A new species of *Saropathes* (Cnidaria, Anthozoa, Antipatharia) from the Norfolk Ridge (south-west Pacific, New Caledonia)

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ABSTRACT
A new species of the genus *Saropathes* Opresko, 2002 (Antipatharia, Schizopathidae, Schizopathinae) is described. *Saropathes margaritae* n. sp. differs from the closely related *S. scoparia* (Totton, 1923) in having shorter curved backward primary pinnules, in a lower order (up to three) of subpinnulation, in more (up to eight) secondary pinnules on each primary, as well as in the size and arrangement of spines. The polypar and abpolypar spines in *S. margaritae* n. sp. differ in form and size, the maximum height of the polypar spines being up to 0.12 mm. The antipatharian fauna reported from seamounts is discussed and a list of species is provided.

KEY WORDS
Cnidaria,
Anthozoa,
Antipatharia,
Schizopathidae,
seamounts,
new species.

RÉSUMÉ
Une espèce nouvelle de Saropathes *(Cnidaria, Anthozoa, Antipatharia) de la Ride de Norfolk (Sud-Ouest Pacifique, Nouvelle-Calédonie).*
Une nouvelle espèce du genre *Saropathes* Opresko, 2002 (Antipatharia, Schizopathidae, Schizopathinae), *S. margaritae* n. sp., est décrite. Elle est proche de *S. scoparia* (Totton, 1923) mais se distingue par des pinnules primaires plus courtes et incurvées en arrière, un moins grand nombre de ramifications des pinnules (du troisième ordre au maximum), un plus grand nombre de pinnules secondaires (jusqu'à huit) sur chaque pinnule primaire ainsi que par la taille et la disposition des épines. Chez *S. margaritae* n. sp. les épines latérales soutenant des polypes sont de forme et de taille différentes selon les côtés, la hauteur maximale des épines relevée sur la nouvelle espèce est 0,12 mm. La faune d'antipathaires récoltée sur les monts sous-marins est discutée et une liste des espèces est fournie.

MOTS CLÉS
Cnidaria,
Anthozoa,
Antipatharia,
Schizopathidae,
monts sous-marins,
espèce nouvelle.

INTRODUCTION

Despite the publications that appeared in the last decades on antipatharian taxonomy, including both descriptions of new species (Opresko & Genin 1990; Opresko 1998, 1999), and extensive taxonomic revisions (Opresko 2001, 2002, 2003), our knowledge of antipatharian fauna and especially that of the south-west Pacific is still very limited. In the course of numerous cruises organized by MNHN (Paris) and Institut de Recherche pour le Développement (IRD, formerly ORSTOM) center in Nouméa (Richer de Forges 1990), an extensive collection of black corals was gathered, including unique material from seamounts and islands of the south-west Pacific. The present work is the first report on antipatharians from the Norfolk Ridge.

ABBREVIATIONS

CP beam trawl;
IORAS P. P. Shirshov Institute of Oceanology, Moscow;
MNHN Muséum national d'Histoire naturelle, Paris;
MSU Moscow State University;
NIWA National Institute of Water and Atmospheric Research, Wellington.

MATERIAL AND METHODS

The only specimen of the new species was collected during the cruise NORFOLK 1 in the northern part of the Norfolk Ridge. The material was initially preserved in 4% seawater-buffered formol and then transferred to 70% ethanol. All measurements were carried out after preservation. The spines were measured using SEM images as well as light microscopy of the skeleton. The distance between spines was that measured between centers of the bases of adjacent spines in the same longitudinal row; the height of the spine was the distance between the apex and the center of the base of the spine.

SYSTEMATICS

Family SCHIZOPATHIDAE Brook, 1889
Subfamily SCHIZOPATHINAE Brook, 1889

Genus *Saropathes* Opresko, 2002

TYPE SPECIES. — *Bathypathes scoparia* Totton, 1923 (by original designation: Opresko 2002: 425), type locality: 7 miles E of North Cape (New Zealand), 127 m.

DIAGNOSIS. — Corallum monopodial, pinnulate and subpinnulate. Primary pinnules arranged in four rows and also in alternating groups of two each. Subpinnules arranged uniserially on anterior (polyp) side of lower order pinnules. Spines triangular compressed, smooth, acute. Polyps 2.8-3.4 mm in transverse diameter.

Saropathes margaritae n. sp.
(Figs 1-3)

HOLOTYPE. — NORFOLK 1, stn CP 1721, 26.VI.2001 (MNHN).

TYPE LOCALITY. — South of New Caledonia, Norfolk Ridge, RV *Alis*, NORFOLK 1, stn CP 1721, 23°19'S, 168°01'E, 416-443 m.

ETYMOLOGY. — The species is named after Margarita (diminutive Gretchen), a character of Goethe's "Faust".

DISTRIBUTION. — The species is known only from the type locality, the north part of the Norfolk Ridge.

DIAGNOSIS. — Corallum monopodial and pinnulate to the third order. Primary pinnules arranged in four bilateral rows and also in alternating groups of two each. Pinnules are up to 9.5-10 cm in length with base diameter 0.9-1.4 mm, spaced 2.8-6.0 mm apart in each row. Subpinnules (up to eight on each pinnule) are up to 7.5 cm, arranged uniserially on anterior (polyp) side of lower order pinnules and spaced 0.7-2.0 cm apart. Spines triangular compressed, smooth, acute, up to 0.12 mm high on polypar side of axis; abpolypar spines usually shorter, 0.03 to 0.08 mm, less regular in form, often bifurcated. Polyps 1.5-3.0 mm in transverse diameter, arranged in one series with 3 to 3.5 polyps per cm.

DESCRIPTION OF THE HOLOTYPE

The holotype is a colony 40 cm tall with a maximum width of about 20 cm (Fig. 1A). The corallum is broken somewhere above the basal plate and the lower part is missing. In the lower part of the colony, the stem is compressed and elliptical in cross section, with a maximum diameter of 7 mm. The stem is almost upright, slightly curved backwards in the upper part of the corallum. The lowermost 4.5 cm of the stem lacks

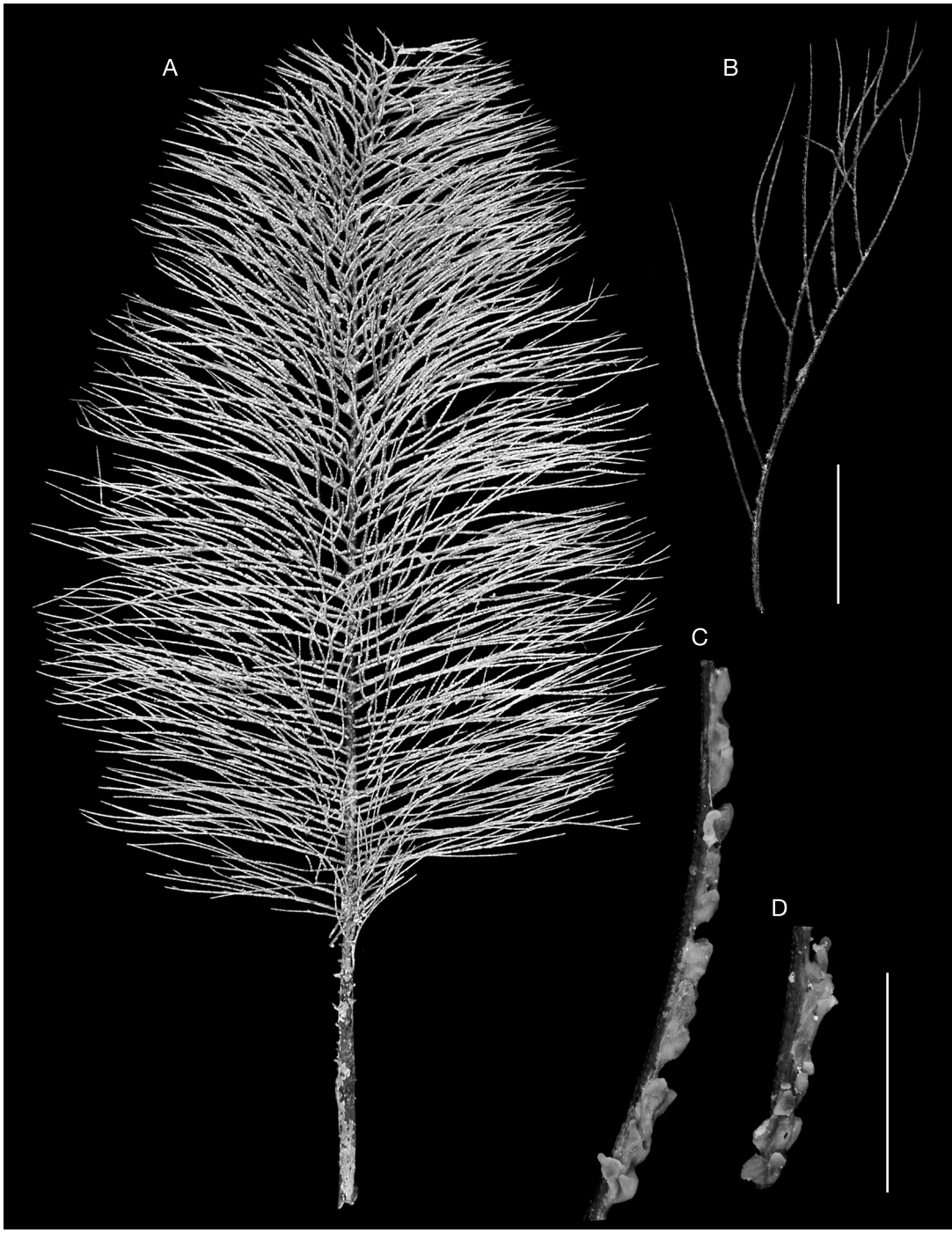

FIG. 1. — *Saropathes margaritae* n. sp., holotype; **A**, entire corallum, height about 40 cm; **B**, view of lateral primary pinnule with subpinnules; **C**, **D**, polyps. Scale bars: B, 2.0 cm; C, D, 0.5 cm.

Fig. 2. — *Saropathes margaritae* n. sp., SEM of spines; **A**, distal part of secondary pinnule; **B**, middle part of secondary pinnule; **C**, **D**, primary pinnules. Scale bars: A, 0.2 mm; B, 0.4 mm; C, D, 0.3 mm.

pinnules and its surface is covered by a series of feebly marked grooves. For the next 4 cm, the bases of broken primary pinnules, arranged in four rows are visible.

The primary pinnules (Fig. 1B) are arranged in four rows with two lateral rows set in planes at an angle of 135-140°, and two anterolateral rows at an angle of 80°. The outer lateral primary pinnules are spaced 2.8-6.0 mm (mainly 3.0-4.5 mm) apart in each row; the distance between pinnules in the row increases toward the apex of the corallum. In the middle of the colony there are, in average, 15 to 16 primary pinnules per 10 cm in each row. Each anterolateral primary pinnule is positioned 1.0-1.5 mm below the adjacent lateral primary pinnule on the same side of the axis, generating bilateral groups consisting of one lateral and one anterolateral pinnules that are arranged alternately along the stem. Lateral primary pinnules are 5.0-5.5 cm long on the lower part of the corallum; in the middle of the colony their length increases to 9.5-10.0 cm; and in the apical part of the colony it does not exceed 3.5 to 4.0 cm. Both lateral and anterolateral pinnules curve backward and slightly incline distally, with the distal angle formed by the lateral pinnules varying from about 65-80° in the lower part of corallum to 50-55° toward the apex of the colony. The diameter of the base of the primary pinnules ranges from 0.9 to 1.4 mm.

Lateral primary pinnules bear up to eight secondary pinnules. The distance between secondaries ranges from 0.7 to 2.0 cm (occasionally up to 2.7 cm). The length of secondary pinnules does not exceed the distance between the attachment of the secondary and the apex of the corresponding primary pinnule; therefore, the length of the secondary pinnules diminishes distally. The longest secondary pinnules do not exceed 7.5 cm. Secondary pinnules form a rather narrow distal angle (15-18°) with the primary on which they arise, and are always curved distally toward the apex of the primary pinnule. The length of the most distal secondaries usually does not exceed 1.0-2.0 cm. Most of secondary pinnules are simple but some can bear one to three tertiary pinnules that are also curved distally. No quaternary pinnules were observed. Anterolateral primary pinnules usually bear two to four uniserially arranged simple secondaries of the same structure as those on the lateral primaries.

Spines are arranged in longitudinal rows. The number of rows visible in lateral view increases from three to four in the distal parts of tertiary pinnules to seven to nine at the basal parts of the primary and secondary pinnules. Along the distal parts of the pinnules the spines are mostly triangular, laterally compressed, inclined distally, acute and close to equal around the axis (Fig. 2A). On pinnules 0.11-0.12 mm in diameter (Fig. 2B) they are 0.03-0.05 mm high, slightly larger on the polypar side of the axis. More proximally (Fig. 2C, D) the difference between polypar and apolypar spines is obvious and on a pinnule 0.2-0.36 mm in diameter the abpolypar spines are 0.03-0.08 mm high and polypar spines are 0.06-0.11 mm high. Polypar spines (Fig. 3A) are triangular to conical, laterally compressed and generally inclined distally; however, some can be inclined in other directions (Fig. 2D). Abpolypar spines (Fig. 3B-E) are of irregular form, from conical, inclined distally, with blunt apex and hook-like to forked, with two to three secondary spines. They often form dense clusters at the base of primary spines so the longitudinal rows are hardly distinguishable (Fig. 3D, E). Distances between polypar spines (measured between bases of adjacent spines of the same row) range from 0.18 to 0.4 mm; those for abpolypar ones are 0.12 to 0.24 mm. There are, on average, three polypar and four to five abpolypar spines per mm in each row.

The polyps (Fig. 1C, D) are arranged in a single row on the anterior, convex side of the pinnules and anterior side of the distal part of the stem. They are 2 to 3 in transverse diameter with interpolypar distances ranging from 0.3 to 0.75 mm. There are 3 to 3.5 polyps per cm. Some developing polyps about 1.4 mm long can be found between full-grown polyps. The tentacles in preserved specimens are short, up to 0.8 mm long.

Remarks

The new species differs from the closely related *Saropathes scoparia* (Totton, 1923) in having

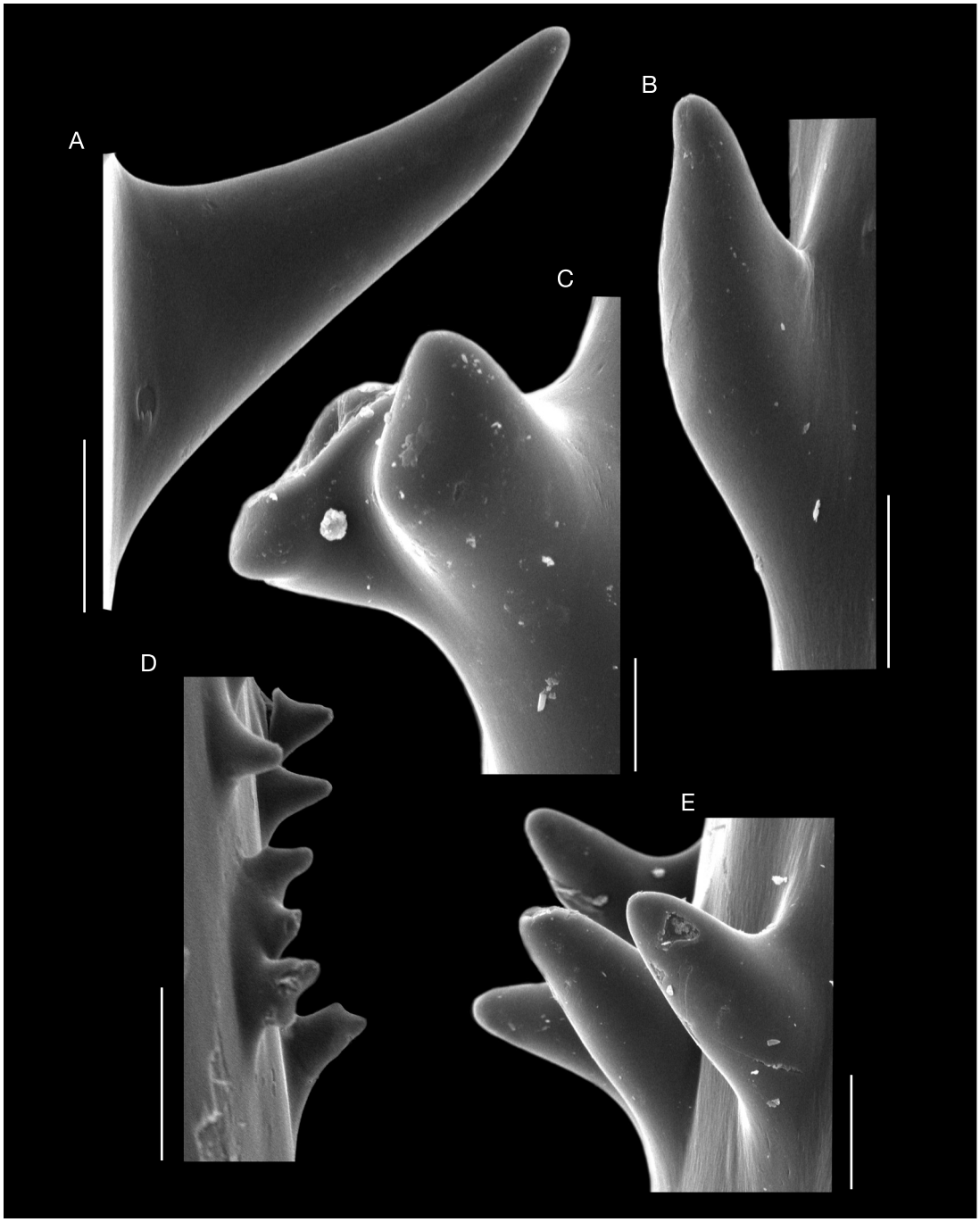

FIG. 3. — *Saropathes margaritae* n. sp., SEM of spines; **A**, polypar spine; **B**, abpolypar spine; **C**, club-shaped abpolypar spine; **D**, abpolypar spines at the base of primary pinnule; **E**, cluster of abpolypar spines. Scale bars: A, B, E, 0.04 mm; C, 0.02 mm; D, 0.1 mm.

TABLE 1. — Antipatharians reported from seamounts. [1], misspelled *Antipathes* Pallas, 1766 (Mironov pers. comm.); [2], correct name: *Bathypathes platycaulus* Totton, 1923.

	Seamount	Species reported	Author, year
North-east Atlantic	Seine	*Stichopathes gracilis* (Gray, 1857)	Schultze 1902
	Gorringe	*Tylopathes atlantica* Roule, 1904	Gravier 1921
	Great-Meteor	*Bathypathus patula* Brook, 1889; *Leiopathes glaberrima* (Esper, 1792); *Antipathes dichotoma* Pallas, 1766; *Antipathella subpinnata* (Elis & Solander, 1786); *Aphanipathes abietina* Pourtalès, 1874; *Parantipathes larix* (Esper, 1790)	Grasshoff 1995; Pasternak 1985
	Josephine	*Antipathes dichotoma* Pallas, 1766; *Aphanipathes abietina* Pourtales, 1874; *Antipathella gracilis* (Gray, 1860)	Roule 1905; Grasshoff 1995
North-east Pacific	Jasper	*Stichopathes spiessi* Opresko & Genin, 1990; *S. paucispina* (Van Pesch, 1914); *Chrysopathes formosa* Opresko, 2003	Opresko & Genin 1990; Opresko 2003
	Fieberling Guyot	*Stichopathes spiessi* Opresko & Genin, 1990; *Trissopathes pseudotristicha* Opresko, 2003	Opresko & Genin 1990; Opresko 2003
	Opal	*S. paucispina* (Van Pesch, 1914)	Opresko & Genin 1990
	Flint	*S. paucispina* (van Pesch, 1914)	Opresko & Genin 1990
Central Pacific	Mid-Pacific mountains	*Bathypathus patula* Brook, 1889; *Parantipathes tristicha* Van Pesch, 1914	Mironov & Pasternak 1981; Opresko 2003
	Brooks Banks	*Myriopathes ulex* (Ellis & Solander, 1786); *Aphanipathes undulata* Van Pesch, 1914; *Antipathes* sp.	Grigg & Opresko 1977
	Lō'ihi	*Stichopathes* sp.; *Parantipathes* sp.	Grigg 1997
	Sala-y-Gomez Ridge	*Bathypathes* sp.; *Cirripathes* sp.; *Curtipathes* sp.[1]	Parin *et al.* 1997
	Naska Ridge	*Cirripathes* sp.	Parin *et al.* 1997
South-west Pacific	Seamounts off Tasmania	*Parantipathes triadocrada* Opresko, 1999; *P. helicosticha* Opresko, 1999; *Trissopathes tetracrada* Opresko, 2003; *Hexapathes australiensis* Opresko, 2003	Opresko 1999, 2003
	Macquarie Ridge	*Dendrobathypathes isocrada* Opresko, 2002	Opresko 2002
	Chatham Rise	*Bathyplates platycaulus*[2]	Probert *et al.* 1997
	Norfolk Ridge	*Saropathes margaritae* n. sp.	this publication

shorter rigid primary pinnules that are curved backward (in contrast with forward curving long primary and secondary pinnules of *S. scoparia*); in a lower order of subpinnulation (three vs four in *S. scoparia*) and in a larger number of shorter secondary pinnules on each of primary (up to eight vs six in *S. scoparia*). These two species also differ in the form and size of the spines. The polypar and abpolypar spines in *S. margaritae* n. sp. are of obviously different size and structure, whereas in *S. scoparia* the spines are subequal around the axis. The maximum height of the polypar spines in the new species is 0.12 mm, whereas in the type species of the genus, the maximum height of the spines is almost one half, being no more than 0.075 mm. There is no great difference in size and arrangement of polyps between the two species.

SEAMOUNTS ANTIPATHARIANS

Antipatharians are a characteristic component of the seamount suspension-feeding fauna (Genin *et al.* 1986; Wilson & Kaufmann 1987; Rogers 1994; Parin *et al.* 1997; Richer de Forges *et al.* 2000; Koslow *et al.* 2001). However, the list of species reported from seamounts is relatively short. Antipatharians are seldom identified to the species level in inventories of seamount faunas, mostly due to difficulties of field identifications. Unbranched forms are reported as *Stichopathes* sp. or *Cirripathes* sp.; branched forms are mostly referred to as *Antipathes* sp. Literature contains rather "exotic" names, as, for example, *Curtipathes* (Parin *et al*. 1997), which is apparently a misrendering of handwritten *Antipathes* Pallas, 1766 (a name not on the list of species in that publication). A complete list of antipatharians reported from seamounts is given in Table 1.
Most antipatharians known from seamounts also occur on islands and continental slopes, but there are a few exceptions. *Stichopathes spiessi* Opresko & Genin, 1990 and *Hexapathes australiensis* Opresko, 2003, initially described from seamounts, have not been reported from other localities, and the type locality of *S. paucispina* (Brook, 1889), reported from seamounts of the north-east Pacific, is unknown (Brook 1889: 87). It is possible that *Saropathes margaritae* n. sp. is not endemic to the Norfolk Ridge. The only other species of the genus, *S. scoparia*, was collected near the North Cape of New Zealand at a depth of 127 m (Totton 1923) and never has been reported again. Some specimens of *Saropathes* from New Zealand (Opresko 2002: 425) found in the collection of NIWA differ from *S. scoparia*. It may be that the specimens seen by Opresko belong to *S. margaritae* n. sp.
The data on the geographic distribution of Antipatharia is poor and generally unreliable. Most antipatharian species were described from a single specimen or even a small fragment, and they are often known only from the type locality. Knowledge of antipatharian biology is fragmentary. Mode of development, which might provide some insights into their dispersion potential, is unknown for most species. The development of the shallow-water species *Antipathella fiordensis* (Grange, 1990) has been studied to some extent; in the case of artificially spawned individuals, fertilization is external and in 36 hours a ciliated planula develops (Miller & Grange 1997), but nothing is known about longevity and competency period of the larvae and, as a consequence, whether long-distant dispersal of the planulae is possible. The fact that dioecy has been reported for all known species of the order (Brook 1889; Van Pesch 1914; Miller & Grange 1997) means that an individual colony cannot constitute a sexually self-reproducing population of antipatharians.

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