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A new species of *Isidella* bamboo coral (Octocorallia: Alcyonacea: Isididae) from northeast Pacific seamounts

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Abstract.—A new species of deep-sea gorgonian, *Isidella tentaculum*, from 720–1050 m depths on Northeast Pacific seamount peaks, continental slopes, and shelf canyons is described and illustrated. The octocoral colonies were observed alive and in situ using a manned submersible and remotely operated vehicles. The new species is a large (up to 132 cm high), abundant, and conspicuous habitat former. It differs from its closest sister species (*I. trichotoma*, *I. longiflora*, *I. lofotensis*, and *I. elongata*) in size and stature, polyp size, and polyp arrangement. Distinctive characteristics of *I. tentaculum* include thornstar-shaped sclerites and large, closely-spaced, dimorphic polyps, never before reported in the family Isididae. Living colonies exhibit long basal zooids trailing from the trunk, similar in appearance to scleractinian 'sweeper tentacles'. Large colonies have long tentacles (~40 cm). The flabellum has whorls of 4–5 large (6–9 mm high, 2–3 mm diameter), closely packed (2–4 mm apart) autozooid polyps. Long needle-shaped sclerites project from the septa between the pinnate tentacles. Small rod and platelet sclerites are evident in pinnules, and thornstars are evident in the pharynx of the polyps. Thornstars have been reported in *Acanella*, but not in *Isidella*.

Gorgonian corals, also known as sea fans, are common and conspicuous coral reef fauna in some parts of the shallow West Atlantic, but they occur worldwide deeper than 4200 m (Bayer 1956). Deep-water gorgonians are broadly distributed throughout the world's oceans wherever suitable substrate exists (Bayer 1956, 1961). They can be abundant on abrupt topographies like seamounts and canyons, where large, suspension feeding colonies provide important habitat to associated species of fish, invertebrates, and microbial fauna. However, deep-sea habitats are poorly sampled, so even the most common deep-sea gorgonians are poorly understood. The bony, hard-bodied calcareous "bamboo corals" in the calcaxonian family Isididae are one example.

Bamboo coral colonies have a distinctive appearance. The skeleton consists of an articulated axis of alternating calcitic internodes and proteinaceous nodes surrounded in life by non-retractile polyps with rod-shaped sclerites and large needles, also called spindles (Deichmann 1936), projecting prominently from the septa at the base of the tentacles. Species of Keratoisidinae are well adapted to bathyal and abyssal depths; they are known from all seas but the Arctic Ocean (Kükenthal 1924, Bayer 1956). The subfamily Keratoisidinae consists of four genera (*Acanella*, *Isidella*, *Lepidisis*, and *Keratoisis*) and two genera (*Tenuisis* and *Australisis*) that may belong elsewhere in Isididae (Bayer 1990).

Species of the genus *Isidella* Gray, 1858 are distinguished from other Keratoisidinae by a flattened, openly flabellate colony with dichotomous branching from the horny nodes, mostly in one plane (Kükenthal 1919, Bayer 1990). Species of the genus *Acanella* Gray, 1869 also branch from the nodes, but colonies branch in whorls, lending a bush-like appearance. *Acanella* could be subsumed under *Isidella* (Muzik, 1978), but the distinctive character of verticillate branching in *Acanella* and a more or less planar colony in *Isidella* has upheld the distinction between the two (Bayer 1990). Yet, molecular research (France 2007) and morphological work (Verrill 1883, Kükenthal 1919) both suggest the branching pattern may not be a useful taxonomic character for genera in the Keratoisidinae.

The genus *Isidella* is comprised of four species: the type species *I. elongata* Esper, 1788; *I. lofotensis* Sars, 1868; *I. trichotoma* Bayer, 1990, and *I. longiflora* (Verrill, 1883). *Isidella elongata* is known from 400–754 m in the Mediterranean (Kükenthal 1924); *I. lofotensis* from 400–700 m along the Scandinavian coast (Madsen 1944) and in the North Atlantic as far west as the Greenland Sea (Mayer & Piepenburg 1996). The type location for *I. longiflora* is the West Atlantic off Dominica at 524 fm (~960 m, Verrill 1883). *Isidella* was unknown from the Pacific until Bayer (1990) described *I. trichotoma* from 1920 m depth southeast of Hawaii.

Isidella longiflora was originally placed in the genus *Lepidisis* (Verrill, 1883) but was moved to the genus *Isidella* based on the character of bifurcating branches (Grasshoff 1986). However, "branching from the nodes" is typical of *Lepidisis* (Verrill 1883, Kükenthal 1919). A key to genera in the Keratoisidinae overlooked branching in *Lepidisis*, referring all unbranched colonies to this genus (Bayer 1990), so this may be a source of confusion. Yet, Verrill (1883) himself noted that *Isidella* is also "imperfectly known and not properly characterized." The definitive characters for the genus to date are sparse, dichotomous branching from the nodes, mostly in one plane (Kükenthal 1919, Bayer 1990).

The new species described herein is a large, flabellate colony that occurs from 720–1050 m depths on Northeast Pacific seamounts, continental slopes, and continental shelf canyons. The new species is the fifth species in the genus, distinguished from others in the genus by dense ramification; large, closely-spaced, dimorphic polyps; with autozooids adorning the axis, and elongated basal zooids, here after referred to as 'sweeper tentacles' trailing from the base of the living colonies. Large colonies tend to have long sweeper tentacles, while smaller colonies have smaller, less developed sweeper tentacles. The new species is not endemic to seamounts, but it is one of the largest and most ubiquitous species on several seamounts with shallow peaks in the northeast Pacific Ocean surveyed between the years 2002 and 2004.

Materials and Methods

Manned submersible explorations of seamounts in the northeast Pacific Ocean using the deep submergence vehicle *Alvin* and R/V *Atlantis* in 2002 and 2004 repeatedly encountered large (>1 m) flabellate bamboo coral colonies and assemblages on rocky slopes near seamount peaks. Colonies branched dichotomously from the organic internodes in one plane like *Isidella* but differed greatly from known *Isidella* species in size and stature. Three complete voucher specimens were retrieved intact from Gulf of Alaska. The largest colony recovered (USNM 1082135, 132 cm high) was found dead and denuded, aside two living colonies. This skeleton is the tallest North American keratoisidid on record since Verrill (1883). Two additional colonies were collected alive in their entirety, and six colonies were sampled for living tissue at the distal tips and at the base. Sweeper tentacles were collected independently of autozooids, using a mini-slurp device consisting of an insulated one-liter chamber connected to a 1.3 cm diameter tube with a sharpened brass metal edge. All colonies sampled were photo- and video-documented in situ and on deck.

To determine the zoogeographic distribution of the species, live-capture collections were augmented with collections and images by Monterey Bay Aquarium Research Institute (MBARI), archives from the California Academy of Sciences (CAS), and from NOAA Fisheries trawl data from Alaska, Washington, and Oregon, USA. Type specimens are deposited at the National Museum of Natural History (USNM), Smithsonian Institution, Washington D.C. and Santa Barbara Museum of Natural History. Scanning electron microscopic (SEM) images were captured using the Amray 1810 at the National Museum of Natural History. Terminology used in the description follows Bayer et al. (1983).

Systematic Description

Subclass Octocorallia
Order Alcyonacea
Suborder Calcaxonia
Family Isididae Lamouroux, 1812
Subfamily Keratoisidinae Gray, 1870
Genus *Isidella* Gray, 1858

Isidella Gray, 1858:283; 1870:14.—Verrill, 1883:13.—Studer [& Wright], 1887:44. —Kükenthal, 1915:118; 1919:564, 783; 1924:414.—Deichmann, 1936:239.—Madsen, 1944:8. —Bayer, 1956:F222. —Carpine & Grasshoff, 1975:107.—Bayer & Stefani, 1987a:51 (in key); 1987b:941 (in key).—Bayer, 1990:207.—Isis.—G. von Koch, 1887:90

Diagnosis.—Keratoisidinae branched dichotomously or trichotomously from nodes, usually in one plane, often in candelabrum form; internodes long (up to 10 cm), solid at proximal end, hollow at distal tips, longitudinally grooved, straight in central flabellum, curved at periphery; base of main stem forming discoid calcareous holdfast on hard substrate or lobed, rootlike holdfast on soft substrate. Polyps non-retractile, cylindrical, armed with needles longitudinally placed in body wall at base of tentacles; prickly rods in wall of tentacles and pharynx.

Type species.—*Isis elongata* (Esper, 1788) by monotypy.

Remarks.—Gray's original description (1858) of *Isidella* was not sufficiently detailed to adequately define the genus; thus, Verrill (1883) considered the genus doubtful and poorly established. Subsequent authors, including Kükenthal (1919), Carpine & Grasshoff (1975), and Bayer (1990), recognized the genus as branching sparsely and dichotomously from the nodes, mostly in one plane. In his review of the Keratoisidinae, Bayer (1990) states the validity of the genus is not in question.

Isidella tentaculum, new species
Figs. 1–7

Material examined.—Holotype: northeast Pacific Ocean, Gulf of Alaska, Dickins Seamount, 54°30.85′N, 136°54.55′W, 775 m, coll. P. Etnoyer, *Alvin* dive 4031, sample 14, 7 Aug 2004. Skeleton of one entire colony, collected alive. Total colony height 36 cm without distal tips, basal internode diameter 1.3 cm, basal internode length 4.7 cm. Dried, glossy, with major branches intact. Distal tip, 2 pieces each ~3 cm, 70% alcohol, USNM 1076658. Sweeper tentacles, preserved in 95% ethanol, fixed in formalin, USNM 1082130. Paratypes: northeast Pacific Ocean, Gulf of Alaska, Welker Seamount, 55°01.65′N, 140°17.52′W, 1049 m, coll. A. Baco-Taylor, *Alvin* dive 4035, sample 24, 11 Aug 2004. Skeleton of one entire colony, collected alive. Total colony

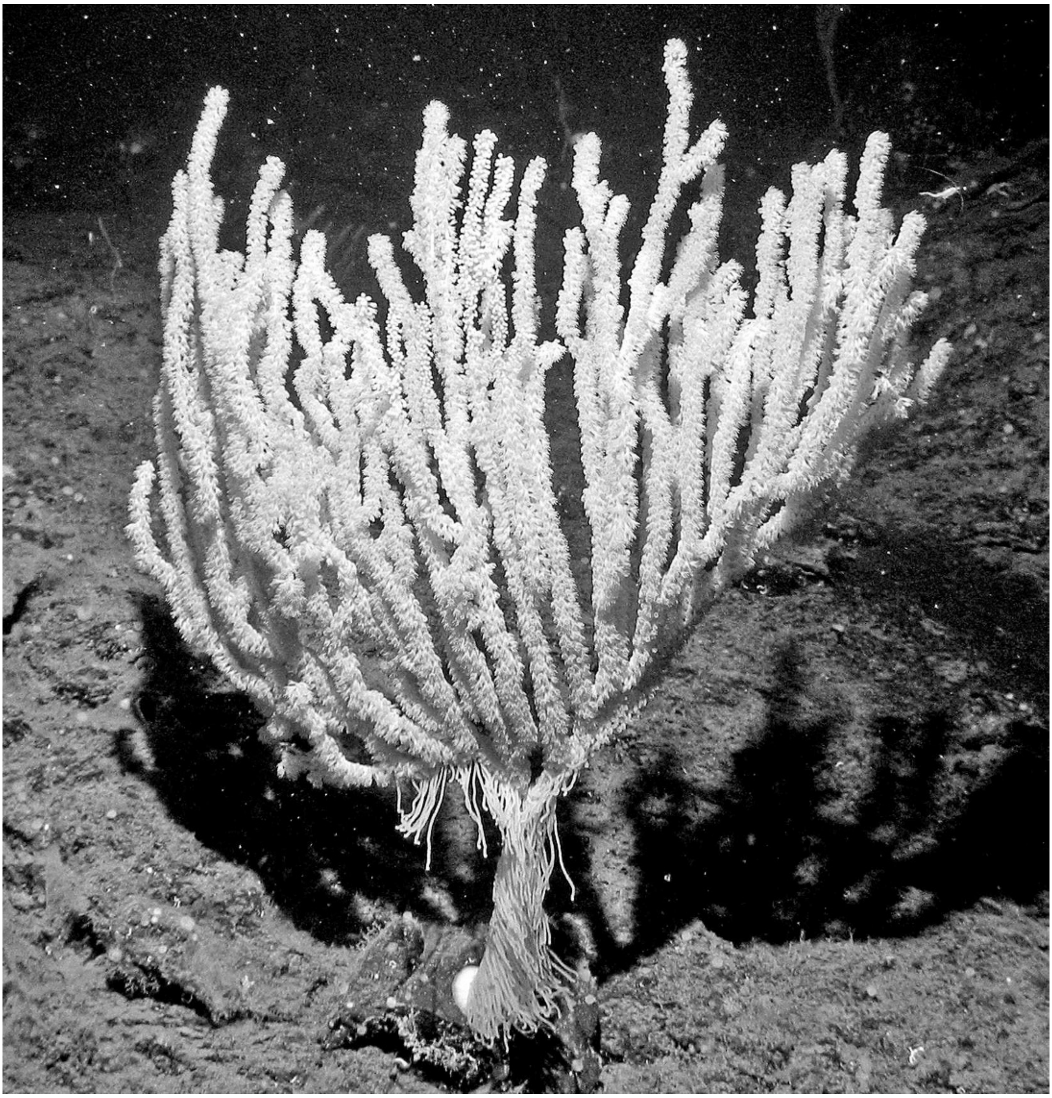

Fig. 1. Living flabellate colony of *Isidella tentaculum* (~75 cm height) photographed on Giacomini Seamount at 891 m depth. Image courtesy of NOAA, WHOI, the *Alvin* Group, and the 2004 GOA Expedition science party.

height 43 cm without distal tips, basal internode diameter 1.22 cm, basal internode length 10.4 cm. Dried, glossy, with major branches intact. SBNMH 369349. Distal tips, 2 unbranched segments, 4 cm and 6 cm long, fixed in formalin. One unbranched segment 10 cm long. 70% ethanol, USNM 1082134.

Northeast Pacific Ocean, Gulf of Alaska, Welker Seamount, 55°01.65′N, 140°17.52′W, 1032 m, coll. B. Strickrott, *Alvin* dive 4035, sample 28, 11 Aug 2004. Skeleton of one entire colony, found dead. Total colony height 132 cm, basal internode diameter 5.2 cm, basal internode length 18.5 cm. Dried, chalky, with major branches intact, USNM 1082135.

Topotype: northeast Pacific Ocean, Gulf of Alaska, Welker Seamount, 55°01.65′N, 140°17.52′W, 1044 m, coll. A. Baco-Taylor, *Alvin* dive 4035, sample

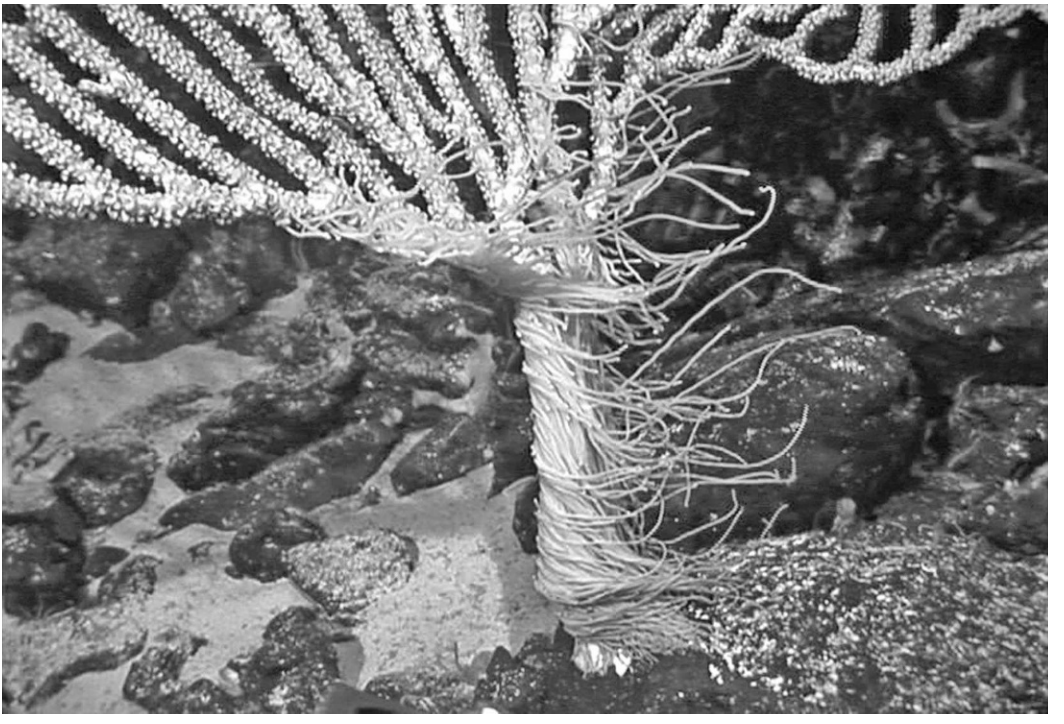

Fig. 2. Elongated basal zooids, or 'sweeper tentacles,' extending from (~20 cm tall) trunk of *Isidella tentaculum*.

31, 11 August 2004. Branched 17 cm segment in 70% ethanol, USNM 1076660.

Non-types: northeast Pacfic Ocean, Gulf of Alaska, Giacomini Seamount, 56°25.40′N, 146°22.28′W, 891 m, coll. P. Etnoyer, *Alvin* dive 4040, sample 2, 16 Aug 2004. Distal tip, branched 7.5 cm segment 95% ethanol, fixed in formalin. USNM 1082142, GenBank accession number EU888118. Sweeper tentacles, 70% ethanol, USNM 1082141.

Northeast Pacific Ocean, Gulf of Alaska, Pratt Seamount, 56°10.15′N, 142°42.03′W, 913 m, coll. P. Etnoyer, *Alvin* dive 4039, sample 23, 15 Aug 2004. Distal tip, broken into 2 pieces, 5 cm and 6 cm, 70% ethanol, USNM 1076664. Sweeper tentacles, USNM 1082139.

Northeast Pacific Ocean, Gulf of Alaska, Pratt Seamount, 56°10.15′N, 142°42.03′W, 1040 m, coll. P. Etnoyer, *Alvin* dive 4039, sample 13, 15 Aug 2004. Distal tip, branched segment 10 cm, 95% ethanol, fixed in formalin, USNM 1082137. Sweeper tentacles, USNM 1082136.

Northeast Pacific Ocean, Gulf of Alaska, Warwick Seamount, 48°03.31′N, 132°44.62′W, 705 m, coll. T. Guilderson, *Alvin* dive 3808, 12 Jul 2002. Distal tip, branched segment 10 cm, 95% ethanol, fixed in formalin, USNM 1082175, GenBank accession number EU888119.

Northeast Pacific Ocean: California, Monterey Canyon, 36.736538°N, 122.033363°W, 907 m, coll. H. Jannasch, MBARI, ROV *Ventana* Dive 1364, sample 1, Clamfield Station (Monterey Canyon), 12 Dec 1998. Total colony height 76.43 cm, largest basal internode diameter 2.3 cm. Dried and mounted, chalky, with major branches intact.

Northeast Pacific Ocean, California, Rodriguez Seamount, 34.0214°N, 121.0898°W, 847 m, coll. D. Clague,

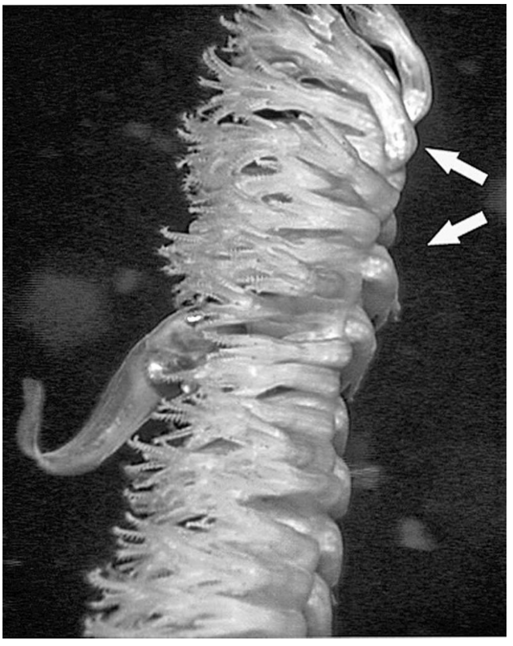

Fig. 3. Eggs (indicated by arrows) in gastric cavity of large (7–9 mm) polyps and shown with unidentified liparid snailfish on distal tips of branch of *Isidella tentaculum.*

MBARI, *Tiburon* dive 630, sample A14. 16 Oct 2003. Branched segment 14 cm, with putative sweeper tentacles, 70% ethanol, USNM 1082174.

Description.—The living adult colony is tall (>1 m), regularly branched in one plane dichotomously from the nodes, with a broad semi-lyrate flabellum (Fig. 1). The coenenchyme is thin and translucent, with an orange or golden hue. Below the flabellum, the unbranched articulated trunk is long and thick, attached to cobbles and rocks by means of a discoid holdfast. The trunk is ~1/3 total colony height, branching into a flabellum with thinner, hollow, parallel branchlets at the distal tips.

Below the first branch point on the colony, the living trunk is draped in dozens (20–100) of tentacle-like elongate (up to 30–40 cm) basal zooids with clavate distal tips (Fig. 2). These extend from the stalk of the colony and undulate in benthic currents. The zooids are considered modified polyps, rather than modified tentacles, because no peristome was observed between them. Nematocysts are present in the tissues, suggesting these may perform a defensive function. Thus, the vernacular term 'sweeper tentacle' is applied. This character was unique among all the octocorals observed during the Gulf of Alaska Seamount Expeditions in 2002 and 2004.

Above the first branch point, autozooid polyps are large (6–9 mm high, 2–3 mm diameter) and tightly spaced. Some colonies were found with small egg shaped masses in the coelenteron (Fig. 3). The polyps are golden to orange-red in color, arranged in whorls of 4–5, spaced 2–4 mm apart. Exsert polyps are approximately 7 mm tall including the anthocodia. Pinnate tentacles are 2–3 mm, slightly shrunken in preservative. Long (2.5 mm) slender needle-like sclerites project between each tentacle (Fig. 4A), with the bulbous end exsert and the narrow end implanted in the septa (Fig. 4D). The needles are not sharp; they are slightly bent towards the abaxial, blunt and rounded on the narrow end, clublike on the other end, bulbous and slightly cristate. Calyces contain small cylindrical rod-shaped sclerites (Fig. 4B) and flattened scales with median constriction are arranged in a chevron pattern along the adaxial ridge of each tentacle (Fig. 4E). Small thornstar sclerites (Fig. 4C) are found in the pharyngeal wall (Fig. 4F). No sclerites were found in the coenenchyme.

Calcitic internodes are longitudinally striated, solid near the base of the colony, but hollow near the distal tips. Internodes in the central flabellum are mostly straight, averaging 5 cm length, 2 cm width on large colonies. Internodes along the peripheral branches are shorter, stouter, and curved slightly. The pattern of striation is fine, with ~15–20 longitudinal ribs cm^{-1}. In cross-section, internodes exhibit a radial pattern of calcification

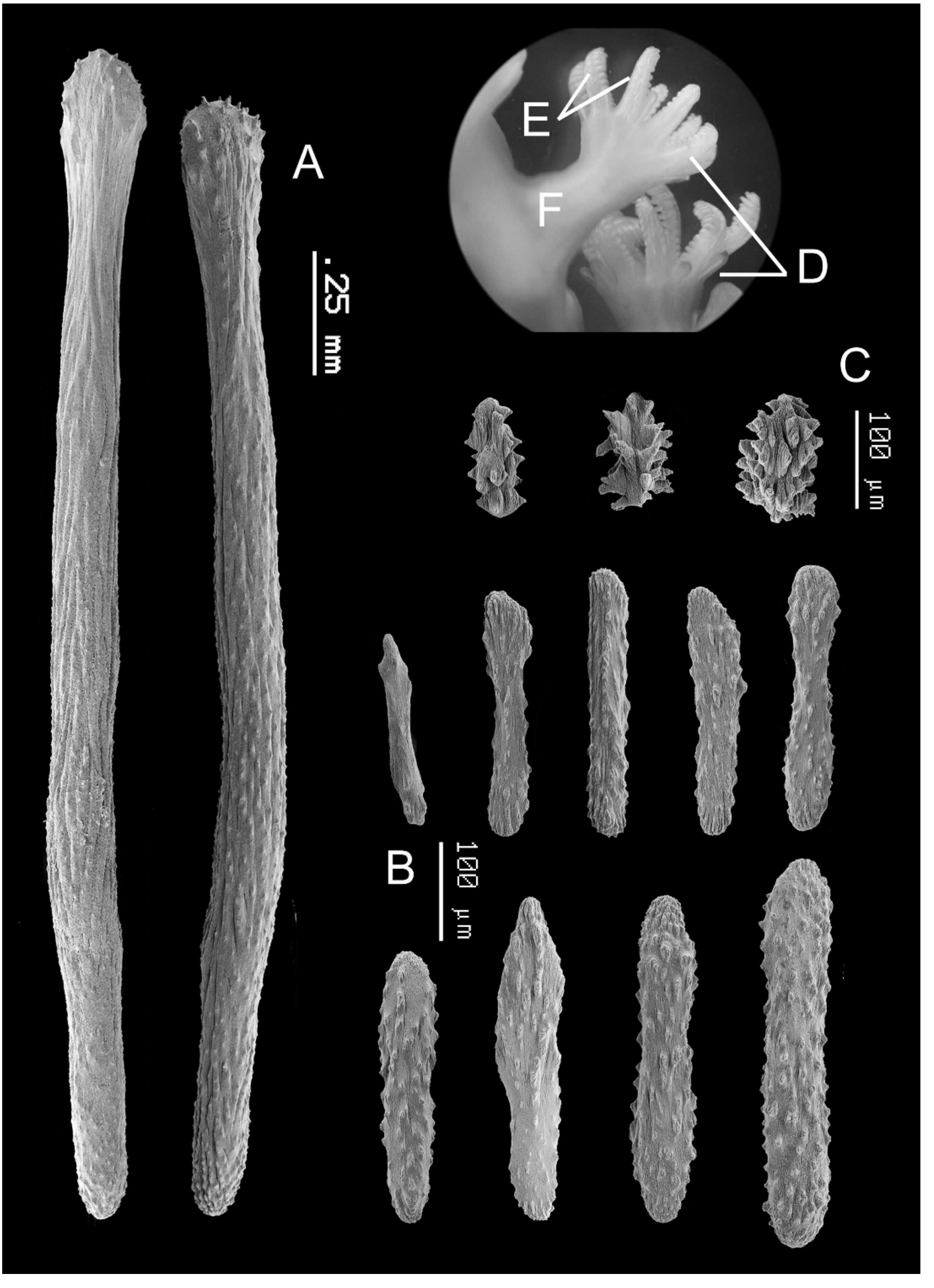

Fig. 4. SEM micrographs of sclerites of *Isidella tentaculum*. Long needles (A), or spindles, project between tentacles (D), scales and rods (B) occur in anthocodia (E), and thornstars (C) occur in pharynx (F).

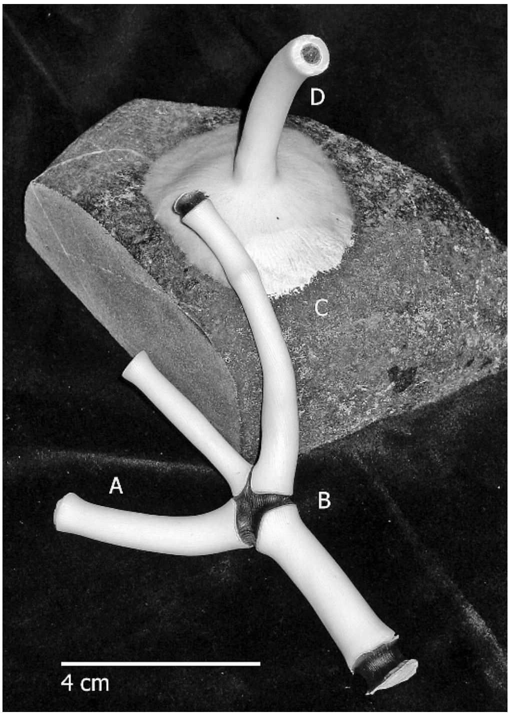

Fig. 5. Skeleton of *Isidella tentaculum* showing internode (A), node (B), discoid holdfast of small colony (C), and proteinaceous material in central axis (D), surrounded by calcitic material.

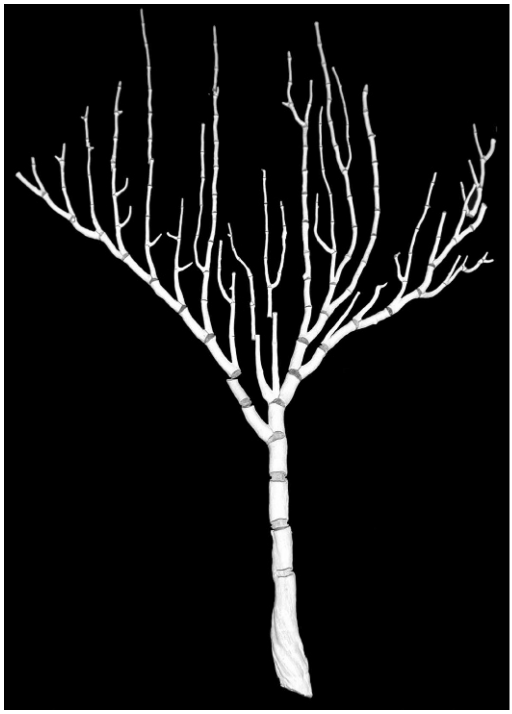

Fig. 6. Skeleton of *Isidella tentaculum* paratype USNM 1082135 from Welker Seamount, 1032 m, branching in one plane from gorgonaceous nodes. Colony height—132 cm.

around a minute central canal. A small central canal runs through the center of the internodes, presumably connecting to the nodes. Large dark deposits are evident within some internodes, presumably originating from the proteinaceous central canal. The internodal gorgonaceous material may perhaps represent some stage in the ontogeny of the nodes, or perhaps calcitic overgrowth (Noe & Dullo 2006). Organic nodes are brown to brownish-gold, longitudinally striated, also with concentric rings in cross-section. (Fig. 5) The stoutest of these nodes is 3.4 cm in diameter, and 1.2 cm thick, at the unbranched base of the largest colony collected in its entirety (Fig. 6).

The largest proximal internode from the 132 cm paratype is dusty white, chalky, 18.5 cm long and 5.2 cm thick at the mid-section. The largest proximal internode from the holotype (USNM 1076658) is glossy bone, 4.33 cm long and 1.26 cm thick. These differ in that specimen USNM (1082135) was found dead, so the calcite was 'weathered' and slightly dissolved, while the holotype (USNM 1076658) was collected alive, and the protective mesoglea was removed on deck.

Comparisons.—*Isidella trichotoma* from the Pacific is the closest geographic congener to *I. tentaculum*, but *I. trichotoma* is sparingly branched, with small, conical, uniserial polyps about 8 mm apart. Furthermore, the internodes of *I. trichotoma* are smooth, not longitudinally striated. *Isidella tentaculum* differs from Atlantic species of *Isidella* in size and stature. *Isidella elongata* is known from 500–1000 m in the Mediterranean Sea (Carpine & Grasshoff 1975). *Isidella lofotensis* is known from "moderate depths" of 400–700 m along the Scandi-

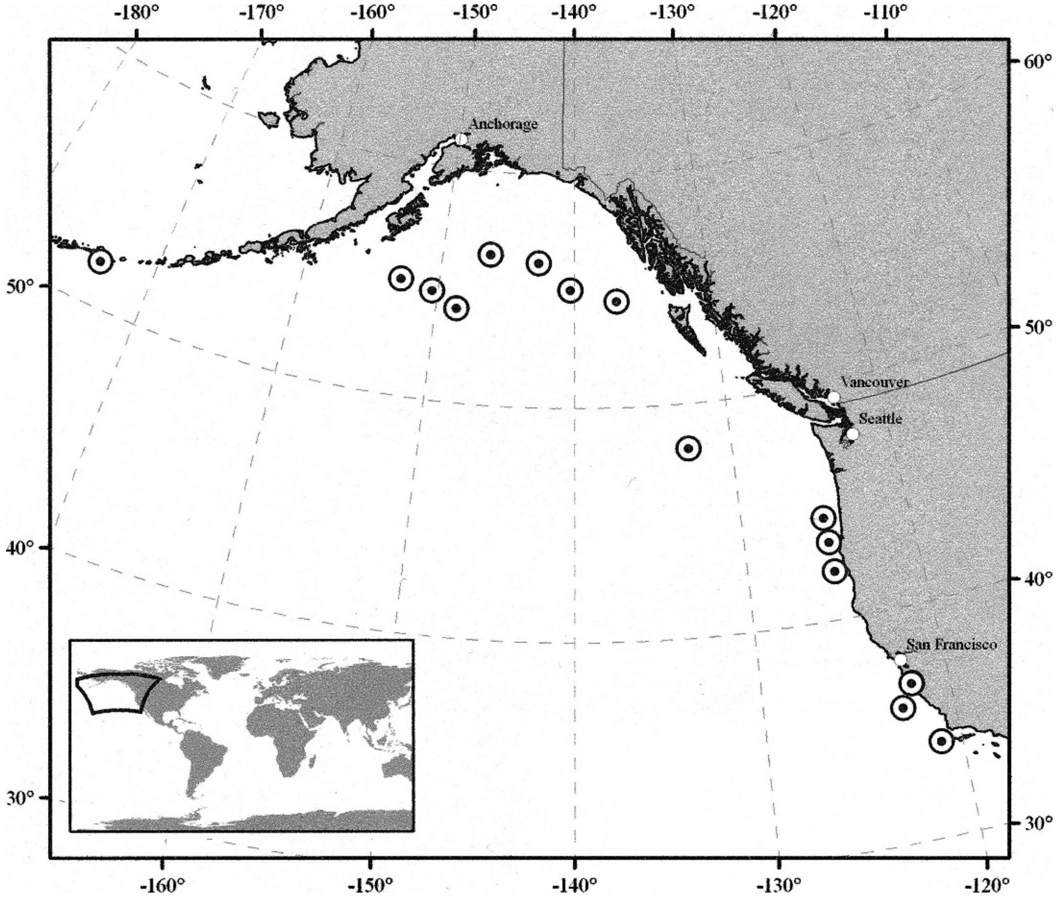

Fig. 7. Distribution map of *Isidella* colonies observed with sweeper tentacles. Map projection is Lambert Azimuthal Equal Area, with central meridian at −140°, latitude of origin at 45°. Inset map is geographic, WGS 84.

navian coast (Madsen 1944). Both are thin and sparingly branched, with sparse polyps (Broch 1912, Kükenthal 1919). Colonies of *Isidella tentaculum* in the Pacific Ocean are large, thick, and copiously branched. The polyps are large and abundant. *Isidella tentaculum* differs from the putative *I. longiflora* in that the colonies lack an "external layer of small fusiform specula" and a "base divided into long, irregular, flat lobes" (Verrill 1883). The holdfasts on all colonies of *I. tentaculum* observed to date were not lobed but discoid in appearance.

The shape and texture of the sclerites in the polyps are unique among *Isidella* spp. The needles of *Isidella tentaculum* are blunt on one end and cristate on the other, with a laminar texture. The needles of *I. trichotoma* are sharp and smooth with low granules, whereas those of *I. elongata* are pointed and granular. The geographic remoteness of the type specimens of *I. lofotensis* and the character of biserial polyps also make the synonymy unlikely. The most unique aspect of sclerites in *I. tentaculum* is the presence of thornstars in the pharynx. Similar characters have been reported in *Acanella dispar* Bayer, 1990.

Isidella tentaculum was observed and collected in a manner quite different from others in the genus. Like many species in the archives, "one colony much broken" was used to describe *I. trichotoma* (Bayer 1990:208). Here, several dozen living colonies were observed alive and in situ across a broad latitudinal range in the northeast Pacific Ocean. Colony height (36–114 cm), basal internode diameter (1.2–5.2 cm), numbers of branches, and length of basal zooids is variable, and probably correlated, but the size and density of polyps appears to be relatively uniform and consistent between the colonies.

Etymology.—Name based on the Latin noun "*tentaculum*", meaning tentacles, or feelers, a reference to the characteristic elongated, tentacle-like modified polyps that surround the base of the living colony.

Distribution.—*Isidella tentaculum* is broadly distributed on northeast Pacific Ocean seamount peaks and continental slopes from the Aleutian Islands in the north, to Rodriguez Seamount in the south, near the Channel Islands, off Southern California (Fig. 7). Living colonies were observed between 720–1050 m depth in temperatures ranging from 2.90–4.20°C on 10 different northeast Pacific Ocean seamount peaks along the Kodiak-Bowie Seamount Chain during the Gulf of Alaska Seamount Expeditions in 2002 and 2004. Most of these peaks intersected the oxygen minima zone near 600–700 m depth.

Isidella tentaculum was relatively common among the sessile benthic megafauna in ROV transects from Pioneer and Rodriguez seamounts, with 1300 and 1900 individual colonies occurring over transit distances of 22 and 42 km, respectively (L. Lundsten, MBARI, pers. comm.). *Isidella longiflora* also occurs in abundance (Grasshoff 1986). According to MBARI's Video Annotation and Reference System (VARS, Schlining and Jacobsen-Stout 2006), the average depth of occurrence on the seamounts was 836 m ± 46 m, temperature was 4.48 ± 0.06°C and dissolved oxygen was 0.38 ± 0.02 ml/L.

Isidella tentaculum is not endemic to seamounts, but observations of living *Isidella* colonies on the North Pacific continental slope are rare outside of MBARI video archives. Many occurrences were recorded from Monterey Canyon at 1000–1100 m. *Isidella* colonies with sweeper tentacles have been reported from the deep slope (843 m) of the Aleutian Islands (R. Stone, NOAA Fisheries, pers. comm.). The depth of occurrence was misreported as 2095 m, but tissue was retained for genetic analysis (France 2007). NOAA Fisheries triennial trawl surveys collected and maintained *Isidella* skeletons from several hauls off the Olympic Coast, Washington and Hecate Bank, Oregon (Etnoyer & Morgan 2003, 2005). The specimens lacked tissue, but the internodes were longitudinally striated, consistent with *I. tentaculum*. Some of the materials were destructively sampled for chemical analyses (Ehrlich et al 2006).

DNA sequences using the mitochondrial msh1 gene support the contention that the same species was collected on Giacomini Seamount (USNM 1082142) and Warwick Seamount (USNM 1082175) 1300 km to the southeast and that two colonies of *Isidella* from the Aleutian Islands slope (France 2007) are genetically identical to the two seamount specimens. The colonies from Adak Canyon, Amilia Island, Giacomini Seamount, and Warwick Seamount share identical haplotypes (S. France, University of Lousiana-Lafayette, pers. comm.).

Remarks.—*Isidella tentaculum* provides food and habitat for associated species of fish and invertebrates. The most conspicuous invertebrate associated with the colonies was a suspension feeding galatheid crab *Gastroptychis iaspus*. Up to six crabs could be found on the leeward side of large *I. tentaculum* colonies (e.g., the holotype) with chelipeds outstretched. One or two crabs were more typical. A small unidentified amphipod was recovered from one preserved sample. One predator was identified in situ. The seastar *Hippasterias* sp. was collected while denuding a colony of its polyps from the base upwards. Coral colonies were also found dead in the absence of *Hippasterias*. An unidentified liparid snailfish was found resting in the polyps on Warwick Seamount in 2002 (Fig. 3), and again on Giacomini Seamount in 2004, 750 km to the north. Other fish observed nearby were flatfish and rockfish, specifically the shortspine thornyhead *Sebastolobus alascanus*.

On the surface aboard the vessel, specimens dripped a clear mucous rich in microbial fauna, including *Proteobacteria*, *Firmicutes*, *Bacteriodites*, and *Acidobacteria* (Penn et al. 2006). Similar to some species of *Keratoisis* and *Lepidisis*, living *Isidella tentaculum* has bioluminescent properties (Muzik 1978). A faint greenish blue light appeared when agitated by the manipulator, but this light was visible only when measures were taken to fully extinguish the lights of the submarine. Bioluminescence is an unexplored aspect of the Keratoisidinae.

Sweeper tentacles were found on all colonies of *I. tentaculum* observed. Large colonies of *I. tentaculum* exhibited long tentacles, while smaller colonies exhibited shorter tentacles. Presumably, these sweeper tentacles grow with the colony. Some deep dwelling genera in the Antipatharia (Goldberg et al. 1990) and Octocorallia are known to exhibit dimorphism, e.g., *Anthomastus* spp. (Cordes et al. 2001), *Corallium* spp. (Abel 1970), and *Paragorgia* spp. (Bayer 1973); however, this is thought to be the first report of 'sweeper tentacles' in a bamboo coral. Defensive sweeper tentacles are better known from shallow hermatypic scleractinian corals (Lang 1973, Chornesky 1983) and shallow encrusting octocorals (Sebens & Miles 1988).

Isidella tentaculum may be the only species in the genus with elongated tentacles around the base, but this character must be considered in the context of in situ observations. Sweeper tentacles may not have been observed on other colonies of *Isidella* because the collection method used to obtain the sample prevented their observation. *Isidella trichotoma* has been observed in situ in the Hawaiian Islands with no elongated polyps at the base (Baco 2008:63), but observations of living *I. elongata* and *I. lofotensis* in their natural habitat have not been reported.

Isidella tentaculum has been collected repeatedly over the years by MBARI and the NOAA Fisheries triennial trawl surveys, but the coenenchyme is thin and delicate. The non-retractile polyps dissociate from the colony and easily slough off the skeleton in warm surface water temperatures. Therefore, tissue retrieval has been difficult, so examination of the sclerites was impossible. In the future, small tissue samples (10–15 cm) may be clipped from the living colony, retrieved in their native seawater, and stored in 90% ethanol for molecular analyses and archival purposes. Specimens may be fixed overnight in 4% buffered formalin, but prolonged exposure to formalin may dissolve the sclerites so this is not recommended for voucher specimens.

Colonies of *Isidella tentaculum* have already proven useful to several scientific disciplines. They have remarkable utility and may provide a model organism for deep-sea research. Quinone-tanned proteinaceous material in the internodes was used to provide the first chemical definition for gorgonin (Ehrlich et al. 2006). The aragonite internodes are denser and stronger than bone but were fully resorbed in test subjects, so the material is potentially suitable as a living bone implant (Ehrlich et al. 2006). The nodes are also useful for dendrochronology. Stable isotope signatures of Pb and U/Th from growth rings in the basal nodes were used to estimate ages of colonies of *I. tentaculum* to be between 75–100 yr (Roark et al. 2004, Andrews et al. 2005). These rings indicate lunar growth cycles but also record oceanic events, such as the testing of nuclear bombs (Roark et al. 2004).

Skeletal axes of the Keratoisidinae are durable and distinctive, one of few octocorals with a fossil history (Di Geronimo et al. 2005). The colonies have commercial value. Bamboo coral beads are popular in the jewelry trade, sometimes dyed red to resemble the precious coral *Corallium* spp. As such, bamboo corals are both target and non-target species in commercial fisheries. *Isidella tentaculum* is a long-lived habitat former that is clearly vulnerable to human activities, and it should be recognized for its unique characteristics, as well as its scientific utility for deep-sea research.

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