Sessile peritrichs (Ciliophora: Peritricha) from freshwater fish in the Transvaal, South Africa

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Sessile peritrichs (Ciliophora: Peritricha) were collected from freshwater fish in lakes, rivers, streams and fish-ponds in the Transvaal, South Africa. Nine species of the genus *Apiosoma* Blanchard, 1885 are described, i.e. seven new species; *A. caulata* sp.n., *A. curvinucleata* sp.n, *A. micralesti* sp.n., *A. mothlapitsis* sp.n., *A. obliqua* sp.n., *A. phiala* sp.n. and *A. viridis* sp.n., and two known species; *A. nasalis* (Timofeev, 1962) and *A. piscicola* Blanchard, 1885. One new species of the genus *Ambiphrya* Raabe, 1952 is described, i.e. *A. neobolae* sp.n. A new genus, *Scopulata* gen.n. is proposed for species with a broad scopula and compact macronucleus. Two previously described *Scyphidia* species are incorporated in this genus, i.e. *S. dermata* (Viljoen & Van As, 1983) comb.n. and *S. epibranchialis* (Viljoen & Van As, 1983) comb.n., as well as a new species, *S. constricta* sp.n. Compendiums of all the known fish-associated species of these genera are provided.

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Sessiele Peritricha (Ciliophora: Peritricha) is versamel vanaf varswatervisse in damme, riviere, strome en visdamme in Transvaal, Suid-Afrika. Nege spesies van die genus *Apiosoma* Blanchard, 1885 word beskryf, nl. sewe nuwe spesies; *A. caulata* sp.n., *A. curvinucleata* sp.n, *A. micralesti* sp.n., *A. mothlapitsis* sp.n., *A. obliqua* sp.n., *A. phiala* sp.n. en *A. viridis* sp.n., en twee bekende spesies; *A. nasalis* (Timofeev, 1962) en *A. piscicola* Blanchard, 1885. Een nuwe spesie van die genus *Ambiphrya* Raabe, 1952, nl. *A. neobolae* sp.n. word beskryf. 'n Nuwe genus, *Scopulata* gen.n. word voorgestel vir spesies met 'n breë skopula en kompakte makronukleus. Twee spesies, vroeër beskryf as *Scyphidia* spesies word by hierdie genus ingesluit, nl. *S. dermata* (Viljoen & Van As, 1983) comb.n. en *S. epibranchialis* (Viljoen & Van As, 1983) comb.n. 'n Nuwe spesie *S. constricta* sp.n. word ook beskryf. Kompendiums van al die bekende vis-geassosieerde spesies van bogenoemde drie genera word gegee.

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In the most comprehensive work to date on sessile peritrichs from freshwater fish, Lom (1966) expresses the opinion that studies of fish parasites have advanced from the purely descriptive to ecological investigations but, in the case of piscean sessile peritrichs, not even the alpha taxonomy has been sufficiently clarified. Since 1966 very few taxonomic works (Banina 1968; Mitenev 1971; Scheubel 1973; Yunchis, Banina & Jukhimenko 1975; Chernyshova 1976; Chernova 1977) on this matter have been published, and very little advance has been made in the field of piscean sessile peritrich taxonomy. The majority of the literature on fish-associated sessile peritrichs is from a fish disease viewpoint where, in most cases, not even specific identifications were made (Meyer 1970; Rogers & Coop 1970; Rogers 1971; Migala 1971; Hoffman & Bauer 1972; Plumb 1973; Hubert & Warner 1975; Miller & Chapman 1976; Esch, Hazen, Dimock & Gibbons 1976; Crites 1977; Rydlo 1977; Hazen, Raker, Esch & Fliermans 1978).

Taxonomic work on piscean sessile peritrichs deals in most cases with European and East European species (Banina 1968; Scheubel 1973; Chernova 1977), in a few cases (Surber 1940, 1943; Davis 1947; Thompson, Kirkegard & Jahn 1947) with the North American fauna and some scattered information from other parts of the world, such as New Zealand (Laird 1953), India (Tripathi 1954) and China (Chen 1956). The only taxonomic work on African sessile peritrichs, so far, is that of Viljoen & van As (1983) and Van As & Viljoen (1984).

In our opinion advances in the field of piscean sessile peritrich taxonomy are hampered by a considerable confusion as to their generic status as well as problems in applying the modern staining techniques of ciliophorans, i.e. silver impregnation and protargol staining. These techniques, now considered essential in ciliatology have as yet not been successfully applied to piscean sessile peritrichs. The only exception to this has been the employment of protargol staining and silver impregnation in studying *Heteropolaria lwoffi*; Syn: *Epistylis lwoffi* (Fauré-Fremiet, 1943) by Foissner (1983).

In the course of a comprehensive study of trichodinid peritrichs of the fish of South Africa (Basson, Van As & Paperna 1983), various sessile peritrichs were encountered. These findings initiated the present study in which a variety of indigenous as well as introduced fish species were examined from lakes, rivers, streams and fish-ponds. Among the sessile peritrichs collected were representatives of the genus *Epistylis*, i.e. *E. transvaalensis* Viljoen & Van As, 1983, as well as two species as yet undescribed. In view of the recent publications of Foissner & Shubert (1977) and Foissner (1983) in which *E. lwoffi* was placed within the genus *Heteropolaria* on the basis of its heteropolar swarmer, and his success in using silver

techniques, the description of these two species is not included in the present paper as it requires further investigation.

Taxonomic descriptions of sessile peritrichs occurring on freshwater fish in Transvaal are presented as well as compendiums (Tables 1, 2 and 3) of all the known fish-associated species of *Apiosoma* Blanchard, 1885, *Ambiphrya* Raabe, 1952 and a newly proposed genus, *Scopulata* gen. nov.

Methods

Surveys were carried out at various localities in the province of Transvaal of the Republic of South Africa during 1982 and 1983. Fish were collected in open waters of impoundments by means of gill nets and seining, and between littoral vegetation and in streams by electrofishing, cast nets and wire gauze scoops. Freshly killed or anaesthetized fish were examined in a field laboratory for the presence of external lesions, and wet smears prepared from the skin and gills under a compound microscope. Photomicrographs were taken of living peritrichs observed. The smears were then air dried, or fixed with either Bouin's or warm formalin. These smears were later stained with Harris' Hematoxylin or impregnated with silver by the method of Klein (1926) and used for further microscopic investigation. Systematic descriptions given are based on observations of live as well as hematoxylin-stained and silver-impregnated specimens. All measurements are in micrometres and obtained from fixed specimens. Minimum and maximum values are given, followed in parentheses by the arithmetic mean, standard deviation and number of specimens measured. Body length is measured from scopula to peristomial disc and body diameter at the widest part of the body.

Collection localities are indicated in parentheses after each host fish. An explanation of the locality codes is presented in Figure 1. Type specimens of new species described are deposited in the fish parasite collection of the Department of Zoology of the Rand Afrikaans University, Johannesburg. Specimen numbers are indicated at the relevant descriptions.

Genus *Apiosoma* Blanchard, 1885, Syn: *Glossatella* Bütschli, 1889

Until quite recently some confusion existed concerning the generic status of sessile peritrichs, which have been placed into the genus *Apiosoma* by Lom (1966). The first species of this genus described, *Apiosoma tintinnabulum* (Kent 1882), was originally placed in the genus *Spirochona* (Scheubel 1973).

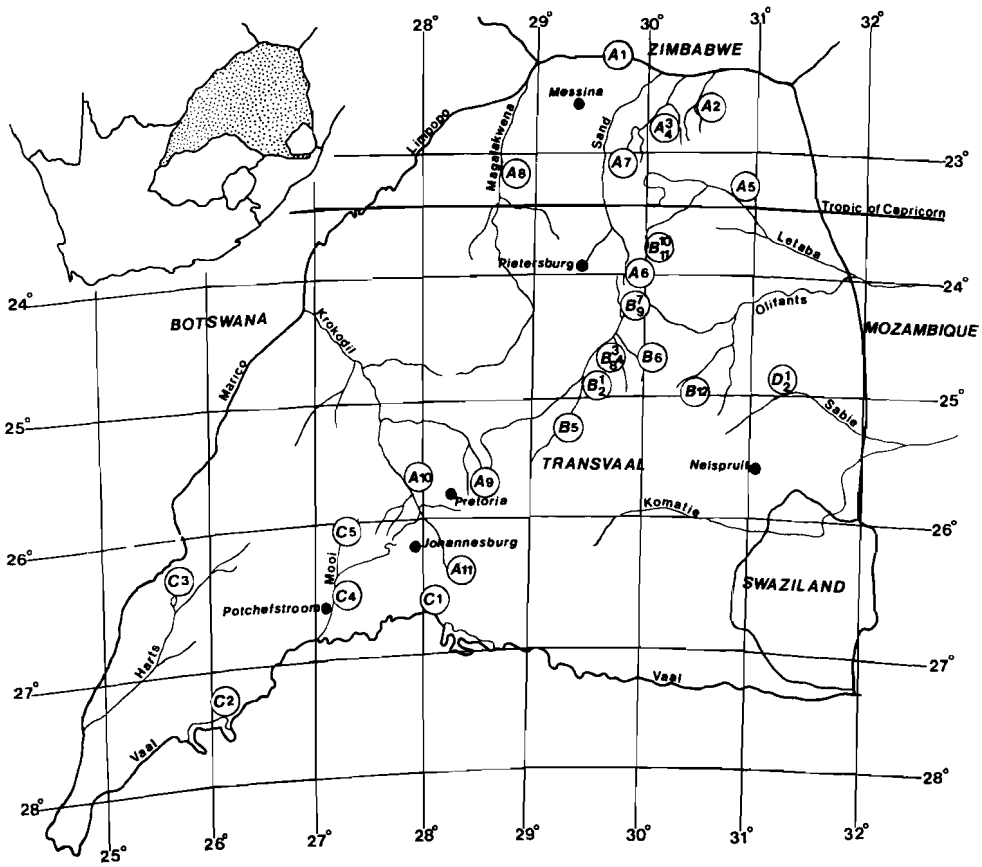

Figure 1 Map of sampling localities of fish in the Transvaal, South Africa.

Limpopo Drainage System

A1 — Limpopo River
A2 — Luphephe-Nwanedzi Dams
A3 — Nzhelele Dam
A4 — Mfongodi River
A5 — Hudson Ntsanwisi Dam
A6 — Smiths Drift
A7 — Farm Pond Soutpansberg
A8 — Glen Alpine Dam
A9 — Roodeplaat Dam
A10 — Hartebeespoort Dam
A11 — Westdene Dam

Vaal Drainage System

C1 — Vaal River
C2 — Bloemhof Dam
C3 — Barbers Pan
C4 — Boskop Dam
C5 — Bovenste Oog – Source of Mooi Rivier

Olifants Drainage System

B1 — Olifants River-Loskop
B2 — Loskop Dam
B3 — Olifants River
B4 — Tompi Seleka Fisheries
B5 — Lowveld Fisheries
B6 — Lepellane Dam
B7 — Piet Gouws Dam
B8 — Lola Montes Dam
B9 — Mothlapitse River
B10 — Ebenezer Dam
B11 — Fanie Botha Dam
B12 — Lydenburg Fisheries

Komati Drainage System

D1 — Sabie River
D2 — Lisbon Estate Prawn Ponds

Bütschli (1889) concluded that this species does not fit the characteristics of the genus *Spirochona* and created a new genus. i.e. *Glossatella* to accommodate it. Blanchard (1885) however had already created the genus *Apiosoma* four years previously with type species *A. piscicola* Blanchard, 1885. Kahl (1935) accepted the validity of the genus *Glossatella* and placed *A. piscicola* within this genus. Since then, various authors have described species within the genus *Glossatella* (Voigt, 1902; Surber, 1940; Tripathi, 1954; Chen, 1956; Timofeev, 1962; Kandilov, 1964).

Lom (1966) established the priority of the name *Apiosoma* and placed all existing species of the genus *Glossatella* within the senior synonym, *Apiosoma*. Since 1966, some authors, apparently unaware of the work of Lom (1966) still used the genus name *Glossatella* (Dogiel, Petrushevski & Polyanski, 1970; Kudo, 1971; Van Duijn, 1973; Rydlo, 1977). The authoritative work of Corliss (1979) however accepts the seniority of *Apiosoma* which is followed in the present study.

Morphology (Figure 2A)

The genus *Apiosoma* comprises peritrichs living as ectocommensals or ectoparasites on the surface of aquatic organisms, mostly freshwater fish. They are solitary, sessile animals, mostly stalkless although a few stalked forms are found. The body is cylindrical to elongated cup-shaped, tapering sharply to a small scopula. It is encircled by a prominent groove without cilia. In silver-impregnated specimens, prominent pellicle striations or silver lines are observed, encircling the body at regularly spaced intervals.

When expanded, the peristomial lip opens to reveal the peristomial disc and adoral cilia consisting of a haplo- and polykinety. The peristomial disc varies from flat to prominently convex and the degree to which the peristomial lip opens, differs in the different species. The peristomial side of the body is very contractile. When contracted the peristomial lip covers the adoral cilia and peristomial disc which are drawn into the body.

Members of the genus *Apiosoma* have one contractile vacuole situated directly below the peristome. The infundibulum is slightly curved and extends downwards to the groove. The macronucleus is compact, with the shape varying from round to triangular and situated in the lower part of the body. Only one micronucleus is present, situated above, below or alongside of the macronucleus. The shape of the micronucleus varies from oval to round. Zoochlorellae are present in some species which are thus green in colour. Reproduction is by longitudinal fission and the conjugation of micro- and macrogametes. Under adverse conditions the apiosome develops into a telotroch or swarmer, which swims by means of an aboral girdle of cilia. The swarmers are bulb-shaped to cylindrical.

Apiosoma caulata **sp.n.** (Figures 3A and 5A)

Hosts and localities: *Neobola brevianalis* (Boulenger, 1908), (A1, A5, B3, B5).

Location on hosts: Skin and gills.

Type host and locality: *Neobola brevianalis* (Boulenger, 1908), Limpopo River (A1), (22°10′S/29°45′E).

Type specimens: Holotype, slide 82/8/30 – 4 and paratype, slide 82/3/30 – 9.

Description: Stalked. Body, when expanded, broad at peristome, tapers towards scopula, contracted body pear-shaped, length 46,4 – 73,9 (61,4 ± 7,7; 26), diameter 31,6 – 60,6 (42,0 ± 6,2; 26). Groove centrally placed. Stalk not branched, shorter than body, diameter 5,8 – 11,4 (8,4 ± 1,7; 20). Peristomial disc flat. Peristomial lip narrow, opens as wide as body when expanded. Zoochlorellae present in upper two-thirds of body. Macronucleus round, sometimes cubiform, situated in base of body, length 13,8 – 31,2 (19,5 ± 3,9; 20), diameter 15,0 – 25,6 (20,4 ± 3,0; 20). Micronucleus oval-shaped, situated below macronucleus, length 2,8 – 8,2 (5,0 ± 1,3; 25), diameter 3,1 – 9,4 (5,9 ± 1,2; 25).

Remarks: Specimens from all populations studied, conform in shape and body dimensions. An outstanding feature of *A. caulata* is the zoochlorellae, which in some cases obscure food vacuoles and infundibulum. Although zoochlorellae have been

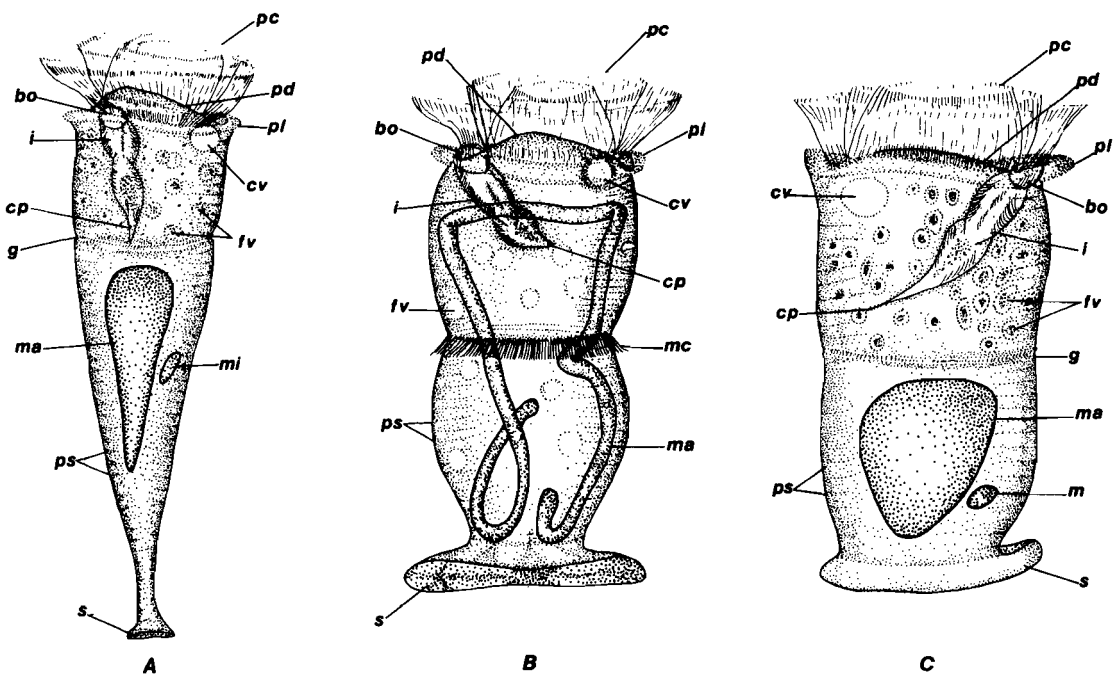

Figure 2 Schematic representation of examples of three genera of the sessile Ciliophora. (A) *Apiosoma*, (B) *Ambiphrya* and (C) *Scopulata*: bo — buccal opening, cp — cytopharynx, cv — contractile vacuole, fv — food vacuole, g — groove, i — infundibulum, ma — macronucleus, mi — micronucleus, mc — medial cilia, pc — peristomial cilia, pd — peristomial disc, pl — peristomial lip, ps — pellicle striations, s — scopula.

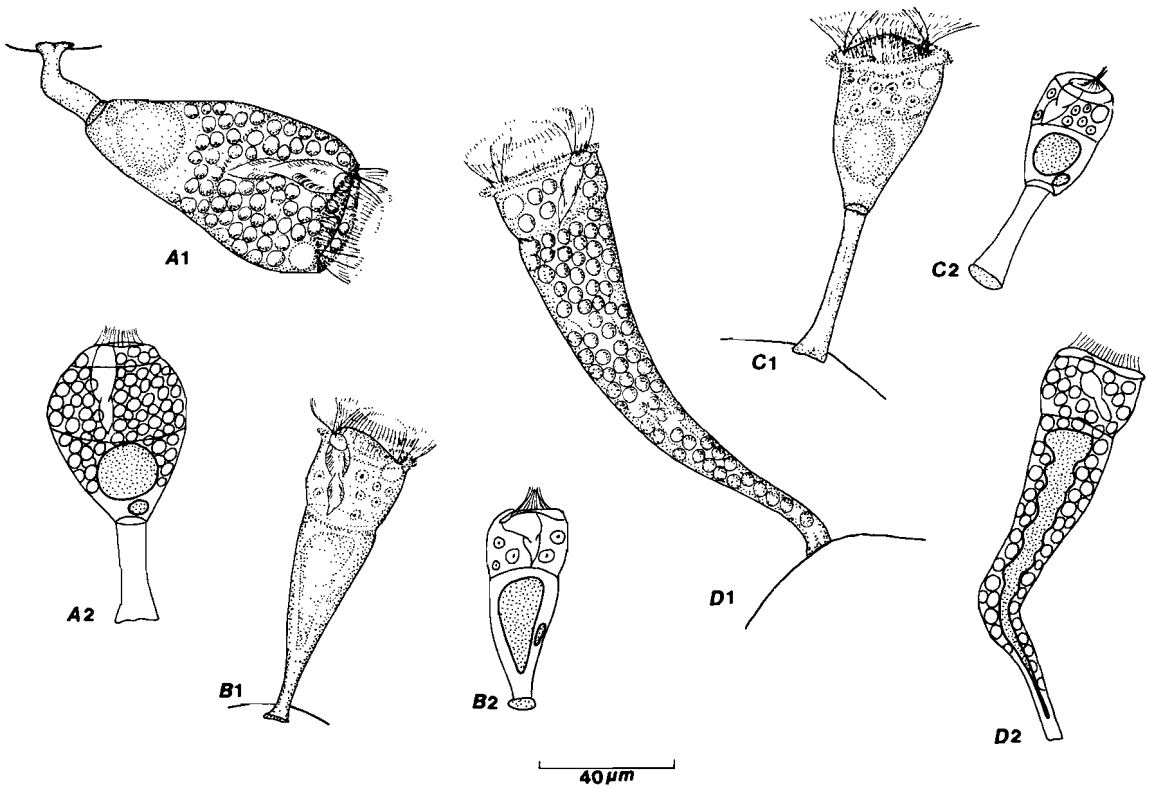

Figure 3 (A) *Apiosoma caulata* (B) *A. piscicola* (C) *A. micralesti* (D) *A. curvinucleata*. (1) In each case: Live, expanded organism. (2) In each case: Hematoxylin-stained, contracted organism.

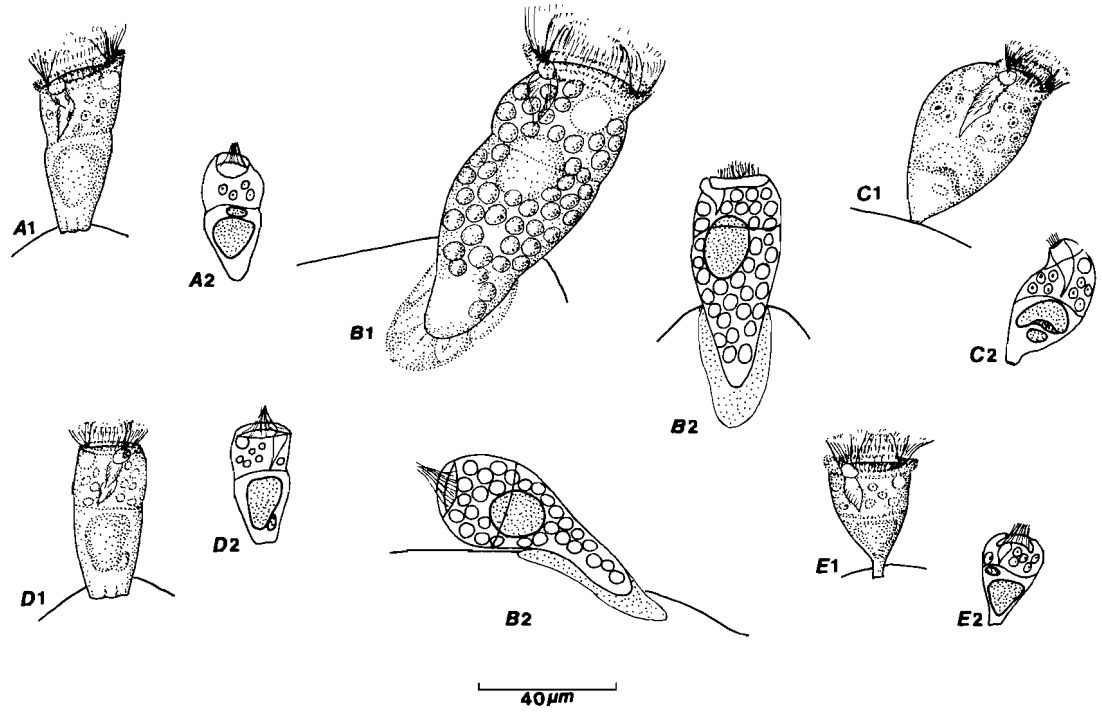

Figure 4 (A) *Apiosoma phiala* (B) *A. viridis* (C) *A. obliqua* (D) *A. nasalis* (E) *A. mothlapitsis* (1) In each case: Live, expanded organism. (2) In each case: Hematoxylin-stained, contracted organism.

found in representatives of the peritrich family Lagenophryidae (Corliss 1979), they have not previously been found in any species of the genus *Apiosoma*.

***Apiosoma curvinucleata* sp.n.** (Figures 3D, 5E and 5F)

Hosts and localities: *Oreochromis mossambicus* (Peters, 1852), (A9, B5).

Location on hosts: Skin.

Type host and locality: *Oreochromis mossambicus* (Peters, 1852), Lowveld Fisheries Research Station (B5), (25°20'S/29°20'E).

Type specimens: Holotype, slide 82/8/6–7 and paratype, slide 82/4/30–1.

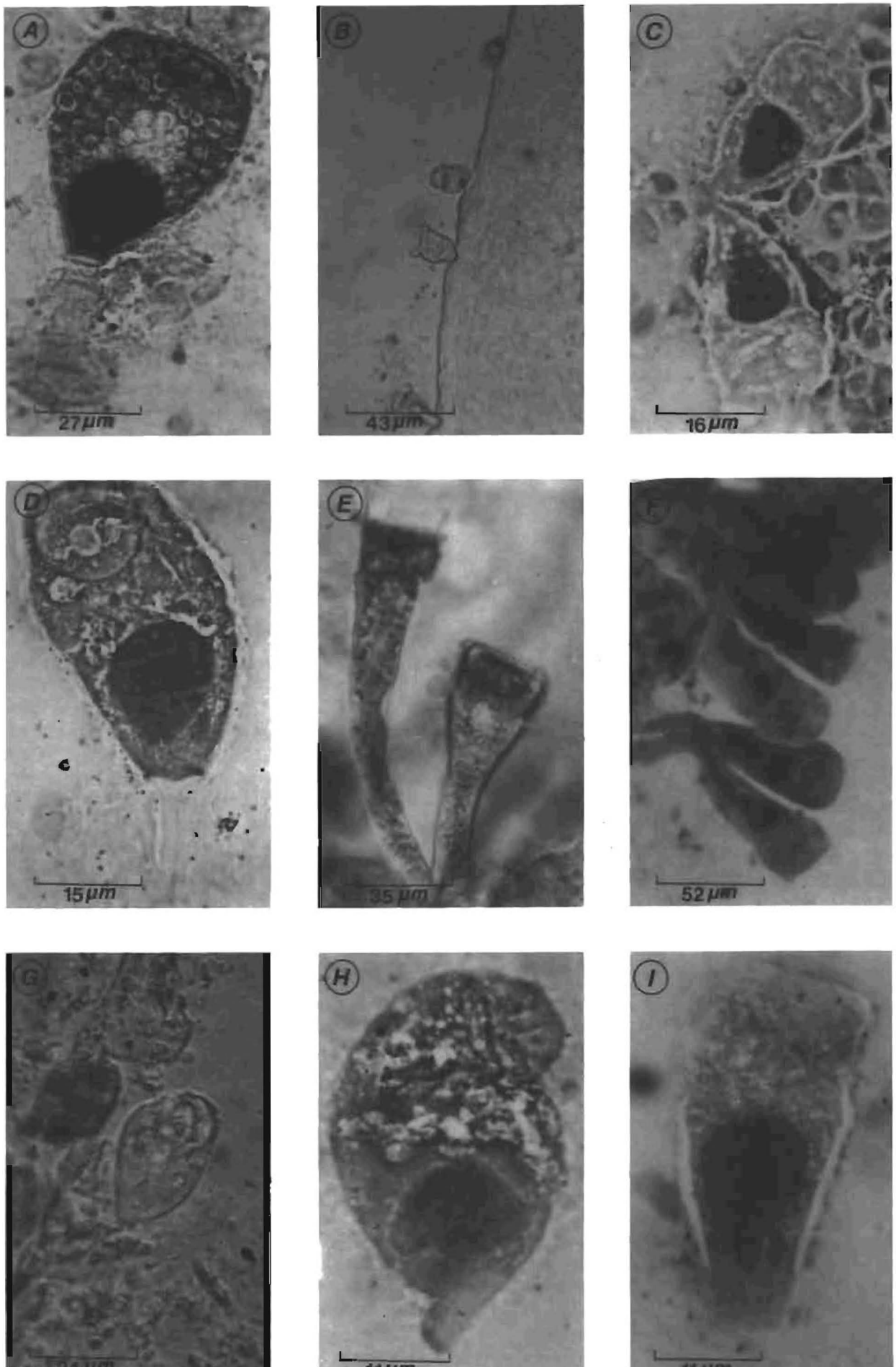

Figure 5 Photomicrographs of hematoxylin-stained (A, C, D, F, H, I) and live (B, E, G) sessile peritrichians from fish in the Transvaal. (A) *Apiosoma caulata*, (B) and (C) *A. mothlapitsis*, (D) *A. micralesti*, (E) and (F) *A. curvinucleata* (G) and (H) *A. obliqua*, (I)*A. nasalis*.

Description: Stalkless. Body slender, elongated, tapers towards scopula, length 113,7 – 171,5 (130,5 ± 17,9; 12), diameter 31,3 – 50,5 (40,5 ± 6,2; 12). Groove situated one-eight of body length from peristome. Scopula 8,8 – 22,1 (14,1 ± 4,8; 11) in diameter. Peristomial disc flat. Peristomial lip narrow, opens wider than body when expanded. Zoochlorellae present, distributed throughout body. Macronucleus triangular, elongated and crenated, extending from groove to scopula, length 50,4 – 70,0 (60,4 ± 5,9; 12), diameter 15,6 – 25,9 (20,7 ± 3,9; 12). No micronucleus observed.

Remarks: Specimens from the same host species from Roodeplaatdam (A9) correspond to the above in body shape and length but with smaller scopula diameter, 7,1 – 14,9 (8,7 ± 2,5; 11). *A. curvinucleata* is by far the largest *Apiosoma* species recorded so far. The only other species sometimes exceeding 100 µm in length is *A. piscicola* and *A. maxima* (see Table 1). Unlike *A. caulata* the zoochlorellae in this species are distributed throughout the body. A distinct characteristic of *A. curvinucleata* is its occurrence in clusters.

Apiosoma micralesti **sp.n.** (Figures 3C and 5D)

Hosts and localities: *Micralestes acutidens* (Peters, 1852), (A2).

Location on hosts: Skin.

Type host and locality: *Micralestes acutidens* (Peters, 1852), Luphephe-Nwanedzi Dams (A2), (22°30′S/30°30′E).

Type specimens: Holotype, slide 82/7/22 – 4 and paratype, slide 82/7/21 – 16.

Description: Stalked. Body when expanded, broad at peristome, tapering towards scopula, when contracted, cylindrical, length 31,2 – 54,1 (40,7 ± 8,0; 7), diameter 19,2 – 37,4 (28,8 ± 6,1; 7). Groove centrally placed. Stalk with broad base, as long as body, diameter 4,2 – 9,2 (6,2 ± 1,9: 7). Peristomial disc convex. Peristomial lip broad, opens wider than body when expanded. Food vacuoles distributed in upper body region. Macronucleus round, length 11,2 – 23,2 (16,5 ± 3,9; 7), diameter 11,8 – 21,0 (15,5 ± 4,1; 7). Micronucleus oval-shaped, situated acentric below macronucleus, length 2,8 – 7,4 (4,5 ± 1,8; 4), diameter 2,7 – 4,5 (3,5 ± 0,6; 4).

Remarks: In comparison to *A. caulata*, the only other stalked species found during the present study, *A. micralesti* is considerably smaller. The stalk length, relative to the body length, is longer than in the case of *A. caulata*.

Apiosoma mothlapitsis **sp.n.** (Figures 4E, 5B and 5C)

Hosts and localities: *Barbus marequensis* Smith, 1841, (B9).

Location on hosts: Skin.

Type host and locality: *Barbus marequensis* Smith, 1841, Mothlapitse River (B9), (24°15′S/19°45′E).

Type specimens: Holotype, slide 83/6/9 – 7 and paratype, slide 83/6/9 – 7.

Description: Stalkless. Body broad at peristome, tapering sharply towards narrow scopula, length 20,1 – 37,8 (27,7 ± 3,5; 32), diameter 11,2 – 25,8 (17,8 ± 3,3: 32). Groove centrally placed. Scopula 1,5 – 4,3 (2,8 ± 0,7; 31) in diamter. Peristomial disc flat. Peristomial lip narrow, opens wider than body when expanded. Food vacuoles distributed in upper body region. Macronucleus triangular, length 6,4 – 13,0 (9,5 ± 1,5; 36), diameter 10,0 – 16,8 (10,4 ± 2,5; 36). Micronucleus oval-shaped, situated acentric above macronucleus, length 2,0 – 6,4 (3,0 ± 0,8; 30), diameter 2,5 – 6,7 (4,7 ± 1,0; 30).

Remarks: Body dimensions of *A. mothlapitsis* fall within the same size range as those of *A. minuta* (Chen, 1961), *A. basiramosa* (Timofeev, 1962) and *A. phiala* sp.n., described later in this paper, but it differs from these species in body shape and position, as well as shape of nuclei.

Apiosoma nasalis **(Timofeev, 1962)** (Figures 4D and 5I)

Hosts and localities: *Pseudocrenilabrus philander* (Weber, 1897), (A11).

Location on hosts: Skin and gills.

Comparative description: *A. nasalis* from *P. philander*, Westdene Dam (A11). Stalkless. Body cylindrical, tapering very slightly towards scopula, length 27,9 – 40,0 (34,2 ± 3,9; 10), diameter 13,8 – 20,1 (15,7 ± 1,6; 10). Groove centrally placed. Scopula 4,8 – 8,2 (6,3 ± 1,1; 8) in diameter. Peristomial disc flat. Peristomial lip narrow, opens as wide as body when expanded. Food vacuoles distributed in upper body region. Cytoplasm of lower body region finely textured without vacuoles. Macronucleus oval-shaped to cubiform, length 8,8 – 15,1 (12,2 ± 9,6; 10), diameter 10,1 – 12,0 (11,3 ± 2,1; 10). Micronucleus round to oval-shaped, situated alongside of lower part of macronucleus, length 1,8 – 3,2 (2,4 ± 0,7; 5), diameter 1,9 – 3,1 (2,9 ± 0,5; 5).

Remarks: Corresponds to the description of *A. nasalis* by Bykhovskaya-Pavlovskaya, Gusev, Dubinina, Izyumova, Smirnova, Sokolovskaya, Shtein, Schulman and Epshtein (1964) occurring in the nasal cavaties of *Carassius carassius* from the Amur River. During the present study *A. nasalis* was found only on the skin and gills of the host fish.

Apiosoma obliqua **sp.n.** (Figures 4C, 5G and 5H)

Hosts and localities: *Labeo cylindricus* Peters, 1852 (A2).

Location on hosts: Skin.

Type host and locality: *Labeo cylindricus* Peters, 1852, Luphephe Dam (A2), (22°30′S/30°30′E).

Type specimens: Holotype, slide 82/7/21 – 8 and paratype slide 82/9/24 – 3.

Description: Stalkless. Body broad at peristome, tapering towards small scopula, length 29,2 – 53,8 (38,2 ± 5,8; 17), diameter 17,3 – 34,0 (24,5 ± 4,2; 17), peristome situated acentric. Groove centrally placed. Scopula 2,3 – 6,3 (3,5 ± 1,1; 13) in diameter. Peristomial disc flat. Peristomial lip broad, does not open as wide as body when expanded. Food vacuoles distributed in upper body region. Macronucleus kidney-shaped, length 6,6 – 14,2 (9,5 ± 1,9; 15), diameter 5,9 – 15,2 (10,4 ± 2,5; 15). Micronucleus situated below macronucleus, length 1,1 – 2,5 (1,7 ± 0,6; 3), diameter 1,1 – 3,6 (2,1 ± 1,1; 3).

Remarks: Outstanding characteristics of this species are the obliquely situated peristome and the kidney-shaped macronucleus which is unique within the genus.

Apiosoma phiala **sp.n.** (Figures 4A, 6A and 6B)

Hosts and localities: *Barbus marequensis* (B1), *B. paludinosus* Peters, 1852 (B1), *B. trimaculatus* Peters, 1852 (A2, B1, C4), *B. unitaeniatus* Günther, 1866 (B7), *Labeo capensis* (Smith, 1841) (C4), *L. cylindricus* (A2), *Neobola brevianalis* (B3, B4), *Oreochromis mossambicus* (B5) and *Pseudocrenilabrus philander* (A2).

Location on hosts: Skin and gills.

Type host and locality: *Barbus trimaculatus* Peters, 1852, Boskop Dam (C4), (26°45′S/27°0′E).

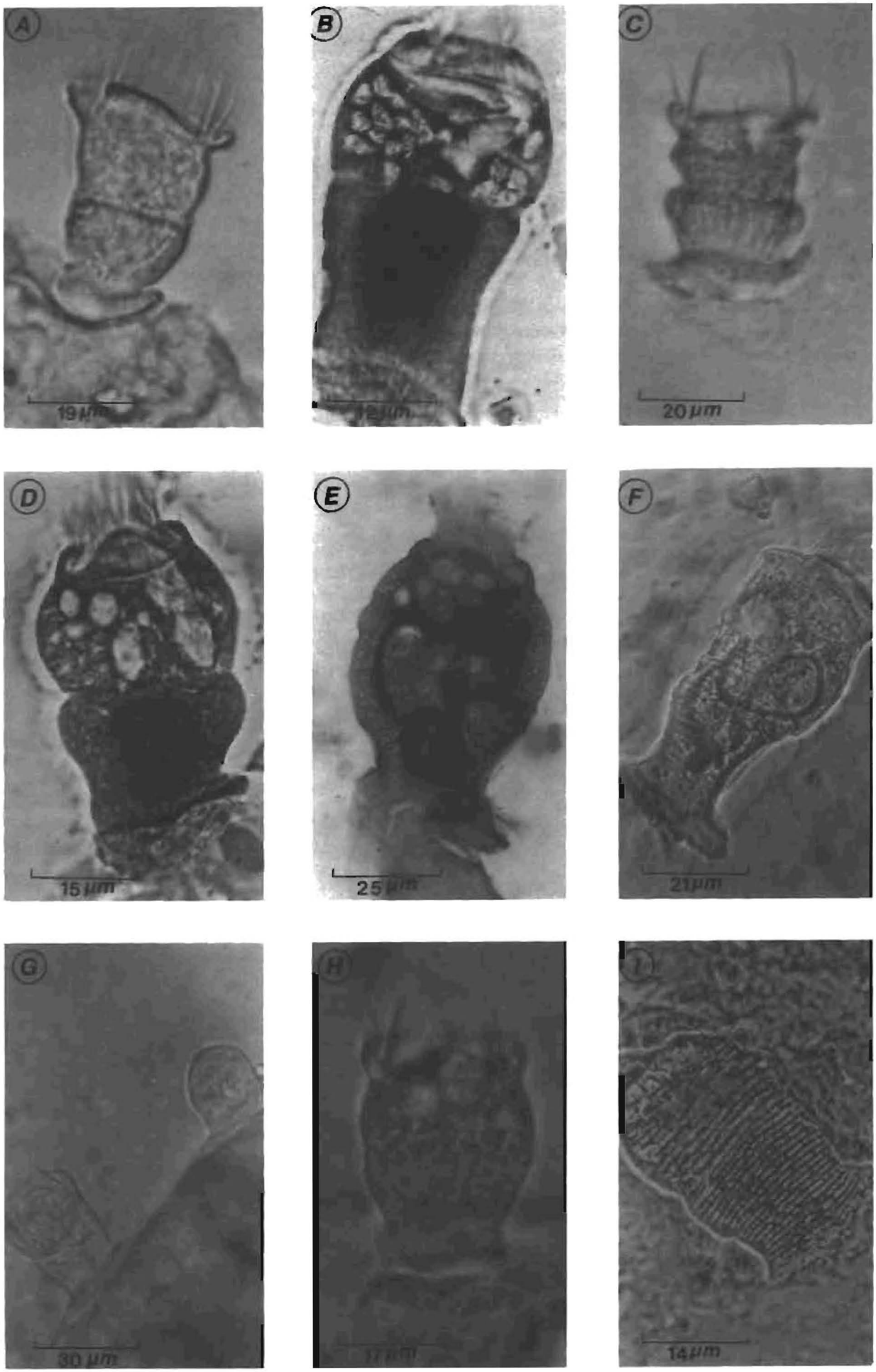

Figure 6 Photomicrographs of hematoxylin-stained (B, C, E, H, I), live (A, D, G) and silver-impregnated (F) sessile peritrichians from fish in the Transvaal. (A) and (B) *Apiosoma phiala*, (C) *Scopulata dermata*, (D), (E) and (F) *Apiosoma piscicola*, (G), (H) and (I) *A. viridis*.

Type specimens: Holotype, slide 81/12/9 – 1 and paratype, slide 82/7/28 – 3.

Description: Stalkless. Body cylindrical above groove, tapering slightly toward scopula when expanded. When contracted, length 22,5 – 49,8 (36,6 ± 5,3; 28), diameter 15,1 – 34,1 (21,5 ± 3,7; 28). Groove centrally placed. Scopula 3,4 – 9,6 (5,9 ± 1,8; 15) in diameter. Peristomial disc flat. Peristomial lip broad, opens as wide as body when expanded. Food vacuoles distributed in region above groove. Macronucleus triangular, length 9,7 – 20,5 (14,6 ± 2,5; 28), diameter 8,8 – 19,6 (13,6 ± 2,7; 28). Micronucleus oval-shaped, situated above macronucleus, length 3,9 – 6,7 (5,0 ± 0,7; 28), diameter 1,7 – 4,6 (3,2 ± 0,7; 28).

Remarks: Body dimensions and nuclei measurements of different populations fall within same range of variability. Some populations, however, showed a smaller scopula diameter than that of the type material: From *B. paludinosus*, Loskop Dam 2,0 – 5,2 (3,0 ± 0,8; 24), *L. cylindricus*, Luphephe-Nwanedzi Dam 3,1 – 5,9 (4,1 ± 0,8; 8) and *B. unitaeniatus*, Piet Gouws Dam 2,0 – 5,2 (3,1 ± 1,1; 16).

***Apiosoma piscicola* Blanchard, 1885. Syn**: *Glossatella piscicola* (Blanchard, 1885) (Figures 3B, 6D, 6E and 6F)

Hosts and localities: *Barbus paludinosus* (C2), *B. trimaculatus* (A2, B1), *Labeo cylindricus* (A2, B1, B9), *Marcusenius macrolepidotus* (Peters, 1852). (B1), *Micropterus dolomieu* (Lacépéde, 1802) (D1), *Oreochromis mossambicus* (A2, A5, A8, B1, B4, B5, B6, B7, B10, B11, D1, D2), *Pseudocrenilabrus philander* (A2, A8, A11, B12, C2, C4) and *Tilapia rendalli* Gilchrist & Thompson, 1917 (B11).

Location on hosts: Skin.

Comparative description: *A. piscicola* from *P. philander*, Boskop Dam (C2). Stalkless. Body elongated, cylindrical above groove and tapering sharply towards narrow scopula below groove, length 47,0 – 84,5 (63,1 ± 8,9; 23), diameter 17,3 – 39,6 (26,5 ± 5,1; 23). Groove without cilia situated one-third of body length from peristome. Number of silver lines above groove 20 – 26 (23,2 ± 1,3; 10) and below 44 – 56 (52,0 ± 3,3; 10). Scopula small 7,3 – 19,3 (11,5 ± 2,5; 23) in diameter. Peristomial disc convex. Peristomial lip narrow, opens wider than body when expanded. Food vacuoles distributed in region above groove. Lower region finely granular without food vacuoles. Macronucleus elongated, triangular, length 15,0 – 26,1 (20,4 ± 2,9; 23), diameter 7,6 – 15,8 (11,3 ± 3,2; 23). Micronucleus oval-shaped, situated alongside of the middle part of macronucleus, length 3,2 – 6,9 (4,8 ± 1,2; 9), diameter 1,6 – 2,7 (2,1 ± 0,3; 9).

Remarks: Different populations of *A. piscicola* displayed considerable variation in body dimensions. The smallest specimens were found in the Luphephe Dam on *Oreochromis mossambicus*, length 10,0 – 55,0 (35,4 ± 19,5; 5) and the largest in Westdene Dam on *Pseudocrenilabrus philander*, length 70,1 – 95,3 (82,3 ± 7,5; 13). Individuals were sometimes found clustered together on host fish, having a colonial appearance. *A. piscicola* has been found widespread on different host fish but mostly on common carp *Cyprinus carpio* Linnaeus, 1758 in Europe and Asia (Reichenbach-Klinke & Elkan 1965; Bykhovskoya-Pavlovskaya *et al.* 1964; Banina 1968; Scheubel 1973; Grupcheva 1975; Rydlo 1977). In South Africa *A. piscicola* has as yet not been found on this host but frequently on other members of the Cyprinidae. Banina (1969) studying the diversity of body forms within the genus *Apiosoma* found a direct correlation between the degree of variation in body shape and the degree of host specificity. This is substantiated by the findings of the present study where *A. piscicola* utilized a variety of fish hosts and displayed a high degree of variation in body shape.

***Apiosoma viridis* sp.n.** (Figures 4B, 6G, 6H and 6I)

Hosts and localities: *Chetia flaviventris* Trewavas, 1961 (B11), *Oreochromis mossambicus* (A2, A5, A8, A10, B3, B4, B5, B6, B7, B9, B11, D1), *Pseudocrenilabrus philander* (A2, A4, A5, A6, A7, A11, B1, B9, C4, C5), *Tilapia rendalli* (B10, B11, D1) and *T. sparmanii* Smith, 1840 (C2).

Location on hosts: Skin.

Type host and locality: *Pseudocrenilabrus philander*, Boskop Dam (C4), (26°45′S/27°0′E).

Type specimens: Holotype, slide 81/12/15 – 10 and paratype, slide 81/12/12 – 1.

Description: Stalkless. Body cylindrical above groove, tapering slightly towards scopula, but with much variability, length 32,7 – 90,8 (62,1 ± 14,2; 34), diameter 14,3 – 45,0 (31,8 ± 7,5; 34). Groove situated one-quarter of body length from peristome. Number of silver lines above groove 15 – 20 (18,04 ± 1,1; 24) and below 34 – 45 (39,9 ± 3,5; 24). Scopula elongated, attached obliquely to body. Peristomial disc flat. Peristomial lip narrow, opens as wide as body when expanded. Zoochlorellae present, distributed throughout body. Macronucleus round, situated on same level as groove, length 11,2 – 17,8 (14,3 ± 1,7; 34), diameter 8,5 – 16,7 (12,3 ± 2,1; 34). No micronucleus observed.

Remarks: Different populations of *A. viridis* displayed considerable variation in body dimensions. The smallest specimens were found on *Oreochromis mossambicus* in the Luphephe Dam, length 31,4 – 74,4 (51,4 ± 10,9; 27), diameter 13,2 – 54,4 (25,2 ± 7,5; 27) and the largest in the Piet Gouws Dam on the same host fish, length 43,4 – 104,3 (72,3 ± 17,3; 25) and diameter 28,6 – 59,6 (41,3 ± 6,8; 25). This species is widespread in South Africa but limited to cichlid host fish. *A. viridis* has two unique characteristics, differentiating it from all other presently known *Apiosoma* species, i.e. the obliquely situated scopula and the position of the macronucleus in the upper half of the body.

Genus *Ambiphrya* Raabe, 1952

Raabe (1952) created the genus *Ambiphrya* with type species *A. miri* Raabe, 1952, collected from the gills of *Nerophis ophidion* from the Baltic Sea. He further placed two species, previously described under the genus *Scyphidia* and collected from freshwater fish in the U.S.A., in his newly created genus, i.e. *A. tholiformis* (Surber, 1943) and *A. macropodia* (Davis, 1947). Thompson, Kirkegaard & Jahn (1947) described *Scyphidia ameiuri* also from freshwater fish, which was placed within the genus *Ambiphrya* by Hoffmann (1970). In the present study, only one species of the genus, i.e. *A. neobolae* sp.n. was found.

Morphology (Figure 2B)

These solitary peritrichs live as ectocommensals or ectoparasites on marine or freshwater fish. They are stalkless with cylindrical bodies above the groove, tapering towards the broad scopula. The body is encircled by a prominent groove with cilia forming a cilia girdle. In silver-impregnated specimens prominent pellicle striations or silver lines are observed encircling the body at regularly spaced intervals.

One contractile vacuole is present, situated directly below

Table 1 Compendium of all known species of *Apiosoma* found on fish

Species and synonyms	Type host(s)	Location on host	Type locality	Body measurements (µm) Length	Diameter	No. in reference list	
A. piscicola Blanchard, 1885 syn: *A. magna* *Glossatella cyprini* *G. cylindriformis* *G. piscicola*	*Cyprinus carpio*	S	France	45 – 110	13 – 40	1, 3, 4, 6, 9, 10 12, 20, 21, 25 29, 32, 38, 39 41, 42, 51, 55, 56	
A. amoeba (Grenfell, 1887) syn: *A. cryptomicronucleata* *Glossatella amoeba* *G. conica* *Scyphidia amoebae*	*Gasterosteus aculeatus*	S,G	Germany	21 – 80	12 – 36	1, 3, 9, 12 24, 32, 39 51, 56	
A. cotti (Voigt, 1902) syn: *Glossatella cotti* *G. tintinnabulum*	*Cottus gobio*	S,G	Germany	40 – 60	20 – 34	32, 39, 56	
A. gasterostei (Fauré-Fremiet, 1905) syn: *Epistylis gasterostei* *Scyphidia gasterostei*	*Gasterosteus aculeatus*	G	France	40 – 70	22 – 34	56	
A. glabra (Roth, 1909) syn: *Cordylosoma glabra*	–	S	Germany	–	–	32, 39, 47 51, 56	
A. esconium Chernyshova, 1916	–	–	Russia	–	–	12	–
A. micropteri (Surber, 1940) syn: *Scyphidia micropteri*	*Micropterus dolomieu* *Huro salmoides*	S	U.S.A.	–	–	39, 57	–
A. pyriformis (Tripathi, 1954) syn: *Scyphidia pyriformis* *Glossatella pyriformis*	*Labeo rohita* *Calta calta* *Cirrhina surigata* *C. reba*	S	India	38 – 47	18 – 21	39, 56, 60	
A. minuta (Chen, 1961) syn: *Glossatella minuta*	*Cyprinus carpio*	S	China	14 – 26	10 – 13	3, 6, 9, 39, 42, 56	
A. basiramosa (Timofeev, 1962) syn: *Glossatella basiramosa*	*Opsariichthys amurensis*	G	Russia	20 – 41	11 – 20	3, 4, 9 39, 56	
A. campanulata (Timofeev, 1962) syn: *Glossatella campanulata*	*Perca fluviatilis*	S	Russia	22 – 68	15 – 32	1, 3, 9, 12, 35 39, 56	
A. dalli (Zhukov, 1962) syn: *Glossatella dalli*	*Dalia pectoralis*	S	Russia	37 – 51	27 – 33	9, 39, 33	
A. doliaris (Timofeev, 1962) syn: *Glossatella doliaris*	*Scardinius erythrophthalmus*	N	Russia	28 – 52	25 – 36	6, 9, 39, 56	
A. megamicronucleata (Timofeev, 1962) syn: *Glossatella megamicronucleata*	*Silurus glanis*	S	Russia	30 – 42	18 – 30	39, 56	
A. nasalis (Timofeev, 1962) syn: *Glossatella nasalis*	*Leuciscus waleckii* *Carassius auratus*	N	Russia	33 – 60	15 – 24	3, 9, 39, 56	
A. peculiformis (Zhukov, 1962) syn: *Glossatella peculiformis*	*Cottus kaganowski*	–	Russia	31 – 44	15 – 18	9, 35, 56	
A. poteriformis (Timofeev, 1962) syn: *Glossatella poteriformis*	*Nemacilus barbatus*	S	Russia	33 – 55	14 – 27	3, 9, 39, 56	

Table 1 (Continued)

Species and synonyms	Type host(s)	Location on host	Type locality	Body measurements (µm) Length	Diameter	No. in reference list	
A. robusta (Zhukov, 1962) syn: *Glossatella robusta*	*Dalia pectoralis*	G	Russia	42 – 45	22 – 37	9, 12, 56	
A. gigantica (Kandilov, 1964) syn: *Glossatella gigantica*	–	–	–	86 – 93	41 – 45	39, 56	
A. baikalensis (Zaika, 1965)	–	S,G	Russia	65	40	56	
A. baueri (Kashkowskij, 1965) syn: *Glossatella baueri*	*Perca fluviatilis* *Esox lucius*	S	Russia	29 – 58	20 – 40	1, 3, 12, 56	
A. kesselri (Zaika, 1965)	–	G	Russia	30	26	56	
A. mucusani (Zaika, 1965)	–	G	Russia	39	18	56	
A. paracotti (Zaika, 1965)	–	G	Russia	50	33	56	
A. shulmani (Kashkowskij, 1965)	*Lota lota*	–	Russia	23 – 62	14 – 36	1, 3, 12, 56	
A. usckani (Zaika, 1965)	–	G	Russia	54	18	56	
A. gobionis Lom, 1966	*Gobio gobio*	S	Poland	32 – 55	18 – 28	39, 56	
A. phoxini Lom, 1966	*Phoxinus laevis*	S,G	Poland	36 – 55	19 – 25	12, 39, 56	
A. carpelli Banina, 1968	*Carassius carassius* *Cyprinus carpio*	S,G	Russia	21 – 54	9 – 22	1, 3, 56	
A. minimicronucleata	*Perca fluviatilis* *Esox lucius*	S	Russia	16 – 43	16 – 32	1, 3, 12	
A. longiciliaris Mitenev, 1971	*Esox lucius*	G	Russia	33 – 50	11 – 20	46	
A. alburni Scheubel, 1973	*Alburnus alburnus*	G	Germany	42	29	56	
A. baninae Scheubel, 1973	*Leuciscus leuciscus* *L. idus*	S	Germany	40 – 60	25 – 35	56	
A. compacta Scheubel, 1973	*Phoxinus phoxinus*	G	Germany	80 – 85	30 – 35	56	
A. extensa Scheubel, 1973	*Phoxinus phoxinus*	G	Germany	80 – 85	30 – 35	56	

Table 1 (Continued)

Species and synonyms	Type host(s)	Location on host	Type locality	Body measurements (µm) Length	Diameter	No. in reference list	
A. filiformis Scheubel, 1973	*Phoxinus phoxinus*	G	Germany	50	25	56	
A. guhli Scheubel, 1974	*Pygosteus pungitis*	G	Germany	50 – 55	28 – 30	56	
A. leuciscus Scheubel, 1973	*Scardinius erythrophthalmus* *Rutilus rutilus*	S,G	Germany	34 – 45	25 – 40	56	
A. lomi Scheubel, 1973	*Leuciscus leuciscus*	G	Germany	56	33	56	
A. matthesi Scheubel, 1973	*Squalius cephalus*	S	Germany	65 – 106	34 – 50	56	
A. maxima Scheubel, 1973	*Squalius cephalus*	S	Germany	70 – 100	24 – 60	56	
A. microstyla Scheubel, 1973	*Leuciscus leuciscus*	G	Germany	50	30	56	
A. miniciliata Scheubel, 1973	*Acerina cernua*	G	Germany	36 – 40	16 – 20	56	
A. pseudopiscicola Scheubel, 1973	*Carassius carassius*	M	Germany	60	20	56	
A. siewingi Scheubel, 1973	*Phoxinus phoxinus*	G	Germany	40	20	56	
A. tretzli Scheubel, 1973	*Leucaspius delineatus* *Squalius cephalus*	G	Germany	35 – 38	22 – 24	56	
A. amurensis Banina & Juchimenko, 1975	–	–	Russia	–	–	65	
A. constricta Kashkovsky, 1975	*Perca fluviatilis*	S	Russia	36 – 60	28 – 46	12, 33	–
A. fungiformis Banina & Juchimenko, 1975	–	–	Russia	25 – 54	22 – 36	65	
A. lopuchinae Yunchis, 1975	–	–	Russia	37 – 39	15 – 17	3, 4, 65	
A. olae Yunchis, 1975	–	–	Russia	37 – 69	19 – 24	12, 65	
A. tenera Kashkovsky, 1975	*Cyprinus carpio*	–	Russia	34 – 57	20 – 32	33	
A. lotae Chernyshova, 1976	–	G	Russia	16	5	12	

Table 1 (Continued)

Species and synonyms	Type host(s)	Location on host	Type locality	Body measurements (µm) Length	Diameter	No. in reference list	
A. sultanowi Allamuratovt Iskov?	–	–	Russia	–	–	42	—
A. caulata n.sp.	*Neobola brevianalis*	S,G	S. Africa	46 – 74	32 – 61		
A. curvinucleata n.sp.	*Oreochromis mossambicus*	S	S. Africa	114 – 172	31 – 51		
A. micralesti n.sp.	*Micralestes acutidens*	S	S. Africa	31 – 54	19 – 37		
A. mothlapitsis n.sp.	*Barbus marequensis*	S	S. Africa	20 – 38	11 – 26		
A. obliqua n.sp.	*Labeo cylindricus*	S	S. Africa	29 – 54	17 – 34		
A. phiala n.sp.	*Barbus trimaculatus*	S,G	S. Africa	22 – 50	15 – 34		
A. viridis n.sp.	*Pseudocrenilabrus philander*	S	S. Africa	33 – 91	14 – 45		

S = Skin, G = Gills, N = Nasal Cavity, M = Mouth cavity, – = Information not available. Figures not drawn to scale. Figures drawn according to the authors listed.

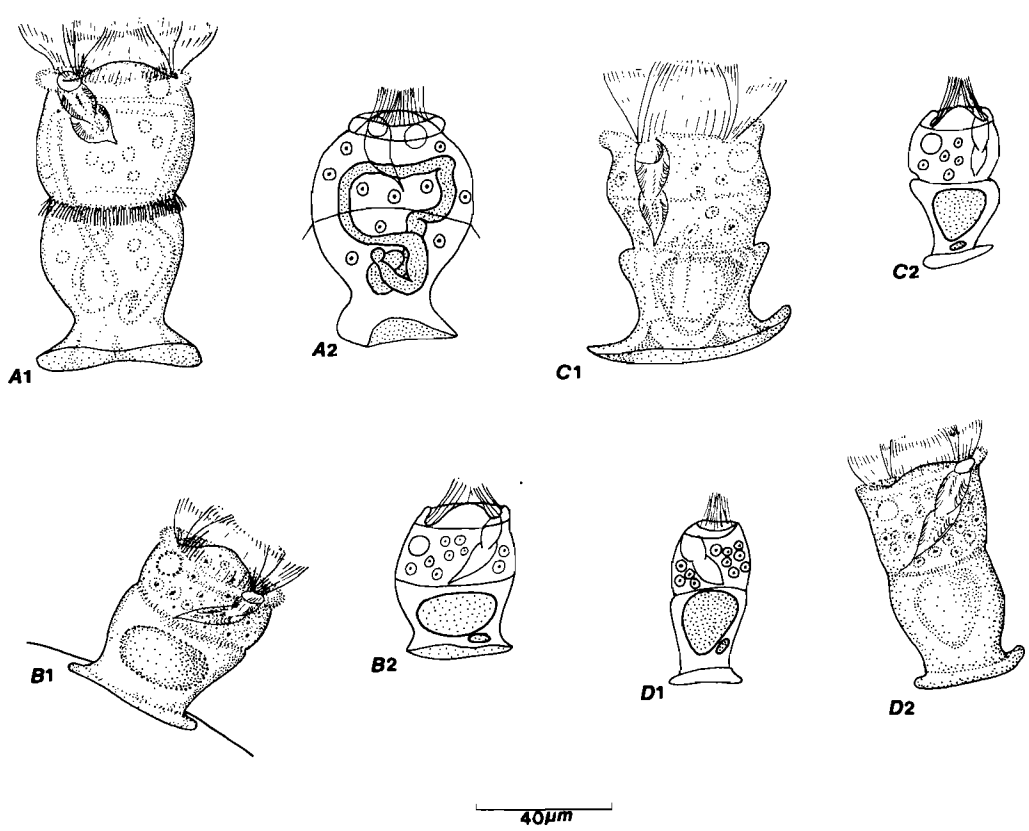

Figure 7 (A) *Ambiphrya neobolae* (B) *Scopulata epibranchialis* (C) *S. constricta* (D) *S. dermata*. (1) In each case: Live, expanded organism. (2) In each case: Hematoxylin-stained, contracted organism.

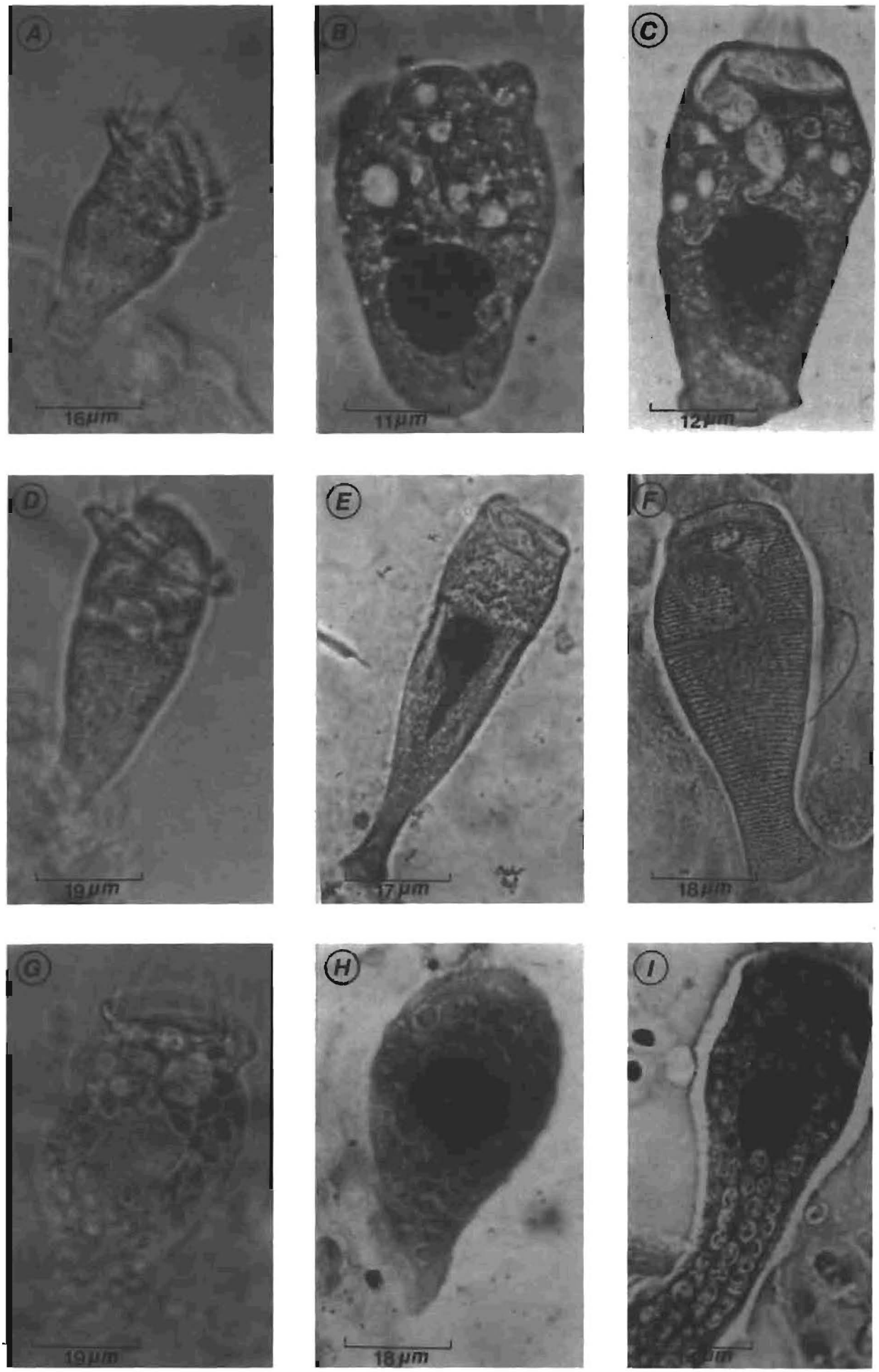

Figure 8 Photomicrographs of hematoxylin-stained (B, E, D), live (A, C, G, H) and silver-impregnated (F,I) sessile peritrichians from fish in the Transvaal. (A) and (B) *Scopulata dermata*, (C) and (D) *S. constricta*, (E) and (F) *Ambiphrya neobolae*, (G), (H) and (I) *Scopulata epibranchialis*.

the peristomial disc. The infundibulum is curved and does not extend to the groove. The macronucleus is ribbon-shaped and in most cases more than twice the length of the body. The peristome is large with the peristomial disc mostly convex. The peristomial lip opens wide when expanded.

Reproduction is by longitudinal binary fission, conjugation and the development of telotrochs or swarmers. The telotrochs are round to pear-shaped.

Ambiphrya neobolae **sp.n.** (Figures 7A, 8E and 8F)

Hosts and localities: *Neobola brevianalis* (Boulenger, 1908), (A1).

Location on hosts: Skin.

Type host and locality: *Neobola brevianalis* (Boulenger, 1908) (A1), (22°10'S/29°49'E).

Type specimens: Holotype, slide 82/8/30 – 10 and paratye, slide 82/8/30 – 1.

Description: Body cylindrical with constriction at groove and above scopula when expanded, rounded without constriction at groove when contracted, length 44,1 – 84,1 (61,9 ± 6,9; 25), diameter 23,8 – 45,4 (36,8 ± 5,6; 23). Groove with cilia centrally placed. Number of silver lines above groove 28 – 36 (31,6 ± 2,1: 15), and below 24 – 30 (26,4 ± 1,4; 15). Scopula broad, diameter 17,4 – 37,6 (27,4 ± 6,3; 24). Peristomial disc convex. Peristomial lip broad, opens as wide as body when expanded. Macronucleus ribbon-shaped, extending throughout body with the tips folded back on itself, diameter 3,2 – 6,8 (4,4 ± 0,9; 21). No micronucleus observed.

Remarks: So far only one population of this species has been found in South Africa. The body shape and the shape of scopula correspond closely to representatives of the genus *Scopulata* gen. nov., described later in this paper. Live specimens can in many cases not be distinguished, owing to the fact that the macronucleus is not visible. In hematoxylin-stained specimens however, the ribbon-like macronucleus facilitates differentiation between the two genera.

Genus *Scopulata* gen. n.

In general fish disease textbooks, cylindrical sessile peritrichs with a solid nucleus occurring on fish are referred to as belonging to the genus *Scyphidia* (Reichenbach-Klinke & Elkan 1965; Hoffman 1970; Roberts & Sheperd 1974; Paperna 1980). In some cases (Hoffman 1970), no distinction is even made between *Ambiphrya* and *Scyphidia* and they are regarded as synonyms. Viljoen & Van As (1983) studying substrate specificity of sessile peritrichs, described two piscean species and placed them within the genus *Scyphidia*, i.e. *S. dermata* Viljoen & Van As, 1983 and *S. epibranchialis* Viljoen & Van As, 1983. The genus *Scyphidia* comprises peritrichs displaying a wide range of characteristics, i.e. body shape varying from flask-shaped to cylindrical, species with and without a medial cilia girdle, scopula varying from narrow to broad and macronucleus varying from round to ribbon-shaped. The substrates utilized by these organisms include detritus, algae, macrophytes and a variety of invertebrates as well as fish (Hirshfield) 1949). Of the fish-associated scyphidians originally described within the genus, Raabe (1952) placed *Scyphidia tholiformis* Surber, 1940 and *S. macropodia* Davis, 1947 in the genus *Ambiphrya*, Lom (1966) placed *Scyphidia amoeba* Grenfell, 1881, *S. gasterostei* Fauré-Fremiet, 1905, *S. micropteri* Surber, 1940 and *S. pyriformis* Tripathi, 1954 in the genus *Apiosoma* and Hoffman (1970) placed *Scyphidia ameiuri* (Thompson, Kirkegaard & Jahn, 1947) in the genus *Ambiphrya*.

Of the remaining piscean scyphidians *S. baninae* Chernova, 1977, *S. doliaris* Chernova, 1977 and *S. schulmani* Evlanov, 1981 all show distinct characteristics of the genus *Ambiphrya* and we suggest that their taxonomic status should be re-evaluated.

After describing *S. dermata* and *S. epibranchialis*, extensive surveys were carried out and another species with similar characteristics was found, associated with freshwater fish in South Africa. We are now of the conviction that these peritrichs do not conform to the genus *Scyphidia*, and warrant the separation into a new genus. We thus propose the genus *Scopulata* for these organisms with *S. dermata* (Viljoen & Van As, 1983). comb. nov. as type.

Table 2 Compendium of all known species of *Ambiphrya* found on freshwater fish

Species and synonyms	Type host(s)	Location on host	Type locality	Body measurements (µm) Length	Diameter	No. in reference list	
A. miri Raabe, 1952	*Nerophis ophidion*	G	Poland	45	25	39, 40, 50	
A. tholiformis (Surber, 1943) syn: *Scyphidia tholiformis*	*Micropterus dolomieu* *Micropterus salmoides*	G,S	U.S.A.	59	35	27, 39, 50, 58	
A. macropodia (Davis, 1947) syn: *Scyphidia macropodia*	*Ameiurus nebulosus*	G,S	U.S.A.	35 – 46	20 – 25	15, 31, 39, 50	
A. ameiuri (Thompson, Kirkegaard & Jahn, 1947) syn: *Scyphidia ameiuri*	*Ameiurus melas melas*	–	U.S.A.	35 – 45	20 – 34	27, 28, 59	
A. neobolae sp.n.	*Neobola brevianalis*	S	S. Africa	44 – 84	24 – 45		

S = Skin, G = Gills, N = Nasal cavity, M = Mouth cavity, – = Information not available. Figures not drawn to scale. Figures drawn according to the authors listed.

Table 3 Species belonging to the genus *Scopulata* gen. nov.

Species and synonyms	Type host(s)	Location on host	Type locality	Body measurements (µm) Length	Diameter	
S. dermata (Viljoen & Van As, 1983)	*Pseudocrenilabrus philander*					
syn: *Scyphidia dermata*	*Barbus trimaculatus*	S	South Africa	46 – 61	25 – 38	
S. epibranchialis (Viljoen & Van As, 1983)						
syn: *Scyphidia epibranchialis*	*P. philander*	S,G	South Africa	27 – 40	20 – 27	
S. constricta sp.n.	*Oreochromis mossambicus*	S	South Africa	33 – 51	21 – 34	

S = Skin, G = Gills, N = Nasal cavity, M = Mouth cavity, – = Information not available. Figures not drawn to scale. Figures drawn according to the authors listed.

Table 4 Differential diagnosis of the genus *Scopulata* in comparison to the other genera found on fish

	Scopulata	*Scyphidia*	*Ambiphrya*	*Apiosoma*	*Epistylis*
Body shape	Cylindrical	Round to cylindrical	Cylindrical above groove, tapers towards scopula	Cylindrical to elongated cupshaped	Bell-shaped
Scopula	Broad	Very small to broad	Broad	Small	Small, attached to stalk
Stalk	Stalkless	Sometimes stalked	Stalkless	Sometimes stalked	Stalked
Groove	Prominent. Without cilia. In middle of body	With or without	Prominent. With cilia. In middle of body	Prominent. Without cilia. One third of body length from peristome	Not prominent. Without cilia
Peristomial disc	Convex	Flat to very convex	Convex	Flat to convex	Protrudes prominently
Peristomial lip	Broad. Opens wider than body	Varies considerably	Narrow to broad. Opens wide	Narrow. Opens as wide or wider than body	Does not open wider than body
Infundibulum	Straight or curved. Extends to groove	–	Curved. Does not extend to groove	Slightly curved. Extends to groove	Shape and length vary
Contractile vacuole	One. In region above groove	Number and position vary	One. Directly below peristomial disc	One. Directly below peristomial disc	One. Directly below peristomial disc
Food vacuoles	In region above groove	–	Throughout body	Mostly in region above groove	Throughout zooid
Macronucleus	Compact. Below groove. In lower part of body	Different shapes and positions. Compact to ribbon-shaped	Ribbon-shaped. Throughout body	Compact. Below groove. In middle of body	Sausage-shaped. In upper half of body
Micronucleus	Below or alongside of lower part of macronucleus	–	In lower half of body	Different positions, near to macronucleus	Different positions
Silver lines	Spaced very widely apart. Low numbers per surface area	–	Spaced widely below groove. Spaced closely together above groove	Spaced widely apart but in higher numbers per surface area than *Scopulata*	Very close together. High numbers per surface area
Swarmer/telotroch	Round	–	Round to pear-shaped	Bulb-shaped to cylindrical	Cylindrical

– = Information not available.

Diagnostic features of the genus *Scopulata* n. gen. (Figure 2C)

This genus comprises peritrichs living as ectocommensals or ectoparasites on the surface of freshwater fish. They are solitary, sessile animals and never stalked. The body is cylindrical with a broad scopula. A prominent groove without cilia encircles the body. In silver-impregnated specimens prominent pellicle striations or silver lines are observed, encircling the body at regular intervals.

When expanded, the peristomial lip opens widely to reveal the convex peristomial disc and adoral cilia consisting of a haplo- and polykinety, completing more than a 360° spiral.

When contracted, the peristomial lip covers the disc and cilia which are drawn into the body. One contractile vacuole occurs in the region above the groove. In most species food vacuoles are also only observed in the region above the groove, the region below being finely granular. The macronucleus is compact and situated below the groove. One micronucleus is present, situated below or alongside of the lower part of the macronucleus.

Reproduction is by longitudinal binary fission and conjugation of micro- and macrogametes. Telotrochs or swarmers are formed by the taking on of a more rounded shape by the body and the development of a cilia girdle on the level of the groove.

Scopulata constricta **sp.n.** (Figures 7C, 8C and 8D)

Hosts and localities: *Oreochromis mossambicus* (Peters, 1852), (A10, B5, D2).

Location on hosts: Skin.

Type host and locality: *Oreochromis mossambicus* (Peters, 1852), Hartebeespoort Dam, (A10), (25°40'S/27°40'E).

Type specimens: Holotype, slide 82/4/8 – 8 and paratype, slide 82/4/8 – 4.

Description: Body markedly constricted at groove and directly above scopula when expanded, retaining the constrictions when contracted, length 32,6 – 50,5 (43,3 ± 5,3; 16), diameter 21,3 – 33,8 (30,0 ± 3,1; 16). Groove without cilia, centrally placed. Number of silver lines above groove 18 – 21 (19, 1 ± 0,03; 8), and below 19 – 21 (19,6 ± 0,02; 8).

Scopula broad, diameter 14,3 – 28,5 (25,9 ± 3,2; 16). Peristomial disc convex. Peristomial lip broad, opens as wide as body when expanded. Infundibulum straight, extends to groove. Food vacuoles distributed in region above groove. Cytoplasm of lower part finely granular with no vacuoles. Macronucleus triangular, situated below groove, length 11,7 – 18,4 (14,8 ± 1,5; 16), diameter 12,7 – 19,4 (15,8 ± 2,1; 16). Micronucleus round, situated directly below macronucleus, length 3,1 – 3,7 (3,3 ± 0,2; 5), diameter 1,9 – 3,4 (2,8 ± 0,5; 5).

Remarks: Specimens from all populations studied conform in shape and dimensions. *S. constricta* differs from the other *Scopulata* spp. in the characteristic body shape and position of the micronucleus.

Scopulata dermata **(Viljoen and Van As, 1983)** (Figures 7D, 6C, 8A and 8B)

Hosts and localities: *Marcusensius macrolepidotus* (Peters, 1852) (B1), *Micralestis acutidens* (Peters, 1852) (B3), *B. trimaculatus* (A11), *O. mossambicus* (A10, B4, B5, B6, B7, D2), *Pseudocrenilabrus philander* (Weber, 1897) (A2, A7, A11, B4, C3, C4, C5), *Tilapia rendalli* Gilchrist & Thompson, 1917, (B5), *Tilapia sparrmanii* Smith, 1840.

Location on hosts: Skin.

Comparative description: *S. dermata* from *O. mossambicus*, Lepellane Dam (B6). Body, elongated cylindrical, length 35,2 – 56,4 (42,7 ± 5,9; 23), diameter 16,8 – 38,6 (25,9 ± 4,7; 23). Groove without cilia, centrally placed. Number of silver lines above groove 15 – 23 (18,5 ± 1,8; 13), and below 19 – 26 (21,2 ± 1,8; 13). Total, mean number of silver lines 35 – 43 (39,8 ± 2,1; 13). Scopula broad, diameter 14,8 – 32,8 (20,2 ± 3,7; 23). Peristomial disc flatly convex. Peristomial lip broad, opens wider than body when expanded. Infundibulum curved, extending to groove. Food vacuoles distributed in region above groove, cytoplasm of lower body region finely granular. Macronucleus triangular, situated below groove, length 12,4 – 20,4 (14,8 ± 3,0; 23), diameter 11,4 – 18,6 (14,1 ± 2,5; 23). Micronucleus oval-shaped, situated alongside of the central part of macronucleus, length 2,7 – 4,1 (2,8 ± 0,8; 8), diameter 1,4 – 2,2 (2,0 ± 0,6; 8).

Remarks: Specimens from all populations studied conform in shape and show the same range of dimension variability. This species is one of the most common sessile peritrichs found on freshwater fish in South Africa.

Scopulata epibranchialis **(Viljoen and Van As, 1983)** (Figures 7B, 8G, 8H, and 8I)

Hosts and localities: *Micropterus dolomieu* Lacépède, 1802 (A9), *O. mossambicus* (A2, A5, A10, B1, B3, B4, B5, B6, B7, B9), *P. philander* (A2, A7, A8, A11, B4, B9, B12, C1, C2, C3, C4, C5).

Location on hosts: Gills. Occasionally skin.

Comparative description: *S. epibranchialis* from *O. mossambicus*, Hartbeespoort Dam (A10). Body cylindrical when expanded, round when contracted, length 20,7 – 49,8 (35,2 ± 7,6; 20), diameter 20,1 – 28,9 (23,4 ± 5,1; 20). Groove without cilia, centrally placed. Number of silver lines above groove 13 – 17 (14,6; 0,7; 9), and below 14 – 22 (18,9 ± 2,3; 9). Scopula broad, diameter 10,9 – 29,1 (20,2 ± 4,6; 20). Peristomial disc prominently convex. Peristomial lip broad, opens wider than body when expanded. Infundibulum curved, extends to groove. Food vacuoles distributed in region above groove, cytoplasm of lower part of body without vacuoles. Macronucleus elongated oval-shaped, situated below groove, length 7,9 – 17,6 (12,6 ± 1,8; 16), diameter 11,3 – 15,9 (14,7 ± 1,0; 16). Micronucleus oval-shaped, situated below macronucleus, length 2,1 – 3,9 (3,1 ± 0,4; 10), diameter 1,3 – 3,0 (1,9 ± 0,4; 10).

Remarks: Specimens from all populations studied conform in shape and dimensions. *S. epibranchialis* in relation to other *Scopulata* species has a short and stout appearance. Although it has been found to occur on the skin of fish, it occurs predominantly on the gills and was found to be the most common gill sessile peritrich in South Africa. There were no marked differences in body shape and dimensions between those occurring on the gills and those on the skin.

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