



A new species of *Aspidiophorus* (Gastrotricha: Chaetonotidae) from the Swedish west coast

TOBIAS KÅNNEBY^{1,3} & M. ANTONIO TODARO²

¹Department of Zoology, Swedish Museum of Natural History, PO Box 50007, SE-104 05 Stockholm, Sweden.

²Department of Life Sciences, University of Modena and Reggio Emilia, via Campi 213/d, I-41100 Modena, Italy

³Corresponding author. E-mail: tobias.kanneby@nrm.se

Gastrotricha is a group of small aquatic acoelomate animals with more than 820 species worldwide (Balsamo *et al.* 2015). The Swedish gastrotrich fauna today comprises 94 nominal species of which 40 are marine and 54 are freshwater (Curini-Galletti *et al.* 2012; Kånneby 2011). Of these, 69 species belong to the order Chaetonotida Remane, 1925 and 25 species belong to the order Macrodasyida Remane, 1925. Compared to other relatively well investigated countries in the region, the Swedish marine Gastrotrich fauna of the west coast appears fairly surveyed. In fact, 38 species have been recorded from Norway (Clausen 2004; Schmidt 1972), while 15 species have been recorded from the seas surrounding the Danish mainland (Grilli *et al.* 2010). The Swedish brackish waters of the Baltic have a lower diversity and so far only 7 species are known from this area (Kånneby 2011; unpublished observations). By comparison, 31 species have been recorded from the Polish Baltic coast (Hummon 2008; Kolicka *et al.* 2015). In this paper we describe a new species of *Aspidiophorus* found during an intensive research on the gastrotrich fauna of the surroundings of the Sven Lovén Centre for Marine Sciences (Kristineberg) on the Swedish west coast carried out in the summer of 2009.

Samples were taken outside the Klubban Biological Station (Uppsala University), Östersidan, Sweden (N 58° 15.10', E 11° 27.93') in July, 2009. Sublittoral sediments were collected in 1L plastic jars by snorkeling at a depth of 0.5–2.5 meters. The sediment consisted of medium sand with some organic content. Soon after collection, the samples were transferred to the laboratory and kept in a refrigerator at 4°C. Subsamples were treated with a 6–7% MgCl₂-solution and subsequently scanned for gastrotrichs under a dissecting microscope. Individual gastrotrichs were extracted with a micropipette and studied alive. Documentation of each specimen were done with a Nikon Eclipse 80i DIC microscope equipped with a Nikon Digital Sight DSFi1 digital camera. The description of species in this paper follows the convention of Hummon *et al.* (1992) where the position of certain morphological characters are given in percentage units (U) of total body length measured from anterior to posterior (distal end of the furca). In species descriptions columns refer to scale rows parallel to the longitudinal body axis while scale rows refer to the rows of scales perpendicular to the longitudinal body axis.

Systematic account

Order Chaetonotida Remane, 1925 [Rao & Clausen, 1970]

Suborder Paucitubulatina d'Hondt, 1971

Family Chaetonotidae Gosse, 1864 [*sensu* Leasi & Todaro, 2008]

Subfamily Chaetonotinae Gosse, 1864

Genus *Aspidiophorus* Voigt, 1903

***Aspidiophorus gullmarsjordensis* n. sp. (Figs. 1–2)**

(Zoobank F9A6D262-69EC-415D-9FC3-1F5F0AD2572E)

Type locality. In medium sand, Klubban, Östersidan, Sweden (N 58° 15.10', E 11° 27.93'). Sediments collected by snorkelling 0.5 to 2.5 m depths on 17 and 21 July, 2009.

Type material. Photographs of two specimens, available at the Swedish Museum of Natural History, Stockholm, Sweden. Accession numbers: Holotype, SMNH Type-8880; Paratype, SMNH Type-8881.

Etymology. This species is named after the Gullmarsfiord where it was first found.

Diagnosis. A medium sized *Aspidiophorus*, 186–190 µm in length. Head rounded to three-lobed with small cephalion and pleuria, slightly separated from trunk by neck constriction. Hypostomium present. Furca straight, 23–25

μm in length. Anterior and posterior pair of sensory bristles present. Body covered by pedunculate keeled rounded to rhomboidal scales. Four dorsal pairs of non-pedunculate keeled elliptical scales present just above furcal branches. Ventral interciliary area naked, except two pairs of keeled spined scales. Ventral ciliation in two separate longitudinal bands. Pharynx with slight terminal swellings, 40–44 μm in length.

Description. A medium sized *Aspidiophorus*, 186–190 μm in total body length. Head rounded to three-lobed with a pair of small pleuria. Cephalion small, 12 μm in width. Hypostomium concave, 4 in length and 10 μm in width, with two small hook-like projections on each side. One pair of ill-defined sensory ciliary tufts, the longest cilia of each tuft 20–25 μm in length. Ocellar granules absent.

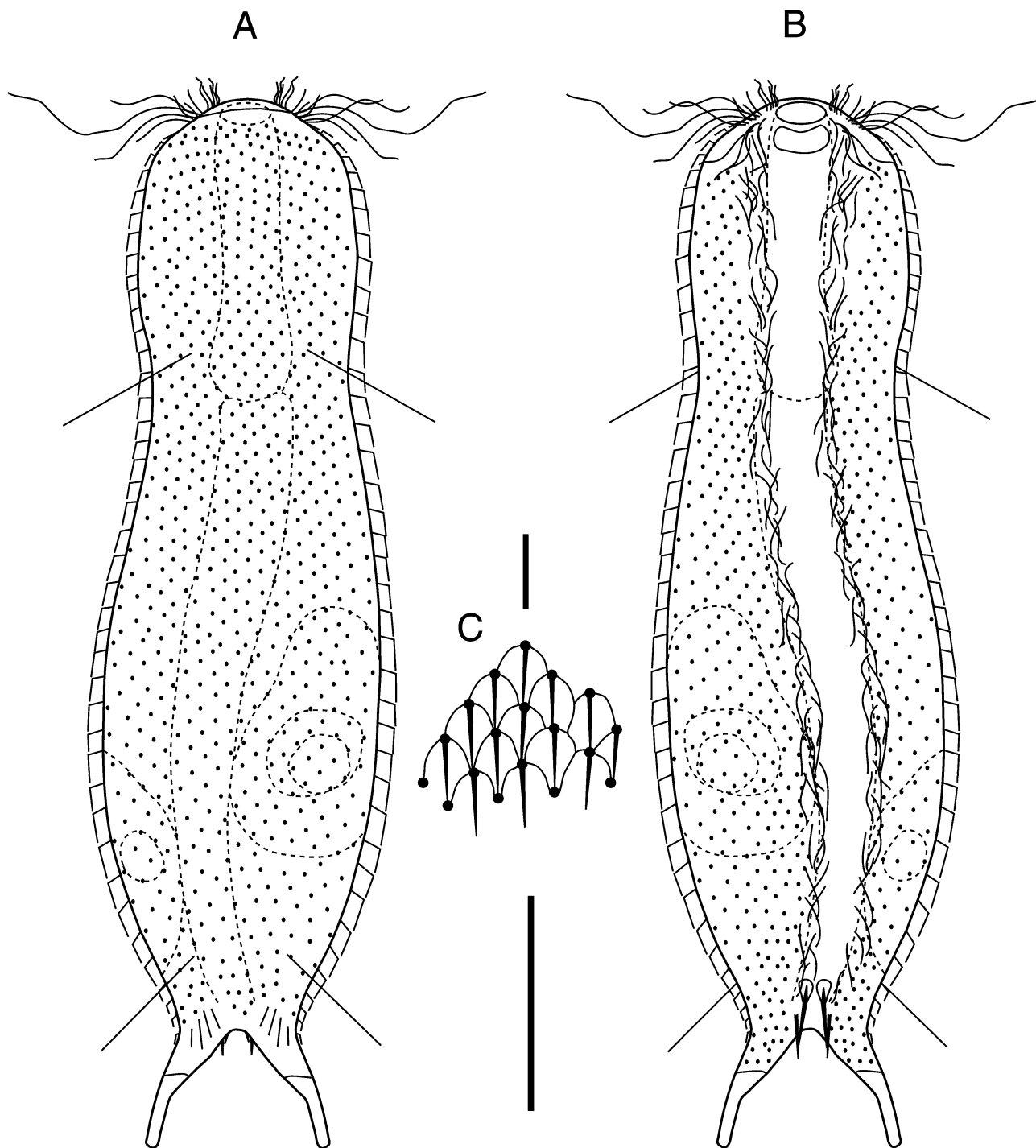


FIGURE 1. Schematic drawing of *Aspidiophorus gullmarsfjordensis* n. sp. A, dorsal view. B, ventral view. C, detail of scales of the dorsal trunk region. Scale bars: A and B, 20 μm ; C, 5 μm .

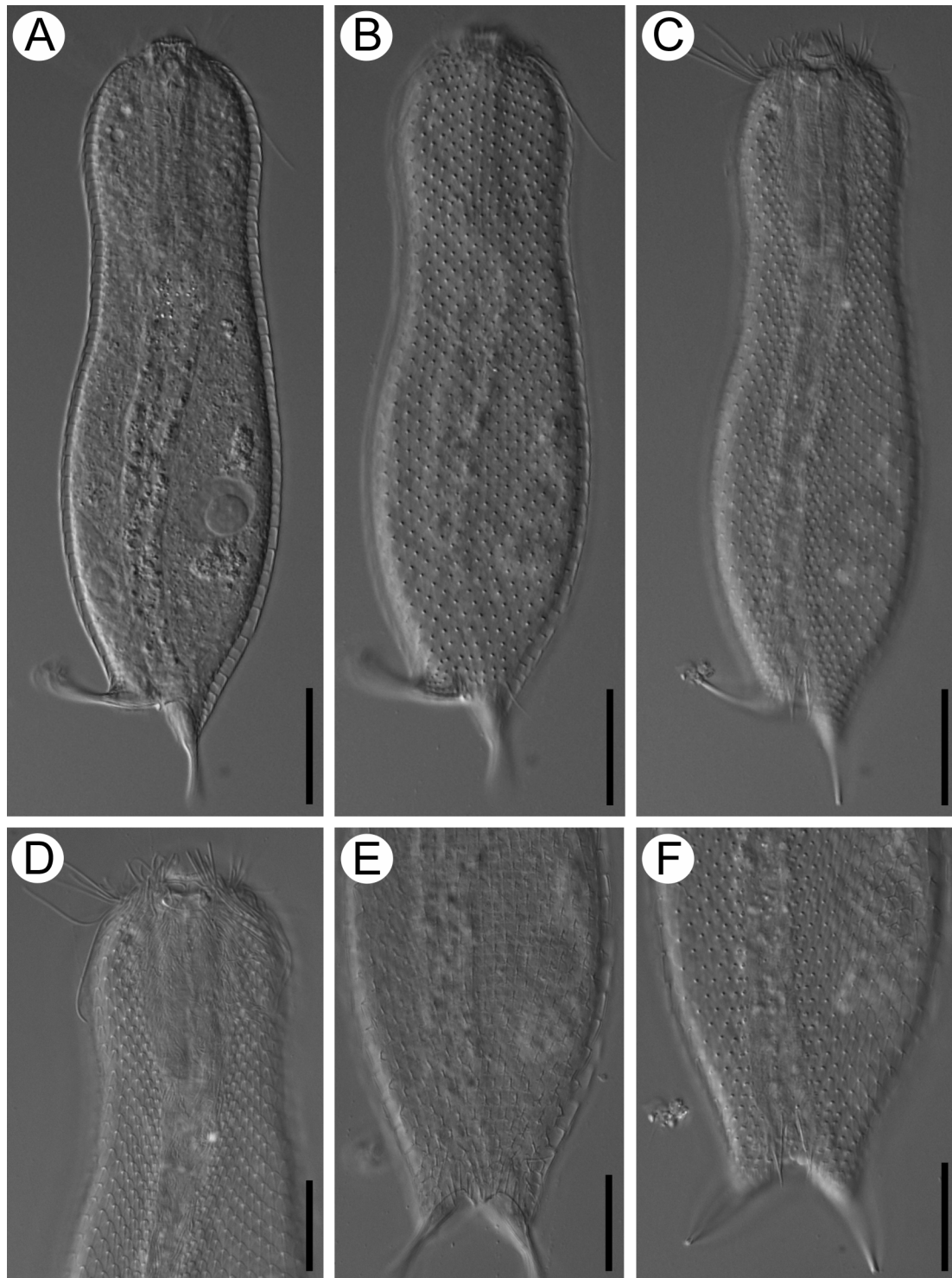


FIGURE 2. *Aspidiophorus gullmarsjordensis* n. sp. A, habitus. B, dorsal view, showing distribution of pedunculate scales. C, ventral view, showing distribution of pedunculate scales and shape of pharynx. D, anterior ventral view, showing hypostomium and ciliary distribution. E, posterior dorsal view, showing non-pedunculate scales at the base of the furca. F, posterior ventral view, showing ventral terminal scales and spines. Scale bars: A–C, 25 μ m; D–F, 20 μ m.

Body width variable, 41–42 μ m at head (U15–16), 37–39 μ m at neck (U26–28), 51–55 μ m at trunk (U59–61), and 20–25 μ m at base of furca (U88–92). Head slightly separated from trunk by neck constriction that progressively widens into the trunk, which reaches its greatest width approximately three fifths down the length of the body. The trunk then tapers into a straight furca, 23–25 μ m in length, with 13–15 μ m long adhesive tubes. Anterior and posterior pair of dorsal sensory bristles present, anterior pair inserted at U22–23 and posterior pair inserted at U83–84.

Dorsal body surface covered by 21–22 columns of 35–38 pedunculate keeled scales, oval to round rhomboidal in

shape. The total number of columns is 42–46. The median column of scales is straight, while the columns on either side slowly approach parallelism with the lateral body outline. Scales increase slightly in size from anterior to posterior end of body, scales of head, neck and trunk measure 3–4 x 3, 4–5 x 4 and 4–5 x 4 µm respectively. The posteriormost pedunculate scales smaller than rest of trunk scales. Peduncle 1–2 µm in height. On either side of the caudal incision, just above each furcal branch, four pairs of non-pedunculate keeled elliptical scales are present. Proximal part of furcal branches covered by small rounded pedunculate keeled scales.

Ventrolateral scales of same type as dorsal scales, but decrease in size towards the locomotory cilia. Ventral intercalary area naked except for two pairs of terminal keeled spined scales. The anterior pair measure 3 x 2 µm and each bear a 10 µm long spine. The posterior pair of terminal scales are hard to discern; however each of them bear a spine 8 µm in length. All four spines reach beyond the caudal incision and can be seen between the furcal branches from the dorsal side. Ventral ciliation distributed in two separate longitudinal bands.

Mouth terminal, 8–9 µm in diameter. Pharynx 40–44 µm long with slight anterior and posterior swellings. Pharyngeal intestinal junction at U27–28. Intestine straight. Anus at U83–84.

The two specimens observed were in parthenogenetic phase. One individual showed two developed eggs on either side of the intestine.

Taxonomic remarks

To date 32 nominal species (not including subspecies), of which 10 are marine and 22 freshwater, are classified within *Aspidiophorus* (Balsamo *et al.* 2009; Todaro *et al.* 2009; Schwank & Kånneby 2014). The new species in this paper is characterized by four pairs of non-pedunculate scales at the base of the furca and two pairs of keeled spined ventral terminal scales. The majority of species within the genus do not possess any of these characters.

There are two marine species, *Aspidiophorus bisquamus* Mock, 1979 and *Aspidiophorus ornatus* Mock, 1979 that possess non-pedunculate scales at the base of the furca and spined terminal scales on the ventral terminal region. The former species has a single pair of non-pedunculate oval keeled scales at the base of the furca and three pairs of keeled scales, each with a fine spine, on either side of the ventral terminal scales (Mock 1979). Compared to *A. bisquamus* the number of non-pedunculate keeled scales are higher and of different shape in *A. gullmarsfjordensis* n. sp. Moreover the ventral terminal scales bear stronger developed spines compared to those of the same region in *A. bisquamus*. A further difference is the presence of hydrofoil scales in *A. bisquamus*, which are absent in *A. gullmarsfjordensis* n. sp. Similarly only a single pair of oval scales are present at the base of the furca of *A. ornatus*. Moreover, *A. ornatus* bears marked cephalic pleuria, which are barely visible in the new species. In addition both *A. bisquamus* and *A. ornatus* are smaller in total body size than *A. gullmarsfjordensis* n. sp., e.g. 120–125 µm and 140–150 µm respectively compared to 186–190 µm (Mock 1979).

There are some freshwater species with non-pedunculate scales in the posteriormost region of the body. Most notable are *A. ophiodermus* Balsamo, 1983 and *A. schlitzensis* Schwank 1990, with a significant greater number of non-pedunculate scales than in *A. gullmarsfjordensis* n. sp. In addition the two aforementioned species have not been found in brackish environments. This study raises the number of nominal species within *Aspidiophorus* to 33 (not taking subspecies into account).

Aspidiophorus is a group traditionally diagnosed by the presence of pedunculated scales, a trait also found within Neogosseidae, Xenotrichulidae and among Chaetonotidae in *Polymerurus* (see e.g. Hochberg 2005; Ruppert 1979; Todaro *et al.* 2013). Furthermore, recent molecular studies (Kånneby *et al.* 2013) have indicated that the group is non-monophyletic and it appears that marine members of the group are the sister group of all other Chaetonotidae and Dasydytidae; clear indications for future investigations on these little creatures.

Acknowledgements

The authors would like to thank Dr. Andreas Wallberg for collecting one of the samples. This study was financially supported by a grant from the Swedish Taxonomy Initiative (to TK).

References

- Balsamo, M., d'Hondt, J.-L., Kisielewski, J., Todaro, M.A., Tongiorgi, P., Guidi, L., Grilli, P. & de Jong, Y. (2015) Fauna Europaea: Gastrotricha. *Biodiversity Data Journal*, 3, e5800.
<https://doi.org/10.3897/bdj.3.e5800>
- Balsamo, M., d'Hondt, J.L., Pierboni, L. & Grilli, P. (2009) Taxonomic and nomenclatural notes on freshwater Chaetonotida (Gastrotricha). *Zootaxa*, 2158, 1–19.

- Clausen, C. (2004) A new species of *Acanthodasys* (Gastrotricha: Thaumastodermatidae) from the west coast of Norway. *Sarsia*, 89, 137–141.
<https://doi.org/10.1080/00364820410004972>
- Curini-Galletti, M., Artois, T., Delogu, V., De Smet, W.H., Fontaneto, D., Jondelius, U., Leasi, F., Martinez, A., Meyer-Wachsmuth, I., Nilsson, K.S., Tongiorgi, P., Worsaae, K. & Todaro, M.A. (2012) Patterns of diversity in soft-bodied meiofauna: Dispersal ability and body size matters. *PLoS ONE*, 7 (3), e33801.
<https://doi.org/10.1371/journal.pone.0033801>
- Grilli, P., Kristensen, R.M. & Balsamo, M. (2010) Contribution to the knowledge of freshwater Gastrotricha from Denmark. *Steenstrupia*, 32, 79–92.
- Hochberg, R. (2005) First record of *Polymerurus* (Gastrotricha, Chaetonotida) from Australia with the description of a new species from Queensland and of cuticular ultrastructure in *P. nodicaudus*. *Invertebrate Biology*, 124, 119–130.
<https://doi.org/10.1111/j.1744-7410.2005.00014.x>
- Hummon, W.D. (2008) Brackish-Water Gastrotricha of the Polish Baltic Coast. *Meiofauna Marina*, 16, 109–116.
- Hummon, W.D., Balsamo, M. & Todaro, M.A. (1992) Italian marine Gastrotricha: I. Six new and one redescribed species of Chaetonotida. *Bollettino di Zoologia*, 59, 499–516.
<https://doi.org/10.1080/11250009209386711>
- Kånneby, T. (2011) *Gastrotricha of Sweden - Biodiversity and phylogeny*. Doctoral thesis. Department of Zoology, Stockholm University, Stockholm, 34 pp.
- Kånneby, T., Todaro, M.A. & Jondelius, U. (2013) Phylogeny of Chaetonotidae and other Paucitubulatina (Gastrotricha: Chaetonotida) and the colonization of aquatic ecosystems. *Zoologica Scripta*, 42, 88–105.
<https://doi.org/10.1111/j.1463-6409.2012.00558.x>
- Kolicka, M., Jankowska, E. & Kotwicki, L. (2015) Baltic Sea Gastrotricha – one new species and one new record of Chaetonotida from Poland. *Zootaxa*, 4027 (4), 487–508.
<https://doi.org/10.11646/zootaxa.4027.4.2>
- Mock, H. (1979) Chaetonotoidea (Gastrotricha) der Nordseeinsel Sylt. *Mikrofauna des Meeresbodens*, 78, 405–507.
- Ruppert, E.E. (1979) Morphology and systematics of the Xenotrichulidae (Gastrotricha, Chaetonotida). *Mikrofauna des Meeresbodens*, 76, 1–56.
- Schmidt, P. (1972) Zonierung und jahreszeitliche Fluktuationen der interstitiellen Fauna in Sandstränden des Gebiets von Tromsø. *Mikrofauna des Meeresbodens*, 12, 1–86.
- Schwank, P. & Kånneby, T. (2014) Contribution to the freshwater gastrotrich fauna of wetland areas of southwestern Ontario (Canada) with redescription of seven species and a check-list for North America. *Zootaxa*, 3811 (4), 463–490.
<https://doi.org/10.11646/zootaxa.3811.4.3>
- Todaro, M.A., Dal Zotto, M., Maiorova, A.S. & Adrianov, A.V. (2009) A new species of *Aspidiophorus* (Gastrotricha, Chaetonotida) from the Russian far east with a key to marine species of the genus. *Marine Biology Research*, 5, 297–303.
<https://doi.org/10.1080/17451000802419430>
- Todaro, M.A., Perissinotto, R. & Bownes, S.J. (2013) Neogosseidae (Gastrotricha, Chaetonotida) from the iSimangaliso Wetland Park, KwaZulu-Natal, South Africa. *Zookeys*, 315, 77–94.
<https://doi.org/10.3897/zookeys.315.5593>