

## Typhloplanoida (Platyhelminthes, Rhabdocoela) from New Caledonia and eastern Australia, with the description of six new taxa

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**Abstract** Thirteen species of Typhloplanoida from the Australian east coast and New Caledonia are reported, six of them new to science. Three of these new species are representatives of the Promesostomidae: *Coronhelmsis cuypersi* new species, *Coronhelmsis novaecaledoniae* new species, and *Kymocarens kanakorum* new species. *Austradenopharynx reynaerti* new genus and species is a member of the Solenopharyngidae. Two species are placed within the Typhloplanidae: *Kaitalugia lydieae* new genus and species and *K. falcata* new species. Furthermore, new localities are given for *Messoplana minuta*, known from the Weddell Sea, *Brinkmanniella palmata*, occurring on the North American Pacific coast, the Swedish west coast and in the Black and Mediterranean Seas, *Ceratopera axi*, a cosmopolitan species, and *Vauchlusia conica* and *Pilamonila bimascula*, two Australian species. For the sake of completeness, two more species of which

insufficient material is available, are mentioned. A complete species list of all marine Typhloplanoida found in the region is given.

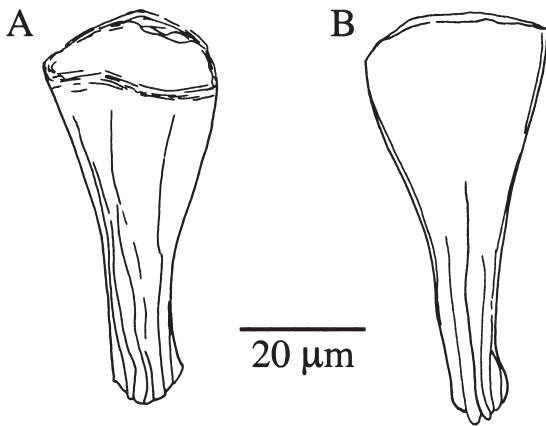
**Keywords** systematics; taxonomy; biodiversity; “Turbellaria”; Promesostomidae; Solenopharyngidae; Trigonostomidae; Typhloplanidae; Australia; New Caledonia

### INTRODUCTION

Our knowledge of marine turbellarians, and of typhloplanoids in particular, from Australia and the adjacent island territories is very scattered. However, in an ecological study in northeastern Australia, Dittman (1991) recognised more than 100 different species of Turbellaria, of which 16 were undescribed typhloplanoids. Up to the present, 14 different species of Typhloplanoida have been described from the region (see Hochberg & Cannon 2003; Hochberg 2004; Willems et al. 2004a,b). An overview of all species occurring on the coasts of New Caledonia and eastern Australia, including those described in this contribution and two new species of *Promesostoma* Graff, 1882 (see further), is given in a species list for the region.

Six new species are described in the present contribution: three species from New Caledonia only; two species from the east coast of Australia only; and one species occurring in both regions. Furthermore, additional data are given on *Ceratopera axi* (Riedl, 1954) Den Hartog, 1964, *Brinkmanniella palmata* Karling, 1986, *Messoplana minuta* Artois et al., 2000, *Vauchlusia conica* Willems et al., 2004 and *Pilamonila bimascula* Willems et al., 2004. For the sake of completeness, two more species are added, *Pratoplana* sp. and *Ptychopera* sp. For both, only observations on live material have been made, and one whole mount in bad condition is available, not allowing exact identification. However, both species may be recognised when found in the future.

Additionally, two *Promesostoma* species were collected from New Caledonia. Because of the



**Fig. 1** *Brinkmanniella palmata*: **A**, **B**, stylet of two different individuals.

taxonomical complexity and species-richness of this taxon, both species are described in a monographical treatment of *Promesostoma*, which is already submitted for publication elsewhere.

## MATERIAL AND METHODS

The specimens for this study were collected during three expeditions: the first in August–September 1996 by Tom Artois and Ernest Schockaert (ES), the second by ES in September–November 1997 and the third by ES in July and August 2003.

The animals were extracted from the sediment or from algae using the  $MgCl_2$ -decantation method (see Schockaert 1996), studied alive and whole mounted with lactophenol. Additional specimens were fixed in marine Bouin's solution, embedded in paraffin, serially sectioned (4  $\mu m$  sections) and stained with Heidenhain's iron haematoxylin, using eosin as a counterstain.

Camera lucida drawings of hard parts in the whole mounts were made with Nomarski microscopy. Drawings without a scale bar are freehand. Photographs are all from live animals and are taken with an Olympus C-5050 Zoom digital camera.

Measurements of hard parts are taken axially, unless indicated otherwise. The position of the gonopore and organs, and the measurements of the pharynx are expressed in percentages of the total body length (distance from the anterior tip of the body).

Voucher specimens of *Ceratopera axi* (Riedl, 1954) Den Hartog, 1964 from California and the Falklands were loaned from the collections of the

Swedish Museum of Natural History in Stockholm (SMNH). Two whole mounts from Australia, one from Kerguelen, one from La Réunion and one from the Weddell Sea are present in the collections of the LUC (Diepenbeek, Belgium). Material of several solenopharyngid species from the SMNH collections was used for reference. The type material of *Vauchlusia conica* and *Pilamonila bimascula* is present in the collections of the Queensland Museum (QM), whereas the type material of *Messoplana minuta* is present in the LUC collections.

The type material of *Austradenopharynx reynaerti* new genus and species and *Coronhelmis cuypersi* new species, both from Australia, will be deposited in the collections of the Queensland Museum, Brisbane, Australia. The type material of the New Caledonian species will be kept in the LUC collections.

## Abbreviations used in the figures

b: brain; ba: bursal appendage; bc: copulatory bursa; bgg: basophilic prostate glands; bh: bursal hook; bu: bursa; cga: common genital atrium; cil<sub>1-2</sub>: cilia; cm: circular muscles; cop: copulatory organ; csp: cirrus spines; de: ejaculatory duct; ds: spermatid duct; e: eye; egg: eosinophilic prostate glands; epg: extrapharyngeal glands; evs: extracapsular seminal vesicle; fd: female duct; gg: prostate glands; gl: glands; gp: common genital pore; gw: "Greifwulst" (prehensile girdle); igg: intracapsular prostate glands; ipg: intrapharyngeal glands; ivs: intracapsular seminal vesicle; lm: longitudinal muscles; m: mouth; ma: male atrium; mb: muscular bulb on female duct; od: oviduct; ov: ovary; pc: prepharyngeal cavity; pg: pharynx glands; ph: pharynx; pl: pharynx lumen; rg: rostral glands; rs: seminal receptacle; s: stylet; sep: muscular septum; sph: sphincter; t: testis; ut: uterus; v: vas deferens; vd: vitelloduct; vg: prostate vesicle; vit: vitellarium; vs: seminal vesicle; x, y, z: features described in respective text.

## TAXONOMIC ACCOUNT

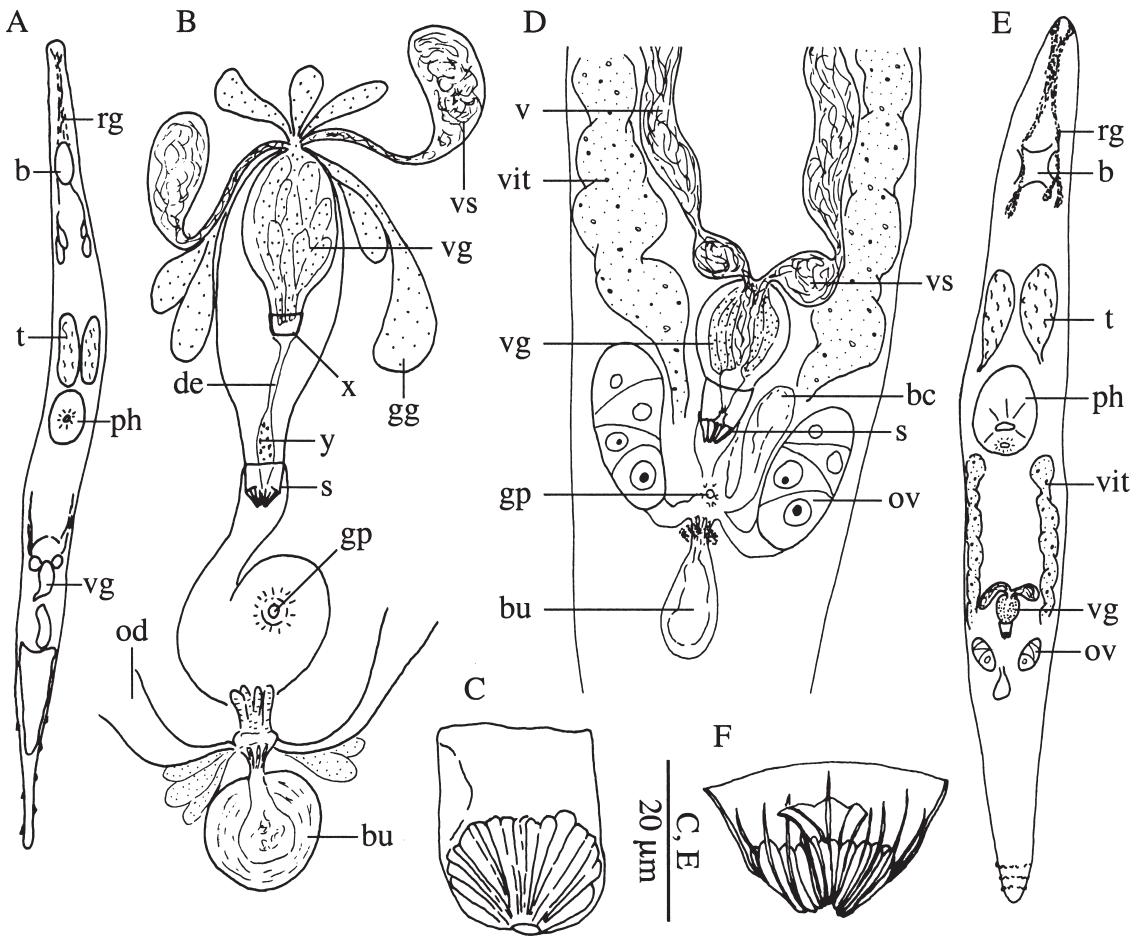
### Family Promesostomidae Den Hartog, 1964

#### Subfamily Brinkmaniellinae Luther, 1948

#### *Brinkmanniella palmata* Karling, 1986 Fig. 1

NEW LOCALITIES: Ile Nou (Nouméa, New Caledonia): on Kuendu Beach in coarse-grained sand, 3 Aug 2003 and on algae in the lagoon, 10 Aug 2003.

KNOWN DISTRIBUTION: North American Pacific coast (Karling 1986), Black Sea (leg. V. Mack-Fira; see



**Fig. 2** *Coronehlmis cuypersi*: **A**, habitus of a live animal; **B**, organisation of the genital system (from a live specimen); **C**, stylet (from the holotype). *Coronehlmis novaecaledoniae*: **D**, organisation of the genital system (from a live specimen); **E**, habitus of a live animal; **F**, stylet (from the holotype).

Karling 1986), Mediterranean Sea (leg. P. Martens; see Karling 1986), Swedish west coast (Karling 1986).

**MATERIAL EXAMINED:** Two specimens (one from each locality) studied alive and mounted.

**REMARKS:** The delicate stylet of the New Caledonian specimens is 56–58 µm long ( $n = 2$ ) and shows six or seven “fingers”, which lie closely together (see Fig. 1). The distal tip is somewhat widened. The structure of the stylet resembles that of two out of six species of *Brinkmanniella* Luther, 1943: *Brinkmanniella obtusa* Luther, 1943 and *B. palmata* Karling, 1986, the difference between the two being the number of fingers (six in *B. palmata*, seven to eight in *B. obtusa*) and the fact that the distal tip is

pointed (in *B. obtusa*) or blunt (Karling 1986). In the specimens from New Caledonia the distal tip of the stylet is blunt, not, however forming a fist-like structure as in *B. palmata* specimens from the North American Pacific coast, the Swedish west coast and the Black Sea and Mediterranean Sea. It is, however, never pointed as in *B. obtusa*.

***Coronehlmis cuypersi* new species**

Fig. 2A–C, Table 1

**LOCALITY:** Arrawarra (New South Wales, Australia); beach south of the marine station, between rocks, fine sand, 30 Oct 1997 (Type locality).

**MATERIAL EXAMINED:** One specimen studied alive and mounted, designated holotype (QM no. G223181).

**Table 1** Comparison of all *Coronhelmis* species. ?, not known.

	<i>C. conspicuus</i>	<i>C. cuypersi</i>	<i>C. exiguus</i>	<i>C. inornatus</i>	<i>C. lutheri</i>	<i>C. multispinosus</i>	<i>C. noerrevangi</i>	<i>C. novae-caledoniae</i>	<i>C. tripartitus</i>
Length animal (mm)	1.5–2	1	0.8–1.0	0.6–0.8	0.8–1.4	0.5–1.5	0.8–1.2	1.2	0.6–1.0
Stylet length (µm)	60–80	24	30	11–12	17–26 (45 under strong pressure)	16–23 (±56 under strong pressure)	17–22	19	15–20
Length “manschette” (µm)	18–25	11	±5	absent	8–9	±33 µm (under strong pressure)	?	9	?
Stylet width (µm)	?	19	?	±10	12–24	18	17–20	29	11–14
No. of spiny rows (strong pressure)	4–5 (?)	?	1	1	max. 8	1	3	1 (?)	1
No. of spiny rows (no pressure)	2–3	1	1	1	1	1	1	1	1 (+2 without spines)
No. of spines	>30	>30	8–10	10–15	>30	±10	15	15–20	25–30
Length spines (µm)	20–30	15	?	max. 11–12	5–10	13 (25)	5–9	9	?
Ejaculatory duct	short	very long (with spines distally)	short	short	short	short	short	short	short
Habitat	freshwater outlet	marine, eulittoral	freshwater outlet	marine, supralittoral	freshwater outlet; tidepools; brackish sandflats	brackish sandflats	marine, supralittoral; brackish sandflats; freshwater outlets	marine, eulittoral	marine, supralittoral
Distribution	Greenland	East Australia	Greenland	North Sea	Baltic Sea, North Atlantic, Alaska	Baltic Sea, North Sea	Greenland, Iceland, Färöer	New Caledonia	North Sea
Literature	Ax (1994, 1995b)	this paper	Ax (1994, 1995b)	Ehlers (1974)	Ax (1951, 1954, 1994, 1995a); Luther (1962); Karling (1974); Ehlers (1974); Ax (1987); Müller & Armonies (1987, 1990)	Luther (1948, 1962); Karling (1974); Ehlers (1974); Ax (1987); Müller & Faubel (1993)	Ax (1994, 1995b)	this paper	Ehlers (1974)

**ETYMOLOGY:** Species dedicated to Dr Ann Cuypers (Centre for Environmental Sciences, LUC, Diepenbeek).

**DESCRIPTION:** The Australian specimen is  $\pm 1.0$  mm long (measured on the whole mount). The pharynx is situated in the middle of the body (Fig. 2A: ph). The prostate vesicle (Fig. 2A,B: vg) is situated in the last third of the body and shows a little cap (Fig. 2B: x) as seen in the live animal. In the whole mount it seems to be an everted (permanently?) muscular collar. From here starts a rather long ejaculatory duct (Fig. 2B: de), which widens slightly distally where it is armed with small spines (thickened basement membrane; Fig. 2B: y). The whole system, prostate vesicle and ejaculatory duct, is enclosed in a septum, forming a typical duplex-type copulatory organ (terminology of Karling 1956). The stylet (Fig. 2C) surrounds the distal part of the ejaculatory duct, is 24  $\mu\text{m}$  long, proximally 19  $\mu\text{m}$  wide, with a proximal thin-walled, 11  $\mu\text{m}$ -long part (“manschette” in Luther 1948) and a single ring of spines distally. The spines (more than 30) are all  $\pm 15$   $\mu\text{m}$  long. A copulatory bursa was not observed.

**DIAGNOSIS:** *Coronhormis* species with stylet 24  $\mu\text{m}$  long and 19  $\mu\text{m}$  wide, with one ring of more than 30 spines and 11  $\mu\text{m}$ -long manschette. Slender spines  $\pm 15$   $\mu\text{m}$  long. Long ejaculatory duct with small spines.

**DISCUSSION:** see Discussion on the taxon *Coronhormis*.

***Coronhormis novaecaledoniae* new species**

Fig. 2D–F, Table 1

**LOCALITY:** Ile Nou (Nouméa, New Caledonia): on Kuendu Beach in coarse-grained sand, 3 Aug 2003 (Type locality).

**MATERIAL EXAMINED:** One specimen studied alive and mounted, designated holotype (LUC no. 305).

**ETYMOLOGY:** The species name/epithet refers to its occurrence in New Caledonia.

**DESCRIPTION:** The animal is  $\pm 1.2$  mm long (measured on the whole mount). The pharynx is situated in the middle of the body (Fig. 2E: ph). The overall structure of the genital system (based on observations of a live animal; Fig. 2D) does not deviate from that of other species of *Coronhormis* Luther, 1948 (see for instance Luther 1948; Ehlers 1974; Ax 1994). The stylet (Fig. 2F) is 19  $\mu\text{m}$  long and 29  $\mu\text{m}$  wide. It consists of a proximal thin-walled,  $\pm 9$   $\mu\text{m}$  long part (manschette in Luther 1948) and one ring of spines (15–20) distally. The 9  $\mu\text{m}$  long spines resemble a

small leaf and are elongated oval in shape with a thickened ridge in the middle, which extends beyond the proximal rim. In the centre of the stylet a flower-shaped structure is present, which possibly is the thickened wall of the ejaculatory duct.

**DIAGNOSIS:** *Coronhormis* species with stylet 19  $\mu\text{m}$  long and 29  $\mu\text{m}$  wide, with one ring of 15–20 spines and  $\pm 9$   $\mu\text{m}$  long manschette. Spines 9  $\mu\text{m}$  long, leaf-shaped with a thickened median ridge, extending beyond the proximal rim.

**DISCUSSION ON THE TAXON *CORONHORMIS*:** *Coronhormis novaecaledoniae* and *C. cuypersi* possess almost all diagnostic characters of the taxon *Coronhormis* Luther, 1948: an elongated body, a copulatory bursa and an oval-shaped copulatory organ connected to a stylet that consists of a proximal part or manschette and a distal ring of spines (diagnosis of Luther 1948). A copulatory bursa was not observed in *C. cuypersi* (as for example also in *C. conspicuus* Ax, 1994, *C. noerrevangi* Ax, 1994 and *C. exiguus* Ax, 1994; see Ax 1994). An overview of all known species is given in Table 1. *Coronhormis urna* Ax, 1954 is regarded as a junior synonym of *C. lutheri* Ax, 1951, following Luther 1962.

The only differences between the species are to be found in the detailed structure and size of the stylet (see Table 1). The stylet of *C. novaecaledoniae* is easily distinguished from that of other *Coronhormis* species by the detailed structure of the spines. In all these species the spines are extremely simple, not leaf-shaped with a median ridge, as in *C. novaecaledoniae*.

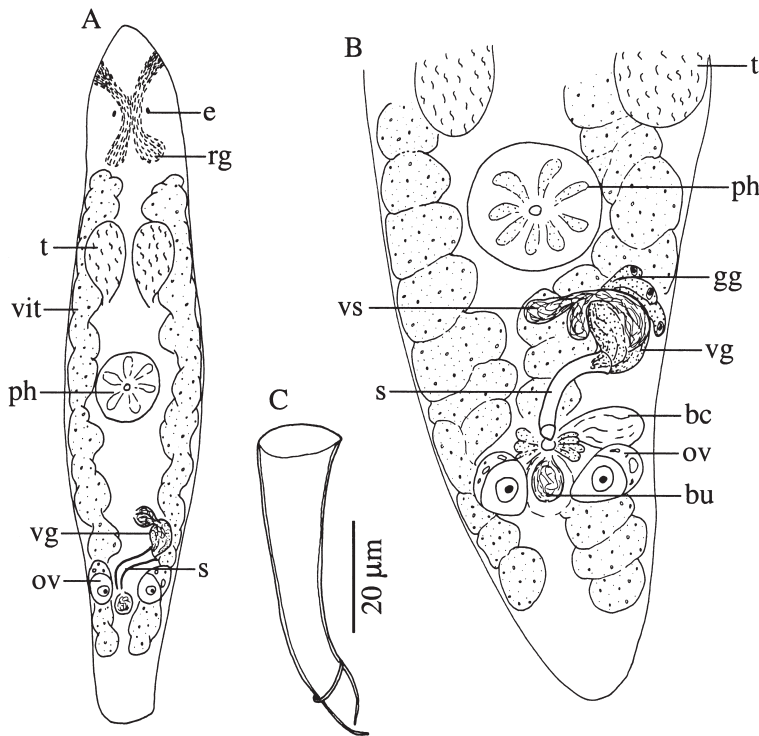
The stylet of *C. cuypersi* closely resembles that of *C. lutheri* (see for instance Ax 1951: fig. 23; Ax 1994: fig. 1A,B, 2A,B; Luther 1962: fig. 19H; Ehlers 1974: fig. 11A,C; Ax & Armonies 1987: fig. 20D,E). In this species the stylet consists of telescopic rings, only visible under high pressure of the cover slide (see for instance Karling 1974: fig. 73; Ehlers 1974: fig. 11B; Ax 1994: fig. 1C, 2C). However, the long ejaculatory duct, armed with spines, is a unique feature within the taxon *Coronhormis*; in all other *Coronhormis* species the stylet is almost directly connected to the prostate vesicle, and the ejaculatory duct is extremely short.

***Kymocarens kanakorum* new species**

Fig. 3

**LOCALITY:** Ile Nou (Nouméa, New Caledonia): on Kuendu Beach in coarse-grained sand, 3 Aug 2003 (Type locality).

**MATERIAL EXAMINED:** One specimen studied alive and mounted, designated holotype (LUC no. 306).



**Fig. 3** *Kymocarens kanakorun*: **A**, habitus of a live animal; **B**, organisation of the genital system (from a live specimen); **C**, stylet (from the holotype).

**ETYMOLOGY:** The species name refers to the original inhabitants of New Caledonia, the Kanaki.

**DESCRIPTION:** Animal  $\pm 0.5$  mm long (measured on the whole mount), with eyes. Two large rhabdite tracts present, running from behind the eyes to the sides of the “head” (Fig. 3A: rg). The caudal end of the animal is blunt, more or less forming a tail plate.

Pharynx situated in the middle of the body (Fig. 3A: ph).

The common genital pore is situated at  $\pm 80\%$ . Some small glands open into the common genital atrium, together with a large vesicle or copulatory bursa (Fig. 3B: bc). The paired testes lie in front of the pharynx (Fig. 3A: t). Paired, elongated ovovitellaria (Fig. 3A: ov + vit) extend over almost the entire body length, with the ovaries in the most caudal part (Fig. 3 A,B: ov).

The paired seminal vesicles fuse and open into the copulatory bulb (Fig. 3B: vg), which is filled with prostate secretion and an internal seminal vesicle. The bulb is connected to a slightly bent tubular stylet (Fig. 3C), which is  $56 \mu\text{m}$  long and  $14 \mu\text{m}$  wide at the proximal opening. This stylet shows a transverse, thin ridge, situated at  $\pm 85\%$  of the stylet length. The terminal opening is asymmetrical in the single studied specimen.

The female genital system is relatively simple, only consisting of the two ovaries and a small sperm-containing vesicle in between both ovaries (Fig. 3B: bu).

**DIAGNOSIS:** *Kymocarens* species with eyes and simple, tubular stylet,  $56 \mu\text{m}$  long and  $14 \mu\text{m}$  wide, with a transverse ridge distally.

**DISCUSSION:** Although this species was only studied alive and on a single whole mount, a number of diagnostic features were observed, resulting in its placement within the taxon *Kymocarens* Ehlers & Ehlers, 1981. This taxon is characterised by the presence of large and conspicuous rostral rhabdite tracts, an adhesive tail plate, paired testes in front of the pharynx, paired seminal vesicles, a tubular stylet, paired ovovitellaria with the ovaries caudally, a bursal organ connected to the common genital atrium, and a female duct with a sperm-containing vesicle (see diagnosis in Ehlers & Ehlers 1981). Apart from *Kymocarens kanakorun*, two additional species of *Kymocarens* are known from the Galapagos and only from a few specimens. The New Caledonian species differs from both other species in the size and detailed structure of the stylet. In *K. proxenetoides* Ehlers & Ehlers, 1981 it is a simple,  $49\text{--}50 \mu\text{m}$  long, elongated funnel, without ridges, whereas it is only

30  $\mu\text{m}$  long and carries two terminal hooks and a thin plate in *K. tibialis* Ehlers & Ehlers, 1981 (see Ehlers & Ehlers 1981). Furthermore, the latter species lacks eyes, which are present in *K. proxenetoides* and *K. kanakorum*.

### Incertae sedis

#### *Vauclusia conica* Willems et al., 2004

NEW LOCALITY: North Stradbroke Island (Queensland, Australia): Dunwich, fine sand between mangroves in front of the marine station, 12 Aug 1996.

KNOWN DISTRIBUTION: Sydney, Australia (Willems et al. 2004a).

MATERIAL EXAMINED: One specimen studied alive and mounted. Holotype (whole mount) and three paratypes (sections) from Sydney (see Willems et al. 2004a).

ADDITIONAL REMARKS: The live animal from Stradbroke Island clearly showed two testes, as in the sectioned material from Sydney, whereas only one was visible in the live individual from Sydney (Willems et al. 2004a). The stylet of the new specimen is 30  $\mu\text{m}$  long and 23  $\mu\text{m}$  wide proximally. These measurements correspond with those of the holotype (29  $\mu\text{m}$  long and 17  $\mu\text{m}$  wide; see Willems et al. 2004a).

### Family Solenopharyngidae Graff, 1882

#### Subfamily Solenopharynginae Ehlers, 1972

#### *Austradenopharynx reynaerti* new genus and species

Fig. 4

LOCALITY: Sydney (New South Wales, Australia): Vaucluse Beach, flat beach with fine sand and numerous crab holes, 10 Oct 1997 (Type locality). North Stradbroke Island (Queensland, Australia): Adams Beach, sand plate with crab holes, medium coarse sand, 16 Sep 1996.

MATERIAL EXAMINED: Several specimens studied alive, one of them mounted and designated paratype (QM no. G223182). One serially-sectioned animal, designated holotype (QM no. G223183).

ETYMOLOGY: The genus name/prænomens refers to its southern distribution and resemblance to *Adenopharynx mitrabortalis* Ehlers, 1972. Auster (Lat.): south (wind). Species dedicated to the first author's lifetime friend, Mr. David Reynaerts.

REMARK: The sectioned individual was damaged ventrally, leaving little of the ventral epidermis and muscle layers. This made the determination of the exact location of the mouth and gonopore somewhat speculative, and details on the structure of their

connection to the prepharyngeal cavity and to the common genital atrium cannot be given. Due to the tiny size of the animal, some details regarding the genital system, and especially the female system, could not be determined precisely.

DESCRIPTION: The transparent animal is extremely small, only about 0.1 mm long (measured on the whole mount) and brightens when observed with Nomarski microscopy. Eyes are lacking. The syncytial epidermis is  $\pm 3 \mu\text{m}$  thick, slightly thinner dorsally, with cilia  $\pm 2 \mu\text{m}$  long. Dermal rhabdites are absent. In the live animal two rostral glands are visible (Fig. 4B: rg).

The mouth is situated at  $\pm 60\%$  (see remark above). The prepharyngeal cavity (Fig. 4C: pc) is lined with a low, anucleated epithelium, surrounded by longitudinal muscles and a few weak circular ones around its distal part only. The pharynx (Fig. 4B: ph), short and almost globular in live animals, bulges deeply into the prepharyngeal cavity and is slightly inclined backwards. As in other solenopharyngids, there is a proximal, rather short, tubular part. The outer circular muscles are very strong, whereas the inner circular layer is much weaker. The exact number of internal longitudinal and radial muscles could not be determined. The radial muscles are thicker in the most proximal and in the tubular part of the pharynx. At least two types of pharyngeal glands are present. The large, coarse-grained basophilic glands have an extra-capsular part (Fig. 4C: epg), surrounded by longitudinal muscles. Small, eosinophilic glands (Fig. 4C: ipg) occur in between them in the distal part of the pharynx.

The common genital pore (Fig. 4B: gp) lies at  $\pm 70\%$  (see remark above), just behind the mouth. The common genital atrium (Fig. 4A,C: cga) is lined with a very low, anucleated (?) epithelium and surrounded by inner circular and outer longitudinal muscles. From the dorsal side, it receives the copulatory bursa (Fig. 4C: bc). It is lined with a thickened basement membrane (pseudocuticula; clearly visible on the whole mount), covered with the remains of the epithelium. The basement membrane even forms two (or more?) large blunt teeth (Fig. 4C: bh), just before the bursal stalk enters the genital atrium. The bursa is surrounded by circular muscles and distally by an outer longitudinal layer as well. The paired testes are situated in the most anterior part of the body and are connected with each other through a wide "bridge", in some live specimens giving the impression of an unpaired testis (see Fig. 4B: t). The unpaired ovary is situated caudally. The paired vitellaria extend over almost the entire body length.

The duplex-type copulatory organ (Fig. 4A; terminology of Karling 1956) enters the common genital atrium from the side, ventrally from the bursa, and is  $\pm 110 \mu\text{m}$  long (measured on the whole mount). It is entirely surrounded by a strong, inner circular muscle layer (Fig. 4A: cm), forming a sphincter close to the atrium (Fig. 4A: sph), and an outer longitudinal muscle layer (Fig. 4A: lm). The proximal part of the copulatory bulb contains a globular seminal vesicle (Fig. 4A: ivs), lined with a high, nucleated epithelium and containing thick, lively sperm. A thin muscular septum (Fig. 4A: sep) separates the seminal vesicle from the distal part of the copulatory organ. Sperm are released into the ejaculatory duct (Fig. 4A: de). Sperm are much thinner here. The ejaculatory duct ( $\pm 80 \mu\text{m}$  long;  $\pm 3 \mu\text{m}$  wide) is lined with a thick basement membrane (or pseudocuticula). Muscles surrounding the ejaculatory duct could not be observed. Prostate glands (Fig. 4A: igg) enter the ejaculatory duct just distally from the seminal vesicle. At its very end ( $\pm$ three-quarters of its total length), distally from the sphincter, the ejaculatory duct widens ( $\pm 9 \mu\text{m}$ ); here the basement membrane is more thickened and forms many small spines (Fig. 4A: csp). This part of the ejaculatory duct bulges into the common genital atrium and resembles a pair of pincers in the live animal.

The female system is extremely complex. The single ovary is slender and elongated (in the sectioned individual) and is connected to the genital atrium via a very narrow female duct, which receives the single vitellocyst near the ovary. The most proximal part of the female duct is widened, almost funnel-shaped, and contains sperm. This part is also connected caudally to a large resorptive bursa (Fig. 4C: bu). Additionally, this bursa is connected through a globular sperm-containing vesicle (Fig. 4C: rs) to the common genital atrium, very close to the copulatory bursa. This vesicle is surrounded by circular muscles and is lined with a low, anucleated epithelium. A large sack, completely filled with large cells (Fig. 4C: ut) opens into the genital atrium from the caudal side (uterus in Ehlers 1972).

DIAGNOSIS: *Austradenopharynx* new genus. Solenopharynginae with short, globular pharynx situated in the middle of the body. Copulatory organ of the duplex-type with pseudocuticularised ejaculatory duct. Copulatory bursa pseudocuticularised with

two large, blunt teeth. Single ovary connected to common genital atrium through two ducts: a narrow female duct and a resorptive bursa that opens into the atrium near the copulatory bursa.

*Austradenopharynx reynaerti* new species. Ejaculatory duct distally widened, with small spines.

DISCUSSION: This species clearly is a member of the taxon Solenopharyngidae Graff, 1882, as it shows all diagnostic features of the taxon (see Ehlers 1972). Furthermore, it can be placed within the subtaxon Solenopharynginae Ehlers, 1972, based on the presence of a cirrus-like copulatory organ, a copulatory bursa and an unpaired ovary that is connected with the common genital atrium through two different ducts (Ehlers 1972). Within the Solenopharynginae, the different taxa mainly differ in the detailed structure of the copulatory organ. However, a copulatory organ with a pseudocuticularised ejaculatory duct that carries spines only distally is unique within the taxon. In all other Solenopharynginae the cirrus is pseudocuticularised over its whole length or carries spines over its whole length, but never a combination of both as in *Austradenopharynx reynaerti*. Furthermore, a copulatory bursa that is lined with a very thick and strengthened basement membrane over its whole length, and has large teeth is also unique within the Solenopharynginae. A copulatory bursa that carries spines is only present in representatives of the taxon *Trisaccopharynx* Karling, 1940, whereas its wall is lined with a thick pseudocuticula (without spines or teeth) in *Adenopharynx mitrabursalis* Ehlers, 1972, *Culleopharynx armatus* (Riedl, 1956) Ehlers, 1972 and *Solenopharynx flavidus* Graff, 1882. Therefore, we conclude that *A. reynaerti* is best placed in its own monospecific taxon for the time being. The alternative would be to synonymise all above taxa; a discussion on this issue is beyond the scope of this contribution.

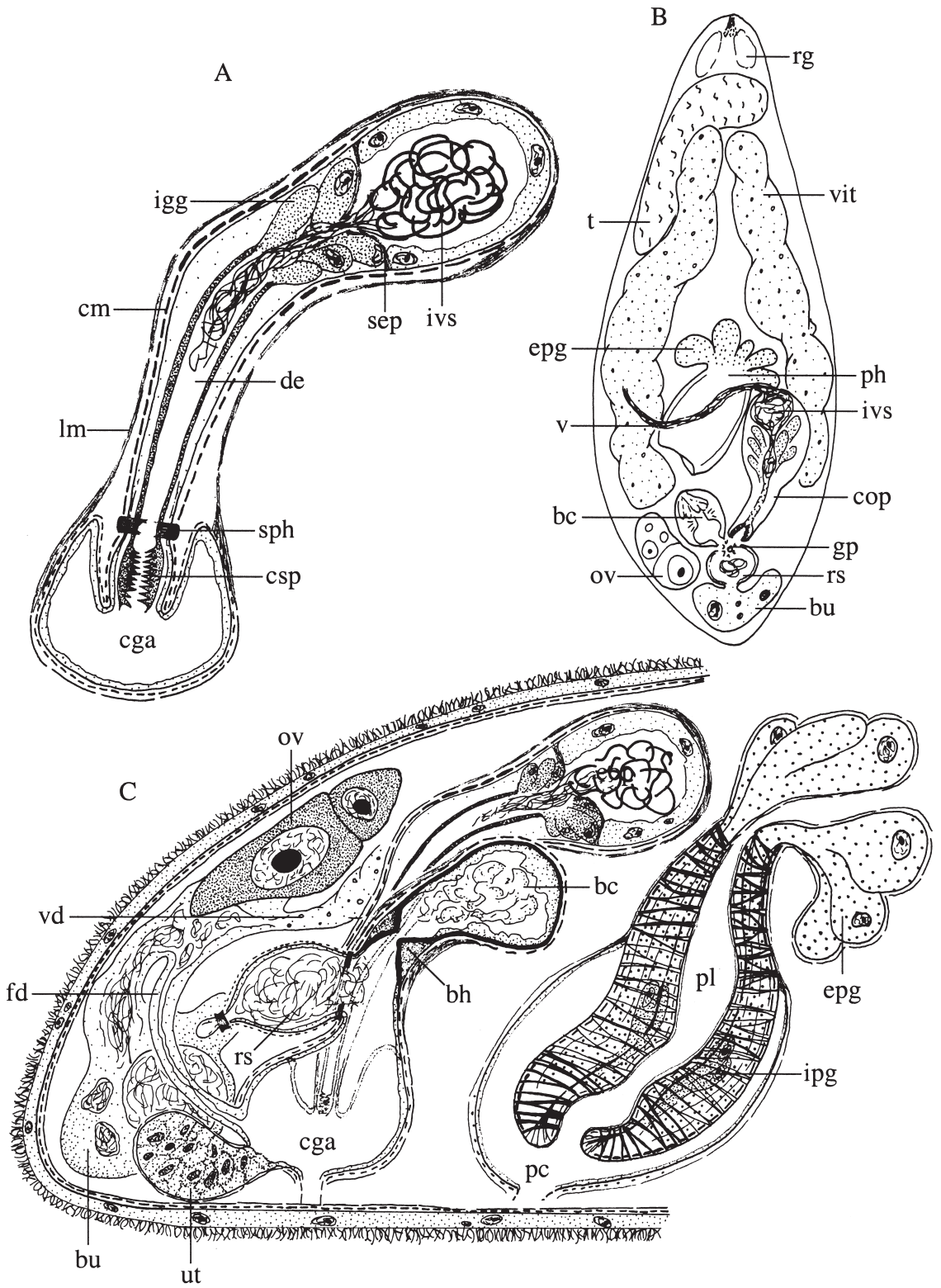
### Incertae sedis

#### *Pilamonila bimacula* Willems et al., 2004

NEW LOCALITIES: Ile Nou (Nouméa, New Caledonia): Nouville, on algae in the lagoon south of the asylum, 3 and 10 Aug 2003; reef in western part of Kuendu Bay, on ramified algae, together with shell gravel and sand, 16 Aug 2003. Baie des Citrons (Nouméa, New Caledonia): on algae in the lagoon, 8 Aug 2003; Baie

Fig. 4 *Austradenopharynx reynaerti*: A, male genital system (from the holotype); B, general organisation (from a live specimen); C, reconstruction of the atrial organs from the right side (from the holotype). ➤





de Magenta (Nouméa, New Caledonia): permanent pool near mangroves, on large algae covered with epiphytes, 22 Aug 2003.

KNOWN DISTRIBUTION: Arrawarra, New South Wales, Australia (Willems et al. 2004a).

MATERIAL EXAMINED: Observations on live animals. Four whole mounts and seven serially-sectioned animals. Type material (see Willems et al. 2004a).

ADDITIONAL REMARKS: The specimens from New Caledonia are 0.3–0.6 mm long (measured on whole mounts). The observations on the serially-sectioned individuals confirm the data given by Willems et al. (2004a). The organisation of the genital system, even its detailed structure, is identical with that of the Australian specimens (see Willems et al. 2004a). The stylet could not be discerned in the whole mounts and even in the sectioned specimens it is inconspicuous. This is largely due to the state of contraction of the cirrus. When completely inverted (as in the New Caledonian specimens) the spines lie on top of the stylet, which also is extremely thin-walled. The only observed difference with the individuals of Australia is the cellular epidermis (stated as syncytial in Willems et al. (2004a) due to misinterpretation of the sectioned specimens from Australia).

### Family Trigonostomidae Graff, 1905 *sensu* Den Hartog, 1964

#### Subfamily Trigonostominae Luther, 1948 *sensu* Den Hartog, 1964

##### *Ceratopera axi* (Riedl, 1954) Den Hartog, 1964

SYNONYMIES: *Proxenetes axi* Riedl, 1954; *Ceratopera bifida* Ehlers & Ax, 1974

NEW LOCALITIES: Baie des Citrons (Nouméa, New Caledonia): on algae in the lagoon, 8 Aug 2003; Ile Nou (Nouméa, New Caledonia): Nouville, on algae in the lagoon south of the asylum, 16 Aug 2003.

DISTRIBUTION: Gulf of Naples and Sicily (Riedl 1954); Galapagos (Ehlers & Ax 1974); Falkland Islands and California (Karling 1986); Weddell Sea and La Réunion (Artois et al. 2000); Eastern Australia (Willems et al. 2004a); Kerguelen (own data).

MATERIAL EXAMINED: Two specimens studied alive and mounted (one from each new locality). Whole mounts from Falklands and California (collections SMNH), Australia, the Weddell Sea, La Réunion and Kerguelen (collections LUC).

ADDITIONAL REMARKS: The stylet of the specimens from New Caledonia measures 78–98  $\mu\text{m}$  (measured along the axis of the stylet; 56–62  $\mu\text{m}$  if measured from top to bottom as in Ehlers & Ax 1974). The

bursal appendage is 80  $\mu\text{m}$  long (measurable on only one specimen). These data can be placed within the known range of measurements for this species (see Willems et al. 2004a; table 1; Willems et al. 2005). However, as the variation in the size of the stylet is rather large, it could very well be that it concerns a species complex instead of a single species, as indicated earlier (see Willems et al. 2005). Since this size variation is the only known difference between the populations, it is highly arbitrary to split this complex into different species. Such an act should be backed up by a more thorough morphological analysis, which is clearly without the scope of this contribution.

##### *Messoplana minuta* Artois et al., 2000 Fig. 5

NEW LOCALITY: Arrawarra (New South Wales): Arrawarra Beach, in sand of rock pool north of headland, 24 Jul 2003.

KNOWN DISTRIBUTION: Weddell Sea (Artois et al. 2000).

MATERIAL EXAMINED: One specimen studied alive and mounted. Type material (see Artois et al. 2000).

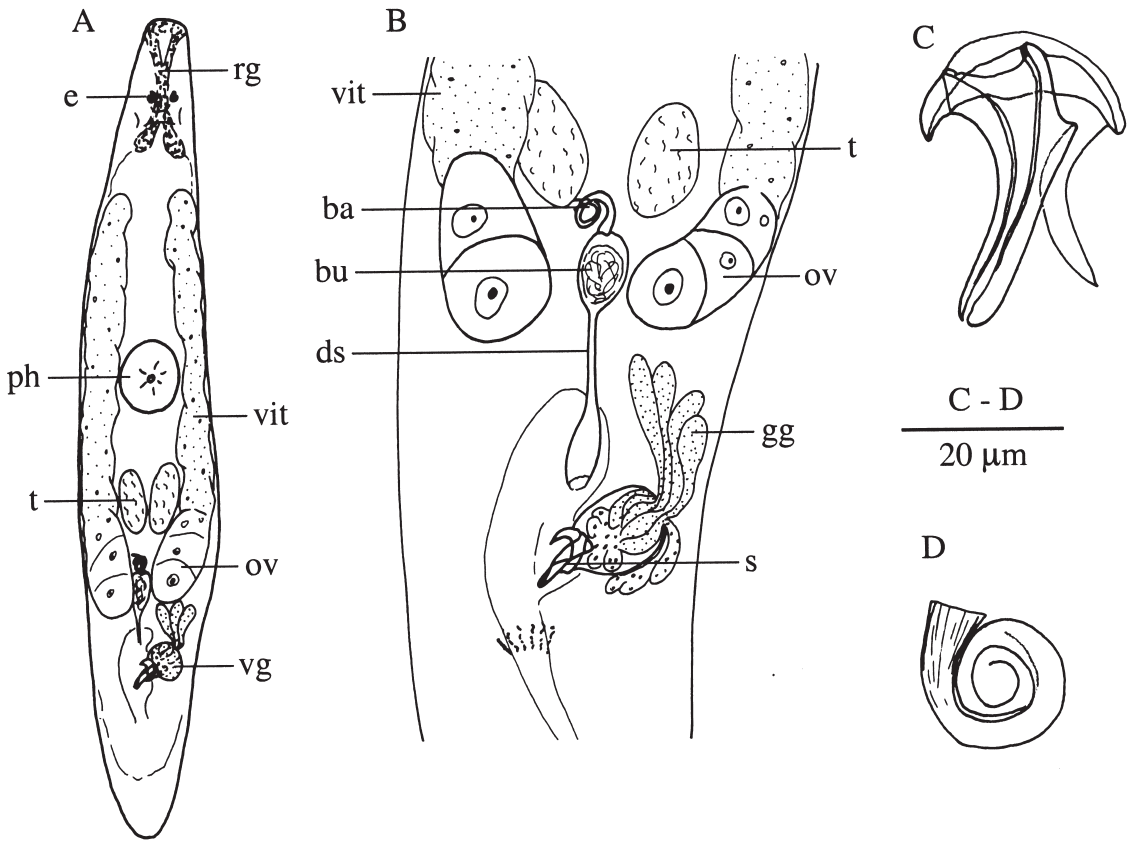
ADDITIONAL REMARKS: The animal is 0.7 mm long (measured on the whole mount) and rather slender (Fig. 5A). The structure of the genital system (Fig. 5B) does not deviate from that of other species of *Messoplana* Den Hartog, 1966. The stylet of the Australian specimen (Fig. 5C) consists of a slightly bent tube, which is 34  $\mu\text{m}$  long. Proximally it is attached to a hook-shaped, 22  $\mu\text{m}$ -long accessory spine. The base of the copulatory organ, which carries both the stylet and the accessory spine, is 32  $\mu\text{m}$  wide. The bursal appendage (Fig. 5D) is curved ( $>360^\circ$ ), 66  $\mu\text{m}$  long and apparently not split distally. In the specimens of *Messoplana minuta* from the Weddell Sea the bursal appendage is split into two short tubes. This is extremely difficult to observe in our specimen, as well as in the type material of *M. minuta*. Nevertheless, the shapes and sizes of the copulatory organ and the bursal appendage of the Australian specimen are almost identical to those of the specimens from the Weddell Sea (Artois et al. 2000).

##### *Ptychopera* sp.

Fig. 6

LOCALITY: North Stradbroke Island (Queensland, Australia): Point Lookout, small rocky bay on the north side, on *Ulva*-like algae in a tidepool, 14 Sep 1996.

MATERIAL EXAMINED: One specimen studied alive and mounted (in bad condition).



**Fig. 5** *Messoplana minuta*: **A**, habitus of a live animal; **B**, organisation of the genital system (from a live specimen); **C**, stilet (from a New Caledonian specimen); **D**, bursal appendage (from a New Caledonian specimen).

**DESCRIPTION AND REMARKS:** Only one individual of this species was observed alive and the whole mount is in a bad condition. Therefore, this description must be seen as provisional.

The pharynx is situated in the first half of the body (Fig. 6A: ph). Paired testes and ovovitellaria are present. Paired seminal vesicles open into a large, globular prostate vesicle, which is connected to a complex stilet. Where a large bursal organ opens into the common genital atrium, some small, hard teeth are present. A pseudocuticularised, winding tube (Fig. 6B: ds) probably forms the connection between this bursa and the ovaries, functioning as a spermatiduct. These characters allow the placement of this species into the taxon *Ptychopera* Den Hartog, 1964 (see Den Hartog 1964). Only the detailed structure of the stilet could not be determined, because of the bad condition of the whole mount, making the identification of this species extremely difficult. We refrain from identifying this species, which is

probably new to science, as no other *Ptychopera* species has similar teeth at the opening of the bursa. At the moment only one other species of this taxon is known to occur in Australia: *Ptychopera scutulifer* Ehlers & Ax, 1974 (see Willems et al. 2004a). However, in this species the pharynx is located in the most caudal part of the body and the stilet is very different in shape, in comparison with the situation observed on live material of the new specimen.

**Family Typhloplanidae Graff, 1905**

**Subfamily Typhloplaninae Luther, 1963**

*Pratoplana* sp.

Fig. 7

**LOCALITY:** Magnetic Island (Queensland, Australia): Cockle Bay, amongst mangroves in detritus-rich sediment with crab holes, 8 Sep 1996.

**MATERIAL EXAMINED:** One animal studied alive and mounted (in bad condition).

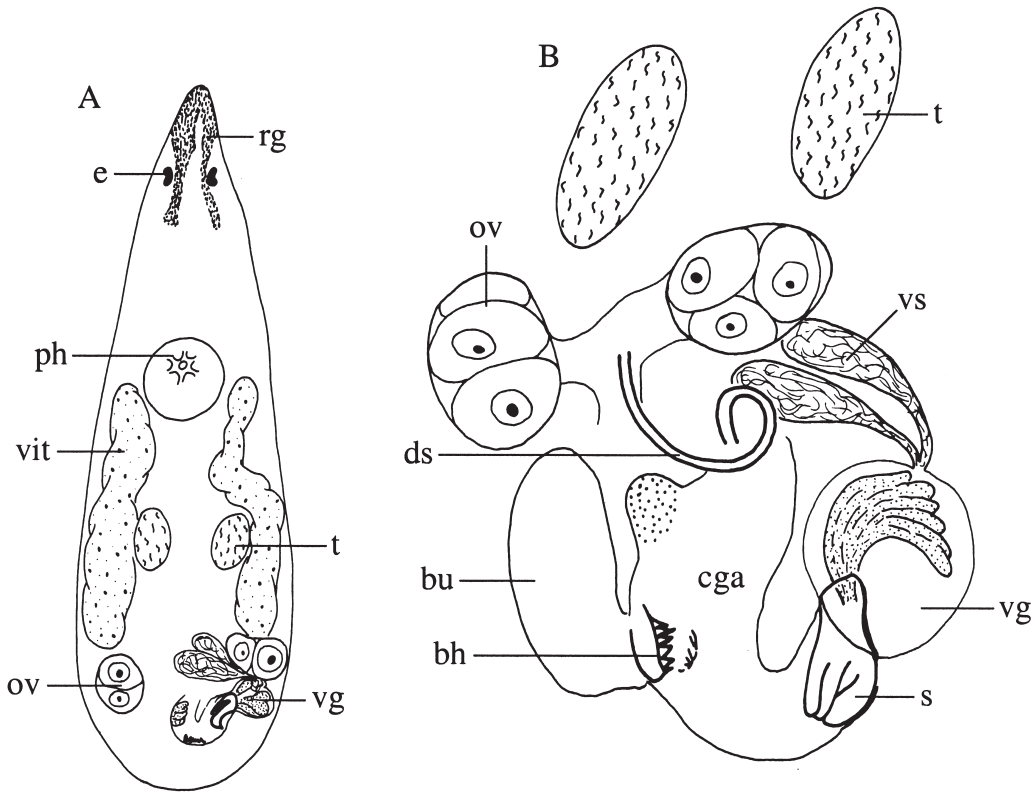


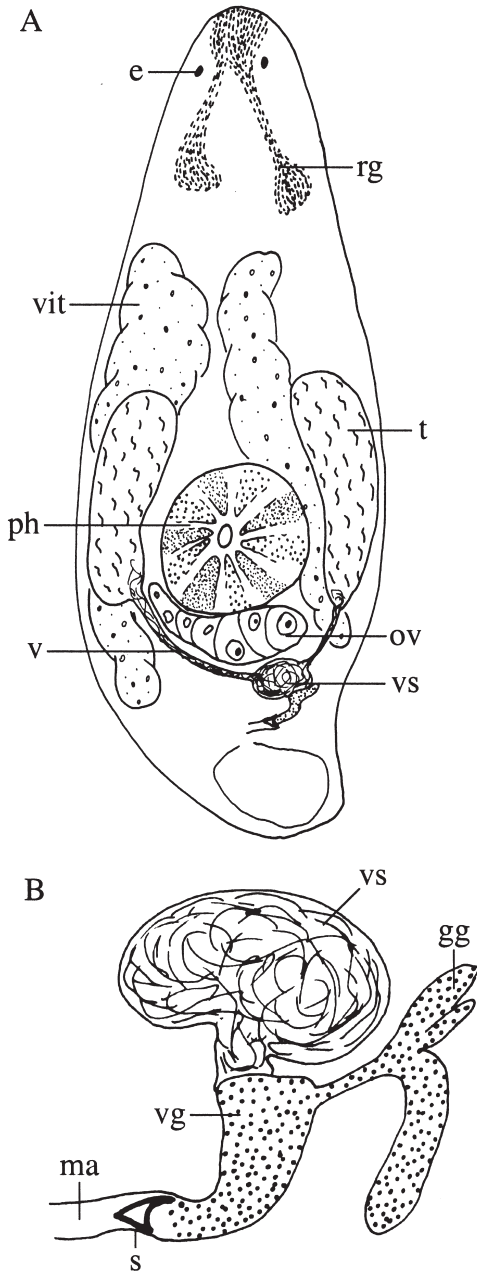
Fig. 6 *Ptychopera* sp.: A, habitus of a live animal; B, organisation of the genital system (from a live specimen).

DESCRIPTION AND REMARKS: Only one individual of this species was observed alive and the whole mount is in a very bad condition. Therefore this description must be seen as provisional.

The animal is small, only about 0.3 mm (measured on the whole mount), with two eyes and two conspicuous rhabdite tracts (Fig. 7A: rg) in between them. The pharynx (Fig. 7A: ph) is situated just behind the middle of the body. The paired testes lie besides the pharynx. There is only one seminal vesicle (Fig. 7A,B: vs), which is obviously intracapsular. The prostate vesicle also contains some coarse-grained prostate glands (Fig. 7B: gg), which have an extra-capsular part and enter the prostate vesicle from the side. The prostate vesicle itself is connected to a small, pseudocuticularised spine (Fig. 7B: s; thickened basement membrane of the male duct?). The vitellaria extend from about one-quarter of the body length caudally to just behind the pharynx. The large, elongated ovary lies immediately behind the pharynx. A large vesicle is present in the caudal body part. The exact nature of it could not

be discerned, but probably it is a part of the female system.

This marine representative of the Typhloplanidae, which encompasses mostly freshwater species, is a representative of the taxon *Pratoplana* Ax, 1960. This taxon is characterised by the presence of a muscular prostate vesicle connected to a small funnel-shaped stylet, paired vitellaria, an unpaired ovary, caudally from the pharynx, a widened female duct, functioning as a "vesicula resorbens" and a seminal receptacle (Ax 1960; Ehlers 1974). It has three representatives: *P. ayorae* Ehlers & Ehlers, 1989, *P. galeata* Ehlers, 1974 and *P. salsa* Ax, 1960. The specimen from Australia differs from *P. galeata* by the presence of eyes, by the shape of the prostate vesicle, which is extremely elongated in *P. galeata*, and by the presence of an intra-capsular seminal vesicle, paired extra-capsular in *P. galeata* (see Ehlers 1974). Furthermore, the stylet of *P. galeata* is 25 µm long and almost tubular, cup-shaped (Ehlers 1974), whereas it is short, funnel-shaped in the Australian specimen. *Pratoplana salsa* and



**Fig. 7** *Pratoiplana* sp.: **A**, habitus of a live animal; **B**, organisation of the male genital system (from a live specimen).

*P. ayorae* resemble each other in the structure of the stylet, which is a 6–7  $\mu\text{m}$  long funnel-shaped piece, with a narrow distal tip (Ax 1960; Ehlers & Ehlers 1989), somewhat resembling the stylet of the Australian specimen. However, both species differ

in the number of seminal vesicles: paired extra-capsular in *P. salsa* (Ax 1960) and unpaired intra-capsular in *P. ayorae* (Ehlers & Ehlers 1989). The Australian specimen therefore closely resembles *P. ayorae*, in the structure of the stylet and the number of seminal vesicles. However, since the detailed structure and the size of the stylet were impossible to determine because of the poor state of the whole mount, we refrain from allocating this specimen to an existing species or erecting a new species.

### Incertae sedis

#### *Kaitalugia lydieae* new genus and species

Fig. 8, 9

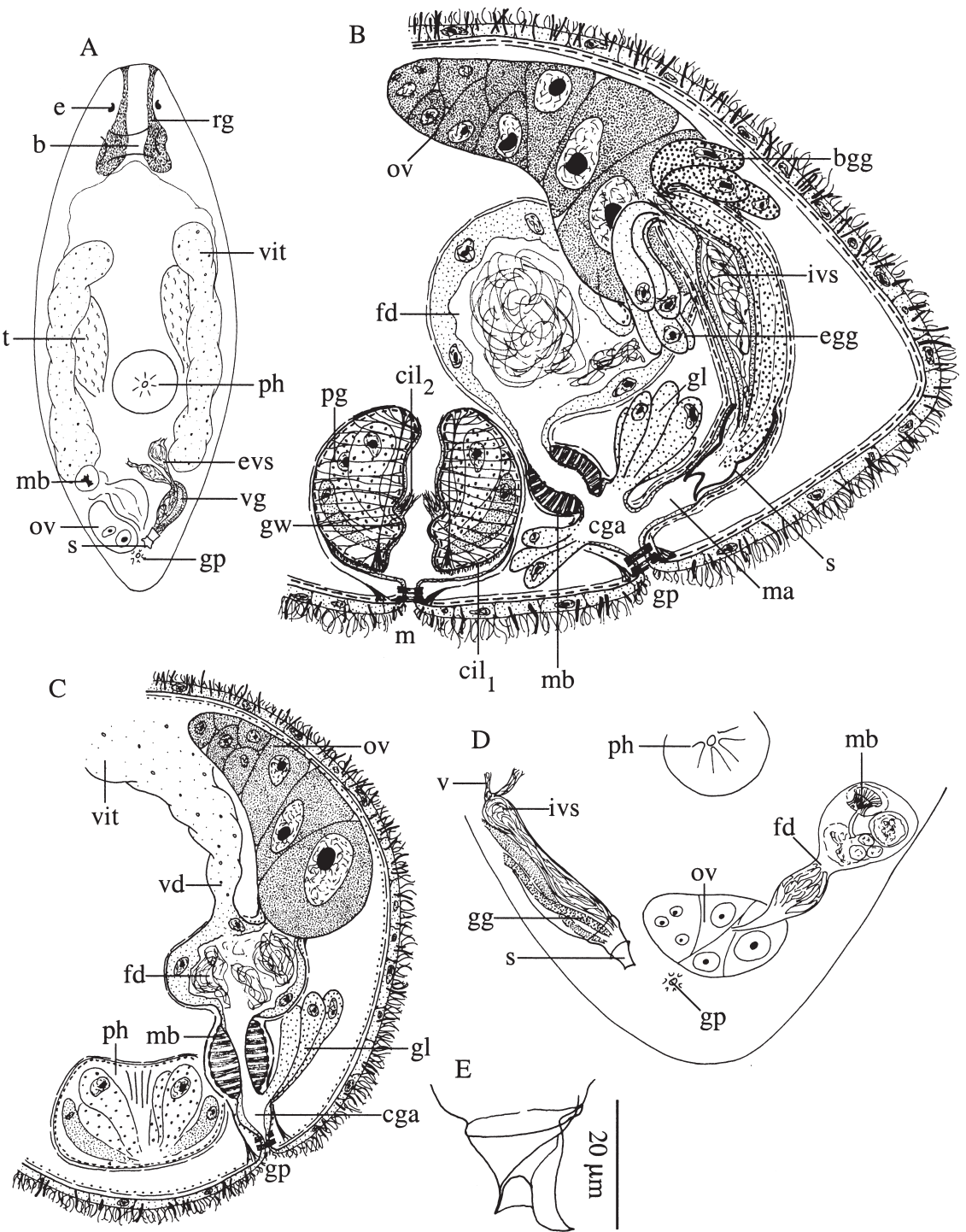
**LOCALITY:** Baie des Citrons (Nouméa, New Caledonia): on algae from the lagoon, 8 Aug 2003 (Type locality).

**MATERIAL EXAMINED:** Observations on live animals. Three whole mounts, one of them designated holotype (LUC no. 307), the others paratypes (LUC no. 308–309). Seven serially-sectioned animals, designated paratypes (LUC nos 310–316).

**ETYMOLOGY:** Genus name/prænomens refers to Kaitalugi, a mythical island in Melanesia, where ships are wrecked. Species dedicated to Mrs. Lydie Grosemans, technical assistant at LUC, Diepenbeek (Belgium).

**DESCRIPTION:** The uncoloured animals are 0.4–0.5 mm long (measured on whole mounts) and have two eyes. Rostral rhabdite glands (Fig. 8A: rg) are well developed, filled with thick rod-shaped,  $\pm 2 \mu\text{m}$ -long rhabdites. The cellular epidermis is  $\pm 3\text{--}4 \mu\text{m}$  thick and carries  $\pm 3 \mu\text{m}$ -long cilia. Dermal rhabdites are slender, rod-shaped, 3–6  $\mu\text{m}$  long and scattered over the body surface, slightly more densely packed on the dorsal side.

The rosulate pharynx (Fig. 8A,C,D: ph) is situated in the second body half, at about 60%. The mouth can be closed by a strong sphincter and is connected to the narrow prepharyngeal cavity by a very short muscular tube. The prepharyngeal cavity proper is lined with a low, anucleated (?) epithelium and surrounded by longitudinal muscles. The distal rim of the pharynx carries cilia (Fig. 8B: cil<sub>1</sub>), a feature difficult to discern because the cavity is very narrow. The pharynx lumen is lined with a low anucleated (?) epithelium. There are 24 internal longitudinal muscles. Both radial and external circular muscle layers are weak, whereas the internal circular muscles are thickened, especially near the proximal opening of the pharynx. Basophilic and eosinophilic gland ducts open into the lumen, distally from the



**Fig. 8** *Kaitalugia lydieae*: **A**, habitus of a live animal; **B**, reconstruction of the atrial organs from the left side (male genital system is displaced caudally for clarity); **C**, reconstruction from transverse sections of the female genital system; **D**, organisation of the genital system (from a live specimen); **E**, stylet (from the holotype).

so-called “Greifwulst” (prehensile girdle; Fig. 8B: gw), which carries long cilia (Fig. 8B: cil<sub>2</sub>).

The common genital pore lies at  $\pm 85\%$  and is guarded by a sphincter. The common genital atrium is lined with a low anucleated (?) epithelium and is surrounded by weak, inner circular and outer longitudinal muscles. The paired testes are situated slightly in front of and at both sides of the pharynx. The large, single ovary is situated caudally. The vitellaria lie dorsally of the testes and extend from  $\pm 30\%$  to the caudal body end.

In the live animal, two extra-capsular seminal vesicles were seen (Fig. 8A: evs), however, they were not observed in sectioned material, and may only represent temporary swellings of the vasa deferentia. The elongated copulatory bulb (Fig. 8A: vg) is directed rostrolaterally towards the pharynx (directed more caudally in Fig. 8B for clarity) and is surrounded by a strong inner circular muscle layer and a weak outer longitudinal one. The copulatory bulb contains a large elongated seminal vesicle (Fig. 8B: ivs), which is lined with a low epithelium, next to two types of glands, each with an extra-capsular part: coarse-grained basophilic (Fig. 8B: bgg) and fine-grained eosinophilic ones (Fig. 8B: egg). Both sperm and prostate secretion are discharged into the stylet (Fig. 8E), which is 27  $\mu\text{m}$  long, 21  $\mu\text{m}$  wide proximally and 8–9  $\mu\text{m}$  wide distally ( $n = 2$ ). It is a simple, short funnel-shaped piece, which narrows slightly distally, and shows a bent hook at one side. It lies in the male atrium (Fig. 8B: ma), which is lined with a low, anucleated epithelium and surrounded by inner circular and outer longitudinal muscles, and enters the common genital atrium from its caudal side.

The very large ovary is situated dorsocaudally and connected with the common genital atrium through a wide female duct. Near the ovary, the female duct is surrounded by some weak circular muscles. More distally, it is lined with a high, nucleated epithelium, surrounded by very weak longitudinal muscles, and filled with sperm. It is swollen asymmetrically, forming a kind of bursal organ in most sectioned individuals. Towards the atrium, the female duct narrows and is guarded by a muscular bulb (Fig. 8A–D: mb) that consists of strong radial muscles and is surrounded by longitudinal muscles, which are clearly stronger in this part than around the rest of the female duct. This muscular bulb is extremely obvious in live animals and contracts regularly (Fig. 9A–D). The female duct enters the common genital atrium from the rostradorsal side, where a large bundle of

basophilic glands (Fig. 8B,C: gl) opens into the genital atrium. A uterus is lacking.

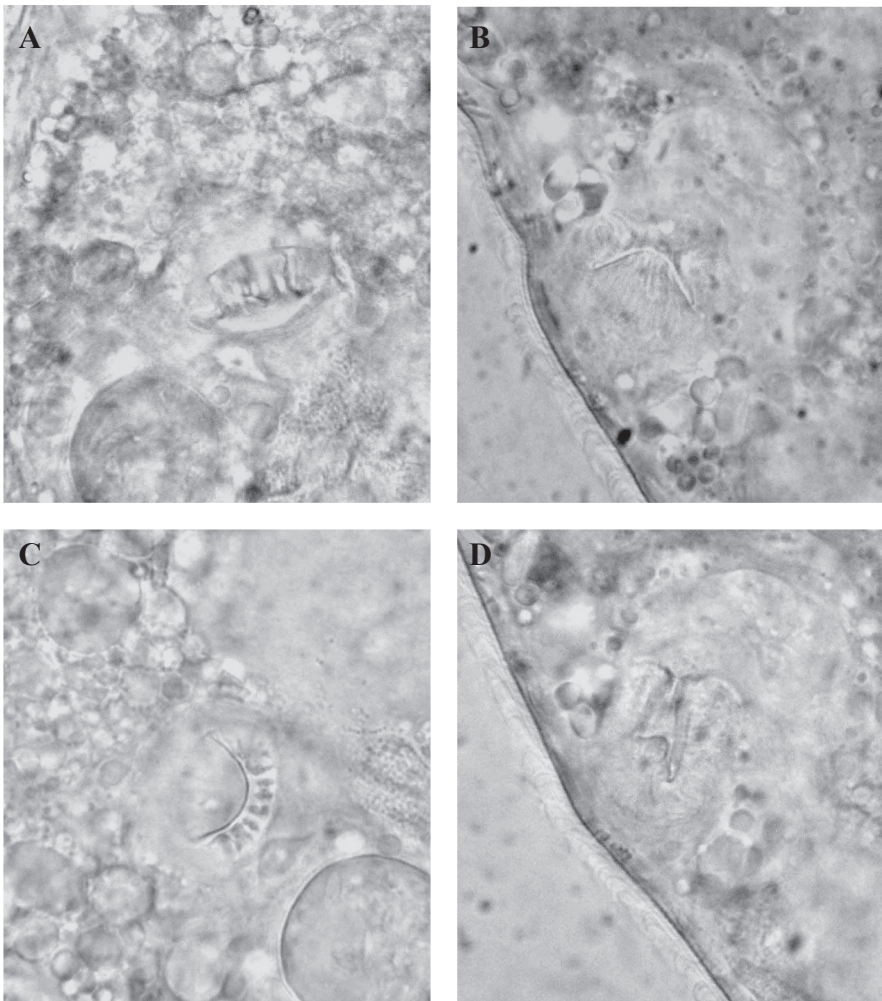
DIAGNOSIS: *Kaitalugia* new genus. Typhloplanidae species with pharynx situated mid body. Distal rim and prehensile girdle (Greifwulst) of pharynx with cilia. Elongated copulatory bulb with intracapsular seminal vesicle. Stylet simple, funnel-shaped. Female duct swollen and filled with sperm, distally with a very strong muscular part. Large bundle of glands at transition of female duct to genital atrium.

*Kaitalugia lydieae* new species. *Kaitalugia* species with simple stylet, 27  $\mu\text{m}$  long, 21  $\mu\text{m}$  wide proximally and 8–9  $\mu\text{m}$  wide distally, with a bent hook at one side.

DISCUSSION: *Kaitalugia lydieae* is characterised by the presence of a single ovary, which is a diagnostic feature for both Mariplanellinae Ax & Heller, 1970 and Typhloplanidae Graff, 1905. However, Mariplanellinae is a subtaxon of Trigonostomidae Graff, 1905 (sensu Den Hartog, 1964) of which the representatives have, apart from the female duct, a second connection between the ovary and the common genital atrium (Den Hartog 1964; Ax & Heller 1970; Ax 1971). Since this double connection is lacking in *K. lydieae*, this new species therefore has to be placed within the Typhloplanidae, which mainly contains freshwater species.

Within this family several taxa are recognised, almost all of which are based on doubtful or difficult to observe characters, such as the position of the testes relative to the vitellaria and the opening of the excretory system (mostly invisible in marine species). Therefore this species is not allocated to any of the subfamilies, but, for the time being, placed as a species incertae sedis within the taxon Typhloplanidae.

Within the Typhloplanidae few species are marine, and *K. lydieae* most closely resembles *Thalassoplanella collaris* Luther, 1946 and *Thalassoplanina geniculata* (Beklemishev, 1927) Ax, 1959. However, both species are easily distinguished from *K. lydieae* by the detailed structure of their stylet (see Luther 1946; Ax 1959), whereas the overall structure of the male system is very similar in all three species. The major differences are to be found in the female system. In *T. collaris* a separate copulatory bursa and a second rudimentary ovary are present (Luther 1946). Both features are absent in *K. lydieae*. Furthermore, the female duct of *T. collaris* is not swollen over almost its whole length, as in *K. lydieae*, but is connected to a terminal seminal receptacle (Luther 1946). In *T. geniculata*, on the other hand, the female system is also swollen



**Fig. 9** *Kaitalugia lydieae*: A–D, different stages of contraction of the muscular bulb on the female duct (from a live specimen).

over its whole length, but is connected to a terminal seminal receptacle (or vesicula resorbens; Ax 1959) and shows a bulge (bursa copulatrix in Ax 1959) about half way along its length. Additionally, the female duct of *T. geniculata* is strongly muscular over its whole length, while in *K. lydieae* a highly muscular bulb in the distal part of the female duct occurs.

***Kaitalugia falcata* new species**

**LOCALITIES:** Ile Nou (Nouméa, New Caledonia); Nouville, on algae from the lagoon south of the asylum, 16 Aug 2003 (Type locality). Arrawarra (New South Wales, Australia): Mullaway Headland,

on red and brown algae in rock pools, 24 Jul 2003; Arrawarra: southern part of the beach near rocks, on *Sargassum*-like algae in a permanent pool, 27 Aug 1996.

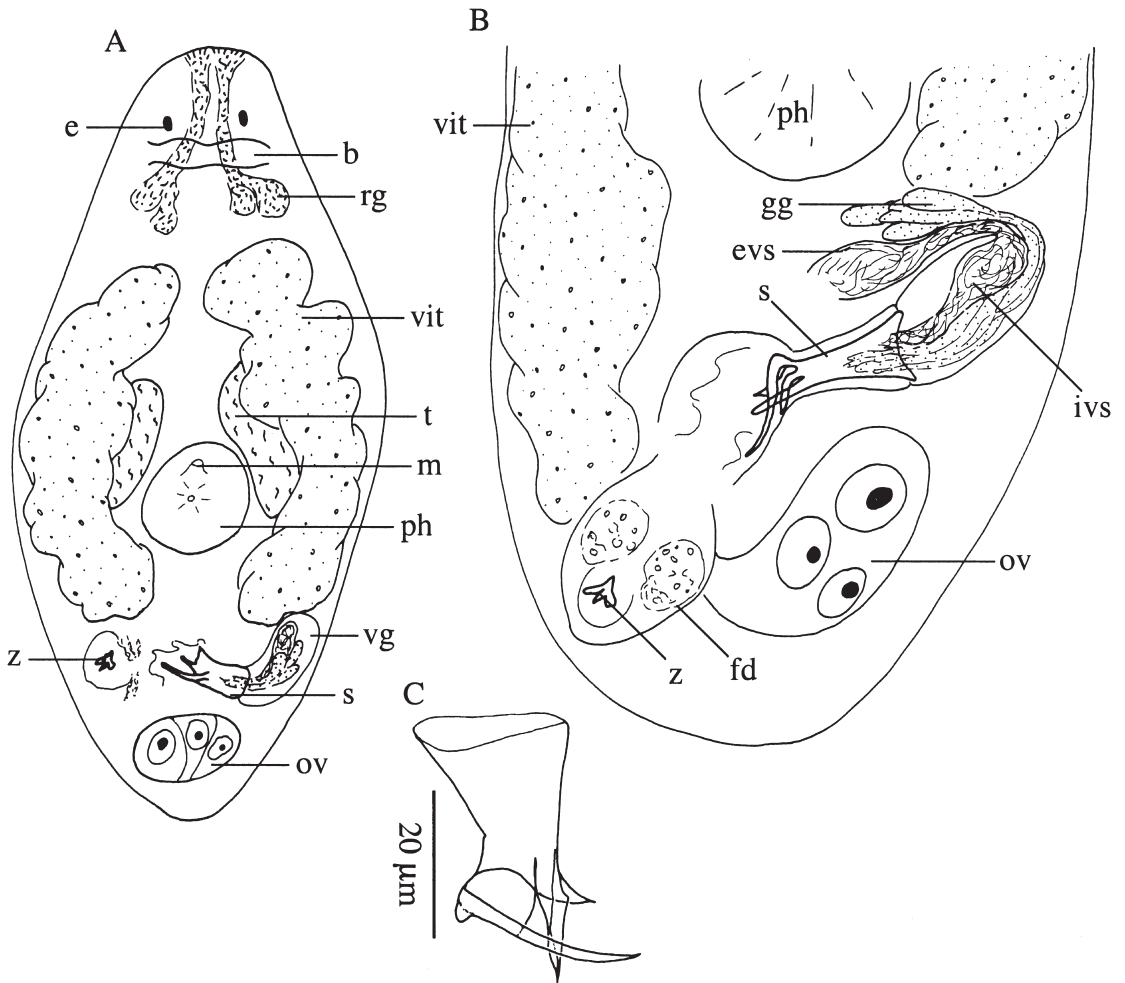
**MATERIAL EXAMINED:** Observations on live animals. Four whole mounts, two of them in bad condition. One whole mount designated holotype (LUC no. 317).

**ETYMOLOGY:** Species name/epithet refers to the presence of a long, scythe-shaped spine on the stylet. *Falcatus* (Lat.): sickle- or scythe-shaped.

**DESCRIPTION:** The unpigmented animals are  $\pm 0.4$  mm long (measured on whole mounts).

Fig. 10





**Fig. 10** *Kaitalugia falcata*: **A**, habitus of a live animal; **B**, organisation of the genital system (from a live specimen); **C**, stylet (from the holotype).

Rostrally two conspicuous rhabdite glands are present, running in between the eyes. The pharynx (Fig. 10A: ph) is situated just behind the middle of the body.

The testes lie at the same level as the pharynx, in the middle of the body. One external seminal vesicle (Fig. 10B: evs) was clearly visible in a live specimen. This seminal vesicle narrows, forming a seminal duct, which enters the copulatory bulb proximally. The bean-shaped copulatory bulb contains the intracapsular seminal vesicle (Fig. 10B: ivs) and the prostate glands (with extra-capsular cell bodies). It is situated caudally of the pharynx and connected to the stylet (Fig. 10A,B: s, 10C), which is 29–34 µm long ( $n = 3$ ;  $m = 31$  µm), 17 µm wide proximally and

7–11 µm wide distally. The stylet is funnel-shaped with three distal projections, the first straight and dagger-like (12–15 µm long), the second short and bent (10 µm long) and the third long, narrow and scythe-shaped (16–25 µm long).

The vitellaria extend from just behind the rostral glands to the level of the pharynx, whereas the single ovary is situated caudally. A large bursal organ (swollen female duct?) is present and contains a star-shaped structure (Fig 10A,B: z; not visible on whole mounts).

**DIAGNOSIS:** *Kaitalugia* species with 29–34 µm-long stylet carrying two additional projections distally: a straight dagger-like one (12–15 µm long) and a slender scythe-shaped one (16–25 µm long).

**Table 2** Species list of all marine Typhloplanoida from the Coral Sea and Tasman Sea, with their known distribution within (column I) and outside (column II) the region. Abbreviations: A: eastern Australia; Al: Alaska; Ber: Bermuda; Braz: Brazil; BS: Baltic Sea; cosm: cosmopolitan; Cur: Curaçao; EA: East Africa; Gal: Galapagos; MS: Mediterranean Sea and Black Sea; NP: North American Pacific coast; NATl: northern Atlantic Ocean; NA: North American Atlantic coast; NC: New Caledonia; SATl: southern Atlantic; SW: Swedish west coast; WS: Weddell Sea.

	I	II	Main literature on distribution
Promesostomidae Den Hartog, 1964			
Brinkmaniellinae Luther, 1948			
<i>Brinkmanniella australiensis</i> Willems et al., 2004	A	–	Willems et al. (2004a)
<i>Brinkmanniella palmata</i> Karling, 1986	NC	NP, MS, SW	Karling (1986); this paper
<i>Coronhelmis cuypersi</i> new species	A	–	this paper
<i>Coronhelmis novaecaledoniae</i> new species	NC	–	this paper
<i>Kymocarens kanakorum</i> new species	NC	–	this paper
Promesostominae Luther, 1948			
<i>Promesostoma</i> new species 1	NC	–	
<i>Promesostoma</i> new species 2	NC	–	
Incertae sedis			
<i>Vauclusia conica</i> Willems et al., 2004	A	–	Willems et al. (2004a)
Solenopharyngidae Graff, 1882			
Solenopharynginae Ehlers, 1972			
<i>Austradenopharynx reynaertsi</i> new genus and species	A	–	this paper
Incertae sedis			
<i>Pilamonila bimacula</i> Willems et al., 2004	A/NC	–	Willems et al. (2004a); this paper
Trigonostomidae Graff, 1905 <i>sensu</i> Den Hartog, 1964			
Trigonostominae Luther, 1948 <i>sensu</i> Den Hartog, 1964			
<i>Ceratopera axi</i> (Riedl, 1954) Den Hartog, 1964	A/NC	cosm	Willems et al. (2004a); this paper
<i>Messoplana minuta</i> Artois et al., 2000	A	WS	Artois et al. (2000)
<i>Ptychopera scutulifer</i> Ehlers & Ax, 1974	A	Gal, EA	Ehlers & Ax (1974); Schockaert & Martens (1985)
<i>Ptychopera</i> sp.	A	–	this paper
<i>Trigonostomum armatum</i> (Jensen, 1878) Gamble, 1900	A/NC	NAtl, SATl, BS, Cur (cosm?)	Willems et al. (2004b)
<i>Trigonostomum australis</i> Willems et al., 2004	A	–	Willems et al. (2004b)
<i>Trigonostomum denhartogi</i> (Karling, 1978) Willems et al., 2004	NC	Cur, Ber, EA	Willems et al. (2004b)
<i>Trigonostomum franki</i> Willems et al., 2004	NC	Cur, Flor, EA	Willems et al. (2004b)
<i>Trigonostomum lilliei</i> (Graff, 1911) Meixner, 1924	A	NA, Braz	Willems et al. (2004b)
<i>Trigonostomum spinigerum</i> Willems et al., 2004	NC	–	Willems et al. (2004b)
<i>Trigonostomum watsoni</i> Willems et al., 2004	A/NC	–	Willems et al. (2004b)
Typhloplanidae Graff, 1905			
Cephalopharynginae Hochberg, 2004			
<i>Cephalopharynx cannoni</i> Hochberg, 2004	A	–	Hochberg (2004)
Typhloplaninae Luther, 1963			
<i>Pratoplana</i> sp.	A	–	this paper
<i>Magnetia queenslandica</i> Hochberg & Cannon, 2003	A	–	Hochberg & Cannon (2003)
Incertae sedis			
<i>Kaitalugia lydieae</i> new genus new species	NC	–	this paper
<i>Kaitalugia falcata</i> new species	A/NC	–	this paper

DISCUSSION: This species must be placed within the taxon *Kaitalugia*, based on its overall resemblance with *K. lydieae*, in both the structure of the genital system (observations of live animals) and the detailed structure of the stylet. However, since no sectioned individuals were available, the detailed structure of the genital system could not be studied. The main difference with *K. lydieae* is the presence of a more or less star-shaped structure in the female duct, evidently the equivalent of the muscular bulb as in *K. lydieae*. However, it is not clear yet if this is a hard structure or a muscular contracting bulb as in *K. lydieae*.

### SPECIES LIST OF TYPHLOPLANOIDA FROM THE CORAL SEA AND TASMAN SEA

On the Australian east coast and in New Caledonia 26 marine species of Typhloplanoida occur, of which 8 species are Promesostomidae, 2 are Solenopharyngidae, 11 are Trigonostomidae and 5 are Typhloplanidae.

An overview of these species and their distribution, is given in Table 2. For *Ceratopera axi* and all species of *Trigonostomum* Schmidt, 1852 only one reference is given, where all distribution data and references can be found.

The two new *Promesostoma* species are treated in a monography of the taxon.

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### REFERENCES

- Artois T, Vermin W, Schockaert E 2000. Rhabdocoela (Platyhelminthes) from the Weddell Sea (Antarctica) with the description of eight new species. *Belgian Journal of Zoology* 130: 103–110.
- Ax P 1951. Die Turbellarien des Eulitorals der Kieler Bucht. *Zoologische Jahrbücher (Abteilung für Systematik, Ökologie und Geographie der Tiere)* 80: 277–378.
- Ax P 1954. Die Turbellarienfauna des Küstengrundwassers am Finnischen Meerbusen. *Acta Zoologica Fennica* 81: 1–54.
- Ax P 1959. Zur Systematik und Tiergeographie der Turbellarienfauna in den ponto-kaspischen Brackwassermeeren. *Zoologische Jahrbücher (Abteilung für Systematik, Ökologie und Geographie der Tiere)* 87: 43–184.
- Ax P 1960. Turbellarien aus salzdurchtränkten Wiesenböden der deutschen Meeresküsten. *Zeitschrift fuer wissenschaftliche Zoologie* 163: 210–235.
- Ax P 1971. Zur Systematik und Phylogenie der Trigonostominae (Turbellaria, Neorhabdocoela). *Mikrofauna des Meeresbodens* 4: 141–220.
- Ax P 1994. *Coronhelmis*-Arten (Rhabdocoela, Platyhelminthes) von Grönland, Island und den Färöer. *Microfauna Marina* 9: 221–237.
- Ax P 1995a. Brackish-water Plathelminthes from the Faroe Islands. *Hydrobiologia* 305: 45–47.
- Ax P 1995b. Plathelminthes aus dem Eulitoral von Godhavn (Disko, Grönland). *Microfauna Marina* 10: 249–294.
- Ax P, Armonies W 1987. Amphiatlantic identities in the composition of the boreal brackish water community of Plathelminthes. A comparison between the Canadian and European Atlantic coast. *Microfauna Marina* 3: 7–80.
- Ax P, Armonies W 1990. Brackish water Plathelminthes from Alaska as evidence for the existence of a boreal brackish water community with circumpolar distribution. *Microfauna Marina* 6: 7–109.
- Ax P, Heller R 1970. Neue Neorhabdocoela (Turbellaria) vom Sandstrand der Nordsee-Insel Sylt. *Mikrofauna des Meeresbodens* 2: 55–98.
- Den Hartog C 1964. A preliminary revision of the *Proxenetes* group (Trigonostomidae, Turbellaria). *Proceedings Koninklijke Nederlandse Akademie van Wetenschappen (Series C)* 67: 371–407.
- Dittman S 1991. Plathelminths in tropical intertidal sediments of northeastern Australia. *Hydrobiologia* 227: 369–374.
- Ehlers U 1972. Systematisch-phylogenetische Untersuchungen an der Familie Solenopharyngidae (Turbellaria, Neorhabdocoela). *Mikrofauna des Meeresbodens* 11: 3–78.

- Ehlers U 1974. Interstitielle Typhloplanoida (Turbellaria) aus dem Litoral der Nordseeinsel Sylt. Mikrofauna des Meeresbodens 49: 427–526.
- Ehlers U, Ax P 1974. Interstitielle Fauna von Galapagos VIII. Trigonostominae (Turbellaria, Typhloplanoida). Mikrofauna des Meeresbodens 30: 641–671.
- Ehlers U, Ehlers B 1981. Interstitial Fauna of Galapagos XXVII. Byrsophlebiidae, Promesostomidae Brinkmaniellinae, Kytorrhynchidae (Turbellaria, Typhloplanoida). Mikrofauna des Meeresbodens 83: 83–116.
- Ehlers U, Ehlers B 1989. Interstitielle Fauna von Galapagos XXXVIII. *Haloplanella* Luther und *Pratoplana* Ax (Typhloplanoida, Plathelminthes). Microfauna Marina 5: 189–206.
- Hochberg R 2004. A new genus and subfamily of Typhloplanidae (Platyhelminthes, Rhabdocoela) from Australia with a cladistic analysis of subfamily relationships. Journal of Natural History 38: 925–937.
- Hochberg R, Cannon LRG 2003. *Magnetia queenslandica*, a new genus and new species of typhloplanid flatworm (Platyhelminthes: Rhabdocoela) from Magnetic Island in North Queensland, Australia. Raffles Bulletin of Zoology 51: 1–6.
- Karling TG 1956. Morphologisch-histologische Untersuchungen an den männlichen Atrialorganen der Kalyptorrhynchia. Arkiv för Zoologi 2: 187–279.
- Karling TG 1974. Turbellarian fauna of the Baltic proper. Identification, ecology and biogeography. Fauna Fennica 27: 1–101.
- Karling TG 1986. Free-living marine Rhabdocoela (Platyhelminthes) from the N. American Pacific coast. With remarks on species from other areas. Zoologica Scripta 15: 201–219.
- Luther A 1946. Untersuchungen an Rhabdocoelen Turbellarien -V- Ueber einige Typhloplaniden. Acta Zoologica Fennica 46: 3–56.
- Luther A 1948. Untersuchungen an Rhabdocoelen Turbellarien -VII- Ueber einige marine Dalyellioida -VIII- Beiträge zur Kenntnis der Typhloplanoida. Acta Zoologica Fennica 55: 3–122.
- Luther A 1962. Die Turbellarien Ostfennoskandiens. III. Neorhabdocoela 1. Dalyellioida, Typhloplanoida: Byrsophlebiidae und Trigonostomidae. Fauna Fennica 12: 1–71.
- Müller D, Faubel A 1993. The ‘Turbellaria’ of the River Elbe Estuary. A faunistic analysis of oligohaline and limnic areas. Archiv für Hydrobiologie Suppl. 75: 363–396.
- Riedl R 1954. Neue Turbellarien aus dem mediterranen Felslitoral. Ergebnisse der ‘Unterwasser Expedition AUSTRIA 1948–1949’. Zoologische Jahrbücher (Abteilung für Systematik, Ökologie und Geographie der Tiere) 82: 157–244.
- Schockaert ER 1996. Turbellarians. In: Hall GS. ed. Methods for the examination of organismal diversity in soils and sediments. Wallingford, CAB International. Pp. 211–226.
- Schockaert ER, Martens PM 1985. Turbellaria from Somalia. III. Lecithoepitheliata and Typhloplanoida. Monitore zoologico italiano (NS) Supplement 20: 27–41.
- Willems W, Artois T, Vermin W, Bäckeljau T, Schockaert E 2004a. Reports on free-living Platyhelminthes from Australia: Typhloplanoida, with the description of three new taxa. Zoological Science 21: 333–341.
- Willems WR, Artois TJ, Vermin WA, Schockaert ER 2004b. Revision of *Trigonostomum* Schmidt, 1852 (Platyhelminthes, Typhloplanoida, Trigonostomidae) with the description of seven new species. Zoological Journal of the Linnean Society 141: 271–296.
- Willems WR, Artois TJ, Vermin WA, Schockaert ER 2005. ‘Typhloplanoida’ (Platyhelminthes: Rhabdocoela) from the Indian Ocean, with the description of six new taxa. Journal of Natural History 39: 1561–1582.