A Submarine Cave near Columbus Cay, Belize: A Bizarre Cryptic Habitat

Ian G. Macintyre, Klaus Rützler, James N. Norris, and Kristian Fauchald

ABSTRACT

An unusual cryptic habitat having an extensive covering of serpulid worms has been discovered in a submerged Pleistocene cave in the Belize barrier-reef platform near Columbus Cay. Aggregates of serpulids, which have been named "pseudostalactites," project from the ceiling of this cave in the direction of a narrow opening (10 m long and less than 3 m wide) that breaches the roof of the cave at a water depth of 17 m. Apparently this opening has restricted the movement of water within the cave so that serpulid worms have become more abundant on the ceiling than other cryptobiota, which include some sponges, filamentous algae, mollusks, and bryozoans. The latter group, with the exception of boring bivalves, occurs only within a radius of 25 m from the entrance of the cave. The pseudostalactites are composed mainly of serpulids belonging to two species of the *Vermiliopsis glandigera infundibulum* group and extend at least 40 m from the cave opening, which is the limit of our observations. Varying amounts of submarine cement consisting of magnesium calcite form a coating on, or matrix in, the serpulid aggregations. A barren sediment cone (very fine sand to mud) occurs at a depth of 30 m below the cave opening.

Introduction

In 1977 a Belizean SCUBA diver sent us a "stalactite" sample approximately 15 cm long and 5 cm in diameter that he had collected from a submarine cave near Columbus Cay. This fragment had two surprisingly different sides: one composed predominantly of serpulid tubes and the other composed of dense microcrystalline Mg calcite forming a knobby surface. In our subsequent search for the source of this sample, we discovered an unusual megacryptic environment. This paper presents the results of our preliminary investigation of the biological and geological characteristics of a highly unusual habitat.

Description of the Submarine Cave

AEREAL SETTING.—The submarine cave about 1 km northwest of Columbus Cay (17°00'N, 88°02'W) occurs in a *Thalassia*-covered lagoon (5 m deep) at a distance of about 3 km inside the outer edge of the Belizean barrier reef platform (Figure 76). The only other natural depression in

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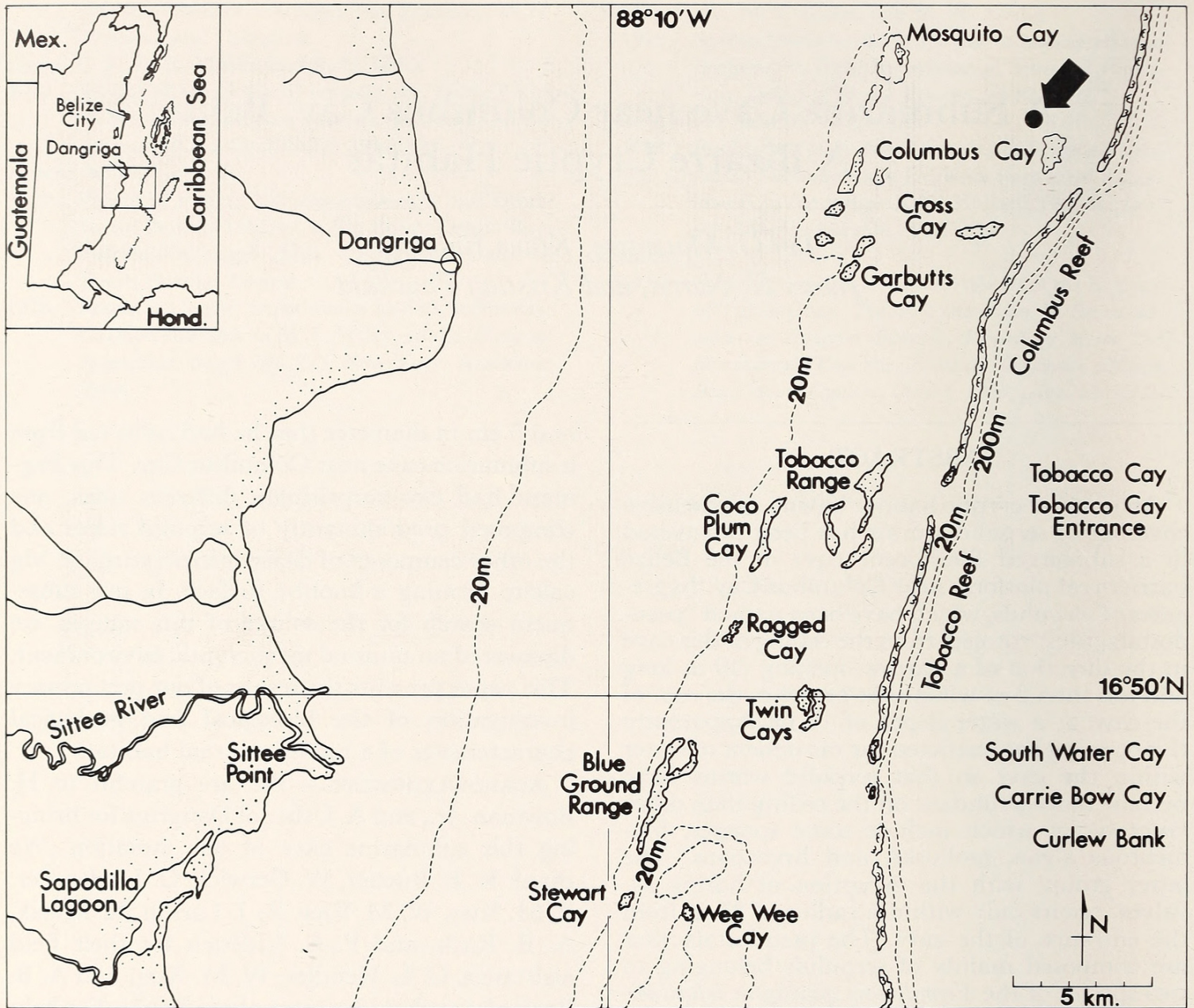
FIGURE 76.—Map showing location of submarine cave near Columbus Cay, Belize.

the smooth *Thalassia* meadow is a sand-filled sinkhole 200 m southeast of the cave (Figure 77). The sinkhole (50 m in diameter) has a smooth sandy bottom (10 m deep) that is ringed by a rich coral community established on rocky ledges and dominated by the corals *Montastrea annularis* (Ellis and Solander), *Acropora cervicornis* (Lamarck), *Diploria strigosa* (Dana), *Porites astreoides* Lamarck, *Porites porites* (Pallas), *Montastrea cavernosa* (Linnaeus), *Agaricia agaricites* (Linnaeus), along with the octocoral *Briareum asbestium* (Pallas), and the sponges *Niphates digitalis* (Lamarck), *Iotrochota bir-*

otula (Higgin), and *Amphimedon compressa* (Duchassaing and Michelotti).

FIGURE 77 (opposite page, top).—Aerial view of location of submarine cave (sc) and sinkhole (sh); regularly spaced and aligned patches of bare sand in the *Thalassia*-covered lagoon delineate seismic shot-hole (ssh) patterns that have not been overgrown since seismic work was carried out here in the early 1960s; diameter of sinkhole in foreground is 50 m.

FIGURE 78 (opposite page, bottom).—Cave entrance; note sediment-laden algal mat (am) covering the surface sloping into the cave; water depth is 17 m.
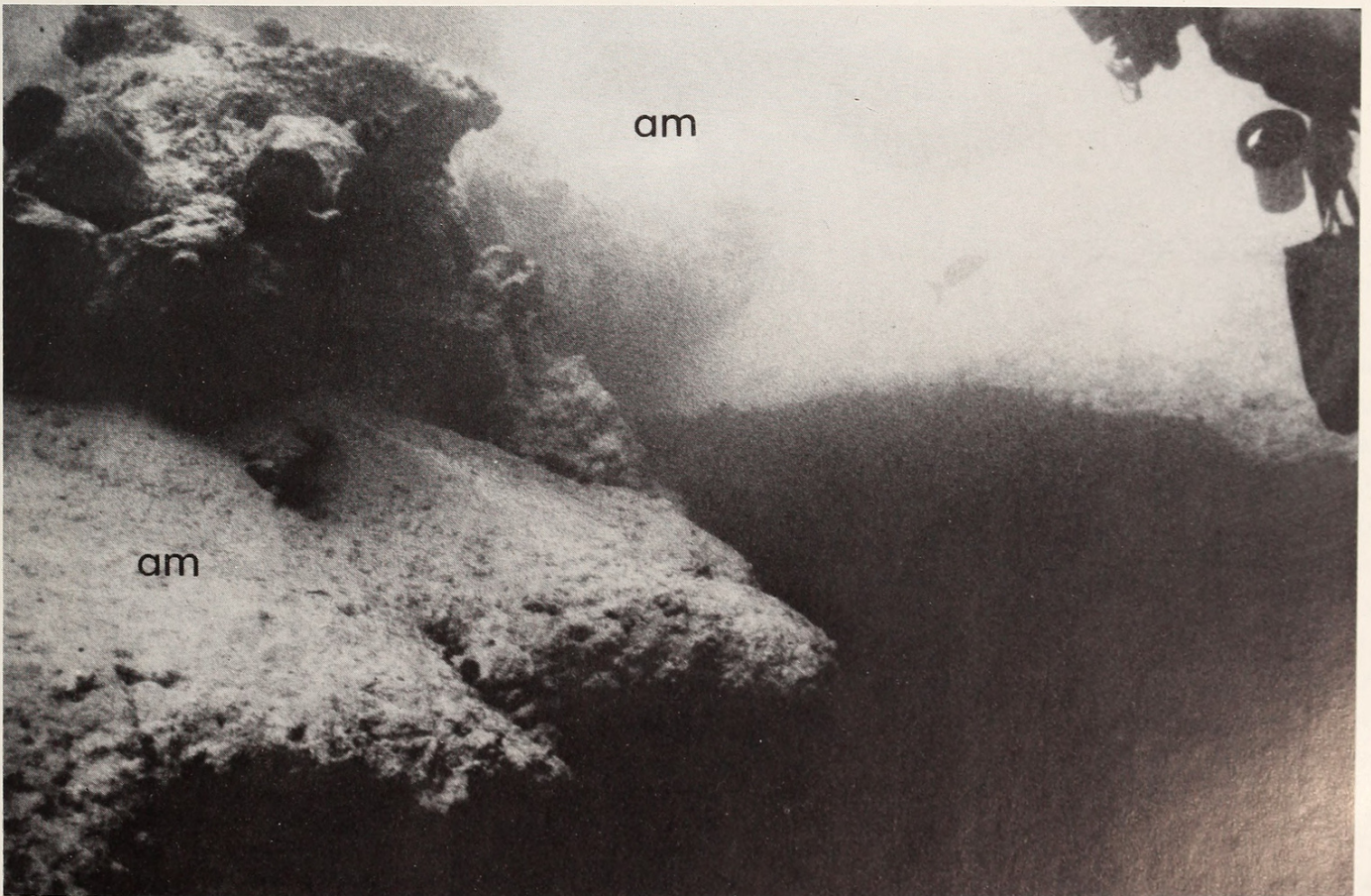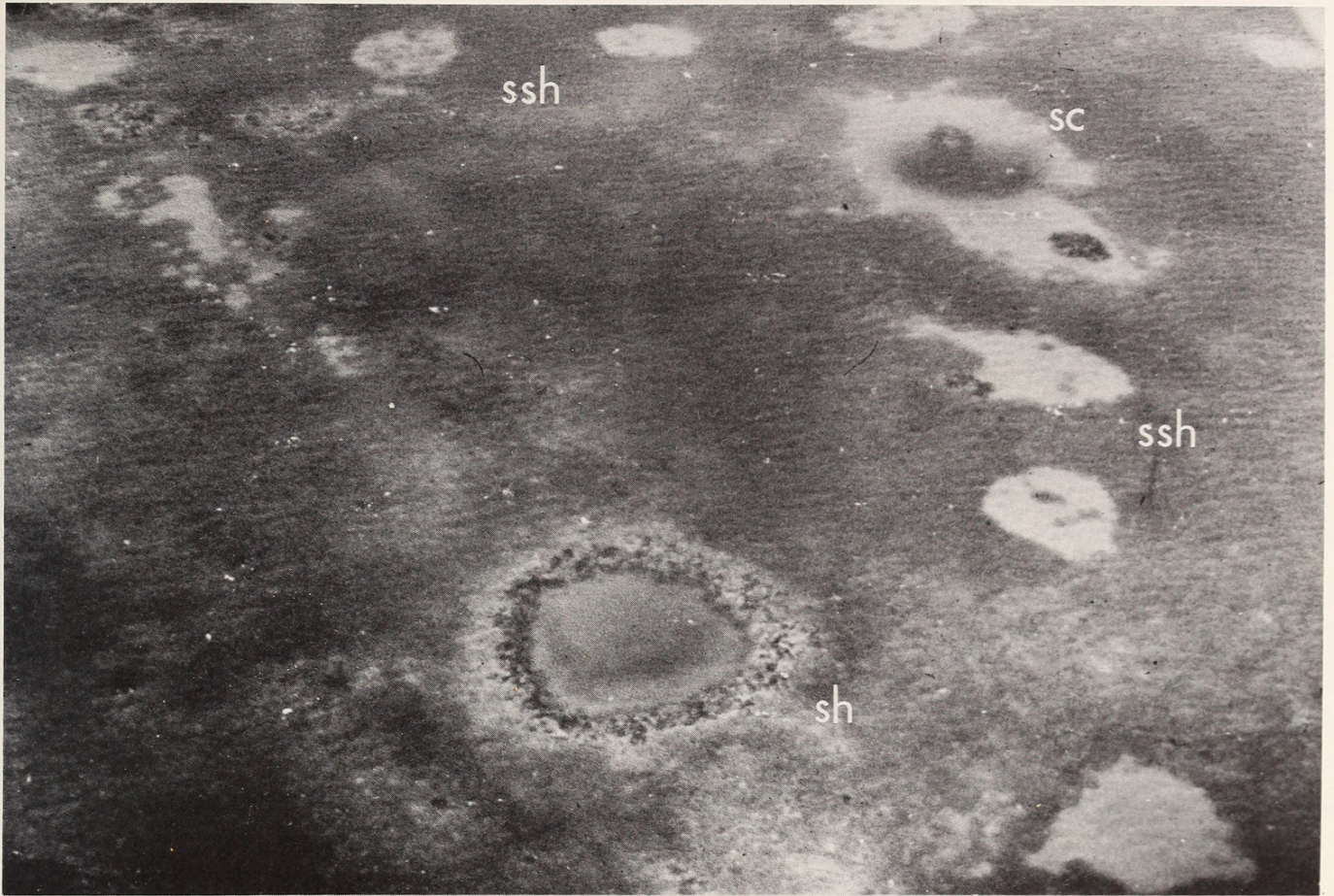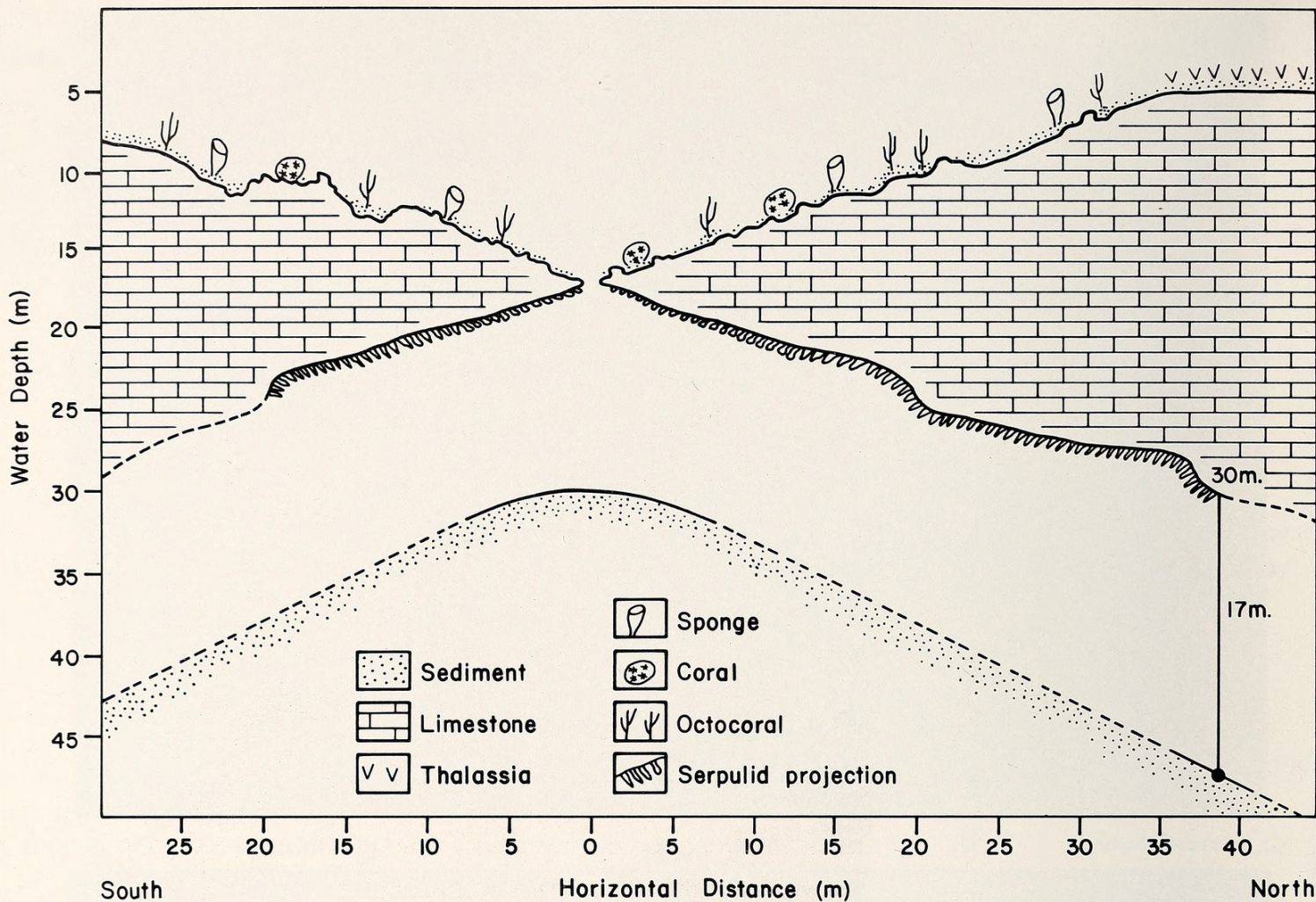
FIGURE 79.—Diagrammatic sketch of cave in cross section; note large sediment cone directly under cave entrance.

Interspersed in the *Thalassia testudinum* Banks ex König bed are several dense and large calcified green algae, mainly *Penicillus pyriformis* f. *explanatus* Boergesen and *Udotea wilsonii* Gepp and Howe ex A. and E. Gepp, with lesser amounts of *Halimeda simulans* Howe, *Rhipocephalus phoenix* (Ellis and Solander) Kützing, and *Penicillus pyriformis* A. and E. Gepp. Brown algae, however, are dominant among the coral heads, primarily *Dictyota bartayressii* Lamouroux, *Padina* sp., and *Lobophora variegata* (Lamouroux) Womersley (all Dictyotales; Dictyotaceae), as well as *Sargassum hystrix* J. Agardh (Fucales; Sargassaceae).

In contrast to the clear water and rich growth of corals at the sinkhole, the waters near the cave are turbid and the sea floor adjacent to the opening is covered by a few hardy scleractinian corals such as *Montastrea cavernosa*, *M. annularis*, *Porites porites*, *Mussa angulosa* (Pallas), and *Scolymia* sp., together with the octocorals *Briareum asbestium* and *Plexaura* sp., and some sponges typical of seagrass bottoms in the lagoon of the barrier-reef platform, branching *Aplysina fulva* (Pallas), *Amphimedon compressa* and *Iotrochota birotula*, vase-shaped *Niphates digitalis* and *Callyspongia vaginalis* (Lamarck) and massive *Ircinia strobilina* (Lamarck).

ENTRANCE ZONE.—An extensive sediment-laden, green algal mat up to 8 cm thick and 1–2 m wide surrounds the entrance to the cave at a depth of 17 m (Figure 78). The sediment is very fine sand to mud size carbonate containing an abundance of sponge chip material. The dominant algal component is the turf/mat-forming *Cladophoropsis membranaceae* (C. Agardh) Børgesen (Siphonocladales; Siphonocladaceae), a siphona-
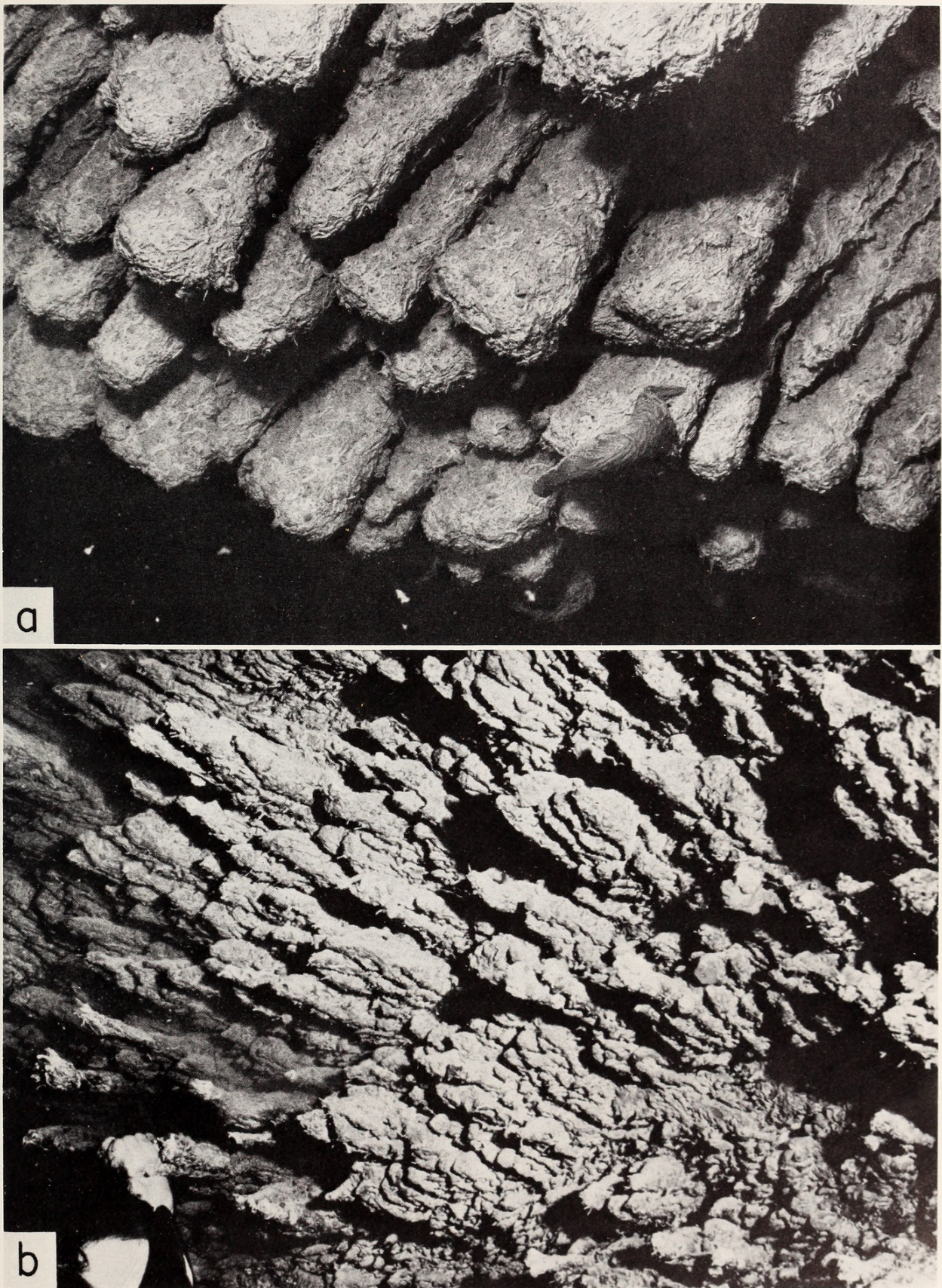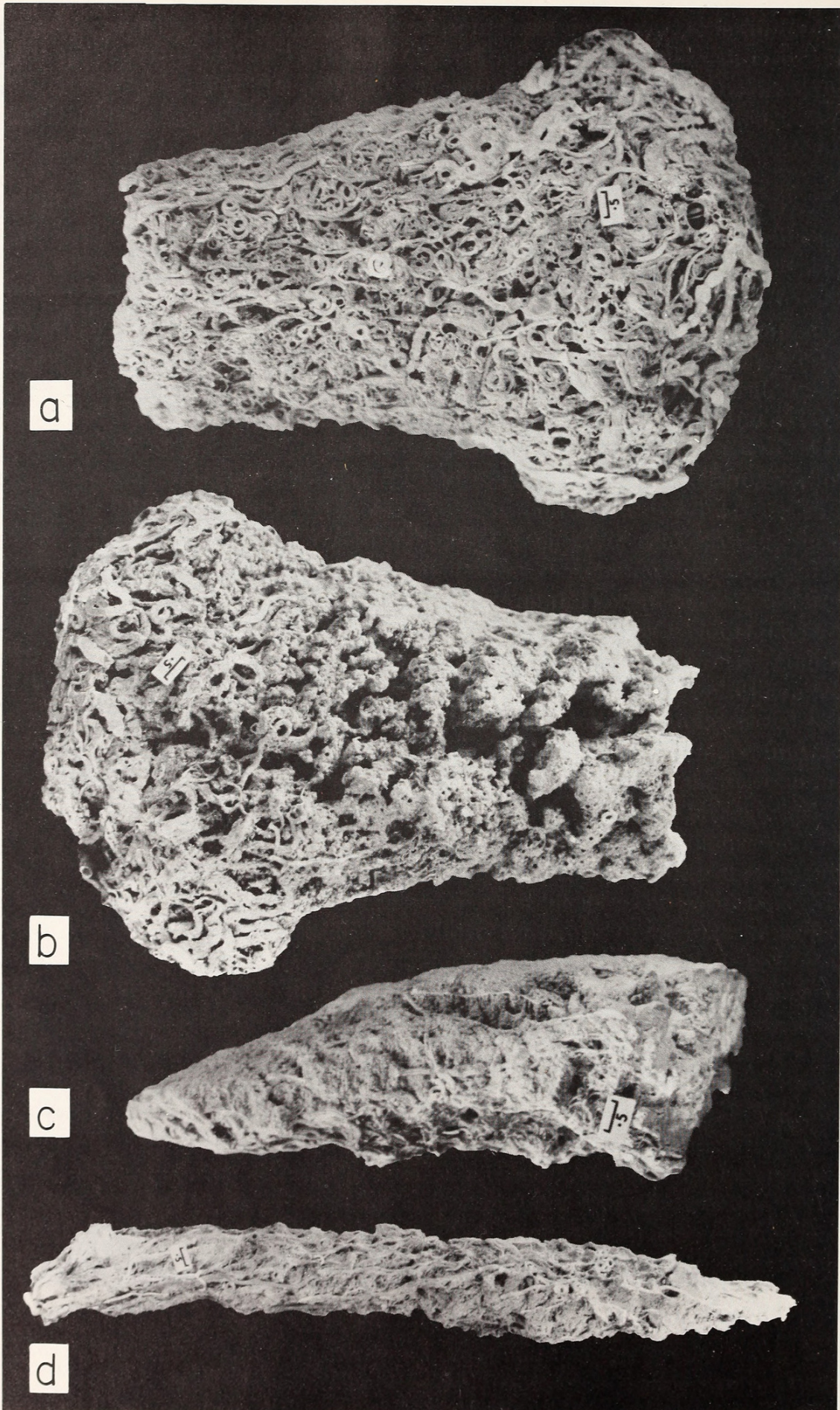
FIGURE 80.—Underwater views of pseudostalactites: *a*, club-shaped and steeply inclined projections 10 m from entrance, with conch shell fragment attached for settlement study; *b*, tapering and almost horizontal projections 20 m from entrance. (Each picture width = 1.5 m.)

ceous green alga (mainly unilaterally branched and having filaments up to 145 μm in diameter) that typically occurs in the intertidal zone in calm water, where it can form extensive mats that sometimes become infiltrated with fine sand (Taylor, 1960; Kapraun, 1972). Because fine sediment clouds the water around the cave entrance at the slightest motion of water, it appears that the area is generally calm. Although suspended or gradually settling very fine sediment hampers visibility around the entrance, apparently enough light is still present to permit luxuriant algal growth, which may be enhanced by nutrients retained in the fine sediments.

Large schools of spadefish, *Chaetodipterus faber* (Broussonet), and permits, *Trachinotus falcatus* (Linnaeus), are common around the cave opening. In addition, a few cobia, *Rachycentron canadum* (Linnaeus), appear along with reef sharks, *Carcharhinus springeri* (Bigelow and Schroeder), which are known to use submarine caves as a retreat where they can rest undisturbed on the sediment floor (Clark, 1975).

CAVE INTERIOR, GEOLOGY AND BIOLOGY.—At a 17 m depth, the opening of the cave itself is no more than a large crack 3 m wide and 10 m long (Figure 78). The resulting poor light conditions within the cave as well as the considerable depth of water to which the cave descends makes it difficult to assess the overall size of the cave. At a point 40 m north from the opening, the cave-floor depth recorded on a line dropped to bottom was 47 m, which indicates a sharp slope away from the crest of the sedimentary cone located in depths of 30 m just below the opening (Figure 79).

The ceiling of the cave, covered by countless projections that are angled toward the opening, is a phenomenon only recently recorded in the

FIGURE 81.—Dried samples of pseudostalactites: *a*, lower surface of club-shaped projections (15 m from entrance) covered by serpulid tubes; *b*, upper surface of specimen in *a* showing knobby calcite cement capping; *c*, side view of tapering projection (25 m from entrance) showing thick calcite cement coating over serpulid tubes; *d*, pencil-thin projection collected 40 m from cave entrance (limit of observation). (Scale = 0.5 cm.)

literature. These projections consist largely of serpulid tubes and magnesium calcite cement, and Macintyre and Videtich (1979) have named them "pseudostalactites" because they superficially resemble stalactites but are entirely of marine origin. The pseudostalactite cover begins about 3 m from the cave opening and extends for at least 40 m (the limit of our diving observations) at a water depth of 30 m (Figure 79). They slope toward the opening at angles varying from 40° to 60° near the opening to an almost horizontal orientation at the inner limit of observation.

These pseudostalactites are composed of serpulid tubes and varying amounts of microcrystalline magnesium calcite cement in and around tubes and infilling borings. Here and there, boring and subsequent lithification have resulted in extensive replacement of worm-tube framework by magnesium calcite cement. The largest pseudostalactites occur about 10 m from the opening of the cave and are distinctly club shaped, in some cases measuring up to 30 cm in width across the tip (Figures 80*a*, 81*a,b*). Within this area the pseudostalactites are dominantly serpulid aggregations and form an almost continuous field of tightly packed projections. In contrast, deeper into the cave, in addition to changing their angle, they become more widely spaced and progressively narrower, and the innermost surfaces observed are covered with almost pencil-thin projections (Figures 80*b*, 81*c,d*). The upper surface of most pseudostalactites consists of a layer of sediment-rich dense to chalky microcrystalline calcite. In general these sediment-rich calcite cement cappings are best developed on the innermost pseudostalactites observed (Figure 81*c*). Scanning electron photomicrographs show that this dominantly silt-sized sediment consists mainly of chips produced by boring sponges (Rützler, 1975).

The serpulid polychaetes partly responsible for these projections have been identified as members of two species of the *Vermiliopsis glandigera infundibulum* group (H. A. ten Hove, pers. comm. 1978), one of which is a thin-walled species commonly referred to in the Caribbean as *Vermiliopsis annulata* (Schmarda), and the other a thicker-walled species yet to be described (Figure 82*a,b*). Other
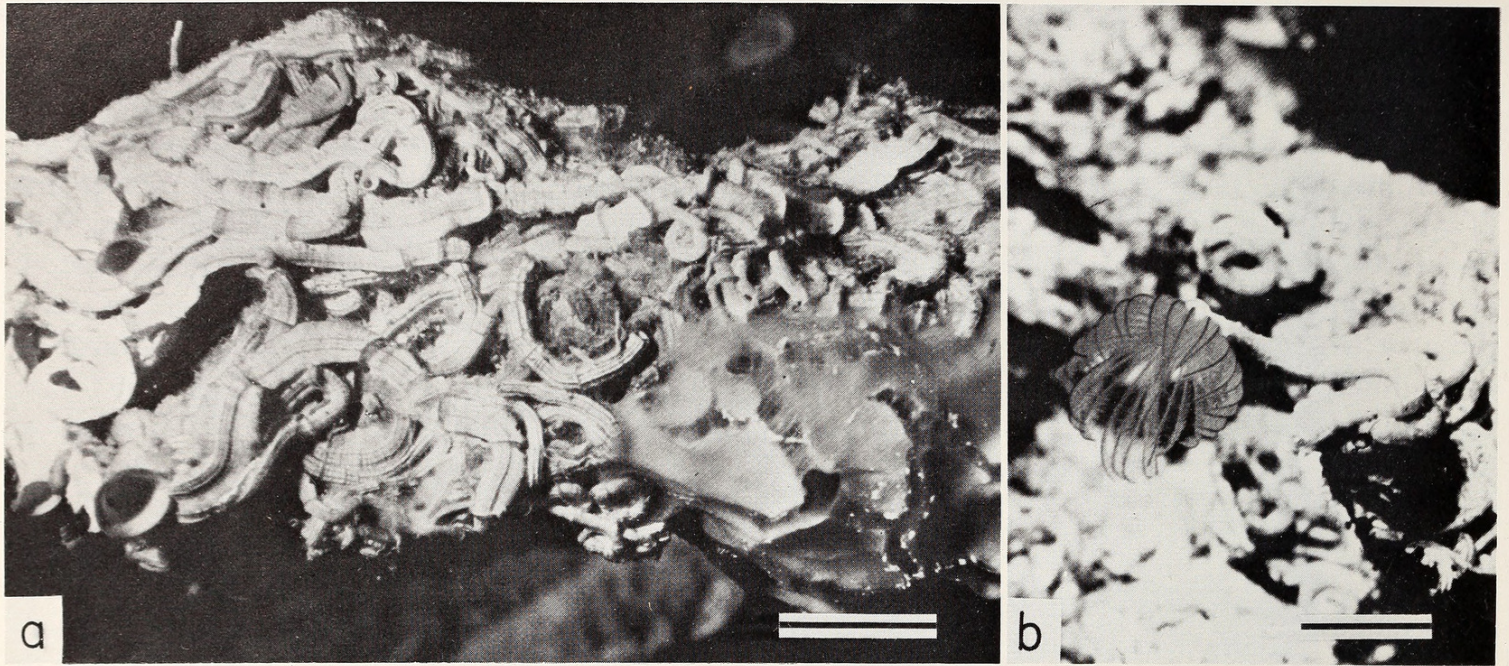
Figure 82.—Underwater close-up of pseudostalactite surfaces: *a*, *Vermiliopsis* spp. worm aggregation with sponge *Placospongia carinata*; *b*, live *Vermiliopsis* sp. with tentacle crown extended. (Scales = 10 mm.)

relatively common tubes, which are long and narrow, closely resemble those of *Metravermilia multicristata* (Philippi). There are also a few Spirorbinae tubes and some fine tubes of *Josephella marenzelleri* Caullery and Mesnic. Although the relative number of living serpulids could not be accurately ascertained, the lack of extended worms as well as a scarcity of worm-filled tubes in collected samples suggest that only about one percent of the surface tubes contain living serpulids.

In the poorly lighted to dark zone of the cave ceiling between 1 m and 20 m from the entrance, sponges are the most conspicuous associates of the serpulid projections. Samples from this area contained gray to white *Geodia gibberosa* Lamarck, some with drooping digitate processes (Figure 83*a*), a stringy yellow *Aplysina* sp., whitish cushions of *Chondrilla nucula* Schmidt, orange-brown cushions and crusts of *Placospongia carinata* Bowerbank (Figure 82*a*), and whitish crusts of *Spirastrella coccinea* Duchassaing and Michelotti. Two other common whitish sponges belong to the Lithistida, encrusting *Desmanthus incrustans* (Topsent) and egg-shaped *Gastrophanella implexa*

Schmidt (Figure 83*b*). Small cryptic species, including *Microciona affinis* (Topsent), *Stellettinopsis* sp., and *Samus anonyma* Gray, coat and permeate dead serpulid worm tubes. The orange sclerosponge *Ceratoporella nicholsoni* (Hickson) (Figure 83*a*) is visible on a close-up photograph of the vertical surface of a break in the ceiling contour, but only a few minute specimens could be secured from a nearby location.

The dominant living mollusks found in association with the pseudostalactites for about 25 m from the cave entrance were the nestling arcid bivalve, *Barbatia dominensis* (Lamarck), and the encrusting venerids, *Chama congregata* Conrad and *Chama macerophylla* (Gmelin). Although boring bivalves are common in the pseudostalactites to the limit of our observations, to date none have been collected alive. Most of these bivalves are well lithified in their borings by magnesium calcite submarine cement. They include *Gastrochaena* sp., *Lithophaga nigra* (Orbigny), *Gregariella coralliophaga* (Gmelin), and *Coralliophaga coralliophaga* (Gmelin). The common occurrence of as many as three of these bivalves, one inside another, in the same bore hole, indicates that many of them

FIGURE 83.—Views of cave ceiling showing sponge population: *a, Geodia gibberosa* (15 cm long) projecting from ceiling and *Ceratoporella nicholsoni* attached nearby (arrow); *b, Gastrophanella implexa* (5 cm diameter).

prefer to occupy an extant boring rather than to form their own.

Other biota present in this habitat include trace occurrences of small and seldom freshly preserved bryozoan colonies belonging to eight species of cheilostomes: *Parellisina curvirostris* (Hincks), *Cribrilaria radiata* (Moll), s.l., *Escharina pesanseris* (Smitt) (?), *Exechonella antillea* (Osburn), *Hippopodina feegeensis* (Busk), *Hippothoa flagellum* (Manzoni) (?), *Tremogasterina* cf. *T. perplexa* Cook, and *Hippoporina pertusa* (Esper). Specimens of ascidians collected belong to *Pyura* sp., possibly near *P. vittata* (Stimpson).

Several epizoic algae were found growing on the pseudostalactites near the cave opening (17 m depth), primarily the red algae *Spermothamnion investiens* (H. and P. Crouan) Vickers (Ceramiales; Ceramiaceae), and *Polysiphonia macrocarpa* Harvey in MacKay (Ceramiales; Rhodomelaceae). Some very small specimens of the green alga, *Cladophoropsis membranaceae* occur here and there, and a single specimen of the filamentous brown alga, *Sphacelaria* sp. (Sphacelariales; Sphacelariaceae), which was non-fertile and could not be identified to species, was also recorded. Some microscopic blue-green algae of *Calothrix* sp. (Nostocales; Rivulariaceae) were also found.

The thickness of the entire veneer of serpulid-calcite cement on the ceiling of the cave could not be determined, and individual projections could not be measured beyond 50 cm because they tend to coalesce as they increase in size. In several recessed areas, the veneer appeared to be poorly developed and the ceiling became a relatively smooth surface except for some rounded depressions that are probably solution cavities in the Pleistocene host limestone. Inverse steps in the relief of the ceiling resembling "false walls" to a diver also indicate that a thin Holocene cover is present. These steps mark areas where the roof slumped off during the formation of the cave in subaerial Pleistocene conditions. In addition, here and there vertical cones that are coated with small inclined pseudostalactites project from the ceiling (Figure 84). These cones are probably true Pleistocene stalactites. The prominence of this

FIGURE 84.—Large (1 m) vertical projection (probably true stalactite) with surface covered by inclined pseudostalactites.

Pleistocene stepped surface and the presence of the stalactites as well as solution cavities in recessed areas indicate that the maximum thickness of the serpulid-cement veneer is probably less than 1 m.

The crest of a large cone of sediment located in a depth of 30 m directly below the cave opening consists mainly of very fine sand to mud-sized sediment (Figure 79); it has a relatively smooth surface and shows no signs of current ripple marks. Some recognizable trails leading to a few empty *Strombus* shells, indicate an unsuccessful search for food after these animals fell through the cave opening. The fresh condition of these trails long after the death and decay of the

trapped gastropods suggest a lack of bottom currents strong enough to disturb the sediments on the cave floor. The flanks of this sedimentary cone slope away to unknown depths.

Discussion

CAVE BIOTA.—Characteristics of the species composition of the sessile benthos of marine caves in the euphotic zone has long been known to differ considerably from that of benthos in surrounding light-exposed substrates. Early work on shaded communities in the Mediterranean (summarized in Riedl, 1966), was followed by studies of coral reef tunnels off Madagascar (Vasseur, 1974), but little attention was given to cryptofauna of the Atlantic reef systems until the discovery of sclerosponges and of a characteristic brachiopod-sclerosponge community under overhangs and in caverns and tunnels on the fore-reef slope of Jamaica (Hartman and Goreau, 1970; Jackson et al., 1971). The distinctive character of the cave faunas is principally the result of decreased illumination—lack of light excludes fast-growing space competitors, mainly algae, and, in coral reefs, hermatypic hydrocorals, scleractinians, and octocorals. The available substrate inside a cave is generally well suited for colonization by sessile filter feeders because its ceiling and vertical walls prevent burial in sediment. Water circulation, however, must be sufficiently strong to ensure the renewal of food supplies and the transport of metabolic waste.

Whether complete darkness may be limiting for organisms that do not depend on photosynthetic processes is difficult to determine because low light levels in shallow-water environments commonly occur in association with poor water circulation. A few observations on dark but open-ended (and therefore well-ventilated) tunnels show that predominant sessile biota consist of sponges, serpulid polychaetes, and a few ascidians and foraminifers (Vasseur, 1974), as well as some ahermatypic corals, sessile or boring mollusks (*Chama* sp., *Lithophaga* sp.), and minute bryozoans (Rützler, unpublished observation from Bermuda). These data indicate that except for sponges, only a few representatives of a small number of sessile groups have adapted to complete darkness within the shallow-water environment. Dark caves in the Mediterranean having a deep (10–40 m) single entrance—and therefore poor water circulation—are reported to be colonized mainly by serpulid polychaetes, along with boring bivalves (*Lithodomus lithophagus* (Linnaeus)), scleractinians, and a few sponges (Laborel and Vacelet, 1959). From such accounts it appears that serpulid polychaetes can adjust more easily than most cave dwellers to both complete darkness and stagnant water conditions.

DISTRIBUTION AND RECRUITMENT OF SERPULIDS.—The dominant serpulids in the pseudostalactites of Belize are not typical colonial organisms, for each tube is the result of the activity of a single individual. The projections thus represent a series of discrete settlement events, but we do not know whether the serpulids mature in the cave and their successive generations are recruited locally, or whether the settlements represent invasions from the outside. Most of the common serpulids in the cave near Columbus Cay mature in about one year, and some reproduce the year round. As a result, if serpulids were recruited locally, distinct settlement surfaces would be difficult to identify. If recruitment was the result of a rare event—such as a major flushing of the cave—then these events should be recognizable in the projections. The distribution of live serpulids suggests local recruitment in that a few scattered individuals were alive when the projections were sampled, but there were not signs of sheets or groups of live animals.

The low percentage of live serpulids and other biota in an area of such impressive serpulid-tube aggregations does suggest the episodic development of this cryptic community, which is supported by observations from "Grotte de la Triperie" near Marseille (Vacelet, 1964). Vacelet found that the center ceiling and the entire blind-ending tunnel of a large subtidal grotto were azoic except for a cover of empty serpulid tubes of *Serpula concharum* Langerhans, *Pomatostegus*

polytrema (Philippi), and *Vermiliopsis infundibulum* (Linnaeus) on the walls and on the numerous stalactites present in that cave. During maneuvering at the end of August 1963, a submersible (Soucoupe Cousteau) that entered the grotto stirred up the water considerably. Subsequently, small but live serpulids that had been established in the normally azoic zones in mid-October, by mid-January were dead.

Because filter-feeding serpulids are rheotactic rather than phototactic, the orientation of the pseudostalactites toward the cave entrance on both sides of this elongate opening is probably related to current conditions rather than light conditions. The accumulation of fine sediment around the entrance of the cave, the preservation of tracks of deceased and decayed *Strombus* on the sediment floor, and the lack of any currents during diving observations suggest minimal current activity around the entrance and inside the cave. Apparently there is, however, enough movement of nutrient-rich water associated with the cave opening to influence the direction of serpulid growth. The abundance of clionid sponge chips on the upper surfaces of pseudostalactites and the apparent lack of excavating sponges in the cave indicate that the occurrence of temporary influxes of outside water capable of transporting this fine sediment into the cave.

DISTRIBUTION OF CAVE SPONGES.—Divers studying the ecology of shallow marine caves (0–5 m) in the Mediterranean have found large and diverse sponge populations whose composition differs significantly from that of sponges found on light-exposed rock substrates in similar depths. Qualitative and quantitative comparisons revealed that gradients of light, water movement, and inclination of substrate (exposure to sedimentation) are responsible for these zonation patterns. Sponges known from much greater depths (10s to 100s m) were also found in these shallow caves (Sarà, 1958, 1961; Russ and Rützler, 1959; Rützler, 1965, 1966). Similar findings have been reported in shallow reef tunnels in the Indian Ocean (Vacelet and Vasseur, 1965) and in deeper caves (4–25 m) in the Mediterranean (Pouliquen,

1972). Among the most interesting sponges collected from dark caves were live pharetronids (Vacelet, 1964; Vacelet and Vasseur, 1965) and sclerosponges (Hartman and Goreau, 1970). In addition, lithistid sponges common at bathyal depths elsewhere have been found in shallow caves in Madagascar (Vacelet and Vasseur, 1971) and in the Mediterranean (Pouliquen, 1972).

The sponge fauna in Columbus Cay cave differs considerably from that of the lagoon surrounding the entrance, which is similar to the fauna of other Caribbean lagoon habitats at similar depths, for example, near Carrie Bow Cay. Of the sponges in the cave, *Geodia gibberosa*, *Placospongia carinata*, and *Spirastrella coccinea* are species common elsewhere under rocks or back-reef rubble; *Chondrilla nucula* is one of the few sponges that grow abundantly either in full light, where it is olive to brown from symbiotic zoocyanelles, or in full darkness, where it is white to cream colored (Wilkinson and Vacelet, 1979); and *Aplysina* sp. has been collected only in caves, although morphologically it closely resembles species from illuminated habitats and ecologically it resembles *Verongia* (= *Aplysina*) *cavernicola* (Vacelet, 1959).

Little information is available on the cryptic species found in the cave. The absence of clinoids in the cave is surprising because most of the carbonate silt on the upper surfaces of the pseudostalactites is derived from these sponges. The lithistid that is present (*Desmanthus incrustans*) is known also from shallow caves in the Mediterranean and Indian Ocean; although its type specimen was dredged from the Campeche Bank, Gulf of Mexico (unknown depth), it has not since been reported from the western Atlantic (Vacelet et al., 1976). The other lithistid in the cave, *Gastrophanella implexa*, has not been found since its first description from west of Florida (180 m depth) and southwest of Cuba (230 m depth) (Schmidt, 1879:29). Although both sclerosponges and bathyal lithistids are now documented in Caribbean caves, no representative of the pharetronids has yet been found in these waters.

Whereas the serpulid pseudostalactites occur along at least 40 m of the ceiling of the cave,

sponges and the few other sessile biota present do not extend beyond the first step in the ceiling, which is less than 20 m from the entrance. Whether or not other openings occur in deeper parts of the cave and possibly admit water from the lagoon, the sponge population near the known entrance appears to receive an adequate supply of nutrient-rich water. This is probably introduced by waves, by the activity of resident or visiting fishes, or by some tidal flow through the small entrance. The inner zones of the ceiling may now and then receive renewed water containing nutrients and serpulid larvae as a result of upheaval during severe winter storms or even hurricanes.

DISTRIBUTION OF ALGAE.—The epizooic algae associated with the pseudostalactites near the entrance of the cave (17 m depth) are all filamentous, small in size, and sparsely distributed, and are typical of cryptic habitats as well as algal turfs, although elsewhere they generally occur in shallower depths.

MINERALOGY OF PSEUDOSTALACTITES.—Microprobe analyses indicate that the magnesium calcite cement, which commonly constitutes more than half of the pseudostalactites averages 15 mole percent $MgCO_3$. This composition together with the dentate crystals, peloidal texture, knobby surface relief, and minor amounts of acicular aragonite present in the pseudostalactites is characteristic of shallow-water submarine cements (Macintyre et al., 1968; Shinn, 1969; Land and Goreau, 1970; Ginsburg et al., 1971; Alexandersson, 1972; James et al., 1976; Macintyre, 1977). Oxygen and carbon isotope analyses indicate that fresh water did not influence the formation of these projections (Macintyre and Videtich, 1979). Thus, petrographic and geochemical data point to a marine origin for the cave cement.

Radiocarbon dates were obtained for two pseudostalactite samples: the core of a club-shaped specimen 5–10 m from the cave opening gave a date of 820±60 years B.P., and the dominantly Mg calcite cement cap of a specimen 25 m from the opening gave a date of 650±40 years B.P.

Because these dates are uncorrected, however, they may be less than true dates if bomb carbon is present. A slow accretion of the Holocene cave encrustation is confirmed by the lack of measurable encrustation over a one-year period on conch-shell fragments nailed to the ceiling at a distance 10 m from the opening. All the projections in the cave, including massive club-shaped formations near the entrance, appear to be accreting slowly. The date of the cement cap clearly indicates that even the thick crusts of cement may have developed over a long period of time. This finding is surprising in light of Goreau and Land's (1974) observation at a blast site in the deep fore reef of Jamaica. They found appreciable lithification within a period of one year.

The extensive cover of Mg calcite submarine cement on the ceiling of the cave confirms earlier observations that submarine lithification is most extensive in areas where little or no sediment accumulation occurs and where substrates are exposed for long periods of time (see Macintyre, 1977). Although similar cements have been well documented in a variety of marine habitats, the processes responsible for submarine lithification remain unidentified.

Conclusion

The submerged Pleistocene cave in a *Thalassia*-covered lagoon of the barrier-reef platform off Belize is an unusual cryptic habitat having no known counterparts in other marine environments. The restricted flow of water in this cave has been more favorable to the establishment of serpulid worms than to other forms of encrusting fauna. Sessile biota, including sponges, filamentous algae, mollusks, and bryozoans are only minor constituents sparsely distributed on the ceiling of the cave over an area generally less than 25 m from the entrance. The serpulids, on the other hand, have formed massive projections superficially resembling stalactites (called pseudostalactites) that are inclined at decreasing angles away from the entrance and oriented toward the cave opening. These projections are present for at least 40 m from the opening, but their

shape changes gradually from club-shaped forms reaching 30 cm in width near the cave entrance to pencil-thin forms at the inner limit of our observation. The pseudostalactites are extensively infilled and encrusted by submarine cement, which is a magnesium calcite cement similar to submarine cements reported elsewhere off Belize as well as in other tropical reef areas of the world.

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