GASTROPODA OPISTHOBRANCHIA COLLECTED DURING THE SPANISH EXPEDITIONS TO THE SCOTIA SEA, ANTARCTICA.

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Palabras clave: Opisthobranchia, Campañas Españolas, Antártida.
Key words: Opisthobranchia, Spanish Expeditions, Antarctica.

RESUMEN

ABSTRACT
During the expeditions Antartida 8611 and Antartida 9101, organized by the Spanish Oceanographic Institute, specimens of eight gastropod opisthobranch species were collected in the Scotia

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sea. Three species belonged to the order Notaspidea (Bathyberthella antarctica Willan & Bertsch, 1987, Parabathyberthella orcadensis García, García-Gómez, Troncoso & Cervera, 1994 and Poli- cenididae tomasi García, Troncoso, Cervera & García-Gómez, 1996) and the rest to the order Nudibranchia, three Doridacea, Bathy- doris clavigera Thiele, 1912, Austrodonis kerguelensis (Bergh, 1884) and A. georgiensis García, Troncoso, García-Gómez & Cervera, 1993 and two Dendronotacea, Tritoniella bellii Elliot, 1907 and Tritonia antarctica Pfeffer in Martens & Pfeffer, 1886. Thus, in this paper we described the diagnostic characters of these species, and their geographic distribution is revised and presented.

INTRODUCTION
During recent expeditions to antarctic and subantarctic waters, specimens of gastropod opisthobranchs were collected. These specimens have provided the means to study and revise some ambiguous species, taken from earlier expeditions, and the description of new genera and species (Marcus, 1983; 1985; Willan & Bertsch, 1987; Wägele, 1989a; 1989b; 1990; 1991a; 1993; 1995; Wägele & Hain, 1991; Wägele & Willan, 1994; Wägele, Bullough & Barnes, 1995; Wägele, Barnes & Bullough, 1995; Hain, Wägele & Willan, 1993). Besides this, knowledge of the zoogeography of this species is being made possible after these expeditions and also new distribution data (Vicente & Arnaud, 1974; Wägele, 1987, 1991b, Cattaneo- Vietti, 1991).

During the expeditions ANTARTIDA 8611 (1986-1987) and ANTARTIDA 9101 (1991), organized by the Spanish Oceanographic Institute at the
Scotia Sea, specimens of opisthobranch gastropods belonging to the order Notaspidea and Nudibranchia were collected. Some of them were unknown, which allowed for the description of new genera and species (García-Troncoso, García-Gómez & Cervera, 1993; García, García-Gómez, Troncoso & Cervera, 1994; García, Troncoso, Cervera & García-Gómez, 1996), while the finding of other species has permitted the amplification of their distribution. Thus, in this article, information on the principal diagnostic features of the species collected is presented. Their distribution is also described, using published data and results from both Spanish expeditions.

MATERIAL AND METHODS

The specimens were collected with a semipelagic trawlnet during the expeditions ANTARTIDA 8611 (1986/87) and ANTARTIDA 9101 (1991) in the Scotia Sea. Table 1 lists the localities, dates and depths. After collection, the specimens were frozen and later fixed in 4% formaldehyde.

In the systematic description of each species, the synonyms are listed, followed by the sampling sites where they were collected, the number of specimens and sizes. Also included is the anatomical description and distribution.

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RESULTS

Order Notaspidea Fischer

Tribe Bathyberthellini García, Troncoso, Cervera & García-Gómez

Bathyberthella antarctica Willan & Bertsch, 1987

Material

ANTARTIDA 8611: station 73, 1 specimen (52 mm long/31 mm wide). ANTARTIDA 9101: station 23, 2 specimens (91 mm long/49 mm wide and 70 mm long/44 mm wide); station 106, 1 specimen (66 mm long/44 mm wide).

Description

B. antarctica has been revised recently by Wagele & Willan (1995). The preserved animals were oval (Fig. 1a). The rhinophores are partially visible, fused at their bases and have a lateral slit. The mantle is smooth and free of the foot, which is visible dorsally. The gill, located on the right side of the animal, is prominent. A pedal gland was not visible.

The shell is 32-35 mm long and 22-23 mm wide (Fig. 1b). It covers almost all the visceral mass. It is translucent and not calcified and the protoconch is subterminal. In the specimens dissected the radula has the formula 49-50 x 185-223.0.185-223. All the teeth are similar, narrow and slightly curved (Fig. 1c). Mandibular elements


FIGURE 1b. Bathyberthella antarctica. Dorsal view of the shell.

FIGURE 1c. Bathyberthella antarctica. Radular teeth.

FIGURE 1d. Bathyberthella antarctica. Reproductive system. Abbreviations: am, ampulla; dd, deferent duct; fg, female gland; gg, gametolytic gland; p, penis; pr, prostate; sr, seminal receptacle; ud, uterine duct; v, vagina.
are crowded, bearing 2 to 5 cusp at their anterior end (Fig. 2). The reproductive system is illustrated in figure 1d. The hermaphroditic duct has a tubular ampulla; the proximal deferent duct is prostatic, while the distal region is straight and coiled. The vaginal duct is long and enlarged distally. The gametolytic gland is oval while the seminal receptacle is digitiform.

**Distribution**

To date B. antarctica has been found West of South Sandwich, South of South Shetland (Willan & Bertsch, 1987) and North and Southwest of the South Orkney Islands (García et al, 1994) Wedell Sea (Wägele & Willan, 1995) and in the South Georgia Islands (Wägele & Willan, 1995 and present paper) (Fig. 3).

*Parabathyberthella orcadensis* García, García-Gómez, Troncoso & Cervera, 1994

**Material**

ANTARTIDA9101: station 105, 1 specimen (105 mm long/60 mm wide).

**Description**

The only specimen collected during expedition ANTARTIDA 9101 was used for the description of the genus and species and constitutes the holotype (García, et al, 1994). The mantle is smooth, oval and free of the foot all around. Rhinophores, smooth and fused to one another at their base, having a lateral slit. Oral veil trapezoidal and smooth. The foot is larger than the mantle and the tail is rounded. A prominent gill is located on the right side of the animal (Fig. 4a).

The shell, uncalcified and flat, covers almost all the visceral mass. The protoconch lies by the posterior left corner (Fig. 4b). The radular formula is 91 x 220-235.0.220-235. All teeth are similar, large, erect and slightly curved at the apex (Fig. 4c). The size of the teeth decreases toward the sides. The jaws are smooth, lacking mandibular elements.

The reproductive system has the proximal deferent duct prostatic, while it is distally narrow and coiled; the penis is smooth (Fig. 4d). The vagina is enlarged distally where a vaginal muscle connects it to the body wall; there is a vaginal gland close to the vaginal opening. The seminal receptacle is tubular and the gametolytic gland rounded.

**Distribution**

To date, the specimen has only been found Southwest of the South Orkney Islands(Fig. 5).

FIGURE 4b. Parabathyberthella orcadensis. Dorsal view of the shell.

FIGURE 4c. Parabathyberthella orcadensis. Radular teeth.

FIGURE 4d. Parabathyberthella orcadensis. Reproductive system. Abbreviations: am, ampulla; dd, deferent duct; fg, female gland; gg, gametolytic gland; p, penis; pr, prostate; sr, seminal receptacle; ud, uterine duct; vg, vaginal gland; vm, vaginal muscle.
FIGURE 5. Distribution of *Parabathyberthella orcadensis*: • specimen collected during the expedition ANTARTIDA 9101. Scale bar 50 km.
Policina tomasi García, Troncoso, Cervera & García-Gómez, 1996

Material

ANTARTIDA9101: station 106, 2 specimens (41 mm long/25 mm wide and 80 mm long/44 mm wide).

Description

The body and oral veil are smooth, with the margin mantle separated from the foot (Fig. 6a). Rhinophores fused at their base, possess a lateral slit. On the right side of the animal there are three very small gills attached one on top of the other (Fig. 6b). The prebranchial sac opens at the end of a well developed cylindrical cutaneous expansion. The anal pore is located at the apex of a short tube behind the gills. The genital apertures are surrounded by cutaneous sheets (Fig. 6b).

The internal shell is oval and covers almost all the visceral mass (Fig. 6c). Radular formula is 67 x 190-270.0.190-270. All teeth are similar, erect and slightly curved at the apex (Fig. 6d). The mandibular elements of the jaws are narrow and have 2-5 conical cusp at their anterior end (Fig. 6e).

The reproductive system P. tomasi has a long vaginal duct with a vaginal muscle attaching it to the body wall (Fig. 6f). The gametolytic gland is round and the seminal receptacle narrow and tubular. The deferent duct has a proximal tubular prostatic gland, while the distal duct is narrow and coiled.

Distribution

It has only been found Southwest of the South Orkney Islands (Fig. 7).
Order Nudibranchia Blainville
Suborder Doridacea Odhner

Bathydoris clavigera Thiele, 1912

Synonyms: Bathydoris obliquata Odhner, 1934.

Material

ANTARTIDA 8611: station 51, 1 specimen (72 mm long/39 mm wide); station 173, 1 specimen (91 mm long/38 mm wide); station 271, 1 specimen (135 mm long/60 mm wide). ANTARTIDA 9101: station 112, 1 specimen (88 mm long/33 mm wide).

Description

This species has been revised recently by Wägele (1989a), who did an excellent study of its anatomy, feeding and distribution. Our specimens are 72-173 mm in length and 39-60 mm wide. Their external and internal anatomical features coincide with those described by Wägele (1989a). The notum has different size papillae. The rhinophores


FIGURE 10. Bathydoris clavigera: Dotted area, literature records (based on Wägele, 1987); * material collected during the expedition ANTARTIDA 8611; • material collected during ANTARTIDA 9101 expedition. Scale bar 50 km.
are long and lamellated and the anus opens at the end of a anal papilla rounded by the gills (Fig. 8). Radular formula of the specimen of 72 mm length was 38 x 5.1.1.1.55. The rachidian teeth are notably variable in size and shape, although generally they have a central cusp and one lateral denticle (Fig. 9). The lateral teeth are broad and pointed, with finely serrate sides. Marginal teeth are narrow and large; usually, the most inner tooth is serrate.

**Distribution**

*B. clavigera* is a circumpolar species (Fig. 10) that could be found in latitudes higher than 50°S in the Atlantic sector (Wägele, 1987). Our specimens were collected around South Georgia Islands and in the North and South of South Orkney Islands.

**Austrodoris kerguelenensis** (Bergh, 1884)

Synonyms: *Archidoris australis* Bergh, 1884; *A. rubescens* Bergh, 1898; *Austrodoris crenulata* Odhner, 1926; *A. michaelensi* Odhner, 1926; *A. macmurdensis* Odhner, 1934; *A. nivium* Odhner, 1934; *A. tomentosa* Odhner, 1934; *A. mithu* Marcus, 1985; *A. vicentei* Marcus, 1985.

**Material**

ANTARTIDA 8611: station 76, 1 specimen (43 mm long/27 mm wide); station 100, 1 specimen (36 mm long/15 mm wide); station 107, 1 specimen (65 mm long/44 mm wide); station 129, 1 specimen (56 mm long/36 mm wide); station 131, 4 specimens (80 mm long/37 mm wide, 79 mm long/38 mm wide, 49 mm long/28 mm wide and 69 mm long/32 mm wide); station 148, 2 specimens (102 mm long/59 mm wide and 48 mm long/19 mm wide); station 152, 1 specimen (40 mm long/15 mm wide); station 153, 1 specimen (81 mm long/32 mm wide); station 155, 1 specimen (80 mm long/51 mm wide); station 275, 1 specimen (66 mm long/39 mm wide); station 370, 1 specimen (44 mm long/20 mm wide); station 377, 1 specimen (52 mm long/32 mm wide); station 381, 1 specimen (35 mm long/24 mm wide); station 381, 1 specimen (35 mm long/24 mm wide); station 408, 1 specimen (51 mm long/33 mm wide); station 554, 1 specimen (69 mm long/26 mm wide). ANTARTIDA 9101: station 34, 1 specimen (66 mm long/42 mm wide); station 39, 1 specimen 77 mm long/58 mm wide); station 55, 2 specimens (85 mm

![FIGURE 11a. Austrodoris kerguelenensis. External view (after García et al, 1993)](image1)

![FIGURE 11b. Austrodoris kerguelenensis. Reproductive system. Abbreviations: am, ampulla; dd, deferent duct; fg, female gland; gg, gametolytic gland; sr, seminal receptacle; v, vagina (after García et al, 1993).](image2)
long 755 mm wide and 75 mm long/45 mm wide); station 85, 2 specimens (77 mm long/30 mm wide and 72 mm long/29 mm wide); station 105, 1 specimen (30 mm long/14 mm wide); station 112, 1 specimen (66 mm long/32 mm wide).

Description

A detailed description of A. kerguelenensis based on specimens collected during the expedition ANTARTIDA 8611 was done by the authors in a recent publication (García et al. 1993). The body is oval, with a broad notum (Fig. 11a). On it are tubercles, more or less abundant, and spiculae, whose arrangement varies depending on the specimen. The rhinophores are retractable and possess 18-40 lamellae. Branchial tuft have 6-10 bi or tripinnate gills.

Radular formula is 33-43 x 43-60, 0.43-60. All teeth are hooked and smooth (Fig. 12a, b). The reproductive system is illustrated in Figure 11b. It has a zig-zag shaped ampulla in the hermaphroditic duct. The deferent duct is long and coiled and the oviduct has a round gametolytic gland and an elongated seminal receptacle. The penis is unarmed.

![Figure 12a-b. Austodoris kerguelenensis: a. Lateral radular teeth, b. Inner most radular teeth.](image)

Distribution

A. kerguelenensis is a circumpolar species also present in the Kerguelen Islands (Wägele, 1987). Our specimens were collected around the South Georgia Islands, South Orkney Islands and South Shetland (Fig. 13).

Austodoris georgiensis García, Troncoso, García-Gomez & Cervera, 1993

Material

ANTARTIDA 8611: station 101, 1 specimen (51 mm long/23 mm wide).
FIGURE 13. Distribution of Austrodoris kerguelenensis: Dotted area, literature records (based on Wägele, 1987); ★ specimens collected during the expedition ANTARTIDA 8611; ● specimens collected during the expedition ANTARTIDA 9101. Scale bar 50 km.
Description

Only one specimen of this species has been found, which was used as the holotype during its description (García et al. 1993). The body is oval, slightly long, with the notal margin short (Fig. 14a). The tail is visible posteriorly. Scarce small tubercles lie on the notum and spicules have not been in it. This could be due to the fact that this specimen was in formaldehyde for several years before its study; thus the spicules could have been lost, since their presence is normal in the species of Austrodoris (Wägele, 1990). The rhinophores are lamellated and the branchial tuft has six bi or tri-pinnated retractable gills in a branchial sheath bordered by tubercles.

The radular formula is 26 x 38.0.38. All teeth are hooked, with smooth sides (Fig. 14b). The reproductive system, illustrated in figure 14c, has a zig-zag shaped ampulla, a long deferent duct without a prostate differentiated and the seminal receptacle and gametolytic gland are large and tubular. The penis is unarmed.

Remarks

Although A. georgiensis is externally similar to A. kerguelenensis they differ by the presence of a large and elongated gametolytic gland in the former.

Distribution

Up to now, the distribution of A. georgiensis is limited to the North Scotia Sea, its type locality (Fig. 15).
Suborder Dendronotacea Odhner

*Tritoniella bellii* Elliot, 1907

Synonyms: *Tritoniella sinuata* Elliot, 1907b

**Material**

ANTARTIDA 8611: station 15, 1 specimen (68 mm long/13 mm wide). ANTARTIDA 9101: station 112, 2 specimens (90 mm long/23 mm wide and 76 mm long/26 mm wide).

**Description**

The body is elongated, with a dorsal longitudinal ridge, which bifurcates at the level of the rhinophores (Fig. 16a). On the back there are small tubercles, more concentrated on the central area than on the laterals. Notal margin is slightly irregular. The smooth club of the rhinophores are surrounded by many feather-like processes. The rhinophoral sheaths are smooth and laterally expanded.

The radular formula is 57 x 87.1.1.1.87. The rachidian teeth have a prominent central cusp and a poorly developed lateral cusp. The size and
shape of these teeth vary in different rows; thus in
the first few rows these teeth are smaller and only
have one cusp. The lateral teeth are shorter than
the marginal teeth and the cusps are broader than
those of the latter, which are hooked and smooth
(Fig. 16b,c). The jaws are brown, with the masticatory
border smooth (Fig. 16d). The reproductive
system is illustrated in figure 16e. The ampullar
region of the hermaphroditic duct appears as a
slight enlargement of the duct. The deferent duct is
long and coiled, connecting to a thick penial sheath.
Seminal receptacle is at the end of a long and
narrow vaginal duct.

**Discussion**

This species shows a large variety in the external as well as the internal anatomy. Thus, the dor-
sal ridge and the tubercles of the notum could be
more or less developed, lacking in some speci-
mens (Wägele, 1989b). Furthermore, the radular
teeth show a large variability in their size and
shape in different specimens (Wägele, 1989b). The
presence of a distal wideness at the vaginal duct is
indicated, however, our specimens lacked this fea-

**Distribution**

T. bellii is a circumpolar species (Odhner, 1934;
Wägele, 1989b). Our specimens were collected in
Northwest of Shag Rocks and South of the South
Orkney Islands (Fig. 17).

**Tritonia antarctica** Pfeffer in Martens & Pfeffer,
1886

**Synonyms:** Tritonia appendiculata Elliot, 1905;
Tritonia challengeri Elliot 1907b non Berg, 1884;
non Elliot, 1907a; Duvaucellia challengeri Odh-
ner, 1926; Marionia cucullata Vicente & Arnaud,
1974 non Couthouy, in Gould, 1852.

**Material**

ANTARTIDA 8611: station 29, 1 specimen (48
mm long/15mm wide); station 94, 1 specimen (46
mm long/16 mm wide); station 311, 1 specimen (61
mm long/15 mm wide).

**Description**

Because of insufficient past descriptions
(Bergh, 1884; Elliot, 1905; 1907a; 1907b; Odhner,
FIGURE 17. Distribution of Tritoniella bellii: dotted area, literature records (Based on Odnner, 1934 and Wägele, 1989b); ★ material collected during the expedition ANTARTIDA 8611; • specimens collected during the expedition ANTARTIDA 9101. Scale bar 50 km.
1926), the taxonomy of Antartic tritoniids is confused. A detailed revision of this group and a description of Tritonia antarctica was done in a recent publication by Wägele (1995). The body has 7-8 small branchial tufts at each side (Fig. 18a). The oral velum is semilunar and shows ten indentations. The rhinophores have a central axis and around their apical half, numerous longitudinal bridges are located. Around the basal half of the rhinophoral surface there are transversal folds. The rhinophoral sheath is cylindrical with the border slightly irregular (Fig. 18b). Notal surface smooth. Genital papillae opens at the right side, on the first third of the animal. The anal pore is located on the same side but at the middle level.

FIGURA 20a. *Tritonia antarctica*. Internal anatomy. Abbreviations: cns, central nervous system; dd, deferent duct; dg, digestive gland; fg, female gland; g, gonad; i, intestine; pe, pericardium; sg, salivary glands; v, vagina.

FIGURA 20b. *Tritonia antarctica*. Reproductive system. Abbreviations: dd, deferent duct; fg, female gland; hd, hermaphroditic duct; p, penis; sr, seminal receptacle; v, vagina.
FIGURE 21. Distribution of Tritonia antarctica: dotted area, literature records (based on Wägele, 1995); ⭐ specimens collected during the expedition ANTARTIDA 8611. Scale bar 50 km.
The radular formula is 51 x 62.1.1.1.62; The rachidian teeth are tricuspid; the first lateral tooth is bulky and some curved, and the rest of the teeth are elongated with the apex curved (Fig. 18c,d). The jaws have a long masticatory border with 6-7 rows of denticles (Fig. 18e,19).

The gonad lies on the anterior half of the digestive gland (Fig. 20a). The hermaphroditic duct lacks a differentiated ampulla; the deferent duct is long and coiled and the penis is straight and elongated. The seminal receptacle is large (Fig. 20b).

Remarks on the diet of Tritonia antarctica

In the specimen of station 94 we observed a white round piece of Alcyonaria into the pharynx.

Distribution

Tritonia antarctica have a circumpolar distribution. The distribution of this species has been revised recently by Wägele (1995), and some sites of distribution are the result of synonymization. Our specimens were collected in the North and West of the South Georgia Islands and South of the South of the South Orkney Islands (Fig. 21).

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