasydytidae* DADAY, 1905

Paucitubulatina having body 75—291 μm in length (spines excluded). Head without tentacles, neck with pronounced constriction (except for *Anacanthoderma*), trunk without caudal appendages and adhesive tubes but occasionally with short paired caudal lobe or paired rear protuberance. Body either covered with one-lobed spined and/or spineless scales, from small to very large, or naked. Lateral and/or ventro-lateral spines usually long and with at least one lateral denticle, often distally furcated, occasionally simple. A club-shaped single spine occasionally present. Spines occasionally (in *Anacanthoderma*) lacking. Cephalion and probably hypostomion always present. Head ciliation consists of two paired anterolateral tufts and a transverse band extending from ventral to dorsal side. Trunk ciliature consists of obliquely disposed short cilia series isolated one from another, often reduced to small tufts and distributed in a paired ventro-lateral row.

Mouth ring terminal and round, occasionally tends to become asymmetrical. Freshwater, semipelagic and planktonic.

Six genera: *Dasydytes* GOSSE, 1851 (type-genus), *Stylochaeta* HLAVA, 1905, *Setopus* GRÜNSPAN, 1908, *Haltidytes* REMANE, 1936, *Ornamentula* gen. nov. and (of unclear affiliation) *Anacanthoderma* MARCOLONGO, 1910.

Genus ***Dasydytes*** GOSSE, 1851

Emended diagnosis. *Dasydytidae* having body 98—291 μm long. Trunk rear protrusions lacking. Lateral spines long, almost straight, at most bent at lateral denticle, with at least one lateral denticle and terminal bifurcation, often with two (occasionally three) lateral denticles. Spine thickness uniform between spine base and the most distal denticle. Lateral groups of spines/single spines in total number of 5—9 pairs. Cephalic lateral (ca), dorsal (d) and ventral (v) long spines often present. One of dorsal spines occasionally modified into a club. Covering scales, if present, are small and completely keeled. Large lateral cephalic plates that border with dorsal and lateral portions of transverse ciliary band absent.

Three subgenera: *Dasydytes* s. str., *Prodasydytes* subgen. nov. and *Chitonodytes* REMANE, 1936.

Subgenus ***Dasydytes*** s. str.

Emended diagnosis. *Dasydytes* having body 130—210 μm in length. With nine (? eight in *D. monile*) pairs of lateral spine groups/lateral single spines including the paired rear (r) spine (the latter occasionally lacking). Lateral and dorsal cephalic spines present. Each long lateral spine with single lateral denticle and distal bifurcation or with two denticles. A dorsal trunk spine modified into club occasionally occurs. Covering scales including ventral field ones absent.

Four species: *D.* (*D.*) *goniathrix* GOSSE, 1851 (type-species), *D.* (*D.*) *ornatus* VOIGT, 1909, *D.* (*D.*) *monile* HORLICK, 1975 and *D.* (*D.*) *nhumirimensis* sp. nov.

Dasydytes* (*Dasydytes*) *nhumirimensis spec. nov.

(Fig. 108, Tabs 45, 55)

Etymology. From the "Fazenda Nhumirim", referring to the locality where the species has been discovered.

Material. 1 sample, 8 specimens. MS: a pond (19). Among root systems of *Salvinia natans*.

Type specimens. Holotype, a specimen collected from a pond located on Fazenda Nhumirim, region of Nhecolândia, Mato Grosso do Sul on 7.11.1984, will be deposited in the Department of Zoology, University of São Paulo. A paratype that derives from the same sample is kept in the author's collection.

Diagnosis. *Dasydytes* (*Dasydytes*) having body 130—148 μm in length. With a club-shaped unpaired ornamented structure 56—59 μm long dorsally on trunk. In the fourth (tb), fifth (tc) and sixth (td) lateral groups more than two spines, in the others up to two spines. Spines with two equal lateral denticles and without distal bifurcation.

Description

The body length reaches 130—148 μm, spines excluded, or 187—208 μm, spines included. The head is practically as wide as the trunk (its maximum width is 34—40 μm compared with 38—40 μm) and is separated from it by neck constriction being of minimum width of 23 μm. There is a short cephalion. The ciliation of every head side consists of an anterior ventrolateral tuft as well as two ventral interrupted transverse bands of cilia, the posterior of them being continued also dorsally. The ventral trunk ciliature consists of several paired tufts usually in number of four, the rearmost one appearing to be the largest. A paired dorsal sensory bristle which arises from long double keel occurs almost terminally on trunk.

The lateral spination consists of nine paired groups of spines/single spines, including two single spines which are inserted on head and neck regions (i. e. ca and cb). At the trunk beginning, a single or double spine (ta or ta_{1-2}) occurs, followed by three

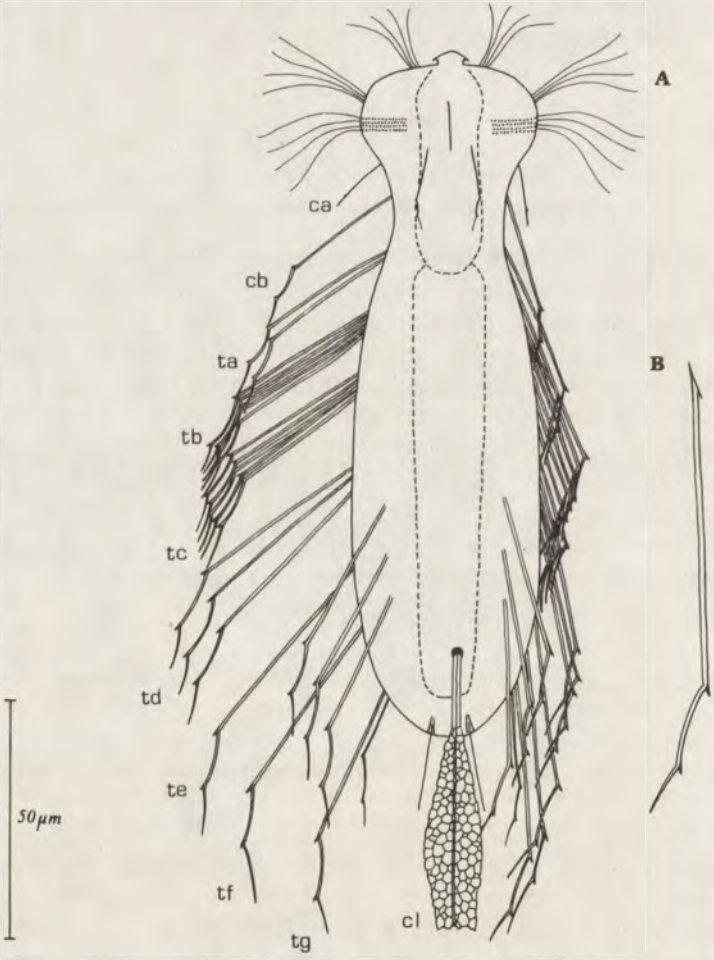


Fig. 108. *Dasydytes* (*Dasydytes*) *nhumirimensis* sp. nov., dorsal view. B — one of lateral spines, enlarged.

groups of more numerous spines, first consisting of five spines (tb_{1-5}), second of four or five (tc_{1-4} or tc_{1-5}) and third of two or three (td_{1-2} or td_{1-3}). Two next paired spines (te, tf) stand alone whereas the rearmost one (tg) is either single (tg) or double (tg_{1-2}), in the latter case the more ventral of spines (tg_2) being shorter and thinner than the other. Length of the lateral spines increases gradually from rostral to caudal, reaching maximum value of 67—75 μm in te and tf spines, whereas the rearmost spine (tg) is somewhat shorter (58 μm). All the lateral spines exhibit two lateral denticles, except for cephalic spines which are usually single-barbed. The first (more basal) denticle on trunk spines is typically placed 29—34%, while the other 11—15% of spine length from spine end. The spines are straight from the base to the first denticle and clearly bent between denticles; their thickness is uniform from the base to the second denticle, whereas distal to it the spine becomes thinner and thinner. The spines arise from triangle base of the *bisacer*-type. Neither whole spine basal scales nor covering dorsal and ventral scales were observed. The spines clearly ventral (v) and rear (r) in position are absent. The dorsal spines occur on head in number of three, the foremost of them being unpaired while the others paired, 17—20 μm long and provided with two lateral denticles. There are three pairs of trunk dorsal spines about 50 μm long and furnished with two lateral denticles each. Apart from them, an unpaired club-shaped structure occurs dorsally in posterior trunk portion close to median body axis, probably always on the right to it.

Table 45. Morphometrical features of *Dasydytes nhumirimensis* sp. nov.

Feature	Range	X	N	L_1	L_2
Body length, spines excluded	130—148 μm	140.8	4		
Total body length, spines included	187—208 μm	197.5	4		
Maximum head width	34; 40 μm		2		
Minimum neck width	23 μm		2		
Maximum trunk width	38; 40 μm		2		
Pharynx length	41—43 μm	41.6	4		
Pharynx formula a	31.0; 34.1%		2		
n	28.0; 29.5%		2		
m	27.6; 28.5%		2		
p	32.2; 33.9%		2		
Diameter of mouth ring	7.5; 8.5 μm		2		
Length of "club"	56—59 μm	57.2	4		
Spine length cb	38 μm		1		
ta_1	45 μm		1		
ta_2	49 μm		1		
tb_1	48; 54 μm		2	29%	13%
tb_5	56 μm		1	33%	12%
tc_1	46; 50 μm		2		
tc_4	57 μm		1		
tc_5	56 μm		1	30%	15%
td_1	58 μm		1		
td_2	64 μm		1		
td_3	68 μm		1	31%	12%
te	58; 75 μm		2	33%	12%
tf	67; 72 μm		2	34%	18%
tg_1	58 μm		1	34%	11%

That peculiar cuticular formation seemed to be an epizoic organism rather than a gastrotrich structure at first glance. However, it was detected in 10 among 12 animals studied, inserted in the very same place and devoid of protoplasm that has excluded the former supposition. The club is 56—59 μm long and consists of stalk 13—17 μm long and 2.5 μm thick as well as wider distal portion which exhibits rich ornamentation. The latter part is 12—13 μm wide and only slightly higher (up to 17 μm). The longitudinal club axis is marked by a straight line extending also in the stalk, while the right and left portions are filled with streaks that form a net with hexagon-like meshes up to 2 μm large. The distal club end is rugged, however, a young specimen appeared to have it closed. The club is not deeply inserted on cuticle and is easily lost since two specimens with the most mature eggs were devoid of it. The club is typically directed posterodorsally and projects behind trunk end.

Mouth ring is terminal. Pharynx is 41—43 μm long and shows two weak terminal dilations. Only parthenogenic specimens have been found.

Taxonomic remarks. *D. nhumirimensis* sp. nov. stands close to *D.* (*D.*) *ornatus* VOIGT, 1909 with respect to body shape and general pattern of lateral spination. Both species have the same number of spine groups/single spines, i. e. nine, however, the VOIGT's species has spines more numerous than two in six groups (tb—tg), while my species only in two or three groups (tb, tc and sometimes td). *D. ornatus* has single-barbed spines with distal bifurcation, whereas *D. nhumirimensis* double-barbed without bifurcation, the more distal denticle and distal spine portion of the latter obviously evolved from the ancestral bifurcation.

The club-shaped dorsal structure of *D. nhumirimensis* neither corresponds with any cuticular formation of other *Dasydytidae* nor even of the *Gastrotricha* as a whole. I believe it has been evolved from typical spine or scale and spine together, since a distinct basal scale is absent. The adaptative significance of the club-shaped stucture is apparently to increase the body surface to body volume ratio of this semipelagic animal. The ornament pattern of wider club portion is reminiscent of that of large scales in *Ornamentula paraënsis* gen. et sp. nov. However, the ornamentation in *D. nhumirimensis* and *O. paraënsis* appear on quite different structures, i. e. on distal spine portion and basal scales respectively. In spite of that difference, the function of such peculiar ornamentation seems to be similar. The spine or scale reinforcements have allowed to evolve larger cuticular formation than anywhere among *Dasydytidae*. Some analogy can be seen with large scales of *Chaetonotus robustus* DAVISON, 1938 and *Halichaetonotus atlanticus* KISIELEWSKI, 1988 (*Chaetonotidae*) which show also linear reinforcements. The scale modifications in two latter species do not appear to be homologous one with the other and obviously not with ornamented structures of *Dasydytidae*. On the contrary, very similar reinforcement pattern suggests the common genetic base of both modifications in the case of *D. nhumirimensis* and *O. paraënsis* (see discussion of the latter taxon).

Subgenus ***Dasydytes* (*Prodasydytes*)** subgen. nov.

Etymology. From the Greek "pro" — before and the generic name "*Dasydytes*", referring to a primitive character of the subgenus.

Diagnosis. *Dasydytes* having body 135—291 μm in length (from 98 μm in *D.* (*?P.*) *lamellatus*). With four to seven pairs of lateral spine groups/lateral single spines,

including two (one in *D.* (*?P.*) *lamellatus*) paired rear spines (r). Lateral cephalic spines and usually also dorsal cephalic spines present. Long lateral spines with one or two lateral denticles and distal bifurcation, occasionally with three denticles and without bifurcation. Covering scales well developed or lacking. With keels on terminal portion of ventral field and (except for *D.* (*?P.*) *lamellatus*) with two pairs of larger terminal ventral scales.

Four species: *D.* (*P.*) *papaveroi* sp. nov. (type-species), *D.* (*P.*) *carvalhoae* sp. nov., *D.* (*P.*) *elongatus* sp. nov. and *D.* (*?P.*) *lamellatus* sp. nov., the last species included provisionally.

Dasydytes* (*Prodasydytes*) *papaveroi sp. nov.

(Figs 109—113, Tabs 46, 56)

Etymology. The species is dedicated to Prof. Dr. Nelson PAPAVERO, the Director of the Museu Paraense Emílio Goeldi at Belém.

Material. 2 stations, 5 samples, 32 specimens. PA: a pond (23) and a river (27). Above silt.

Type specimens. Holotype, a specimen collected on 30.1.1985 from a small river (Igarape) da Barragem, Municipio de Benevides, Fazenda Morelândia (station 27), will be deposited in the Department of Zoology, University of São Paulo. Three paratypes that derive from the same sample are kept in the author's collection.

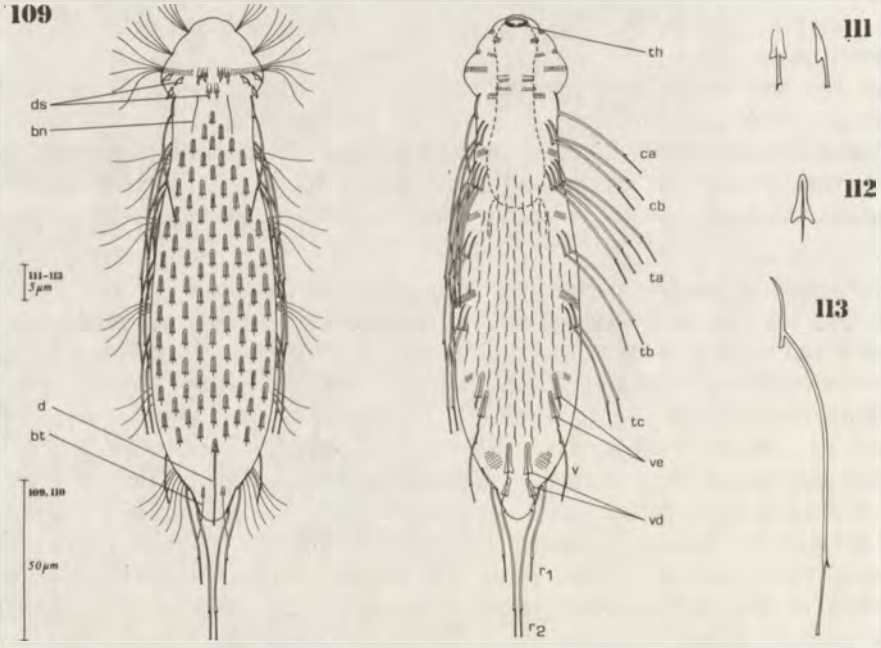
Diagnosis. Slender *Dasydytes* (*Prodasydytes*) having body 144—166 μm in length. With seven paired spine groups/single spines laterally, including two on head and neck (ca and cb) and two rear spines (r_1 and r_2). All lateral spines of similar length (32—40 μm on average, maximum 45 μm), with one lateral denticle and distal bifurcation. Paired ventro-lateral (v) and unpaired medio-dorsal (d) spine occur on posterior trunk portion. Dorsal and ventral body sides with many covering keeled scales having short spines. With two pairs of ventral terminal keeled scales provided with short spines.

Description

Body length of mature specimens reaches 144—166 μm, posterior spines excluded, or 183—203 μm, the spines included. The body is slender with triangular head, rather thick neck and trunk as wide as head and ending with slightly separated triangular lobe. Head is provided with cephalion 9 μm long and 13 μm wide as well as 8 μm long hypostomion. The ciliature of every head side consists of two lateral tufts, several ventral tufts and a transverse band which crosses the head slightly rostral to the widest cephalic region and extends from ventral to dorsal, dorsally being longer than ventrally. The trunk ciliature consists of five paired ventrolateral tufts, the anteriormost of them being placed between the bases of cb and ta spine groups while the rearmost one (the largest) in front of the r_1 spine base. The ventral tufts of cilia are, the third of them in particular, in form of short oblique bands, whereas the cilia proper are 19—23 μm long. There are two pairs of dorsal sensory bristles, the anterior of them arising at boundary between head and neck region (Fig. 109 — bn) and the other at front of caudal lobe (bt). The caudal bristles are accompanied by double keel each.

Lateral spines are distributed in seven paired groups/paired single spines. There are two groups of spines per side in neck region (ca and cb), three on anterior $^3/_5$ of trunk (ta, tb and tc) and two rear spines (r_1 and r_2). The anterior neck paired spine is single (ca) while the other double (cb_{1-2}). Anteriormost trunk group consists of four spines

(ta_{1-4}) whereas the second and third of two (tb_{1-2} and tc_{1-2}). All these spines including rear ones are borne on one-lobed narrow scales having concave posterior edges, contacting the cuticle only with their anterior portions and being 7—10 μm long. The spine bases form elongate triangles of the *bisacer*-type, whereas the spines proper are slightly bent and have single lateral denticles localized 21—25% of spine length from spine end. Each spine is of uniform thickness from its base to the denticle, whereas its distal part is thinner and terminates with bifurcation, the latter being better seen in side view. The spine length is similar within and between groups, its mean value ranging from 31.9 to 39.9 μm. The paired rear spines are characteristic of the species. Anterior of them is always shorter than the other, both protrude behind trunk extremity and are parallel one to the other. Apart from lateral spines, conspicuous paired ventrolateral spines (v) and unpaired medio-dorsal one (d) occur on posterior trunk portion. They originate from scales similar to those of lateral spines, show the base of the *bisacer*-type, are single-barbed and end with bifurcation, their mean length is 21.0 and 24.8 μm respectively and the length of their basal scales 5.5 and 10.5—11 μm respectively. Apart from these spines, the cuticular armature consists of many covering keeled scales with short spines which are regularly distributed on dorsal and ventral body sides, as well as of six pairs of peculiar cephalic spines (Fig. 109 — ds). Three pairs of the latter structures



Figs 109—113. *Dasydytes* (*Prodasydytes*) *papaveroi* sp. nov. Fig. 109 — dorsal view, Fig. 110 — ventral view, Fig. 111 — dorsal cephalic spined scale (A — from above, B — from lateral), Fig. 112 — covering spined scale from dorsal trunk side, Fig. 113 — one of lateral spines with basal scale, lateral view.

are situated dorsally and the other three pairs laterodorsally. They have thick and 3.5—6.5 μm long spines with strong lateral denticle and arise from rather small (3.5—6.5 μm long) scales with distinct lateral and posterior edges. Covering dorsal scales extend from the neck to the base of unpaired scale d, occurring within an area which becomes wider and wider from rostral to caudal and on middle-trunk being distributed in 11 longitudinal alternating rows, maximum 12 scales in a row. Like the basal scales of long lateral spines, they are keeled, very narrow, one-lobed and have concave posterior edges, being up to 7.5 μm long. However, their spines are simple and short (1.5—4.5 μm long). The spined scales similar to covering dorsal ones occur ventrally. They are 3.5—7 μm long, have hardly visible edges and bear simple spines 1.5—5.5 μm long. They are distributed in 13—14 longitudinal alternating rows, 11—12 in each along intestinal body portion and some further ones at the end of pharyngeal portion. Apart from these scales, further four pairs of conspicuous spined scales occur ventrally, two of them lying near trunk rear (Fig. 110 — vd) and two others (ve) rostral to long ventral spines v. More caudal from vd scales are 7 μm long, bear 4 μm long spines and are directed posterolaterally, whereas the others are longer (12 μm long), bear 7 μm long spines and lie in parallel to body axis. The ve scales are about 9.5 μm long, whereas their spines are usually about 5 μm long and clearly barbed.

Table 46. Morphometrical features of *Dasydytes papaveroi* sp. nov.

Feature	Range	X	N	L_1	L_2
Body length, spines excluded	144—166 μm	157.0	7		
Total body length, spines included	183—203 μm	196.4	7		
Maximum head width	32 μm		1		
Minimum neck width	24 μm		1		
Maximum trunk width	32 μm		1		
Pharynx length	58—62 μm	59.6	5		
Pharynx formula a	22.1—24.2%	23.7	3		
n	19.8—22.6%	21.1	3		
m	20.3—22.3%	21.7	3		
p	27.6—36.3%	31.4	3		
Diameter of mouth ring	6.5—7.5 μm	7.0	4		
Cephalion length	9 μm		1		
Cephalion width	13 μm		1		
Spine length ca	31—37 μm	33.7	11	24%	0%
cb_1	30—40 μm	38.1	8	22%	0%
cb_2	31—42 μm	39.1	8	23%	0%
ta_1	32—45 μm	39.0	6	21%	0%
ta_2	27—42 μm	36.3	7	24%	0%
ta_3	31—41 μm	37.6	9	24%	0%
ta_4	37—43 μm	39.9	7	21%	0%
tb_1	31—40 μm	37.7	6	22%	0%
tb_2	31—43 μm	37.8	5	21%	0%
tc_1	27—41 μm	33.4	5	24%	0%
tc_2	27—43 μm	34.0	5	24%	0%
r_1	24—35 μm	31.9	11	25%	0%
r_2	35—42 μm	39.5	11	22%	0%
v	18—24 μm	21.0	6	30%	0%
d	20—28 μm	24.8	11	28%	0%

The mouth ring is somewhat subterminal, slightly fissure-like and exhibits two ventral thickenings (Fig. 110 — th). Pharynx is very long in relation to body size reaching 58—62 μm. Its posterior portion is strongly dilated. Only parthenogenic worms have been found.

The gastrotrich swims in peculiar way, wriggling and whirling.

Taxonomic remarks. *D. papaveroi* sp. nov. is characterized, together with *D.* (*P.*) *elongatus* sp. nov., by much more developed covering scales than any other species of the *Dasydytidae*, thus, it presents particular phylogenetic interest. Its scales, both covering ones and those provided with long spines are one-lobed, narrow, keeled and concave-edged posteriorly. Conspicuous spines exhibit elongate triangular bases like those of transverse band spines in *Chaetonotus bisacer* GREUTER, 1917 (*Chaetonotidae*) and of caudal spines in *Neogossea acanthocolla* sp. nov. (*Neogosseidae*). If one takes in consideration large number, uniform character and distribution of the spined scales through almost whole body as well as less differentiated lateral spines and small length of them in comparison to other taxa, it becomes evident that the species has preserved more complete ancestral characters than any other taxon of *Dasydytidae*. The ancestor of *D. papaveroi* should be sought among members of the family *Chaetonotidae* which were covered with undifferentiated spined scales of similar type. I believe that the branch of the *Chaetonotidae* to answer this condition is that represented by *Chaetonotus* (*Zonochaeta*) *bisacer* GREUTER, 1917. The covering scales of the latter species are of the same type as those of *D. papaveroi*. Moreover, its long spines are straight and of even thickness along their whole length showing elongate triangular bases and distal bifurcations. The evolutionary diversification within the *Prodasydytes* subgen. nov. is discussed in the subsection on *D.* (*P.*) *elongatus* sp. nov. whereas phylogenetic relationships within the *Dasydytidae* as a whole are discussed at the end of this chapter.

Dasydytes* (*Prodasydytes*) *carvalhoae sp. nov.

(Figs 114, 115, Tabs 47, 57)

Etymology. The species is dedicated to Miss Mirian LEAL CARVALHO, a former researcher at the Museu Paraense Emilio Goeldi, Belém.

Material. 2 stations, 5 samples, 31 specimens. PA: ponds (23, 25). Above silt.

Type specimens. Holotype, a specimen collected from a small pond at the entrance to the campus of MPEG (station no. 23) on 5.3.1985 will be deposited in the Department of Zoology, University of São Paulo. Two paratypes that derive from the same sample are kept in the author's collection.

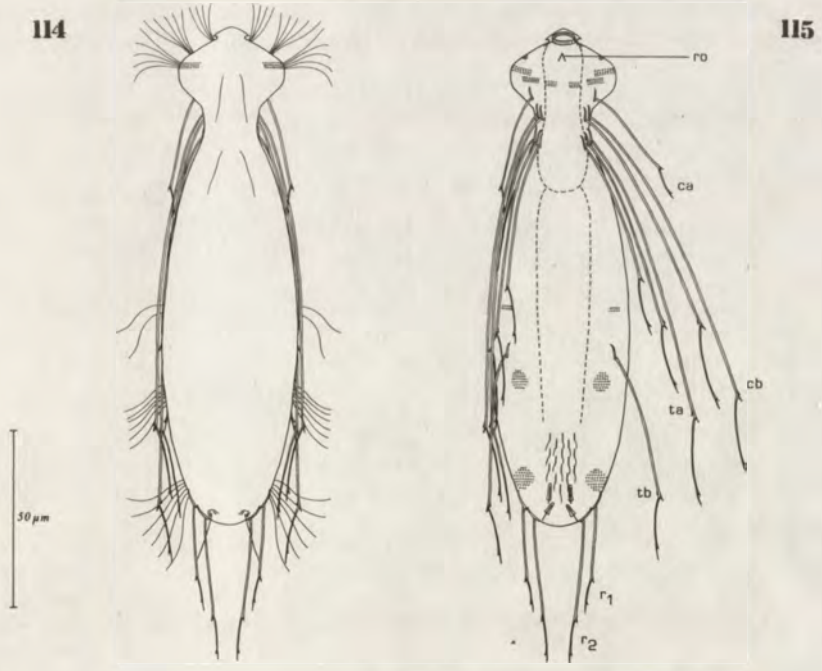
Diagnosis. *Dasydytes* (*Prodasydytes*) having body 135—143 μm in length. With six lateral paired spine groups/single spines, including two on head and neck (ca and cb) and two rear spines (r_1 and r_2). Lateral spines up to 107—116 μm long (in cb and ta groups), mostly with three lateral denticles, the most basal and the median denticles placed close one to the other, without distal spine bifurcation. Neither dorsal and ventral long spines nor dorsal covering scales present. Ventral covering scales restricted to a narrow band in posterior trunk portion where about twenty keeled and spined scales occur, including two pairs of larger terminal scales provided with short spines.

Description

The body length of mature specimens is 135—143 μm, spines excluded, or 176—183 μm, spines included. As far as the body shape is concerned, the gastrotrich

resembles the members of the genus *Stylochaeta* HLAVA; moreover, its long spines oriented in parallel to body axis are also similar. The head is the largest in its middle part and is separated from trunk by pronounced neck constriction. The trunk, being somewhat wider than head, shows rounded-off posterior portion. Cephalion is 11.5—17 μm wide. Hypostomion has not been detected. The ciliature of each head side consists of two anterolateral tufts, a transverse band extending from ventral to dorsal side rostral to the widest head portion as well as an interrupted transverse ventral band which occurs behind the widest head portion. The ventral trunk ciliation consists of three paired cilia groups, the anteriormost of them being in form of two short transverse series of cilia whereas the others in form of tufts. The foremost group is situated rostral to tb spine basis, the median one caudal to tb spine, while the rearmost in front of r_1 spine.

The lateral spines occur in six paired groups/paired single spines, including two on neck region (the single spine ca and the double spine cb_{1-2}), two on anterior $^3/_5$ of trunk (three-spine group ta_{1-3} and single spine tb) and two at trunk rear (single spines r_1 and r_2). Each of these spines has at least two lateral denticles, more basal of two main ones placed approximately $^1/_4$ of spine length from spine end and the other near spine end, the former being usually preceded by a supplementary denticle that is finer and not necessarily inserted at the same spine side as the main one. The spine is clearly bent at the inserting place of first main denticle, while its section distal to the denticle



Figs 114, 115. *Dasydytes* (*Prodasydytes*) *carvalhoae* sp. nov. Fig. 114 — dorsal view, Fig. 115 — ventral view.

is rather straight, very thin and sharp-pointed. More dorsal spines from the second neck group (cb_1) and first trunk group (ta_1) are the longest, reaching on average 110.0 and 108.3 μm respectively, whereas all the other spines are considerably shorter. It is worthy of mention that single spine tb varies particularly in length ranging from 27 to 84 μm. The rear spines (r_1 and r_2) are oriented parallelly, the frontal of them (r_1) being usually shorter than the caudal. Neither spines clearly dorsal or ventral in position nor dorsal covering scales occur. The ventral cuticular armature is restricted to posterior trunk portion. There are two pairs of terminal scales which exhibit keels and short spines; the posterior of them are oriented obliquely while the others in parallel to body axis. In front of these scales, there occurs a band that consists of keels prolonged in 4 μm long spines, the band being as wide as the gut. The keels are arranged in 5 longitudinal alternating rows, 4 in each.

Mouth ring is terminal and does not show asymmetry. Pharynx is long and has conspicuous posterior dilation. Its anterior portion is provided with a pair of cuticular rods being placed rather far from mouth ring. I have found exclusively parthenogenic specimens.

Like *D.* (*P.*) *papaveroi* sp. nov., but to less extent, *D.* (*P.*) *carvalhoae* sp. nov. swims wriggling.

Taxonomic remarks. The new gastrotrich is closely allied to *D. papaveroi* sp. nov. exhibiting identical pattern of spination and scale distribution at trunk rear. Both species have two pairs of rear spines (r_1 and r_2), the spines being in addition of similar length and posterior of them tending to be longer than the other. Two pairs of ventral one-lobed narrow keeled scales with concave posterior edges and short spines occur also

Table 47. Morphometrical features of *Dasydytes carvalhoae* sp. nov.

Feature	Range	X	N	L_1	L_2	L_3
Body length, spines excluded	135—143 μm	140.0	3			
Total body length, spines included	176—183 μm	179.3	3			
Maximum head width	30 μm		2			
Minimum neck width	19 μm		1			
Maximum trunk width	34 μm		1			
Pharynx length	42; 43 μm		2			
Pharynx formula a	25.1; 28.6%		2			
n	22.3; 24.4%		2			
m	22.1; 24.5%		2			
p	33.1; 36.5%		2			
Diameter of mouth ring	6.5 μm		3			
Cephalion width	11.5; 17 μm		2			
Spine length ca	35 μm		2	?	27%	5%
cb_1	105—116 μm	110.0	5	23%	20%	2%
cb_2	61—105 μm	90.0	3	27%	24%	3%
ta_1	107—109 μm	108.3	3	29%	27%	2%
ta_2	74; 78 μm		2	27%	24%	3%
ta_3	55; 58 μm		2	28%	25%	3%
tb	27—84 μm	63.0	5	28%	25%	5%
r_1	24—45 μm	29.8	4	38%	35%	9%
r_2	40—42 μm	41.0	3	32%	29%	6%

in both cases. This conformity gives sufficient reason to classify them in the same subgenus, i. e. *Prodasydytes* subgen. nov. The characters distinguishing *D. carvalhoae* from its relative are: lower number of groups of lateral trunk spines (two compared with three), sharply-pointed spines with two (three including supplementary one) lateral denticles instead of bifurcated and single-barbed, highly variable spine length both within (ta group in particular) and between groups as well as the longest spines at least twice as long (116 μm compared with 45 μm). Moreover, in contrast to *D. papaveroi*, the dorsal and ventral trunk spines are lacking. However, the essential difference between both taxa consists in great reduction of covering scales in *D. carvalhoae*. What is worthy of note is the presence of cuticular pharyngeal rods in *D. carvalhoae*, the rods being situated and oriented as in many taxa of *Chaetonotidae*, however, they were never recorded in the *Dasydytidae*.

Dasydytes (Prodasydytes) elongatus sp. nov.

(Figs 116—120, Tabs 48, 58)

Etymology. From the Latin "elongare" — elongate, referring to a slim body shape.

Material. 2 stations, 2 samples, 6 specimens. PA: a pond (23) and a river (29). Above silt.

Type specimens. Holotype, a specimen collected from the river Apeú, Municipio de Castanhal, Pará on 16.2.1985 will be deposited in the Department of Zoology, University of São Paulo. Three paratypes that derive from the same sample are kept in the author's collection.

Diagnosis. Slender *Dasydytes* (*Prodasydytes*) having body 254—291 μm in length. With four paired groups of spines/single spines, including a neck group (ca), a trunk group (ta) and two rear spines (r_1, r_2). Spines up to 142—159 μm long, with single lateral denticle and distal bifurcation. With unpaired dorsal (d), and two paired ventrolateral (v_1, v_2) spines, all of them single-barbed and bifurcated terminally. Dorsal and ventral body sides with many covering keeled scales having short spines. With two pairs of ventral terminal keeled scales, those more caudal provided with long spines (v_3). Mouth ring triangular.

Description

The gastrotrich reaches length of 254—291 μm, spines excluded, or 345—377 μm, spines included, being thus the largest known member of its family. The body is slender and the long spines which lie dorsally along the trunk (these from the ca and ta groups) and long protruding terminal spines (r_1, r_2, d and v_3) give it still slimmer appearance. Head is transverse-oval, having bilobed anterolateral edges. The neck region is long and separated from head and trunk by distinct constrictions. Trunk is widest in its middle portion while its rear is rather sharply cut being provided with a pair of fine triangular teeth. There occurs 12—13 μm long and 23—27 μm wide cephalion as well as 10 μm long hypostomion. The head ciliature consists of a paired anterolateral tuft and two paired dorso-latero-ventral transverse bands, the posterior of them crossing the widest head region. Apart from cephalic ciliature, there are five paired groups of cilia, the anteriormost of them occurring at neck region while the other four on trunk. All these groups are actually short bands, each consisting of 3—8 rows of cilia. The foremost band is placed dorso-latero-ventrally whereas the others only ventrally. Three anterior bands of every body side are obliquely directed from anterodorsal to posteroventral, the fourth one extends transversally, while the rearmost band is oblique

again, extending however from anteroventral to posterodorsal. The dorsal sensory bristles have not been detected.

The occurrence of long paired lateral spines is restricted to only one group of two spines which arise from the head/neck junction (ca_{1-2}), a group of three spines at trunk beginning (ta_{1-3}) and two rear spines (r_1 and r_2). Apart from them, two ventrolateral spines occur in posterior trunk portion (v_{1-2}) and three further spines arise near median body axis, i. e. an unpaired postero-dorsal one (d) and a paired terminal ventral spine (v_3). The spines which belong to the ca and ta groups are borne ventrolaterally, turn towards dorsum and then go backward in parallel one to another (Fig. 116). Also the spines r_1, r_2, d and v_3 are disposed close and in parallel one to another, appearing to form a common tuft. The spines v_{1-2} are bent and project posterolaterally. All the long spines are thin, have rather fine single lateral denticle placed between $^1/_5$ and $^1/_3$ of spine length from spine end and show distal bifurcation. They arise from strongly elongated one-lobed scales with concave posterior edges. The scales are 12—14 μm long except for those bearing v_{1-2} spines which are considerably shorter (10.5 μm long). A narrow triangular spine base of the "*bisacer*"-type extends almost along the whole scale. Apart from basal scales of long spines, there are many covering scales being uniformly distributed through the whole body in 35 longitudinal alternating rows. The scales, which are 10 μm long on dorsal trunk side, are also elongated, one-lobed and concave-edged terminally, exhibiting keels prolonged in 1.5—3 μm long (4 μm long near to the trunk rear) spines. Although the majority of covering scales is of similar appearance and of uniform distribution, some of them are distinct. The dorsal scales which occur on head just behind cephalion are considerably smaller than the others, while two paired scales that follow them (Fig. 116 — ck) are much larger. On lateral head sides, there are four paired keeled but spineless scales which lie obliquely, with their tops directed anteroventrally (Figs 116, 117 — kl). Four keeled scales with short spines are densely packed in a transverse line at trunk rear dorsally. The scales are particularly narrow being 19 μm long and only 2 μm wide. The v_3 spined scales are preceded by a paired oblique scales similarly shaped but spineless.

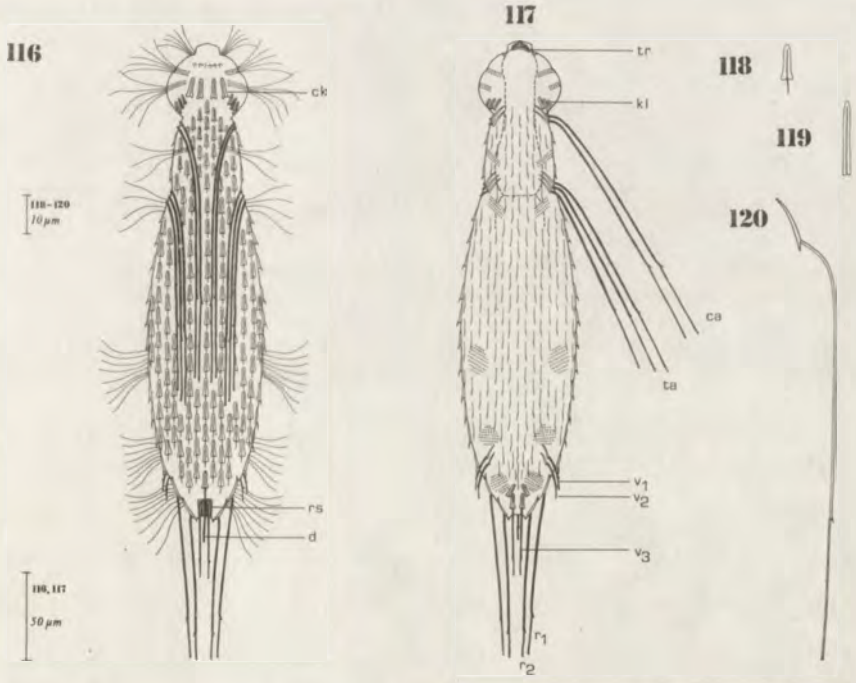
The mouth ring is terminal and exhibits clear triangular shape, the triangle base being disposed ventrally (Fig. 117 — tr). Pharynx is 84 μm long. It shows weak anterior dilation and large posterior bulb. Apart from parthenogenic specimens, there occur hermaphroditic worms with bilobed organ x and rod-shaped spermatozoa which have one end hooked (KISIELEWSKA in prep.).

Like *D. papaveroi* sp. nov., *D. elongatus* sp. nov. swims in peculiar way, wriggling and wheeling.

Taxonomic remarks. The species *D. papaveroi* sp. nov., *D. carvalhoae* sp. nov. and *D. elongatus* sp. nov. all belong to an unknown evolutionary line for which I propose the status of subgenus within *Dasydytes* GOSSE and the name *Prodasydytes* subgen. nov. Some of its features characterize also *D. lamellatus* sp. nov. However, the latter taxon stands clearly aside from the others, so it is classified in *Prodasydytes* provisionally. Thus, only essential characteristics of the new subgenus will be discussed here on the basis of three typical species, whereas the relationship between them and *D. lamellatus* will be discussed in the next subsection. Although *D. papaveroi*, *D. carvalhoae* and *D. elongatus* differ one from another in body shape and size, number and length of long spines, number of spine lateral denticles as well as in degree of development of covering scales, they have three following characters in common:

— the occurence of two paired spines (r_1 and r_2) which are both of similar length and are disposed in parallel to body axis;
— the occurrence of two paired elongated keeled scales posteroventrally, the anterior of them being furnished at most with short spine while the posterior is either provided with short spine (in *D. papaveroi* and *D. carvalhoae*) or with long spine like other long spines of the body (in *D. elongatus*);
— the occurrence of keeled and spined scales on the posterior portion of ventral field.

Peculiar features of *Prodasydytes*, not occurring however in all the species, are:
— presence of unpaired posterodorsal long spine similar to other conspicuous body spines (in *D. papaveroi* and *D. elongatus*);
— occurrence of two paired ventrolateral keeled scales placed at approximately ¾ of trunk length and bearing either short spines (*D. papaveroi*) or long spines like other long spines of the body (v_{1-2} in *D. elongatus*);
— tendency to asymmetry of mouth ring which is unknown among *Paucitubulatina* and has been observed in *D. papaveroi* and, particularly, in *D. elongatus*;
— occurrence of many covering scales, both on dorsal and ventral body sides (in *D. papaveroi* and *D. elongatus*).



Figs 116—120. *Dasydytes* (*Prodasydytes*) *elongatus* sp. nov. Fig. 116 — dorsal view, Fig. 117 — ventral view, Fig. 118 — dorsal covering spined scale, Fig. 119 — trunk rear dorsal scale, Fig. 120 — the ta_3 spine with basal scale, from lateral.

The last character is of particular phylogenetic significance since no other member of *Dasydytidae* exhibits uniform body covering with scales. BALSAMO (1983a) described the cuticular structures on ventral field of *Setopus tongiorgii*, however, the dorsal side of that gastrotrich was naked. Among eight new *Dasydytidae* described in this paper, well-developed covering scales have been also detected in *Setopus aequatorialis*, *Haltidytes squamosus* and *Ornamentula paraënsis*, however, the scales were in all three cases more or less diversified in size, shape and distribution between dorsal and ventral body sides and less numerous than in *Prodasydytes* that suggests their apomorphous character. In contrast to three last species, the shape, size and distribution of covering scales in *D. papaveroi* and *D. elongatus* do not vary between dorsal and ventral body sides. One can believe that the last feature is plesiomorphous, by analogy with *Chaetonotidae*, where similar character, number and size of ventral and dorsal scales, which occur in the genus *Lepidochaetus* gen. nov. and partly in *Polymerurus* REMANE and *Lepidodermella* BLAKE, are interpreted as an ancestral condition (see discussion of *Lepidochaetus*). As was mentioned above, the family *Chaetonotidae* is believed to be the ancestral group for the *Dasydytidae* and *Chaetonotus* (*Zonochaeta*) *bisacer* GREUTER, 1917 exhibits most joint characters with the subgenus *Prodasydytes*. The covering scales of *Ch. bisacer* and *Prodasydytes* are narrow, one-lobed, concave-edged posteriorly, keeled along most of their length and provided with short spines. Also the long spines which occur in a transverse trunk band in *Ch. bisacer* are alike those of *Prodasydytes*, having narrow triangular base,

Table 48. Morphometrical features of *Dasydytes elongatus* sp. nov.

Feature	Range	X	N	L_1	L_2
Body length, spines excluded	245—291 μm	273.0	3		
Total body length, spines included	345—377 μm	362.0	3		
Maximum head width	42; 45 μm		2		
Width of 1st neck constriction	30 μm		1		
Width of 2nd neck constriction	41 μm		1		
Maximum trunk width	68 μm		1		
Pharynx length	84 μm		1		
Pharynx formula a	26.4%		1		
n	19.0%		1		
m	20.8%		1		
p	33.6%		1		
Cephalion length	12; 13 μm		2		
Cephalion width	23—27 μm	25.3	3		
Spine length ca_1	142—159 μm	151.5	4	32%	0%
ca_2	142—157 μm	147.5	4	34%	0%
ta_1	122—125 μm	123.0	3	32%	0%
ta_2	119—122 μm	120.3	3	29%	0%
ta_3	108—118 μm	111.3	3	34%	0%
r_1	90—98 μm	93.3	3	23%	0%
r_2	81—84 μm	82.7	3	18%	0%
d	32—38 μm	35.7	3	18%	0%
v_1	20—25 μm	22.4	4	28%	0%
v_2	20—22 μm	20.7	3	29%	0%
v_3	38—44 μm	40.2	5	25%	0%

uniform thickness along whole length and being distally bifurcated. It seems that the spine lateral denticles in *Prodasydytes* are derived from spine bifurcation by unilateral growth of the latter. This assumption is proved by a comparison between the long "band" spines of *Ch. bisacer* and a related species *Ch. pentacanthus* BALSAMO, 1981. The spines are simple and bifurcated in the former case while single-barbed without bifurcation in the latter. Similar homology between the distal spine bifurcation and the spine section between lateral denticle and spine end may be seen in the case of *D. papaveroi* and *D. carvalhoae*, the former species having one-barbed and terminally bifurcated spines, and the latter two- (or three-) barbed without bifurcation. Apart from its phylogenetic significance as the most primitive line of *Dasydytidae*, the subgenus *Prodasydytes* provides interesting evidence on the divergence within the family, since three *Prodasydytes* species, although closely-related, present high degree of morphological diversification. Therefore, the speciation within the *Prodasydytes* was accompanied by the following changes:

— great differentiation of body shape and size (the mean body length varying from 140—273 μm, spines excluded);
— complete reduction of dorsal covering scales and partial reduction of ventral ones (in *D. carvalhoae*);
— reduction in number of lateral spine groups/single spines (from seven in *D. papaveroi*, to four in *D. elongatus*);
— differentiation in spine length between spine groups (from uniform length in *D. papaveroi* to at least three times longer one than another in *D. carvalhoae*);
— increase in number of lateral denticles (from one denticle and distal bifurcation in *D. papaveroi* and *D. elongatus* to three denticles occasionally in *D. carvalhoae*);
— tendency to asymmetry of mouth ring.

Dasydytes* (?*Prodasydytes*) *lamellatus sp. nov.

(Figs 121, 122, Tabs 49, 59)

Etymology. From the Latin "lamella" — thin plate, referring to the occurrence of the spine membrane.

Material. 1 station, 2 samples, 7 specimens. PA: a pond (25). Above silt.

Type specimens. Holotype, a specimen collected from the pond situated at Belém, near the Faculdade de Ciência Agraria do Pará (FCAP) on 3.4.1985, will be deposited in the Department of Zoology, University of São Paulo. Three paratypes that derive from the same sample are kept in the author's collection.

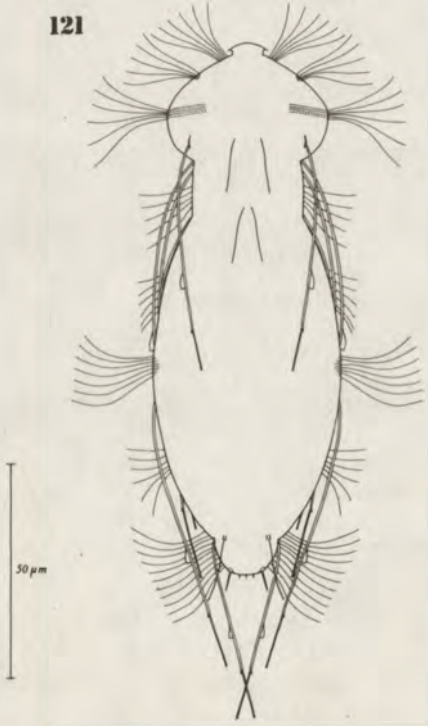
Diagnosis. Stumpy *Dasydytes* (*Prodasydytes*) (?) having body 98—125 μm in length. With five paired groups of spines/single spines laterally, including two on head and neck (ca and cb) and one on trunk rear (r). Spines up to 80—86 μm long (in ta group), with lamella-like denticle, an usual (typically double) denticle and distal bifurcation. Neither dorsal and ventral spines nor dorsal covering scales present. Ventral covering structures restricted to a group of spined scales occurring in narrow terminal band. Conspicuous ventral terminal scales lacking.

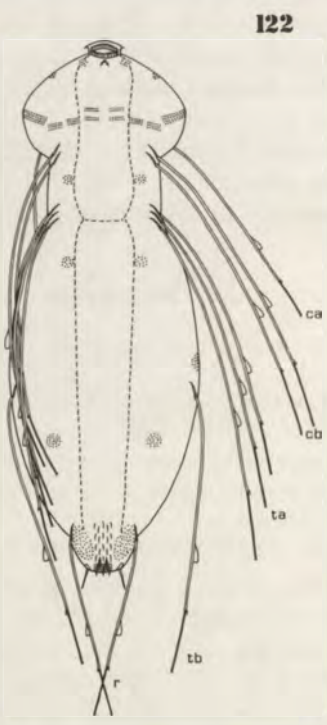
Description

The body is stumpy and reaches length of 98—125 μm, spines excluded, or 137—159 μm, spines included. The neck region is separated from the head and trunk

by constrictions. The posterior trunk portion is in form of distinct rounded-off caudal lobe. The cephalion maximum width reaches 18 μm. Hypostomion has not been detected. The cephalic ciliature consists of two paired tufts and a paired transverse band. The first tuft is placed ventrolaterally while the other laterally. The band extends through the widest head portion from dorsal to ventral side, ventrally being interrupted and almost reaching mid-ventral line. The ciliature of neck and trunk body regions consists of five paired tufts. The foremost tuft, ventral in position, is placed on neck, whereas the others are borne on trunk. The first trunk cilia tuft is ventral in position and is located behind the ta spine bases. The second trunk tuft is lateral and occurs in front of the tb spine bases. The third and fourth tufts are again ventral, the latter being larger than any other tuft on whole body and located on caudal lobe. There are three pairs of dorsal sensory bristles. The anteriormost pair is inserted at head end near the middle of pharynx, the median one at the end of neck region and the rearmost pair at the beginning of caudal lobe. The last bristles arise from tiny double-keeled scales.

The total number of lateral paired spine groups/single spines amounts to five. The foremost single spine arises from head (ca), the next group, consisting of two spines,





Figs 121, 122. *Dasydytes* (? *Prodasydytes*) *lamellatus* sp. nov. Fig. 121 — dorsal view, Fig. 122 — ventral view.

from the boundary between head and neck (cb_{1-2}), the third one, formed by three spines, from the trunk beginning (ta_{1-3}), the fourth single spine somewhat behind middle of trunk (tb) and the rearmost single spine from the beginning of caudal lobe (r). Each of these spines has a lateral denticle inserted at about $^1/_5$ of spine length from spine end and distal bifurcation as well as 2 μm high lamella which is located between $^2/_5$ and $^1/_2$ of spine length from spine end. The lamella becomes higher and higher towards spine top and is softly cut posteriorly, whereas the denticle consists actually, at least in some specimens, of two unequal denticles standing side by side. The spine basal scales proper are not visible, however, the spine bases are in form of narrow triangles, thus, of the "*bisacer*"-type. The longest are spines from the ta group, where the ta_3 spine attains 86 μm. The spines inserted more rostrally and more caudally become shorter and shorter, however, the spine length does not vary too much between groups, mean values ranging from 46.2 to 81.8 μm. Neither dorsal, ventral and ventro-lateral long spines nor dorsal covering scales occur. The ventral field cuticular armature is restricted to a narrow band which covers the caudal lobe and extends somewhat more rostral. It consists of short (2 μm long) spines which are bent, raised and arranged in 5—6 longitudinal alternating rows, up to 5 spines in a row. The caudal lobe extremity is provided ventrally with three keeled scales. Lateral to them, a pair of 5.5 μm long simple spines is inserted, whereas in front of them a pair of somewhat shorter spines occurs.

The mouth ring is terminal, round and 6.5—7.5 μm in diameter. Pharynx is long in relation to body dimensions and rather thick, having two weak terminal dilations. There occurs a pair of small cuticular rods in its anterior portion. No hermaphroditic specimens have been observed.

Taxonomic remarks. Although *D. lamellatus* sp. nov. exhibits some subgeneric characters of *Prodasydytes* subgen. nov., it stands aside from the three above-described species belonging to the latter taxon. The feature that links *D. lamellatus* with *Prodasydytes* is the presence of a paired rear spine (r) which appears to be homologous with anterior of two paired rear spines (r_1) in *D. papaveroi* sp. nov., *D. carvalhoae* sp. nov. and *D. elongatus* sp. nov. The paired simple short spine which occurs at caudal lobe extremity in *D. lamellatus* may be homologous with the r_2 spine in *Prodasydytes*, however, it is not obvious. One can believe that the paired spined scale which precedes three ventral rear keeled scales is homologous with one of two paired terminal ventral scales in *Prodasydytes*. Although these similarities between *D. lamellatus* and *Prodasydytes* are very poor, they suggest closer relation between both taxa than between *D. lamellatus* and any other subgenus of *Dasydytes*. The former taxon has lower number of lateral spine groups/single spines than the subgenus *Dasydytes* s. str. (five compared with nine) and, in contrast to members of the subgenus *Chitonodytes*, shows a pair of rear spines (r). High lamella-like spine lateral denticle has been unknown within *Dasydytidae*, however, this peculiarity of *D. lamellatus* does not justify establishment a higher-level taxon for it prior to finding similar structures in further closely-related species. Like many members of the genera *Dasydytes* and *Stylochaeta*, *D. lamellatus* exhibits long spines equally thick along their greater portion and distally bifurcated. However, in contrast to *Stylochaeta*, the bristled terminal protuberances are absent. Therefore, *D. lamellatus* sp. nov. should be classified in the genus *Dasydytes* GOSSE and provisionally included into the subgenus *Prodasydytes* subgen. nov.

Table 49. Morphometrical features of *Dasydytes lamellatus* sp. nov.

Feature	Range	X	N	L_1	L_2	L_3
Body length, spines excluded	98—125 μm	112.0	4			
Total body length, spines included	137—159 μm	148.3	3			
Maximum head width	31; 33 μm		2			
Width of 1st neck constriction	22; 24 μm		2			
Width of 2nd neck constriction	21; 27 μm		2			
Maximum trunk width	40; 43 μm		2			
Pharynx length	37—39 μm	38.0	3			
Pharynx formula a	33.8; 36.5%		2			
m	28.7; 32.7%		2			
p	34.1; 41.9%		2			
Diameter of mouth ring	6.5—7.5 μm	6.8	3			
Cephalion width	18 μm		1			
Spine length ca	51—53 μm	52.2	4	40%	18%	0%
cb_1	71—73 μm	72.5	4	39%	18%	0%
cb_2	70—76 μm	73.2	4	39%	18%	0%
ta_1	67—71 μm	69.0	5	41%	20%	0%
ta_2	70—76 μm	71.8	5	40%	17%	0%
ta_3	80—86 μm	81.8	6	38%	20%	0%
tb	62—69 μm	66.0	5	41%	20%	0%
r	43—50 μm	46.2	6	47%	23%	0%

Subgenus ***Dasydytes* (*Chitonodytes*)** REMANE, 1936

Emended diagnosis. *Dasydytes* having body 140—170 μm in length. With three paired groups of lateral spines. Dorsal (d) and lateral cephalic (c) spines as well as dorsal and ventral covering scales absent. Longest spines with two lateral denticles and without distal bifurcation. Rear spines (r) probably absent (a paired terminal bristle is apparently sensory in function).

Two species: *D.* (*Ch.*) *longispinosus* GREUTER, 1917 (type-species) and *D.* (*Ch.*) *collini* REMANE, 1927. No member of *Chitonodytes* was found during the present study.

Genus ***Stylochaeta*** HLAVA, 1905

Diagnosis. *Dasydytidae* having body 148—190 μm in length. Trunk rear with a pair of bristled papillae. Lateral spines long, almost straight, with one or two lateral denticles each. Spine thickness even between spine base and denticle (that more distal in case of two). With three paired groups of lateral trunk spines (t) and a pair of ventral rear spines (v); either lateral or ventral spines occasionally lacking. Dorsal (d) and lateral cephalic (c) spines absent. Covering scales absent. Pharynx with large posterior bulb.

Five species: *S. fusiformis* (SPENCER, 1890) — type-species, *S. stylifera* (VOIGT, 1904), *S. longispinosa* GREUTER, 1917, *S. scirteticus* BRUNSON, 1950 and *S. curviseta* KRIVANEK et KRIVANEK, 1959.

Stylochaeta fusiformis (SPENCER, 1890)

(Tabs 50, 60)

Material. 8 stations, 16 samples, many specimens. MS: ponds (18, 19) and a channel (17); many specimens. PA: ponds (23, 25) and rivers (26, 27, 29); 53 specimens. Above silt (17, 18, 23, 25, 26, 27, 29) and among root systems of *Salvinia natans* (19).

Recorded for the first time from South America.

Comparative description. The specimens found both in the state Mato Grosso do Sul and Pará fully agree with the individuals of the species studied in Europe, those described in most detail from Italy by BALSAMO (1981) in particular. Both the Italian and Brazilian worms have all the long lateral spines (these from ta, tb and tc groups) provided with two lateral denticles, the latter localized on spines in surprising accordance (compare respective data in Tab. 50). The Mato Grosso specimens had three long and one shorter spines in the anteriormost lateral group (ta), while those from Pará only three long ones, the latter case being like Italian gastrotrichs. All the Brazilian specimens showed three spines in the median lateral group (tb), whereas BALSAMO's animals had also fourth shorter one. The spine number in the third lateral group (tc) and of ventral spines (v) did not vary within Brazilian population and between it and that from Italy, amounting to two and one per side respectively. Unlike

Table 50. Morphometrical features of Brazilian specimens of *Stylochaeta fusiformis* compared with literature data from Italy (BALSAMO 1981)

Feature	Specimens from Corumbá				A specimen from Belém			Literature data from Italy		
	Values	N	L_1	L_2	Value	L_1	L_2	Value	L_1	L_2
Body length, spines excluded	140; 152 μm	2			179 μm			150 μm		
Total body length, spines included	179 μm	1			210 μm					
Pharynx length	33; 36 μm	2			39 μm			30 μm		
Pharynx formula a	39.7; 43.9%	2			32.6%					
n					25.6%					
m					34.6%					
p	56.7; 60.6%	2			51.3%					
Diameter of mouth ring	8.5 μm	2			9.5 μm					
Cephalion width					13.5 μm					
Spine length ta_{1-3}	126—130 μm	2	25%	9%	138 μm	25%	9%	110 μm	25%	18%[1]
ta_4	34 μm	1	?	?	—			—		
tb_{1-3}	87—89 μm	2								
tb_1								ca. 37 μm		
tb_{2-4}								74 μm		
tc_{1-2}	76—86 μm	2			66—76 μm	24%	9%	63 μm		
v	19 μm	1			28 μm	28%		16 μm		

[1] Calculated on the basis of direct data from paper cited.

BALSAMO's worms, the specimens in the present study exhibited on their ventral spines a lateral denticle and terminal bifurcation instead of a single denticle. However, it could not serve as evidence of difference between the South American and European populations since bifurcation on spine v was quite regularly observed in Polish specimens of *S. fusiformis* (own unpublished data). An actual pattern of ventral trunk ciliation is worth of mention. The cilia occur in five paired tufts, the rearmost of them being the largest and arising from round area which is located just rostral to ventral spine (v) base. Four other paired "tufts" are actually short single series of cilia oriented obliquely to body axis, the foremost series extending from anterodorsal to posteroventral and three others from anteroventral to posterodorsal. I believe that the oblique separated series evolved from continuous cilia bands which were parallel to body axis in a distant *Chaetonotus*-ancestor.

Genus ***Setopus*** GRÜNSPAN, 1908

Emended diagnosis. *Dasydytidae* having body 84—170 μm in length. Trunk extremity with a pair of spines (r) usually of unequal length; occasionally with short paired caudal lobe. A pair or (in *S. abarbitus*) two pairs of supplementary short spines occur occasionally on caudal protuberances. Lateral spines distributed on trunk in 3—6 (1 in *S. abarbitus*) paired groups/single spines (r spines excluded). Spines simple or with single weak lateral denticle. If spines long, they are thick and bent basally, becoming thinner and thinner distally; never bent at lateral denticle. Head covering scales, if present, small and spined. Trunk covering scales, if present, large, oval and incompletely keeled. Ventral field either with oval keeled and/or spined scales or smooth. Dorsal portion of transverse band of cephalic cilia occasionally runs between edges of large dorso-lateral plates.

Seven species: *S. primus* GRÜNSPAN, 1908 (type-species), *S. bisetosus* (THOMPSON, 1891), *S. dubius* (VOIGT, 1909), *S. iunctus* GREUTER, 1917, *S. abarbitus* (VISVESVARA, 1964) n. comb., *S. tongiorgii* (BALSAMO, 1983) and *S. aequatorialis* sp. nov.

Setopus aequatorialis spec. nov.

(Figs 123, 124, Tabs 51, 61)

Etymology. From the Latin "aequator" — equalizing, referring to occurrence of the species near the equator.

Material. 1 station, 7 samples, 13 specimens. PA: a pond (25). Above silt.

Type specimens. Holotype, a specimen collected from the pond at Belém, near the Faculdade de Ciência Agraria do Pará (FCAP) on 18.4.1985, will be deposited in the Department of Zoology, University of São Paulo. A paratype, that derives from the same water body but was collected on 3.4.1985, is kept in the author's collection.

Diagnosis. *Setopus* having body 105—135 μm long. Lateral trunk spines very long (up to 101—108 μm), with fine lateral denticle, distributed in four paired groups along anterior trunk half. Spines from two first groups (ta and tb) are longest, while the shortest from the third one (tc). Trunk dorsally covered with very large (14—16.5 μm long) oval scales with short keels. Dorsal head side with many smaller spined scales. Wide ventral field with keeled and spined scales along whole trunk. Dorsal portion of transverse cephalic ciliary band runs between edges of large dorsolateral plates.

Description

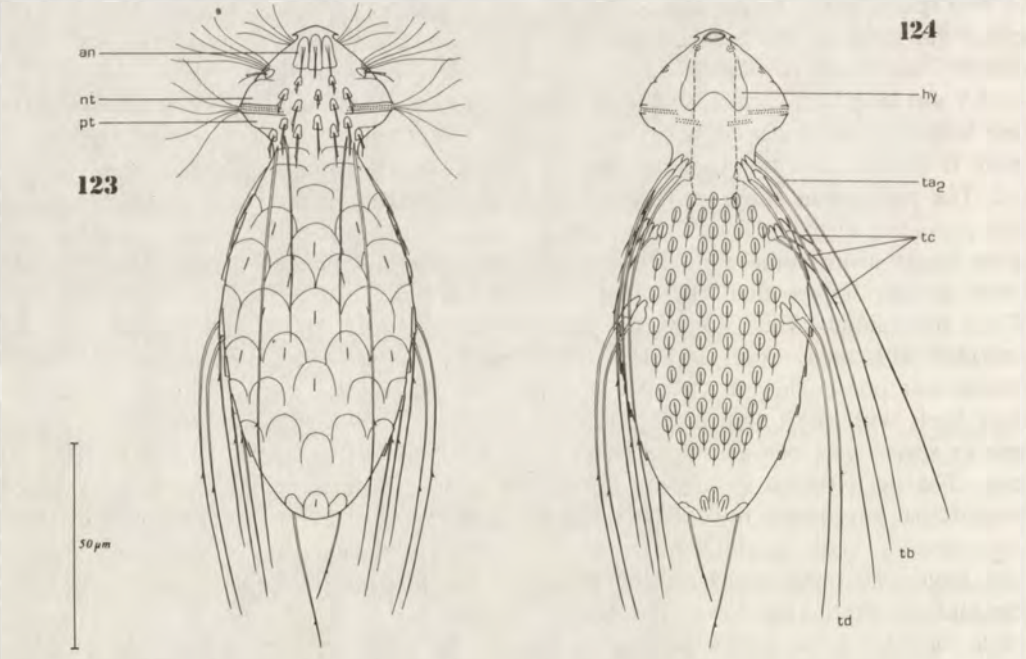
The body of mature animals reaches length of 105—135 μm, spines excluded, or 144—168 μm, spines included. Typically of the genus, the head is of triangular shape. Trunk is elongate-oval showing rounded-off end with no trace of caudal lobes. There is terminal cephalion 16—17.5 μm wide as well as large hypostomion which is as long as wide (13—16.5 μm) and exhibits peculiar three-lobed shape (Fig. 124 — hy). The ciliature of every head side consists of an anteroventral tuft, medio-lateral tuft and long posterior transverse band which extends from ventral through lateral to dorsal side. The band runs dorsally and laterally between edges of large lateral plates (Fig. 123 — nt, pt), whereas ventrally it is accompanied by shorter transverse band placed nearer to body axis and more posteriorly (Fig. 124). The trunk ciliature pattern has not been satisfactorily studied, however, at first glance it did not seem to be considerably different from that of another *Setopus*-species known by myself, viz. *S. tongiorgii* (BALSAMO). Dorsal sensory bristles have not been detected.

Lateral spination consists of four paired series of spines inserted along anterior trunk half (ta—td) and a pair of spines set at trunk rear (r). The first lateral series (ta) is borne dorsolaterally at short neck constriction and trunk front. It consists of two spines, one of them being very long (97—107 μm) while the other is at least twice shorter. Three other series (tb, tc and td) are inserted ventrolaterally. The group tb consists of three very long spines, the most ventral of them (tb_3) being the longest and reaching 101—108 μm. The next group (tc) consists of three spines which are much shorter and thinner than the others (7—24 μm long), whereas the td group is formed by two spines being longer again (70—80 μm) and almost of equal length. All the long spines are more or less bent, thickest at their bases and distally becoming thinner and thinner, the distal portion being always hair-like. They arise from rather wide scales 7—8.5 μm long (only scales of thin tc spines are 6 μm long). Each spine exhibits rather fine lateral denticle placed between $^1/_3$ and $^1/_2$ of spine length from spine end. The spine is neither bent nor becomes sharply thinner at the place where denticle is inserted. The paired rear spine (r) is borne on scale shaped as those of ta—td spines and is also provided with fine lateral denticle, the latter being placed between $^1/_5$ and $^1/_4$ of spine length from spine end. The r spines are always of unequal length, the left one being usually longer than the other (32—33 μm long comparing with 16—25 μm). When the animal swims slowly, the spines intersect slightly one another. The body is provided with many covering scales. Of dorsal head scales, conspicuous are the three frontalmost ones. They are placed side by side just behind cephalion top and show thick keels with short spines (Fig. 123 — an). Apart from them, approximately fifteen smaller scales with barbed spines occur on head dorsally, the spines being 6.5—11 μm long. The neck region is covered dorsally with several large scales arranged in three longitudinal alternating rows. The scales are either very short or strongly overlap since their anterior edges lie close to one another. Dorsal and lateral trunk sides are covered with large oval scales which exhibit short and flat median keels and are arranged in 9 longitudinal alternating rows. The scales are attached only with their frontal portions while their posterior halves are slightly raised. The scales occurring in anterior trunk half are larger than the others, reaching length of 14—16.5 μm. Ventral side of head and neck is free from scales, whereas ventral trunk side exhibits wide band of elongate-oval keeled scales with short spines. The scales are 3.5—7.5 μm long and their spines

2.5—5.5 μm, the spines at posterior trunk portion being shorter than in anterior (!). Three small median keeled scales occur ventrally near trunk extremity.

The mouth ring is 4.5 μm in diameter. Pharynx, 39—40 μm long, is of almost uniform width along its whole length. Apart from parthenogenic specimens, a hermaphroditic worm with bilobed organ x and spindle-shaped spermatozoa was found (KISIELEWSKA in prep.).

Taxonomic remarks. Although the body covering of *S. aequatorialis* sp. nov. is in sharp contrast to that of other *Setopus* species, most its characters are typical of the genus. First of all, the body shape of *S. aequatorialis*, its triangular head in particular, resembles much more other species of *Setopus* than any other member of *Dasydytidae*. Moreover, the absence of long dorsal and lateral cephalic spines and ventral spines as well as presence of four paired spine series along anterior trunk half and a pair of rear spines agree with main generic criteria of *Setopus*. Although the majority of congeneric species has been described as showing thin simple lateral spines and a pair of rear spines of equal length, recent evidence reveals the presence of at least fine spine lateral denticle and clearly unequal length of rear spines (BALSAMO 1983a, KISIELEWSKA and KISIELEWSKI 1986a). It seems that lateral denticle in *Setopus* was not detected by earlier authors because of weaker microscope resolution, whereas equal length of r spines was reported as reflecting conviction on full symmetry in *Gastrotricha* rather than actual condition. The only member of the genus described as exhibiting ventral



Figs 123, 124. *Setopus aequatorialis* sp. nov. Fig. 123 — dorsal view, Fig. 124 — ventral view (trunk ciliation omitted).

covering scales was *S. tongiorgii* (BALSAMO, 1983a). Its scales are similar to those of *S. aequatorialis*, however, smaller and restricted to narrower band. The features distinguishing *S. aequatorialis* from other congeneric species are of phylogenetic significance. The character of its lateral spines is easier to understand than in the case of any other *Setopus* since the spines are thicker and much longer. The spine base is bent and thick whereas its remaining portion becomes gradually thinner and thinner. At the place where the lateral denticle is inserted, the spine neither exhibits sharp reduction of thickness nor is additionally bent. This condition is in common with that of the genus *Haltidytes* (see below) and sharply contrasts with that of the genera *Dasydytes* and *Stylochaeta*. Two latter taxa show straighter spines of uniform thickness from spine base to most distal lateral denticle and spine distal bending. Covering scales of *Dasydytes*, if present which is the case of some members of *Prodasydytes* subgen. nov., are small, elongated, completely keeled and provided with short spines. In contrast, those of *S. aequatorialis* and *Haltidytes squamosus* sp. nov. are very large, more or less oval, unspined and with reduced keels. The dorsal portion of transverse band of cephalic cilia runs in *S. aequatorialis* between edges of large paired lateral plates. This condition was observed also in *Haltidytes squamosus* sp. nov. and *H. festinans* whereas the respective plates lack in *Dasydytes* and *Stylochaeta*. All the above differences clearly prove that the genera *Setopus* and *Haltidytes* belong to a distinct evolutionary branch and should be excluded from the genus *Dasydytes*. Having large and oval covering trunk scales as well as very long and basally bent lateral trunk spines, *S. aequatorialis* occupies an intermediary position

Table 51. Morphometrical features of *Setopus aequatorialis* sp. nov.

Feature	Range	X	N	L
Body length, spines excluded	105—135 μm	119.3	3	
Total body length, spines included	144—168 μm	154.7	3	
Maximum head width	32; 35 μm		2	
Minimum neck width	18; 20 μm		2	
Maximum trunk width	42; 51 μm		2	
Pharynx length	39—40 μm	39.3	3	
Pharynx formula a	27.0; 27.1%		2	
n	24.4; 27.0%		2	
m	23.1; 26.5%		2	
p	27.0; 29.7%		2	
Diameter of mouth ring	4.5 μm		2	
Cephalion width	16; 17.5 μm		2	
Spine length ta_1	47 μm		1	44%
ta_2	97—107 μm	102.8	3	36%
tb_1	88—98 μm	94.3	3	43%
tb_2	97—104 μm	100.3	3	33%
tb_3	101—108 μm	103.3	3	31%
tc_1	7 μm		1	?
tc_2	14 μm		1	?
tc_3	24 μm		1	17%
td_1	70—80 μm	73.7	3	48%
td_2	70—78 μm	72.7	3	44%
r (longer one)	32—33 μm	32.5	4	21%
r (shorter one)	16—25 μm	21.8	4	23%

between other congeneric species and the members of *Haltidytes*. It seems therefore that the species has retained many ancestral characters of the whole *Setopus-Haltidytes* line. The branch of *Setopus* proper evolved then towards length and thickness reduction of trunk spines, retaining a pair of rear spines, while the line of *Haltidytes* towards vanishing of rear spines, differentiation of trunk spines between ventral saltatorial and dorsal covering ones as well as shortening of trunk. Such different evolutionary tendencies justify considering also *Setopus* and *Haltidytes* as separate genera.

VISVESVARA (1964) has described from India a new dasydytid under the name *Stylochaeta abarbita*. The gastrotrich exhibits smooth cuticle, one pair of dorsolateral trunk spines, paired tuft of three simple rear spines inserted on small caudal protuberances as well as a pair of large posterolateral ciliary areas. The head shape of "*Stylochaeta*" *abarbita* is reminiscent more of the genus *Setopus* than of the former. Also simple spines were never recorded for the *Stylochaeta*. The species has been apparently classified in *Stylochaeta* because of the presence of caudal protuberances. However, small caudal lobes occasionally occur in the genus *Setopus* and all the other above characters give reason to include the Indian taxon into the latter genus. The only important difference between *S. abarbitus* and other members of *Setopus* is the presence of three pairs instead of one pair of rear spines. It should be remembered here that *Setopus dubius* (VOIGT, 1909) shows a supplementary pair of short rear spines, apart from a pair of main ones. As three pairs of rear spines have never been observed within *Dasydytidae*, either their number in *S. abarbitus* is an apomorphous character or the innermost spines are remnants of ventral terminal spines.

Genus ***Haltidytes*** REMANE, 1936 stat. nov.

Emended diagnosis. *Dasydytidae* having body 83—205 μm in length. Trunk short and rounded-off. With three pairs of groups (ta—tc) and a pair of single trunk spines (td). The anteriormost group (ta) consists of dorsal covering spines, the second and third (tb and tc) of dorsal covering and ventral spines and the single spine td is long, S-shaped, inserted ventrally and saltatorial in function. Spines simple or with single fine lateral denticles, thick and strongly bent basally and becoming thinner and thinner distally. Cephalic (c), dorsal (d), rear (r) and terminal ventral (v) spines lacking. Covering scales either large and oval or lacking. Dorsal portion of transverse band of cephalic cilia occasionally runs between edges of lateral plates.

Five species: *H. festinans* (VOIGT, 1909) (type-species), *H. saltitans* (STOKES, 1888), *H. crassus* (GREUTER, 1917), *H. ooëides* (BRUNSON, 1950) n. comb. and *H. squamosus* sp. nov.

Haltidytes festinans (VOIGT, 1909)

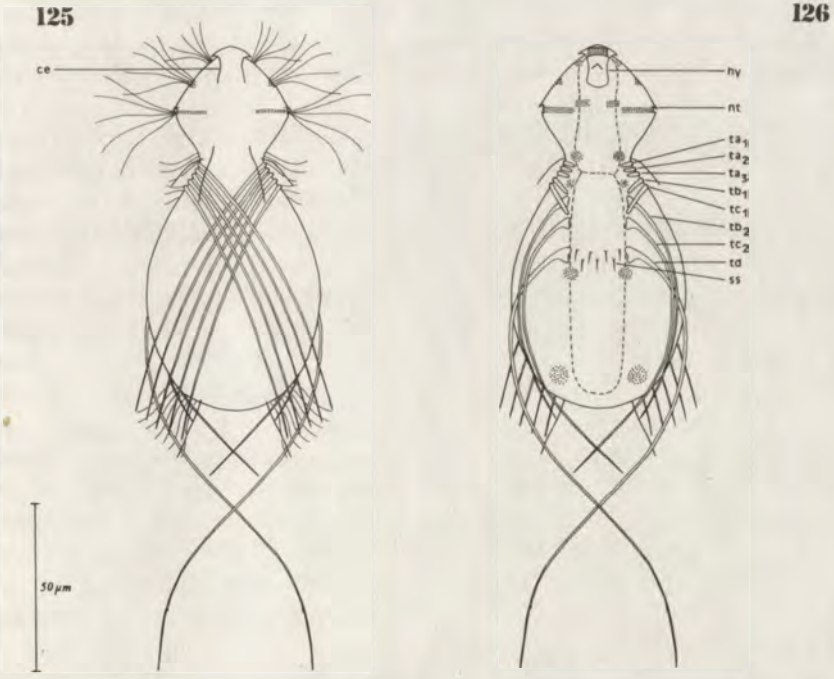
(Figs 125, 126, Tabs 52, 62)

Dasydytes (H.) crassus: GROSSO, 1973b; GROSSO and DRAHG 1983; KISIELEWSKI 1974, 1981, 1986b; KISIELEWSKA 1982; KISIELEWSKA and KISIELEWSKI 1986a, 1986 b; NESTERUK 1986; SZKUTNIK 1986.

Material. 5 stations, 11 samples, many specimens. SP: region of São Paulo — a reservoir (4); 1 specimen. MS: a river (17) and a pond (18); many specimens. PA: ponds (22, 25), 18 specimens. Above silt (4, 17, 18, 25) and among *Lemna* sp. (22).

Emended diagnosis. *Haltidytes* having body 105—130 μm in length. With five pairs of dorsal intersecting spines (ta_{1-3}, tb_1 and tc_1) and three pairs of ventral spines (tb_2, tc_2 and td). At least saltatorial spines td finely barbed. With several short spines borne ventrally between bases of td spines. Remaining cuticle smooth, occasionally with several fine dorsal spines on head and a pair of lateral spines on neck. Lateral portion of transverse band of cephalic cilia runs between edges of plates.

Redescription (based exclusively on Brazilian material). The body of mature specimens is 105—114 μm long, spines excluded, or 184—201 μm long, spines included. Head is provided with cephalion 15—17 μm in maximum width (Fig. 125 — ce) and well developed elongate hypostomion (Fig. 126 — hy). It seems that cephalion and hypostomion are joined around mouth ring. The ciliation of every head side consists of anterior ventrolateral tuft, median lateral tuft and a transverse band which extends from ventral through lateral to dorsal head side, its ventral portion being interrupted medially. Ventral ciliation on neck and trunk consists of four paired tufts, the foremost of them implanted on neck just in front of spine group ta, the second between the ta and tb groups, the third behind td and the rearmost (to be the largest one) near trunk extremity. There are two paired dorsal sensory bristles, more anterior of them arising at front and the other at end of trunk.



Figs 125, 126. *Haltidytes festinans* (VOIGT). Fig. 125 — dorsal view, Fig. 126 — ventral view.

Long trunk spines are implanted on anterior trunk half in four paired groups spaced invariably 10 μm. Five paired spines that extend obliquely on dorsum and intersect those from other trunk side (Fig. 125) are 85—97 μm long. They belong to three anterior groups (ta_{1-3}, tb_1 and tc_1). Three paired ventral spines (tb_2, tc_2 and td) are 67 μm, 76 μm and 119—135 μm long respectively. Usually only saltatorial spines td but occasionally all the long spines including dorsal ones, are finely barbed, lateral denticle being inserted ca. $^1/_7$ of spine length from spine end. When the animal swims slowly, two most posterior ventral spines (tc_2 and td) of both body sides are intersecting each other behind body end. In some of Belém specimens, I have observed several fine spines placed dorsally on head. On ventral trunk side between the bases of td spines, there occur several 3.5—4 μm long simple spines (Fig. 126 — ss) occasionally accompanied caudally by small unkeeled scales. However, the animals which appeared to have whole ventral field naked were also found.

The mouth ring is terminal and 6—6.5 μm in diameter. Pharynx is 33—38 μm long, rather thick and does not exhibit distinct terminal dilations. In its anterior portion, deeper however than usual among the *Chaetonotidae*, a pair of cuticular rods occurs. Only parthenogenic specimens were observed.

Taxonomic remarks. Spination pattern of the *Haltidytes* is difficult to study. Although the long trunk spines are easy to count, their natural disposition can be understood only when a freely swimming specimen is examined. VOIGT (1909) described a *Haltidytes* species, viz. *H. festinans* n. comb., whose body shape and dimensions as well as number of spines were in agreement with many further observations, among them those of GROSSO (1973b) from Argentina and KISIELEWSKI (1974) from Poland. Two last authors however classified their gastrotrichs in the species *Dasydytes* (*H.*) *crassus* GREUTER, 1917 since the disposition of spines fully conformed to the GREUTER's description, although dimensions were considerably smaller than those originally given for *H. crassus*. Long trunk spines, as described by VOIGT for *H. festinans*, were all, except for a pair of ventral saltatorial ones, disposed laterally which might be considered specific character. With large dimensions given by GREUTER (body length 200—205 μm, length of saltatorial spines 240 μm), *H. crassus* was the largest dasydytid known and the present author silently presumed GREUTER's mistake, the more so as such body size of the species was confirmed only once (RUDESCU 1967), in addition without giving original measurements. In the region of Belém, I had opportunity to simultaneously study three species of *Haltidytes*. Two of them, viz. the presently described and *H. squamosus* sp. nov. agree in body size with VOIGT's *H. festinans*, whereas the other, undescribed here because of scarcity of material studied, was larger, reaching length of 205 μm, spines excluded, or 340 μm, spines included. The last gastrotrich is therefore of size identical with GREUTER's *H. crassus* from Switzerland. All three Amazonian species do not vary in spine number and disposition (five pairs of dorsal spines, i. e. ta_{1-3}, tb_1, tc_1 and three pairs of ventral spines, i. e. tb_2, tc_2, td). All of them exhibit covering scales and/or fine supplementary spines, although they are well developed only in *H. squamosus* and large *Haltidytes* sp., while rudimentary in *H. festinans*. It becomes therefore evident that different spine disposition as presented by VOIGT could not be used as specific character and the only feature distinguishing two European *Haltidytes* remains body size. Consequently, all the findings of *Haltidytes* in Poland previously referred to *H. crassus* (G.EUTER) concern actually *H. festinans* (VOIGT). As far as the South American

Table 52. Morphometrical features of Brazilian specimens of *Haltidytes festinans* compared with diverse literature data from Europe and those from Argentina (GROSSO 1973b)

Feature	Specimens from Belém				Specimen from Corumbá	Literature data from Europe	GROSSO's data from Argentina
	Range	X	N	L			
Body length, spines excluded	105—110 μm	107.3	7		114 μm	112—130 μm	95 μm
Total body length, spines included	184—195 μm	189.2	6		201 μm		
Maximum head width	31—35 μm	32.8	4		33 μm		32 μm
Minimum neck width	17—18 μm	17.5	4		19 μm		18 μm
Maximum trunk width	51—52 μm	51.8	4		52 μm		63 μm
Pharynx length	33—38 μm	35.9	7			33—39μm	32 μm
Pharynx formula a	31.6—38.2%	35.2	4				
n	26.6—35.5%	30.6	4				
m	26.3—33.3%	30.2	4				
p	32.4—38.8%	34.8	4				
Diameter of mouth ring	6—6.5 μm	6.2	3				
Cephalion width	15; 17 μm		2				
Spine length ta_{1-3}	85—97 μm	90.2	4	13%			
tb_2	67 μm		1				
tc_2	76 μm		1		89 μm		
td	119—135 μm	127.8	6	16%	129 μm	140—146 μm	

findings of *Haltidytes* prior to my study in Amazonia are concerned, i. e. that of GROSSO (1973b) and GROSSO and DRAHG (1983) in Argentina and my own in São Paulo region and the Mato Grosso do Sul, the affiliation to any species is problematic. It should be stressed, that all those observations, like those from Europe, were made prior to discovery of any cuticular structures other than long spines and cephalion in *Haltidytes*, thus, fine ventral spines or delicate edges of covering scales might be overlooked. With fine ventral spines, occasional ventral scales and cephalic spines as well as distinct edges of lateral cephalic plates, the Amazonian *H. festinans* initially seemed to be a separate taxon. To confirm it, I have studied alive, in autumn 1988, a typical *Haltidytes* coming from region of Siedlce, eastern Poland. Surprisingly, I have found both several fine simple spines between bases of td spines and distinct edges of anterolateral cephalic plates. Thus, these features apparently were formerly overlooked and there is no reason to separate the Brazilian gastrotrich from the European form of *H. festinans*. Although each regional population should be reexamined, I refer findings from Argentina, São Paulo and Mato Grosso also to *H. festinans*.

Haltidytes squamosus spec. nov.

(Figs 127, 128, Tabs 53, 63)

Etymology. From the Latin "squama" — scale, referring to the body covering with large scales.

Material. 1 station, 7 samples, 16 specimens. PA: a pond (25). Above silt.

Type specimens. Holotype, a specimen collected from the pond at Belém near the Faculdade de Ciência Agraria do Pará (FCAP) on 27.3.1985, will be deposited in the Department of Zoology, University of São Paulo. Three paratypes, that derive either from the same sample or were collected on 3.4.1985, are kept in the author's collection.

Diagnosis. *Haltidytes* having body 105—122 μm in length. With five pairs of dorsal intersecting spines (ta_{1-3}, tb_1 and tc_1) and three pairs of ventral spines (tb_2, tc_2 and td). Trunk dorsally and laterally covered with large rhomboid scales with short keels, while ventrally with smaller cross-oval smooth (partly shortly-spined) scales. Posterior saltatorial (td) and median ventral (tc_2) spines usually barbed and with anterior edges undulated along their basal portions. Transverse cephalic band of cilia runs between edges of large lateral plates.

Description

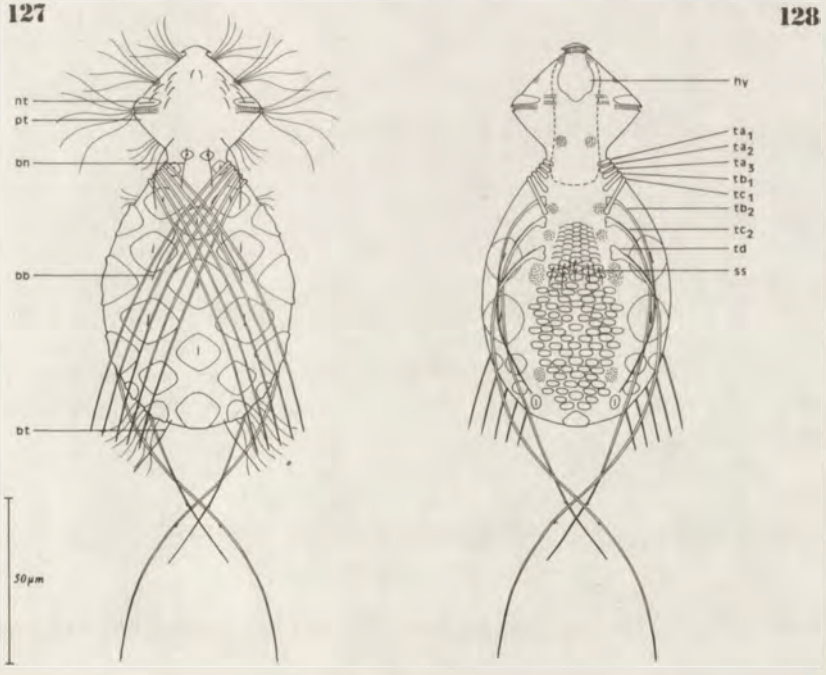
The body of mature specimens is 105—122 μm long, spines excluded, or 187—203 μm long, spines included. Its shape is typical of the genus. Head is provided with elongate cephalion as well as well visible hypostomion (Fig. 128 — hy), the latter being 13 μm long and wide. The ciliature of every head side consists of the anterior ventrolateral tuft, mediolateral tuft and posterior transverse band. The band extends from ventral through lateral to dorsal side, lying at least dorsally and laterally between edges of large lateral plates, while ventrally it is accompanied by two shorter bands situated more medially and rostrally (Fig. 128). Of the paired lateral cephalic plates, the anterior one is usually entirely visible, being disposed transversally and having keel also transverse to body axis. The other plate is hardly noticeable except for dorsal portion of its anterior edge. The rest of body ciliation consists of five paired tufts, the foremost of them being implanted at head rear, the second between tb and tc spine groups, the third between tc and td, the fourth (the largest one) caudal to td spine, and the rearmost at some distance from trunk end. There are typically three paired dorsal sensory bristles, the foremost being inserted near head end (Fig. 127 — bn), the medial one in ⅓ of trunk length (bb) and the rearmost at the trunk rear (bt).

Long spines occur in four paired groups inserted close one to another in anterior trunk half, the foremost group (ta) arising ventrolaterally, whereas the others (tb, tc and td) clearly ventrally. Three spines which form the first group (ta_{1-3}) as well as more dorsal spines from two next groups (tb_1 and tc_1) are all of the same size (100—108 μm in chord length), extend obliquely through dorsum and intersect respective spines of the other body side (Fig. 127). Three other strong paired spines are disposed ventrally. The foremost of them is 62 μm long and median one 107—108 μm long, both being more ventrally inserted spines of the tb and tc two-spine groups. The rearmost ventral spine (td) is 121—125 μm long and is saltatorial in function, allowing to leap efficiently. All the ventral spines are usually finely barbed, the lateral denticle being placed between $^1/_6$ and $^1/_3$ of spine length from spine end. Anterior edges of the spines tc_2 and td are in most specimens undulated along basal spine portion. The basal scales of dorsally lying spines are round and very small, while those of ventral spines, of td in particular, are triangular and somewhat larger. Apart from all above spines, some simple short ones arise dorsally from anterior head half as well as from a restricted area of ventral field (see below). A pair of thin spines bent and 24 μm long is also borne dorsolaterally on neck region. Dorsum, sides and ventrolateral trunk portions are covered with large (up to 15 μm long) rhomboid scales which either show short median keels or are smooth. In the widest trunk region, they are distributed in seven longitudinal alternating rows. The scales lie sparsely and their size decreases frontally and caudally from the widest trunk region. The trunk rear is medially covered with large unpaired scale similar to those from middle-trunk. The area limited by paired row of ventral cilia tufts

is smooth from head to the level of the tc spine bases. Caudal to that place, there occur many small (2.7 × 3.5 μm in dimensions) cross-oval scales distributed in nine irregular longitudinal alternating rows. Two subsequent scales in every row, those situated somewhat caudal to td spine base level, are provided with short simple spines. Rostral and caudal to them, the scales are naked, the rostral ones much overlapping one another while the others are spaced.

The mouth ring is terminal and 6.5 μm in diameter. Pharynx, 39—43 μm long, is rather thick and has weak posterior dilation. Apart from parthenogenic specimens, a hermaphrodite with bilobed organ x and spindle-shaped spermatozoa was found (KISIELEWSKA in prep.).

Taxonomic remarks. The spination pattern of *H. squamosus* sp. nov. (five pairs of intersecting dorsal and three pairs of ventral spines, all distributed in four paired groups) is identical with that of *H. crassus* (GREUTER) and *H. festinans* (VOIGT) (see above discussion of the later species). Moreover, all three species exhibit similar body shape while *H. festinans* and *H. squamosus* also similar dimensions. Spination pattern different from that of above species was described only for *H. saltitans* (STOKES, 1888), which shows only four dorsal spines. It should be mentioned, that no morphological records to support original descriptions of *H. saltitans* have been added latter. Therefore, it is not unlikely, that the spination pattern as described in this paper is



Figs 127, 128. *Haltidytes squamosus* sp. nov. Fig. 127 — dorsal view, Fig. 128 — ventral view.

universal within the genus. In any case, *H. squamosus* sp. nov. differs from all hitherto-described species of *Haltidytes* in having many large and well discernible covering scales. Their character as well as shape of long spines obviously correspond with those of *Setopus aequatorialis* sp. nov., proving close relationship between both genera (see discussion of *S. aequatorialis*).

Table 53. Morphometrical features of *Haltidytes squamosus* sp. nov.

Feature	Range	X	N	L
Body length, spines excluded	105—122 μm	113.9	7	
Total body length, spines included	187—203 μm	192.2	5	
Maximum head width	36 μm		1	
Minimum neck width	17.5 μm		1	
Maximum trunk width	51 μm		1	
Pharynx length	39—43 μm	40.4	5	
Pharynx formula a	31.0%		1	
n	27.0%		1	
m	27.0%		1	
p	40.0%		1	
Diameter of mouth ring	6.5 μm		1	
Spine length ta_{1-3}	100; 108 μm		2	
tb_2	62 μm		1	16%
tc_2	107; 108 μm		2	18%
td	121—125 μm	122.3	3	32%

Genus ***Ornamentula*** gen. nov.

Etymology. From the Latin "ornamentum" — ornament, referring to ornament of cuticle. Feminine gender.

Diagnosis. *Dasydytidae* having body 106—132 μm in length. Body covered with "lorica" formed by very large and ornamented scales. With four paired spine groups (ta—td) along anterior trunk half and two pairs of spines (r_1 and r_2) near trunk end. Long cephalic and trunk dorsal spines present. Each long spine provided with strong single lateral denticle. Transverse band of cephalic cilia situated between large lateral plates. Posterior trunk half ventrally with fine ornamented and spined scales.

A single species:

Ornamentula paraënsis spec. nov.

(Figs 129, 130, Tabs 54, 64)

Etymology. From the geographic name "Pará", referring to the Brazilian state where the species has been discovered.

Material. 1 station, 9 samples, 48 specimens. PA: a pond (25). Above silt.

Type specimens. Holotype, a specimen collected from the pond at Belém, near the Faculdade de Ciência Agraria do Pará (FCAP) on 5.3.1985, will be deposited in the Department of Zoology, University of São Paulo. Four paratypes that derive from the same sample are kept in the author's collection.

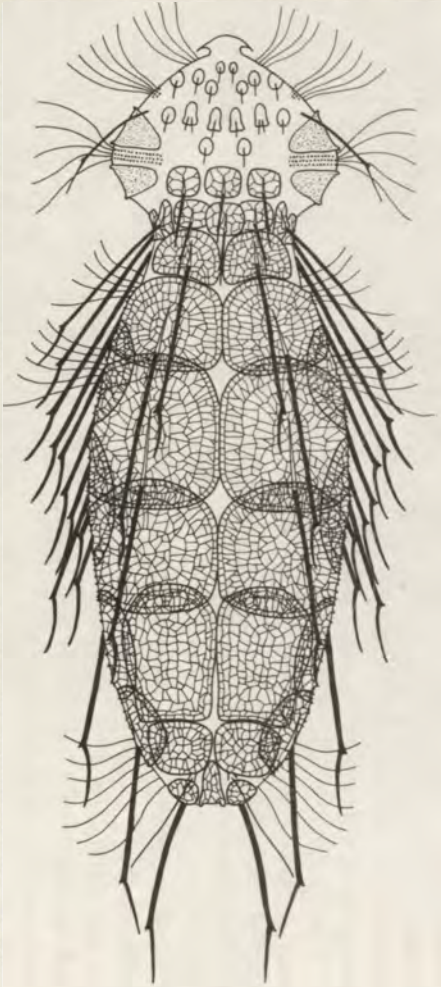
Diagnosis — same as genus.

Description

The body of mature specimens is 106—132 μm long, spines excluded, or 133—162 μm long, spines included. Head is cone-shaped, neck region short and narrow, trunk elongate-oval and rounded-off terminally. The body is only somewhat flattened dorso-ventrally, the ventral surface being more convex than usual among *Dasydytidae*. There is a short cephalion 8 μm long and 19 μm wide as well as 9 μm wide hypostomion. The cephalic ciliation, being generally typical of the family, consists of two paired lateral tufts, a paired ventral tuft and a transverse band. The anteriormost tuft is situated ventrolaterally just caudal to mouth ring, while the next one is placed exactly at the lateral head margin. The paired ventral tuft lies almost medially and consists each of four short transverse rows of cilia. The transverse ciliary band extends through the widest head portion from ventral to dorsal, neighbouring to edges of large lateral plates and ventrally being interrupted. Its median ventral portion is placed slightly more posteriorly and joins usually with respective band portion of the other head side. The ventral trunk ciliature consists of three paired tufts. The foremost tuft occurs at the base of tb spines, the second one at the tc spines, whereas the rearmost tuft (the largest one) between scales r_1 and r_2. The ciliation pattern as described above may be incomplete since thick body ornamentation makes cilia hardly discernible. As far as the dorsal sensory bristles are concerned, only a pair of trunk ones has been found, set close one to the other near trunk end, each accompanied by two rudimentary spines.

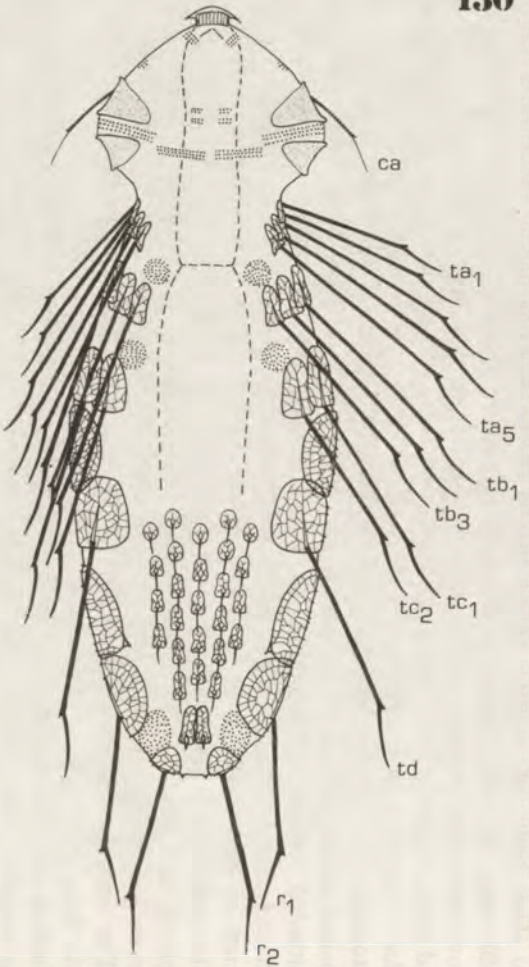
The cuticular covering is of unusual appearance. The body surface is densely covered with lines that form together a complicated ornamentation. The lines are actually reinforcements of scales, most of the latter being unusually large. Apart from ornamented covering scales, typical of *Dasydytidae* long lateral spines occur. Every body side is provided with one conspicuous cephalic spine (ca), four spine groups being distributed between neck region and $^3/_5$ of trunk length (ta—td) as well as two rear spines (r_1 and r_2). The ca spine is 17.5—23 μm long and arises dorsolaterally just rostral to anterolateral cephalic plate. Its spine section distal to lateral denticle is hairlike. The first group of trunk spines consists of five, or (rarely) six spines (ta_{1-5} or ta_{1-6}) growing in a line, the anteriormost of them dorsolaterally still at head end whereas the rearmost one is placed ventrolaterally at anterior trunk portion. The second, third and fourth groups of trunk spines are borne ventrolaterally and consist of three, two and one spines respectively (tb_{1-3}, tc_{1-2} and td). Their scales are either three-lobed (ta) or triangular (tb—td) becoming longer and longer from rostral to caudal (these of tc and td groups reaching length of 12—13 μm) and being either narrow (up to 4 μm wide in ta—tb groups) or almost as wide as long (up to 11 μm wide in the case of td scales). The length of lateral trunk spines does not vary considerably between groups, amounting approximately 40 μm, except for ta_1, ta_2 and tc_2 spines being somewhat shorter. The anterior of two paired rear spines (r_1) arises from large oval scale 24—31 μm long, while the other (r_2) from considerably smaller (15 μm long) but also oval scale. The r_1 and r_2 spines are of similar length (respectively 29.1 and 28.2 μm of mean length). As it was already mentioned, the scales exhibit rich ornamentation seen already on posterior head half scales and both on ventral and dorsal trunk sides. Two large paired cephalic lateral plates do not show ornamentation, however, their surface is finely granulated. Apart from conspicuous spined scale ca, the anterior head half is provided dorsally with ap-

129



50 µm

130



proximately eight pairs of fine scales with short spines. The head end and neck region are covered dorsally with six rectangle-like scales provided with barbed spines. The trunk dorsum is covered with scales arranged in a paired unalternating row, six scales in each. Lacking of unpaired median row of scales is worth of mention; the only single median trunk scale is situated at caudal trunk extremity. The trunk dorsal scales are large and some of them enormous in relation to the body size. The anteriormost large dorsal trunk scale (d_1) is one-lobed and exhibits concave posterior edge, like the fifth one (d_5). The rearmost scale (d_6) is oval-trapezoidal whereas the second, third and fourth ones (d_2, d_3 and d_4) oval. The d_2—d_5 scales are much larger than d_1 and d_6, reaching maximum length of 27—32 μm (!), varying however considerably in size between specimens. For instance, length of d_2 scale ranged from 16 to 27 μm, and length of d_3 scale from 23 to 32 μm. The scales d_1, d_2 and d_3 are provided with long spines which usually reach length of somewhat more than 30 μm, while the scales d_4—d_6 are spineless. Each of lateral trunk spines (ta—td), rear spines (r_1 and r_2) and dorsal ones (d_1—d_3) is strong, almost straight and shows single thick lateral denticle, the latter located ca. $^1/_4$ of spine length from spine end at t and r spines and up to $^1/_5$ in d spines. The spine section distal to lateral denticle is bent downwards and becomes thinner and thinner towards spine end, whereas the end spine portion itself is slightly bent upwards. Laterally, a paired row of scales sized as dorsal ones occurs along trunk. It consists of five scales, three anterior of them being devoid of spines while two posterior ones are basal scales of rear spines (r_1 and r_2). The median ventral area of trunk is covered in its posterior portion with spined scales. The scales are 3.5—5.5 μm long, those placed more anterior are oval whereas more posterior ones are elongate with concave posterior edges. They are distributed in 5—6 longitudinal alternating rows, up to 6 scales in a row. Their spines are up to 5.5 μm long, simple and basally thickened. Near to the trunk end medially, there is a pair of triangle-like ventral scales which lie close one to the other and show rudimentary spines. Ornamentation of ventral scales is simpler than that on dorsal body side due to smaller scale size. The scale reinforcements are in form of polygonal net and are somewhat higher than remaining scale portions, which can be observed in lateral view. On the largest dorsal scales, at least three growing zones are seen. In contrast to all the other gastrotrichs, both freshwater and marine, the cuticular armature of *O. paraënsis* functions as a rigid lorica. It is reflected by very limited head movability while swimming, and unchanged body shape after fixation.

The mouth ring is terminal, round and 6.5 μm in diameter. Like in other *Dasydytidae*, it consists of rods. Pharynx is 35—43 μm long, rather narrow and almost lacking terminal dilations. Its anterior part is furnished with a pair of weak cuticular rods. Anatomy of sexual organs has not been satisfactorily studied as rich surface ornamentation made internal structures hardly visible.

Taxonomic remarks. Although the new gastrotrich greatly differs from all the members of *Dasydytidae* known so far, it shows many joint characters with one of species described in this paper and collected from the same water body, viz. *Setopus aequatorialis* sp. nov. Both gastrotrichs have four paired groups of lateral trunk spines being

Figs 129, 130. *Ornamentula paraënsis* sp. nov. Fig. 129 — dorsal view, Fig. 130 — ventral view.

single-barbed, their trunks are covered with large and mostly oval scales as well as their transverse ciliary cephalic bands run between edges of lateral plates. The two latter characters occur also in *Haltidytes squamosus* sp. nov. and the last in *H. festinans* (VOIGT) as well. Moreover, the body shape of *Ornamentula paraënsis* is similar to that of *Setopus*, while the second pair of rear spines (r_2) is likely homologous with the rear spines (r) of the compared genus. The above similarities of *Ornamentula* and *Setopus*, those of *O. paraënsis* and *S. aequatorialis* in particular, suggest derivation from a close common ancestor. *Ornamentula* and *Haltidytes* have a common although more distant ancestor. For phylogenetic relationship between *Setopus* and *Haltidytes* see discussion of *S. aequatorialis* and remarks at the end of this chapter. In spite of these affinities and because of the following considerations, *Ornamentula* should be regarded as a new genus of *Dasydytidae*. First of all, its scales have developed a net of polygonal reinforcements which occur neither in *Setopus* nor in *Haltidytes*. The presence of reinforcements enabled the scales to reach much larger size in relation to body dimensions than anywhere among *Gastrotricha*. The length ratio of largest scales and body in *O. paraënsis* reaches 0.24, whereas only 0.13 in *Haltidytes squamosus*, 0.12 in *Setopus aequatorialis*, 0.11 in *Halichaetonotus aculifer* (*Chaetonotidae*) and 0.07 in *Diplodasys ankeli*, *D. minor* and *D.*

Table 54. Morphometrical features of *Ornamentula paraënsis* gen. et sp. nov.

Feature	Range	X	N	L
Body length, spines excluded	106—132 μm	122.2	10	
Total body length, spines included	133—162 μm	149.7	10	
Maximum head width	28—44 μm	34.5	6	
Minimum neck width	17—26 μm	21.7	5	
Maximum trunk width	33—48 μm	41.5	5	
Pharynx length	35—43 μm	38.2	4	
Pharynx formula a	24.0; 26.9%		2	
n	21.2; 24.4%		2	
m	21.9; 24.4%		2	
p	26.5; 27.9%		2	
Diameter of mouth ring	6.5 μm		1	
Cephalion length	8 μm		1	
Cephalion width	19 μm		1	
Spine length ca	17.5—23 μm	20.1	4	22%
ta_1	31 μm		1	26%
ta_2	29; 38 μm		2	24%
ta_3	41; 42 μm		2	23%
ta_4	44 μm		1	27%
ta_5	42 μm		1	?
tb_1	38—44 μm	41.7	3	28%
tb_2	40—44 μm	42.5	4	26%
tb_3	43; 44 μm		2	27%
tc_1	36; 40 μm		2	27%
tc_2	33—36 μm	34.7	3	28%
td	38—41 μm	39.8	4	25%
r_1	26—34 μm	29.1	11	25%
r_2	26—31 μm	28.2	11	27%
d_1	31—33 μm	32.0	3	20%
d_2	31—38 μm	36.0	6	18%
d_3	30—34 μm	31.6	7	17%

swedmarki (*Macrodasyida, Thaumastodermatidae*). The occurrence of enormous rigid cuticular structures overlapping one another makes the body of *Ornamentula* inflexible. Such a lorica, although formed in different way, is adaptively closer to that of many planktonic rotifers than to body covering of any other gastrotrich. Not only body ornamentation reveals separate position of the new gastrotrich in relation to the genus *Setopus*. Like the genera *Dasydytes* and *Stylochaeta* and in contrast to *Setopus, O. paraënsis* exhibits a pair of strong cephalic lateral spines (ca). Moreover, it has two pairs of rear spines, the anterior of them (r_1) is likely homologous with the r_1 spines in *Dasydytes* (*Prodasydytes*) and lacking in *Setopus*. Two last features, if they are actually homologous with those of *Dasydytes*, prove early branching of *Ornamentula* from the line of *Setopus*. Further character distinguishing *Ornamentula* from *Setopus* is presence of three pairs of strong dorsal spines (d_1—d_3). Long spines of *Ornamentula* are much thicker and provided with stronger lateral denticles than those of any *Setopus*. However, this feature cannot be regarded as difference itself since strong spines may reflect the same process that enabled the scales to form ornamentation. It is of great interest, that the cuticular reinforcements of very similar pattern to those of *O. paraënsis* have been detected in *Dasydytes* (*Dasydytes*) *nhumirimensis* sp. nov. In the latter case, however, reinforcements appeared on an unpaired dorsal spine modified into rigid club, instead of on scales (Fig. 108 — cl). The reinforcements of *O. paraënsis* and *D. nhumirimensis* originated independently as they are lacking in more primitive taxa of both evolutionary lines (i. e. *Setopus aequatorialis* sp. nov. and *Prodasydytes* subgen. nov. respectively) and they appear in *O. paraënsis* and *D. nhumirimensis* on different cuticular structures (scales and modified spine respectively). In spite of this, the ornamentation is very similar and its function the same, namely to form a rigid "skeleton" on cuticular structures which are much larger (linearly or three-dimensionally) than in ancestral condition.

Tables 55—64. Spination and cuticular covering pattern of the *Dasydytidae* species found in Brazil

Table 55. *Dasydytes* (*Dasydytes*) *nhumirimensis* sp. nov.

Spine and scale group	Spine number within a group	Mean spine length	Number of lateral denticles	Remarks
Lateral spines ca	1	?	1?	
cb	1	38 μm	1?	
ta	1—2	45—49 μm	2	
tb	5	51—56 μm	2	
tc	4—5	48—57 μm	2	
td	2—3	58—68 μm	2	
te	1	66 μm	2	
tf	1	70 μm	2	
tg	1—2	58 μm	2	
Rear spines	lacking			
Dorsal head spines	an unpaired	?	?	
	a pair	18 μm	2	
Dorsal trunk spines	3 pairs	ca. 50 μm	2	
	an unpaired	58 μm	0	club-shaped
Ventral spines	lacking			
Covering scales	lacking			

Table 56. *Dasydytes (Prodasydytes) papaveroi* sp. nov.

Spine and scale group	Spine number within a group	Mean spine length	Number of lateral denticles
Lateral spines ca	1	34 μm	1+b
cb	2	38—39 μm	1+b
ta	4	36—40 μm	1+b
tb	2	38 μm	1+b
tc	2	33—34 μm	1+b
Rear spines r_1		32 μm	1+b
r_2		40 μm	1+b
Dorsal head spines	6 pairs	5 μm	1
Dorsal trunk spines	an unpaired	25 μm	1+b
Covering dorsal spined scales	many	3 μm	0
Covering ventral spined scales	many	3 μm	0
Ventral spines	a pair	21 μm	1+b

Table 57. *Dasydytes (Prodasydytes) carvalhoae* sp. nov.

Spine and scale group	Spine number within a group	Mean spine length	Number of lateral denticles	Remarks
Lateral spines ca	1	35 μm	2 (?3)	
cb	2	90—110 μm	3	
ta	3	56—108 μm	3	
tb	1	63 μm	3	
Rear spines r_1		30 μm	3	
r_2		41 μm	3	
Dorsal spines	lacking			
Ventral spines	lacking			
Covering dorsal spined scales	lacking			
Covering ventral spined scales	several			restricted to narrow band at caudal trunk portion

Table 58. *Dasydytes (Prodasydytes) elongatus* sp. nov.

Spine and scale group	Spine number within a group	Mean spine length	Number of lateral denticles	Remarks
Lateral spines ca	2	148—152 μm	1+b	
ta	3	111—123 μm	1+b	
Rear spines r_1		93 μm	1+b	
r_2		83 μm	1+b	
Dorsal spines	an unpaired	36 μm	1+b	
Ventral spines	3 pairs	21—40 μm	1+b	
Covering scales	many			continuously distributed around the body

Table 59. *Dasydytes* (*?Prodasydytes*) *lamellatus* sp. nov.

Spine and scale group	Spine number within a group	Mean spine length	Number of lateral denticles	Remarks
Lateral spines ca	1	52 μm	2+b	
cb	2	72—73 μm	2+b	
ta	3	69—82 μm	2+b	
tb	1	66 μm	2+b	
Rear spines	a pair	46 μm	2+b	
Dorsal spines	lacking			
Ventral spines	lacking			
Covering dorsal scales	lacking			
Covering ventral scales	many			restricted to a narrow band at trunk rear

Table 60. *Stylochaeta fusiformis* (Both data from Brazil and Europe included)

Spine and scale group	Spine number within a group	Mean spine length	Number of lateral denticles
Lateral spines ta	3—4	110—138 μm	2
tb	3—4	74—88 μm	2
tc	2	63—81 μm	2
Dorsal spines	lacking		
Ventral spines	a pair	16—28 μm	1 or 1+b
Covering scales	lacking		

Table 61. *Setopus aequatorialis* sp. nov.

Spine and scale group	Spine number within a group	Mean spine length	Number of lateral denticles	Remarks
Lateral spines ta	2	47—103 μm	1	
tb	3	94—103 μm	1	
tc	3	7—24 μm	1	
td	2	73—74 μm	1	
Rear spines	a pair	22; 32 μm	1	asymmetry
Dorsal and ventral long spines	lacking			
Dorsal and ventral covering scales	many			

Table 62. *Haltidytes festinans*

Spine and scale group	Spine number within a group	Mean spine length	Number of lateral denticles	Remarks
Lateral spines ta	3 dorsal	90 μm	0 or 1	
tb	1 dorsal +		0 or 1	
	1 ventral	67 μm	0 or 1	
tc	1 dorsal +		0 or 1	
	1 ventral	76—89 μm	0 or 1	
td	1 ventral	128—146 μm	1	
Rear spines	lacking			
Mid-dorsal and mid-ventral spines	lacking			
Dorsal covering scales	several, on head			occasionally
Ventral covering scales	several			sometimes not discernible

Table 63. *Haltidytes squamosus* sp. nov.

Spine and scale group	Spine number within a group	Mean spine length	Number of lateral denticles
Lateral spines ta	3 dorsal	104 μm	0
tb	1 dorsal +		0
	1 ventral	62 μm	1
tc	1 dorsal +		0
	1 ventral	108 μm	1
td	1 ventral	122 μm	1
Rear spines	lacking		
Mid-dorsal and mid-ventral spines	lacking		
Dorsal and ventral covering scales	many		

Table 64. *Ornamentula paraënsis* gen. et sp. nov.

Spine and scale group	Spine number within a group	Mean spine length	Number of lateral denticles	Remarks
Lateral spines ca	1	20 μm	1	
ta	5—6	31—44 μm	1	
tb	3	42—44 μm	1	
tc	2	35—38 μm	1	
td	1	40 μm	1	
Rear spines	2 pairs	28—29 μm	1	
Dorsal trunk spines	3 pairs	32—36 μm	1	
Ventral spines	lacking			
Covering scales	many			enormous

Genus *Anacanthoderma* MARCOLONGO, 1910

Diagnosis. *Dasydytidae* (?) having body 75—120 μm in length. Head much narrower than trunk; neck constriction almost lacking. Without lateral (c, t), dorsal cephalic and rear (r) spines. Covering trunk spines present or absent. Pharynx with two prominent terminal bulbs.

Two species: *A. punctatum* MARCOLONGO, 1910 (type-species) and *A. paucisetosum* (MARCOLONGO, 1910) n. comb. No member of the genus was found during the present study.

PHYLOGENY OF THE FAMILY *DASYDYTIDAE*

The origin of the *Dasydytidae* and generic-level relationships within it are poorly known. Sofar, the family assembled 23 described species included, according to commonly accepted system of REMANE (1936), in the genera *Dasydytes* GOSSE, 1851 and *Stylochaeta* HLAVA, 1905. For the former genus, REMANE proposed a division into five subgenera, viz. *Dasydytes* s. str., *Setopus* GRÜNSPAN, 1908, *Anacanthoderma* MARCOLONGO, 1910, *Chitonodytes* REMANE, 1936 and *Haltidytes* REMANE, 1936. The present paper contains descriptions of a new genus and as many new species as eight. However, the significance of new Brazilian dasydytids consists mainly in possessing in some cases well developed and highly diversified scales. These characters are especially useful in phylogenetic discussion since they make the comparison with the closest families, i. e. *Chaetonotidae* and *Neogosseidae* more adequate, and provide evidence on ancestral conditions for main dasydytid lines. The discussion on the phylogenetic relationships within *Dasydytidae* was already initiated in the subsections on *Dasydytes* (*Prodasydytes*) *elongatus* sp. nov., *Setopus aequatorialis* sp. nov. and *Ornamentula paraënsis* gen. et sp. nov., and will be only summarized here.

A key problem to solve is to ascertain what was the ancestral character of the family. Like the *Neogosseidae,* the *Dasydytidae* have apparently derived from a freshwater member of the *Chaetonotidae,* which, as a result of adaptation to semipelagic mode of life, has lost caudal lobes and adhesive tubes, developed rounded-off body and reduced ventral ciliature to several short band sections isolated one from another, the latter becoming oblique to body axis as a result of dilating head and trunk. The family ancestor obviously had the cephalion, as the latter has been detected in all the well-known *Dasydytidae.* Its head was provided with two paired anterolateral tufts of cilia as well as a transverse ciliary band extending from ventral to dorsal and being interrupted medio--dorsally. Such a pattern of cephalic ciliation occurs in all the better-studied *Dasydytidae* and only its insignificant modifications were found.

The origin of dasydytid cuticular structures has remained obscure sofar. REMANE (1936, Fig. 24) suggests that the long spines (in *Dasydytidae*? — Fig. 24s is not explained) have derived directly from short simple and scaleless spines, although he allows an opposite way, i. e. indirect derivation from spined scales. This presumption allowed to include into the genus *Dasydytes* the subgenus *Anacanthoderma,* a member of which, viz. *A. paucisetosum,* has its trunk uniformly covered with medium-length simple spines without traces of long barbed spines. A rich new material from Brazil leads however to

quite a new interpretation. As it was already mentioned in the discussion of *D. elongatus* sp. nov., *Dasydytes* (*Prodasydytes*) subgen. nov. seems to preserve the most complete set of ancestral features of the *Dasydytidae*. The *Prodasydytes* was found to be related to the subgenus *Chaetonotus* (*Zonochaeta*) REMANE, the latter being already characterized by the presence of long and specialized spines, including those bifurcated and barbed. Some species of *Prodasydytes*, i. e. *D.* (*P.*) *papaveroi* sp. nov. and *D.* (*P.*) *elongatus* sp. nov. exhibit elongate covering scales with concave posterior edges and complete keels prolonged in short spines, whereas all its species have long and nearly straight spines of even thickness along almost their whole length. The tendency to reduce covering scales appeared already within the subgenus *Prodasydytes* (e. g. in *D. carvalhoae* sp. nov.), while smooth cuticle is a rule within other subgenera (i. e. *Dasydytes* s. str. and *Chitonodytes*) and the genus *Stylochaeta*. Other main evolutionary lines of *Dasydytidae* also reduced covering scales, however, independently (see below). If seven is assumed to be ancestral number of lateral paired spine groups/single spines, as it has been found in *D.* (*P.*) *papaveroi*, the number both have reduced (in the majority of cases) and increased (in the subgenus *Dasydytes* s. str.) as a result of further divergence. The phylogenetic position of the genus *Stylochaeta* is unclear. The taxon exhibits spination pattern similar to that of the subgenus *Dasydytes* (*Chitonodytes*), however, it is considered a distinct genus because of the presence of posterior bristled protuberances unique within *Gastrotricha*. Whether the line of *Stylochaeta* was branched prior to or during the process of forming subgenera of *Dasydytes* is hard to establish as neither the origin nor function of the protuberances is known. The presence of a paired posteroventral spines (v) in all the members of the genus suggests early branching of *Stylochaeta* since the v spines occur in the subgenus *D.* (*Prodasydytes*) but have been lost both in the subgenera *D.* (*Dasydytes*) and *D.* (*Chitonodytes*). It is doubtless, that the other main line of *Dasydytidae*, i. e. that comprising the genera *Setopus*, *Haltidytes* and *Ornamentula* gen. nov., was branched prior to separation of the *Stylochaeta* from *Dasydytes*. The primitive character of three former genera is the occurrence of large covering scales and four paired groups of spines/single spines along anterior $^3/_5$ of trunk. Moreover, their long spines gradually become thinner and thinner distally and have at most a single (usually fine) lateral denticle. The ancestral character of that line was also the presence of rear spines (r), I believe in number of two pairs, as well as the occurrence of long lateral cephalic spines and probably long spines derived from some dorsal covering trunk scales. If this set of characters was actually the most primitive within the line of *Setopus-Haltidytes-Ornamentula*, the last genus would have diverged first from the main branch. Retaining strong spines on dorsal covering scales, two pairs of rear spines and a pair of cephalic lateral spines, *Ornamentula* evolved towards increase in size and reinforcement of scales by a system of reticulate streaks. It is likely that the moderate length of lateral spines and considerable spine thickness are apomorphous characters which appeared as a result of sclerodermatization. This hypothesis is supported by the following consideration. The spines of considerable length occur in that species of *Setopus* which exhibits the most primitive characters within its genus, viz. in *S. aequatorialis*, and commonly within *Haltidytes*. The genus *Setopus* retained the ancestral spination pattern and body shape, tending to lose large scales and reduce spine length and thickness, whereas *Haltidytes* evolved towards modification of most posteroventral from lateral spines into saltatorial ones and some others into covering (? protecting) the dor-

sal trunk side. It should be stressed that the ability to leap using long lateral spines is widespread among the *Dasydytidae*. Apart from *Haltidytes*, I have observed it in most species having spines of considerable length, viz. in *Dasydytes* (*P.*) *carvalhoae*, *Stylochaeta fusiformis* and *Setopus aequatorialis*, however, their leaping was never so effective as in the case of *Haltidytes*. Therefore, the capability of leaping seems to be very primitive and might be even derived from as distant ancestor as *Zonochaeta*. Although the gastrotrichs of the latter taxon do not leap, they are able to rapidly raise their transverse band of long trunk spines. If this ability is actually a plesiomorphous character, the long spines of *Setopus aequatorialis* and *Haltidytes* are also primitive condition. Consequently, the spine length decreasing in *Ornamentula* should be interpreted as an apomorphous tendency. The trunk of *Haltidytes* became short and rounded-off and lost the rear spines. As far as the rear spines of *Setopus* are concerned, they have not been lost. Instead, an interesting tendency to asymmetry of them is observed. The function of a pair of rear spines (obviously defensive) is succeeded by one of them (the longer one).

Little is known on the origin of the taxon *Anacanthoderma*. It was originally established as genus, but later (REMANE 1936) considered to be a subgenus of *Dasydytes*. Taking into account its distinct character and exclusion of the *Setopus* and *Haltidytes* from *Dasydytes*, I propose to restore its generic status. The two species now recognized, viz. *A. punctatus* MARCOLONGO, 1910 and *A. paucisetosus* (MARCOLONGO, 1910), were described at the beginning of this century and their only two later records are these of MOLA (1932; both species) and RUDESCU (1967; *A. paucisetosus*). A complete lack of long lateral spines is a unique character within the *Dasydytidae*. Further characters distinguishing *Anacanthoderma* from all the other *Dasydytidae* are lacking cephalion (?), not marked neck constriction as well as presence of strong anterior pharyngeal bulb. Although available details on cephalic ciliature are not satisfactory, there is reason to suppose that a transverse ciliary band does not occur. It is likely that *Anacanthoderma* represents a distinct line which evolved from *Chaetonotidae* independently from *Dasydytidae*. The finding of the third semipelagic line that apparently evolved from *Chaetonotidae* independently from *Dasydytidae* and *Neogosseidae*, viz. *Undulinae* subfam. nov., makes this hypothesis still more probable. Until *Anacanthoderma* is found again and reexamined, the taxon remains provisionally affiliated as the genus with the family *Dasydytidae*.

The cladogram reflecting postulated relationships in the *Dasydytidae* is presented in Fig. 131. The numbered character states are as follows. Lower number in a branching concerns plesiomorphous and higher number apomorphous set of features (except for some features in the state no. 11 and 12).

1. Cephalion present. Cephalic ciliature consists of two paired anterolateral tufts and posterior transverse band interrupted dorsally. With long lateral spines. Neck constriction more or less pronounced. Pharynx with posterior bulb or bulbs lacking.

2. Lateral spines do not differ from dorsal ones or spines lacking at all. Head small, neck constriction lacking. Pharynx with two prominent terminal bulbs. Cephalion lacking (?).

3. Lateral spine thickness considerable and uniform from the base to the most distal lateral denticle. Long spines with at least one denticle and distal bifurcation, or, if bifurcation absent, with two (occasionally three) denticles. Covering scales, if present, are numerous, fine, elongated, concave-edged terminally and completely keeled. Pharynx with clear posterior dilation.

4. Long spines with at most one lateral denticle and never bifurcated. If covering scales present, they are large, not numerous, and more or less oval. Transverse cephalic ciliary band runs between edges of lateral plates. Pharynx without conspicuous dilations.

5. Trunk extremity without bristled protuberances.
6. Trunk extremity with a pair of bristled protuberances. Covering scales absent.
7. With lateral cephalic (c) and rear (r) spines.
8. Without dorsal (d), cephalic (c), rear (r), and ventral (v) spines as well as covering scales.
9. Up to seven paired lateral groups of spines/paired single spines. Covering scales usually present (at least on ventral field).
10. With nine (? eight) paired lateral groups of spines/paired single spines. Without covering scales.
11. With conspicuous trunk dorsal spines (d) and two pairs of rear spines (r). Some large dorsal scales cut posteriorly. Scales enormous, with reticulate system of reinforcements; spines thick, of medium length and with strong lateral denticle (apomorphous trend).
12. If lateral spines very long, they are strongly bent basally and gradually becoming thinner and thinner up to hair-like distal portion (plesiomorphous feature). Lateral denticle weak or absent. Covering trunk scales, if present, spineless, more or less oval and with at most short median keels.
13. With one pair (occasionally two or three pairs) of rear spines (r). Trunk elongated.
14. Without rear spines (r). Trunk nearly round. Lateral spines differentiated into ventrally-disposed saltatorial ones and those covering dorsum.

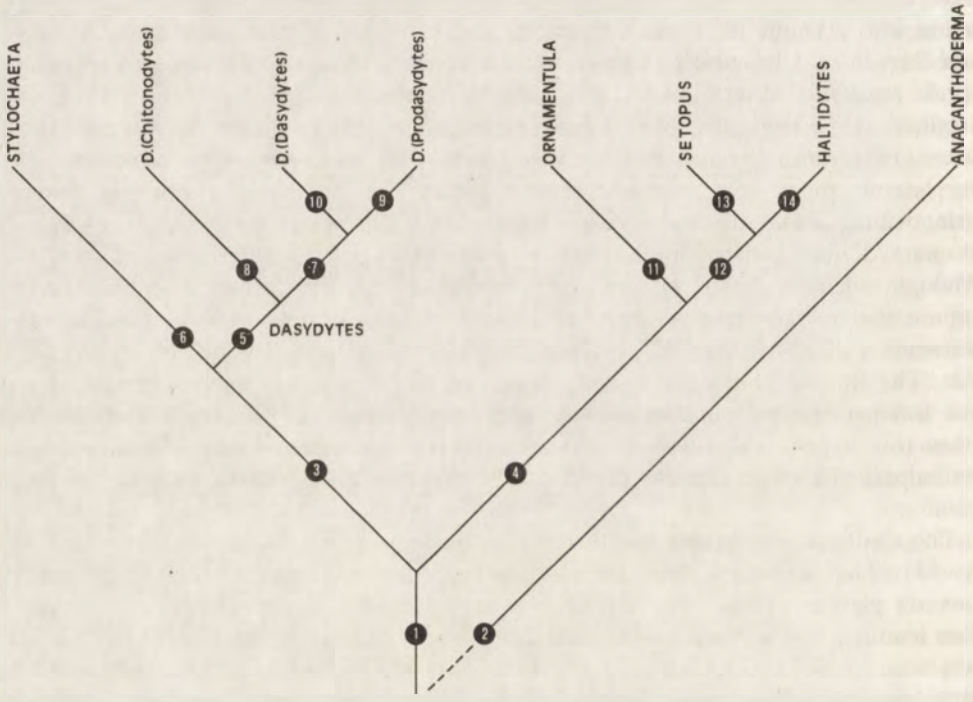


Fig. 131. Cladogram of the family *Dasydytidae*.

FAUNISTIC REMARKS

Although the study was mainly taxonomic in character and particular habitats were explored to unequal extent, some conclusions on the occurrence of fresh- and brackish-water gastrotrichs in Brazil can be formulated.

Richness of the fauna

In 86 samples collected from 30 stations I have found a total of 86 species, including 2 described in an earlier paper (KISIELEWSKI 1987), 59 presented here and 25 omitted in this paper as insufficiently studied. The list of species, although long, is far from complete even for stations that have been explored, these from the region of Belém in particular. A limited period of study, time-consuming sorting and morphological examination as well as studying restricted only to alive material obviously resulted in omitting many further species. One of eutrophic ponds located at Belém (station no. 25) in which nine species of *Dasydytidae* (including seven new) and three species of *Neogosseidae* (all new) were detected in 13 samples during two-month study may serve as a good example of the fauna richness. In the pond, the fauna of *Chaetonotidae* was also abundant and at least as diversified as that of *Dasydytidae* and *Neogosseidae*. Nevertheless, it still remains poorly known since almost the whole time available was devoted to study on the members of two former families, and only ten species of *Chaetonotidae* (including five determined) have been recorded. Moreover, the fauna composition in the pond varied highly from week to week. This suggests that many further species may appear in the annual cycle. Therefore, the diversity of Brazilian fauna of inland-water gastrotrichs is unusually high and further detailed studies are recommended.

Fauna composition

The gastrotrichs found represent two orders, i. e. *Chaetonotida* and *Macrodasyida*. The only species of the latter order, viz. *Redudasys fornerisae* KISIELEWSKI, being the first undoubted macrodasyid reported from fresh water, was discovered in the psammon of the reservoir Represa do Lobo (station no. 6). The water body is located about 280 km of the Atlantic shore (KISIELEWSKI 1987).

The species composition of chaetonotids may be summarized as follows.

1. In the tropical zone of Brazil (the states Mato Grosso do Sul and Pará, the latter in particular), a very rich fauna of *Dasydytidae* occurs. According to the new system of the *Dasydytidae* introduced in this paper, four of the five genera recognized sofar (except for *Anacanthoderma* MARCOLONGO) are represented in the fauna of Brazil. A new genus *Ornamentula* has also been described. A total of 12 species of *Dasydytidae* has been found in Brazil, including 10 previously unknown (eight of them described here). This number is surprisingly large in comparison to 23 species recognized so far in the world. It is likely that the *Dasydytidae* are mainly dwellers of tropical zone and only few species reach temperate regions. This assumption is supported by the results of studies in the temperate zone of South America where only one species of *Dasydytidae*, i.e. *Haltidytes festinans* (VOIGT), has been found (GROSSO 1973b and GROSSO and DRAHG 1983 — as *H. crassus*; the present study).

2. The family *Neogosseidae* was represented by both genera, viz. *Neogossea* REMANE and *Kijanebalola* BEAUCHAMP, and three species, including two described in the present paper. All these taxa were found in the tropical zone (states Mato Grosso do Sul and Pará). The genus *Kijanebalola* is known so far from single localities in Africa (BEAUCHAMP 1932), North America (KRIVANEK and KRIVANEK 1958) and presumably Europe (as *Eretmia cubeutes* GOSSE — see REMANE 1936 and BEAUCHAMP 1932).
3. The family *Chaetonotidae* is represented by 48 determined species which belong to ten genera and both subfamilies, including the newly described subfamily *Undulinae*. Among the genera of *Chaetonotinae*, the *Arenotus* KISIELEWSKI, 1987 was previously unknown. An undetermined species of *Halichaetonotus* REMANE which was found in the mangrove is omitted in the paper.
4. Like in Europe and North America (compare BALSAMO 1983b, KISIELEWSKI 1986b, BRUNSON 1950), about a half of all species found belongs to the genus *Chaetonotus* EHRENBERG. All the species-groups of *Chaetonotus* except for *schultzei*-group were detected, including *formosus*- and *uncinus*-groups, each of the latter two represented by one scarcely studied species omitted in the paper. It is of interest to note an unusually large number of species and forms closely related to *Ch. polyspinosus* GREUTER occurring in Brazil (apart from *Ch. polyspinosus* proper and three forms closely related to, also *Ch. breviacanthus* sp. nov., *Ch. intermedius* sp. nov., *Ch. pseudopolyspinosus* sp. nov. and *Ch. ventrochaetus* sp. nov.). A total of eight new species of *Chaetonotus* has been described in the present paper, all belonging to the *maximus*-group.
5. The genus *Polymerurus* REMANE is represented in Brazil by larger number of taxa than elsewhere thoroughout the world. I have found a total of six taxa, including one newly-described species, one new subspecies and two further new taxa which remain undescribed. Including other three species, i. e. *P. elongatus* described by DADAY (1905) from Paraguay, *P. ringueletti* GROSSO, 1975 and *P. paraelongatus* GROSSO et DRAHG, 1986 (two latter species described from Argentina), the genus *Polymerurus* is represented in South America by nine species. The number is larger than reported from Europe where five species (including a doubtful *P. nodifurca* MARCOLONGO) were found. It is also much larger than that from North America where three species were detected (STOKES 1887, BRYCE 1924, BRUNSON 1950).
6. The genus *Lepidodermella* BLAKE is represented by four species, including two new ones and a new subspecies. This number is larger than that recorded from Europe (three) and North America (two).

Habitat preferences (Tab. 65)

Ponds and reservoirs. A total of 48 determined species was found in all stagnant waters, both natural and artificial. The number is larger than in any other environment, however, such water bodies were the most intensely studied. Reservoirs, being highly diversified in their character, usually showed species composition similar to that of ponds. Nevertheless, their fauna is shown separately in Tab. 65 due to their artificial character (concrete shores and fauna derivation from diverse points in the region: stations no. 3 and 21), strong anthropopressure (pollution: station no. 4), young age and unnaturally large size in relation to other water bodies in the region (station no. 6). The species which are the most common in stagnant water bodies are as follows: *Heterolepidoderma majus, Lepidodermella squamata, Lepidochaetus zelinkai, Stylochaeta fusiformis, Polymerurus rhomboides* and *Chaetonotus bisacer*. Surprisingly, all the above species belong to the most common taxa of gastrotrichs in stagnant waters in Europe (for summary of gastrotrich fauna of Poland see KISIELEWSKI 1986b).

Table 65. Occurrence of particular species (expressed in number of samples) in diverse regions of Brazil and in diverse environments. Numbers of environment types denotes: 1 — ponds; 2 — reservoirs; 3 — rivers, out of current; 4 — rivers, within a current; 5 — puddles in tropical rain forest; 6 — water recipients in *Bromeliaceae;* 7 — Mangrove; 8 — Amazonian estuary.

No.	Taxa	Total	States of Brazil			Types of environments							
			SP	MS	PA	1	2	3	4	5	6	7	8
	Chaetonotida — *Chaetonotidae*												
1	*Arenotus strixinoi*	3	3				3						
2	*Aspidiophorus* ? *oculifer*	3	3				1	1		1			
3	*A. ophiodermus*	2	2			2							
4	*A. pleustonicus* sp. nov.	1	1				1						
5	*A. slovinensis*	1	1			1							
6	*A.* aff. *tetrachaetus*	1	1					1					
7	*Chaetonotus acanthocephalus*	6	5	1		2	1	2		1			
8	*Ch. acanthodes*	2	2			1					1		
9	*Ch. bisacer*	7	5		2	3	4						
10	*Ch. breviacanthus* sp. nov.	1	1			1							
11	*Ch. furcatus* sp. nov.	1	1								1		
12	*Ch. heideri*	6	4		2	2		4					
13	*Ch.* ? *heteracanthus*	3	3				3						
14	*Ch. hystrix*	1	1						1				
15	*Ch. intermedius* sp. nov.	1	1									1	
16	*Ch. lobo* sp. nov.	1	1				1						
17	*Ch. macrochaetus*	1	1			1							
18	*Ch. novenarius* s. BALSAMO	2	2			1		1					
19	*Ch. oculifer*	1	1								1		
20	*Ch. paucisquamatus* sp. nov.	4	4			1	3						
21	*Ch. persetosus*	1	1				1						
22	*Ch. polyspinosus*	5	4	1		4				1			
23	*Ch.* aff. *polyspinosus* I	1			1	1							
24	*Ch.* aff. *polyspinosus* II	1	1				1						
25	*Ch.* aff. *polyspinosus* III	1	1			1							
26	*Ch. pseudopolyspinosus* sp. nov.	2	2				1					1	
27	*Ch. sanctipauli* sp. nov.	2	2			1	1						
28	*Ch.* aff. *silvaticus*	1	1			1							
29	*Ch. similis*	4	3		1			3		1			
30	*Ch. succinctus*	1			1	1							
31	*Ch. ventrochaetus* sp. nov.	2	2									2	
32	*Heterolepidoderma gracile*	2		1	1	1		1					
33	*H. jureiense* sp. nov.	1	1									1	
34	*H. majus*	20	15	1	4	5	7	5	1	2			
35	*H. ocellatum* s. KISIELEWSKI	1	1								1		
36	*Ichthydium chaetiferum* sp. nov.	1	1							1			
37	*I. forficula*	5	5			1	3	1					
38	*Lepidochaetus brasilense* sp. nov.	5	4		1	2	2	1					
39	*L. zelinkai*	11	7	2	2	3	4	4					
40	*Lepidodermella amazonica* sp. nov.	1			1								1
41	*L. broa* sp. nov.	1	1				1						
42	*L. minus chaetifer* ssp. nov.	4	4				3	1					
43	*L. squamata*	15	9	1	5	6	5	3			1		

Table 65 — continued

No.	Taxa	Total	States of Brazil			Types of environments							
			SP	MS	PA	1	2	3	4	5	6	7	8
44	*Polymerurus corumbensis* sp. nov.	1		1				1					
45	*P. nodicaudus*	2	2			1	1						
46	*P. rhomboides*	12	4	2	6	6	4	2					
47	*P. squamofurcatus matogrossensis* ssp. nov.	2		2		1		1					
48	*Undula paraënsis* gen. et sp. nov. — *Neogosseidae*	3			3	3							
49	*Kijanebalola canina* sp. nov.	2			2	2							
50	*Neogossea acanthocolla* sp. nov. — *Dasydytidae*	3		1	2	2		1					
51	*Dasydyteš carvalhoae* sp. nov.	5			5	5							
52	*D. elongatus* sp. nov.	2			2	1		1					
53	*D. lamellatus* sp. nov.	2			2	2							
54	*D. nhumirimensis* sp. nov.	1		1		1							
55	*D. papaveroi* sp. nov.	5			5	4		1					
56	*Haltidytes festinans*	11	1	2	8	9	1	1					
57	*H. squamosus* sp. nov.	7			7	7							
58	*Ornamentula paraënsis* gen. et sp. nov.	9			9	9							
59	*Setopus aequatorialis* sp. nov.	7			7	7							
60	*Stylochaeta fusiformis* *Macrodasyida*	16		3	13	12		4					
61	*Redudasys fornerisae*	4	4				4						

Rivers. In the rivers, a total of 22 species was found including 5 not detected in stagnant waters. Thus, the fauna does not differ considerably from that inhabiting stagnant waters. It should be added however, that most samples taken from rivers, derived from quiet places with slow water current and vegetation similar to that covering fertile stagnant waters rich in gastrotrichs (i. e. *Nymphaeaceae, Pistia* sp., *Salvinia* sp.). Only two species, viz. *Chaetonotus hystrix* and *Heterolepidoderma majus,* were found within a current of a clean rain-forest river (the Juréia Reserve, station no. 15). They occurred among mosses which covered rocky bottom. Apart from *Heterolepidoderma majus* and *Lepidochaetus zelinkai* which are common in Brazilian stagnant waters as well, also *Chaetonotus heideri* is a common dweller of current waters.

Puddles in tropical rain forest. The occurrence of gastrotrichs in that environment was studied only in the Ecological Reserve of Juréia. Four species were identified, viz. *Chaetonotus polyspinosus, Ch. similis, Heterolepidoderma majus* and *Ichthydium chaetiferum* sp. nov. All the species except for the last one were detected also in stagnant and/or current waters.

Water recipients of *Bromeliaceae*. In that peculiar microenvironment which I have studied in the Juréia Reserve, five species of gastrotrichs were found, i. e. *Chaetonotus furcatus* sp. nov., *Ch. oculifer*, *Ch. acanthodes*, *Heterolepidoderma ocellatum* s. KISIELEWSKI 1981 and *Lepidodermella squamata*. Apart from the first species being new and the last being eurytopic, all the gastrotrichs surprisingly show special inclination to live among peat bog *Sphagnum* in Poland (KISIELEWSKI 1981).

Mangrove. The mangrove were studied in mouth regions of three rivers in the Juréia Reserve. Five following new species were found: *Chaetonotus intermedius*, *Ch. pseudopolyspinosus*, *Ch. ventrochaetus*, *Heterolepidoderma jureiense* and *Halichaetonotus* sp. All the species of *Chaetonotus* derive from the same line and are closely related to *Ch. polyspinosus* GREUTER. Thus, that branch is probably of freshwater origin, and *Ch. pseudopolyspinosus* had been even found in an inland water body as well. Two other species are likely of marine origin since the presence of ventrolateral lamellae in *H. jureiense* is a character of exclusively marine extent and the genus *Halichaetonotus* is purely marine and brackish in its distribution.

Amazonian estuary. In 5 sandy samples taken from eastern part of Amazonian delta, three species of gastrotrichs were found, i. e. *Lepidodermella amazonica* sp. nov. and two undescribed species of *Chaetonotus*. The morphology of two latter worms suggests that they derive from a freshwater line of the *maximus* group.

Salt lakes on Pantanal marshes (Mato Grosso do Sul). In one of three samples taken, a single specimen was found of an unknown species of *Chaetonotus*, the *maximus* group. Its morphology did not present phylogenetic interest.

Occurrence in particular substrata (Tab. 66)

In a mud, as many as 43 species were found, however, this substratum was the most intensely studied. The only species which shows clear preference to mud over aquatic vegetation is *Chaetonotus polyspinosus*. Although some other species, i. e. *Polymerurus rhomboides* and members of *Neogosseidae* and *Dasydytidae*, were also found mainly (or exclusively) among or just above organic sediment, their preference to this substratum can be hardly proved since a slime was the only substratum collected in most of localities where a particular species was found.

Among aquatic vegetation, 30 species were detected, including those found in small water recipients of *Bromeliaceae*. None of common species except for *Chaetonotus similis* occurred amongst vegetation more often than among organic sediment. The likely reason of such a similarity in fauna composition between both substrata is that a decaying matter accumulates on root systems of pleustonic plants such as *Salvinia natans*, *Pistia stratiotes* and *Eichhornia* sp. and on leaf bottom side of *Nymphaeaceae*. Two following species were found among duckweed: *Lepidodermella squamata* and *Haltidytes festinans*. Among mosses, other than *Sphagnum*, four species were detected, i. e. *Chaetonotus similis*, *Ch. hystrix*, *Heterolepidoderma majus* and *Ichthydium chaetiferum* sp. nov. Two following species were collected from *Sphagnum*: *Lepidochaetus brasilense* sp. nov. and *Chaetonotus* aff. *silvaticus*. Although the type-form of *Ch. silvaticus* was originally described from forest litter in Hungary (VARGA 1963), it regularly occurs in oligotrophic type of *Sphagnum* peat bogs in Poland (KISIELEWSKI 1981). *Heterolepidoderma jureiense* sp. nov. was found among algae of *Bosthrichia* sp. in the mangrove. For the species found in *Bromeliaceae* see above.

Table 66. Preference of particular species to diverse substrata, expressed in number of samples

No.	Taxa	Substrata			
		Total	Mud	Vegetation	Sand
	Chaetonotida — Chaetonotidae				
1	*Arenotus strixinoi*	3			3
2	*Aspidiophorus ? oculifer*	3	1	2	
3	*A. ophiodermus*	2	1		1
4	*A. pleustonicus* sp. nov.	1		1	
5	*A. slovinensis*	1	1		
6	*A.* aff. *tetrachaetus*	1		1	
7	*Chaetonotus acanthocephalus*	6	3	2	1
8	*Ch. acanthodes*	2	1	1	
9	*Ch. bisacer*	7	4	3	
10	*Ch. breviacanthus* sp. nov.	1	1		
11	*Ch. furcatus* sp. nov.	1		1	
12	*Ch. heideri*	6	4	2	
13	*Ch. ? heteracanthus*	3	2	1	
14	*Ch. hystrix*	1		1	
15	*Ch. intermedius* sp. nov.	1	1		
16	*Ch. lobo* sp. nov.	1	1		
17	*Ch. macrochaetus*	1	1		
18	*Ch. novenarius* s. BALSAMO	2	1	1	
19	*Ch. oculifer*	1		1	
20	*Ch. paucisquamatus* sp. nov.	4	2	2	
21	*Ch. persetosus*	1		1	
22	*Ch. polyspinosus*	5	5		
23	*Ch.* aff. *polyspinosus* I	1	1		
24	*Ch.* aff. *polyspinosus* II	1			1
25	*Ch.* aff. *polyspinosus* III	1			1
26	*Ch. pseudopolyspinosus* sp. nov.	2	1		1
27	*Ch. sanctipauli* sp. nov.	2	1	1	
28	*Ch.* aff. *silvaticus*	1		1	
29	*Ch. similis*	4		4	
30	*Ch. succinctus*	1	1		
31	*Ch. ventrochaetus* sp. nov.	2	1		1
32	*Heterolepidoderma gracile*	2	2		
33	*H. jureiense* sp. nov.	1		1	
34	*H. majus*	20	11	6	3
35	*H. ocellatum*	1		1	
36	*Ichthydium chaetiferum* sp. nov.	1		1	
37	*I. forficula*	5	2	3	
38	*Lepidochaetus brasilense* sp. nov.	5	3	1	1
39	*L. zelinkai*	11	3	7	1
40	*Lepidodermella amazonica* sp. nov.	1			1
41	*L. broa* sp. nov.	1			1
42	*L. minus chaetifer* ssp. nov.	4	1	3	
43	*L. squamata*	15	6	7	2
44	*Polymerurus corumbensis* sp. nov.	1	1		

Table 66 — continued

No.	Taxa	Substrata			
		Total	Mud	Vegetation	Sand
45	*P. nodicaudus*	2	2		
46	*P. rhomboides*	12	10	2	
47	*P. squamofurcatus matogrossensis* ssp. nov.	2	2		
48	*Undula paraënsis* gen. et sp. nov. — *Neogosseidae*	3	3		
49	*Kijanebalola canina* sp. nov.	2	2		
50	*Neogossea acanthocolla* sp. nov. — *Dasydytidae*	3	3		
51	*Dasydytes carvalhoae* sp. nov.	5	5		
52	*D. elongatus* sp. nov.	2	2		
53	*D. lamellatus* sp. nov.	2	2		
54	*D. nhumirimensis* sp. nov.	1		1	
55	*D. papaveroi* sp. nov.	5	5		
56	*Haltidytes festinans*	11	10	1	
57	*H. squamosus* sp. nov.	7	7		
58	*Ornamentula paraënsis* gen. et sp. nov.	9	9		
59	*Setopus aequatorialis* sp. nov.	7	7		
60	*Stylochaeta fusiformis* *Macrodasyida*	16	15	1	
61	*Redudasys fornerisae*	4			4
Total			43	30	14

In sandy substrata of inland waters, I found 12 species, whereas in sand of mangrove and Amazonian delta one species each. It is noteworthy that as many as four forms closely related to *Ch. polyspinosus* were found in sandy substrata, i. e. *Ch.* aff. *polyspinosus* II and III, *Ch. pseudopolyspinosus* and *Ch. ventrochaetus*. Also both Brazilian species of the genus *Lepidochaetus* occur in that substratum as well as three of four species of the genus *Lepidodermella* found in Brazil. In the river sand of mangrove, I have found *Chaetonotus ventrochaetus*.

ZOOGEOGRAPHIC REMARKS

Little is known on geographic distribution of inland-water gastrotrichs due to unequal degree of studying fauna of particular continents and small comparability of taxonomic descriptions offered by various authors. Numbers of determined species from particular higher taxa having been recorded from various continents are given in Tab. 67. There are 163 species known from Europe, 55 from North America and Asia each but only 8 from Africa and 4 from Oceania. As far as the fauna of South America is concerned, 30 species of inland-water gastrotrichs were reported before this study and 79 determined species representing 18 genera, 4 families and 2 orders are known including the results of the present paper and my own earlier one (KISIELEWSKI 1987).

Table 67. Occurrence of particular taxa of *Gastrotricha* of the subgeneric and higher level in fresh- and brackish-waters on diverse continents, expressed in number of determined species. "x" — denotes record of undetermined species

Taxon	Europe	Asia	Africa	North America	South America	Oceania
Order *Chaetonotida*	162	55	8	55	78	4
Family *Chaetonotidae*	140	52	6	45	62	4
Subfamily *Chaetonotinae*	140	52	6	45	61	4
Arenotus					1	
Aspidiophorus	11	4		1	7	
Chaetonotus	86	29	4	26	33	2
Heterolepidoderma	13	4		3	4	
Ichthydium	15	8		9	3	
Lepidochaetus	2	1			2	1
Lepidodermella	6	3	1	3	4	
Polymerurus	7	3	1	3	7	1
Subfamily *Undulinae*					1	
Undula					1	
Family *Dasydytidae*	17	1		8	10	
Anacanthoderma	2					
Dasydytes	4			2	5	
D. (Chitonodytes)	2					
D. (Dasydytes)	2			2	1	
D. (Prodasydytes)					4	
Haltidytes	3			2	2	
Ornamentula					1	
Setopus	5	1		1	1	
Stylochaeta	3			3	1	
Family *Dichaeturidae*	2					
Dichaetura	2					
Family *Neogosseidae*	3	1	2	2	4	
Kijanebalola	x		1	x	1	
Neogossea	3	1	1	2	3	
Family *Proichthydidae*		1			1	
Proichthydioides		1				
Proichthydium					1	
Order *Macrodasyida* (incertae sedis)	1				1	
Marinellina	1					
Redudasys					1	

A limited taxonomic value of mounted specimens as well as inconsistent choice of criteria used in taxonomy make data given by various authors hardly comparable. Because of this, most non-European researchers, BRUNSON (1950) who studied the gastrotrichs in Michigan in particular, preferred to classify their specimens which had morphology in accordance with European taxa in separate species (e. g., *Ichthydium monolobum* BRUNSON, in spite of its similarity to *I. forficula* REMANE — see KISIELEWSKI 1981).

Only few species are commonly considered cosmopolitan, e. g. *Lepidodermella squamata* (DUJARDIN) which is known from many stations in Europe, North America, South America and Asia. My own study conducted in Brazil, preceded by many years' research of inland-water gastrotrichs in Poland and fragmentary comparative studies in France, Finland and Italy, is therefore a chance to compare the fauna of two distant continents on the basis of uniform taxonomic criteria.

Distribution of superspecific-level taxa

If members of the order *Macrodasyida* and the family *Dichaeturidae* (*Chaetonotida*) are excluded, the former having been found at single interstitial stations in Europe (RUTTNER-KOLISKO 1955) and South America (KISIELEWSKI 1987) and the latter in few stations in Europe (MEČNIKOW 1865, MURRAY 1913, MOLA 1932, RUDESCU 1967), it may be generally stated that high-level taxa of inland-water gastrotrichs are widely distributed. The members of the families *Chaetonotidae* and *Neogosseidae* have been detected on all continents where the gastrotrichs were studied at all (it is not the case of Oceania). The family *Dasydytidae* was recorded from all continents except for Africa, whilst the *Proichthydidae* in South America (CORDERO 1918) and Asia (SUDZUKI 1971a). Almost all common genera irrespective of a family they belong to, have been reported from all continents, Africa and Australia excluded because of insignificant or nonexistent knowledge of their fauna. Of genera which are known from only one continent, most were sampled from a single station. If a species irregularly occurs even in its terra typica, like in these cases, its presence in another continent can not be excluded. The following genera were reported from only one continent where they were rare:

Arenotus (*Chaetonotidae*) — found at one station in Brazil (KISIELEWSKI 1987);

Undula (*Chaetonotidae*) — one station in Brazil (the present paper);

Ornamentula (*Dasydytidae*) — one station in Brazil (the present paper);

Proichthydium (*Proichthydidae*) — only one specimen found in Uruguay (CORDERO 1918);

Proichthydioides (*Proichthydidae*) — found at one station in Japan (SUDZUKI 1971a); moreover, described from soil which is an environment scarcely studied throughout the world.

More attention should be paid to the following genera and subgenera which have been more or less regularly found on one or more continents and were not detected in another.

Lepidochaetus gen. nov. — common in Europe and South America, found also in Asia, Africa and Oceania, whereas never reported from North America;

Dasydytes (*Chitonodytes*) — although not common, widely distributed in Europe (Switzerland, Germany, Poland, Romania) and never reported from another continent;

D. (*Dasydytes*) — common in Europe, known also from North America (HORLICK 1975) and South America (present paper), but never reported from Asia;

D. (*Prodasydytes*) — common in Brazilian Amazonia (present paper) where is represented by four species, whereas not found in another continent;

Anacanthoderma — although not common, known from five stations in Europe (Italy, Hungary and Romania) and never reported from another continent;

Haltidytes and *Stylochaeta* — common in Europe, North America and South America but not reported from Asia.

All the above genera and subgenera except for *Lepidochaetus* (*Chaetonotidae*) belong to the *Dasydytidae*. It is doubtful whether *Lepidochaetus* does actually not occur in North America since one of the species, i. e. *L. zelinkai*, is common and widely distributed in Palearctic (from France — D'HONDT 1967 to Japan — SAITO 1937 and SUDZUKI 1971b, as *Chaetonotus zelinkai*). As far as the genera *Haltidytes* and *Stylochaeta* are concerned, it is also doubtful whether they are actually absent in Asia if they are common in Europe and North America. However, differences in the occurrence of subgenera of *Dasydytes* in Europe and South America seem to be significant, the absence of *Prodasydytes* in Europe in particular.

Large number of species that represent the families *Dasydytidae* and *Neogosseidae* and the genus *Polymerurus* (*Chaetonotidae*) which have been found in South America is worth noting. Although it is similar or only insignificantly larger than that reported from Europe, it has been obtained as a result of much less complete study. The above gastrotrichs are highly diversified and abundant in tropical waters of Brazil, i. e. in the Mato Grosso do Sul and Amazonian delta, especially in the latter region. As it was already mentioned, occurrence of many further species of *Dasydytidae* and *Neogosseidae* in Amazonia is expected. It remains an open question whether the primitive character and high diversity of *Dasydytidae* are observed in South America because the main radiation of the family took place just on that continent, or because the *Dasydytidae* find optimal conditions of life in tropical waters. The tropical fauna of gastrotrichs is scarcely known throughout the world and appropriate data from other continents are lacking (see Introduction). The attractiveness of the tropics for the *Neogosseidae* seems to be evident since all the undoubted records of the genus *Kijanebalola* are from tropical and subtropical waters (Uganda — BEAUCHAMP 1932; Louisiana — KRIVANEK and KRIVANEK 1958; Amazonian delta — present paper), like most findings of *Neogossea*.

Distribution of species

Of 79 species of the inland-water gastrotrichs reported from South America, 44 (55.7%) were never found on another continent. Such species are listed in Tab. 68, whereas in Tab. 69 the South American species reported also from another continent are reviewed. Of 29 joint species in the fauna of Brazil and Europe (48.3% of the Brazilian fauna of *Gastrotricha*), 21 species (35.0%) seem not to exhibit morphological differences between both continental populations, *Heterolepidoderma gracile* REMANE showing in addition accordance in anatomy of sexual organs and behavior (see the present paper). Another five species (8.3%) show considerable morphological differences and in the cases of two further taxa (3.3%) the existing differences justify their classification even in separate subspecies. *Chaetonotus* aff. *silvaticus* and *Aspidiophorus* aff. *tetrachaetus* appear to be taxa distinct from their relatives in Europe, however, the European material should be reexamined prior to definite affiliation. It is of particular interest, that all the most common Brazilian gastrotrichs are of intercontinental or cosmopolitan distribution, being equally common in Europe (see chapter "Faunistic remarks"). To sum up, ⅓—½ of South American inland-water gastrotrichs is cosmopolitan. However, a significant number of species, and even subgenera and genera, seem to be either of local distribution or intercontinental but restricted to the tropical zone.

Table 68. Species of *Gastrotricha* known exclusively from South America

No.	Species	Country of finding	Author
	Order *Chaetonotida*		
	Family *Chaetonotidae*		
1	*Arenotus strixinoi*	Brazil	KISIELEWSKI 1987
2	*Aspidiophorus brahmsi*	Argentina	GROSSO 1973a; GROSSO and DRAHG 1983
3	*A. lilloensis*	Argentina	GROSSO and DRAHG 1983
4	*A. pleustonicus*	Brazil	present paper
5	*Chaetonotus breviacanthus*	Brazil	present paper
6	*Ch. dubius*	Brazil	DADAY 1905
7	*Ch. erinaceus*	Paraguay	DADAY 1905
8	*Ch. furcatus*	Brazil	present paper
9	*Ch. heterochaetus*	Paraguay	DADAY 1905
10	*Ch. intermedius*	Brazil	present paper
11	*Ch. lobo*	Brazil	present paper
12	*Ch. majestuosus*	Argentina	GROSSO and DRAHG 1984
13	*Ch. montevideensis*	Uruguay	CORDERO 1918
14	*Ch. odontopharynx*	Argentina	GROSSO and DRAHG 1986
15	*Ch. paucisquamatus*	Brazil	present paper
16	*Ch. pilaga*	Argentina	GROSSO 1982
17	*Ch. pseudopolyspinosus*	Brazil	present paper
18	*Ch. sanctipauli*	Brazil	present paper
19	*Ch. soberanus*	Argentina	GROSSO and DRAHG 1983
20	*Ch. tenuisquamatus*	Argentina	GROSSO 1982
21	*Ch. ventrochaetus*	Brazil	present paper
22	*Heterolepidoderma jureiense*	Brazil	present paper
23	*Ichthydium crassus*	Paraguay	DADAY 1905
24	*I. chaetiferum*	Brazil	present paper
25	*Lepidochaetus brasilense*	Brazil	present paper
26	*Lepidodermella amazonica*	Brazil	present paper
27	*L. broa*	Brazil	present paper
28	*Polymerurus corumbensis*	Brazil	present paper
29	*P. elongatus*	Paraguay	DADAY 1905
30	*P. paraelongatus*	Argentina	GROSSO and DRAHG 1986
31	*P. ringueletti*	Argentina	GROSSO 1975
32	*Undula paraënsis*	Brazil	present paper
	Family *Dasydytidae*		
33	*Dasydytes (Dasydytes) nhumirimensis*	Brazil	present paper
34	*D. (Prodasydytes) carvalhoae*	Brazil	present paper
35	*D. (P.) elongatus*	Brazil	present paper
36	*D. (?P.) lamellatus*	Brazil	present paper
37	*D. (P.) papaveroi*	Brazil	present paper
38	*Haltidytes squamosus*	Brazil	present paper
39	*Ornamentula paraënsis*	Brazil	present paper
40	*Setopus aequatorialis*	Brazil	present paper
	Family *Neogosseidae*		
41	*Kijanebalola canina*	Brazil	present paper
42	*Neogossea acanthocolla*	Brazil	present paper
	Family *Proichthydidae*		
43	*Proichthydium coronatum*	Uruguay	CORDERO 1918
	Order *Macrodasyida* (incertae sedis)		
44	*Redudasys fornerisae*	Brazil	KISIELEWSKI 1987

Table 69. Species of *Gastrotricha* found both in South America and any other continent including forms of unclear affiliation

No.	Species	Finding in South America		Finding out of South America		Remarks
		Country	Author	Continent	Author	
	Order *Chaetonotida*					
	Fam. *Chaetonotidae*					
1	*Aspidiophorus oculifer*			Europe	KISIELEWSKI 1981, 1986b	
		Brazil	present paper			doubtful
2	*A. ophiodermus*	Brazil	present paper	Europe	BALSAMO 1983a, KISIELEWSKI 1986a, b	
3	*A. slovinensis*	Brazil	present paper	Europe	KISIELEWSKI 1986a, b	
4	*A. tetrachaetus*			Europe	KISIELEWSKI 1986a, b	
		Brazil	present paper			doubtful
5	*Chaetonotus acanthocephalus*	Brazil	present paper	Europe	VALKANOV 1937, KISIELEWSKI 1981, 1986b	
6	*Ch. acanthodes*	Brazil	present paper	North America	STOKES 1887	
				Europe	RUDESCU 1967	
					KISIELEWSKI 1981, 1986b	
7	*Ch. bisacer*	Brazil	present paper	Europe	many	
		Argentina	GROSSO 1973a			as *Ch. guruguetoi*
				Asia	SAITO 1937	
8	*Ch. formosus*			North America	STOKES 1888	
		Uruguay	CORDERO 1918	Africa	DADAY 1910	doubtful
				Europe	KISIELEWSKI 1986b	doubtful
9	*Ch. heideri*	Brazil	present paper	Europe	many	
			? MURRAY 1913	North America	EMBERTON 1981	
10	*Ch. heteracanthus*			Europe	REMANE 1927; RUDESCU 1967; KISIELEWSKI 1974, 1986b	
		Brazil	present paper			doubtful
11	*Ch. hystrix*	Paraguay	DADAY 1905	Europe	many	
		Brazil	present paper	Asia	SAITO 1937	
12	*Ch. larus*			Europe	many	
				Asia	SUDZUKI 1975a	doubtful
		Uruguay	CORDERO 1918	North America	STOKES 1887	doubtful
13	*Ch. macrochaetus*	Brazil	present paper	Europe	many	
				North America	ROBBINS 1973	

14	*Ch. novenarius* s. BALSAMO	Brazil	present paper	Europe	BALSAMO 1983b; KISIELEWSKI 1981	as *Ch. anomalus*
					KISIELEWSKI and KISIELEWSKA 1986	
15	*Ch. oculifer*	Brazil	present paper	Europe	KISIELEWSKI 1981, 1986b	
16	*Ch. persetosus*	Brazil	present paper	Europe	many	
				Asia	SAITO 1937	
17	*Ch. polyspinosus*	Brazil	present paper	Europe	many	
18	*Ch. pusillus*	Paraguay	DADAY 1905	Africa	DADAY 1910	
		Brazil	DADAY 1905			
19	*Ch. silvaticus*			Europe	VARGA 1963; KISIELEWSKI 1981	
		Brazil	present paper			doubtful
20	*Ch. similis*	Brazil	present paper	Europe	many	
				North America	STOKES 1887	as *Ch. maximus*
					PACKARD 1936	
				Asia	SAITO 1937	
					SHARMA 1980	
		Paraguay	DADAY 1905			
21	*Ch. succinctus*	Brazil	present paper	Europe	many	
22	*Heterolepidoderma gracile*	Brazil	present paper	Europe	many	
				Asia	SAITO 1937	
				North America	ROBBINS 1973	
					ANDERSON and ROBBINS 1980	
		Argentina	GROSSO 1973b			as *Ichthydium stokesi*
			GROSSO and DRAHG 1983			as *Ichthydium stokesi*
23	*H. majus*	Argentina	GROSSO and DRAHG 1984	Europe	REMANE 1927; RUDESCU 1967;	
		Brazil	present paper		KISIELEWSKI 1981, 1986b	
				Asia	SAITO 1937	
24	*H. ocellatum* s. KISIELEWSKI	Brazil	present paper	Europe	KISIELEWSKI 1981, 1986b	
25	*Ichthydium forficula*	Brazil	present paper	Europe	REMANE 1927	
					KISIELEWSKI 1981, 1986b	
				Asia	SAITO 1937	
				North America	BRUNSON 1950	as *I. monolobum*

Table 69. Species of *Gastrotricha* found both in South America and any other continent including forms of unclear affiliation (cont.)

No.	Species	Finding in South America		Finding out of South America		Remarks
		Country	Author	Continent	Author	
26	*Lepidochaetus zelinkai*	Brazil	present paper	Europe	many	
				Asia	SAITO 1937; SUDZUKI 1971b	
		Argentina	GROSSO 1976			as *Chaetonotus berissensis*
27	*Lepidodermella minus chaetifer*	Brazil	present paper			
				Europe	REMANE 1936	*L. minus minus*
					KISIELEWSKI 1981, 1986b	*L. minus minus*
28	*L. squamata*	Uruguay	CORDERO 1918	Europe	many	
		Argentina	GROSSO and DRAHG 1984	Asia	many	
				North America	many	
		Brazil	present paper			
29	*Polymerurus nodicaudus*	Brazil	present paper	Europe	many	
				North America	BRYCE 1924; DAVISON 1938	
				Asia	SAITO 1937; VISVESVARA 1964 SUDZUKI 1975b	
30	*P. rhomboides*	Argentina	GROSSO 1975; GROSSO and DRAHG 1983	North America	STOKES 1887 DAVISON 1938 ANDERSON and ROBBINS 1980	
		Brazil	present paper	Europe	many	
				Asia	SUDZUKI 1981	
31	*P. squamofurcatus matogrossensis*	Brazil	present paper			
				Europe	PREOBRAŻENSKAJA 1926	*P. s. squamofurcatus*
					KISIELEWSKI 1979, 1986b	*P. s. squamofurcatus*
	Fam. *Neogosseidae*					
32	*Neogossea fasciculata*	Paraguay	DADAY 1905	Europe	BEAUCHAMP 1933	
33	*Neogossea pauciseta*	Paraguay	DADAY 1905	Africa	DADAY 1910	
				Europe	ROSZCZAK 1968	
	Fam. *Dasydytidae*					
34	*Haltidytes festinans*	Argentina	GROSSO 1973b; GROSSO and DRAHG 1983			as *Dasydytes crassus*
						as *Dasydytes crassus*
		Brazil	present paper	Europe	many	
35	*Stylochaeta fusiformis*	Brazil	present paper	Europe	many	

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LITERATURE CITED

AMATO A.J., WEISS M.J. 1982. Developmental flexibility in the cuticular pattern of a cell-constant organism, *Lepidodermella squammata* (*Gastrotricha*). Trans. Amer. micr. Soc., Lancaster, **101**: 229—240, 7 ff.

ANDERSON M.T., ROBBINS C.E. 1980. A new species of gastrotrich from Illinois. Trans. Amer. micr. Soc., Lawrence, **99**: 225—227.

ANNANDALE N. 1907. The fauna of brackish ponds at Port Cannino. Lower Bengal I. Rec. Ind. Mus. Calcutta, **1**: 35—43.

BALSAMO M. 1978. Prime ricerche sui Gastrotrichi dulciacquicoli italiani. Atti Soc. tosc. Sci. nat., Pisa, Ser. B, **84**: 87—150, 16 ff., 3 tt.

BALSAMO M. 1980. Secondo contributo alla conoscenza dei Gastrotrichi delle acque dolci italiane. Atti Soc. tosc. Sci. nat., Pisa, Ser. B, **87**: 97—126, 15 ff., 3 tab.

BALSAMO M. 1981. Gastrotrichi della Toscana: Il lago di Sibolla. Boll. Mus. civ. St. nat., Verona, **7**: 547—571, 7 ff.

BALSAMO M. 1983a. Three new gastrotrichs from a Tuscan-Emilian Apennine lake. Boll. Zool., Modena, **49**: 287—295, 4 ff.

BALSAMO M. 1983b. Gastrotrichi (*Gastrotricha*). Guide per il riconoscimento delle specie animali delle acque interne italiane, **20**. Verona, 92 pp., 60 ff.

BALSAMO M., KISIELEWSKI J. 1986. *Chaetonotus fluviatilis*, a new freshwater gastrotrich. Bol. Zool., Modena, **53**: 111—114, 2 ff.

BEAUCHAMP P. 1932. Scientific results of the Cambridge Expedition to the East African Lakes, 1930—1. 6. Rotifères et Gastrotriches. J. linn. Soc. (Zool.), London, **38**: 231—248, 4 ff.

BEAUCHAMP P. 1933. Sur la morfologie et l'éthologie des *Neogossea* (Gastrotriches). Bull. Soc. zool. France, Paris, **58**: 331—342, 1 f.

BREHM V. 1917. Ergebnisse einiger im Franzensbader Moor unternommener Exkursionen. Arch. Hydrobiol., Stuttgart, **11**: 306—323.

BRUNSON R.B. 1950. An introduction to the taxonomy of the *Gastrotricha* with a study of eighteen species from Michigan. Trans. Amer. micr. Soc., Lancaster, **69**: 325—352, 10 tt.

BRYCE D. 1924. The *Rotifera* and *Gastrotricha* of Devils and Stump Lakes, North Dakota, USA. J. Quekett micr. Club, London, Ser. 2, **15**(90): 81—108, 1 t.

CORDERO E.H. 1918. Notes sur les Gastrotriches. Physis, Buenos Aires, **4**: 241—255, 1 t.

DADAY E. 1901. Mikroskopische Süsswasserthiere aus Deutsch-Neu-Guinea. Termész. Füzetek, Budapest, **24**: 1—56, 26 ff., 3 tt.

DADAY E. 1905. Untersuchungen über die Süsswasser-Mikrofauna Paraguays. IV. *Nematorhyncha*. Zoologica, Stuttgart, **18**, 44: 72—86, tab. 5—6.

DADAY E. 1910. Untersuchungen über die Süsswasser-Mikrofauna Deutsch-Ost-Afrikas. VII. *Gastrotricha*. Zoologica, Stuttgart, **23**, 59: 56—59.

DAVISON D.B. 1938. A new species of gastrotrichan — *Chaetonotus robustus*, new species. Amer. Mus. Nov., New York, 972: 1—6, 1f.

DUJARDIN F. 1841. Histoire naturelle des Zoophytes. Infusoires. Librairie Encyklopedique de Roret. Paris, xii + 684 pp. and atlas, 19 pp., 22 tt.

EMBERTON K.C. 1981. First record of *Chaetonotus heideri* (*Gastrotricha*: *Chaetonotidae*) in North America. Ohio J. Sci., Columbus, **81**: 95—96, 2 ff.

GREUTER A. 1917. Beiträge zur Systematik der Gastrotrichen in der Schweiz. Rev. suisse Zool., Genève, **25**: 35—76, 3 tt.

GROSSO L.E. 1973a. Notas sobre Gastrotricos argentinos. I. *Chaetonotus* (*Zonochaeta*) *guruguetoi* sp. nov. y *Aspidiophorus brahmsi* sp. nov. Physis, Buenos Aires, Sec. B, **32** (84): 133—137, 3 ff.

GROSSO L.E. 1973b. Notas sobre Gastrotricos argentinos. II. Neotropica, La Plata, **19** (59): 87—89, 3 ff.

GROSSO L.E. 1975. Especies argentinas del genero *Polymerurus* REMANE 1927 (*Gastrotricha*). Neotropica, La Plata, **21** (674): 46—50, 7 ff.

GROSSO L.E. 1976. *Chaetonotus berissensis* n. sp. (*Gastrotricha*) relacionada a los organos sumergidos de plantas flotantes. Neotropica, La Plata, **22** (68): 121—124, 3 ff.

GROSSO L.E. 1982. Nuevas especies de Gastrotricos relacionadas a la vegetacion flotante. Neotropica, La Plata, **28** (80): 189—192, 10 ff.

GROSSO L.E., DRAHG F. 1983. Gastrotricos dulceacuicolas de la provincia de Tucuman. I. *Chaetonotus soberanus* sp. nov. y *Aspidiophorus lilloensis* sp. nov. Neotropica, La Plata, **29** (82): 189—193, 4 ff.

GROSSO L.E., DRAHG F. 1984. Gastrotricos dulceacuicolas de la provincia de Tucuman. II. *Chaetonotus majestuosus* n. sp. Ac. zool. Lilloana, Tucuman, **37**: 227—230, 9 ff.

GROSSO L.E., DRAHG F. 1986. Gastrotricos dulceacuicolas de la provincia de Tucuman. III. Ac. zool. Lilloana, Tucuman, **38**: 139—142, 10 ff.

GRÜNSPAN T. 1908. Beiträge zur Systematik der Gastrotrichen. Zool. Jb. Syst., Jena, **26**: 214—256.

HONDT J.-L. D'. 1967. Documents sur les Gastrotriches dulcicoles des eaux françaises. Ann. Limn., Paris, **3**: 381—397, 9 ff.

HONDT J.-L. D'. 1971. Note sur quelques Gastrotriches *Chaetonotidae*. Bull. Soc. zool. France, Paris, **96**: 215—235, 9 ff.

HUDSON C. T., GOSSE P.H. 1886. The *Rotifera*; or wheel animalcules. London, 144 pp., 34 tt. + 64 pp.

KAMESWARA RAO R., CHANDRA MOHAN P. 1977. New records of some *Gastrotricha* from India with notes on their ecology. Geobios, Lyon, **4**: 204—206, 4 ff.

KISIELEWSKA G. 1981. Hermaphroditism of freshwater gastrotrichs in natural conditions. Bull. Acad. pol. Sci., Varsovie, Ser. biol., **29**: 167—172, 6 ff.

KISIELEWSKA G. 1982. *Gastrotricha* of two complexes of peat hags near Siedlce. Fragm. faun., Warszawa, **27**: 39—57, 3 ff.

KISIELEWSKA G. Hermaphroditism in freshwater *Chaetonotida* (*Gastrotricha*). (in prep.)

KISIELEWSKA G., KISIELEWSKI J. 1986a. Freshwater *Gastrotricha* of Poland. III. *Gastrotricha* from the Białowieża Forest and the Białowieża Glade. Fragm. faun., Warszawa, **30**: 195—213.

KISIELEWSKA G., KISIELEWSKI J. 1986b. Freshwater *Gastrotricha* of Poland. V. *Gastrotricha* of alder woods. Fragm. faun., Warszawa, **30**: 235—250.

KISIELEWSKI J. 1974. Nowe dla fauny Polski gatunki brzuchorzęsków (*Gastrotricha*) słodkowodnych. Bad. fizjogr. Pol. zach., Poznań, Ser. C-Zool., **27**: 103—111, 5 ff.

KISIELEWSKI J. 1979. New and insufficiently known freshwater *Gastrotricha* from Poland. Ann. zool., Warszawa, **34**: 415—435, 17 ff.

KISIELEWSKI J. 1981. *Gastrotricha* from raised and transitional peat bogs in Poland. Monogr. Fauny Pol., **11**. Kraków, 142 pp., 25 ff.

KISIELEWSKI J. 1986a. Taxonomic notes on freshwater gastrotrichs of the genus *Aspidiophorus* VOIGT (*Gastrotricha*: *Chaetonotidae*), with descriptions of four new species. Fragm. faun., Warszawa, **30**: 139—156, 6 ff.

KISIELEWSKI J. 1986b. Freshwater *Gastrotricha* of Poland. VII. *Gastrotricha* of extremely eutrophicated water bodies. Fragm. faun., Warszawa, **30**: 267—295.

KISIELEWSKI J. 1987. Two new interesting genera of *Gastrotricha* (*Macrodasyida* and *Chaetonotida*) from the Brazilian freshwater psammon. Hydrobiologia, Ghent, **153**: 23—30, 2 ff.

KISIELEWSKI J. 1988. New records of marine *Gastrotricha* from the French coasts of Manche and Atlantic. II. *Chaetonotida*, with descriptions of four new species. Cah. Biol. mar., Roscoff, **29**: 187—213, 8 ff.

KISIELEWSKI J., KISIELEWSKA G. 1986. Freshwater *Gastrotricha* of Poland. I. *Gastrotricha* from the Tatra and Karkonosze Mountains. Fragm. faun., Warszawa, **30**: 157—182, 2 ff.

KRIVANEK R.C., KRIVANEK J.O. 1958. Taxonomic studies on the *Gastrotricha* of Louisiana. ASP Bull., **5**: 12.

KRIVANEK R.C., KRIVANEK J.O. 1959a. A new and a redescribed species of *Neogossea* (*Gastrotricha*) from Louisiana. Trans. Amer. micr. Soc., Lancaster, **77**: 423—428, 8 ff.

KRIVANEK R.C., KRIVANEK J.O. 1959b. A new species of *Stylochaeta* (*Gastrotricha*) from Louisiana. Trans. Amer. micr. Soc., Lancaster, **78**: 77—81, 5 ff.

MARCOLONGO I. 1910. Primo contributo allo studio dei Gastrotrichi del lago-stagno craterico di Astroni. Monit. zool. ital., **21**: 315—318.

MEČNIKOW E. 1865. Ueber einige wenig bekannte niedere Thierformen. Z. wiss. Zool., Leipzig, **15**: 450—463, 1 t.

MOCK H. 1979. *Chaetonotidea* (*Gastrotricha*) der Nordseeinsel Sylt. Mikrofauna Meeresbodens, Mainz, **78**, 107 pp.

MOLA P. 1932. *Gastrotricha* delle acque dolci italiane. Int. Rev. Hydrobiol., Leipzig, **26**: 397—423, tt. 18—22.

MURRAY J. 1913. *Gastrotricha*. J. Quekett micr. Club, London, (2) **12**: 211—238, t. 19.

NAIDU K.U. 1962. Three species of *Gastrotricha* from fresh-waters of Cuddapah, India. Ann. Mag. nat. Hist., London, (13) **5**: 1—4.

NESTERUK T. 1986. Freshwater *Gastrotricha* of Poland. IV. *Gastrotricha* of fish ponds in the vicinity of Siedlce. Fragm. faun., Warszawa, **30**: 215—233.

PACKARD C.E. 1936. Observations on the *Gastrotricha* indigenous to New Hampshire. Trans. Amer. micr. Soc., Lancaster, **55**: 422—427, 1 f.

POR F.D., IMPERATRIZ-FONSECA V.L. 1984. The Juréia Ecological Reserve, São Paulo, Brazil — facts and plans. Environm. Conserv., Lausanne, **11** (1): 67—70.

PREOBRAŽENSKAJA E.N. 1926. Rasprostranenie *Gastrotricha* v vodoemah Kosina i ego okrestnostej. Trudy kosin. biol. Stanc., Moskva, **4**: 3—14, 1 t.

REMANE A. 1927. Beiträge zur Systematik der Süsswassergastrotrichen. Zool. Jb. Syst., Jena, **53**: 269—320, 12 ff.

REMANE A. 1936. *Gastrotricha*, in: BRONN's Klassen und Ordnungen des Tierreichs, **4**. Leipzig, 242 pp., 209 ff.

RENAUD-MORNANT J. 1967. *Heterolepidoderma foliatum* n. sp. (*Gastrotricha, Chaetonotoidea*) des facies saumatres du Bassin d'Arcachon. Bull. Soc. zool. France, Paris, **92**: 161—166, 1 f.

ROBBINS C.E. 1973. *Gastrotricha* from Illinois. Trans. Ill. Acad. Sci., Springfield, **66**: 124—126, 4 tt.

ROSZCZAK R. 1969. Brzuchorzęski (*Gastrotricha*) Środkowej Wielkopolski. Pr. Kom. biol. Pozn. TPN, Poznań, **32** (6), 92 pp., 56 ff.

RUDESCU L. 1967. *Gastrotricha*. Fauna Republ. Socialiste Romania, **2** (3). Bucureşti, 289 pp., 151 ff.

RUTTNER-KOLISKO A. 1955. *Rheomorpha neiswestnovae* und *Marinellina flagellata*, zwei phylogenetisch interessante Wurmtypen aus dem Süsswasserpsammon. Österr. zool. Z., Wien, **6**: 33—69, 10 ff.

SAITO I. 1937. Neue und bekannte Gastrotrichen der Umgebung von Hiroshima (Japan). J. Sci. Hiroshima Univ., Hiroshima, ser. B, **1**, 5: 245—265, 13 ff.

SCHROM H. 1972. Nordadriatische Gastrotrichen. Helgoländer wiss. Meeresunters., Helgoland, **23**: 286—351, 24 ff.

SHARMA B.K. 1980. Taxonomic notes on some freshwater *Gastrotricha* from West Bengal, India. Hydrobiologia, Gent, **70**: 265—267, 5 ff.

SPENCER T. 1890. On a new rotifer. J. Quekett micr. Club, London, (2) **4**.

STOKES A.C. 1887. Observations sur les *Chaetonotus*. J. Microgr., Paris, **11**: 77—85, 150—153, 560—566, tt. 1—2.

STOKES A.C. 1888. Observations sur les *Chaetonotus* et les *Dasydytes*. J. Microgr., Paris, **12**: 19—22, 49—51, t. 1.

SUDZUKI M. 1971a. Die das Kapillarwasser des Lückensystems bewohnenden Gastrotrichen Japans I. Dobutsugaku Zasshi, Zool. Mag., Tokyo, **80**: 256—257, 1 f.

SUDZUKI M. 1971b. Die das Kapillarwasser des Lückensystems bewohnenden Gastrotrichen Japans II. Bull. biogeogr. Soc. Japan, Tokyo, **27**: 37—41, 10 ff.

SUDZUKI M. 1975a. Saprobiological diagnosis of the Tama River based on the microbiota found in 1973—74. In: Fauna and flora of the Tama River and its present situation of pollution. Kwanto Block, Ministry of Construction, pp. 125—178, 8 ff., 5 tt.

SUDZUKI M. 1975b. List of *Rotifera* and *Gastrotricha* from garden ponds of Tokyo 1974—75 and some notes on *Rhinoglena, Fadeewella, Neogossea*, etc. Proc. Japan. Soc. syst. Zool., **11**: 5—12, 2 ff., 1 t.

SUDZUKI M. 1981. Periphytic biota (Aufwuchs) in sewages and park waters. In: M. SUDZUKI (ed.): Some approaches to saprobiological problems. Sanseido Co. Ltd., Tokyo, pp. 69—107, 24 ff.

SZKUTNIK A. 1986. Freshwater *Gastrotricha* of Poland. VI. *Gastrotricha* of small astatic water bodies with rush vegetation. Fragm. faun., Warszawa, **30**: 251—266.

VALKANOV A. 1937. Über die Gastrotrichen Bulgariens. Zool. Jb. Syst., Jena, **70**: 171—176, 7 ff.

VARGA L. 1963. *Aspidiophorus silvaticus* n. sp., eine neue bodenbewohnende Gastrotrichen-Art. Acta. zool. Acad. Sci. hung., Budapest, **9**: 209—217, 6 ff.

VISVESVARA G. 1964. On some *Gastrotricha* from India with description of two new species. Ann. Mag. nat. Hist., London, (13) **6**: 435—443, 5 ff.
VISVESVARA G. 1965. On some *Gastrotricha* of the genus *Chaetonotus* from India. Ann. Mag. nat. Hist., London, (13) **7**: 209—216, 5 ff.
VOIGT M. 1901. Über einige bisher unbekannte Süsswasserorganismen. Zool. Anz., Leipzig, **24**: 191—195.
VOIGT M. 1902. Drei neue *Chaetonotus*-Arten aus Plöner Gewässern. Zool. Anz., Leipzig, **25**: 116—118.
VOIGT M. 1904. Die Rotatorien und Gastrotrichen der Umgebung von Plön. Forschungs. Biol. Stat., Plön, **11**: 126—180, 4 ff., tt. 5—7.
VOIGT M. 1909. Nachtrag zur Gastrotrichen-Fauna Plöns. Zool. Anz., Leipzig, **34**: 717—722, 3 ff.
ZELINKA C. 1889. Die Gastrotrichen. Eine monographische Darstellung ihrer Anatomie, Biologie und Systematik. Z. wiss. Zool., Leipzig, **49**: 209—383, tt. 11—15.

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STRESZCZENIE

[Tytuł: *Gastrotricha* z wód śródlądowych Brazylii]

W trakcie prowadzonych w latach 1984—85 badań wód śródlądowych, mangrowych i estuarium Amazonki stwierdzonych zostało 59 oznaczonych gatunków, w tym 26 nowych gatunków i 2 nowe podgatunki. Dla niektórych nowych gatunków ustanowiono trzy nowe rodzaje i nowy podrodzaj. Nowe taksony należą do rodzin: *Chaetonotidae* (2 rodzaje, 16 gatunków i 2 podgatunki), *Dasydytidae* (rodzaj, podrodzaj i 8 gatunków) oraz *Neogosseidae* (2 gatunki). W związku z opisaniem nowego półpelagicznego rodzaju *Undula* z Amazonii, dokonano podziału rodziny *Chaetonotidae* na podrodziny: *Chaetonotinae* (skupiającą wszystkie opisane wcześniej rodzaje) i *Undulinae*. Wyodrębniono nowy rodzaj *Lepidochaetus* o pierwotnych cechach podrodziny *Chaetonotinae*, skupiający nowy gatunek i cztery opisane wcześniej w rodzaju *Chaetonotus* EHRENBERG (m. in. *L. zelinkai* GRÜNSPAN). W rodzinie *Dasydytidae* dotychczasowy podrodzaj *Haltidytes* REMANE podniesiono do rangi rodzaju, zaś taksonom *Setopus* GRÜNSPAN i *Anacanthoderma* MARCOLONGO przywrócono status rodzaju. Opisano także nowy monotypowy rodzaj *Ornamentula* oraz nowy podrodzaj *Dasydytes* (*Prodasydytes*) z czterema nowymi gatunkami. Większość nowych taksonów *Dasydytidae* odznacza się występowaniem dobrze wyodrębnionych tarczek, niekiedy o niespotykanie dużych rozmiarach (*Ornamentula*). Rodzina *Dasydytidae* poddana została analizie filogenetycznej, a także wprowadzono dla niej nową terminologię morfologiczną. W rodzaju *Kijanebalola* (*Neogosseidae*) opisano nowy gatunek, po raz pierwszy na podstawie żywych osobników. Uwzględniając nowe dane morfologiczne poprawiono diagnozy rodzin *Chaetonotidae*, *Dasydytidae* i *Neogosseidae* a także wszystkie diagnozy rodzajowe w dwu ostatnio wymienionych rodzinach. Poddano analizie skład fauny oraz preferencje środowiskowe *Gastrotricha* Brazylii. Z analizy zoogeograficznej wynika, że 55,7% gatunków południowoamerykańskich nie zostało wykazanych z innych kontynentów, zaś pozostałe są rozmieszczone szeroko, w tym w większości przypadków występują w najlepiej zbadanej pod tym względem Europie. Rodziny *Dasydytidae* i *Neogosseidae* oraz rodzaj *Polymerurus* z *Chaetonotidae* wydają się mieć centra radiacji w strefie tropikalnej.

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