New freshwater interstitial Otoplanidae (Platyhelminthes: Proseriata) from the Paraná and Uruguay rivers, South America

CAROLINA NOREÑA¹, CRISTINA DAMBORENEA², & FRANCISCO BRUSA²

¹Departamento de Biodiversidad y Biología Evolutiva, Museo Nacional de Ciencias Naturales, Madrid, Spain, and ²CONICET, División Zoología Invertebrados, Facultad de Ciencias Naturales y Museo, La Plata, Argentina

(Accepted 21 April 2004)

Abstract
This study describes two new freshwater otoplanid species (Platyhelminthes, Proseriata), Itaspiella parana n. sp. and Philosyrtis rauli n. sp., from interstitial habitats of the middle Paraná river (Argentina) and lower Uruguay river (Uruguay), respectively. Kata sp. from the Uruguay river is briefly characterized. This is the first report of otoplanids from freshwater environments of South America. The studied areas are particular biotopes. At present, only a few studies on the turbellarian fauna and its ecology have been carried out in the Paraná river and the records presented here are the first for the Uruguay river. The main difference between other known otoplanid species and Itaspiella parana, Philosyrtis rauli and Kata sp. is their ecological characterization. Until now the family Otoplanidae was known only from marine environments, with a few exceptions.

Keywords: Freshwater Otoplanidae, new species, South America

Introduction
The family Otoplanidae is well known from marine environments of the North Atlantic (and adjacent seas: North Sea and Baltic Sea) and the Pacific Ocean (Karling 1964; Ax and Ax 1967, 1974a, 1974b; Sopott 1972; Tajika 1983a, 1983b). Ax’s monograph (1956) is a basic work on the morphology, systematics and distribution of this family.

Among otoplanids only three species of Pseudosyrtis (Paratoplaninae) (P. subterranea (Ax, 1951) Ax, 1956, P. fluviatilis (Gieysztor, 1938) Ax, 1956 and P. neiswestnovae Riemann, 1965) are known to occur in limnic/brackish environments of northern Europe. These species have been considered as marine immigrants to limnic environments (Gieysztor 1938; Ax 1956).

The interstitial turbellaria of South America are generally poorly known, with the exception of the well-known marine Proseriata from the Galápagos Islands (Ecuador) (Ax...
and Ax 1974a, 1974b, 1977), and those from localities near São Paulo (Brazil) (Marcus 1949, 1950, 1952). The species found in these habitats belong to the families Archimonocelididae, Coelogynoporidae, Monocelididae, Nematoplanidae, Otoplanidae, and Polystyliophoridae (Noreña et al. 2003).

In the present paper two new freshwater otoplanid species, *Itaspiella parana* and *Philosyrtis rauli*, from the middle Paraná river and lower Uruguay river, respectively, are described. Furthermore, *Kata* sp. from the Uruguay river is briefly characterized.

The discovery of freshwater species from the Paraná and Uruguay rivers extends the distribution of the family Otoplanidae with regard to the biotopes it occupies.

This new occurrence of the family Otoplanidae in freshwater biotopes increases its relevance from a phylogenetic and ecological viewpoint (Ax 1956; Sopott-Ehlers 1985).

### Material and methods

The materials were collected in October 1989 from the benthos of the Paraná river (31°39'S, 60°46'W) and Colastiné river (31°37'S, 60°36'W), Santa Fé Province (Argentina) using a dredge. Other samples were taken in November 2002 and January and February 2003, from the benthos of the Uruguay river at Las Cañas (33°09'34.3"S, 58°21'30.3"W), Department of Río Negro (Uruguay) with a corer (a 5 cm diameter plastic tube) (Figure 1). All samples were transported to the laboratory in plastic bags.

The specimens were removed alive from the sandy sediment under a stereo-microscope and then studied through squash preparations under the microscope. For histological procedures the individuals were fixed in Bouin’s fluid and preserved in 70% ethanol. Sections, 4.5 and 4 μm thick, were stained with Azan and mounted in DPX following Romeis (1989).

The temperature, pH, conductivity, total dissolved sediments (TDS), salinity, and dissolved oxygen were recorded at all localities (Table I).

The ecological characterization of the specimens is based on the studies of Karling (1974), Heitkamp (1982) and Noreña-Janssen (1995b).

### Results

**Family OTOPLANIDAE** Hallez, 1892

**Subfamily OTOPLANINAE** Hallez, 1910

*Itaspiella* Ax, 1956

*Itaspiella parana* n. sp. (Figure 2)

**Locality**

Paraná and Colastiné rivers near Santa Fé, Argentina. Sublittoral, sandy sediments, October 1989.

**Material**

Some individuals studied alive and one of them sagittally sectioned (4.5 μm).

**Type material**

Holotype: one sagittally sectioned specimen deposited in the Museo Nacional de Ciencias Naturales de Madrid (cat. no. MNCN 4.01/45).
**Etymology**

The specific name refers to the Paraná river where the specimens were found.

**Description**

Length about 2 mm. Rapid and extremely spastic movements through the sand grains. Body fusiform, dorsally convex, ventrally flat, cross-section triangular (Figure 2a),

---

Table I. Temperature, pH, conductivity, TDS, salinity and dissolved oxygen values of sampled localities.

|                                    | Paraná river, Santa Fé, Argentina | Uruguay river, Las Cañas, Uruguay |
|------------------------------------|-----------------------------------|-----------------------------------|
|                                    | 23 October 1989                   | 18 November 2002 21 January 2003 13 February 2003 |
| Temperature (°C)                   | 19.1–21.6                         | 25.5 28 31.3                     |
| $O_2$ (mg l$^{-1}$)                | 7.5–7.6                           | 6.96 6.58 7.35                   |
| $O_2$ (%)                          | –                                 | 78.9 85 94.6                     |
| pH                                 | 6.8                               | 6.87 6.58 7.01                   |
| Conductivity (μS)                  | 45–59                             | 82.8 59.3 97.3                   |
| TDS (mg l$^{-1}$)                  | –                                 | 41.5 28.9 49                     |
| Salinity ($S \times 10^{-3}$)      | 0.0315–0.0413                      | 1.0 0 0                          |
| Depth (m)                          | 8–14                              | 1 1 1                            |

---

Figure 1. South American map with a detail of sample sites.
colourless and transparent. Anterior part of the body with a small cephalic lobe and a row of sensory bristles. Two strong bristles laterally, behind the lobe. Posterior end with numerous adhesive papillae. Pharynx cylindrical, in the middle of body. Encapsulated, characteristically shaped brain communicated with the statocyst through subepidermal muscle fibres. Frontal glands situated behind the brain. Creeping sole extending from the anterior end to the posterior end, sparser behind the genital pore. Epidermis is devoid of dorsal cilia, provided with rod-shaped adenal rhabdites. Epidermal nuclei depressed.

There are three rows of adhesive papillae: two on the lateral margins and one dorsally situated. The papillae consist of one or three cells with connecting subepidermal glands. The posterior end of the body shows a special adhesive area with well-developed papillae. The cylindrical pharynx is situated horizontally, twice as long as wide, with completely ciliated epithelium and the longitudinal muscle layer next to the epithelium. All the
pharynx glands are extrapharyngeal and aggregated ventrolaterally. The gut is not extended above the brain. The gastrodermis is thin-walled. The small ovaries at the basis of the pharynx are not divided into follicles and contain only a few oocytes. The two regular rows of testes, with about seven follicles each, are situated below the prepharyngeal gut, separated from each other by a longitudinal fold of the gut. There are two lateral rows of yolk follicles along the body, without a gap along the pharynx. The common oviduct, running on the right side of the atrium, arises by fusion of the two germovitellosducts behind the pharynx. The common genital pore is located near the posterior end. The atrium is funnel-like and receives the bursa stalk from behind, the penis needles dorsally and the shell glands frontally. Cement glands discharge their secretion through the body wall around the gonopore. The male copulatory apparatus consists of a large ovoid seminal vesicle, a caudal diverticulum, a distal tubular prostatic vesicle and a cuticular apparatus. This latter structure comprises 15 needles, each 48.5\,\text{mm} long, and a medial 54\,\text{mm} long stylet ("Trichterrohr" after Ax 1956). The needles are proximally straight, distally curved, with a short, pointed denticle above the tip. The stylet is dagger-like and pointed distally. The bursa ("primäre Bursalorgan" after Ax 1956), with nucleated epithelium and a weak muscular layer, is situated behind the common atrium, and is connected to the latter by a long tubular insemination canal or stalk.

**Ecological features.** *Itaspiella parana* was found in the middle Paraná river in sublittoral sediments composed of fine and medium-grained sand. This interstitial habitat, influenced by high water-currents and poor in organic matter, shows generally low biological diversity and abundance. According to the abiotic factors measured in the sample areas (Table I), the ecological characterization is estimated as follows: stenothermic, mesoeuryionic, rheobiotic, stenobiotic, stenoecious freshwater inhabitant.

**Discussion.** *Itaspiella parana* is the first known freshwater representative of genus *Itaspiella*. At present, only three freshwater species belonging to the Otoplanidae are known: *Pseudosyrtis fluviatilis* (Gieysztor, 1938) Ax, 1956, *P. subterranea* (Ax, 1951) Ax, 1956 and *P. neiswestnovae* Riemann, 1965. Despite its freshwater habitat, *I. parana* is a typical representative of the subfamily Otoplaninae. It shares the following characters with genus *Itaspiella*: epidermis with depressed nuclei; two rows of testicular follicles in front of the pharynx; two rows of yolk follicles beside the testes, and beside and behind the pharynx; cuticular apparatus consisting of needles and a stylet; and unpaired bursa behind the common atrium.

The genus *Itaspiella* is based on *I. helgolandica helgolandica* (Meixner, 1938) Sopott, 1972 from the North Sea. Other taxa from the Pacific Ocean are included in the genus: *I. helgolandica magna* (Ax and Ax, 1967) Sopott, 1972; *I. bursituba* Karling, 1964; *I. bodegae* Karling, 1964, and *I. macrostilifera* Tajika, 1984. The main features and differences between the species are the number of testicular follicles, number of needles and the presence or absence of a precerebral gut diverticulum. *Itaspiella h. helgolandica* shows 8–10 pairs of testicular follicles and seven to eight needles (Sopott 1972); *I. bursituba* 17–22 testicular follicles and 10 needles; *I. bodegae* 20–30 testicular follicles and 10 needles, and *I. macrostilifera* seven very strong needles. *I. parana* is clearly differentiated from its congeners by the presence of a compact bursa, 15 needles and about seven pairs of testicular follicles, and most notably by its habitat, a freshwater environment.

*Itaspiella parana* is the first record of genus *Itaspiella* from South America, and the first freshwater record for the Otoplaninae.
Kata Marcus, 1949
Kata sp.
(Figure 3)

Locality
Uruguay river near Las Cañas, Río Negro Department, Uruguay. Sublittoral, sandy sediments, November 2002.

Material
Ten immature individuals studied alive, six immature specimens sagittally sectioned (4 μm), voucher specimens deposited in Helminthological Collection, Museo de La Plata, Argentina (cat. no. 5312).

Description
The live specimens studied move fast and very spastically. Colourless and translucent, approximately 1 mm long. Anterior end clearly set off as a cephalic lobe with long sensory bristles. Two lateral pairs of strong bristles behind the lobe. Two groups of rhabdites at each side on the cephalic lobe. Caudally tapering evenly to pointed end. Numerous, finger-like adhesive papillae at the posterior end, and also distributed at moderately regular distances along the body. Epidermis with depressed nuclei. The ciliated creeping sole extending from the anterior end to the genital pore. Well-developed ventral muscle layers. Large, cylindrical and horizontally located pharynx situated in the last third of the body. The gut does not extend above the characteristically shaped brain.

The reproductive organs were not entirely developed. One pair of small immature ovaries lie at the basis of the pharynx. There are two lateral rows of yolk follicles, with gaps beside and behind the pharynx in the studied animals.

Discussion. The genus Kata is characterized by the following features: depressed epidermis; adhesive papillae mainly in the posterior end; conical caudal end; cylindrical pharynx topographically arranged in the last third of the body; testes, two rods of yolk glands and paired ovaries in front of the pharynx; cuticular apparatus with circular positioned needles and with or without stylet; paired or unpaired bursal organ with a dorsal porus vaginalis. Not considering the male copulatory organ and the bursal organ, of which hardly anything is known, the captured specimens are closely related to the species of genus Kata, specially due to their external characteristics and internal anatomy, and are consequently regarded ( provisionally) as a species of Kata.

In the event that this species belongs to genus Kata, it is necessary to emphasize that this would be the first record of a specimen of Kata in a freshwater habitat.

Subfamily PARATOPLANINAE Ax, 1956
Philosyrnis Girad, 1904
Philosyrnis rauli n. sp.
(Figure 4)

Locality
Uruguay river near Las Cañas, Río Negro Department, Uruguay. Sublittoral, sandy sediments, November 2002, January and February 2003.
Figure 3. *Kata* sp. Ventral view of the body. b, bristles; br, brain; co, copulatory organ, ov, ovary; ph, pharynx; st, statocyst; t, testes; vi, vitellaria.
Figure 4. *Philosyrtis rauli*. (a) Ventral view of the body. b, bristles; br, brain; co, copulatory organ; ov, ovary; ph, pharynx; rh, rhabdites; st, statocyst; t, testes; vi, vitellaria; vs, vesicula seminalis. (b) Details of the needles of the copulatory organ.
Material
Ten individuals (mature and immature) studied alive, six immature and two mature specimens sagittally sectioned (4 \(\mu\)m).

Type material
Holotype: one sagittally sectioned specimen deposited in the Helminthological Collection, Museo de La Plata, Argentina (cat. no. 5313). Paratype: one sagittally sectioned specimen deposited in the Museo Nacional de Ciencias Naturales de Madrid (cat. no. MNCN 4.01/46).

Etymology
This species is dedicated to Raúl Codina.

Description
The living animals are 0.8–1.1 mm long and about 0.09 mm thick, fast-moving and strongly spastic. Colourless and transparent. The cephalic lobe is not clearly set off, but it is provided with long sensory bristles (Figure 4a). Adhesive papillae and bristles on the lateral side of the body at more or less regular distances, more abundant at the posterior end. Numerous needle-like rhabdites grouped behind the encapsulated brain, anterior to the pharynx and between the testes, forming two parallel rows. Isolated rhabdites over the entire body. Epidermis unciliated dorsally, ventrally well developed, ciliated and forming a creeping sole. Pharynx internally ciliated, before the middle of the body. Gut extending from the brain to the posterior end of the body, behind the vesicula seminalis.

Ovaries situated at the basis of the pharynx. Two lateral rows of yolk follicles running from the pharynx to the posterior end. Only one pair of testicular follicles in adult animals, and up to three pairs in juveniles, situated just behind the brain and in front of the ovaries. Male copulatory apparatus consisting of an ovoid vesicula seminalis, the prostatic glands and the cuticular apparatus. The cuticular apparatus consisting of eight needles 23 \(\mu\)m long and 2.73 \(\mu\)m thick. The needles are proximally straight with an elongated, sickle-like terminal end (Figure 4b). Bursa absent.

Biology. Philosyrtilus rauli was found on a beach with sandy sediment near Las Cañas. According to the abiotic factors measured in the sample areas (Table I), the ecological characterization is estimated as follows: rheobiotic, thermophilic (it is unquestionably a mesotypical species with thermophilic tendencies that depend on its adaptation to warm environments), stenobiotic (poly-oxibiotic), mesoionic, freshwater inhabitant.

Discussion. Philosyrtilus rauli is a typical representative of the subfamily Paratoplaninae (Ax 1956) and shares the following features with genus Philosyrtilus: depressed epithelium in the regions of the creeping sole, dorsally unciliated epithelium; long, finger-like papillae; pharynx in the middle of the body; two rows of testicular follicles and paired ovary in front of the pharynx; two rows of yolk follicles behind the pharynx; cuticular apparatus with needles, but without stylet; absence of a bursa.

The genus Philosyrtilus includes eight species, three of them occurring in South America: P. sanjuanensis Ax and Ax, 1974, P. santacruzensis Ax and Ax, 1974 (Galápagos Islands, Ecuador) and P. eumeca Marcus, 1950 (Brazil).
The main difference between *Philosyrtis rauli* and other South American *Philosyrtis* species lies in the cuticular apparatus. Whereas *P. sanjuanensis* and *P. santacruzensis* bear two groups of needles, one dorsal and one ventral, and *P. eumeca* has three groups of needles with different structure and localization, *P. rauli* shows a semicircle with a single type of needle. A similar cuticular apparatus can be found in *P. rotundicephala* Sopott, 1972, but this species differs from *P. rauli* in the number of needles (10 needles in *P. rotundicephala*, eight needles in *P. rauli*) and in the shape of their distal end. Another difference between the two species is the number of testicular follicles, only one pair in *P. rauli* (character shared with *P. eumeca*) and four pairs in *P. rotundicephala*.

*Philosyrtis rotundicephala* is a marine species from northern Europe, while *P. rauli* is the only freshwater species of the genus, from interstitial habitats of the Uruguay river. Within the Paratoplaninae only three species of *Pseudosyrtis* (*P. subterranea*, *P. fluviatilis* and *P. neiswestnovae*) have been recorded for brackish/freshwater habitats.

**Discussion and ecological considerations**

The studied areas are very particular biotopes. At present, only few studies on the turbellarian fauna and its ecology have been carried out in the Paraná river (Noreña-Janssen 1995a, 1995b; Noreña-Janssen and Faubel 1996) and the records presented here are the first for the Uruguay river.

*Itaspiella parana* lives in sublittoral fine and medium-grained sandy sediments in the Paraná and Colastiné rivers. This interstitial habitat is poor in organic matter because of the high flow speed and low food supply from the water column, therefore the biodiversity and abundance are low.

*Itaspiella parana* was collected together with *Myoretronectes parananensis* Noreña-Janssen and Faubel, 1996 (Retronectidae), *Narapa bonettoi* Righi and Varela, 1983 (Oligochaeta), *Potamocaris* sp. (Harpacticoida) (Dussart 1979) and another unidentified microturbellarian species. *Itaspiella parana* and the other invertebrate species co-occurred throughout the year, owing to the fact that the abiotic factors of the biotope are very stable. The occurrence of *Myoretronectes parananensis*, *Itaspiella parana* and the unidentified turbellarian species decreases downstream and with increasing distance of the tributaries from the main river. The reason is the increase of detritus and the transition to oligo- and mesohaline areas. This group of microturbellarian species of the interstitium of the Paraná river is adapted to and characteristic of freshwater lotic environments.

*Myoretronectes parananensis* was also found in the upper Paraná river near Misiones province, Argentina (M. Marchese, personal communication). On account of the cohabitation of both species, it can be expected that the distribution of *Itaspiella parana* extends also to the regions of the upper Paraná river.

*Philosyrtis rauli* and *Kata* sp. were collected from the interstitial of the Uruguay river. The habitat is similar to that described for *Itaspiella parana*, with sediments composed of medium-grained sands and poor in organic matter due to the current speed and the strong fluctuations in the water level caused by flood pulses. Other unidentified species of Retronectidae were found in the same samples, as well as *Narapa bonettoi*. Contrary to *I. parana*, *P. rauli* and *Kata* sp. were found only during the summer months (November, January and February), this fact perhaps shows the dependence of both taxa with respect to high temperatures. The Uruguay river shows sporadic strong water fluctuations due to the action of strong south-east winds and the occasional opening of the Salto Grande dam.
These environmental impacts are probably the cause of the disappearance and displacement of the interstitial fauna.

According to Ax (1956) and Cannon (1986) the family Otoplanidae is characterized by the following features: common genital pore; male copulatory organ with a single, caudally or dorsally located vesicula seminalis; cuticular apparatus consisting of needles and, sometimes, a stylet (“Trichterrohr”); ciliation restricted to the ventral sole and about the head (except Archotoplana sp.), often with paired antero-lateral ciliated pits; one pair of protonephridia opening in midbody anterior to pharynx; free-living marine. Genus *Itaspiella* is characterized by: epidermis with depressed nuclei, and two rows of testes.

According to the family and genus characterization, the three freshwater species collected in the Paraná and Uruguay rivers belong to family Otoplanidae. The main difference between the known species and *Itaspiella parana*, *Philosyrtis rauli* and *Kata* sp. is their ecological characterization. Until now the family Otoplanidae was known only from marine or brackish environments, with few exceptions, but this difference is not sufficient for the constitution of a new genus.

Several zoological and botanical data verify the hypothesis, first held by Herman von Ihering, that a well-defined marine connection between the South Atlantic, the Caribbean area and the Pacific Ocean, known as the “arm of the Tethys”, existed in the late Cretaceous. During the Pliocene this connection became smaller and salinity levels decreased. Finally, the arm of the Tethys became the Paraná river and other rivers and lakes from the Chaco–Paraná basins (Boltovskoy 1991). This connection, corroborated by an extensive fossil record, explains the distribution of many taxa of Caribbean origin and the presence in this area of many freshwater species that represent marine relicts. Within the Crustacea, the isopod *Fritzianira exul* (Müller, 1892) and the decapod *Macrobrachium borellii* (Nobili, 1896), both of which inhabit the Plata basin, are freshwater species representative of freshwater genera that belong to marine families. The isopod *Pseudosphaeroma platense* (Giambiagi, 1922) and the decapod *Paleomonetes argentinus* Nobili, 1901, also found in the area, are freshwater species that belong to completely marine taxa (Lopretto 1995). The freshwater otoplanid species described here could represent other examples of marine relicts.

**Acknowledgements**

We thank CONICET for the financial support (PIP no. 02762, Damborenea) and the staff of the Instituto Nacional de Limnología (INALI) and the Museo Nacional de Ciencias Naturales (Madrid, Spain) for their help. The field work in the Uruguay river was carried out through an agreement between the Comisión Administradora del Río Uruguay (CARU) and Facultad de Ciencias Naturales y Museo (FCNyM, UNLP).

**References**

Ax P. 1956. Monographie der Otoplanidae (Turbellaria). Morphologie und Systematik. Akademie der Wissenschaften und der Literatur in Mainz, Abhandlungen der Mathematisch-naturwissenschaftlichen Klasse 13:499–796.

Ax P, Ax R. 1967. Turbellaria Proseriata von der Pazifikküste der USA (Washington). I. Otoplanidae. Zeitschrift für Morphologie der Tiere 61:215–254.

Ax P, Ax R. 1974a. Interstitielle Fauna von Galapagos. V. Otoplanidae (Turbellaria, Proseriata). Mikrofauna des Meeresbodens 27:573–598.

Ax P, Ax R. 1974b. Interstitielle Fauna von Galapagos. VII. Nematoplanidae, Polystyliphoridae, Coelogyonoporidae (Turbellaria, Proseriata). Mikrofauna des Meeresbodens 29:613–638.
Ax P, Ax R. 1977. Interstitielle Fauna von Galapagos. XIX. Monocelididae (Turbellaria, Proseriata). Mikrofauna des Meeresbodens 64:397–438.

Boltovskoy E. 1991. Hering’s hypothesis in the light of foraminiferological data. Lethaia (Oslo) 24:191–198.

Cannon LRG. 1986. Turbellaria of the world: a guide to families and genera. Brisbane: Queensland Museum. 136 p.

Dussart BH. 1979. Algunos Copépodos de America del Sur. Publicación Ocasionial del Museo Nacional de Historia Natural de Santiago de Chile 30:3–13.

Gieysztor M. 1938. Über einige Turbellarien aus dem Süßwasserpsammon. Archiv für Hydrobiologie und Ichthyologie 11:364–382.

Heitkamp U. 1982. Untersuchungen zur Biologie, Ökologie und Systematik limnischer Turbellarien periodischer und perennialer Kleingewässern Südniedersachsens. Archiv für Hydrobiologie, Supplement 64:65–188.

Karling T. 1964. Marine Turbellaria from the Pacific Coast of North America. III. Otoplanidae. Archiv für Zoology 36:527–541.

Karling T. 1974. Turbellarian Fauna of the Baltic Proper. Identification, ecology and biogeography. Fauna Fennica 27:1–101.

Lopretto EC. 1995. Crustacea Eumalacostraca. In: Lopretto EC, Tell G, editors. Ecosistemas de aguas continentales: metodologías para su estudio, III. La Plata: Ediciones Sur. p 1001–1039.

Marcus E. 1949. Turbellaria Brasileiros (7). Boletins da Faculdade de Filosofia, Ciencias e Letras. Universidade de Sao Paulo. Zoologia 14:7–156.

Marcus E. 1950. Turbellaria Brasileiros (8). Boletins da Faculdade de Filosofia, Ciencias e Letras. Universidade de Sao Paulo. Zoologia 15:5–151.

Marcus E. 1952. Turbellaria Brasileiros (10). Boletins da Faculdade de Filosofia, Ciencias e Letras. Universidade de Sao Paulo. Zoologia 17:5–187.

Noren˜a-Janssen C. 1995a. Studies on the taxonomy and ecology of the Turbellarian (Plathelminthes) in the floodplain of the Paraná river (Argentina). I, Biotope and research area. Archiv für Hydrobiologie, Supplement 107:187–210.

Noren˜a-Janssen C. 1995b. Studies on the taxonomy and ecology of the Turbellarian (Plathelminthes) in the floodplain of the Paraná river (Argentina). II, Taxonomy and ecology of the Turbellaria. Archiv für Hydrobiologie, Supplement 107:211–262.

Noreña C, Brusa F, Faubel A. 2003. Census of “microturbellarians” (free-living Platyhelminthes) of the zoogeographical regions originating from Gondwana. Zootaxa 146:1–34.

Noreña-Janssen C, Faubel A. 1996. *Myoretronectes paranaensis* n. gen. et sp., a new freshwater genus of the family Retronectidae (Turbellaria, Catenulida) from Paraná river, Argentina. Hydrobiologia 330:111–118.

Romeis B. 1989. Mikroskopische Technik: 17 neubearbeitete Auflage. Munich: Urban and Schwarzenberg. 697 p.

Sopott B. 1972. Systematik und Ökologie der Proseriaten (Turbellaria) der deutschen Nordseeküste. Mikrofauna des Meeresbodens 13:167–236.

Sopott-Ehlers B. 1985. The phylogenetic relationships within Seriata (Platyhelminthes). In: Conway Morris S, George JD, Gibson R, Platt HM, editors. The origins and relationships of lower invertebrates. Oxford: Oxford University Press. p 159–167.

Tajika KI. 1983a. Zwei neue interstitielle Turbellarien der Gattung Archotoplana (Proseriata, Otoplanidae) aus Hokkaido, Japan. Journal of Faculty of Sciences, Hokkaido University (VI Zoology) 23:179–194.

Tajika KI. 1983b. Zwei neue Otoplaniden (Turbellaria, Proseriata) aus Hokkaido, Japan. Annotationes Zoologicae Japonenses 56:100–110.