New species of *Koralionastes* (Ascomycotina) from the Caribbean and Australia[1]

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Koralionastes giganteus Kohlm. & Volkm.-Kohlm. sp.nov. is described from subtidal coral slabs of back reefs of two small islands off the coast of Belize, Central America. ***Koralionastes violaceus*** Kohlm. & Volkm.-Kohlm. sp.nov. occurs on an island of the Great Barrier Reef, off the Queensland (Australia) coast, and is the first record of the genus outside of the Caribbean. All five *Koralionastes* species are associated with crustaceous sponges.

Key words: *Koralionastes, Koralionastes giganteus, Koralionastes violaceus*, marine fungi, ascomycetes, corals, sponges.

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Koralionastes giganteus Kohlm. & Volkm.-Kohlm. sp.nov. est décrit de récifs coraliens provenant de deux petites îles au large du Bélize en Amérique Centrale. ***Koralionastes violaceus*** Kohlm. & Volkm.-Kohlm. sp.nov. se retrouve sur une des îles de la grande barrière de coraux au large des côtes du Queensland en Australie et il s'agit de la première mention du genre à l'extérieur des Caraïbes. Les cinq espèces de *Koralionastes* sont toutes associées avec des éponges crustacées.

Mots clés : *Koralionastes, Koralionastes giganteus, Koralionastes violaceus*, champignon marin, ascomycètes, coraux, éponges.

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The mycota of coral reefs has been little explored and so far only seven taxa of ascomycetes have been collected *in situ*. They consist of three species of *Koralionastes* (Kohlmeyer and Volkmann-Kohlmeyer 1987), two species and one variety of *Lulworthia* (Kohlmeyer and Volkmann-Kohlmeyer 1989), and one species of *Halographis* (Kohlmeyer and Volkmann-Kohlmeyer 1988). We found a fourth species of *Koralionastes* in the back reef of two small islands off the coast of Belize and an additional one on an island of Queensland (Australia), and we describe them here.

Koralionastes giganteus Kohlm. & Volkm.-Kohlm. sp.nov.
Figs. 1–3

ETYMOLOGY: From the Latin *giganteus* meaning very large, in reference to the size of ascomata and ascospores compared to the other *Koralionastes* species.

Ascomata 1.3–1.8 mm alta (subicula inclusa), 0.9–1.2 mm diametro, ellipsoidea, superficialia, ostiolata, periphysata, breve papillata, coriacea, nigra, subiculata, singularia; periphyses 3–4 μm diametro; subiculum 125–345 μm crassum, 425–850 μm diametro; peridium 125–190 μm crassum, tristratum, texturam angularem formans; stratum externum atrobrunneum, stratum medium dilute brunneum, stratum internum hyalinum; paraphyses 5–12 μm diametro, hyalinae, simplices vel furcatae, septatae, ascomata immatura implentes, ascos circumdantes; asci 400–525 × 115–150 μm, octospori, clavati, breve pedunculati, leptodermi, unitunicati, deliquescentes, e textura ascogena basale exorientes; ascosporae 123–170 × 61–89 μm ($\bar{x}$ = 145 × 76 μm; n = 150), late ovoideae ad ellipsoideae, 2- ad 4-(ad 6)(plerumque 2-)septatae prope apices, non constrictae ad septa, pachydermae, muris bistratis, hyalinae, laeves; antheridia non observata.

SUBSTRATUM: Saxa corallinarum, inter spongias.

DISTRIBUTIO: Oceanus Atlanticus (Belize).

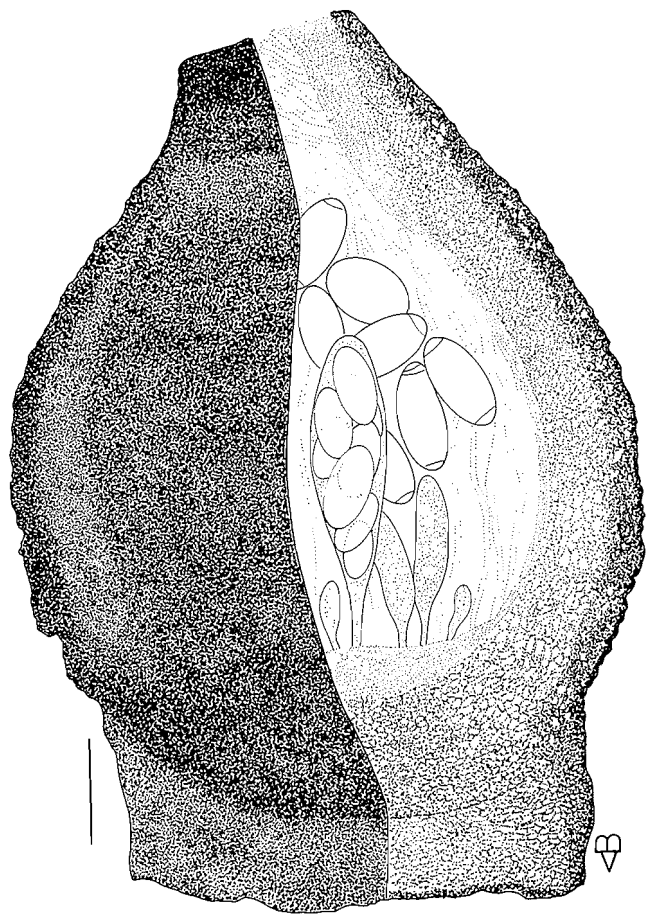

FIG. 1. *Koralionastes giganteus* sp.nov., subiculate ascoma, partly shown in longitudinal section, Herb. J.K. 5022. Bar = 150 μm.

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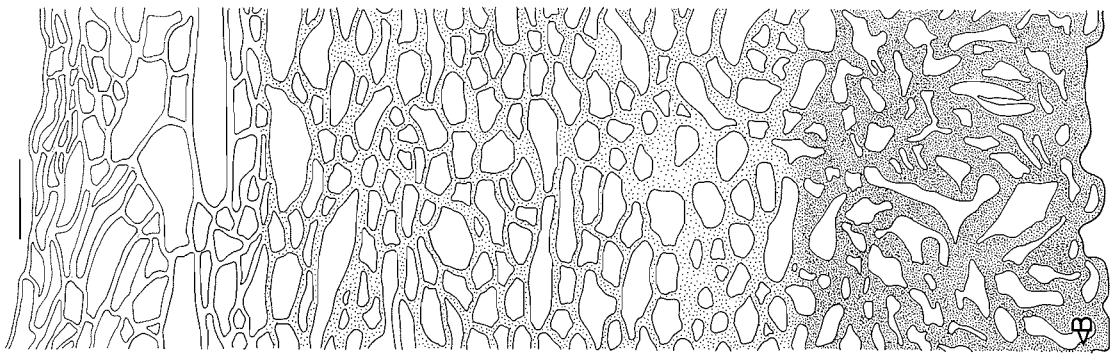

FIG. 2. *Koralionastes giganteus* sp.nov., peridial section, outside to the right, Herb. J.K. 5022. Bar = 10 μm.

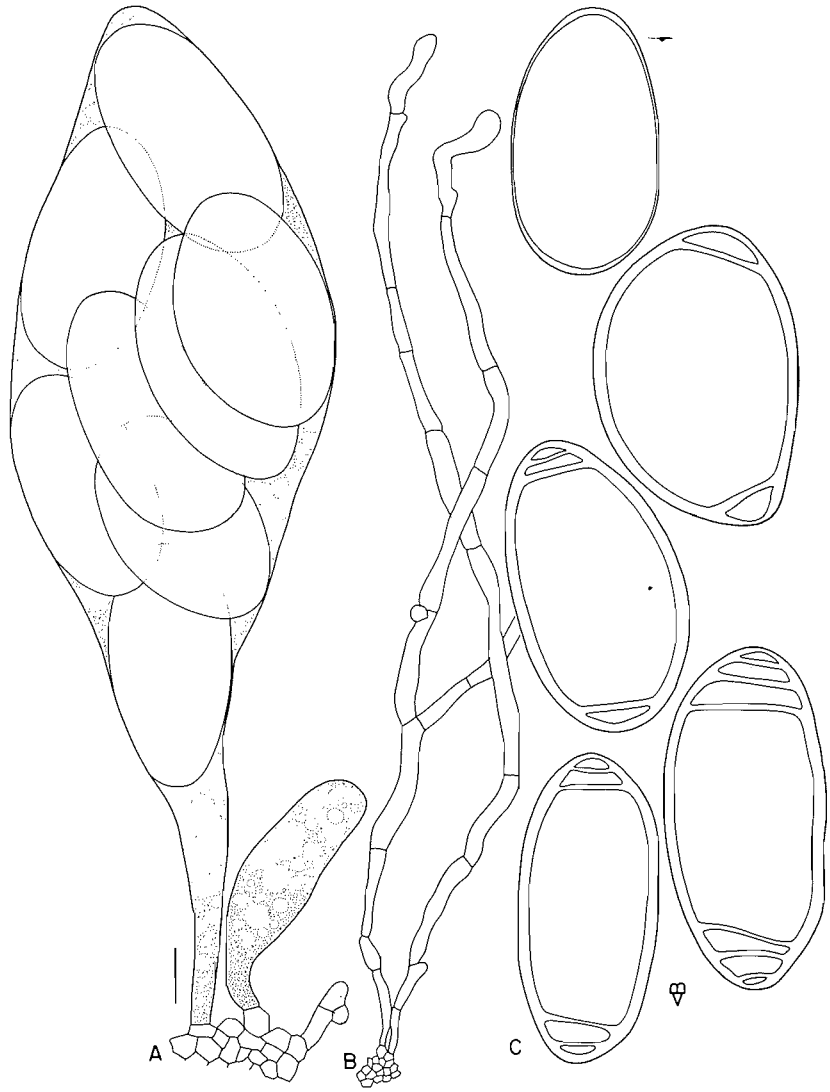

FIG. 3. *Koralionastes giganteus* sp.nov. (A) Asci in different developmental stages, Herb. J.K. 5259. (B) Paraphyses, Herb. J.K. 5259. (C) Ascospores, the upper one immature, Herb. J.K. 5022. Bar = 25 μm.

HOLOTYPUS: J.K. 5022*a* (IMS).

ISOTYPUS: J.K. 5022*b* (FH).

Ascomata 1.3–1.8 mm high (including subiculum), 0.9–1.2 mm in diameter, ellipsoidal, superficial, ostiolate, periphysate, short papillate, coriaceous, black, subiculate, single (Fig. 1). Periphyses 3–4 μm in diameter. Subiculum 125–345 μm thick, 425–850 μm in diameter, surrounding the base of the ascoma, attached to coral slabs (Fig. 1). Peridium 125–190 μm thick, warty on the outside, composed of about 30–40 cell layers, arranged in three strata; outer stratum of irregular, dark brown cells, almost epidermoid; middle stratum light brown, forming a *textura angularis*; inner stratum of hyaline, flattened cells, relatively broad around the ostiolar canal (Fig. 2). Paraphyses 5–12 μm in diameter, hyaline, simple or branched, septate, filling immature ascomata, surrounding the asci in mature fruiting bodies (Figs. 1 and 3B). Asci 400–525 × 115–150 μm, eight-spored, clavate, short pedunculate, thin-walled, unitunicate, dissolving before ascospore maturity, arising from an ascogenous tissue at the base of the locule (Figs. 1 and 3A). Ascospores 123–170 × 61–89 μm ($\bar{x}$ = 145 × 76 μm; n = 150), broad ovoid to ellipsoidal, 2- to 4-(to 6)(mostly 2-)septate near the apices, not constricted at the septa, thick-walled, walls two-layered, hyaline, smooth (Fig. 3C). Antheridia not observed.

SUBSTRATE: Lower side of coralline-coated coral rock, usually among crustaceous sponges.

RANGE: Atlantic Ocean (known only from the type locality, Belize).

MATERIAL EXAMINED: Subtidal coral slabs, back reef of South Water Cay, Belize, 16°49′N, 88°04′45″W, 26 May 1987, J.K. 5022*a* (HOLOTYPE, IMS), J.K. 5022*b* (ISOTYPE, FH); same substrate and location, 22 Nov. 1986, 22 May 1987, 25 May–2 June 1989, J.K. 4965*e*, 5026, 5259–5261 (PARATYPES, IMS); same substrate, Tobacco Cay, Belize, 16°54′30″N, 88°03′30″W, 24 and 25 May, 2 June 1987, J.K. 5023 (PARATYPE, IMS).

Koralionastes violaceus Kohlm. & Volkm.-Kohlm. sp.nov. Figs. 4–6

ETYMOLOGY: From the Latin *violaceus* meaning violet, in reference to the violet-colored outer layer of the peridium, as observed in microscopic sections.

Ascomata 630–800 μm alta (subicula inclusa), 570–715 μm diametro, ellipsoidea, superficialia, ostiolata, periphysata, breve papillata vel epapillata, coriacea, nigra, subiculata, gregaria; papilla 120–240 μm alta, 75–130 μm diametro; periphyses 1.5–3 μm diametro; subiculum 40–60 μm crassum, 350–550 μm diametro; peridium 50–70 μm crassum, tristratum, texturam angularem formans; stratum externum violaceum, stratum medium dilute brunneum, stratum internum hyalinum; paraphyses 5–12 μm diametro, hyalinae, simplices, septatae, ascomata immatura implentes, ascos circumdantes; asci 380–415 × 80–100 μm, octospori, clavati, breve pedunculati, leptodermi, unitunicati, deliquescentes, e textura ascogena basale exorientes; ascosporae 85–130 × 25–34 μm ($\bar{x}$ = 107 × 30 μm; n = 105), cylindricae (ad ellipsoideae), 3- ad 6-(plerumque 4- et 5-)septatae, non constrictae ad septa, pachydermae, hyalinae, laeves; antheridia non observata.

SUBSTRATUM: Saxa corallinarum, inter spongias.

DISTRIBUTIO: Oceanus Pacificus (Australia, Queensland).

HOLOTYPUS: J.K. 5227*a* (DAR).

ISOTYPUS: J.K. 5227*b* (IMS).

Ascomata 630–800 μm high (including subiculum), 570–715 μm in diameter, ellipsoidal, superficial, ostiolate, periphysate, short papillate or epapillate, coriaceous, black, subiculate, gregarious (Fig. 4). Papilla 120–240 μm high, 75–130 μm in diameter. Periphyses 1.5–3 μm in diameter. Subiculum 40–60 μm thick, 350–550 μm in diameter, surrounding the base of the ascoma, mostly crustose, sometimes hyphoid, attached to coral slabs (Fig. 4). Peridium 50–70 μm thick, composed of about 25 cell layers, arranged in three strata, forming a *textura angularis*; outer stratum of violet cells with large lumina; middle stratum of smaller light brown cells; inner stratum of hyaline, flattened cells that are largest near the locule (Fig. 5). Paraphyses 5–12 μm in diameter, hyaline, simple, septate, filling immature ascomata, surrounding the asci in mature fruiting bodies. Asci 380–415 × 80–100 μm, eight-spored, clavate, short pedunculate, thin-walled, unitunicate, dissolving at ascospore maturity, arising from an ascogenous tissue at the base of the locule (Figs. 4 and 6A). Ascospores 85–130 × 25–34 μm ($\bar{x}$ = 107 × 30 μm; n = 105), cylindrical (to ellipsoidal), 3- to 6-(mostly 4- and 5-)septate, not constricted at the septa, thick-walled, hyaline, smooth (Fig. 6B). Antheridia not observed.

SUBSTRATE: Lower side of coralline-coated coral rock, among crustaceous sponges.

RANGE: Pacific Ocean (known only from the type locality, Queensland, Australia).

MATERIAL EXAMINED: Subtidal coral slabs, back reef of Heron Island, Queensland, Australia, 23°27′S, 151°55′E, 27 Feb. 1988, J.K. 5227*a* (HOLOTYPE, DAR 65434), J.K. 5227*b* (ISOTYPE, IMS); same substrate and location, 25–28 Feb. 1988, J.K. 5223–5226, 5229 (PARATYPES, IMS), 5225 (PARATYPE DAR 65435).

Discussion

Koralionastes giganteus is the largest among the species of this genus. Dimensions of ascomata, asci, and ascospores, as well as the peridial thickness surpass those of *K. angustus* Kohlm. & Volkm.-Kohlm., *K. ellipticus* Kohlm. & Volkm.-Kohlm., *K. ovalis* Kohlm. & Volkm.-Kohlm., and *K. violaceus*. Another distinguishing character is the small number of ascospore septa in *K. giganteus*. *Koralionastes giganteus* appears to be much rarer than the other known species of *Koralionastes* as it occurred in only eight collections among hundreds of rocks examined, often consisting of a single ascoma, mostly on one island in Belize (South Water Cay), much rarer on another (Tobacco Cay).

Ascomata of *K. giganteus* develop singly or rarely two together and are never completely covered by sponges, whereas the earlier described species and the newly discovered *K. violaceus* were found mostly in large groups among or under crustaceous sponges on the lower side of coral slabs. The regular association of *Koralionastes* species with sponges suggests a possible nutritional dependence of these ascomycetes on Porifera.

We encountered *K. giganteus* for the first time in November of 1986, but ascomata had deteriorated and were mostly empty. All later collections were made at the end of May or at the beginning of June. Most ascomata were immature in these early summer samples. Therefore, we conclude that there is a distinct seasonality in the development of *K. giganteus*. The peak of ascospore release is probably between July and September. The extremely thick, carbonaceous peridia of ascomata (Fig. 2)

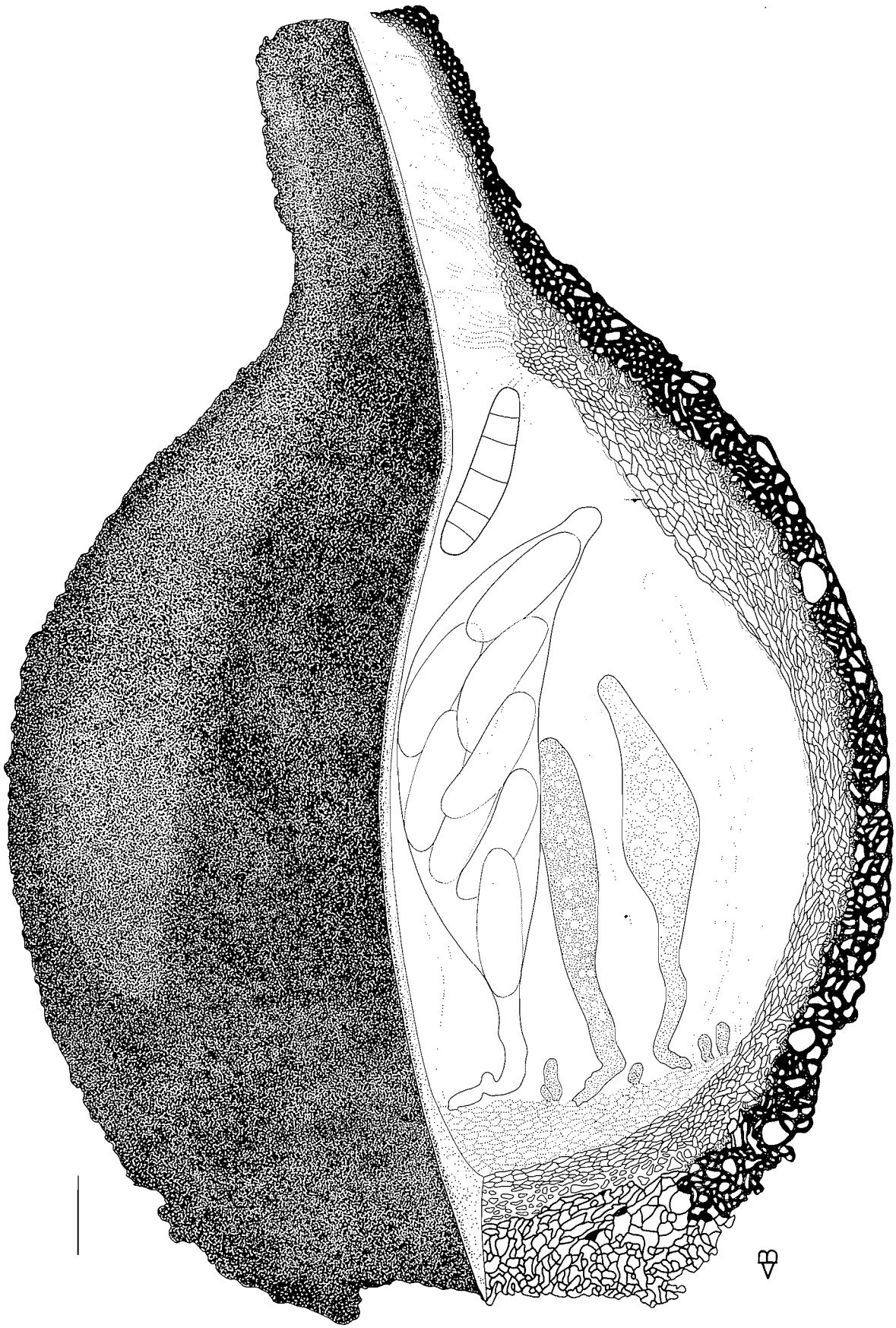

FIG. 4. *Koralionastes violaceus* sp.nov., subiculate ascoma, partly shown in longitudinal section, Herb. J.K. 5227. Bar = 50 μm.

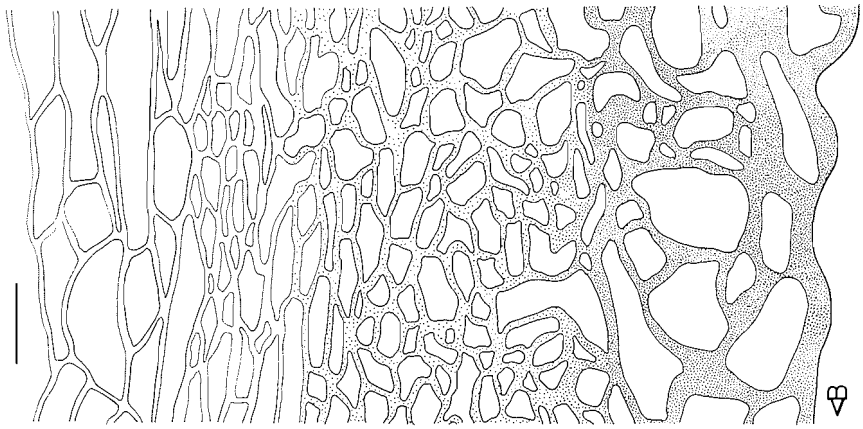

FIG. 5. *Koralionastes violaceus* sp.nov., peridial section, outside to the right, Herb. J.K. 5227. Bar = 10 μm.

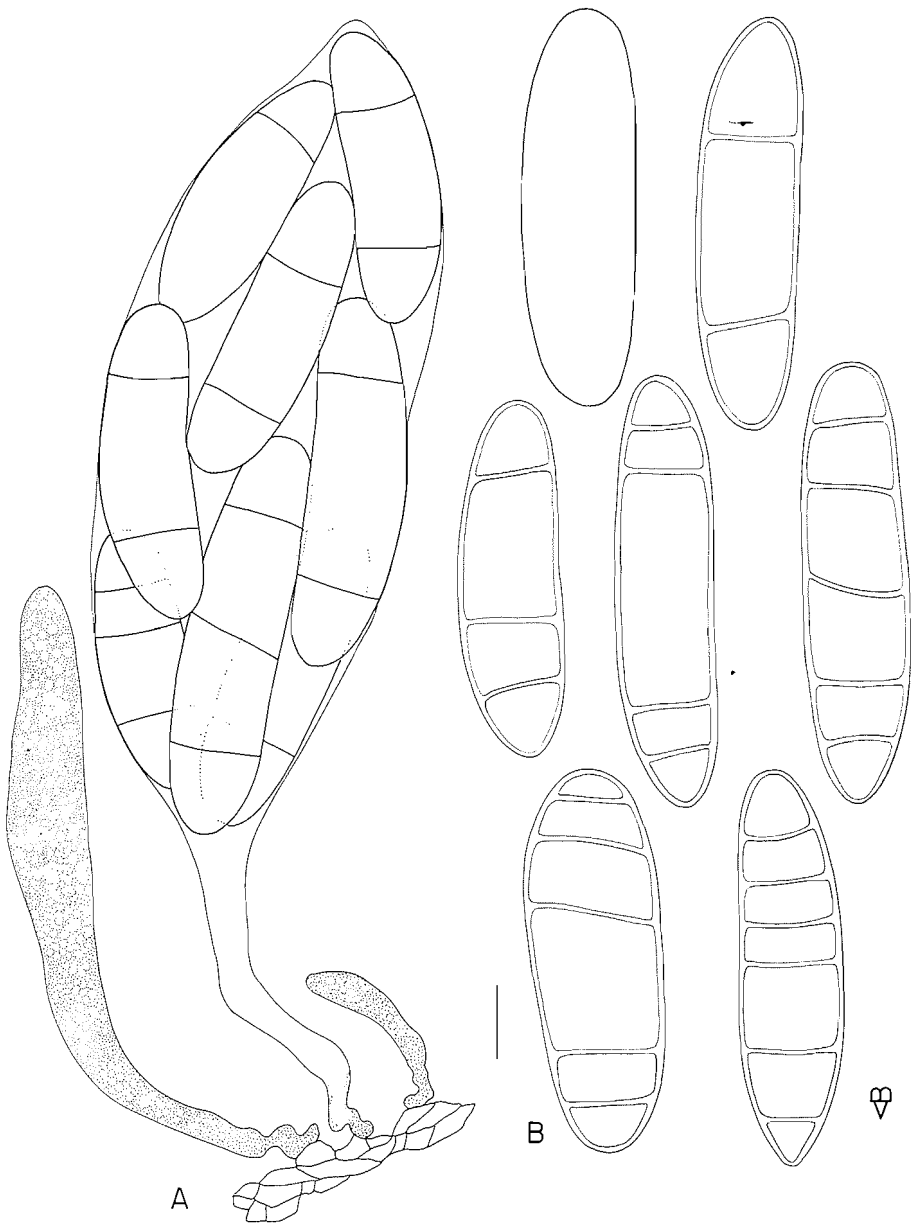

FIG. 6. *Koralionastes violaceus* sp.nov. (A) Asci in different developmental stages. (B) Ascospores, the upper two immature, Herb. J.K. 5227. Bar = 25 μm.

appear to provide good protection for the delicate tissues of the centrum. Water temperatures in the shallow reef flat areas where *Koralionastes* species occur may reach 35°C in May and June (Rützler and Ferraris 1982), especially during daytime periods of spring tides. So far, we have not found any germinating ascospores with antheridia in *K. giganteus* and *K. violaceus*, as are known for the other three *Koralionastes* species (Kohlmeyer and Volkmann-Kohlmeyer 1987).

At first sight, *K. violaceus* appears to be very close to *K. ellipticus* that occurs in the same location; however, there are distinct differences between them. Whereas ascospore dimensions in the two species are almost identical, they differ in overall shape and in the number of septa. Ascospores of *K. ellipticus* are ellipsoidal, 1- to 8-(mostly 6-)septate, while those of *K. violaceus* are almost cylindrical, 3- to 6-(mostly 4- and 5-)septate. Another distinguishing feature is the peridium of ascomata that has two strata in *K. ellipticus* (outside light brown, inside hyaline) but three strata in *K. violaceus* (outside violet, middle light brown, inside hyaline).

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