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Identification guide to the shallow water (0–200 m) octocorals of the South Atlantic Bight

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Abstract

Octocoral diversity is well documented in the tropical western Atlantic and Indo–Pacific, but it has been several decades since a thorough species account of the shallow South Atlantic Bight region was produced (northwestern Atlantic between Cape Hatteras, NC and Cape Canaveral, FL, USA). Through the use of material from the NMNH and SERTC Octocorallia (=Alcyonaria) collections, this work documents the presence of 28 species of octocorals recorded in the shallow (0–200 m) South Atlantic Bight and reports five new range extensions. Included are illustrated keys to the species, synonymies, species images and remarks, and SEM images of sclerites from described species without previously published sclerite imagery. A brief history of previous work and discussion of octocoral morphology are also included.

Key words: Coelenterata, Cnidaria, Octocorallia, Alcyonaria, Gorgonacea, Alcyonacea, Alcyoniidae, Nidaliidae, Nephtheidae, Anthothelidae, Plexauridae, Gorgoniidae, Ellisellidae, Clavulariidae, Renillidae, Kophobelemnidae, Virgulariidae, western Atlantic

Introduction

The presence of octocorals is recorded in all the world's oceans and at all depths. While diversity of the group is highest in the tropical western Pacific, the Atlantic also maintains a rich octocoral species assemblage. Worldwide, there are approximately 340 genera of octocorals from 46 valid families (Bayer 1981a; Williams 1995; Williams 2001–2010). The growing number of new species recorded and revisions within the families makes it difficult to arrive at an exact number of species, but it is estimated at over 3200 worldwide (Bayer 1981a; Williams 1995; Williams 2001–2010; Daly *et al.* 2007). The Octocorallia has been the subject of many recent molecular phylogenetic studies which may eventually lead to major revisions of the classification as it is currently accepted. C.S. McFadden reviewed these studies and their significance to modern classification in Daly *et.al* (2007). Using the classification of Bayer (1981a) and Williams (1995), this work discusses 28 species from 11 families known from the South Atlantic Bight (SAB) to a depth of 200 m.

The presence of octocorals in nearly all benthic marine habitats indicates the adaptive nature of this group compared to other taxa within the Cnidaria. Octocorals are very numerous in shallow tropical reef communities and are well-documented in deep benthic communities, where the colonies may provide substrate in habitats with poor complexity. The diversity of the Octocorallia (=Alcyonaria) in the shallow SAB is low in comparison to similarly shallow areas of the Caribbean and tropical western Pacific, however this group can be considered an abundant sessile invertebrate taxon in hard bottom communities and colonies are often associated with numerous commensal organisms.

The paucity of recent, regional taxonomic literature and the problematic identification associated with the Octocorallia presented the need for this regional guide. Specifically, some members of the former Paramuriceidae (now Plexauridae) occurring in the shallow SAB have not been treated for several decades apart from inclusion in checklists and technical reports. This work aims to bridge this gap and is intended to assist scientists, managers, educators and students to identify, through the use of keys, species notes, and images, the octocorals present from depths less than 200 m in the SAB.

Prior work. The taxonomy and classification of western Atlantic octocorals were treated extensively by Deichmann (1936), who included in her monograph all western Atlantic shallow- and deep-water species known at the time and she also described several new species. Her work was a continuation of A. E. Verrill's study of material collected during the Blake Expedition of 1877–1878, a manuscript he was unable to complete before his death. Nearly 30 years later, Bayer (1961) presented an updated taxonomic treatment of western Atlantic tropical and subtropical shallow water octocorals and then produced a key (Bayer, 1981a) to the non-pennatulacean genera of world-wide Octocorallia. Subsequently, Williams (1995) published a world key to the pennatulacean octocorals which complemented Bayer's (1981a) key, and the two works comprise a standard for the modern classification of the Octocorallia. In the shadow of these important taxonomic works, the rationale for developing a regional key to the octocorals of the SAB was based on the following: a) since the publishing of Deichmann's (1936) western Atlantic key many new species have been described, four of which are included in the present work, and octocoral classification has changed significantly; b) although

works by Bayer (1981a) and Williams (1995) contain modern classifications, they treat worldwide genera and do not have species diagnoses; c) Bayer (1961) and Deichmann (1936) included many species that do not occur in the shallow SAB, creating the necessity of a regional, concise, user-friendly guide; d) there is a current lack of color and *in situ* images of growth forms of many species which are included in this guide.

Bayer (1961) did not include a key to the species or descriptions of the former Paramuriceidae (now Plexauridae) because they occurred too deep in the West Indian region. These species do occur in shallow water (<200 m) in the SAB and are included in this key. Also included are five range extensions not previously recorded in shallow water at this latitude range. Future collections will undoubtedly reveal new species, although none are described in this work. See Table 1 for an updated taxonomic listing of octocoral species recorded in the shallow SAB.

This document relies heavily on the prior work of F. M. Bayer and the reader is encouraged to refer to his relevant papers when identifying difficult specimens. In particular, his illustrations of octocoral sclerites are unparalleled and, in the absence of scanning electron microscope imagery, are the only quality reproductions of the sclerites of many species. Since the identification of virtually all octocoral species relies on sclerite morphology, his skillful illustrations are a valuable resource.

Unless otherwise noted, all references, key characteristics, diagnoses, etc. in this document are applicable to octocoral species in the shallow SAB and do not necessarily represent world species.

The South Atlantic Bight. For the purposes of this paper, the SAB is defined as the coastal waters of the United States between Cape Hatteras, North Carolina and Cape Canaveral, Florida (Figure 1). This region of the Atlantic encompasses the continental shelf, slope and rise, and includes the Blake Plateau. This work discusses only octocorals found in 200 m or less in the SAB, as the continental slope rapidly drops off at that point and becomes habitat to a significantly different assemblage of octocoral species. The sub-tropical and tropical areas to the south of Cape Canaveral have a more diverse group of octocorals, specifically gorgoniids and plexaurids, but some species overlap. Several species discussed in this work occur through the tropical latitudes and into the coast of South America, but for a few the southern tip of Florida is the limit to their southern range. Some of these species are absent in Florida and the Caribbean, but reappear in the Gulf of Mexico. Bayer (1954, 1961) discussed the concept of Carolinian fauna and disjunct populations in the northern Gulf of Mexico.

Octocoral morphology

A brief overview of octocoral morphology and a glossary are provided here for reference.

The Octocorallia are anthozoan cnidarians with polyps bearing eight pinnate tentacles (with rare exceptions) and eight complete mesenteries. The tissue of nearly all species contains calcareous skeletal elements called sclerites, and many have an axis that is horny and/or calcified, with or without sclerites, to varying degrees.

Colony form. Octocoral colonies worldwide take on many forms, such as branching, encrusting, whip-like, feather-like, fleshy or even completely calcareous structures resembling their scleractinian (stony coral) counterparts. Many of the common octocorals in the SAB have a branching colony form and the types of branching displayed by octocorals in the SAB are illustrated in Figure 2. The type and degree of branching (or lack thereof) may easily distinguish some species. Non-branching colony forms found in the SAB include whip-like, capitate, encrusting, leaf-like, club-shaped and pen-like (Figure 3). Growth form of some octocorals is affected by the environment (Bayer 1961) and is often variable between localities.

Polyps. Although there is one octocoral species that exists as a solitary polyp, all of the species in the SAB are colonial and contain multiple polyps. Colonies that have one type of polyp are termed monomorphic; colonies with two types of polyps are called dimorphic. Some octocorals are trimorphic and quadrimorphic, but none of these are found in the SAB. Some terminology used here may differ among groups. For instance, when referring to polyps of the monomorphic Alcyonacea, the terms ‘anthocodia’ and ‘polyp’ are often used, while the terms ‘autozooid’ or ‘siphonozooid’ are used when describing the dimorphic Alcyonacea and Pennatulacea.

The octocoral polyp is divided into the anthocodia, which is the visible portion that can extend and retract, and the anthostele, although the latter is simply the extension of the gastrodermal canal into the coenenchymal mass. The polyps have eight tentacles which generally have pinnules (finger-like projections that serve to increase surface area). The tentacles house stinging cells and, in some species, symbiotic algae. Some groups, such as the Plexauridae, have sclerites that form a collaret and points within the polyp (Figure 4; Figure 32 D). Octocoral polyps may: a) contract, by deflating and folding the tentacles into the basal area of the polyp, leaving only the collaret and/or points exposed; or b) retract, where the entire anthocodia is withdrawn into the anthostele, in some cases leaving only a small pore or invagination visible on the surface of the coenenchyme. The degree of contraction or retraction is highly variable among species.

In the Pennatulacea, the colony form is actually an oozooid modified to give rise to the peduncle (stalk) and the rachis, which bears the secondary polyps (autozooids and siphonozooids) (Figure 5). In some taxa, such as members of the Virgulariidae, the secondary polyps are arranged on leaf-like extensions (Figure 6).

FIGURE 1. The South Atlantic Bight, which includes coastal waters between Cape Hatteras and Cape Canaveral, USA. The 200 m isobath is shown.

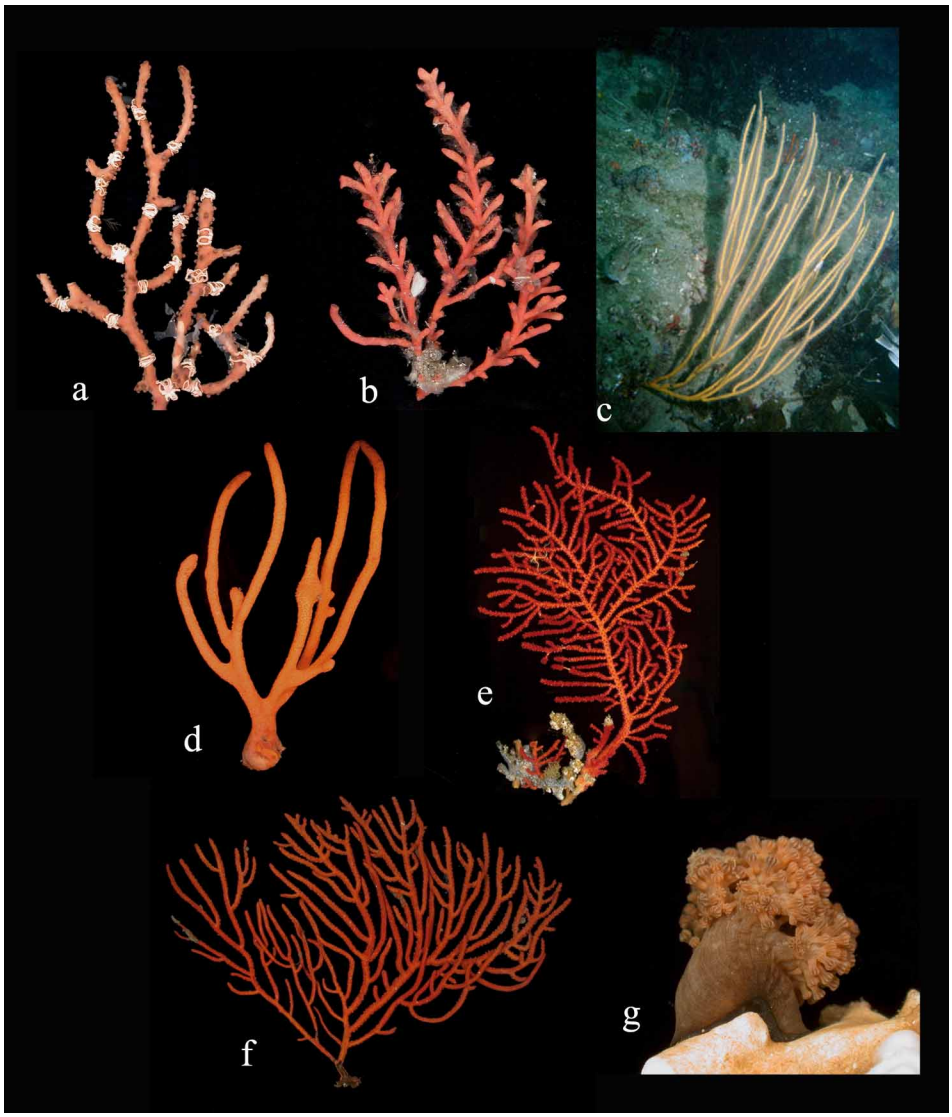

FIGURE 2. Branching colony forms; **a)** dichotomous (*Iciligorgia schrammi*); **b)** monopodial (*Telesto* sp.); **c)** whip-like branches (*Leptogorgia virgulata*); **d)** rod-like branches (*Titanideum frauenfeldii*); **e)** open, irregularly pinnate (*Muricea pendula*) **f)** planar (*Leptogorgia hebes*); **g)** lobed, with clusters of polyps (*Pseudodrifa nigra*).

Tissues. The outer layer of polyp tissue in contact with the external environment is the epidermis, which contains various specialized cells, such as cnidocytes. The inner tissue layer, the gastrodermis, lines the tentacles and the gastrodermal cavity, and thus covers eight mesenteries and the inner surface of the pharynx. The coenenchyme is the colonial tissue between the polyps and includes the calyces or polyp mounds (if present). This tissue is perforated by many solenia, the narrow canals that transport fluids between the polyps. In species that have a spiculated axis, the coenenchyme is often referred to as the cortex (see Figure 7).

Sclerites. Sclerite is the term that encompasses all calcified microscopic elements embedded in the coenenchyme of octocorals. More specific names for each sclerite shape are capstan, spicule, spindle, double head, rod, plate, club, etc. Bayer *et al*. (1983) provided images that represent the different morphologies of over 150 types of octocoral sclerites.

With the exception of few species, sclerite morphology plays an important role in the classification and identification of octocorals. Bearing that in mind, it is sometimes difficult to identify specimens based on sclerites alone because there is some degree of variance within species populations, and examining the sclerites can be challenging without a compound or scanning electron microscope. Specimens such as those in the Gorgoniidae and some members of the Plexauridae have small sclerites that need to be viewed under at least 100x magnification to properly examine the features. Sclerite morphology often varies within colonies,

with different forms present in various layers or regions of the coenenchyme and polyps. In some cases it is not necessarily just the morphology of the sclerites that is important but the comparative lengths of sclerite types that distinguishes the species, making a measuring device important during examination. Lastly, there are species in which the orientation of the sclerites within the soft tissue (such as the tentacles) is important for proper identification, so examining live or freshly dead specimens is helpful.

Axis. Axis morphology is a character that separates octocorals (specifically the Alcyonacea) into suborders, although the taxonomic significance of the suborders has been diminished (Bayer 1981a; Fabricus & Alderslade 2001; McFadden *et al.* 2006; Daly *et al.* 2007) since earlier works. Most octocoral species in the SAB have an axis, which may be horny, horny and calcified, or comprised primarily of sclerites. Octocorals in the family Anthothelidae have an axis (medulla) that consists of densely packed sclerites that are often very different than the cortical sclerites (Figure 7). Members of the Plexauridae and Gorgoniidae have a horny axis (composed of gorgonin) with varying degrees of loculation (empty pockets within the layers of gorgonin, sometimes filled with deposits of non-scleritic calcareous material; Figure 8) and a hollow, cross-chambered central core. The axis of the Ellisellidae appears solid and is comprised of large amounts of calcareous material accreted in a concentric manner in radial sectors within the gorgonin matrix, with no hollow inner core.

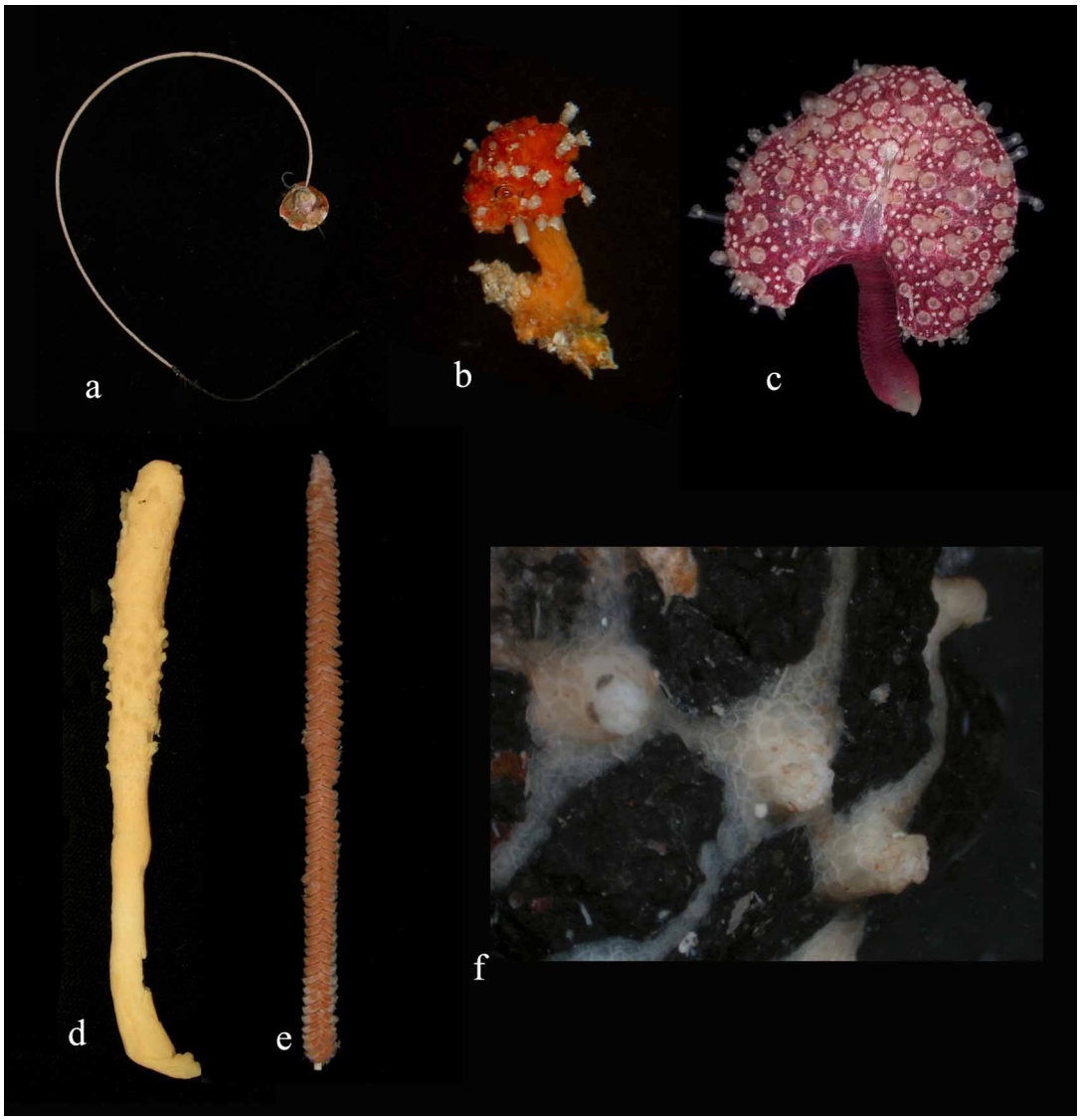

FIGURE 3. Unbranched colony forms; **a)** flagelliform (whip-like) (*Leptogorgia setacea*); **b)** capitate (*Nidalia occidentalis*); **c)** foliose (*Renilla reniformis*) **d)** club-like (*Sclerobelemnon theseus*); **e)** pen-like (*Virgularia presbytes*); **f)** stoloniferous (*Scleranthelia rugosa* var. *rugosa*).

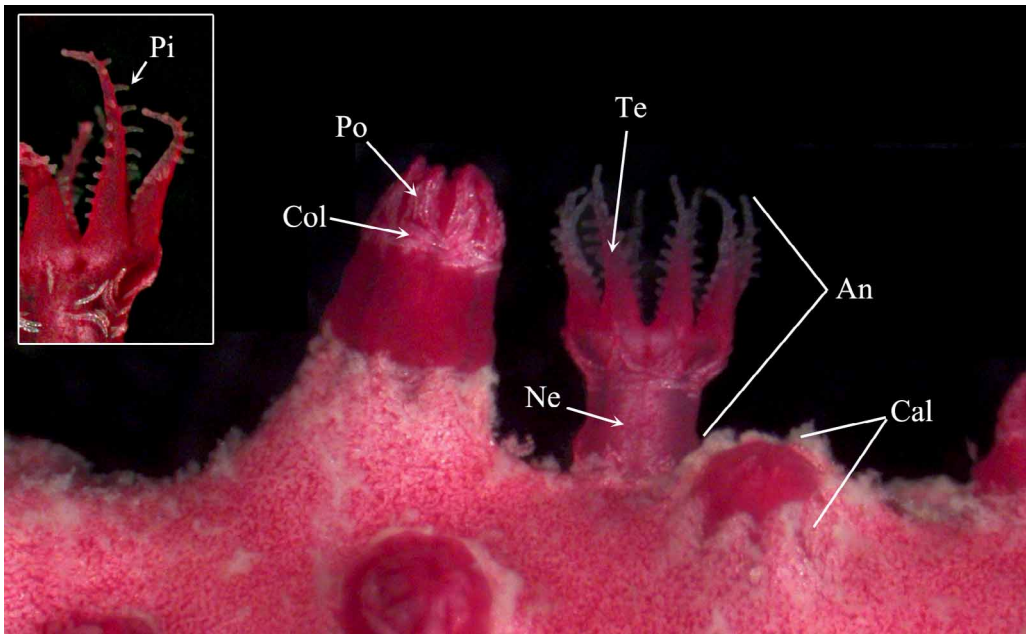

FIGURE 4. Anthocodiae of *Thesea nivea.* Indicated are pinnules (Pi), sclerites forming points (Po) and collaret (Col), tentacles (Te), neck (Ne), anthocodia (An) and calyx (Cal).

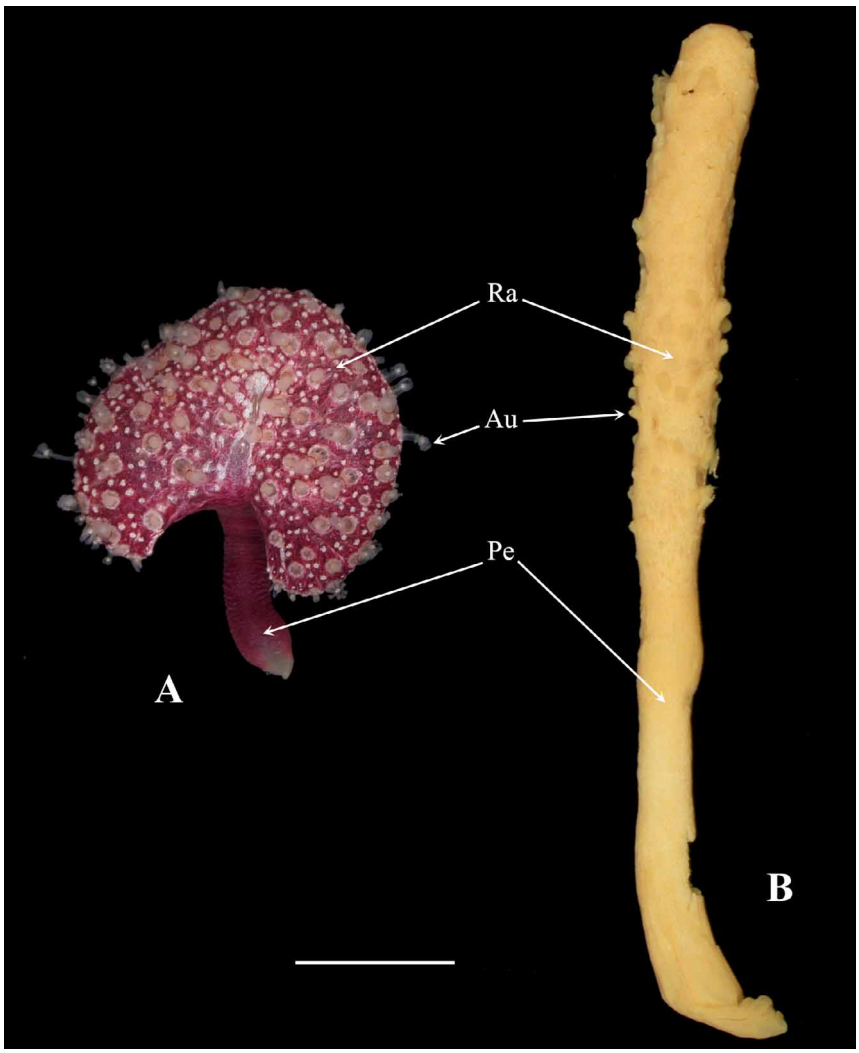

FIGURE 5. Pennatulaceans **A**, *Renilla reniformis* and **B**, *Sclerobelemnon theseus*, indicating the rachis (Ra), autozooids (Au), and peduncle (Pe) (scale bar = 1 cm).

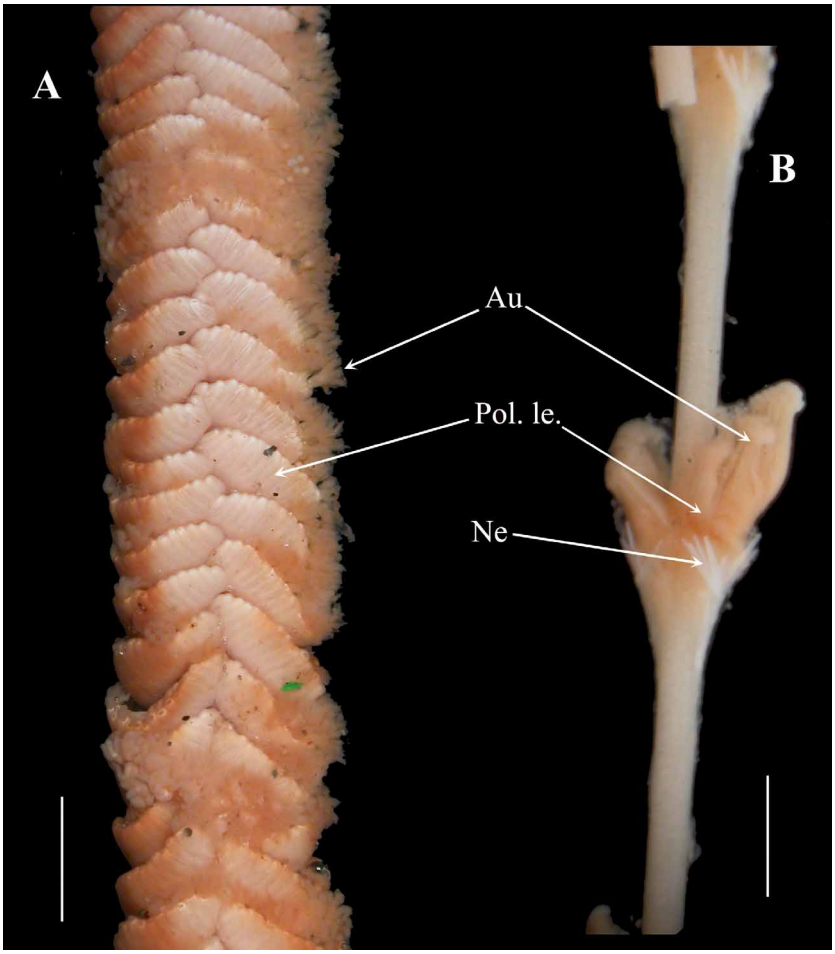

FIGURE 6. Pennatulaceans **A**, *Virgularia presbytes* and **B**, *Stylatula elegans*, indicating autozooids (Au), polyp leaves (Pol. le.) and needles (Ne) (scale bar for **A** = 5 mm; **B** = 1mm).

Species without an axis, such as true soft corals, depend on hydrostatic pressure to maintain their shape, forming what is called a hydroskeleton. Other species without an axis (such as some pennatulaceans) may have dense spiculation that allows for a rigid form.

Color. Many octocorals are noted as being vibrantly pigmented; however, color is rarely a diagnostic character and is often highly variable. Because their sclerites may have pigment incorporated during their accretion, octocorals often maintain some or all of their color after preservation. Although many of the octocorals in the SAB do not have symbiotic zooxanthellae, this association often results in octocoral pigmentation that is not retained after preservation.

Methods

The specimens examined for this work were deposited either in the National Museum of Natural History (NMNH), Smithsonian, Washington, DC or the invertebrate collection of the Southeastern Regional Taxonomic Center (SERTC), Charleston, SC. The majority of cataloged SERTC specimens were collected from SERTC cruises or accessioned from the College of Charleston's Grice Marine Laboratory (GML), which holds a largely unidentified collection of octocorals from the early 1970's to present. The species list presented in this work is limited by the restricted amount of sampling done by the NMNH, SERTC, and GML in the SAB and is not intended to be a complete distributional representation. Undoubtedly, as more collections are made in the SAB, more range extensions and new species are likely to be encountered. All

SERTC specimens were examined and identified by the first author, and every attempt was made to compare them with specimens deposited in the NMNH that were identified by knowledgeable workers.

Collections of fresh specimens were made by scallop trawl, hand collection using SCUBA, or by manned submersible. Live specimens were relaxed in 32 mg/l magnesium chloride to induce tissue expansion and photographed with a Nikon Coolpix, either through a dissecting microscope or with the camera's macro setting. For long term storage most live specimens were preserved in 95% ethanol, but occasionally specimens were fixed in 10% buffered formalin and then switched to 70% ethanol.

Specimens were viewed under a dissecting microscope to examine gross morphology and the orientation of sclerites in the tissue. To examine sclerites individually, polyps and small fragments of coenenchyme were dissolved in household bleach (sodium hypochlorite), washed repeatedly with water, and prepared on a glass slide for viewing under a compound microscope fitted with an ocular micrometer.

To prepare specimens for scanning electron microscopy, tissue was selected from specific localities on the colonies (such as polyp, coenenchyme, medulla, etc). The tissue was dissolved in bleach and the liberated sclerites were washed in distilled water and 95% ethanol. Once dried, the sclerites were hand selected using a single-bristle brush or fine forceps and placed on adhesive mounted onto aluminum SEM stubs. Samples were coated with approximately 1.5 nm of gold-platinum using a Denton Vacuum Desk II Sputter Unit. Samples were examined using a JEOL 5600LV Scanning Electron Microscope at 20 kV. Once captured, images were selected for publication based on their representative value and quality.

The following abbreviations have been used: **GML**: Grice Marine Laboratory, College of Charleston, Charleston, SC; **NMNH**: National Museum of Natural History (Smithsonian Institution); **SAB**: South Atlantic Bight; **SCDNR**: South Carolina Department of Natural Resources; **SERTC**: Southeastern Regional Taxonomic Center, Charleston, SC; **USNM:** United States National Museum (used for previously cataloged material).

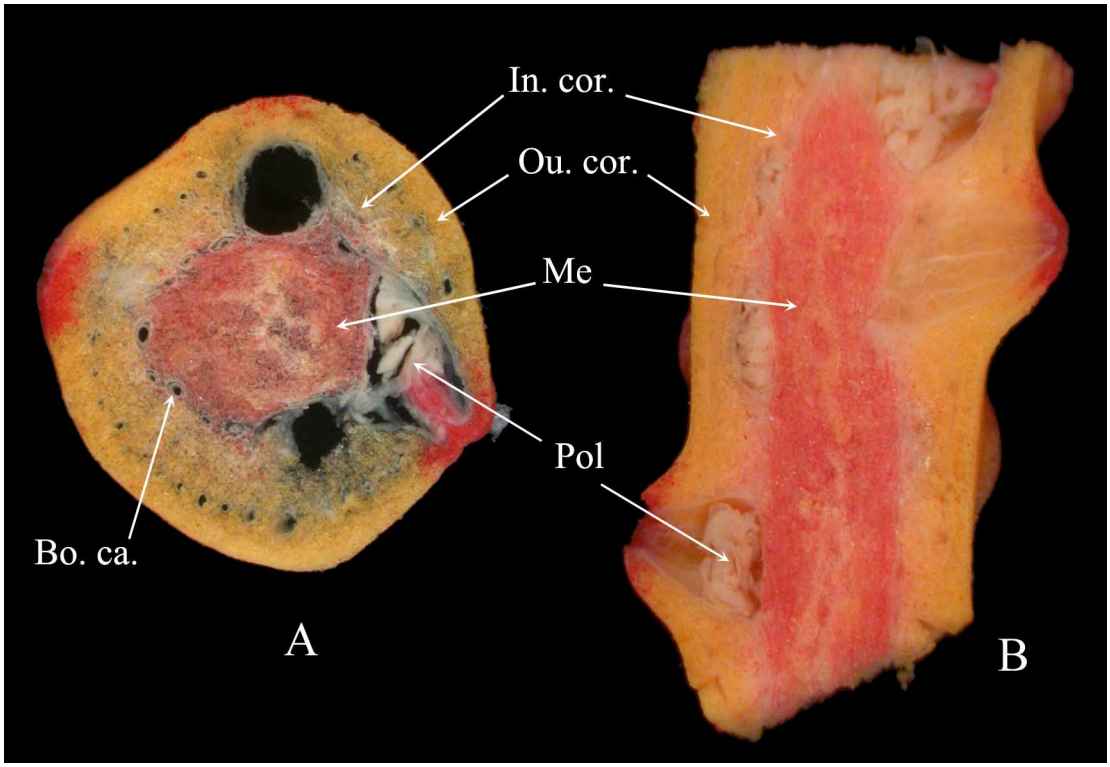

FIGURE 7. A, Transverse and **B**, longitudinal cross-sections of scleraxonian octocoral axis (*Diodogorgia nodulifera*), showing inner cortex (In. cor.), outer cortex (Ou. cor.), spiculated medulla (Me), polyps (Pol), and ring of boundary canals (Bo. ca.).

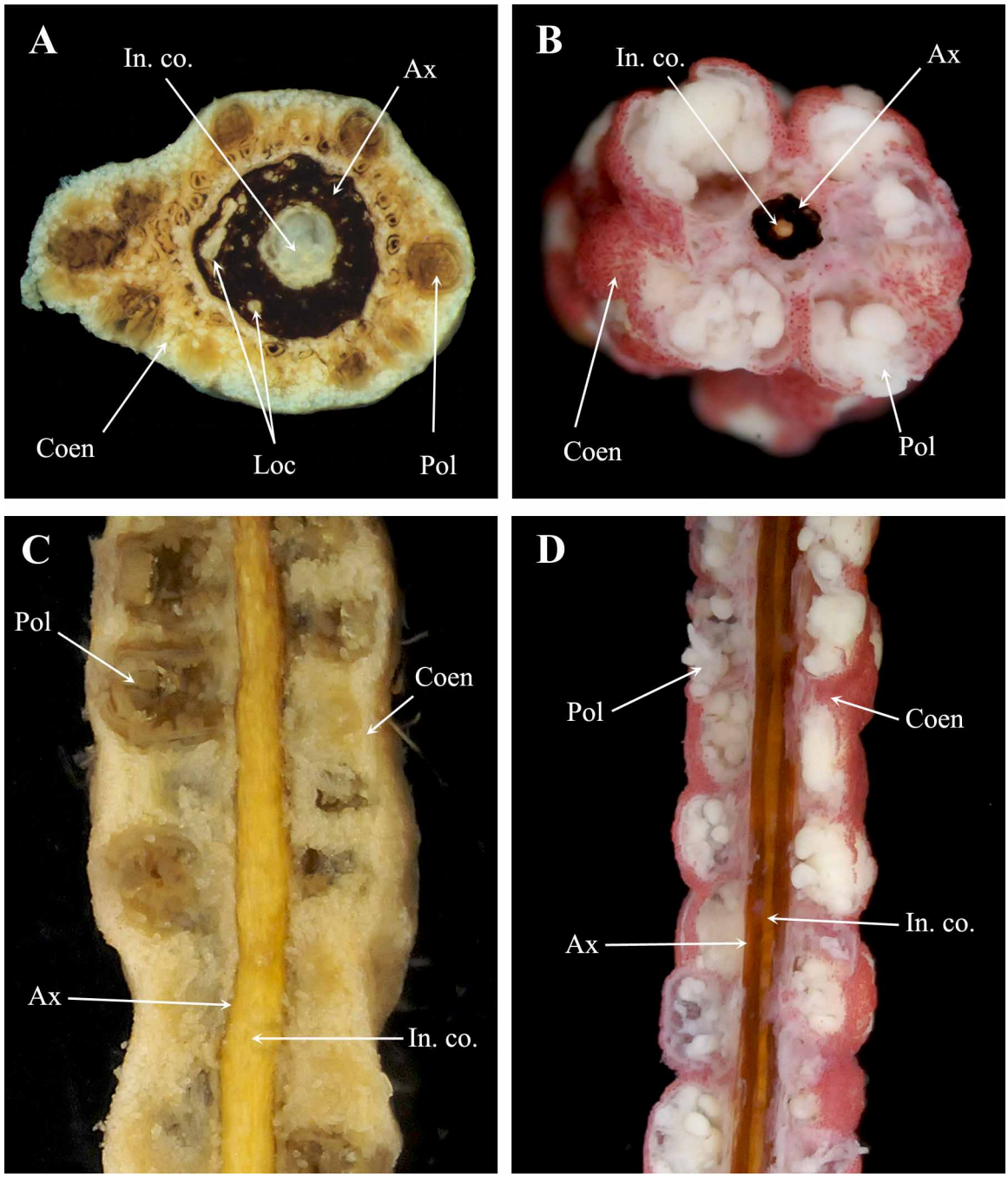

FIGURE 8. **A, B,** cross and **C, D,** longitudinal sections of holaxonian octocorals, showing axis (Ax), cross-chambered inner core (In. co.), loculi (Loc.), polyps (Pol.) and coenenchyme (Coen). The axes of the plexaurids *Euplexaura* sp. **(A)** and *Thesea nivea* **(C),** and the gorgoniid *Leptogorgia virgulata* **(B, D)** are displayed for comparison of axis characteristics. (Image **A** modified from Fabricus & Alderslade, 2001).

Key to Families (and unique species) of Octocorallia of the South Atlantic Bight (to 200m)

Subclass Octocorallia

1. Colonies attached to substrate with a basal disc or holdfast (Figure 9a,b), or encrusting (Figure 9c). Colonies generally moderately branching to highly arborescent (although a few species may be unbranched). No leaf-like structures. Coenenchymal sclerites present in all species; medullar or axial sclerites present in some species .... **Order Alcyonacea** **2**

- Colonies with a basal muscular peduncle for anchoring in soft substrate (Figure 10a,b). Growth form foliose, bilateral, whip-like or club-like, but not branching or encrusting, sometimes with leaf-like structures on the rachis (Figure 10c,d). Sclerites usually present in form of three-flanged rods, plates or needles, never spindles, but absent in axis ..... **Order Pennatulacea** … **9**

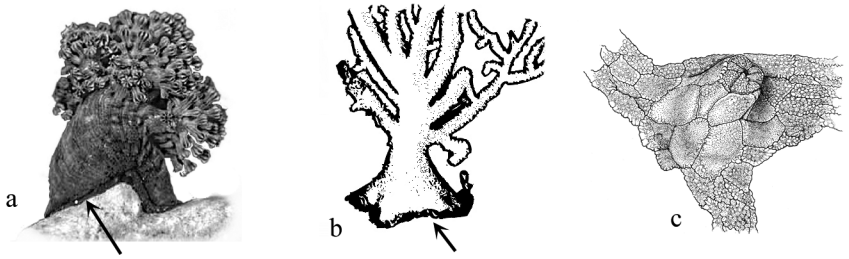

FIGURE 9. a) *Pseudodrifa nigra*, basal disc indicated; **b)** holdfast of *Muricea pendula*; **c)** encrusting colony of *Scleranthelia rugosa* (from Bayer 1981a).

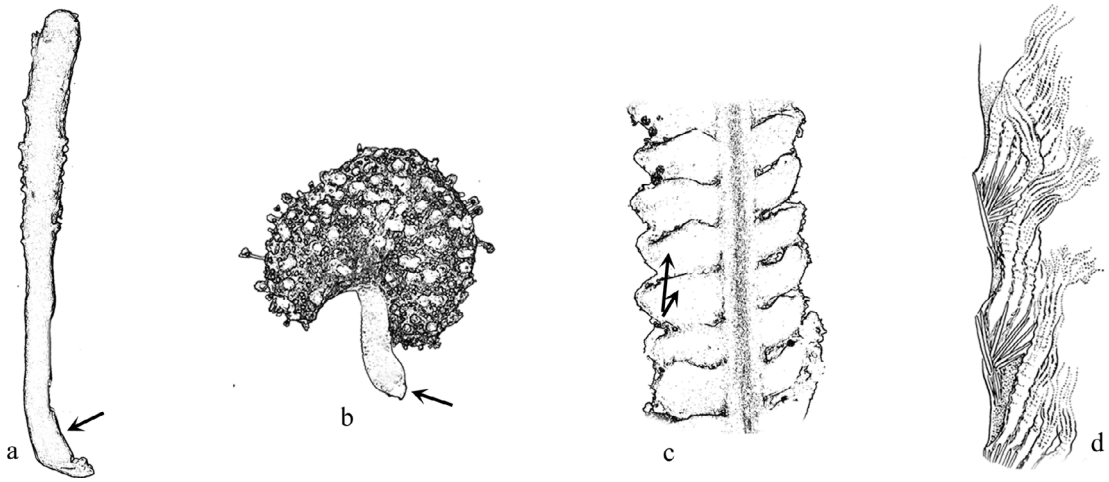

FIGURE 10. a) *Sclerobelemnon theseus* peduncle indicated; **b)** *Renilla reniformis*, peduncle indicated; **c)** *Virgularia presbytes*, leaf-like structures indicated; **d)** *Stylatula elegans*, showing two polyp leaves (modified from Bayer, 1958).

2. Colonies containing a horny (Figure 11a,b) or highly calcified (Figure 11c) axis, or distinct spiculated medular region **3**
- Colonies containing no horny or highly calcified axis or distinct spiculated medular region (although tissue may occasionally encrust dead octocoral colonies [see Figure 28B]) **6**
3. Octocorals with axial structure (medulla) composed of free sclerites. Stem divided into outer cortex and inner spiculated medulla, with ring of boundary canals between (see Figure 7) .... **Suborder Scleraxonia** … **Family Anthothelidae**
- Octocorals with axial structures not composed of free sclerites; horny axis with a distinct hollow, cross-chambered core (Figure 11a,b') or highly calcified axis with no hollow core (Figure 11c) **4**
4. Colonies with a horny axis containing a hollow, cross-chambered central core ..... **Suborder Holaxonia** … **5**
- Colonies with highly calcified axis with no hollow, cross-chambered inner core..... .....**Suborder Calcaxonia, Family Ellisellidae** … ***Viminella barbadensis* (Duchassaing & Michelotti, 1864)**
5. Coenenchyme contains some large (0.3–2.0 mm) sclerites, including spindles (Figure 12a,b), double-heads (Figure 12c), rosettes, cups (Figure 12d), knobbed stars or plates (Figure 12e,f), thorn-scales (Figure 12g,h). Axis typically loculated (Figure 12i). Calyces often very prominent, appearing spiky, conical (Figure 12j), cylindrical (Figure 12k) or shelf-like (Figure 12l) ..... **Family Plexauridae**
- All sclerites small (<0.2 mm), including warty spindles (Figure 13a-c), capstans, (Figure 13d,e) and flattened rods (Figure 13f,g), generally symmetrical, except for sometimes having partially fused disks (Figure 13h,i). Axis unloculated or minimally so (Figure 13j). Calyces absent, but polyp mounds may be moderately prominent, hemispherical (Figure 13k) or absent when polyp is retracted (Figure 13l) ..... **Family Gorgoniidae**

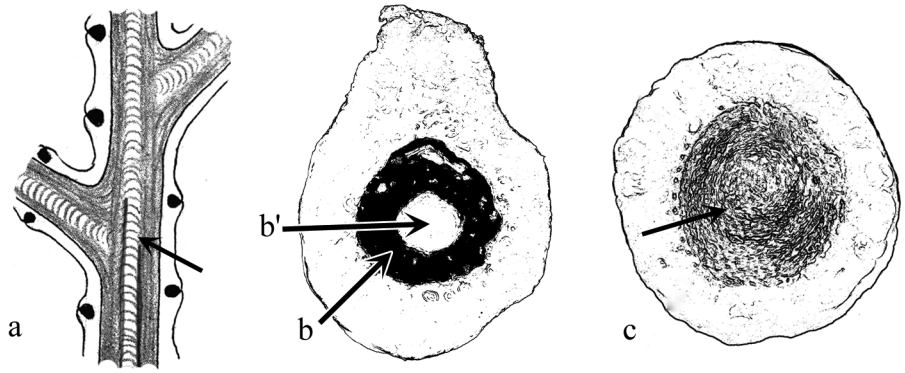

FIGURE 11. a) Longitudinal section of gorgoniid branch, horny axis with hollow, cross-chambered central core indicated; **b, b')** cross section of plexaurid branch, horny axis (b) and hollow core (b') indicated; **c)** cross-section of ellisellid branch, highly calcified axis indicated. Illustration **a** from Bayer, 1961; illustrations **b** and **c** modified from images in Fabricus and Alderslade, 2001).

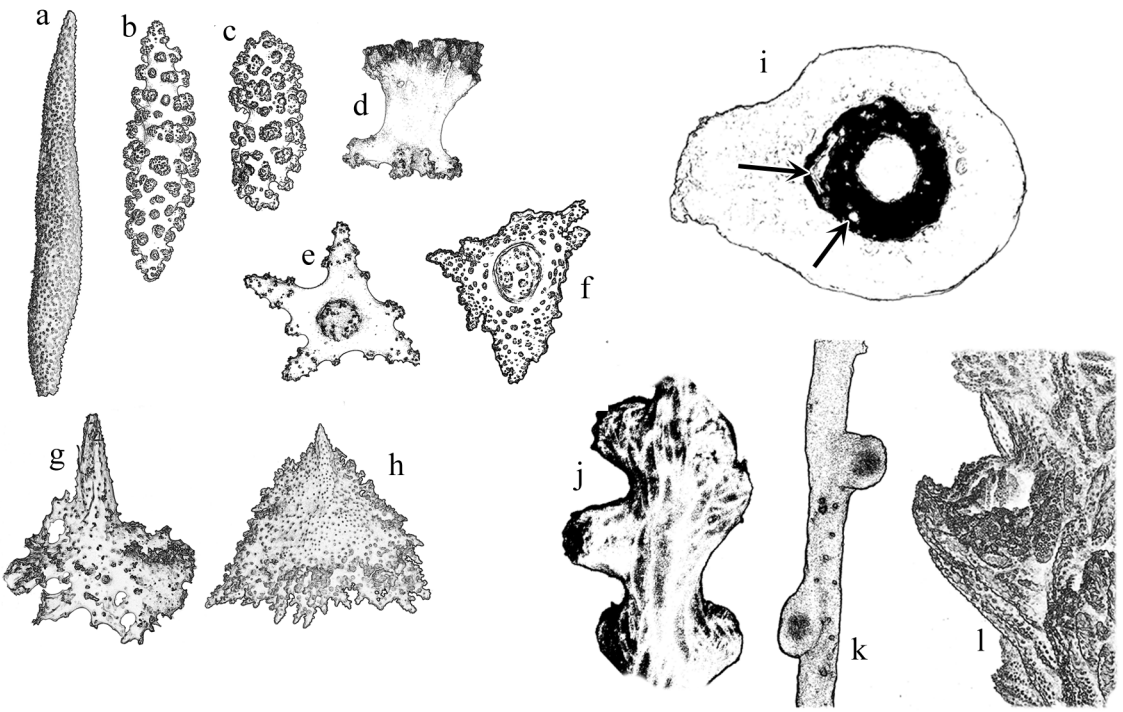

FIGURE 12. a) *Scleracis guadalupensis* spindle; **b)** *Thesea nivea* spindle and **c)** double head; **d)** *Bebryce parastellata* cup-shaped sclerite and **e)** knobbed plate; **f)** *Bebryce cinerea* knobbed plate; **g, h)** *Paramuricea* sp. thornscales; **i)** cross-section of plexaurid branch, loculi within axis indicated; **j)** *Scleracis guadalupensis* conical calyces; **k)** *Bebryce parastellata* cylindrical calyces; **l)** *Muricea pendula* shelf-like calyx. Illustrations **d** and **e** modified from images by S. Cairns/ Smithsonian Institution; illustration **i** modified from image in Fabricus and Alderslade, 2001; illustration **l** modified from image by FM Bayer/Smithsonian Institution.

6. Encrusting colonies, or branching colonies with a primary polyp and budded lateral daughter polyps (Figure 14a) arising from sheet-like, ribbon-like (Figure 14b), or reticulating stolons. Calyces long, cylindrical, with retractile polyps (Figure 14a,b) ..... **Family Clavulariidae**
- Soft corals with fleshy stalk and/or base, not encrusting and without a primary polyp from which all daughters arise; colonies moderately arborescent, lobed, capitate, digitiform or club-like. Polyps often in clusters (Figure 15) .... **Suborder Alcyoniina** … **7**
7. Colony digitiform (Figure 15c); polyps not restricted to clusters, but scattered around the colony .... **Family Alcyoniidae** … ***Bellonella rubistella* (Deichmann, 1936)**
- Colony capitate, lobed or arborescent; polyps occurring in clusters at ends of stalk or lobes (Figure 15a,b) **8**

8. Colonies non-branching, torch-like or capitate, with long, stiff stalk (Figure 15b). Sclerites long, slender, 6 times longer than wide ..... **Family Nidaliidae** … ***Nidalia occidentalis* Gray, 1835**
- Colonies lobed or slightly arborescent, with polyp clusters on terminal lobes (Figure 15a). Sclerites in the form of foliated clubs and tuberculate rods ..... **Family Nephtheidae** … ***Pseudodrifa nigra* (Pourtalès, 1868)**

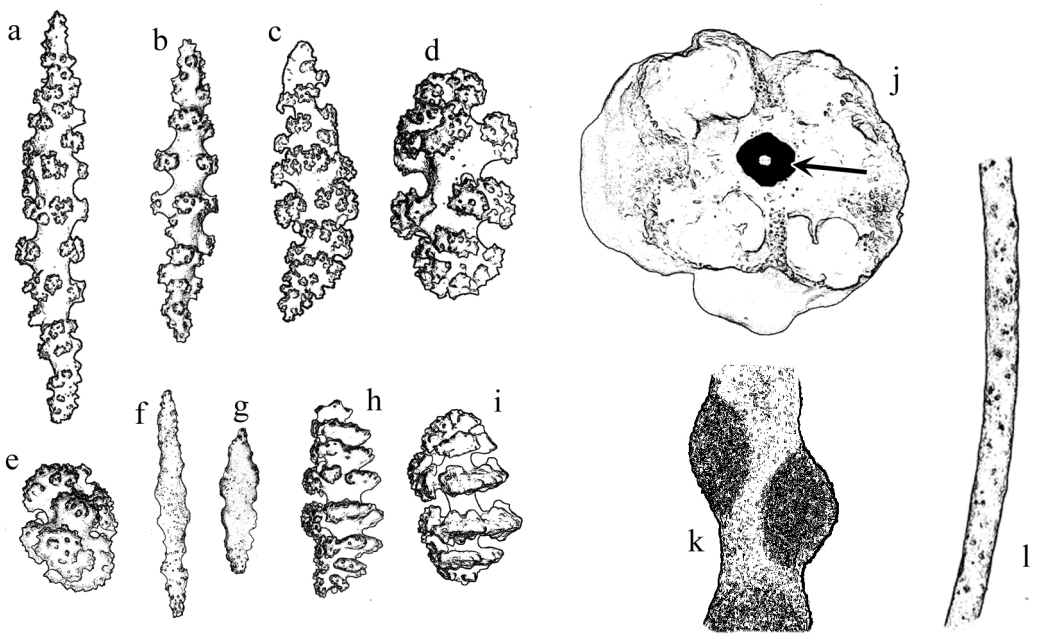

FIGURE 13. a, b) *Leptogorgia cardinalis* spindles; **c)** *Leptogorgia virgulata* spindle; **d)** *Leptogorgia hebes* capstan; **e)** *Leptogorgia punicea* capstan; **f)** *Leptogorgia cardinalis* rod; **g)** *Leptogorgia hebes* rod; **h, i)** disc spindles of *Leptogorgia setacea*; **j)** cross-section of gorgoniid branch, unloculated axis indicated; **k)** hemispherical polyp mounds of *Leptogorgia euryale*; **l)** branch of *Leptogorgia setacea* with no polyp mounds.

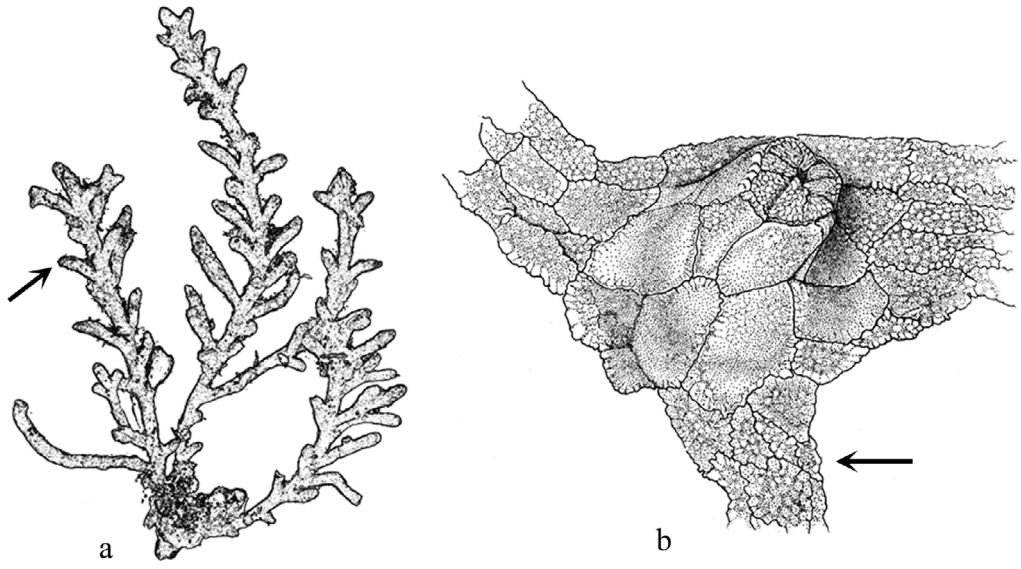

FIGURE 14. a) *Telesto sanguinea* colony, daughter polyps indicated; **b)** *Scleranthelia rugosa*, encrusting, ribbon-like stolon indicated (from Bayer, 1981a).

9. Colony foliose or heart-shaped, with polyps on upper surface. Sclerites rod-like. No axis..... ..... **Family Renillidae** … ***Renilla reniformis* (Pallas, 1766)**
- Colony slender, elongate, pen-like (Figure 16a), whip-like, or club-like (Figure 16b), often with naked dorsal groove or track (Figure 16c). Sclerites, when present, as scales (Figure 16d) or needles (Figure 16e). Axis always present **10**

10. Colonies pen- or whip-like, with autozooids arranged in polyp leaves (Figure 16a,c,e) along sides of axis..... ..... **Family Virgulariidae**
- Colonies club-like, without polyp leaves, with autozooids scattered or in rows on rachis (Figure 16b) …..... **Family Kophobelemnidae** .... ***Sclerobelemnon theseus* Bayer, 1959**

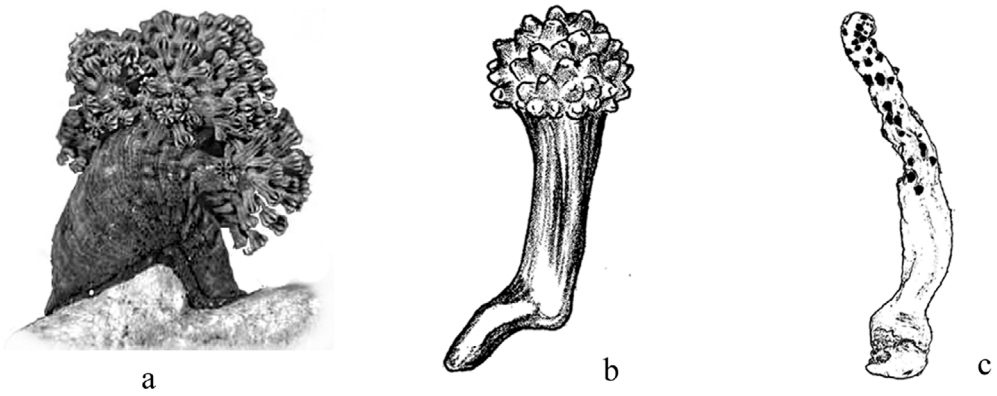

FIGURE 15. a) *Pseudodrifa nigra*; **b)** *Nidalia occidentalis* (from Bayer, 1961); **c)** *Bellonella rubistella.*

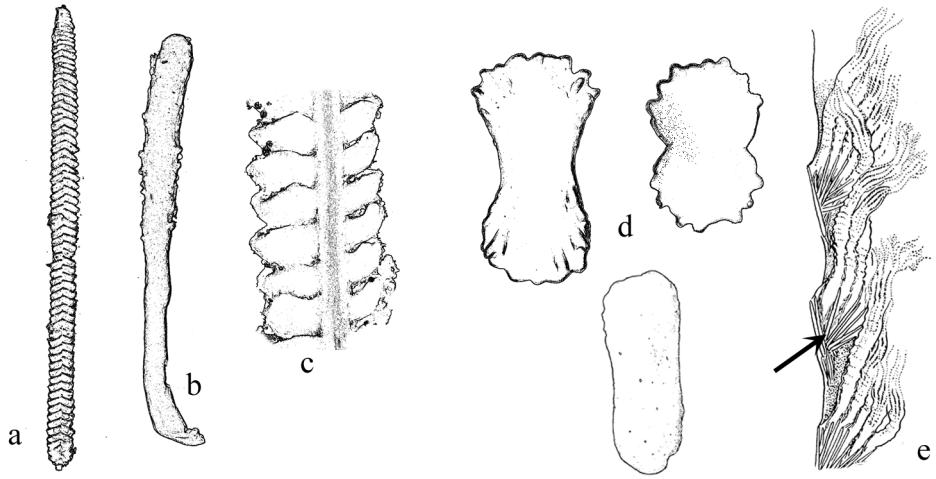

FIGURE 16. a) *Virgularia presbytes*; **b)** *Sclerobelemnon theseus*; **c)** dorsal streak of *Virgularia presbytes*; **d)** scale sclerites of *Sclerobelemnon theseus*; **e)** polyps of *Stylatula elegans*, needle sclerites indicated (modified from Bayer, 1958).

Notes on the families and keys to species

Order Alcyonacea

Suborder Stolonifera

Family Clavulariidae

Octocorals with cylindrical polyps connected by reticulating stolons. Branching species have a primary polyp from which secondary polyps arise, and encrusting species develop thin ribbon-or sheet-like stolons between polyps.

There are five species belonging to three genera of clavulariid octocorals in the SAB. The species of *Telesto* represented in this region are often distinguished by the presence and orientation of the flat anthocodial rods in the polyp tentacles. These rods may be difficult to see, especially if the polyps are retracted into the calyces. Variability in these features can be seen not only between colonies, but also between

individual polyps. Preservation may affect the polyp shape and make it difficult to distinguish the orientation of the tentacular rods. Relaxing the polyps prior to preservation (see Methods) or chemically clearing the tissue may make identification easier. Refer to Fabricus and Alderslade (2001) for phenol-xylene clearing methodology.

Both forms of *Scleranthelia rugosa* have an encrusting growth form that makes them difficult to recognize *in situ*.

Key to species of Clavulariidae in the South Atlantic Bight

1. Colonies encrusting hard substrate or dead colonies of octocorals. Calyces conical (Figure 17a), connected by ribbon (Figure 17b) or sheet-like stolons. Sclerites consisting of coarse plates arranged in mosaic-like manner (Figure 17a,b) 2
- Colonies with monopodial branching, sometimes bushy (Figure 18a). Calyces cylindrical. Sclerites as forked or warty rods, granules and spindles (Figure 18b–e), but not plates 3
2. Calyces connected by slender (1 mm) ribbon-like stolons .... *Scleranthelia rugosa* (Pourtalès 1867) … growth form *rugosa*
- Calyces connected by sheet-like membranous stolons .... *Scleranthelia rugosa* (Pourtalès 1867) … growth form *musiva* Studer

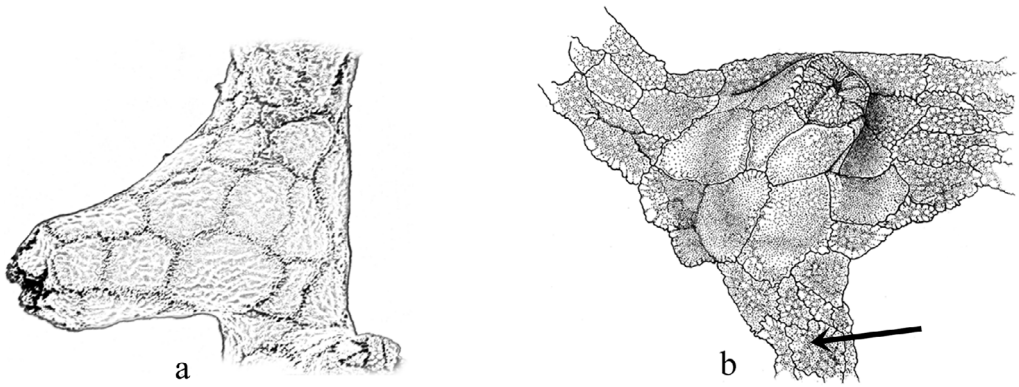

FIGURE 17. *Scleranthelia rugosa*; **a)** conical calyx of var. *musiva* (encrusting dead octocoral axis); **b)** var. *rugosa*, ribbon-like stolon indicated. Flat plate sclerites in mosaic-like arrangement are displayed in both illustrations (**a** modified image taken by F.M. Bayer; **b** from Bayer, 1981a)

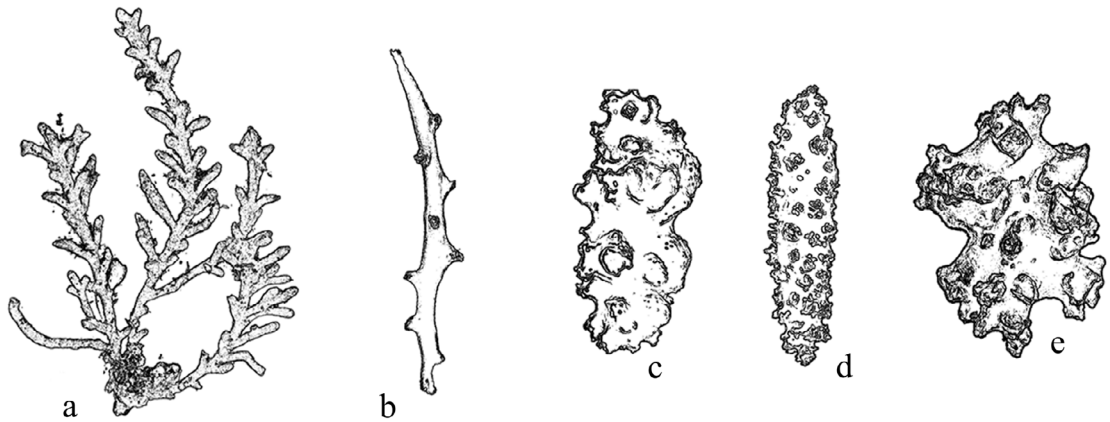

FIGURE 18. **a)** *Telesto sanguinea* colony; sclerites of **b)** *Carijoa riisei*; **c)** *Telesto fruticulosa*; **d)** *Telesto nelleae*; **e)** *Telesto sanguinea*.

3. Sclerites of coenenchyme slender, branching, thorny, not blunt (Figure 18b). Color in life white or pale brown; white when preserved in alcohol..... *Carijoa riisei* (Duchassaing & Michelotti, 1860)

- Sclerites of coenenchyme coarse, rounded, blunt spindles, often one side coarser than other side (Figure 18c–e). Color red, pink, yellow, orange or light brown in life and when preserved in alcohol 4

4. Sclerites dense in distal and proximal portions of tentacle rachis, oriented longitudinally at base, and in two horizontal rows in distal half of rachis; Color bright red ..... *Telesto sanguinea* Deichmann, 1936
- Sclerites present only in proximal half or base of tentacles, or if in distal portion, sparingly so; few horizontally oriented rods; Color light red, yellow, orange or brown 5

5. Base of tentacle with dense cluster of sclerites (>10) extending up to half the length of the rachis; coenenchymal sclerites mostly blunt, branching granules, no elongate spindles. Color yellow, orange, pink or red .... *Telesto fruticulosa* Dana, 1846
- Base of tentacle with sparse cluster of sclerites (<10) not extending into rachis; coenenchymal sclerites blunt granules and elongate spindles. Color yellowish-brown ..... *Telesto nelleae* Bayer, 1961

Suborder Alcyoniina

Octocorals with arborescent, lobed or capitate form and fleshy stalk without consolidated axis or medullar region; gastric cavities of at least some of the polyps extending deep into the stalk and sometimes to the base of colony. In the Atlantic, this group is limited to a few shallow water species, with the majority Alcyoniina taxa inhabiting deeper (>200 m) areas.

Family Alcyoniidae

Alcyoniids have fleshy or membranous colonies, a bare stalk (if present) and scattered polyps not arranged in clusters. Some species may have lobes but are not considered truly arborescent or branching. Refer to Verseveldt and Bayer (1988) for some revisions within this family.

The family is represented by only one species in the SAB, *Bellonella rubistella* (Deichmann, 1936).

Family Nidaliidae

While most nidaliids form branching colonies, species of *Nidallia* have capitate colonies with a stiff or firm texture and prominent calyces, bearing retractable polyps, in a terminal cluster. Refer to Verseveldt and Bayer (1988) for some revisions within this family.

The family is represented by only one species in the SAB, *Nidalia occidentalis* Gray, 1835.

Family Nephtheidae

Nephtheids form fleshy, lobed or arborescent colonies with non-retractile polyps that are typically concentrated in clusters at the ends of branches, although a few species may bear polyps on the branches or stalk. *Pseudodrifa nigra* (Pourtalès, 1868), the only representation of this family in the SAB, is generally restricted to deep water. See Ofwegen & Groenenberg (2007) and Utinomi (1961) for remarks about this family.

Suborder Scleraxonia

Octocorals with a medulla or axial-like structure composed of free or inseparably fused sclerites.

Family Anthothelidae

This family contains octocorals with a spiculated medulla and a ring of longitudinal boundary canals separating the medulla from cortex. The family and suborder are represented by three species in the SAB,

Iciligorgia schrammi, *Diodogorgia nodulifera* and *Titanideum frauenfeldii*. *Titanideum frauenfeldii* is the most common of the three species in this region. There are only two records of *D. nodulifera* in the SAB, and the present work is the first record of *Iciligorgia schrammi* occurring north of Florida.

Key to species of Anthothelidae in the South Atlantic Bight

1. Branches fistulose (Figure 19a). Polyps arranged along edges of flattened branches. Medullar sclerites comprised of long, slender, unbranched needles (Figure 19b) ..... *Iciligorgia schrammi* Duchassaing 1870
- Branches not fistulose. Polyps scattered on all sides of branches. Medullar sclerites comprised of branching rods, spindles, capstans, tuberculated spheroids, not needles 2
2. Branches with projecting calyces or low polyp mounds, sometimes of a color contrasting with the surrounding coenenchyme. Cortex containing capstans, tuberculated branched bodies, tuberculated spheroids and spindles in outer region, and spindles in inner region ..... *Diodogorgia nodulifera* (Hargitt, in Hargitt and Rogers, 1901)
- Coenenchyme flush, with no calyces or polyp mounds. Cortex containing only short capstans and tuberculated branched bodies and spheroids, no spindles ..... *Titanideum frauenfeldii* (Kölliker, 1865)

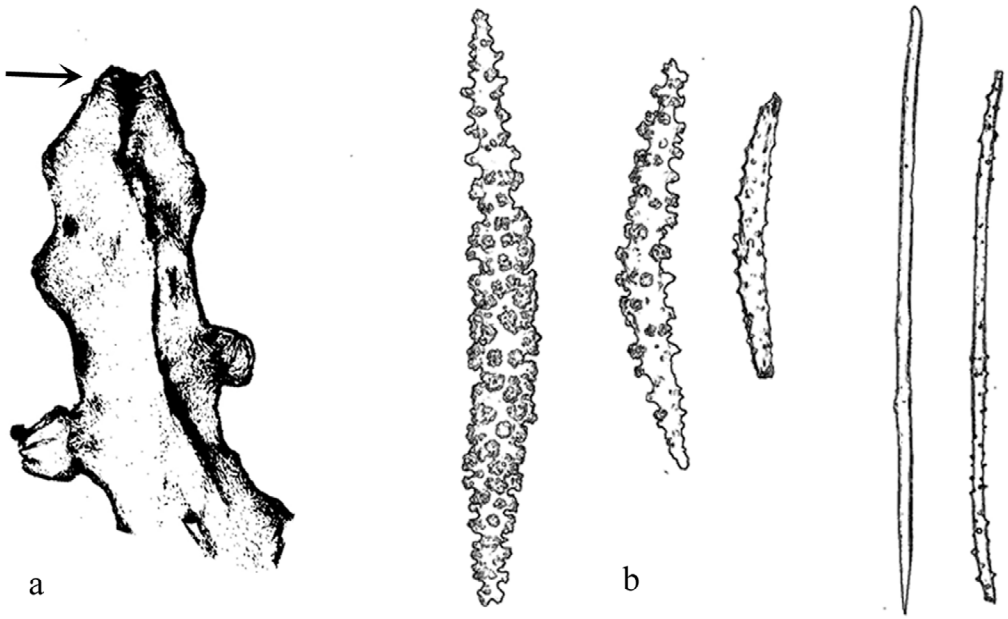

FIGURE 19. *Iciligorgia schrammi*; **a)** fistulose branch, tip indicated; **b)** needles

Suborder Holaxonia

Octocorals with unspiculated, horny axis containing a soft, cross-chambered central core.

When using sclerites alone, it is sometimes difficult to distinguish between the two families of Holaxonia represented in the SAB. The Plexauridae have a much more diverse assemblage of sclerite morphology as a whole than the Gorgoniidae, but there are some species (e.g. *Thesea nivea*) that contain spindles that initially resemble those in the Gorgoniidae. Spindle size and degree of loculation within the axis must also be considered while attempting to place holaxonian specimens in the correct family.

Family Plexauridae

Members of the families Paramuriceidae and Muriceidae were reclassified in Bayer (1981a) to Plexauridae. Members of this family in the SAB have an unspiculated, horny axis with a wide, hollow, cross-chambered inner core. The axes of plexaurids typically have a great deal of loculation (permeation with pockets which may be filled with calcareous material) within the gorgonin layers. The calyces are often prominent and may

have large sclerites in the walls. Polyps are retractile and usually have anthocodial sclerites in a collaret and points arrangement.

Key to species of Plexauridae in the South Atlantic Bight

1. Sclerites of colonies include warty stellate plates with a central knob (Figure 20a,b) as well as cup-shaped rosettes (Figure 20c) in outer coenenchyme, with concavity of cup facing away from axis 2
- Sclerites of colonies include spindles (Figure 21a-c), rods or thorn-scales (Figure 21d,e) but no cup-shaped rosettes in outer coenenchyme 3
2. Colony stout and branching, with branches and stems up to 3 mm thick; polyps closely set and numerous .... *Bebryce cinerea* Deichmann, 1936
- Colony slender, unbranched or sparsely branched; stem diameter not exceeding 1 mm; polyps widely set apart and sparse ..... *Bebryce parastellata* Deichmann, 1936
3. Sclerites of colonies include calicular thorn-scales ..... *Paramuricea* sp.
- Thorn-scales absent..... 4
4. Colonies with prominent conical calyces along two sides of branches, with large spindles (up to 3 mm) in coenenchyme and smaller spindles towards rim of calyces ..... *Scleracis guadalupensis* (Duchassaing & Michelotti, 1860)
- Colonies with crowded shelf- or dome-like calyces scattered on all sides of branches, largest sclerites not reaching 3 mm 5
5. Calyces appearing spiny or shelf-like (Figure 12l); calyx with large (often >1 mm) orange spindles extending beyond its edge and very apparent when polyp is retracted. Coenenchyme containing spindles only .... *Muricea pendula* Verrill, 1864
- Calyces domelike with no large sclerites. Coenenchyme with small colorless spindles, double heads, double cones (but see exception in Remarks on species) ..... *Thesea nivea* Deichmann 1936

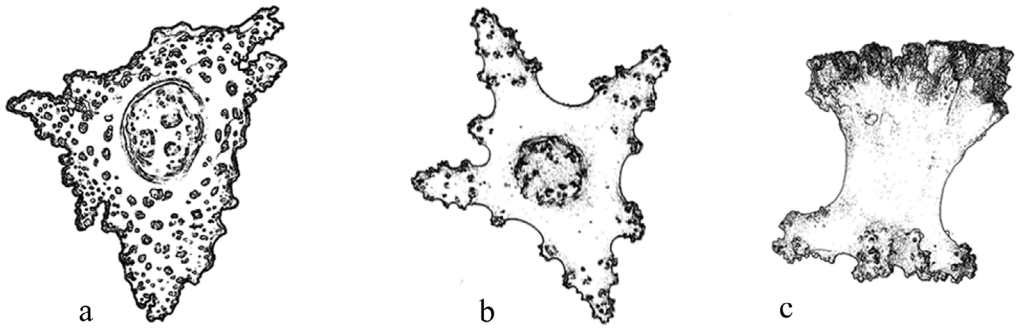

FIGURE 20. a) *Bebryce cinerea* knobbed plate; *Bebryce parastellata* **b)** knobbed star and **c)** cup-shaped rosette (**b** and **c** modified from images by S. Cairns/Smithsonian Institution).

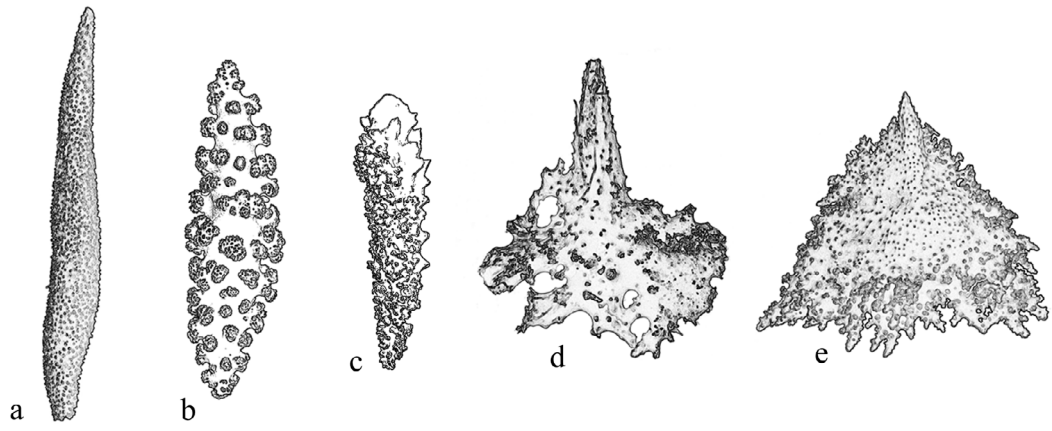

FIGURE 21. a) *Scleracis guadalupensis* spindle; **b)** *Thesea nivea* spindle; **c)** *Muricea pendula* spindle; **d, e)** *Paramuricea* sp. thornscales.

Family Gorgoniidae

This family has the highest diversity in the SAB but is represented only by the genus *Leptogorgia*. The pinnate branching forms of *Leptogorgia* found here were at one time classified in the genus *Lophogorgia*, distinguished by their asymmetrical spindles with partially fused discs. Grasshoff (1988) found this feature to be true only of Atlantic species and not a consistent distinction based on species described from West Africa. As a result, he merged the Atlantic *Lophogorgia* species into *Leptogorgia* (senior synonym). The historical synonomizing and separation of *Lophogorgia* and *Leptogorgia* is further discussed by Breedy and Guzman (2007).

The *Leptogorgia* species are sometimes difficult to distinguish based on sclerites alone, and often colony morphology of the branching species is highly variable. The SAB members of this family have very small sclerites (<0.3 mm) spindles, capstans and flattened, scalloped rods. The horny axis is quite dense with little or no loculation and has a narrow, hollow, cross-chambered inner core. Polyps are retractile into low polyp mounds or flush coenenchyme.

Key to species of genus *Leptogorgia* in the South Atlantic Bight

1. Colony unbranched (Figure 22a) or moderately branched near base (Figure 22b); attached or unattached 2
- Colony irregularly pinnately branched (Figure 23a,b), branched in one plane or shrubby; always attached 4
2. Colony moderately branched close to attached base ..... *Leptogorgia virgulata* (Lamarck, 1815)
- Colony unbranched or with small branchlets arising from main axis, may be unattached 3
3. Colony diameter >2 mm. Color white, yellow or purple with purple apertures. Polyp mounds absent or slightly dome-like ..... *Leptogorgia setacea* (Pallas, 1766)
- Colony extremely slender (0.5 mm–1.5 mm exclusive of polyp mounds), with dome-like polyp mounds..... ..... *Leptogorgia euryale* (Bayer, 1952)
4. Colony branches stout, >2 mm in diameter exclusive of polyp mounds. Sclerites of coenenchyme containing blunt capstans ..... *Leptogorgia hebes* (Verrill, 1869)
- Colony branches thin (<1.5 mm) exclusive of polyp mounds. Many spindles acute and not blunt 5
5. Colony irregularly pinnate, with short branches curving upward. Dome-like polyp mounds in double series along terminal twigs..... *Leptogorgia punicea* (Milne Edwards & Haime 1857)
- Colony regularly pinnate, branches long and only slightly curving, if at all. Polyp mounds in single series along terminal twigs, moderately to prominently protruding ..... *Leptogorgia cardinalis* Bayer, 1961

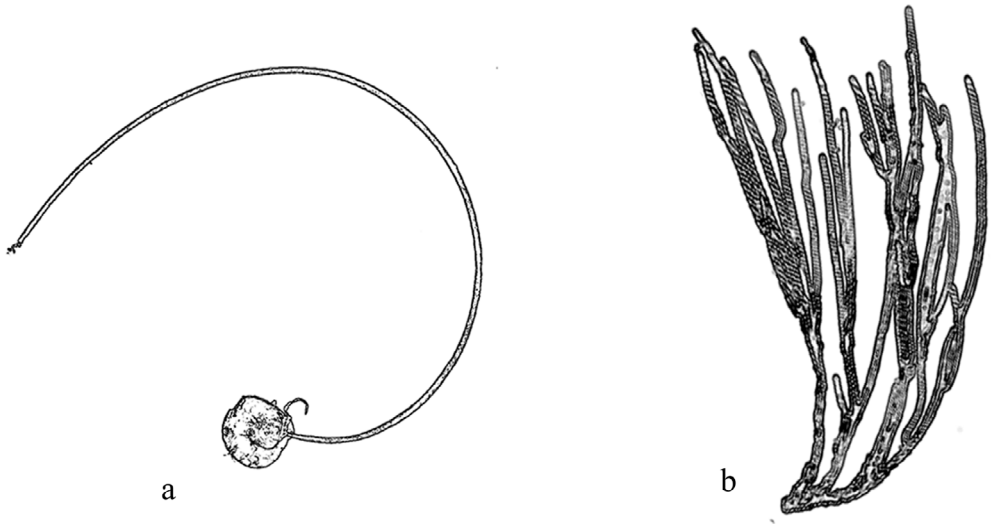

FIGURE 22. **a)** Unbranched colony of *Leptogorgia setacea* (attached to vacant bivalve shell)*;* **b)** *Leptogorgia virgulata*

FIGURE 23. Branching colonies of **a)** *Leptogorgia hebes*; **b)** *Leptogorgia cardinalis*

Suborder Calcaxonia

Octocorals with a horny axis, sometimes highly calcified, without a hollow, cross-chambered central core.

Family Ellisellidae

Octocorals with a highly calcified axis exhibiting a radial pattern in cross section, no hollow core, and sclerites as double heads and clubs. Polyps are contractile but not retractile. The only member of this suborder and family found in the shallow SAB is *Viminella barbadensis* (but see Remarks section for this species). The highly calcified, unspiculated axis characteristic of members of this suborder makes them easily distinguishable from other gorgonaceans found within the shallow SAB.

Order Pennatulacea

Pennatulaceans are octocorals with a oozooid modified to form a rachis bearing all secondary polyps (autozooids and siphonozooids), a barren stalk, and a peduncle for anchoring the colony in soft substrate (with a few rare exceptions [Alderslade, pers. comm.]). When present, the sclerites of pennatulaceans are in the form of simple rods, needles, plates, or egg-like ovals.

The Pennatulacea are poorly represented in the shallow SAB. Four species occur in this region but only two appear to be common.

Suborder Sessiliflorae

Family Renillidae

Pennatulacea with heart-shaped rachis containing all siphonozooids and autozooids on the dorsal surface. The stalk does not contain an axis nor does it support polyps.

This family is represented by one species in the SAB, *Renilla reniformis*. Deichmann (1936) divided this taxon into two forms, *americana* and *typica* based on saturation of colony and sclerite color. Colonies found

on the coast of the Carolinas and north Florida are pale purple (forma *typica*) whereas those off the coast of South America are darker and more violet (forma *americana*). Bayer (1961) disputed this division, finding both pale and dark colonies in the Antilles. Both forms have been recorded in the SAB.

Family Kophobelemnidae

Bilateral octocorals with well developed axis, club-like colony form, dimorphic polyps distributed in longitudinal rows on rachis, and a naked dorsal streak. One species occurs in the shallow SAB, *Sclerobelemnon theseus* Bayer, 1959.

Suborder Subselliflorae

Family Virgulariidae

Octocorals with a distinct axis and autozooids arranged in leaves, giving the colonies a bilaterally symmetrical form. This family is represented by two species, *Virgularia presbytes* and *Stylatula elegans*, in the shallow SAB.

Key to species of Virgulariidae in the South Atlantic Bight

1. Colony stout and rigid, with leaves arranged in overlapping pairs along axis. Sclerites generally absent .... *Virgularia presbytes* Bayer, 1955
- Colony slender and flexible, leaves arranged in offset pairs distinctly separated along the axis. Sclerites in form of large needles, forming fan-like structures beneath leaves ..... *Stylatula elegans* (Danielssen, 1860)

Notes on the shallow-water (<200 M) species of Octocorallia in the South Atlantic Bight

The following section contains those octocoral species known or likely to occur in the coastal and offshore waters of the SAB. Comments are presented on their biology as well as their distribution within the SAB and restricted synonymies are given.

Subclass Octocorallia

Order Alcyonacea

Suborder Stolonifera

Family Clavulariidae

***Carijoa riisei* (Duchassaing and Michelotti, 1860)**
(Figure 24)

Clavularia riisei Duchassaing and Michelotti, 1860:34.— Duchassaing and Michelotti, 1864:23.—Kölliker 1865:131; Plate 18 fig. 24.
Carijoa rupicola Müller, 1867:330; Plate 9 figs. 56–67.
?*Telesto africana* Verrill, 1870:372; Fig. 3.
Telesto rupicola Laackmann, 1909:81; Fig. D; Plate 2 figs. 1–2; Plate 3 fig. 3.

Telesto riisei.—Verrill 1870:372.—Hargitt and Rogers 1901:278; Fig A.—Laackmann 1909:78; Fig. C; Plate 3 fig 4; Plate 7 figs. 28–29.—Deichmann 1936: 44; Plate 2 figs.17–19.—Bayer 1959b:3; Fig. 1.—Bayer 1961:39; Figs. 3, 4, 9g; Plate XII.—Tixier-Durivault 1970:147.
Carijoa riisei.—Bayer 1981a:909; Fig.2.—Cairns *et al*, 2002:33.

Material examined. USNM 72448, 35 m, off Georgia, March 12, 1980. SERTC S2719, 30.5 m, off Edisto Island, South Carolina, April 29, 2005.

Remarks. *Carijoa riisei* is considered a fouling organism. The colonies are densely branching, often having a large, bushy appearance, and are white or pale when preserved. The cylindrical calyces of the primary polyps and daughter polyps have eight longitudinal grooves. Specimens of *C. riisei* are distinguished easily from other branched SAB clavulariids by the sclerites, which are branching, thorny rods and spindles, as opposed to granular bodies of *Telesto sanguinea*, *T. fruticulosa* and *T. nelleae*. There is some weak fusion of thorny rods. The polyps bear sparse spiculation in the form of small rods, which are located in the polyp bases and basal regions of the mesenteries.

Atlantic distribution: South Carolina to Brazil, Gulf of Mexico, Caribbean; low tide line to 104 m (NMNH records indicate a specimens collected from 309 m off Havana, Cuba, and from 732 m off the Florida Keys; Deichmann (1936) noted a colony from St. Lucia collected from 508 m). (Deichmann, 1936; Bayer, 1961; NMNH collections; SERTC collection).

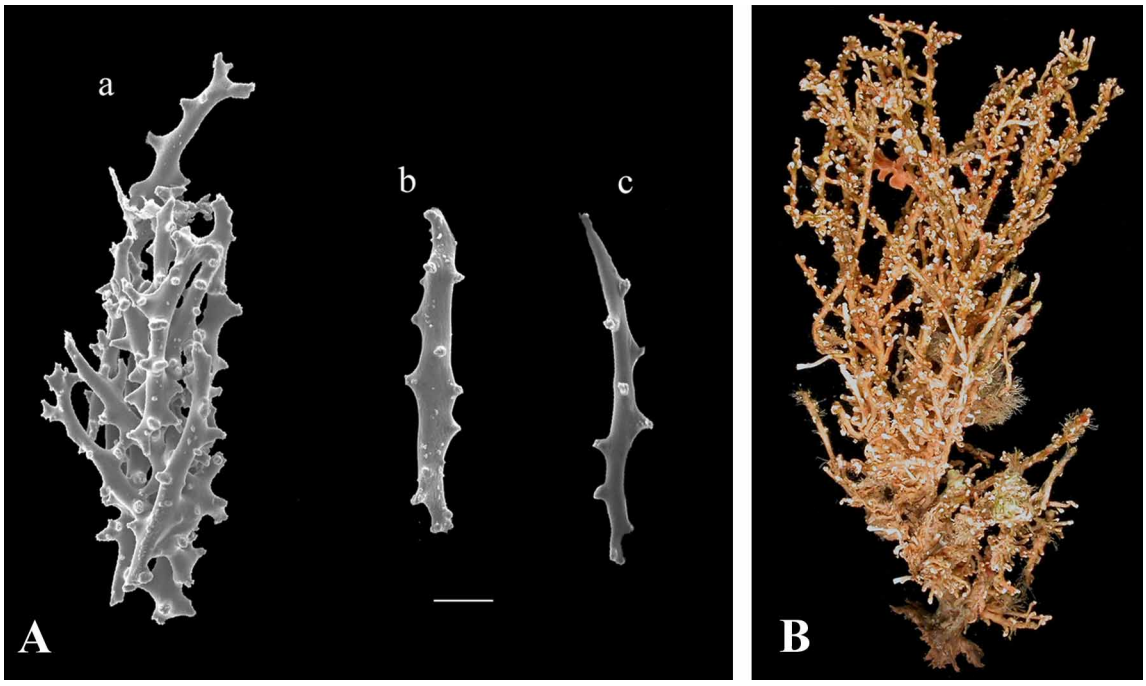

FIGURE 24. *Carijoa riisei*: **A,** coenenchymal sclerites (USNM 72448); *a)* fused rods; *b, c)* rods (scale bar = 0.05 mm); **B,** preserved colony.

Telesto fruticulosa Dana, 1846
(Figure 25)

Telesto fruticulosa Dana, 1846:632.—Laackmann 1909:74; Plate 8 fig. 32; text fig. B.—Deichmann 1936: 43; Plate 2 figs. 20–22.—Bayer 1961:46; Figs. 7, 9c.—Cairns *et al.* 2002:33.

Material examined. SERTC S1743, 13.7 m, off Charleston, South Carolina, May 13, 2003; SERTC S2486, 21.6 m, off St. Catherine's Island, Georgia, June 3, 2004. SERTC S1744, 12.4 m, off Charleston, South Carolina, April 21, 2004. SERTC S2688, 7 m, off Debidue Island, South Carolina, November 8, 2002. SERTC S2691, 21.4 m, off Charleston, South Carolina, August 15, 2006. SERTC S2687, 19.5 m, Gray's Reef

National Marine Sanctuary, off Savannah, Georgia, May 31, 2006. SERTC S2690, 24 m, off Charleston, SC, August 15, 2006.

Remarks. *Telesto fruticulosa* colonies are monopodially branched and usually found in colonies of multiple branches. The daughter polyps sometimes develop into tertiary branches. The color of the coenenchyme may be orange, light red, or yellow, but may be obscured or completely encrusted by fouling organisms such as sponges and bryozoans. One encrusting sponge produced a thin veneer that was observed to be the bright red of *Telesto sanguinea*, a species closely resembling *T. fruticulosa*, such that the true color of the colony was completely obscured until preserved in ethanol. As is typical of the members of this genus in the Atlantic, there are eight longitudinal grooves present in the body wall of the primary polyps, but they are sometimes more distinct near the calyces or the base of the colony. There is a dense cluster of vertically oriented, overlapping flat rods in the base and proximal half of the polyp tentacles.

This species can be distinguished from *T. sanguinea* by the absence of dense rows of horizontally oriented flat rods in the distal region of the tentacles. If horizontal rods are present in the distal region they are sparse and do not reach the tip of the tentacles. The coenenchymal sclerites consist of glassy, blunt, branching bodies and some small (0.2 mm) granules that are opaque and lumpy on one side and coarsely warty and glassy on the other. Occasionally weak fusion of the sclerites is observed.

T. fruticulosa is a very common species in hardbottom habitats within the SAB. The polyps are usually expanded during the day but, unless relaxed prior to preservation, retreat into the cylindrical calyces when exposed to preservatives or disturbance.There are numerous lots of specimens of this species in the collections of the NMNH (Smithsonian) that were collected from the shallow SAB.

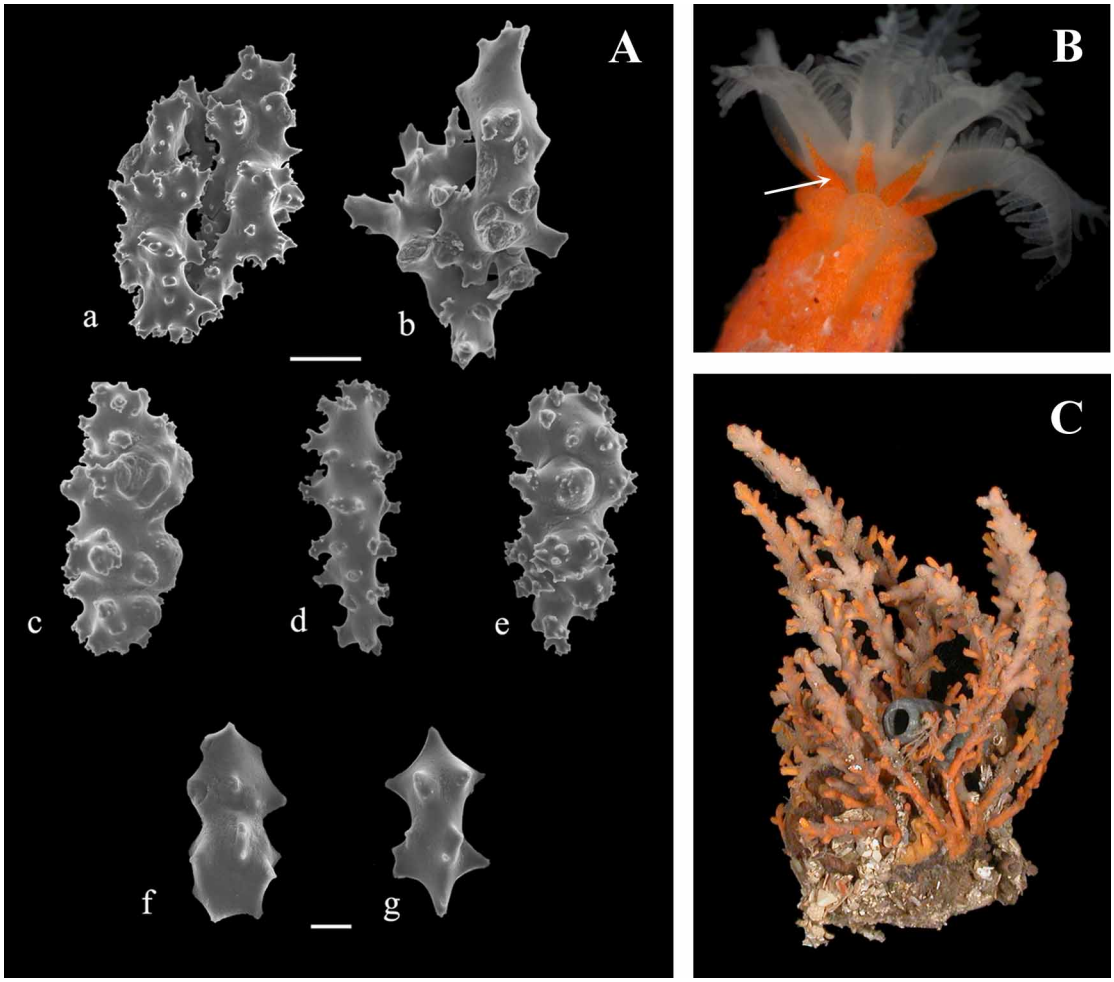

FIGURE 25. *Telesto fruticulosa*: **A,** sclerites (S2690): *a, b)* fused sclerites from coenenchyme; *c–e)* sclerites from coenenchyme; *f, g)* anthocodial sclerites; (scale bar for *a–e* = 0.05 mm; *f, g* = 0.02 mm); **B,** polyp (live specimen), arrow indicating anthocodial rods in basal region of rachis; **C,** preserved colony (approximately 12 cm in height).

Atlantic distribution: Coasts of the North Carolina, South Carolina, Georgia and northern Florida, 7–100 m (Deichmann 1936; Bayer 1961; NMNH collections; SERTC collection).

Telesto nelleae Bayer, 1961
(Figure 26)

Telesto nelleae Bayer, 1961:48; Figs. 8a–e, 9d.—Cairns *et al.* 2002:33.

Material examined. USNM 50703 (holotype), 90 m, off Cape Hatteras, NC, October 17, 1885. USNM 61225, 104 m, off North Carolina, May 14, 1981.

Remarks. *Telesto nelleae* is similar to *T. fruticulosa*, but can be distinguished by the presence of elongate, spindle-like sclerites in the coenenchyme, and the presence of a sparse cluster of flat rods restricted to the base of the tentacles. Granular and branching sclerites in addition to the elongate spindles are present in the coenenchyme. The color of the colony is yellowish brown when preserved in ethanol.

Atlantic distribution: North Carolina, 27–227 m; Cuba, 210–298 m; Bahamas, 1153 m (Bayer, 1961; NMNH collections).

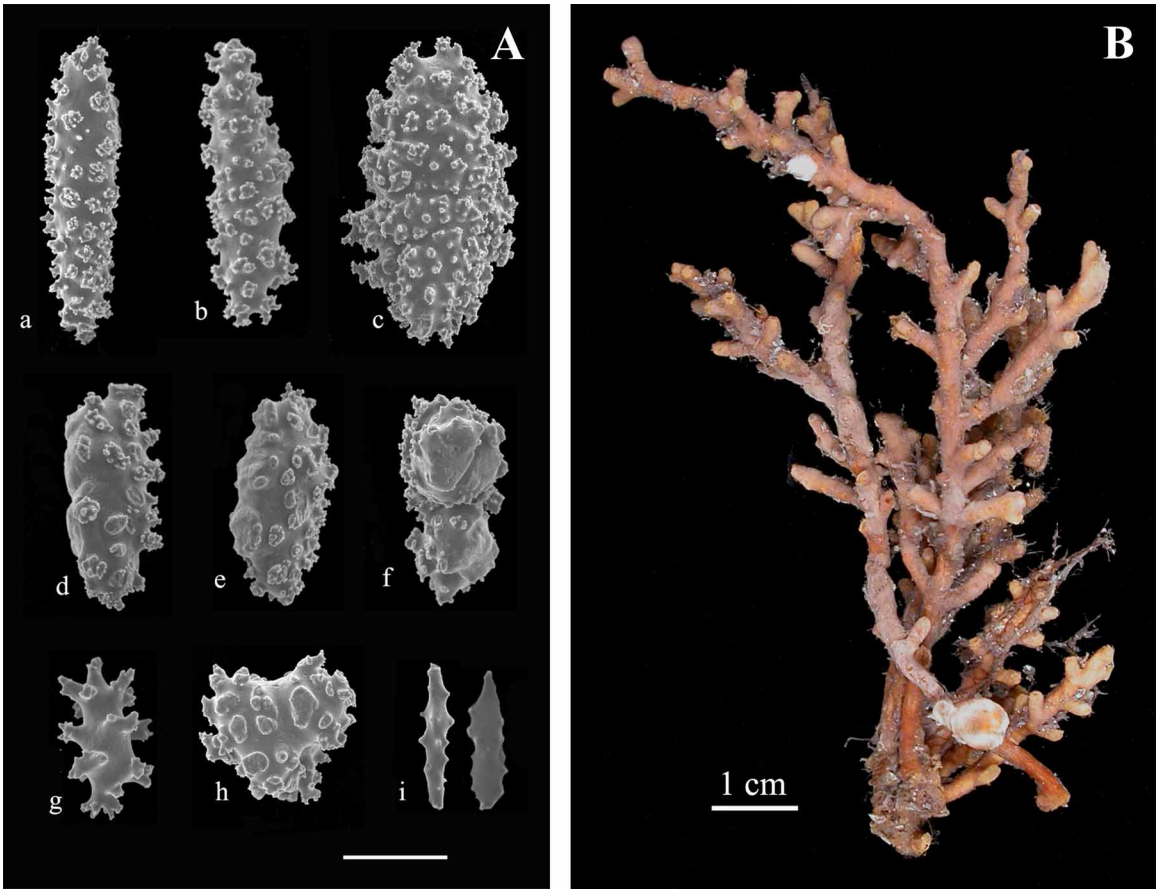

FIGURE 26. *Telesto nelleae*: **A,** sclerites (USNM 61225): *a–c)* spindles from calyx; *d–f)* granular sclerites from calyx; *g, h)* sclerites from coenenchyme; *i)* flat rods from polyp tentacle (scale bar = 0.1 mm); **B,** preserved specimen (USNM 50703, holotype) (scale bar = 1 cm).

Telesto sanguinea Deichmann, 1936
(Figure 27)

Telesto sanguinea Deichmann, 1936:41; Plate 1 fig. 5[*sic*. 3]; Plate 2 figs. 9–12.—Bayer 1952:183.—Baye, 1961:44; Fig. 6a–e; Fig. 9e.—Cairns *et al.* 2002:33.

Material examined. USNM 50357, 26 m, ESE of Port Royal Sound, South Carolina, February 3, 1940. USNM 50358, 29 m, off Daytona Beach, FL, January 19, 1940. SERTC 2487, 30.5 m, off Edisto Island, South Carolina, April 29, 2005. SERTC 2689, 19.5 m, off Edisto Island, South Carolina, April 29, 2005.

Remarks. *Telesto sanguinea* colonies are monopodially branched and may have multiple branches rising from stolons. The daughter polyps sometimes develop into tertiary branches. The color of the coenenchyme is bright red but may be obscured or completely encrusted by fouling organisms such as sponges and bryozoans. The species may rarely be orange, pink or yellow (Bayer 1961). As is typical of the members of this genus in the Atlantic, there are eight longitudinal grooves present in the body wall of the primary polyp but they are sometimes more distinct near the calyces or the base of the colony.

This species, which may resemble *Telesto fruticulosa*, can be distinguished by the presence of a dense layer of flattened rods oriented vertically in the proximal region of the tentacles and two rows of rods oriented horizontally in the distal region of the tentacles, reaching the tip. The coenenchymal sclerites consist of small (0.2 mm) granules that are lumpy on one side and coarsely warted on the other, as well as blunt, branching bodies. There occurs some moderate fusion among the sclerites, usually in the form of 2–3 weakly connected individuals. The sclerites generally appear glassy but occasionally some opaque pink or white granular bodies are observed, often near the base of the colony. The sclerites are usually red and are consistent with the color of the colony.

This species appears to be relatively common in hardbottom communities in the SAB, and has a more southern range than *T. fruticulosa*.

Atlantic distribution: South Carolina to the Florida Keys and Gulf of Mexico, 18–134 m (Deichmann 1936; Bayer 1961; NMNH collections; SERTC collection).

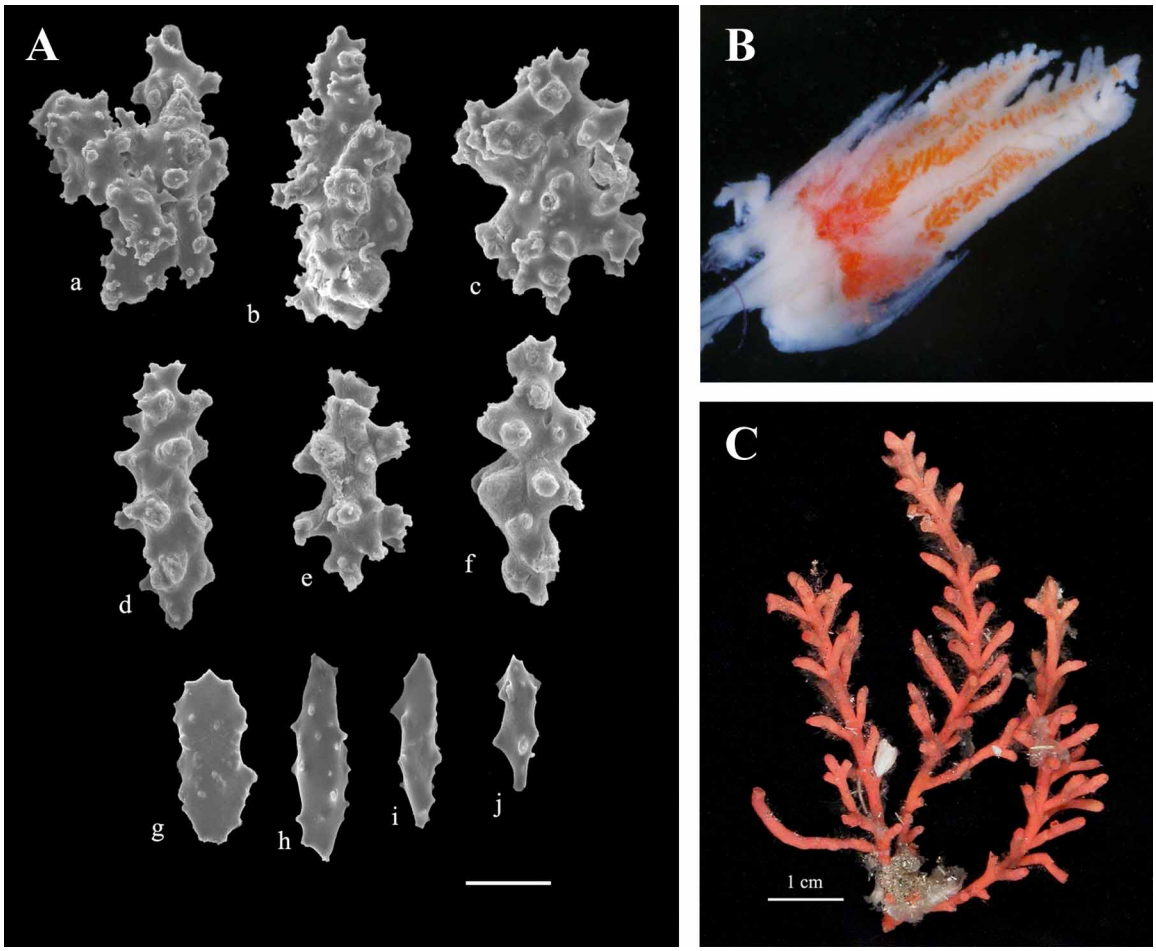

FIGURE 27. *Telesto sanguinea*: **A,** sclerites of preserved specimen (USNM 50357); *a)* fused sclerites from coenenchyme; *b)* sclerite from coenenchyme; *c–f)* sclerites from calyx; *g–j)* rods from polyp (scale bar = 0.05 mm); **B,** close up of polyp showing orientation of polyp sclerites; **C,** preserved specimen (S2487); (scale bar = 1 cm).

***Scleranthelia rugosa* (Pourtalès, 1867)**
(Figure 28)

Growth form *rugosa* (Pourtalès, 1867)

Sarcodictyon rugosum Pourtalès, 1867:113.—Hickson 1930:211.—Deichmann, 1936 (discussion of type):37.
Scleranthelia musiva.—Carpine 1964:3; Figs. 1–3.
Scleranthelia rugosa (Pourtalès) growth form *rugosa* Bayer, 1981b (description):891; Fig. 5a, b.

Material examined. USNM 94530, 175–196 m, off Charleston, SC, July 5, 1993.

Growth form *musiva* Studer, 1878

Scleranthelia musiva Studer, 1878:634; Plate 1 fig. 4
Scleranthelia rugosa growth form *musiva* Bayer, 1981b:895; Fig. 5c, d.

Material examined. USNM 55450, 70–95 m, SE of Charleston, SC, July 28, 1964.

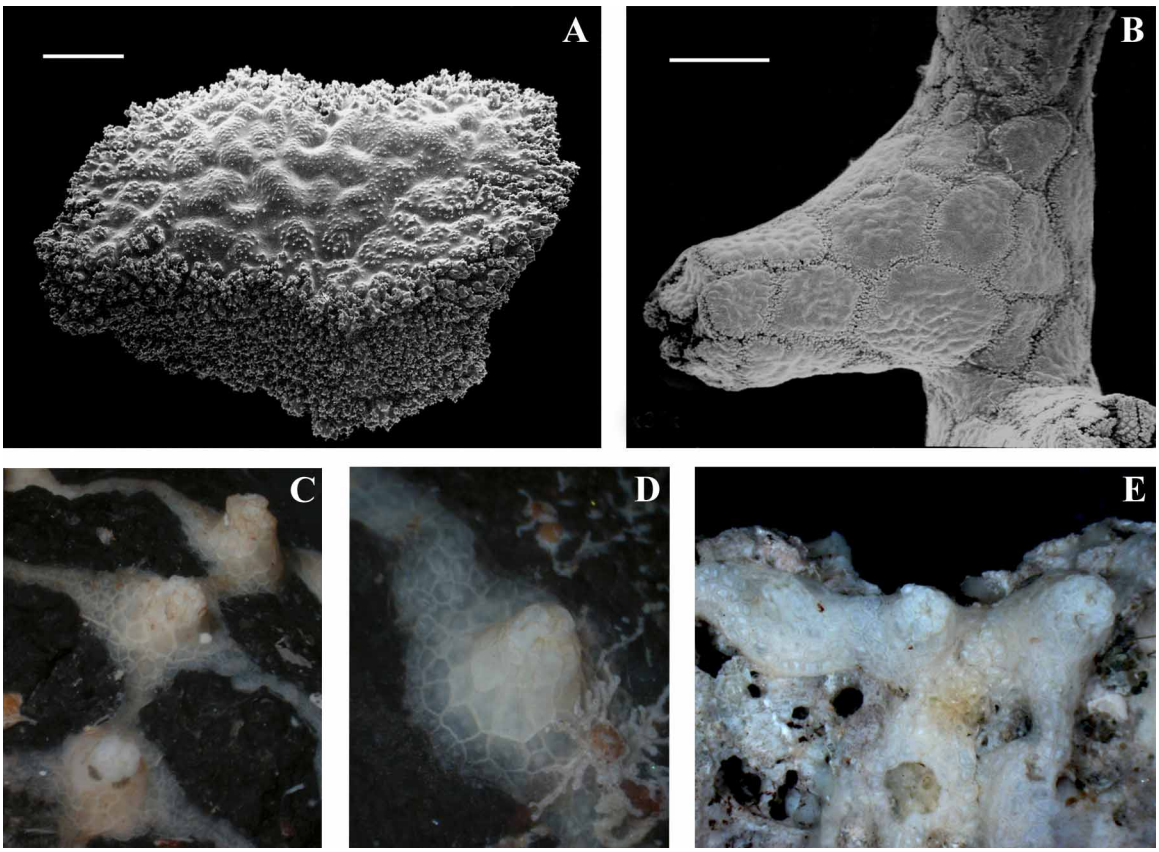

FIGURE 28. *Scleranthelia rugosa*: **A,** plate sclerite of var. *musiva* (USNM 54586) (scale bar = 0.1 mm); **B,** calyx of var. *musiva* (USNM 55107) (scale bar = 0.5 mm); **C,** var. *rugosa* showing ribbon-like stolons (USNM 94534, preserved specimen); **D,** var. *rugosa*, close up of calyx, showing stolon and plate sclerites; **E,** var. *musiva*, showing sheet-like stolons (USNM 55540, preserved specimen). **A** and **B** SEM images by F.M. Bayer/Smithsonian Institution.

Remarks. This octocoral is the only encrusting species recorded in the SAB. The two growth forms of *Scleranthelia rugosa* differ mainly in the expanse of the stolon between calyces. Growth form *rugosa* resembles a "network" of individual calyces interconnected by band-like stolons (up to 2 mm in width), whereas form *musiva* may encrust dead octocoral axes, shells or substrate with more sheet-like coenenchyme. Both forms have colorless sclerites mainly in the form of large (up to 1 mm) flat plates that fit closely together

in mosaic fashion, and somewhat cylindrical calyces that widen near the base, taking the shape of a cone. Thorny stars and rods are present in the anthocodiae. The *rugosa* specimen examined for this work was encrusted on a dark rock which made the translucent white coenenchyme very visible, but the *musiva* specimen was encrusted on a piece of pale shell hash and was well camouflaged. Bayer (1981b) did not recognize these two forms as separate species but they are cataloged in the USNM as such. This species is probably not found within typical SCUBA diving limits. The *S. rugosa* growth form *rugosa* specimen examined for this work was collected via manned submersible.

Atlantic distribution: form *rugosa* **—** South Carolina to Martinique, Guyana, 100–550 m; form *musiva* — New York to Guyana, Gulf of Mexico, Caribbean, 70–300 m (type recorded off Havana at 493 m) (Deichmann, 1936; Bayer, 1981b; NMNH records).

Suborder Alcyoniina

Family Alcyoniidae

***Bellonella rubistella* (Deichmann, 1936)**
(Figure 29)

Alcyonium rubistella Deichmann, 1936:49; Plate 1 fig 2; Plate 3 figs. 1–7.
Bellonella rubistella.—Verseveldt 1978:42; Fig. 1a–n; Fig. 2a–p; Plate 1.—Verseveldt and Bayer 1988:25.

Material examined. NMNH 55376, 60–71 m, off Venezuela, July, 21, 1968; SERTC S2363, 92 m, off Charleston, SC, April 12, 1974.

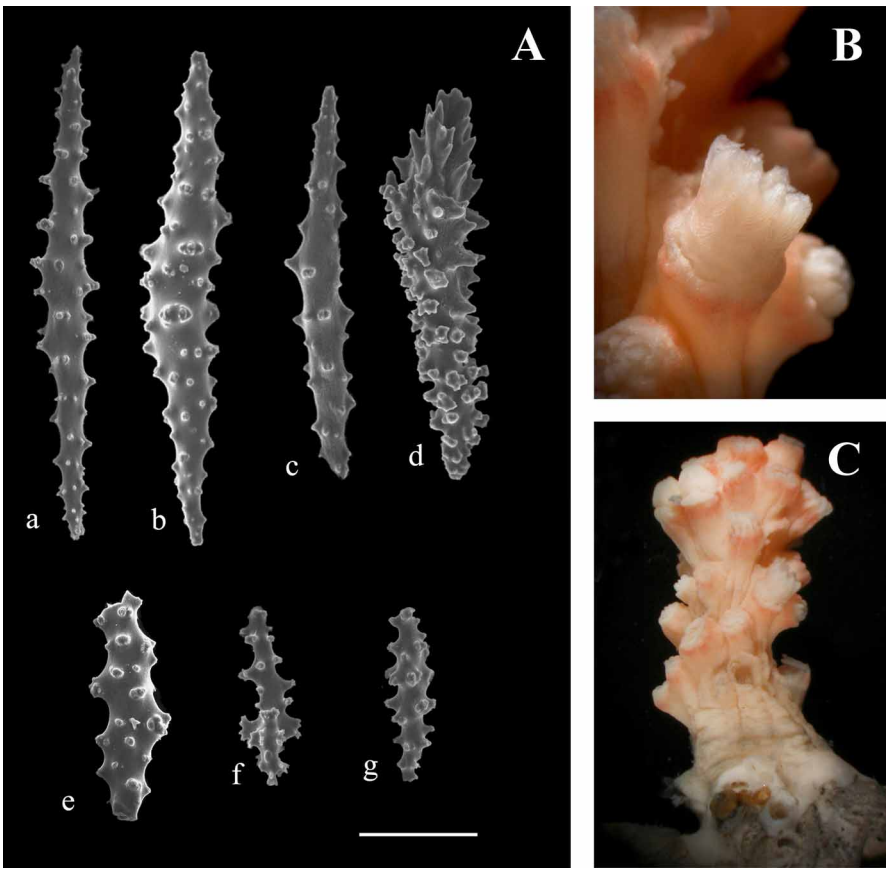

FIGURE 29. *Bellonella rubistella* (preserved specimen, S2363): **A,** sclerites; *a)* spindle from anthocodia; *b ,c, e–g)* spindles from coenenchyme; *d)* club from coenenchyme (scale bar = 0.1 mm); **B,** calyx and anthocodia, showing collaret and points; **C,** colony (height approximately 17 mm).

Remarks. This species is the only member of the Alcyoniidae found in the shallow SAB, and typically inhabits deeper areas. This work represents the first record of *Bellonella rubistella* in the SAB.

The colony from the SAB examined here is smaller than the USNM specimens from more southern or tropical localities. The colony is unbranched and attached to a piece of rock. The base is 8 mm wide and total length is 17 mm. The calyces are more crowded at the tip and the stalk near the base is bare. The calyces are 1.5 mm in diameter and appear light pink around the apertures, when contracted they have eight lobes which develop into eight grooves along the colony surface. The partially exsert anthocodiae reveal a collaret and points arrangement of the sclerites. The coenenchyme is ivory.

The stalk bears sclerites in the form of elongate acute spindles, slightly flattened, up to 0.3 mm in length, club-like spindles, and small (< 0.1 mm) tuberculated rods. The anthocodiae contain sclerites as elongate needles, some curved, 0.2–0.5 mm in length. Most spindles are white with pink rods occurring in the calyces.

Other colonies from tropical regions are recorded as having a digitiform shape that narrows distally to more or less a point, and bright red calyces (Verseveldt 1978). The examined specimen more closely resembles the figure in Deichmann (1936) than those in Verseveldt (1978).

Atlantic distribution: South Carolina, Florida, Caribbean, Colombia to Venezuela, 24–366 m (Deichmann 1936; Verseveldt, 1978; Verseveldt and Bayer 1988; NMNH collections; SERTC collection).

Family Nephtheidae

Pseudodrifa nigra (Pourtalès, 1868)

(Figure 30A,B)

Nephthya nigra Pourtalès, 1868:130
Paraspongodes nigra.—Ma, 1900:148
Eunephthya nigra .—Verrill 1883:44.—Kükenthal 1906:77.— Kükenthal 1907:350.—Deichman, 1936: 60; Plate 1 fig. 7; Plate 4 figs. 5–13; Plate 27 figs. 1–2.—Bayer 1961:55; Figs. 9j, 10g–i.
Pseudodrifa nigra.—Utinomi 1961:241. —Cairns *et al.* 2002:33.

Material examined. USNM 55234, 70–95 m, SE of Charleston, SC, July 28, 1964.

Remarks. This soft coral is generally found in deeper water along with other members of the Nephtheidae, and it is included in this guide based on one record. *Pseudodrifa nigra* is easily distinguished by the dark brown color (dull brown or gray in ethanol), pale longitudinal grooves from polyp tips to polyp base, and sclerites set *en chevron* along the length of the polyps. The stalk is short and fleshy with dozens of polyps crowded on a few very short branches. Sclerites from the coenenchyme are tuberculate rods, and the polyp walls contain clubs with foliate heads reaching 0.5 mm in length. This species has been found on *Lophelia pertusa* rubble and *Keratoisis ornata* colonies in deeper areas.

Atlantic distribution: South Carolina to the Florida Keys, Bahamas, Cuba, 60–1153 m (Deichmann, 1936; Bayer, 1961; Utinomi, 1961; NMNH collections; SERTC collection).

Family Nidaliidae

Nidalia occidentalis Gray, 1835

(Figure 30C,D)

Nidalia occidentalis Gray 1835:60.—Deichmann 1936: 56; Plate 1 fig. 3[*sic*. 5]; Plate 4 figs. 1–3.—Utinomi 1958:102; Figs. 1–3.—Bayer 1961:53; Figs. 9h, 10a–c.—Verseveldt 1978:45.—Verseveldt and Bayer 1988:59; Figs. 42e–g, 45, 47b, 52, 53. —Cairns *et al.* 2002:33.

Material examined. SERTC S1384, 63 m, off Anastasia Island, FL, August 30, 2004. S2325, 92 m, off Charleston, South Carolina, April 12, 1974. S2788, 60 m, off Anastasia Island, Florida, August 31, 2004.

Remarks. *Nidalia occidentalis* is easily distinguishable from other octocorals in the SAB by its stiff, barren stalk and capitate head bearing the monomorphic polyps and conical calyces. The stalk bears large (up to 1 mm), slightly curved, tuberculated spindles while the anthocodiae contain smaller needle-like rods in a collaret and points arrangement, and small flat platelets. The large spindles are six times longer than wide, a feature that distinguishes *N. occidentalis* from *N. rigida,* which bears thicker spindles. In life, one SERTC *Nidalia occidentalis* specimen had an orange stalk and red terminus bearing white polyps. In the preserved state the colors are slightly duller. The examined specimens reach 20 mm in length.

Atlantic distribution: North Carolina to French Guiana, Gulf of Mexico, Caribbean, 37–440 m (one record off Venezuela indicates collection from 914 m) (Deichmann, 1936; Bayer 1961; Verseveldt 1978; NMNH collections; SERTC collection).

Suborder Scleraxonia

Family Anthothelidae

***Diodogorgia nodulifera* (Hargitt, in Hargitt and Rogers, 1901)**
(Figure 31)

Solanderia nodulifera Hargitt, in Hargitt and Rogers 1901:279; Fig. C, 1, 3–5.
Solanderia crustata Hargitt, in Hargitt and Rogers 1901:280; Fig. C, 2, 6–7.
Diodogorgia ceratosa Kükenthal, 1919:97; Figs. 44–52.—Deichmann 1936:86.
Diodogorgia cervicornis Kükenthal, 1919:645.
Corallium vanderbilti Boone, 1933:51; Plates 12–14.
Diodogorgia nodulifera.—Deichmann 1936: 87; Plate 5 figs. 11–19.—Bayer 1959b:6; Fig. 3.—Bayer 1961:73; Fig. 15.—Cairns *et al*, 2002:33.

Material examined. USNM 60883, 61 m, off Jacksonville, Florida, March 11, 1980. SERTC S2698, 49 m, off Sapelo Island, GA, July 12, 1994. USNM 49705, 73 m, off Palm Beach, Florida, April 26, 1950.

Remarks. Fragments of the only two samples of this species recorded in the SAB were examined for this work, as well as a sample from a colony (USNM 49705) collected south of the SAB for comparison because of the variance in colony morphology. The southern colony displays the most common form and could conceivably be found in the SAB. The southern colony sample is yellow with red, moderately protruding polyp mounds and the cylindrical stem is approximately 5 mm in diameter. A ring of boundary canals divides the cortex and medulla. The cortex has a dense outer layer and spongy inner layer separated by a plexus of solenia. The outer cortex and polyp mounds contain small tuberculated spheroids, tuberculated, irregularly branched bodies, capstans and slender, warty, amber spindles. Also present are elongated, sparsely warted spindles. The neck of the polyps contain small, red tuberculated spheroids and branched bodies. The medulla contains light pink warted rods that are occasionally branched.

One sample from the SAB is an unbranched fragment that is entirely red with an inflated tip; this specimen appears to conform to some degree with Deichmann's (1936) description of *Diodogorgia ceratosa.* The polyp mounds protrude much more than those of the southern specimen and are almost cylindrical. The coenenchyme completely surrounds a hollow tube similar to the description in Deichmann (1936), suggesting an encrusting nature around a worm tube. The cortical spindles are more robust than those in the southern specimen, and a few long, bent, coarsely warted spindles are present. The medulla contains branched, warted rods similar to those in the southern specimen, as well as spindles. It is noted that the small portion of material available for study limited sclerite examination.

Atlantic distribution: Georgia to Surinam, Gulf of Mexico, Caribbean, 20–183 m (Deichmann 1936; Bayer 1959; Bayer 1961; NMNH collections; SERTC collection).

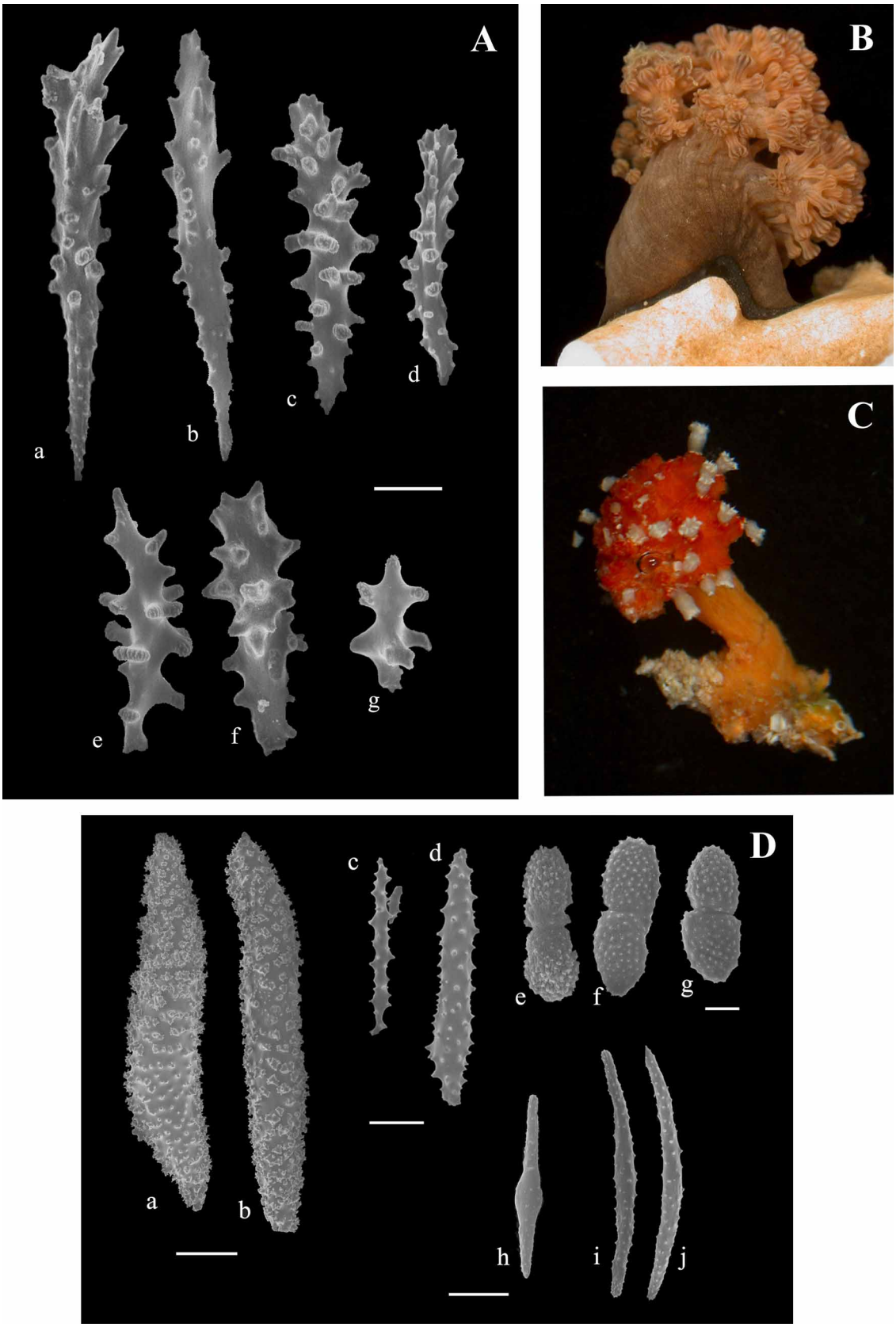

FIGURE 30. A, *Pseudodrifa nigra* (USNM 55234) sclerites; *a, b)* foliated clubs from polyp wall; *c–g)* sclerites from stalk (scale bar = 0.05 mm); **B,** *Pseudodrifa nigra* (live specimen), base width approximately 27 mm; **C,** *Nidalia occidentalis* (live specimen, S1384), height approximately 20 mm; **D,** *Nidalia occidentalis* (S1384) sclerites; *a, b)* large spindles from capitulum; *c, d)* small spindles from capitulum; *e–g)* small platelets from polyp; *h–j)* spindles from polyp (scale bar for *a, b* = 0.2 mm; *c, d, h–j* = 0.1 mm; *e–g* = 0.02 mm).

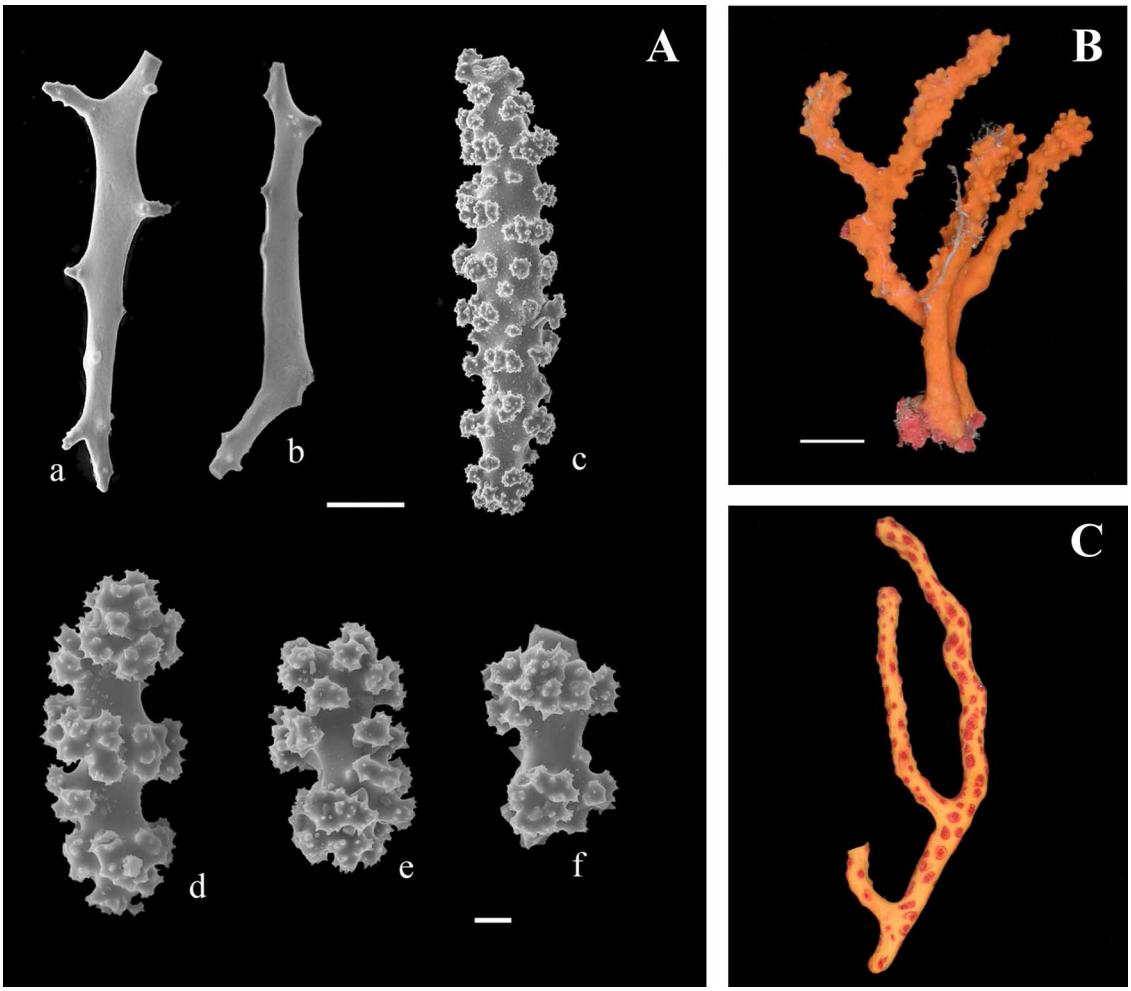

FIGURE 31. *Diodogorgia nodulifera*: **A,** sclerites (S2698); *a, b)* rods from medulla; *c–e)* spindles from cortex; *f)* capstan from cortex (scale bar for *a–c* = 0.05 mm; *d–f* = 0.01 mm); **B,** preserved specimen S2698 (scale bar = 10 mm); **C,** branch of preserved specimen USNM 49705 (scale bar for **B** applies).

Iciligorgia schrammi Duchassaing, 1870

(Figure 32)

Iciligorgia schrammi Duchassaing, 1870:12.—Kükenthal 1924:39.—Deichmann 1936:82; Plate 5 figs. 3–5.—Bayer 1959b:6; Fig. 2.—Bayer 1961:66; Fig. 12, cover photograph.—Cairns 1977:22; Fig. 3. —Cairns *et al.* 2002:33.
Iciligorgia ballini Kükenthal, 1908:479; Plate 23 fig. 3; text figs. L, M, N

Material examined. SERTC S2697, 49 m, off Sapelo Island, GA, July 12, 1994.

Remarks. This species, not previously recorded north of Florida, is represented in the SAB by a single specimen collected from offshore Georgia. *I. schrammi* is considered a deep reef species in tropical latitudes, but the examined specimen has no associated habitat data.

The specimen is dichotomously branched in one plane, and the main branches appear flattened and are 3–5 mm in width. The colony examined is relatively small, as this species tends to form very large, planar structures in southern latitudes. Because no definite base is attached to the stem it is not known if the specimen is complete. The color is light brown, but this species has been reported to be bright red in life (Cairns 1977; Humann 1993). The polyps are arranged biserially along the two edges of the flattened stem. Most polyps are visible and substantially armed with curved spindles and rods arranged as collaret and points (Figure 32D). Calyces are domelike and have eight distinct lobes. The fistulose branches (Figure 32C) distinguish this species from any other in the shallow western Atlantic.

The cortical sclerites are chiefly elongate, spiny spindles 0.5–0.6 mm in length, varying in coarseness. The medullar sclerites are long (0.5–0.7 mm), extremely slender needles that vary from smooth to slightly warty. The anthocodiae have flattened, slightly curved rods up to 0.5 mm, with a few that are a fraction of that size.

This specimen is associated with numerous small gorgonocephalid ophiuroids.

Atlantic distribution: Georgia, south Florida to Brazil, Caribbean, 3–368 m (Deichmann 1936; Bayer 1961; NMNH collections; SERTC collection).

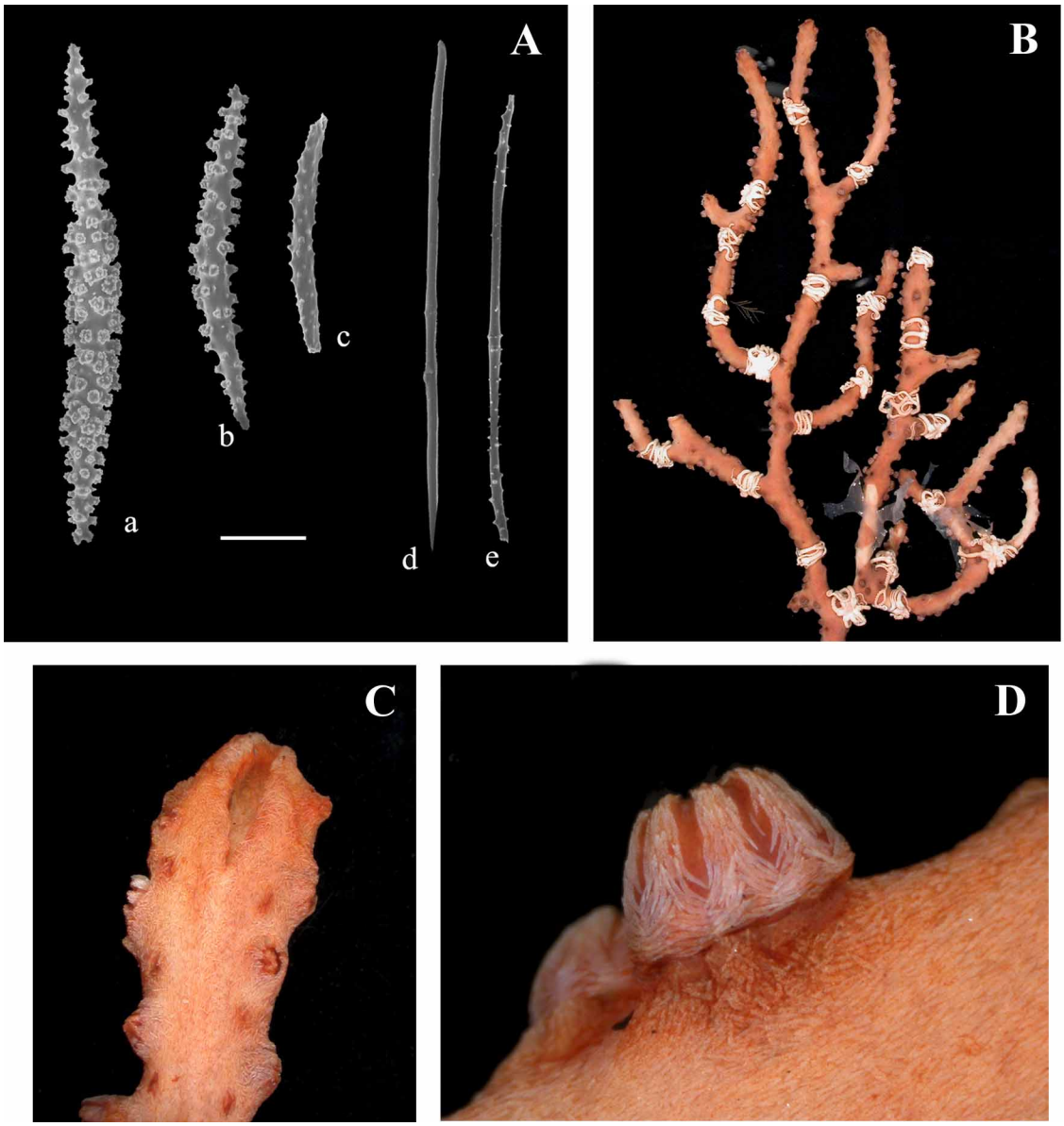

FIGURE 32. *Iciligorgia schrammi* (S2697, preserved specimen): **A,** sclerites; *a–c)* spindles from cortex; *d–e)* needles from medulla (scale bar = 0.1 mm); **B,** colony with attached ophiuroids (height approximately 13 cm); **C,** fistulose branch; **D,** anthocodia showing orientation of collaret and points.

Titanideum frauenfeldii **(Kölliker, 1865)**

(Figure 33)

Gorgonia suberosa Ellis and Solander 1786:193.
not *Gorgonia suberosa* Pallas, 1766:191 [=*Suberogorgia suberosa*].
Titanideum suberosum Verrill, 1864b:39.—Deichmann 1936:83; Plate 5 figs. 6–10.

Solanderia Frauenfeldii Kölliker, 1865:141; Plate 19 figs. 19–20, 22.
Titanideum frauenfeldii.—Bayer, 1961:77; Fig. 16a–d.—Cairns *et al.* 2002:33.

Material examined. SERTC S426, 13 m, off Edisto Island, SC, June 4, 2004. SERTC S2314, 91.4 m, off Charleston, SC, March 31, 1979. SERTC S2655, 91 m, off Charleston SC, April 2, 1977. SERTC S2654, 24.4 m, off St. Helena Sound, SC, April 29, 2005. SERTC S2660, 72–69 m, off Charleston, SC, March 28, 1981.

Remarks. *Titanideum frauenfeldii* is a very common species occupying hardbottom habitats in the SAB. The colonies are moderately branched (or unbranched if small), with stiff, cylindrical, rod-like branches reaching 8 mm in diameter. The coenenchyme may appear smooth, slightly indented, or have slightly protruding polyp mounds. They vary from yellow to deep red in color. The ring of boundary canals separating the cortex and medulla is typical of this family and is generally very apparent when examining the branch in cross section. Also present is a layer of solenia, which divides the cortex into two layers— a thin, densely spiculated outer cortex and a thick, spongy inner cortex. The cortical sclerites consist of variable pink tuberculated spheroids and tuberculated branched bodies, and the medulla is filled with densely packed, colorless branching rods, most of which are oriented longitudinally.

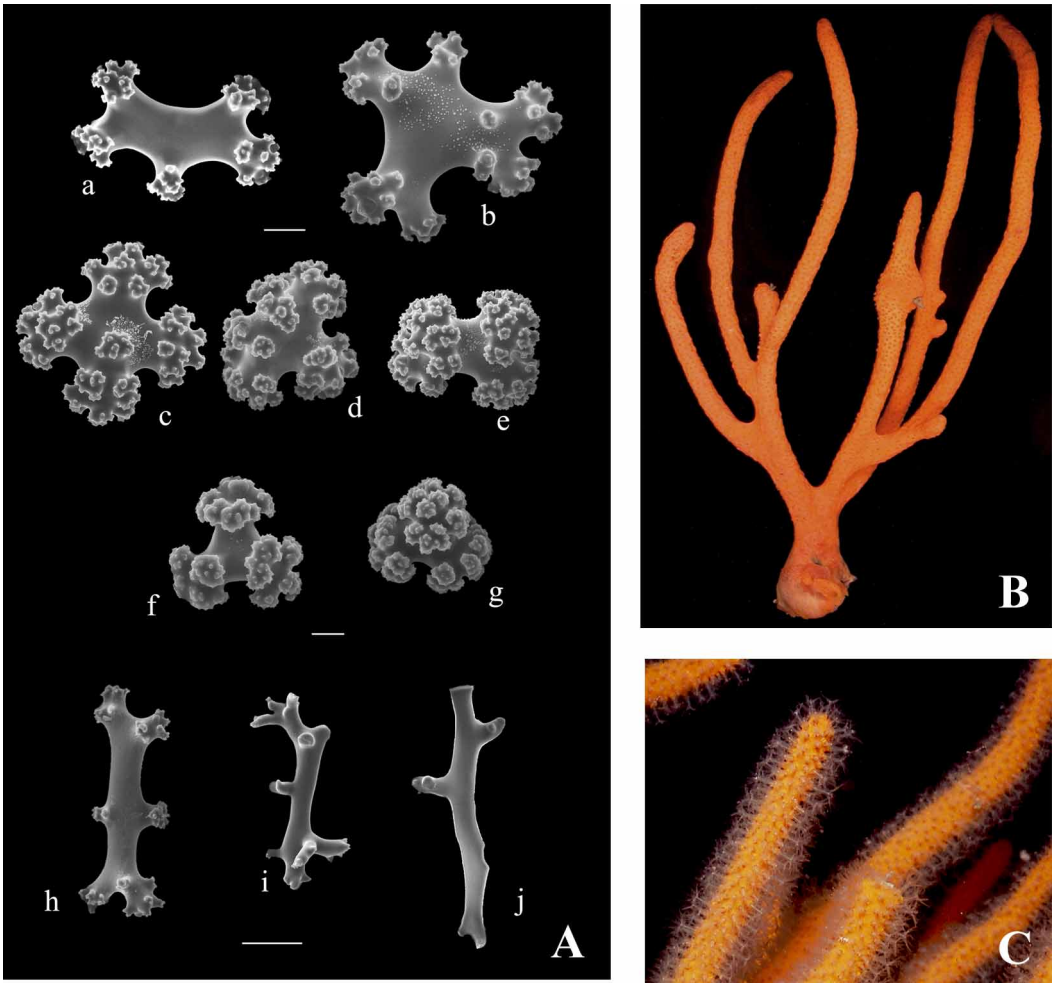

FIGURE 33. *Titanideum frauenfeldii*: **A,** sclerites (S2658); *a–e)* tuberculated branched bodies from cortex; *f)* triradiate from cortex; *g)* tuberculated spheroid from cortex; *h-j)* branching rods from medulla (scale bar for *a-e* = 0.02 mm; *f, g* = 0.01 mm; *h-j* = 0.05 mm); **B,** whole colony (preserved, height approximately 26 cm); **C,** live colony (*in situ*), showing expanded polyps.

Some colonies examined (S2314, S2655, S2660) for this work do not appear consistent with the typical *T. frauenfeldii* morphology. These colonies are not stiff, generally unbranched, and have protruding conical

polyp mounds. The width of the stems range from 2–4 mm and the tips are somewhat inflated. Growing tips at both ends of some colonies suggests that they were unattached. The color of the colonies varies from pinkish orange to white. Spiculation of these colonies is consistent with the description of *T. frauenfeldii* in Bayer (1961) and distinguishes them from any other member of the western Atlantic Anthothelidae. Information on the nature of this morphological variation is not available, however all of the species examined for this work that display the variance were collected from 79–91 m, which is considerably deeper than some of the hard-bottom habitats that the common morphotype of *T. frauenfeldii* occupies. This observation might suggest further investigation of the role of depth in the morphological differences exhibited by this species.

There are numerous lots of this species in the NMNH collections representing the shallow SAB.

Atlantic distribution: North Carolina to Cuba, north Gulf of Mexico, 13–293 m (Deichmann, 1936; Bayer, 1961; NMNH collections; SERTC collections).

Suborder Holaxonia

Family Plexauridae

Bebryce cinerea Deichmann, 1936

(Figure 34)

Bebryce cinerea Deichmann, 1936:126; Plate 8 fig. 5; Plate 10 figs.1–8.

Material examined. SERTC 2856, 76 m, off Charleston, SC, August 7, 2003.

Remarks. The examined specimen of *Bebryce cinerea* displays a branching, planar growth form, approximately 67 mm in height with stems reaching 2–3 mm width. The colony was yellow in life and yellow-brown when preserved in ethanol. The calyces are cylindrical and reach lengths of 2 mm with 1 mm widths and are more or less crowded along two sides of the branches in a loosely alternating manner. Most of the polyps are partly contracted, but are apparently retractile (Deichmann 1936).

The outer coenenchyme contains small, cup-shaped rosette sclerites with warty bases, and are oriented with the concavity facing away from the axis. The inner coenenchyme contains some rod-like spindles and warty stellate plates with a central knob or boss. The knobbed plates vary in shape from 4-6 armed stars to multi-lobed amoeboid masses. The calyx contains numerous echinulate rods projecting upward around the rim, which are only visible when the polyps are retracted. These rods have one tuberculated, flattened, slightly lobed end; the opposite end is bluntly rounded, and occasionally flattened and/or bifurcated at the tip. The anthocodiae contain curved, elongate rods in a collaret and points arrangement. All sclerites are colorless.

The specimen examined for this work is the only record north of the Bahamas on the east coast of the Unites States and was collected, attached to a rock, by a manned submersible.

Atlantic distribution: South Carolina, 76 m; Gulf of Mexico, 69–274 m; Bahamas, 4–329 m; Caribbean 51–549 m; Panama, 64-128 m; Venezuela, 77–86 m (Deichmann, 1936; NMNH collections; SERTC collection).

Bebryce parastellata Deichmann, 1936

(Figure 35)

Bebryce parastellata Deichmann, 1936:127, Plate 8 fig. 4; Plate 10 figs. 22–28. —Cairns *et al.* 2002:33.

Material examined. USNM 56422, 46–53 m, off Cape Lookout, North Carolina, March 1, 1961.

Remarks. *Bebryce parastellata* colonies may occur in unbranched or sparsely branched forms. Colonies are white in alcohol and have small (1 mm) cylindrical calyces spaced 2–5 mm apart, generally along one side

of the slender (1–2 mm) branch. The outer coenenchyme contains small (0.1 mm) cup-like sclerites with a base, with the concavity of the cup facing away from the axis. Other sclerites are bent, foliated spindles and stellate plates or crosses with a raised center, resembling a knob.

Atlantic distribution: North Carolina, 46–53 m; Gulf of Mexico (Mississippi), 60–73 m; Bahamas, 256–586 m; Cuba, 40 m–unknown depth; Barbados, 186 m (type) (Deichmann, 1936; NMNH collections).

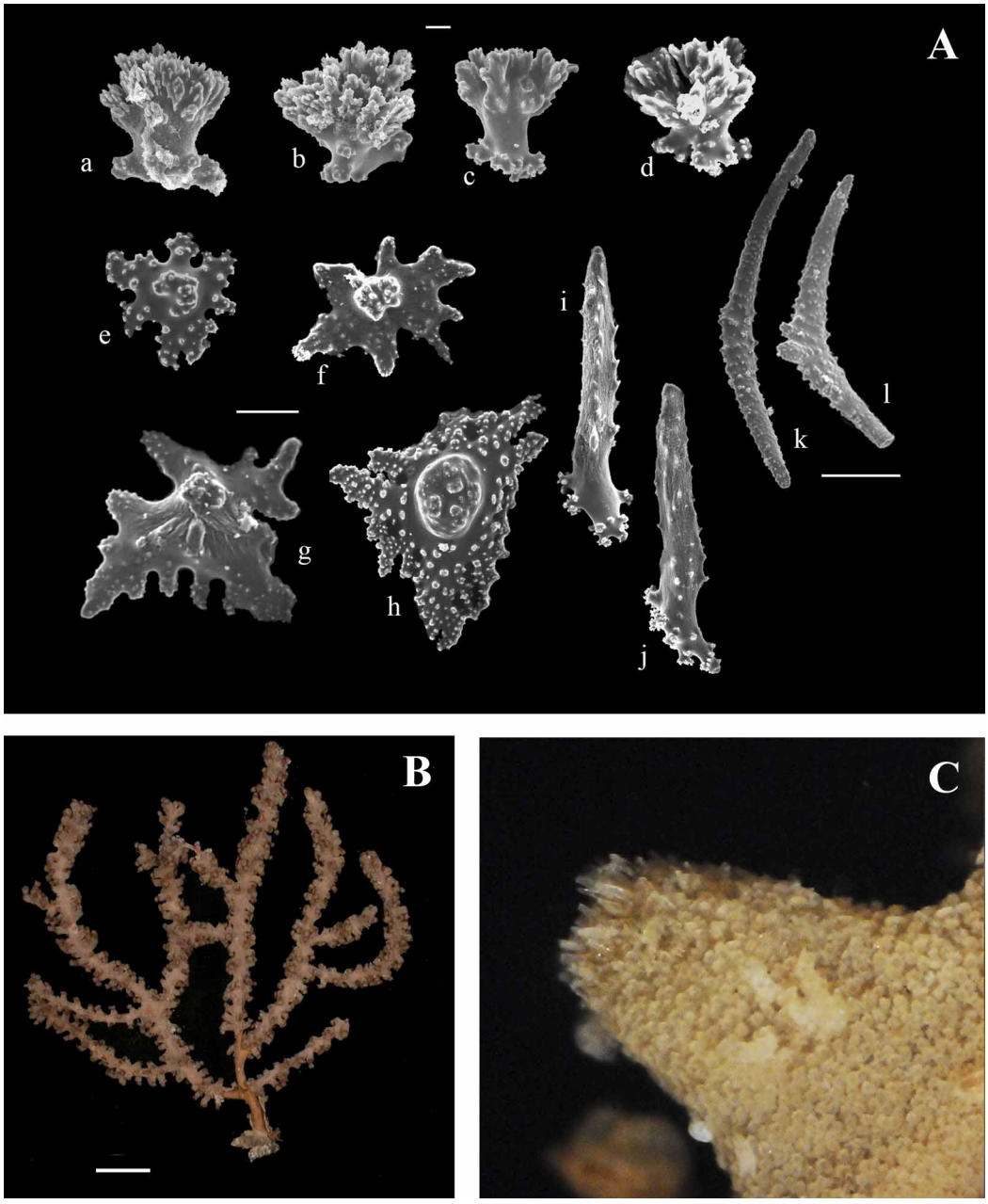

FIGURE 34. *Bebryce cinerea* (S2856); **A,** sclerites; *a–d)* cup sclerites from outer coenenchyme; *e–h)* stellate plates from inner coenenchyme; *i, j)* rods from calyx*; k, l)* curved spindles from polyp (scale bar *a–d* = 0.01 mm; *e–j* = 0.05 mm; *k, l* = 0.1 mm); **B,** preserved colony (scale bar = 1 cm); **C,** calyx, showing rods.

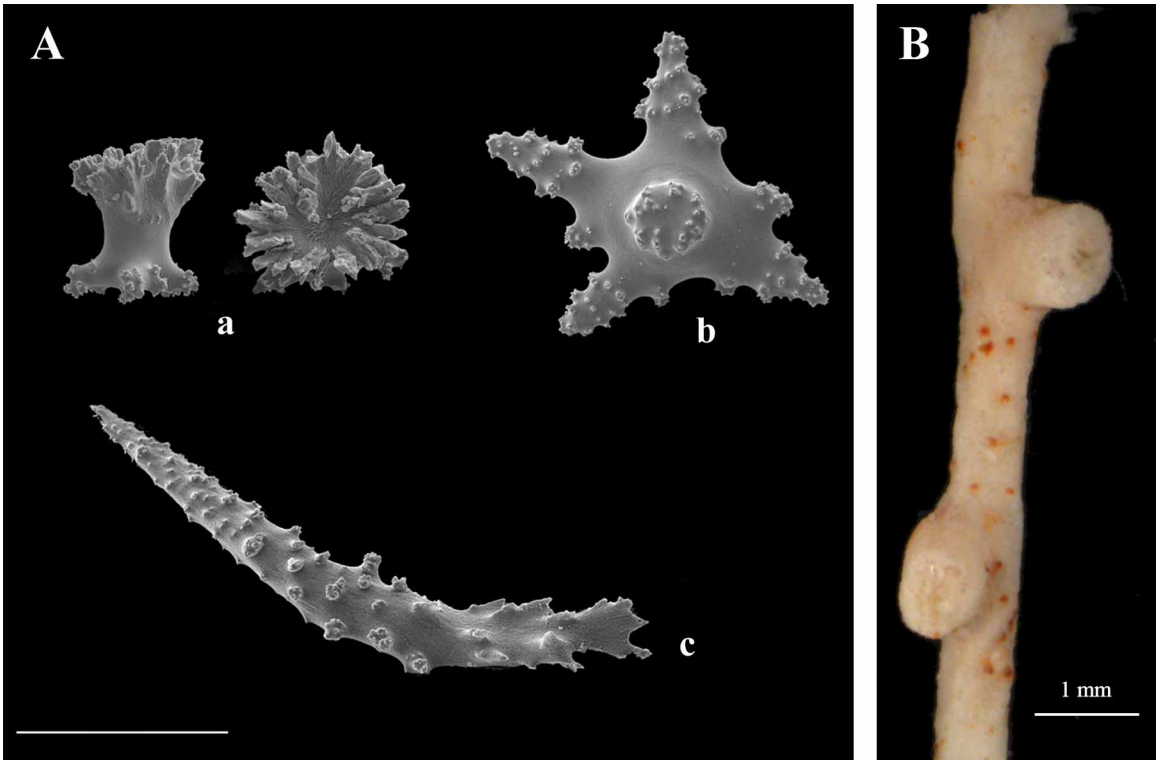

FIGURE 35. *Bebryce parastellata* (USNM 56422); A, sclerites; *a)* lateral and top view of cup-like rosette from outer coenenchyme; *b)* stellate plate; *c)* bent foliated spindle (scale bar = 0.1 mm); (SEM images by S. Cairns/NMNH); B, stem and calyces (scale bar = 1 mm).

***Muricea pendula* Verrill, 1864**
(Figure 36)

Muricea elegans (Agassiz ms.), Verrill, 1864a:9.
Muricea pendula Verrill, 1864a:45.—Deichmann 1936:103; Plate 9 figs. 12–14.—Bayer 1961:191; Fig. 58d–f; Plate V fig. 3.—Cairns *et al.* 2002:34.
not *Muricea pendula*.— Riess, 1929:385; Plate 8 fig. 1.[=*Muricea laxa* Verrill].—Kükenthal 1924:144.

Material examined. SERTC S1327, 29 m, off Hilton Head Island, South Carolina, June 4, 2004. SERTC S1328, 63 m, off Anastasia Island, Florida, August 30, 2004. SERTC S2712, 24 m, off Charleston, South Carolina, August 15, 2006.

Remarks. *Muricea pendula* colonies are planar and irregularly pinnate, with the twigs sometimes turned upward. Colonies may reach a large size (up to 0.5 m). The prominent calyces may be sparse around the base of the colony and are quite crowded near the tips. This species displays the strong polyp armature typical of the genus *Muricea.* Large (up to 1.5 mm) calicular spindles extend out from the calyx rim, giving a spiny or shelf-like effect to the calyces when the polyps are retracted. The large spindles are warty and may have one side that has numerous small spines. Smaller acute, warty spindles are found in the non-calicular coenenchyme, particularly near the base or surrounding the axis. The colony is a dark magenta to bright red when alive, and a dark to dull orange when preserved or dried. The sclerites are amber or orange.

There are numerous lots of this species in the NMNH from the shallow SAB.

Atlantic distribution: North Carolina to Florida Keys; Gulf of Mexico, 13–125 m (Deichmann, 1936; Bayer, 1961; NMNH collections; SERTC collection).

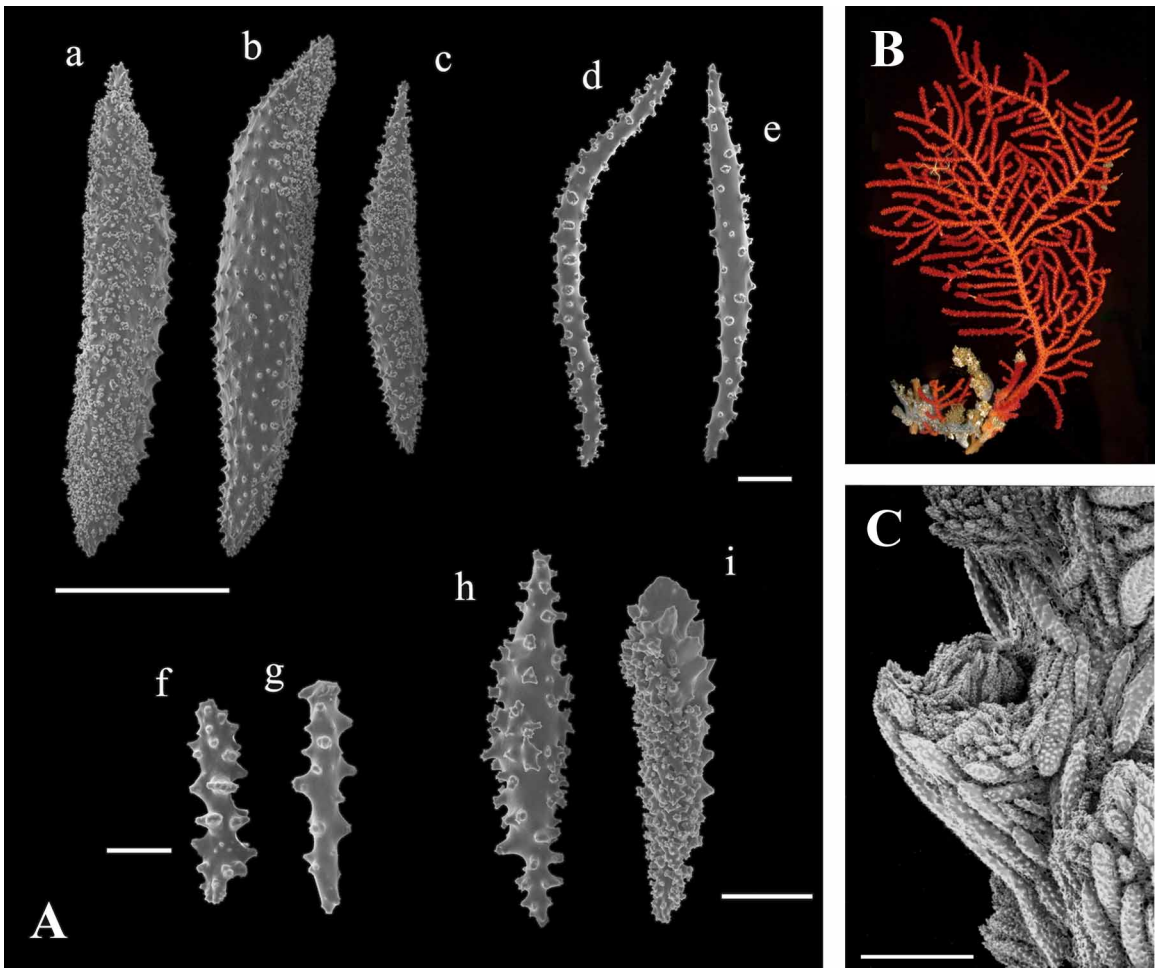

FIGURE 36. *Muricea pendula*: **A,** sclerites (S1328); *a–c)* large spindles from calyx; *d, e)* elongate spindles from coenenchyme; *f, g)* small spindles from inner coenenchyme; *h, i)* spindles from coenenchyme (scale bar for *a–c* = 0.05 mm; *d, e* = 0.1 mm; *f, g* = 0.05 mm; *h, i* = 0.1 mm); **B,** live specimen (S1328), whole colony (height approximately 30 cm); **C,** preserved specimen (USNM 49748), showing orientation of sclerites in calyx and surrounding coenenchyme (scale bar = 0.5 mm); SEM image by F. M. Bayer/Smithsonian Institution.

***Paramuricea* sp.**
(Figure 37)

Material examined: SERTC S2922, 78 m, off Charleston, South Carolina, August 7, 2003.

Remarks: The only specimen examined for this work is a complete, large (35 x 23 cm) colony that was collected by submersible and subsequently dried. In life the specimen was bright yellow but turned black when exposed to air. After drying the colony appeared dirty white but still liberated yellow pigment when exposed to sodium hypochlorite (bleach). The colony shape is fan-like and mostly in one plane, with small, upturned branchlets arising from the main stem, and occasional anastomoses occur. The branch tips are slightly inflated. The main stem at widest is 1 cm and the branches are 2–5 mm in diameter.

The calyces are crowded at the tips of distal branchlets but are sparsely distributed near the base of the colony and on larger branches. The surface coenenchyme contains stout, bent, randomly oriented warty spindles that may reach 0.75 mm. Some spindles have blunt, warty projections. The coenenchyme also contains forked spindles and antler-like plates. The anthocodial sclerites are in a collaret and points arrangement, with each point consisting of 2–3 bent, thin rods with fine tuberculation. The calyx walls consist of 2–3 series of thornscales, the distal ones forming an armed rim around the opening, giving the colony a "fuzzy" appearance when viewed unaided. The polyps are partially retracted and the armature is exposed.

The thornscales have an echinulate spine and tuberculate base. They vary considerably in size and shape with some approaching almost 1 mm in greatest length. Some thornscales are nearly triangular in shape with a reduced spine and highly-fused base; some scales have a very prominent spine and weakly fused base.

The thornscale variation has led to difficulty identifying this specimen to a level below genus. The specimen was determined to be a species of *Paramuricea* based on the amount of fusion of the basal lobes of the thornscales (Bayer 1959a), and the lack of spinous lateral projections on the bent coenenchymal spindles (Bayer, 1959a; Grasshoff, 1977). The specimen does not unequivocally fit any of the descriptions of *Paramuricea* species in Deichmann (1936) or Grasshoff (1977) so a species level determination has not been made.

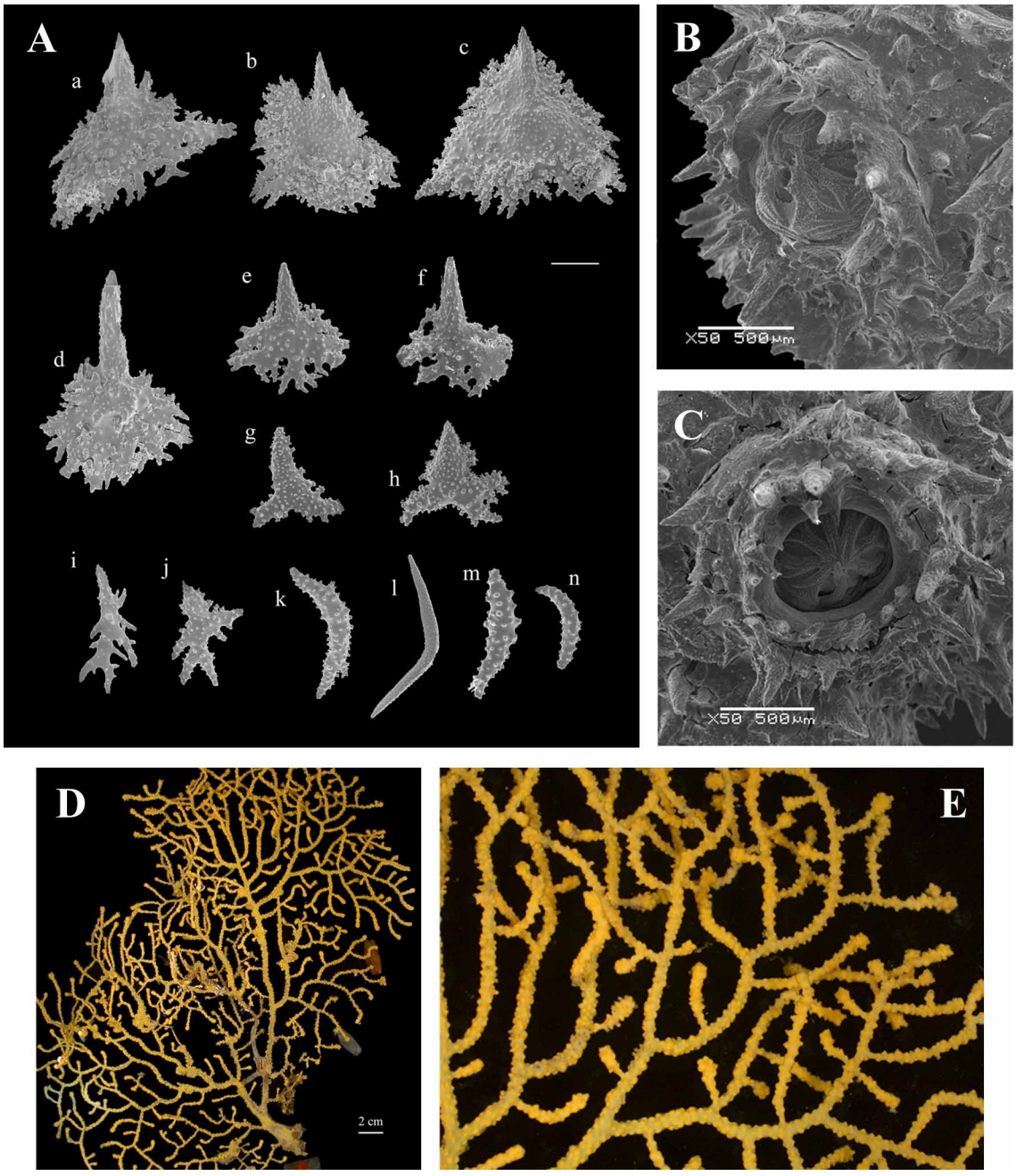

FIGURE 37. *Paramuricea* sp. (S2922); **A,** sclerites; *a–d)* thornscales from calyx; *e, f)* thornscales from colony base; *g, h)* forked scales from colony base; *i)* antler sclerites from stem tip and *(j)* base; *k)* bent spindle from branch tip coenenchyme; *l)* bent rod from anthocodia; *(m, n)* bent spindles from colony base; (scale bar = 0.2 mm); **B, C,** *Paramuricea* sp., dried specimen, showing calyces and arrangement of thornscales and anthocodial points (scale bars = 0.5 mm); **D,** whole colony, live specimen (scale bar = 20 mm); **E,** branchlets showing stem tips.

***Scleracis guadalupensis* (Duchassaing & Michelotti, 1860)**
(Figure 38)

Acis guadaloupensis Duchassaing and Michelotti, 1860: 20; Plate 1figs. 14–15.
Scleracis pumila Reiss, in Kükenthal 1919:908.—Kükenthal 1924:161.—Reiss 1929:405; Plate 8 fig. 6.
Thesea guadaloupensis.—Kükenthal 1924:153.
Scleracis guadaloupensis.—Deichmann 1936:108; Plate 6 figs. 5–7.
Scleracis guadalupensis—Cairns *et a.*, 2002:34.

Material examined. USNM 61176, 32 m, off North Carolina, May 18, 1981. USNM 61244, 30 m, off North Carolina, November 30, 1981.

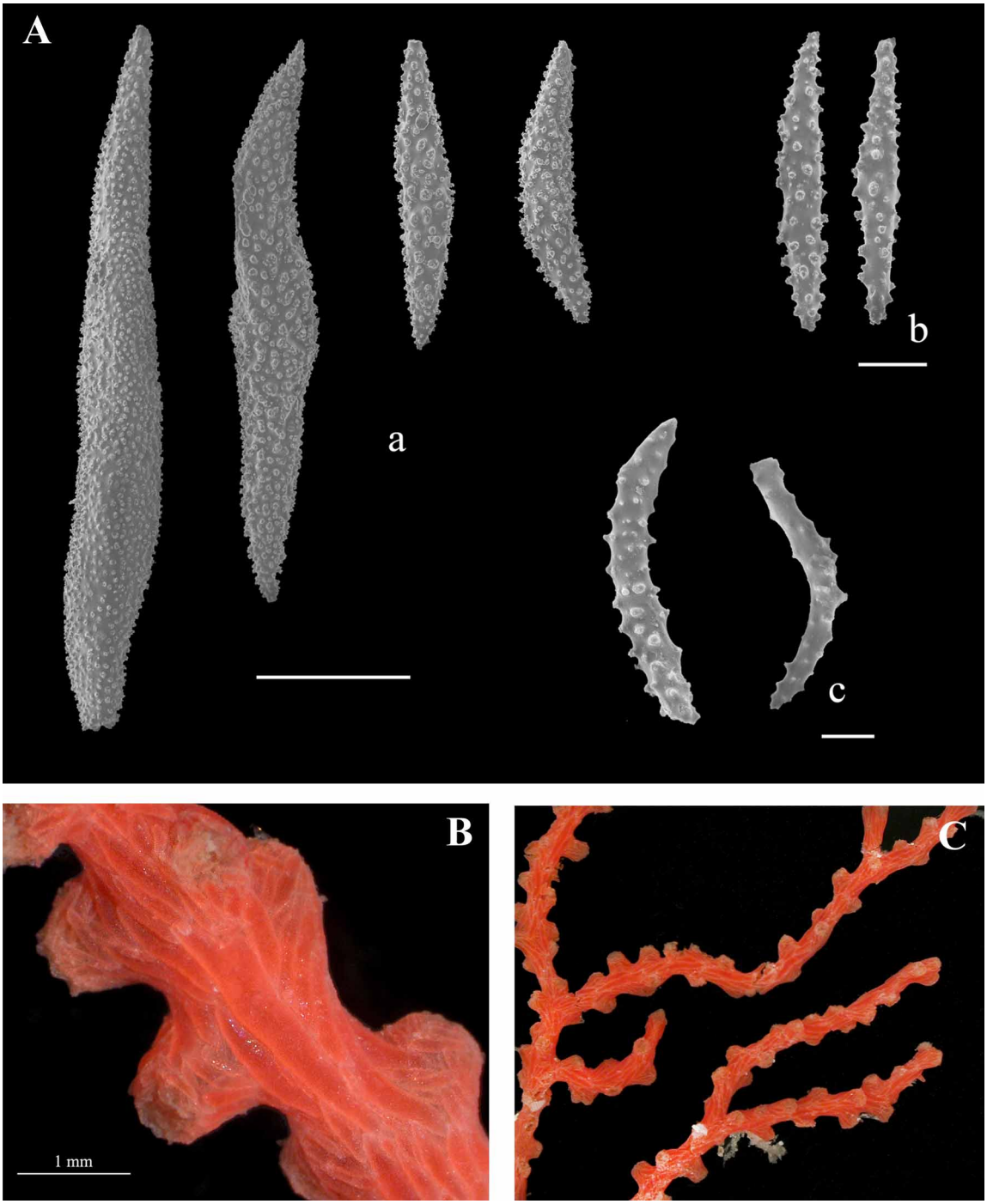

FIGURE 38. *Scleracis guadalupensis* (preserved specimen, USNM 61244): **A,** sclerites; *a)* large spindles from outer coenenchyme; *b)* small coenenchymal spindles; *c)* small rods from anthocodia (scale bar for *a* = 0.5 mm; *b* = 0.1 mm; *c* = 0.05 mm); **B,** stem section, showing calyces and large spindles in the coenenchyme (scale bar = 1 mm); **C,** branches.

Remarks. *Scleracis guadalupensis* forms small colonies dichotomously branching in one plane. The specimens examined for this work had a stem width of 1–2 mm and a maximum height of 4 cm. The cylindrical calyces are very prominent, tending to be biserially arranged along the sides of the branches, but in a spiral manner. Near the rim of the calyces there is an arrangement of small, warted spindles, and towards the stem the spindles become large (1–3 mm) and are orientated longitudinally along the axis. The large spindles are densely scattered with fine, spinous warts, except near the acute tips where the warts may become sparse. The examined specimens are coral red in ethanol, but pink, gray and white colonies have been reported (Deichmann 1936).

Atlantic distribution: Bermuda, North Carolina, Florida, Gulf of Mexico, 18–184 m; Bahamas, 600–715 m; Mexico, 174–348 m; Caribbean, 50–358 m; Costa Rica, 55–69 m; Brazil, 110 m (Deichmann, 1936; NMNH collections).

Thesea nivea Deichmann, 1936
(Figure 39)

Thesea nivea Deichmann, 1936:122; Plate 7 fig. 7; Plate 11 figs. 16–18.—Cairns *et al.* 2002:34.

Material examined. USNM 16836, 27 m, off Cape Fear, North Carolina, October 20 1885. SERTC S2692, 24.5 m, off Charleston, South Carolina, 20 March 1976. SERTC S2693, 29 m, off Hilton Head, South Carolina, June 4, 2004. SERTC S2695, 24 m, off Charleston, South Carolina, August 15, 2006. SERTC S2696, 24.1 m, off Charleston, South Carolina, August 15, 2006. SERTC S2703, 49 m, off Charleston, South Carolina, July 28, 1981.

Remarks. This species grows more or less in one plane with slender branches that bend upward, occasionally at a right angle. In life, the colony is reddish violet, with dark red to purple polyps with white centers. Under magnification, the tissue of the polyps and coenenchyme is violet, but colorless sclerites are visible on the surface of the branches and at the base and neck of the expanded polyps. When preserved in alcohol the coenenchyme color is gray, creamy white or light brown. The dome-like calyces form an eight-lobed star and are scattered around the branches. The branches are 3–4 mm in diameter and tips on some branches are slightly inflated. This species may be fouled with epibionts such as ascidians and barnacles, and colonies often have multiple galls that are occupied by invertebrates such as the spionid worm *Polydora* sp. and the crab *Pilumnus floridanus* (DeVictor, pers. obs.).

Sclerites are colorless and consist of large, warty, acute spindles and small double heads, and some spiny or warty curved rods. The polyp armature consists of curved or arched rods in a collaret and points arrangement. The spindles range from 0.3–0.5 mm; double heads, 0.1– 0.2 mm; and the curved rods, 0.3–0.6 mm.

Some colonies have a bushy appearance that departs from the typical flat, planar growth form, with slightly shorter and more crooked branchlets. These colonies also have thicker branches up to 5 mm in diameter, but the sclerite assemblage remains consistent with the more slender colonies.

In addition to the identified specimens examined, one *Thesea* specimen was collected and examined but remains unidentified. The specimen is approximately 63 mm in height with a lateral branching growth form. All branches appear to be 1–2 mm in width and gently curve upward from the main stem. The calyces are moderately protruding and domelike with retracted polyps. The most obvious character about this specimen is the sclerites, which range from 0.1 mm to over 1 mm in length. The largest of the sclerites are bluntly elongate to globular with two distinct sides. The outer side displays undulating, irregular humps which are quite smooth with the exception of the clusters of low, fine spines at the apex of each hump. The opposing side, which tends to face the axis, displays a very coarse texture and crowded, fine tubercles. The smaller sclerites tend to be concentrated toward the calyces and are warty, elongate spindles with acute tips. All sclerites are coral red with the exception of the yellow anthocodial rods and calicular spindles. Although several of the western Atlantic *Thesea* species in Deichmann (1936) are described as having large, ridged or undulating outer sclerites, identification of the specimen to species level was not possible.

Atlantic distribution: North Carolina to South Carolina, 24–49 m; Dry Tortugas, 71 m; St. Lucia, 371 m; Guadalupe, 358 m (type) (Deichmann, 1936; NMNH collections; SERTC collection).

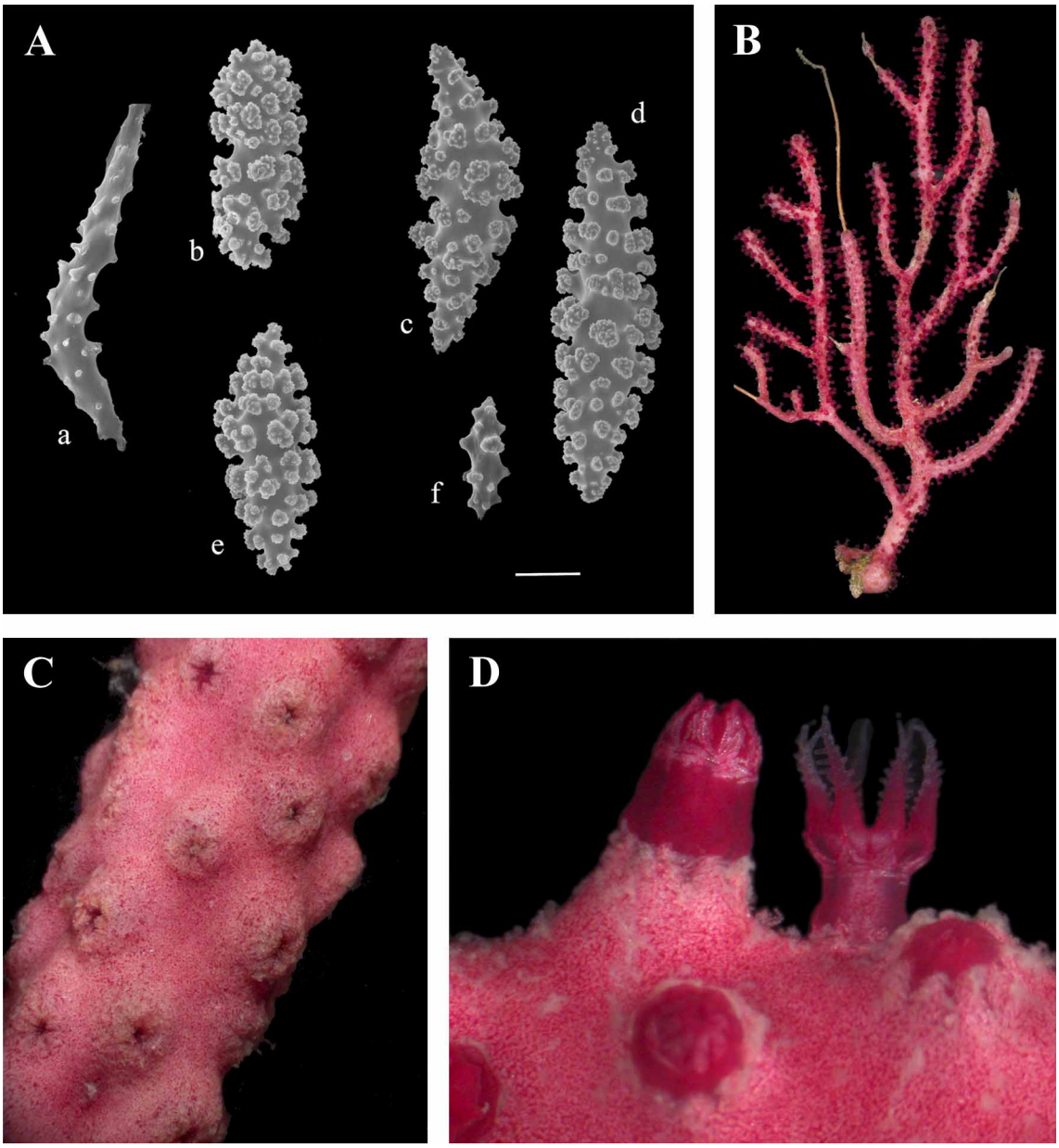

FIGURE 39. *Thesea nivea*: **A,** sclerites (USNM 16836): *a)* curved rod from anthocodia; *b–e)* coenenchymal sclerites; *b)* double head; *c–f)* spindles (scale bar = 0.05 mm); **B,** colony with expanded polyps (live specimen, S2695; height approximately 15 cm); **C,** calyx arrangement on stem (live specimen, S2695); **D,** partly contracted *(left)* and expanded *(right)* polyps (live specimen, S2695).

Family Gorgoniidae

***Leptogorgia cardinalis* (Bayer, 1961)**
(Figure 40)
Lophogorgia cardinalis Bayer, 1961:201; Fig. 60; Plate VII fig. 5.—Cairns *et al.* 2002:35.

Material examined. USNM 72437, 61 m, off Jacksonville, Florida, March 11, 1980.

Remarks. The Florida specimen examined for this work is the only record of the presence of this species in the SAB. The specimen is 46 mm in length and the branches are 1.5 mm in diameter. The branches are

irregularly openly pinnate, sometimes alternate, sometimes opposite, in one plane, and generally straight or with a slight curve. The polyp mounds are moderately prominent, rounded and biserial, giving the branches a flattened appearance. Sclerites are in the form of slender, acute spindles, reaching almost 0.2 mm, and some blunt capstans reaching 0.1 mm. Anthocodial rods are present and are approximately the same size as the spindles. The rods are pink and the spindles and capstans pale orange. The colony color is bright red or orange.

The examined specimen has acute spindles that are longer and more slender than those in Bayer's (1961) description, in which he notes the variance in the spindles and anthocodial rods. The described spiculation of this species resembles that of *L. punicea*, so distinguishing the two species may be easier when comparing colony morphology rather than sclerites.

Atlantic distribution: Gulf of Mexico, northern Florida to Cuba, 19–77 m (Bayer 1961; NMNH collections).

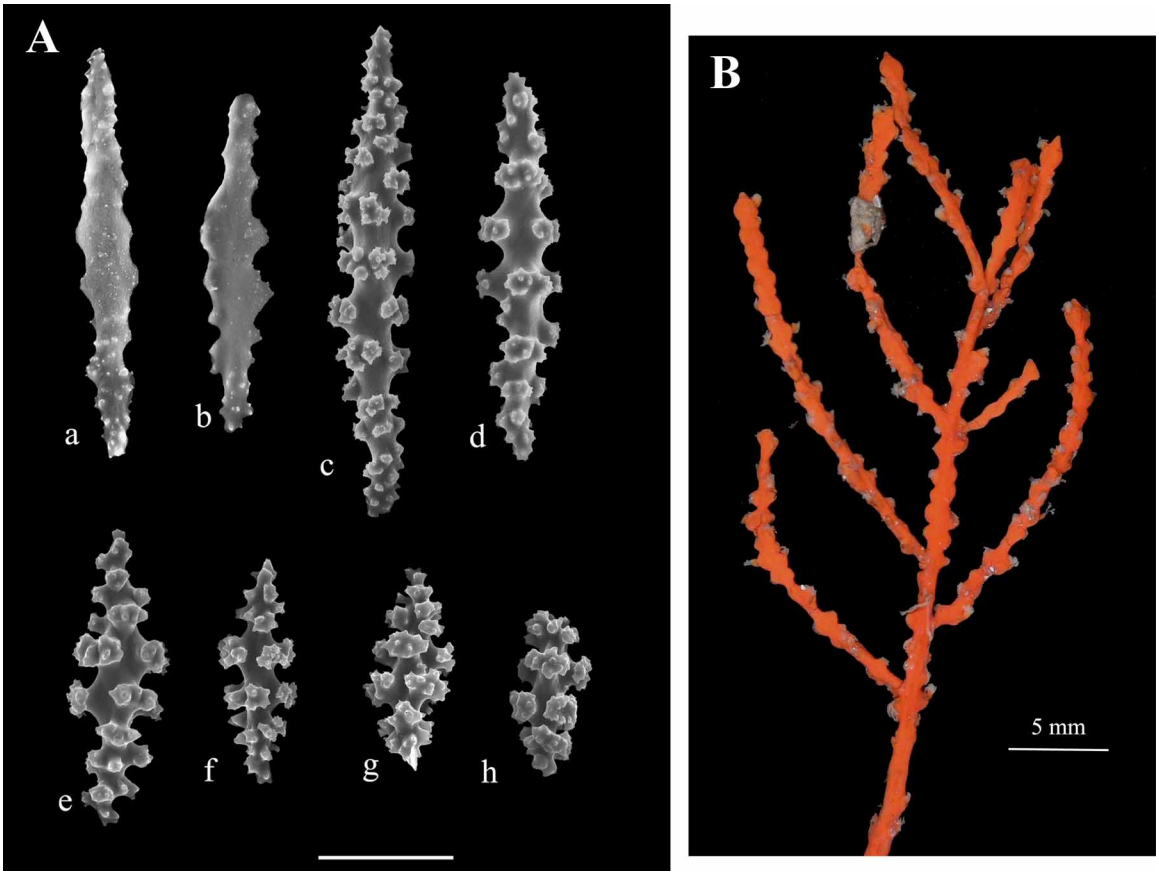

FIGURE 40. *Leptogorgia cardinalis* (preserved specimen, USNM 72437); **A,** sclerites; *a, b)* anthocodial rods; *c, d)* elongate spindles from coenenchyme; *e–h)* small spindles from coenenchyme (scale bar = 0.05 mm); **B,** colony, showing branching (scale bar = 5 mm).

***Leptogorgia euryale* (Bayer, 1952)**
(Figure 41)

Eugorgia euryale Bayer, 1952:186; Fig. 1 o-s.
?Xiphigorgia setacea Kükenthal, 1916:502; Figs. Z, A'; Plate 23 fig. 6.
Leptogorgia euryale.— Bayer 1961:222; Fig. 69 f–i.—Cairns *et al.* 2002:35.

Material examined. SERTC S425, 41 m, off St. Helena Island, South Carolina, June 2, 2004. SERTC S2716, 15.6 m, off Charleston, South Carolina, April 22, 1977. SERTC S2717, 91 m, off Charleston, South Carolina, April 2, 1977. SERTC S2718, 37.5 m, off Charleston Harbor, South Carolina, October 26, 1974.

Remarks. This work represents the first record of this species in the SAB. This species is unbranched and very slender (1–2 mm) in comparison to other *Leptogorgia* species in the SAB. The prominent, conical polyp mounds are biserial along the sides of the branch, sometimes alternating, with the apertures separated by approximately 3 mm. The preserved colonies examined for this work are pale orange or pale pink with dark pink polyp mounds with yellow apertures. A band of dark pink tissue, giving the appearance of a pink lateral stripe, connects the polyp mounds. The inner coenenchyme immediately adjacent to the axis is dark pink. The coenenchyme contains elongate (up to 0.15 mm) warty spindles, asymmetrical disk spindles, and flat, serrate anthocodial rods that approach the length of the longest spindles. It appears as though this species may exist unattached as some specimens have growing tips on both ends. One fragment examined had a very small branchlet on which the polyps were separated by 5 mm or more.

Atlantic distribution: South Carolina, Gulf of Mexico (Florida), 15–91 m (Bayer, 1952, 1961; NMNH collections; SERTC collection).

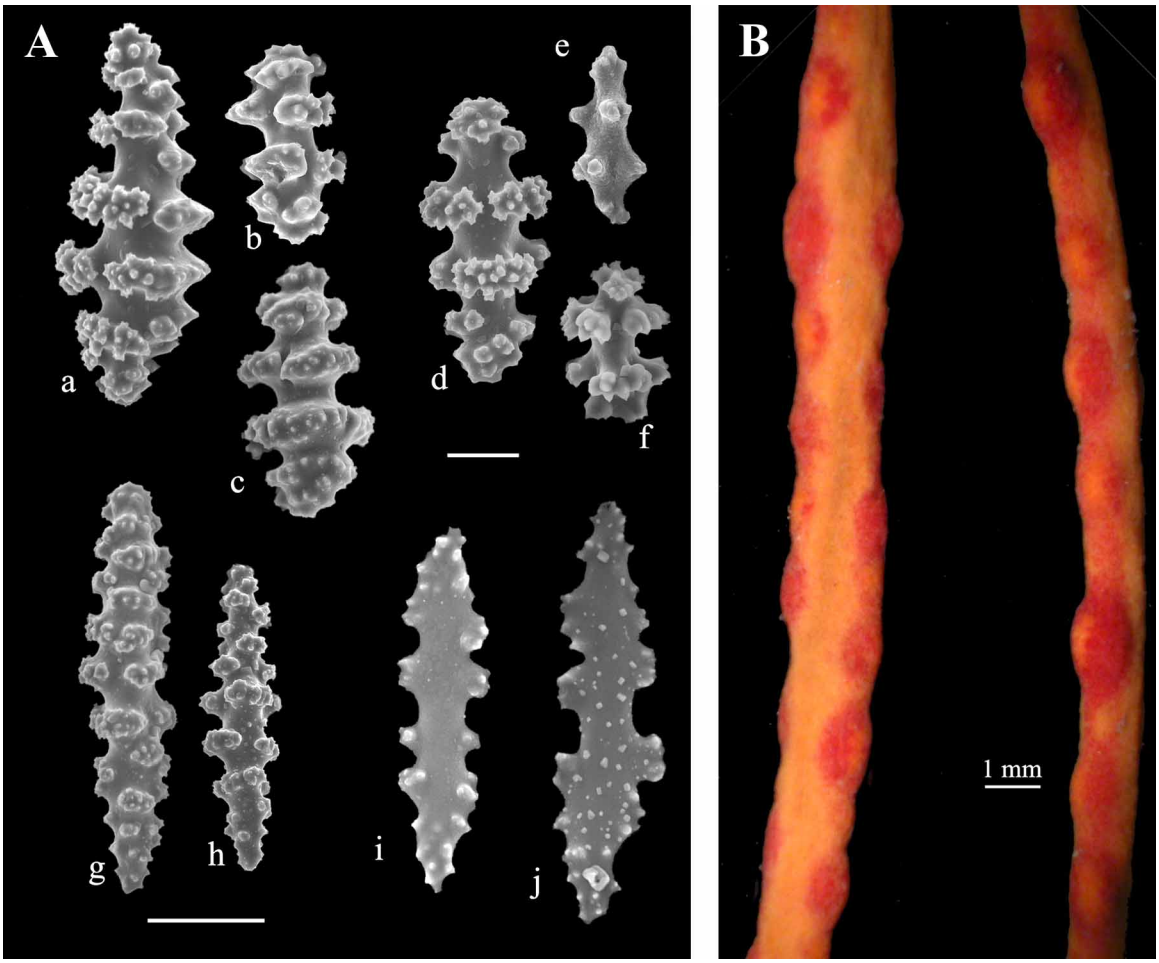

FIGURE 41. *Leptogorgia euryale*: **A,** sclerites (S425); *a–c)* disc spindles from coenenchyme; *d–f)* capstans from coenenchyme; *g, h)* large spindles from coenenchyme; *i, j)* flat rods from anthocodia (scale bar for *a–f, i, j* = 0.02 mm; *g, h* = 0.05 mm); **B,** preserved specimen, showing distribution of polyps; (scale bar = 1 mm).

Leptogorgia hebes **Verrill, 1869**
(Figure 42)

Leptogorgia hebes Verrill, 1869:422.—Deichmann 1936:179; Plate 17 fig. 3; Plate 19 figs. 16–23.—Cairns *et al.* 2002:35.
Leptogorgia rubropurpurea Verrill, 1912:398; Plate 29 figs. 5–5a; Plate 30 fig. 1; Plate 33 fig. 8; Plate 35 figs. 10–10a.
Leptogorgia carolinensis Verrill, 1872:432.
Lophogorgia hebes.— Bayer 1961:207; Figs. 62 f–I, 63; Plate VII fig. 4.

Material examined. SERTC S428, 12.4 m, Charleston Harbor, South Carolina, April 21, 2004. SERTC S429, 13.7 m, off Edisto Island, South Carolina, June 4, 2004. SERTC S430, 28.4 m, off Hilton Head, South Carolina, June 4, 2004. SERTC S721, 18.3 m, off North Inlet, Georgetown, South Carolina, June 1, 2004. SERTC S1325, 33.5 m, off Bull Island, South Carolina, June 2, 2004. SERTC S2517, 24.4 m, off St. Helena Sound, South Carolina, April 29, 2005**.**

Remarks. *Leptogorgia hebes* is a very common species in the shallow SAB and can be found on hardbottom environments along with *Titanideum frauenfeldii* and *Leptogorgia virgulata*. The colonies reach moderate size and are irregularly pinnately branched in one plane or slightly bushy. The polyp mounds are hemispherical near the main branch and less distinct near the ends of the twigs, and the apertures are slit-like. There is often a distinct groove that runs down two sides of the slightly flattened branches. Terminal twigs are 1–2 mm in diameter while branches near the colony base may be up to 6 mm.

The coenenchymal sclerites are blunt capstans and 8-radiates up to 0.1 mm, and the polyps have flattened serrated rods of approximately the same size. *L. hebes* is usually bright red, orange or dark yellow, but purple colonies have been recorded (Bayer 1961). This species has been observed with numerous small gorgonocephalid ophiuroids attached to its branches (DeVictor, pers. obs.).

There are numerous lots of this species in the NMNH from the shallow SAB.

Atlantic distribution: Virginia to north Florida, 8–116 m; Gulf of Mexico, 0–37 m; Aruba, unknown depth; Brazil (unknown depth) (Deichmann, 1936; Bayer, 1961; NMNH collections; SERTC collection).

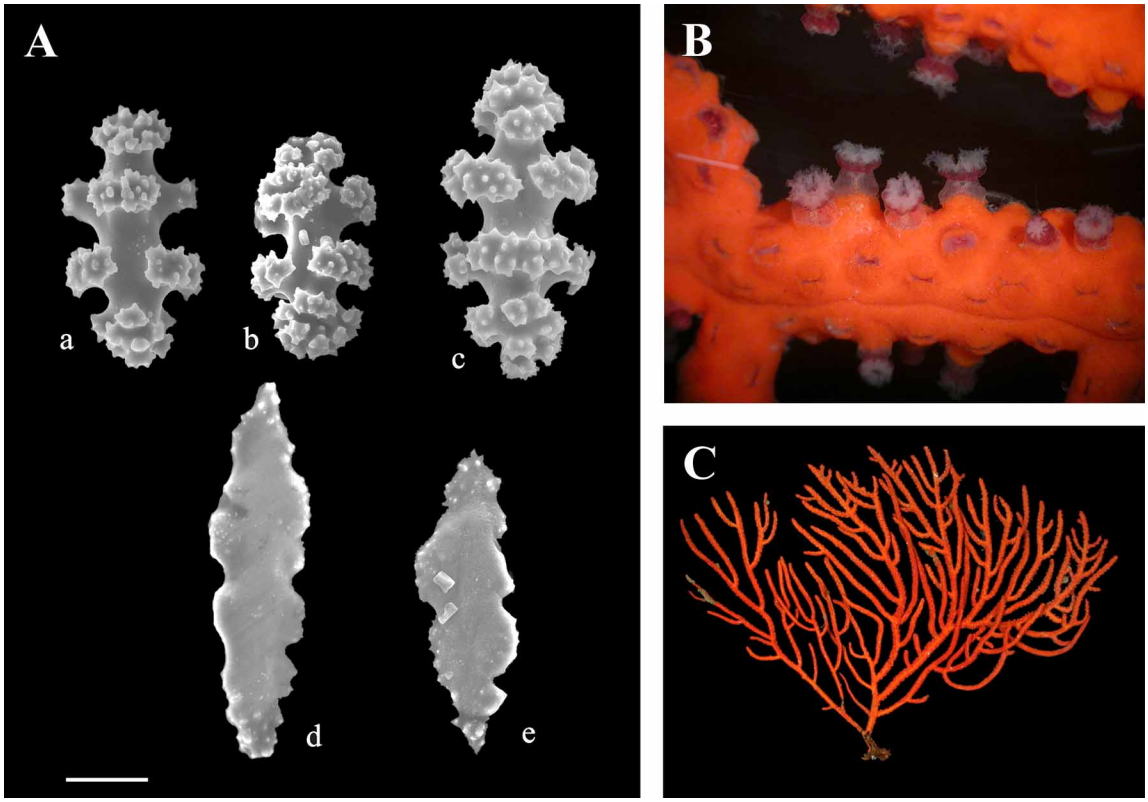

FIGURE 42. *Leptogorgia hebes*: **A,** sclerites (S1863); *a–c)* capstans from coenenchyme; *d, e)* flat anthocodial rods (scale bar = 0.02 mm); **B,** stem and expanded polyps; **C,** colony morphology (S430, preserved specimen; height approximately 15 cm).

***Leptogorgia punicea* (Milne Edwards & Haime, 1857)**
(Figure 43)

Gorgonia punicea Valenciennes, 1855:12 [Nomen nudum].
Gorgonia pumicea.—Milne Edwards and Haime 1857:160 [error of transcription].
Leptogorgia purpurea (part) Wright and Studer, 1889:151; Plate 29 fig. 1; Plate 34 fig. 3.

Leptogorgia pumicea.—Verrill 1912:399; Plate 33 fig. 10; Fig. 9; Plate 35 fig. 11.—Stiasny 1951:73.
?Leptogorgia studeri Verrill, 1912:400.
Leptogorgia rathbunii Verrill, 1912:397; Plate 29 figs. 4–4a; Plate 33 fig. 11; Plate 35, figs. 9–9a.
?*Leptogorgia diffusa* Stiasny, 1951:71; Plate 20 fig. B; Plate 21 figs. 2–3.
not *Leptogorgia diffusa*.—Verrill 1868:397.
Lophogorgia punicea.—Bayer 1961:204; Figs. 61 a–h; 62 a–e; Plate VII fig. 6.
Leptogorgia punicea.—Cairns *et al*, 2002:35.

Material examined. USNM 60196, 60 m, off North Carolina, March 4, 1981. SERTC S2743, 20 m, Gray's Reef National Marine Sanctuary, off Sapelo Island, Georgia, May, 28, 2006.

Remarks. Colonies of *L. punicea* display irregularly open pinnate branching and prominent polyp mounds which are in double rows on two sides of the branches. The largest of the examined specimens has a height 8 cm and the branches are 1 mm wide exclusive of polyp mounds. The sclerites consist of acute spindles and blunt capstans in the coenenchyme and flat, scalloped anthocodial rods. The spindles and flattened rods reach 0.12 mm in length and are roughly four times longer than wide and the blunt capstans are slightly shorter. The spindles and capstans are reddish orange and the anthocodial rods are pink. The color of the colony is generally purple or reddish purple.

Smaller colonies of this species may resemble *Leptogorgia cardinalis* or *Leptogorgia miniata. L. miniata* is not reported in this region, but specimens are easily distinguished from *L. punicea* by examining the anthocodial rods, which are significantly larger than the largest spindles. *L. cardinalis* has less curvature to the branches, less prominent polyp mounds, and slender, more acute spindles than *L. punicea*.

Atlantic distribution: North Carolina, 62–105 m; Georgia, 20 m; Gulf of Mexico, 23 m; southern Florida, 27–73 m; Venezuela to Brazil, 1–69 m (Bayer 1961; NMNH collection; SERTC collection).

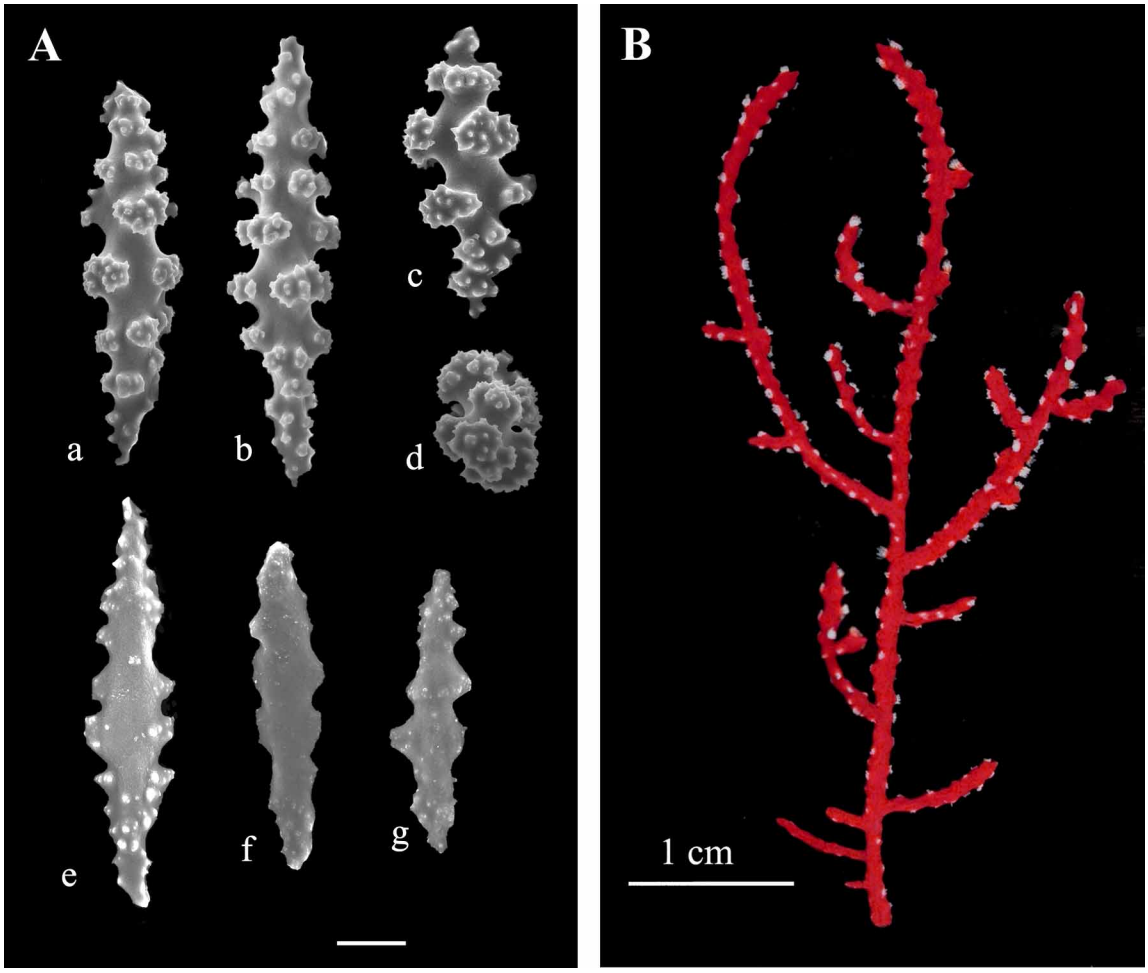

FIGURE 43. *Leptogorgia punicea*: **A,** sclerites (USNM 61096); *a–c)* spindles from coenenchyme; *d)* capstan from coenenchyme; *e–g)* anthocodial rods (scale bar = 0.02 mm); **B,** branch (preserved specimen, S2743; scale bar = 1 cm).

***Leptogorgia setacea* (Pallas, 1776)**
(Figure 44)

Gorgonia setacea Pallas, 1766:182.
Pterogorgia gracilis Verrill, 1868:359; Plate 4 figs. 2–3.
Gorgonia gracilis.—Verrill 1912:393; Plate 29 fig. 2; Plate 35 figs. 5–5a.
Gorgonia brasiliensis Verrill, 1912: 392; Plate 29 fig. 3; Plate 33 fig. 7; Plate 35 fig 7.
Not *Xiphigorgia setacea*.—Kükenthal 1916:502.
?Leptogorgia contorta Kükenthal, 1919:915
Leptogorgia trinidadensis Hickson, 1928:416; Plate 4 fig. 7; text fig. 37.
Leptogorgia virgulata Cowles, 1930:332.
Leptogorgia setacea.—Verrill 1872:433.—Deichmann 1936:178; Plate 19 figs. 35–38.—Bayer 1961:218; Figs, 67, 68 a–d.—Cairns *et al*, 2002:35.

Material examined. SERTC S1326, 12 m, off South Island, South Carolina, June 1, 2004. SERTC S2123, 21 m, off St. Catherine's Island, Georgia, June 3, 2004. SERTC S2715, 18.3 m, off Sapelo Island, Georgia, May 28, 2006.

Remarks. *Leptogorgia setacea* is usually unbranched and often completely unattached, or attached to a vacant bivalve shell. The single branch is usually between 2 and 4 mm in diameter and can reach 2 m in length (Deichmann 1936). The polyp mounds are arranged in a single or multiple rows along the sides of the branch, and often are a darker color than the coenenchyme. The polyp mounds may be moderately prominent, or the apertures may be flush with the surrounding coenenchyme. Coenenchymal sclerites are in the form of acute, warty spindles reaching 0.2 mm in length and smaller disc spindles and capstans. Anthocodial rods are usually less than half the length of the large spindles. The colonies are purple, yellow, or pale lavender with dark purple polyp mounds.

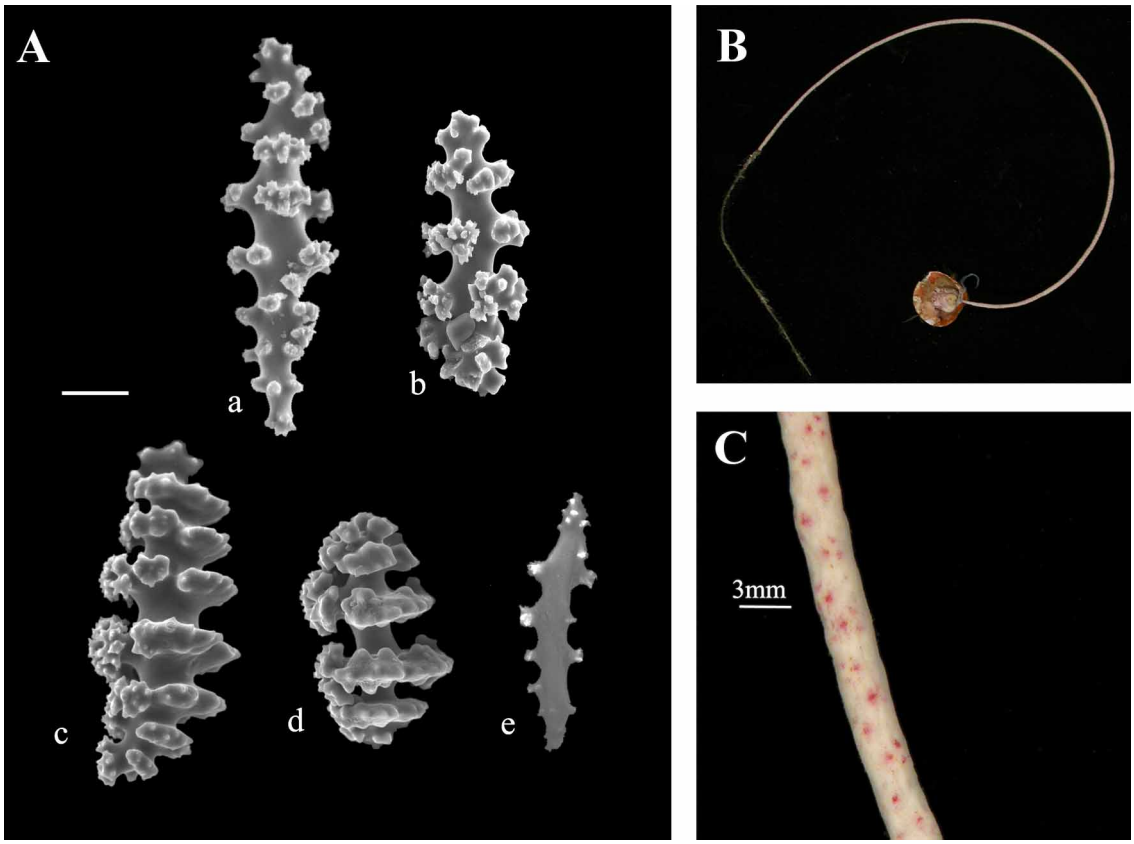

FIGURE 44. *Leptogorgia setacea*: **A,** sclerites (S2123); *a, b)* spindles from coenenchyme; *c, d)* disk spindles from coenenchyme; *e)* anthocodial rod (scale bar = 0.02 mm); **B,** colony attached to a bivalve shell; **C,** section of stem; (scale bar = 3 mm).

This species shares many characters with *L. virgulata*, especially with regard to spiculation. Most *L. setacea* colonies are easily recognizable based on colony morphology, but if only fragments of colonies are available, close examination of the sclerites is necessary. Both *L. setacea* and *L. virgulata* are common along the southeastern coast of the US and penetrate into lower salinity habitats such as tidal creeks and bays.

There are numerous lots of this species in the NMNH from the shallow SAB.

Atlantic distribution: Chesapeake Bay to Florida, Gulf of Mexico, Colombia to Brazil 1–68 m (one record from Guyana indicates collection at 9245 m, but this is likely an error). Deichmann recorded specimens from Bahamas and West Indies, but no depth was mentioned (Deichmann 1936; Bayer 1961; NMNH collections; SERTC collection).

***Leptogorgia virgulata* (Lamarck, 1815)**
(Figure 45)

?Gorgonia viminalis Pallas, 1766:184.—Ellis and Solander 1786:82; Plate 82; Plate12 fig. 1.—Esper 1791:(2)51; Plate 11.
Gorgonia virgulata Lamarck, 1815:157
Gorgonia ceratophyta, var. *flava* + var. *rubra* Donovan, 1825(4):114, 115.
Gorgonia flavida Duchassaing and Michelotti, 1860:32; Figs. 11–13.—Bielschowsky 1929:134.
Leptogorgia floridana Verrill, 1864b:31.
Leptogorgia tenuis Verrill, 1864a:8.
Leptogorgia brasiliensis Verrill, 1912:392; Plate 29 figs. 3–3a; Plate 33 fig. 7; Plate 35 figs. 7–7a.
Leptogorgia sulfurea Bielschowsky, 1929:126; Fig. 20; Plate 3 fig. 11.
Leptogorgia virgulata.—Bielschowsky 1929:127; Fig. 21; Plate 3 fig. 12.—Deichmann 1936:177; Plate 19 figs. 24–34.—Bayer 1961:216; Fig. 66; Plate VII fig. 7.—Cairns *et al.* 2002:35.

Material examined. SERTC S2488, 6.7 m, Charleston, South Carolina, November 19, 1971. SERTC S2489, 2 m, Georgetown County, South Carolina, August 3, 1970. SERTC S2713, 8.5 m, off South Carolina, December 12, 2002; SERTC S2714, 31 m, off Wassaw Island, Georgia, June 3, 2004.

Remarks. *Leptogorgia virgulata* is one of the most common octocoral species in the SAB. Colonies have a distinctive colony form with whip-like branches, moderately branching near the attached base, and can approach a height of one meter. The branches are 2–5 mm in diameter with multiple rows of polyp mounds all around, sometimes with a bare strip. Polyp mounds are moderately prominent to flush with the surrounding coenenchyme. The coenenchyme contains short (<0.1 mm), asymmetrical disk spindles and longer (0.15 mm) sculptured spindles, while flat rods are observed near the polyp mound apertures. The flat, serrate anthocodial rods are at most half the length of the longest spindles. Colonies may be uniform yellow, orange, purple, white, or various shades in between, with corresponding spicular coloration.

This species is found in shallow reef environments and can tolerate low salinity environments such as tidal creeks and bays. *L. virgulata* is often colonized by the barnacle *Conopea galeata*, the Atlantic pearl oyster *Pteria colymbus*, and the bryozoans *Alcyonidium hauffi* and *Membranipora arborecens* (DeVictor, pers. obs.).

There are numerous lots of this species in the NMNH from the shallow SAB.

Atlantic distribution: New York, unknown depth; Chesapeake Bay to Florida, Gulf of Mexico, 2–59 m (one record from 220 m); Brazil, unknown depth (Deichmann, 1936; Bayer, 1961; NMNH collections; SERTC collection)

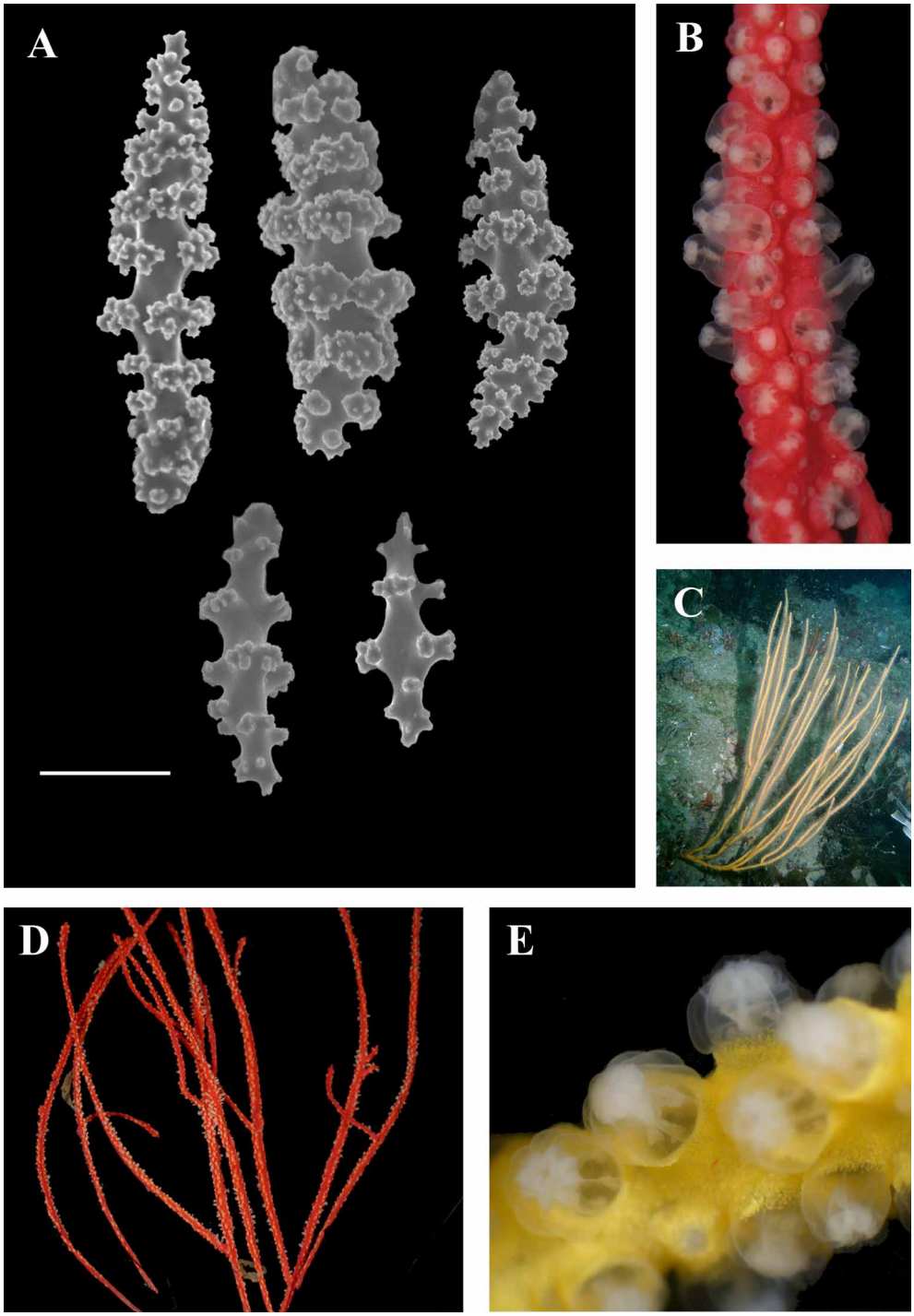

FIGURE 45. *Leptogorgia virgulata*: **A,** coenenchymal sclerites (S2713) (disc spindles and anthocodial rods not shown; scale bar = 0.05 mm); **B,** close-up of branch (live specimen), showing polyp expansion (stem width approximately 3 mm); **C,** colony *in situ*; **D,** branching arrangement (preserved specimen); **E,** polyps (live specimen).

Family Ellisellidae

***Viminella barbadensis* (Duchassaing & Michelotti, 1864) new combination**
(Figure 46)

Juncella barbadensis Duchassaing and Michelotti, 1864:22; Plate 5 figs. 5–6.
not *Juncella barbadensis*.—Wright and Studer 1889:159.
Scirpearia rigida typica Toeplitz in Kükenthal, 1919:859.

Scirpearia rigida Toeplitz 1929:297; Fig. 11; Plate 6 fig. 5.
Scirpearia rigida var. *tenuis* Toeplitz, 1929:299; Fig. 12; Plate 6 fig. 5a.
?Scirpearia flagellum Toeplitz, 1929:308; Fig. 16.
Scirpearia barbadensis.—Deichmann 1936:208; Plate 24 figs. 1–19.
Ellisella barbadensis.—Bayer 1958:386; Fig. 4b.—Bayer 1959b:21; Fig. 9.—Bayer 1961:281; Fig. 93.—Cairns *et al.*, 2002:35.
Ctenocella barbadensis.—Sanchez *et al.* 1998:256.—McFadden *et al*. 2006:525.
Ctenocella (Ellisella) barbadensis.—Sanchez and Cairns 2004:2.

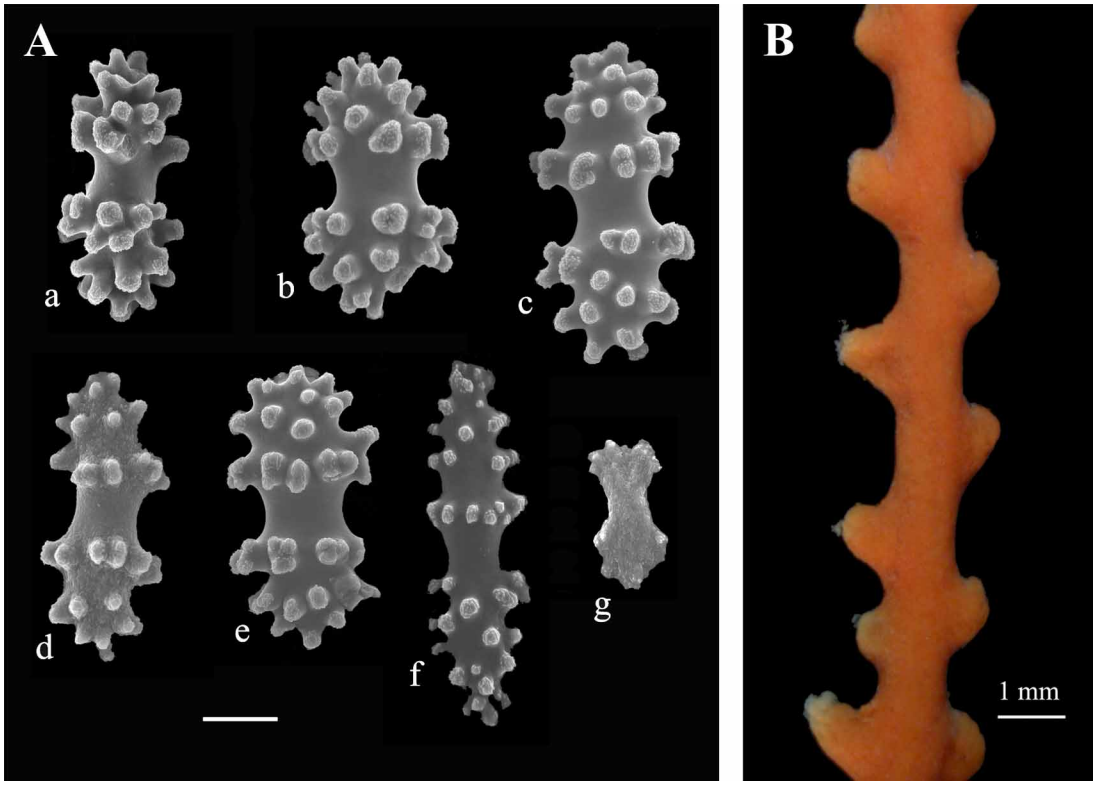

FIGURE 46. *Viminella barbadensis*: **A,** sclerites (USNM 50395); *a–e)* double heads from coenenchyme; *f)* flattened double cone from calyx; *g)* small flattened rod from polyp (scale bar = 0.02 mm); **B,** stem, preserved specimen (S2629) (scale bar = 1 mm).

Material examined. USNM 50395, 46 m, off St. Augustine, FL, March 10, 1956. SERTC 2316, 91.4 m, off Charleston, SC, March 31, 1979. SERTC 2629, 72–69 m, off Charleston, SC, March 28, 1981.

Remarks. *Viminella barbadensis* is one of several ellisellid species that have been the subject of reclassification in the last two decades. Bayer and Grasshoff (1994) suggested that unbranched species of *Ellisella* be placed into the genus *Viminella* based on Kukenthal's (1924) classification, and that *Viminella* [*Ellisella*] is a subgenus of *Ctenocella*. Grasshoff (1999) removed the subgenus status and placed ellisellids with unbranched growth forms ("whips") under the genus *Viminella*, establishing the basis for the new combination presented in this document.

The specimens examined for this work do not exhibit the large stem diameter and crowded polyps discussed by Bayer (1961), but variability of these characters has been noted (Deichmann, 1936). The SERTC and USNM colonies are all unbranched, slender colonies (1–2 mm in diameter exclusive of polyps) with polyps arranged biserially in a row on each side in a somewhat alternating pattern. The polyps are very prominent and sometimes upturned, except in a few areas where the coenenchyme appears 'inflated' and the polyps are reduced. The color of the preserved colonies varies from pale to deep orange, with a very dense, white axis. As is diagnostic of the Ellisellidae, the axis does not have a hollow central core and is comprised of calcareous material that is accreted in a concentric manner in radial sectors. In some cases where the polyps are not as prominent, the slender colonies of *V. barbadensis* may resemble colonies of *Leptogorgia euryale;*

microscopic examination of the axis characteristics and absence of colored spindles will readily distinguish *V. barbadensis* from members of the Gorgoniidae.

The sclerites examined from the tip of the USNM specimen are dominated by amber, tuberculated double heads, double cones and warty rods. Other specimens examined contain double heads that are more coarsely tuberculated, perhaps a function of the location of the subsample on the colony. Many of the double-headed sclerites have a notable degree of granulation on the tips of the tubercles. The largest double cones or spindles are no more than twice the length of the double heads.

This species can reach a very large size in some parts of the tropical Atlantic, reaching a few meters in length and almost a centimeter in diameter.

Note: A small ellisellid fragment was found among a lot of *Leptogorgia* specimens and was tentatively identified as *Nicella* cf. *schmitti* (Breedy, pers. comm.). The fragment is too small to reveal the characteristic branching of this species, thus precluding the addition of *N. schmitti* to this guide. Although there are no records of *N. schmitti* occurring north of Boca Raton, Florida (approximately 26°22' N), the presence of *N. schmitti* in the shallow SAB is possible.

Atlantic distribution: South Carolina to Brazil, Gulf of Mexico, Caribbean, 12–453 m (Deichmann 1936; Bayer 1961; NMNH collections; SERTC collection).

Order Pennatulacea

Suborder Sessiliflorae

Family Renillidae

Renilla reniformis (Pallas, 1766)

(Figure 47)

Pennatula reniformis Pallas, 1766:374.
Renilla reniformis forma *typica* Deichmann, 1936:259.
Renilla reniformis.—Bayer 1961:301.—Cairns *et al,* 2002:36.

Material examined. SERTC S427, 11.5 m, Charleston Harbor, South Carolina, April 22, 2004. SERTC S745, 5.5 m, Sullivan's Island, South Carolina, May 13, 2004. SERTC S2262, 10 m, off Jacksonville, Florida, July 24, 2003.

Remarks. This species is easily recognizable as the only leaf-shaped octocoral in the shallow SAB, and is well described by its familiar name, "sea pansy". The frond (oozooid) is approximately as wide as it is long, with polyps (autozooids and siphonozooids) restricted to the upper surface. Sclerites are in the form of three flanged rods, which are longer in the frond than in the stalk. The color of the colonies and sclerites includes varying shades of rose and purple.

Renilla reniformis is distinguishable from its southern tropical counterpart, *R. muelleri,* by the shape of the frond, which is not conspicuously wider than long, and by the sclerites of the stalk, which are shorter than those in the rachis. Both species can vary in intensity of color. Colonies can be found in intertidal systems and tidal creeks, as well as deeper marine habitats with soft sediment. The species is well known for its ability to bioluminesce.

There are numerous lots of this species in the NMNH from the shallow SAB.

Atlantic distribution: North Carolina to Brazil, Caribbean, 1–72 m (Deichmann 1936; Bayer 1961; NMNH collections; SERTC collection).

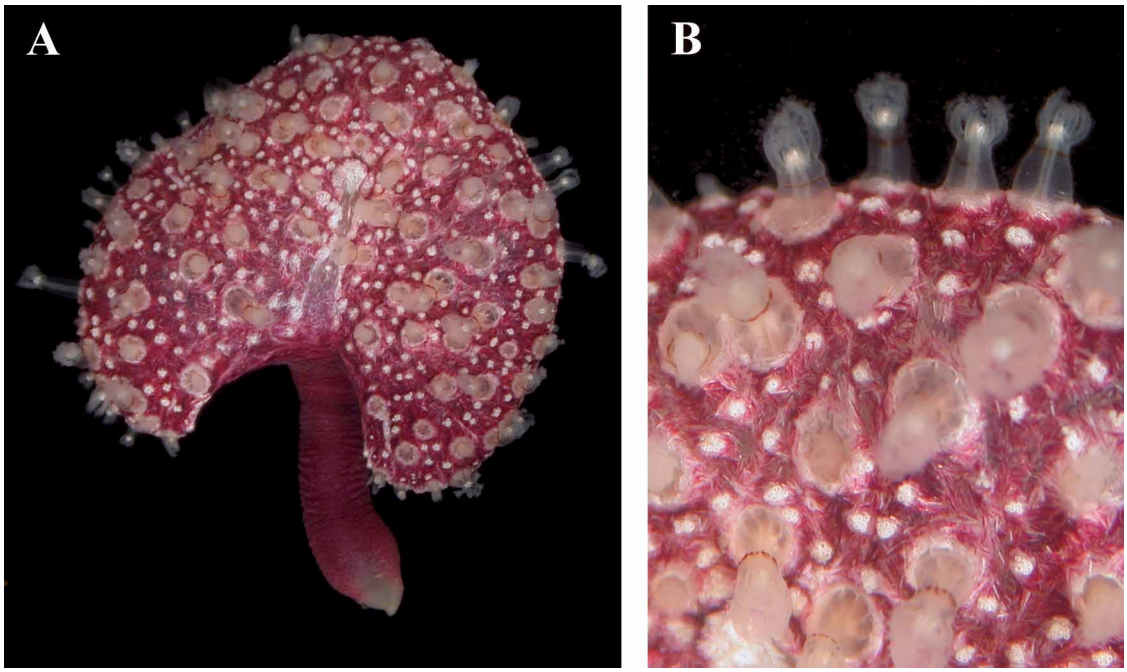

FIGURE 47. *Renilla reniformis*: **A,** live specimen (S427), whole colony (diameter approximately 22 mm); **B,** frond with expanded polyps, showing sclerites.

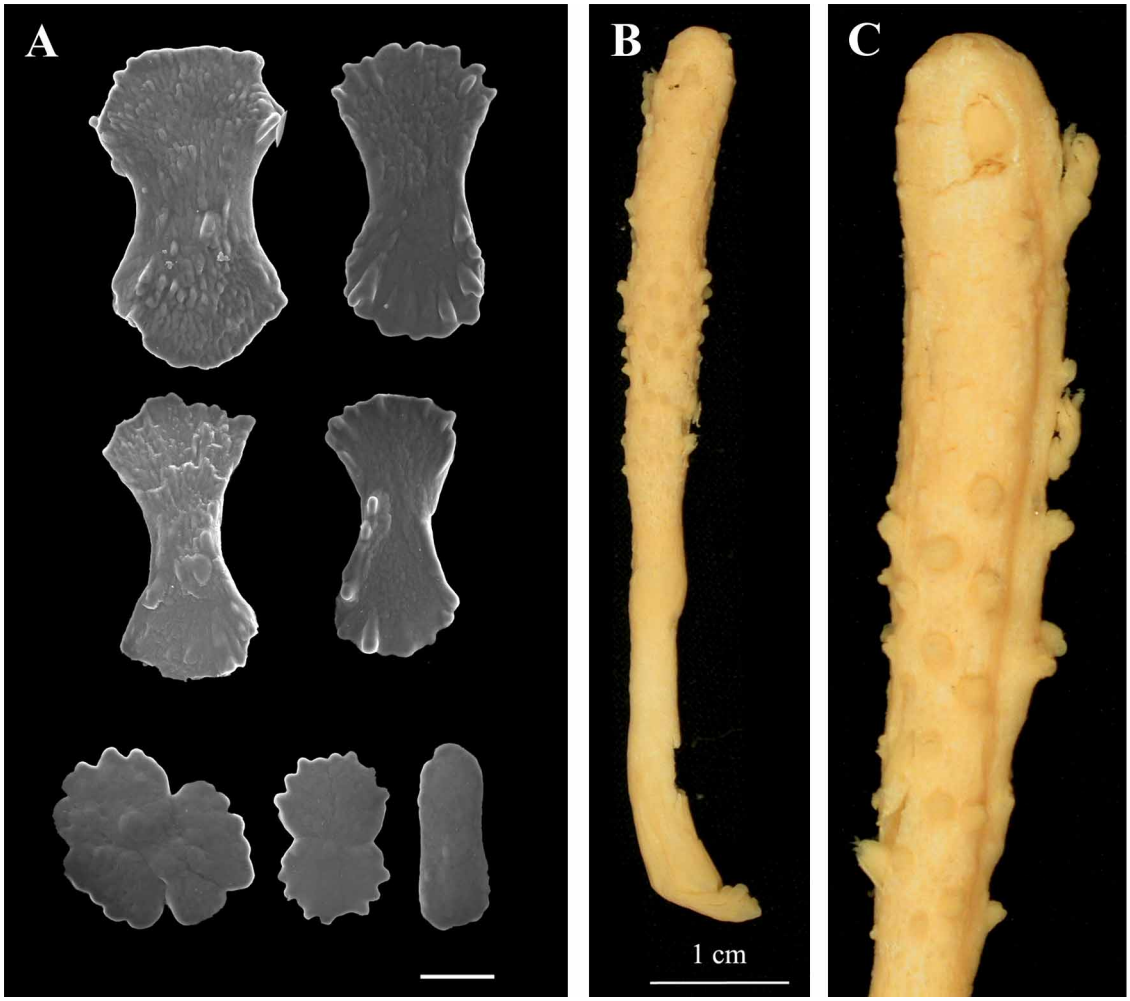

FIGURE 48. *Sclerobelemnon theseus* (S2312, preserved specimen): **A,** sclerites from peduncle (scale bar = 0.05 mm); **B,** whole colony (scale bar = 1 cm); **C,** close up of rachis showing dorsal streak and polyps.

Family Kophobelemnidae

***Sclerobelemnon theseus* Bayer, 1959**
(Figure 48)

Sclerobelemnon theseus Bayer, 1959b:33; Figs. 18–21; 1961:304; Fig. 98.—Bayer 1961:304; Fig. 98.

Material examined. SERTC S2312, 79 m, off Charleston, South Carolina, April 23, 1977.

Remarks. This species has a club-like shape with the peduncle slightly longer than the rachis. The distal end of the peduncle is slightly pointed and not inflated to any extent. The examined specimen is about 7 mm at its widest point and 65 mm in length. The rachis contains some exsert autozooids but most are contracted, with minute, indistinct siphonoozooids scattered between polyps. The autozooids are arranged in 12 indistinct longitudinal rows, leaving a bare dorsal streak along the back of the colony. The axis is slightly flexible and the coenenchyme is tough and rubbery. The color of the colony is creamy white in alcohol.

The autozooids contain sclerites in the form of plates that resemble double sided axe heads or plates with a medial constriction, reaching 0.3 mm in length. The ends of some plates have serrated or ridged edges. The rachis contains similar plates with a medial constriction and serrations, and the peduncle contains smaller plate-like bodies. This is the first record of this species in the SAB, although one specimen in the USNM from Cape Fear is identified as *Sclerobelemnon* sp. and was not examined for this work.

Atlantic distribution: Charleston, 79 m, Gulf of Mexico (unknown depth), Surinam, Trinidad, 57 m (Bayer 1959b; Bayer 1961; Williams 1995; NMNH collections; SERTC collection).

Suborder Subselliflorae

Family Virgulariidae

***Stylatula elegans* (Danielssen, 1860)**
(Figure 49)

Virgularia elegans Danielssen, 1860:277.
Stylatula elegans.—Kükenthal 1915:69; text. Fig. 68.—Deichmann 1936:270.—Bayer 1958:381; Fig. 1a.—Williams 1995:123 —Cairns *et al*, 2002:36.

Material examined. USNM 10068, 181 m, off Charleston, SC, January 5, 1885. USNM 59567, 30 m, off South Carolina, August 23, 1977. USNM 59513, 24 m, off North Carolina, April 30, 1980.

Remarks. This species has distinct needle-like sclerites arranged in a supporting fan in the basal section of the polyp leaves, which contain up to six autozooids. There are approximately 10 large needles in each fan, reaching 1 mm in length, with smaller needles interspersed. These leaves and fans flank the axis in an alternate opposite, bilateral arrangement. The axis measures up to 0.4 mm in diameter. The polyps contain rod-like sclerites which are not easily visible. In the specimens examined that were complete, the leaf pairs are closer together towards the peduncle but more spread out distally.

Of the three specimens examined, one is a fragment and two are complete. The complete specimens have significantly smaller polyps and axis diameter, and only reach a total length of 65–75 mm. The fragment has a wider axis width and leaves, which are separated by approximately 4 mm. All specimens have a white axis with light brown polyps, and white needles.

There are numerous lots of this species in the NMNH from the shallow SAB.

Atlantic distribution: Norway (type), New Jersey to Cape Canaveral, Dry Tortugas, 20–812 m (Deichmann 1936; Bayer 1958; Williams 1995; NMNH collections; SERTC collection).

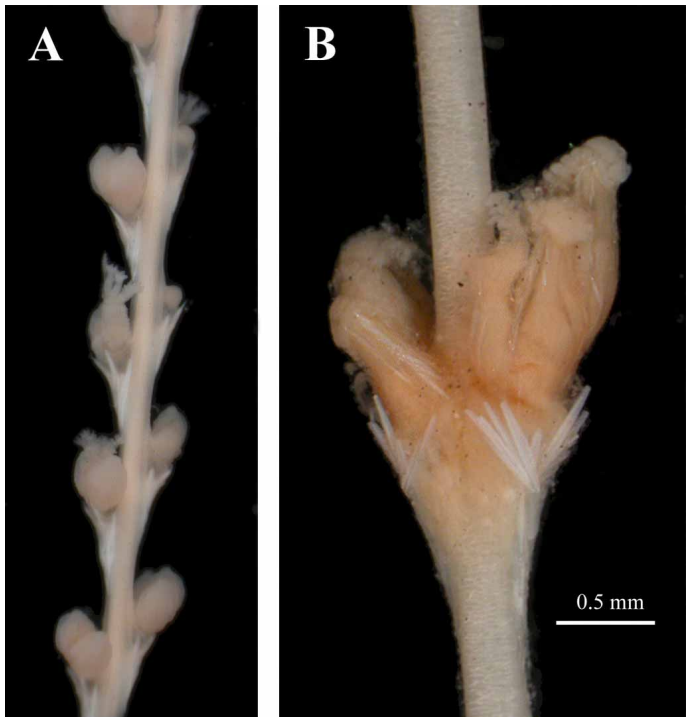

FIGURE 49. *Stylatula elegans* preserved specimens: **A,** rachis, showing polyp arrangement (USNM 59567 = S2593); **B,** polyps, showing autozooid leaves and sclerite arrangement (USNM 10068) (scale bar = 0.5 mm).

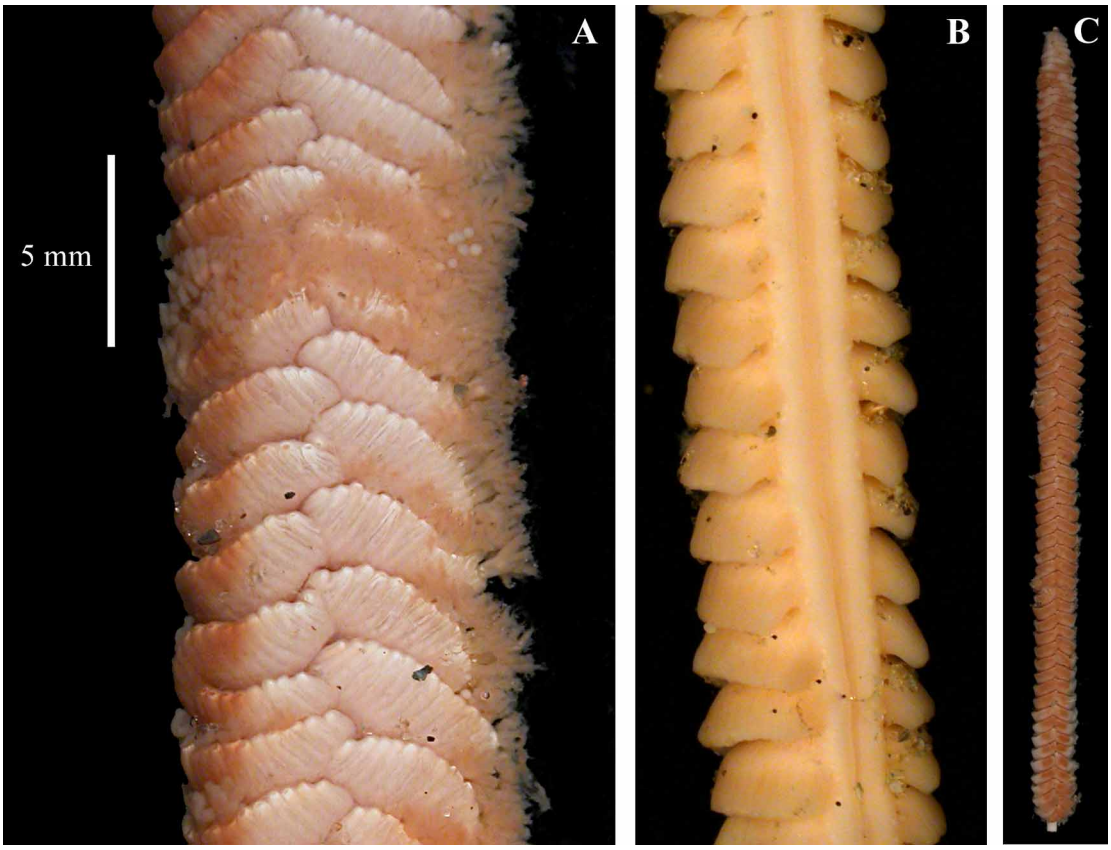

FIGURE 50. *Virgularia presbytes*, preserved specimens (S2125); **A,** showing polyp leaves and autozooids (scale bar = 5 mm); **B,** showing dorsal track; **C,** whole colony (length approximately 15 cm).

***Virgularia presbytes* Bayer, 1955**
(Figure 50)

Virgularia spec. Deichmann, 1936:274.
Virgularia presbytes Bayer, 1955:295; Figs. 1, 2 a–e.—Bayer 1958:379.—Bayer 1961:306; Fig. 97.—Cairns *et al.* 2002:36.

Material examined. SERTC S2125, 19.5 m, off Edisto Island, South Carolina, April 29, 2005. SERTC S2508, 19.5 m, off Edisto Island, South Carolina, April 29, 2005. SERTC S2513, 31.1 m, off Folly Island, South Carolina, April 28, 2005. SERTC S2711, 36 m, off Charleston Harbor, South Carolina, June 2, 2004.

Remarks. *Virgularia presbytes* maintains a rigid, pen-like colony shape that has overlapping, fleshy leaves comprised of numerous autozooids, fused at the base in a fan-like manner. On the ventral side, the edges of the leaves are arranged in an imbricating manner, but they do not touch dorsally where they leave a very distinct bare track with a medial groove. The presence of the autozooids causes the leaves to appear heavily ridged. Between the leaves are small siphonozooids in multiple rows, visible only when the larger leaves are lifted to expose the rachis. The axis is white, rigid and becomes flattened towards the base. *V. presbytes* usually lacks spiculation.

Atlantic distribution: North Carolina to Florida, Gulf of Mexico, Trinidad and Tobago, Surinam, and Brazil, 9–91 m (Bayer 1955; Bayer 1959b; Bayer 1961; NMNH collections; SERTC collection).

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TABLE 1. Taxonomic listing of the octocorals found in the South Atlantic Bight to 200m (classification from Bayer, 1981a).

- Subclass OCTOCORALLIA
  - Order ALCYONACEA
    - Suborder Stolonifera
      - Family Clavulariidae
        - *Carijoa riisei* (Duchassaing & Michelotti, 1860)
        - *Scleranthelia rugosa* (Pourtalès, 1867)
        - *Telesto fruticulosa* Dana, 1846
        - *Telesto nelleae* Bayer, 1961
        - *Telesto sanguinea* Deichmann, 1936
    - Suborder Alcyoniina
      - Family Alcyoniidae
        - *Bellonella rubistella* (Deichmann, 1936)*
      - Family Nephtheidae
        - *Pseudodrifa nigra* (Pourtalès, 1868)
      - Family Nidaliidae
        - *Nidalia occidentalis* Gray, 1835
    - Suborder Scleraxonia
      - Family Anthothelidae
        - *Diodogorgia nodulifera* (Hargitt and Rogers, 1901)
        - *Iciligorgia schrammi* Duchassaing, 1870*
        - *Titanideum frauenfeldii* (Kölliker, 1865)
    - Suborder Holaxonia
      - Family Plexauridae
        - *Bebryce cinerea* Deichmann, 1936*
        - *Bebryce parastellata* Deichmann, 1936
        - *Muricea pendula* Verrill, 1864
        - *Paramuricea* sp.†
        - *Scleracis guadalupensis* (Duchassaing & Michelotti, 1860)
        - *Thesea nivea* Deichmann 1936
      - Family Gorgoniidae
        - *Leptogorgia cardinalis* (Bayer, 1961)
        - *Leptogorgia euryale* (Bayer, 1952)*
        - *Leptogorgia hebes* (Verrill, 1869)
        - *Leptogorgia punicea* (Milne Edwards & Haime, 1857)
        - *Leptogorgia setacea* (Pallas, 1776)
        - *Leptogorgia virgulata* (Lamarck, 1815)
    - Suborder Calcaxonia
      - Family Ellisellidae
        - *Viminella barbadensis* (Duchassaing & Michelotti, 1864)
  - Order PENNATULACEA
    - Suborder Sessiliflorae
      - Family Renillidae
        - *Renilla reniformis* (Pallas, 1766)
      - Family Kophobelemnidae
        - *Sclerobelemnon theseus* Bayer, 1959*
    - Suborder Subselliflorae
      - Family Virgulariidae
        - *Stylatula elegans* (Danielssen, 1860)
        - *Virgularia presbytes* Bayer, 1955

* range extension for this species

† suspected range extension for this species

Glossary of Octocoral Terms (adapted from Bayer *et al.* 1983)

Anthocodia (*p.* **Anthocodiae)**—distal part of a polyp including the mouth, neck and tentacles, which may or may not be retractable into coenenchyme.

Anthostele—the lower part of the polyp consisting of the gastrodermal canal where it penetrates the coenenchyme; typically not visible on the surface of the colony.

Arborescent—tree-like branching pattern, generally comprising a bare stalk and polyps arranged on the distal branches and twigs (e.g. *Pseudodrifa nigra*).

Armature—the arrangement of the sclerites on the head of a polyp.

Autozooid—a polyp containing eight tentacles and mesenteries; in dimorphic colonies, they are larger than siphonozooids.

Axis—inner supporting structure of some octocoral colonies; may or may not contain sclerites; may be horny and/or calcareous, hollow or solid.

Boundary canals—in Scleraxonia, canals that run longitudinally throughout colony, separating medulla from cortex.

Calyx (*p.* **Calyces,** *adj.* **Calicular)**—stiff, projecting portion of the coenenchyme, typically reinforced by modified sclerites, into which the anthocodia may retract.

Capitate—unbranched colonies with a disk-like, spherical or hemispherical terminus on a narrow stalk, commonly resembling a club or torch (e.g. *Nidalia occidentalis*).

Capstan—an elongate sclerite with two girdles of warts or tubercles at each end (e.g. *Leptogorgia hebes*); often named by number of tubercles (e.g. triradiate capstan).

Coenenchyme (*adj.* **Coenenchymal)**—the common colony tissue between the polyps, consisting of mesoglea penetrated by solenia and gastrodermal canals and containing sclerites.

Collaret—a ring of transversely-arranged, bowed anthocodial sclerites located below the bases of the tentacles; typically associated with points (see below), forming a 'collaret and points' arrangement.

Contractile—ability of an anthocodia to reduce in size without inversion into the upper part of the anthostele within the coenenchyme, often accomplished by folding the tentacles inward.

Cortex (*adj.* **Cortical)**—In Scleraxonia, the layer of coenenchyme surrounding the medulla.

Dichotomous—branching pattern displaying a repeating bifurcation (e.g. *Iciligorgia schrammi*).

Digitiform—unbranched, finger-like colony form (e.g. *Bellonella rubistella*)

Dimorphic—having two types of polyps, autozooids and siphonozooids (e.g. Pennatulacea).

Disk-spindle—spindle-shaped sclerite that displays the fusion of warts into girdles on one or both sides (e.g. *Leptogorgia setacea*).

Double cone—a spindle-like sclerite with a medial constriction and acute ends (e.g. *Viminella barbadensis*).

Double head—a sclerite with a medial constriction and blunt ends (e.g. *Viminella barbadensis*).

Fistulose—a state in which the end of a flattened branch is rolled inward, partially fusing and forming a terminal groove (e.g. *Iciligorgia schrammi*).

Foliated club—elongate sclerite with an enlarged end adorned with leaf-like or spinous processes (e.g. *Pseudodrifa nigra*).

Foliose—resembling a leaf; dorsoventrally compressed and broad (e.g. *Renilla reniformis*).

Lobed—colonies with a few short, stout branches, often with clusters of polyps at tips (e.g. *Pseudodrifa nigra*)

Loculation (*n.* **loculus,** *n. p.* **loculi**)– the presence of spaces between layers of gorgonin in a holaxonian axis, which may be filled with calcified material, often very prominent in Plexauridae (**loculi** refers the pockets or empty spaces between the layers).

Medulla—inner supporting structure of a scleraxonian colony, comprised of sclerites often bound together with various amounts of horny gorgonin.

Monomorphic—having one type of polyp, autozooids.

Monopodial—branching in which a primary polyp gives rise to lateral daughter or budded polyps (e.g. *Telesto* sp., *Carijoa riisei*).

Oozooid—enlarged and modified polyp of the pennatulacean colony bearing autozooids and siphonozooids.

Peduncle—often called a stalk, the lower, bare portion of a pennatulacean colony that anchors in soft substrate.

Pinnate—branching in one plane that appears feather-like (e.g. *Muricea pendula*).

Planar—branching colonies that grow in one plane; fan-like.

Plate—a broad, flat, irregularly shaped sclerite (e.g. *Scleranthelia rugosa*).

Platelet—a small flattened sclerite of diverse outline (e.g. *Sclerobelemnon theseus*).

Points—sets of anthocodial sclerites, often bent spindles, forming eight longitudinal groups at the base of each tentacle; located above the collaret (if present), forming a 'collaret and points' arrangement.

Polyp leaves—flattened expansions bearing secondary polyps in some pennatulaceans, such as Virgulariidae.

Polyp mounds—raised regions of the coenenchyme into which polyps retract; not reinforced by modified or specialized sclerites.

Primary polyp—polyp (in Clavulariidae) giving rise to lateral or daughter polyps; often the polyp farthest from substrate.

Rachis—fleshy part of a tentacle from which pinnules arise; in Pennatulacea, the part of the oozooid that produces the other polyps.

Retractile—ability of an anthocodia to fully withdraw into the upper part of the anthostele within the coenenchyme.

Sclerite—microscopic, calcareous structures found in the coenenchyme, anthocodiae, and sometimes in the axes of octocorals.

Siphonozooid—in dimorphic colonies, a polyp with reduced tentacles and mesenteries; smaller and less conspicuous than autozooids.

Spindle—common sclerite shape displaying an elongate form and tapering ends (e.g. Gorgoniidae).

Stellate plate—flat sclerite with peripheral lobes, appearing star-like, sometimes with a protruding knob in the center (e.g. *Bebryce parastellata*).

Stolon—an extension of the coenenchyme that traverses the substrate and connects polyps or colonies, often broad and ribbon-like.

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