

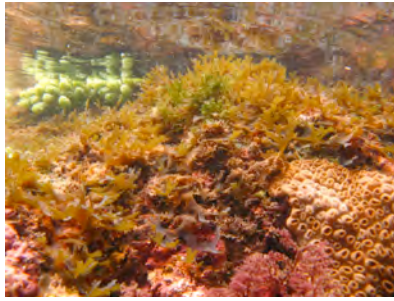
**Training in Tropical Taxonomy**  
**9-23 July, 2008**  
**Tropical Field Phycology Workshop**



**Field Guide to Common Marine Algae  
of the Bocas del Toro Area**

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**Kevin Miklasz**  
**Andrea Eugenia Planas Orellana**  
**Jimena Samper Villareal**  
**Liz Sargent**  
**Thomas Sauvage**  
**Samantha Schmitt**  
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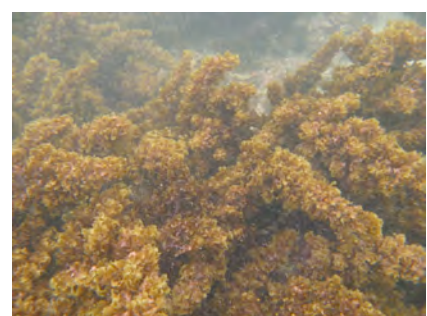


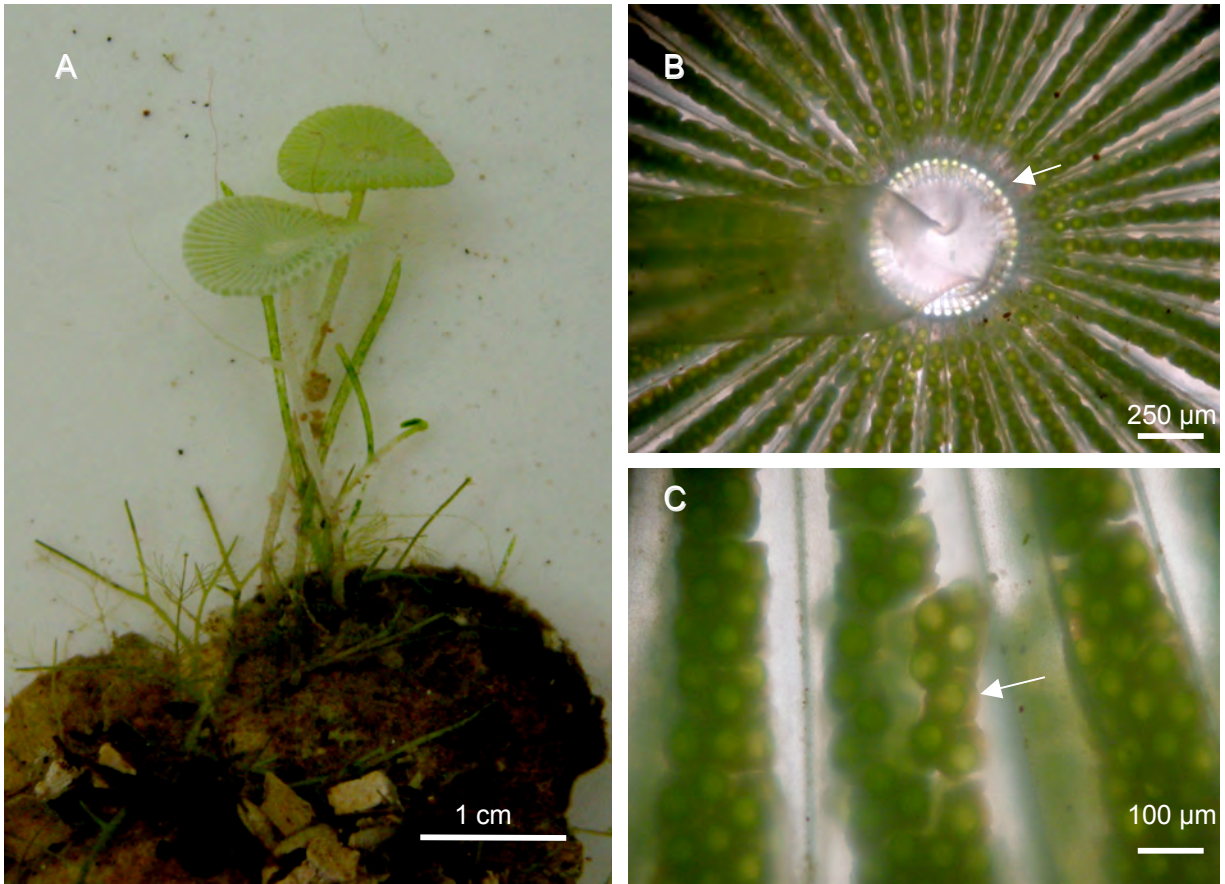
From July 9<sup>th</sup>-23<sup>rd</sup>, 2008, 11 graduate and 2 undergraduate students representing 6 countries (Colombia, Costa Rica, El Salvador, Germany, France and the US) participated in a 15-day Marine Science Network-sponsored workshop on Tropical Field Phycology. The students and instructors (Drs. Brian Wysor, Roger Williams University; Wilson Freshwater, University of North Carolina at Wilmington; Suzanne Fredericq, University of Louisiana at Lafayette) worked synergistically with the Smithsonian Institution's DNA Barcode initiative. As part of the Bocas Research Station's Training in Tropical Taxonomy program, lecture material included discussions of the current taxonomy of marine macroalgae; an overview and recent assessment of the diagnostic vegetative and reproductive morphological characters that differentiate orders, families, genera and species; and applications of molecular tools to pertinent questions in systematics.

Instructors and students collected multiple samples of over 200 algal species by SCUBA diving, snorkeling and intertidal surveys. As part of the training in tropical taxonomy, many of these samples were used by the students to create a guide to the common seaweeds of the Bocas del Toro region. Herbarium specimens will be contributed to the Bocas station's reference collection and the University of Panama Herbarium. Many of the samples will also be used to elucidate phylogenetic and biogeographic questions pertaining to Panamanian algae in a worldwide context. The workshop also proved successful in its goal to establish a collaborative network of Central American algal researchers.

A special project was also initiated to barcode the Gracilariaceae (red algae) and Dictyotaceae (brown algae) for the Bocas Barcode Initiative in collaboration with Dr. Amy Driskell of the Smithsonian Institution's National Museum of Natural History.

This workshop was funded by the Smithsonian Institution's Marine Science Network, with additional support from the National Science Foundation's Biodiversity Surveys and Inventories Program, and the NSF Partnership for the Enhancement of Expertise in Taxonomy (PEET) Program.





***Acetabularia schenckii*** K. Möbius. Bryopsidophyceae, (Dasycladales, Polyphysaceae) A. Hábito (TFP 0257), B. Corona inferior, C. Gametangio con cistes recubiertos por carbonato de calcio.

•**Hábitat**

Sobre fragmentos de conchas en áreas protegidas entre pastos marinos cerca de raíces de mangle. A menos de 1 m de profundidad.

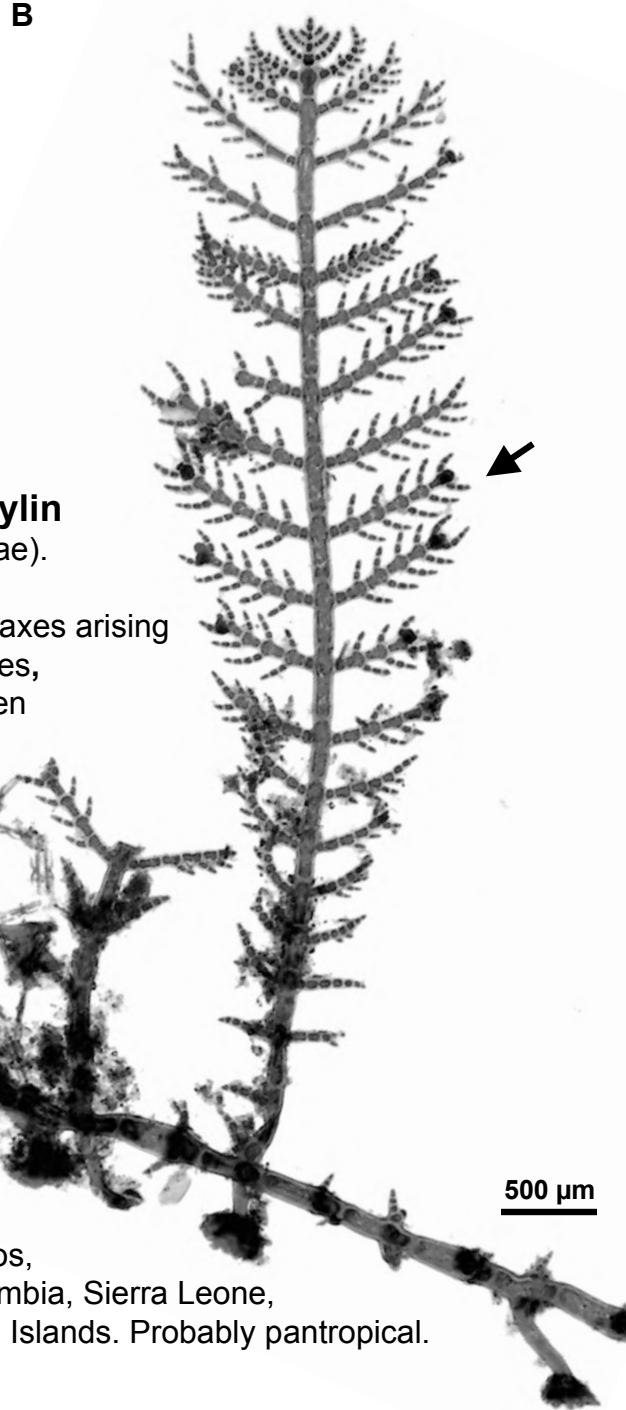
•**Distribución BdT**

San Cristobal Magrove Cove

•**Distribución Mundial**

Islas Caribe, Florida, Venezuela, Caribe Costa Rica y Panamá

Talos solitarios o grupos pequeños. Posee corona superior e inferior. Pedúnculo largo. La principal característica de esta especie es que los cistes están rodeados por una capa de carbonato de calcio.



***Acrothamnion butlerae* (Collins) Kylin**  
(Florideophyceae, Ceramiales, Ceramiaceae).

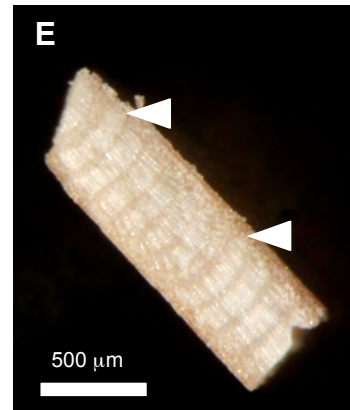
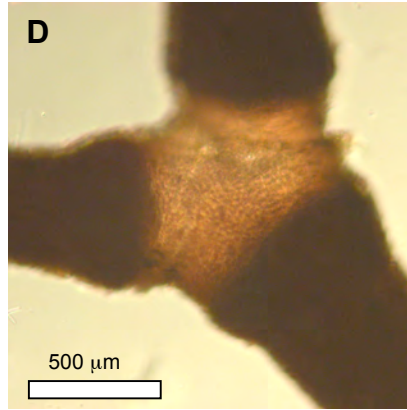
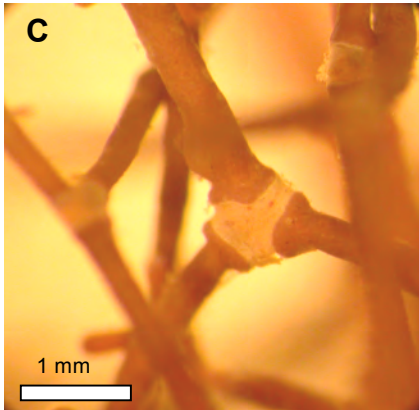
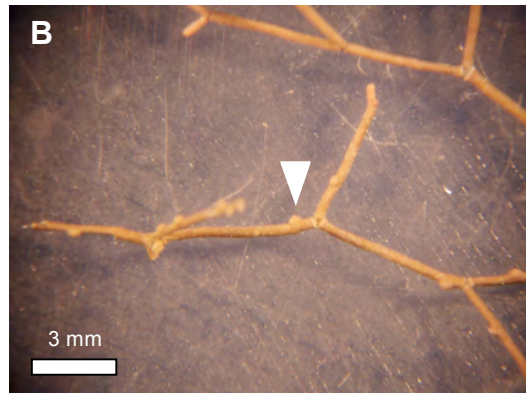
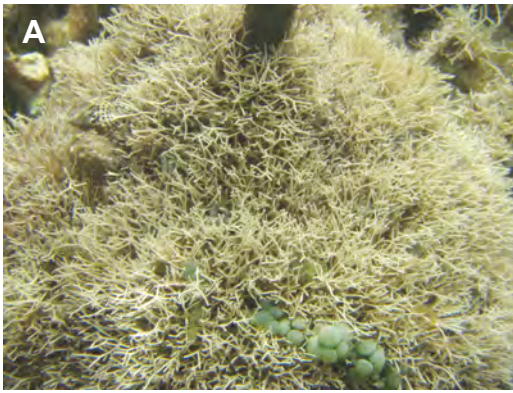
**A.** Habit of live specimen depicting 3 erect axes arising from a common creeping axis. **B.** Erect axes, creeping axis and gland cell (arrow) between terminal pair of branchlets.

**Habitat:**  
Subtidal in turf assemblages or epiphytic on macroalgae.

**BdT distribution:**  
Wild Cane Key (10m)  
(Specimen TFP08 #0033).

**Worldwide distribution:**  
Jamaica (type locality), Bahamas, Barbados, Caicos Islands, Virgin Islands, Cuba, Colombia, Sierra Leone, Maldives, India, southern Japan, Hawaiian Islands. Probably pantropical.

**Note:**  
Currently with 2 species in the genus: *A. preissii* (Sonder) E.M. Wollaston and *A. butlerae* (F.S. Collins) Kylin. Some key features of this genus are the presence of indeterminate erect axes with 2-4 opposite branches (pinnae) per axial cell. A terminal refractive gland cell is present at the tip of the pinnule, which bear opposite branchlets. (Note: *A. butlerae* can easily be confused with *Perikladosporon percurrens*; the latter can be differentiated by the unilateral branching pattern of the pinnules and the lack of terminal gland cells.



***Amphiroa fragilissima* Linnaeus** (Florideophyceae, Corallinales, Corallinaceae) TFP08-166. A) Specimens growing *in situ*. B) Intergenicula of equal length, with a conceptacle (arrowhead). C) Branches with swollen ends. D) Multi-tiered geniculum. E) Longitudinal section through intergeniculum showing 6 rows of long cells alternating with a row of short cells (arrowheads).

**•Habitat**

Forms mats of tangled fronds on most substrata, especially on rocks or on live or dead corals, to 60 m depth.

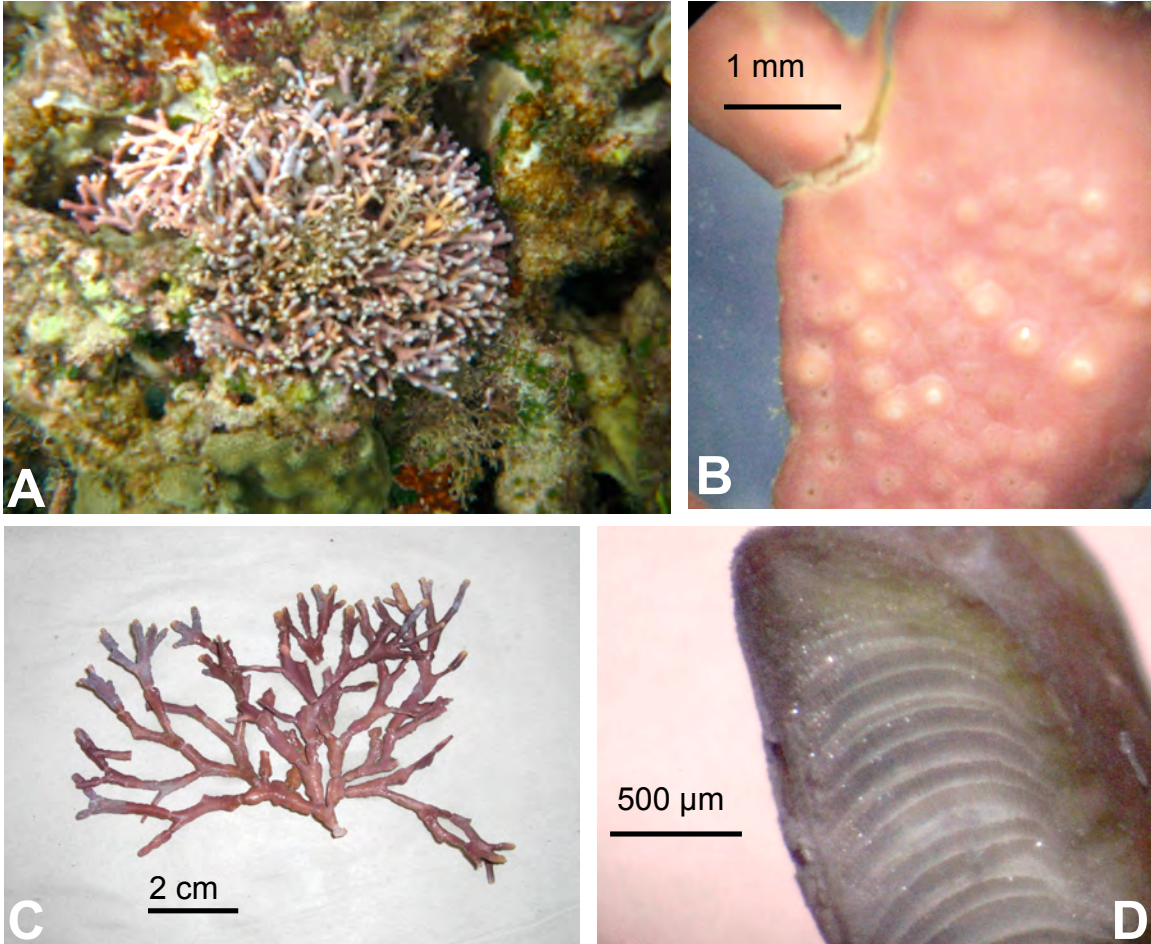
**•BdT Distribution**

STRI dock, Tervi Bight, Isla Carenero, Bastimento Solarte Channel

**•Worldwide Distribution**

Worldwide

*Amphiroa fragilissima* is extremely fragile, as the name implies. The calcified branches will often crack and break upon collection and handling. This species could be confused with the similarly sized *Jania spp.* from which it can be distinguished by the presence of: **1)** multi-tiered genicula (D), and **2)** dichotomies arising from genicula, not intergenicula (C). *A. fragilissima* is mainly distinguished from other local *Amphiroa* species by its fragility and minute size. Longitudinal sections reveal rows of elongated cells alternating with a single row of short cells (for *A. fragilissima*, 4-8 rows of long cells per row of short cells, see E).



***Amphiroa hancockii*** W.R. Taylor (Rhodophyceae, Corallinales, Corallinaceae). (A) Specimen on rocky substratum (Wild Cane Key, Bocas del Toro, Panama), (B) Close-up of hemispherical conceptacles, (C) Pressed specimen for herbarium collection (TFP08-0024), (D) Longitudinal section showing tiered medullary cells.

•**Habitat**

Found growing on rocks, coral, and coral rubble (dead coral)

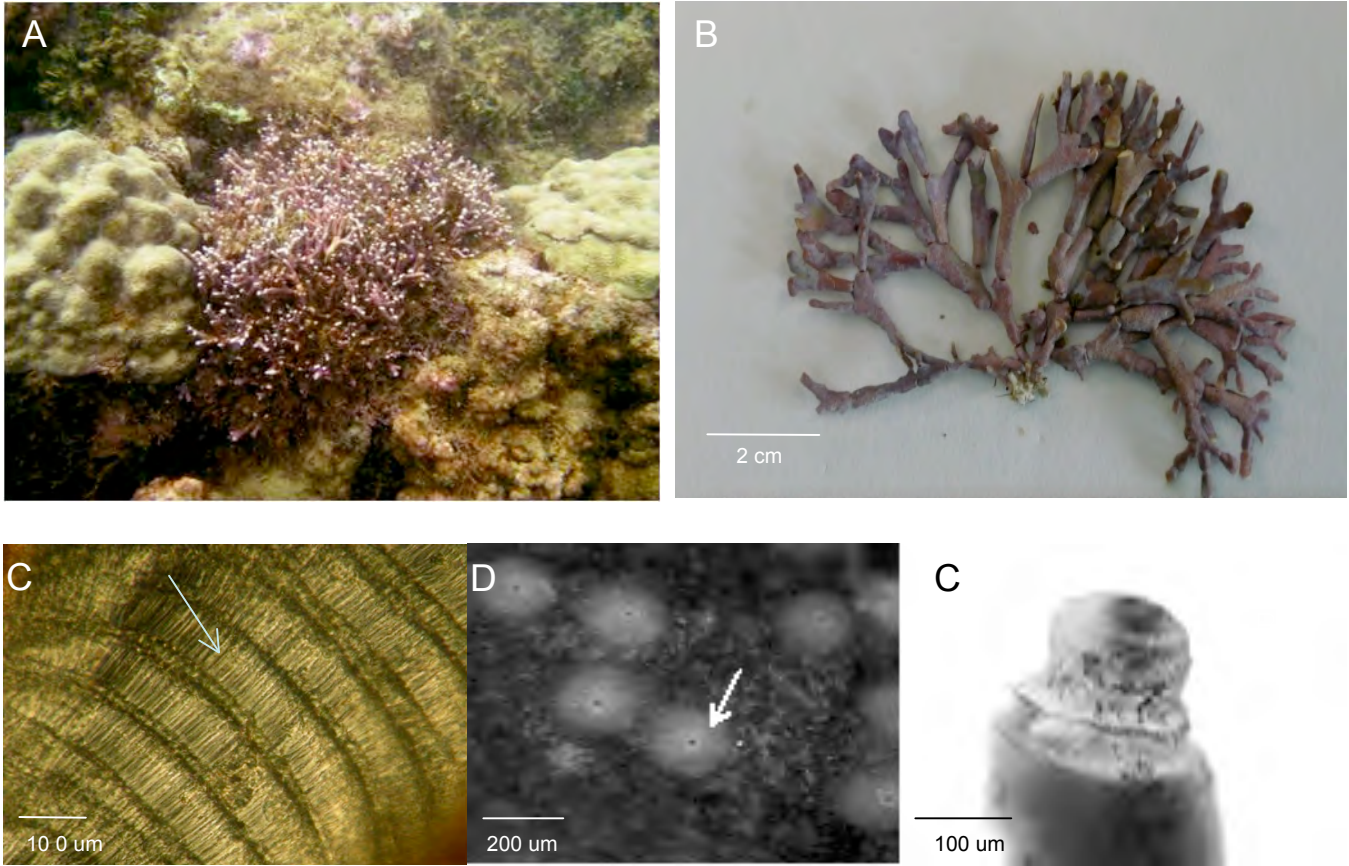
•**BdT Distribution**

Wild Cane Key, Isla Carinero, Turvey Bight

•**Worldwide Distribution**

Central America (Panama, Honduras, Costa Rica), Caribbean Islands (Caribbean, Hispaniola, Lesser Antilles), South America (Colombia), Southwest Asia (Philippines)

Heavily calcified. Pink or purple to light brown. Mature branches stout, flat (greater than 2 mm diam.), irregular to dichotomous branching, without central vein (versus *Amphiroa tribulus* with distinct center vein). Medullary tiers composed of 1-2 transverse rows of long cells alternating with 1 row of short cells. Conceptacles crowded on fertile segments with solitary terminal pore.

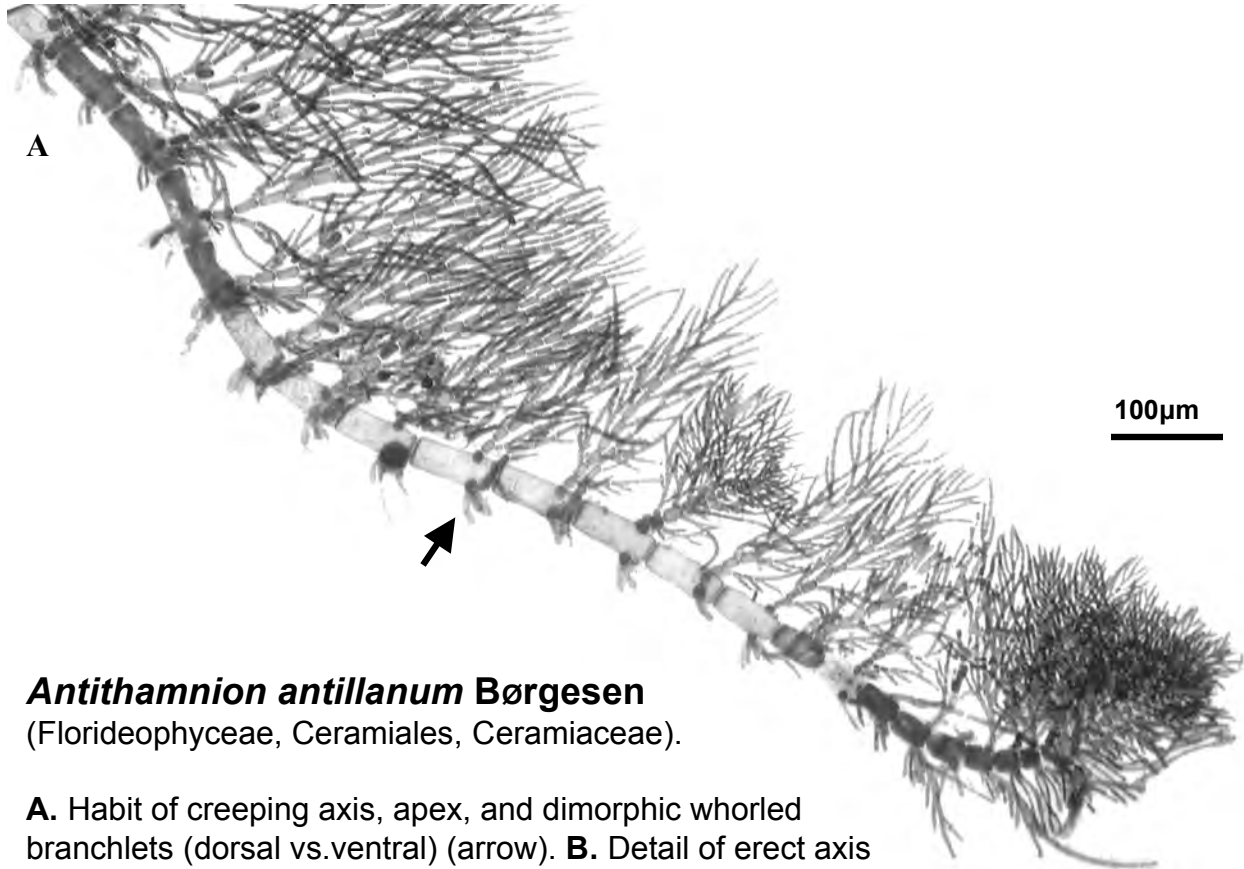


***Amphiroa hancockii* W.R. Taylor** (Florideophyceae, Corallinales, Corallinaceae), TFP08-0163. Specimen growing on rubble among corals. A. Habit of herbarium specimen TFP08-0163, B. Longitudinal section through branch segment. Arrow points to transverse rows of elongated cells, C. Hemispherical reproductive conceptacles on thallus surface; arrow points to single conspicuous pore per conceptacle; D. Close up of uncalcified intergenicular joint

**BdT Distribution:** Most often found on coral rubble, dead coral, rocky substratum in Wild Cane Cay (TFP08-0024, 0039, 0058, 0077), Isla Carenero (TFP 08-0119), Tervi Bight (0,163, 0170, 0171, 0178), Swan Cay (TFP08-0360, 0364, 0365, 0383)

**Worldwide Distribution:** Caribbean Sea (Honduras, Hispanola, Lesser Antilles, Colombia).

Thallus heavily calcified, pink-purple, forming clumps to 15 cm diam., branching irregular to subdichotomous. Branches up to 1 cm wide, segments cylindrical to flattened, terminal branchlets tapered. Conceptacles conspicuous, with single pore. Medulla with series of single transverse rows of long cells (100 μm) alternating with single row of short cells.



***Antithamnion antillanum* Børgesen**  
(Florideophyceae, Ceramiales, Ceramiaceae).

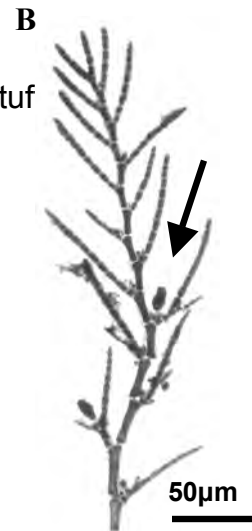
**A.** Habit of creeping axis, apex, and dimorphic whorled branchlets (dorsal vs.ventral) (arrow). **B.** Detail of erect axis (pinnae) exhibiting alternate distichous branching and adaxial tetrasporangia (arrow).

**Habitat:** Creeping on crustose corallines in crevices, forming dense turf Intertidal to shallow subtidal (<1 m depth).

**BdT distribution:** Flat Rock Beach (Specimen TFP08 #0268).

**Worldwide distribution:**

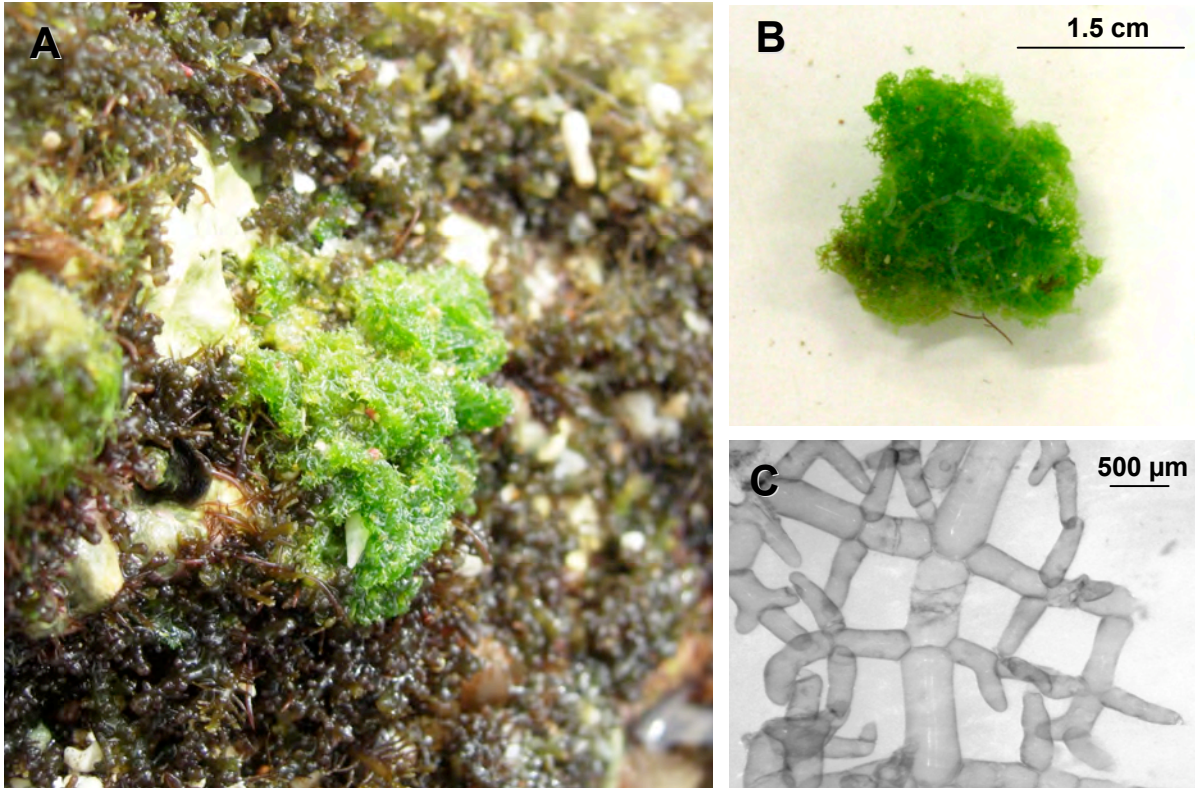
Virgin Islands (type locality), Caribbean, Mediterranean, Eastern Australia, Southern Japan, Mauritius, Hawaiian Islands. Tropical to temperate.



**Note:**

The genus *Antithamnion* is characterized by having prostrate and erect axes (pinnae), and 2 whorl branchlets per axial cell. These are dimorphic in *A. antillanum*, the ventral one short and simple, the dorsal one alternate-distichous. Gland cells are placed adaxially on the pinnules when present. Cruciatly divided tetraspores often present for this species.





***Boodlea composita*** (Harvey) F. Brand (Ulvothlyceae, Chladophorales, Boodleaceae). (A) Habit of specimen attached to hard substratum in high energy intertidal area (Flat Rock Beach, Bocas del Toro, Panama); (B) Sample for herbarium collection showing habit of sponge-like tufts (TFP08-0307); (C) Close up of thallus network showing fused cells from neighboring filaments.

### Habitat

Attached to hard substratum (rock or dead coral), intertidal (less than one meter).

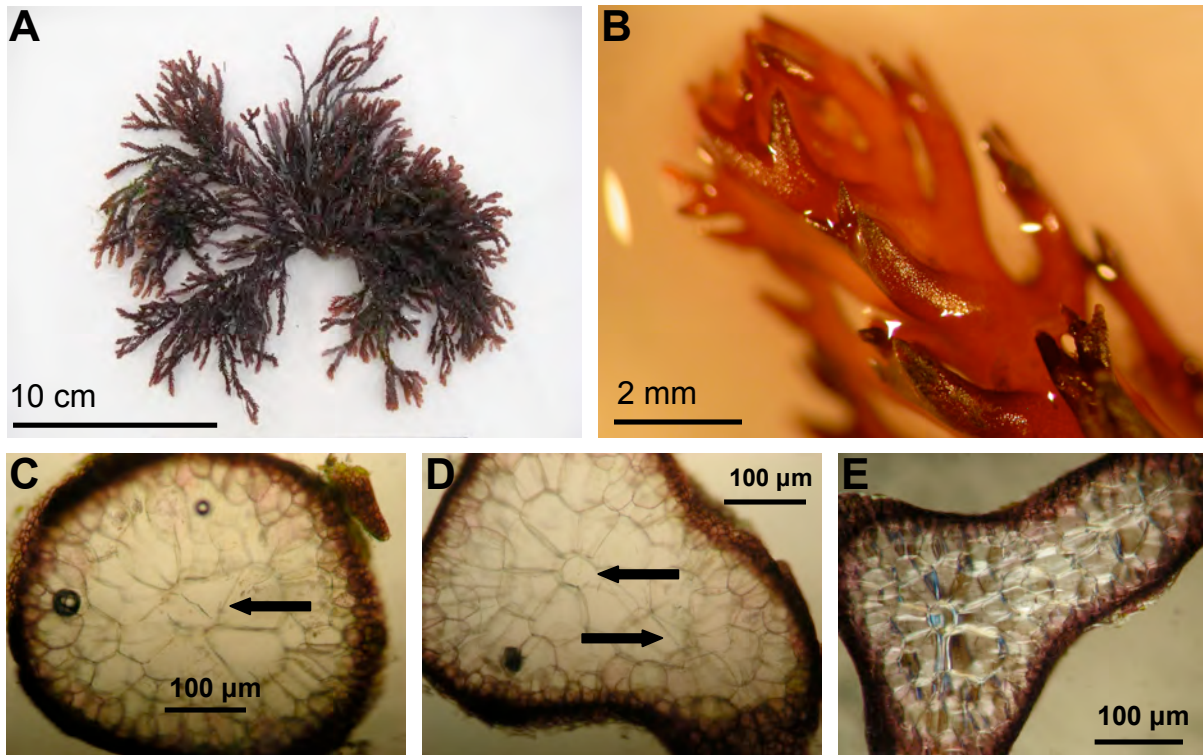
### BdT Distribution

Flat Rock Beach.

### Worldwide Distribution

Atlantic Islands (Bermuda, Cape Verde Islands), North America (Mexico), Central America (Panama), South America (Ecuador, Venezuela), Africa, Indian Ocean Islands, Asia, Pacific Islands, Australia and New Zealand.

Uncalcified thallus forming sponge-like tufts branched in all directions (versus those in the genera *Struvea* and *Phyllocladion* which develop in one plane). Branches commonly attached to other branches with which they come in contact by tenacular cells. Branching rather irregular, thallus not stalked (versus *Boodlea struveoides* which has more regular, often opposite branchlets in a single plane, and with a distinct stipe).



***Bryothamnion triquetrum*** (S.G. Gmel.) M. Howe (Florideophyceae, Ceramiales, Rhodomelaceae). (A) Pressed specimen for herbarium collection (TFP08-0068), (B) Branch apices, (C) Transverse section through thallus below branch showing central axial filament (arrow), (D) Transverse section through thallus near side branch showing central axial filaments for main axes and branch (arrows), (E) Transverse section showing three-sided nature of branch.

•**Habitat**

Found growing intertidal on jagged limestone shoreline on seaward side of small island (not in immediate “squash” zone).

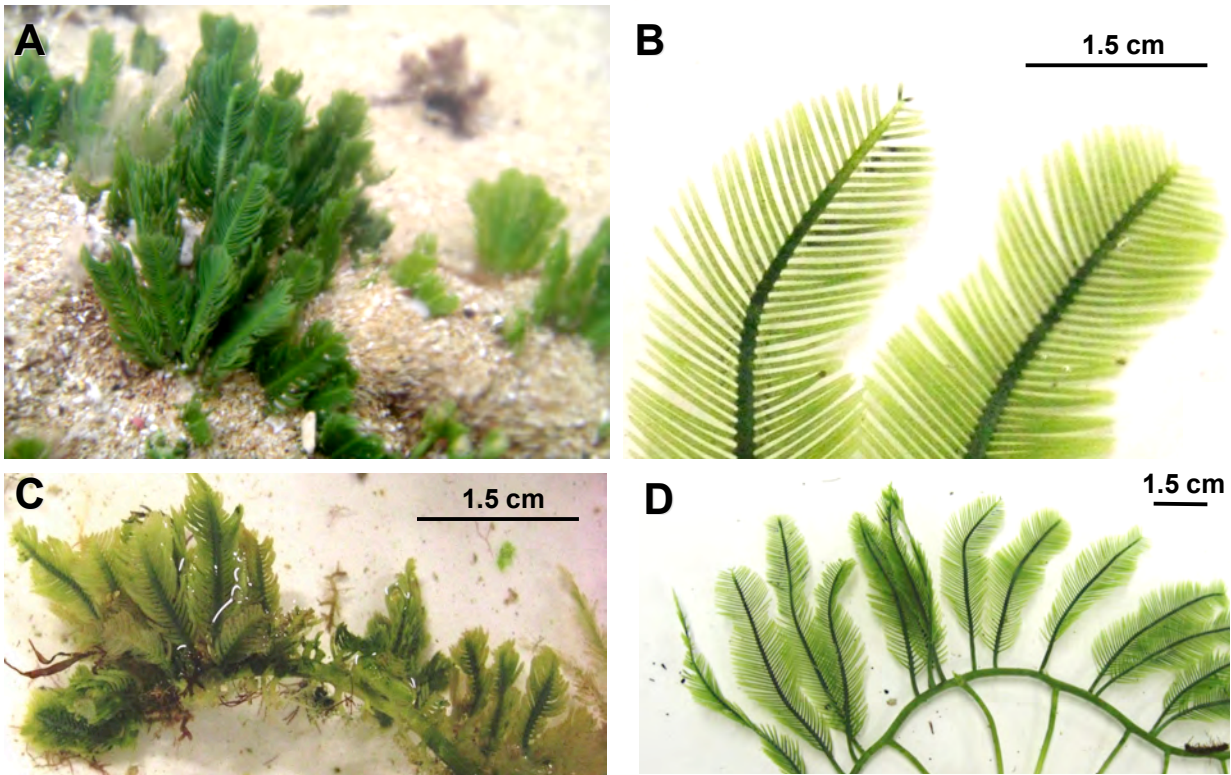
•**BdT Distribution**

Swan Key

•**Worldwide Distribution**

Atlantic Islands (Cape Verde Islands), North America (Florida, Mexico), Central America (Costa Rica, Panama), Caribbean Islands (Bahamas, Barbados, Caribbean, Cuba, Hispaniola, Jamaica, Lesser Antilles, Netherlands Antilles, Puerto Rico, Trinidad & Tobago, Virgin Islands), South America (Brazil, Venezuela), Africa (Angola, São Tomé & Príncipe).

Thallus coarse and bushy. Branching irregularly alternate. Branchlets stiff, arranged in three vertical rows, often spiraling or twisting. Apices incurved and forked. Disklike holdfast.



**Caulerpa sertularioides** (S.G. Gmelin) M.A. Howe (Ulvoephyceae, Bryopsidales, Caulerpacae). (A) Specimen growing on sandy substratum showing typical growth pattern (Flat Rock Beach, Bocas del Toro, Panama); (B) Close up of specimen for herbarium collection (TFP08-0209) illustrating feather-like fronds with branchlets of similar length; (C) Shorter fronds found in specimen from high energy site, on hard substratum (TFP08-0300); (D) Tall fronds found in specimens from low energy site in mangrove and seagrass areas, growing on mangrove prop roots (TFP08-0209).

### Habitat

Sandy or mixture of sandy and muddy substrata, mangrove prop roots, or on hard bottoms (rock and dead coral), in both wave-exposed and calm areas. From 0 to 3 meters in depth.

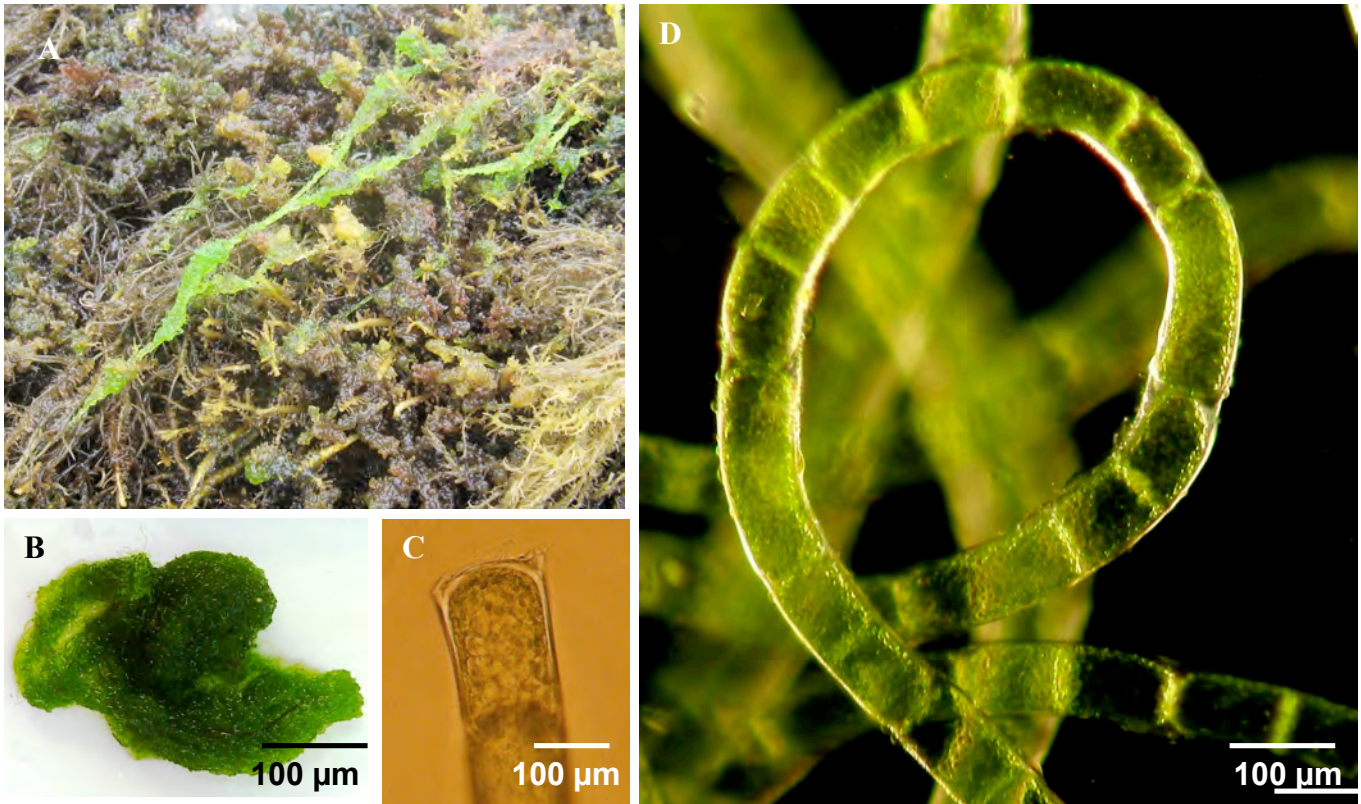
### BdT Distribution

Smithsonian Research Station Bay, San Cristobal Mangrove Cove, and Flat Rock Beach.

### Worldwide Distribution

Europe, Atlantic Islands, North America, Central America (Belize, Costa Rica, Panama), Caribbean Islands, South America (Brazil, Colombia, and Venezuela), Africa, Indian Ocean Islands, Asia, Australia and New Zealand, Pacific Islands

Fronds feather-like with two opposite rows of cylindrical branchlets in one plane. Length of branchlets more than double their diameter, and branchlet apices not swollen. General appearance and texture delicate or fine (versus *Caulerpa ashmeadii* which is large and coarse), with unbranched fronds (versus *Caulerpa sertularioides f. longiseta* that branches dichotomously 2-4 times per frond).



**Figure 1.** *Chaetomorpha gracilis* (Bory de Saint-Vincent) Kützing (Bryopsidophyceae, Cladophorales, Cladophoraceae) TFP08-296. A. Specimen in the field. B. Cluster of filaments from herbarium specimens. C. Two cells. D. Microscopic view of filament.

**•Habitat**

**BdT:** epiphytic, hard substratum in the intertidal

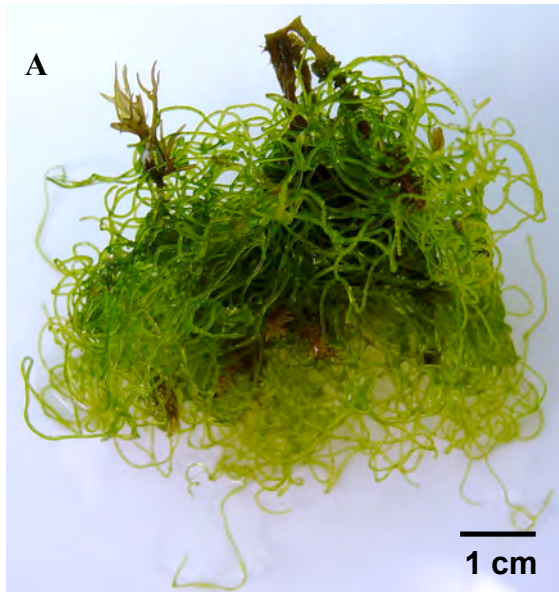
**General:** on hard rocky surfaces; filamentous mass draped over rocks, often in high energy areas, intertidal

**•Distribution**

**BdT:** Flat Rock Beach (TFP08-296, TFP08-342, TFP08-392)

**General:** Florida, Greater Antilles, Lesser Antilles, Southern Caribbean, Western Caribbean, Gulf of Mexico, Bermuda, Brazil

Thallus bright yellow-green, fine, stringy, composed of masses of uniseriate filaments, to 15(-200) cm long; filaments curled or twisted, loosely attached by basal cell, easily fragmenting. Cells cylindrical, 32-100(-120) µm in diameter.



**Figure 1. *Chaetomorpha linum* (O.F. Müller) Kützing** (Bryopsidophyceae, Cladophorales, Cladophoraceae) TFP08-386. A. Habit of entangled filaments; B. Microscopic view- *C. linum* (left) versus *C. gracilis* (right)

**•Habitat**

**BdT:** entangled with other algae

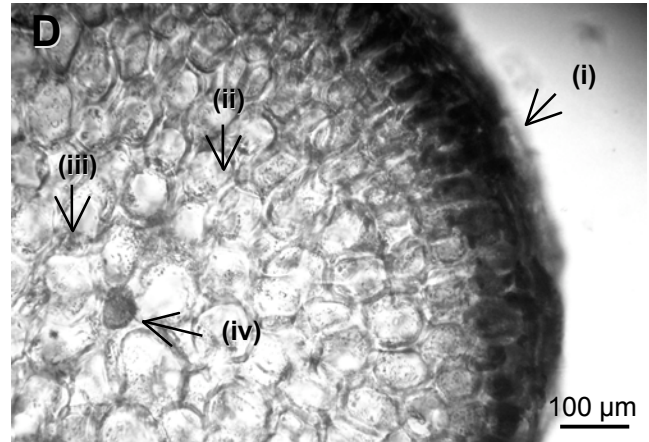
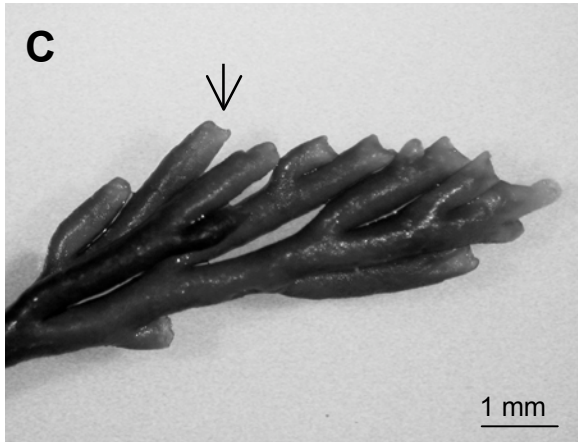
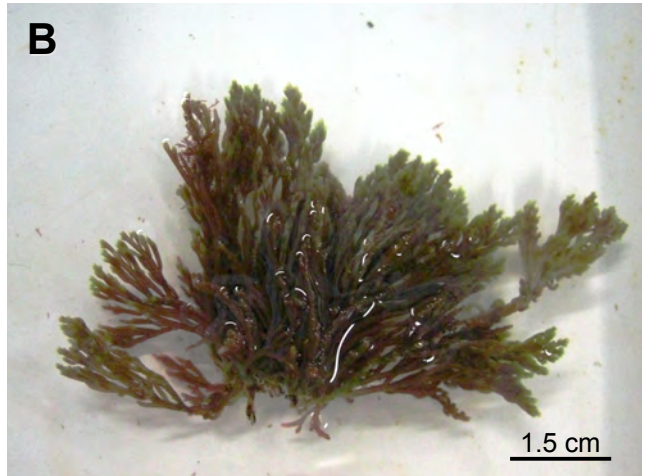
**General:** as mats or mounds lying free in high-nutrient areas (near bird-inhabited islands); to 3 m deep.

**•Distribution**

**BdT:** Swan Cay (TFP08-386)

**General:** Florida, Bahamas, Greater Antilles, Lesser Antilles, Southern Caribbean, Western Caribbean, Gulf of Mexico, Brazil.

Thallus, yellowish green, composed of large, unattached, loosely entangled stiff uniseriate filaments; forming mounds to 1 m high and 2 m wide; cells cylindrical (80-)100-375(-400)  $\mu\text{m}$  in diameter.



**'*Chondria filiformis*'<sup>1</sup>** C. Agardh (Florideophyceae, Ceramiales, Rhodomelaceae). (A) Habit of specimen adhering to hard substratum in high energy area (Flat Rock Beach, Bocas del Toro, Panama); (B) Specimen for herbarium collection (TFP08-0363); (C) Close up of typical branching pattern with apical cells and trichoblasts sunken in terminal pits (arrow); (D) Transverse section through thallus with cortical cells (i), medullary cells (ii), and 5 pericentral cells (iii) surrounding the central axial cell (iv).

### Habitat

Hard substratum (rock and dead coral), in high energy area, growing in less than one meter depth.

### BdT Distribution

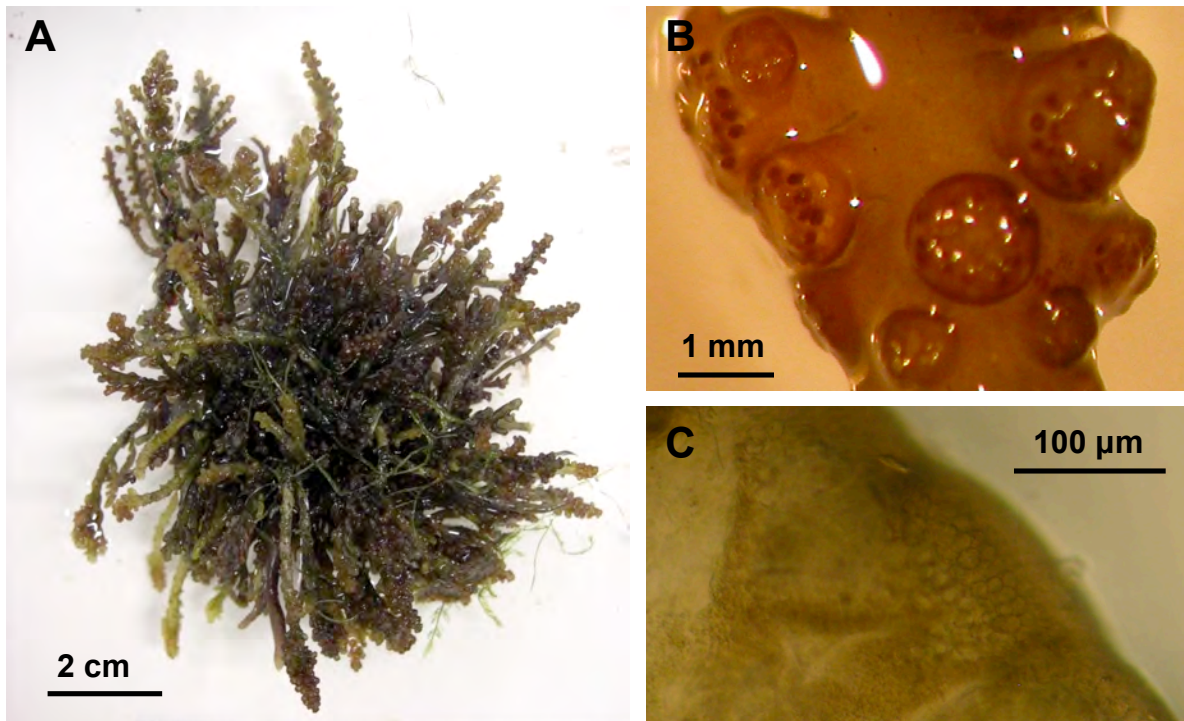
Flat Rock Beach (TFP08-0363).

### Worldwide Distribution

North America (Florida), Central America (Belize), Caribbean Islands (Cuba), South America (Brazil, Venezuela), Africa, Asia, Australia and New Zealand.

Thallus not densely branched, with short knobbed branches less than 1 mm in diameter. The central axial cell surrounded by five pericentral cells remains evident in transverse sections. Surface cells greater than 40 μm diameter.

<sup>1</sup>This species is also referred to as *Laurencia filiformis*, but due to the 5 prominent pericentral cells, this taxon belongs in *Chondria* instead. This species needs to be further studied taxonomically.



***Chondrophyucus papillosus*** (C. Agardh.) Garbary & J.T. Harper (Florideophyceae, Ceramiales, Rhodomelaceae). (A) Specimen for herbarium collection (TFP08-0080), (B) Branch showing knob-like branchlets with tetrasporangia crowded near apex, (C) Transverse section through branchlet apex showing apical filament tuft in terminal depression.

•**Habitat**

Found growing intertidal on jagged limestone shoreline on seaward side of small island (“squash” zone).

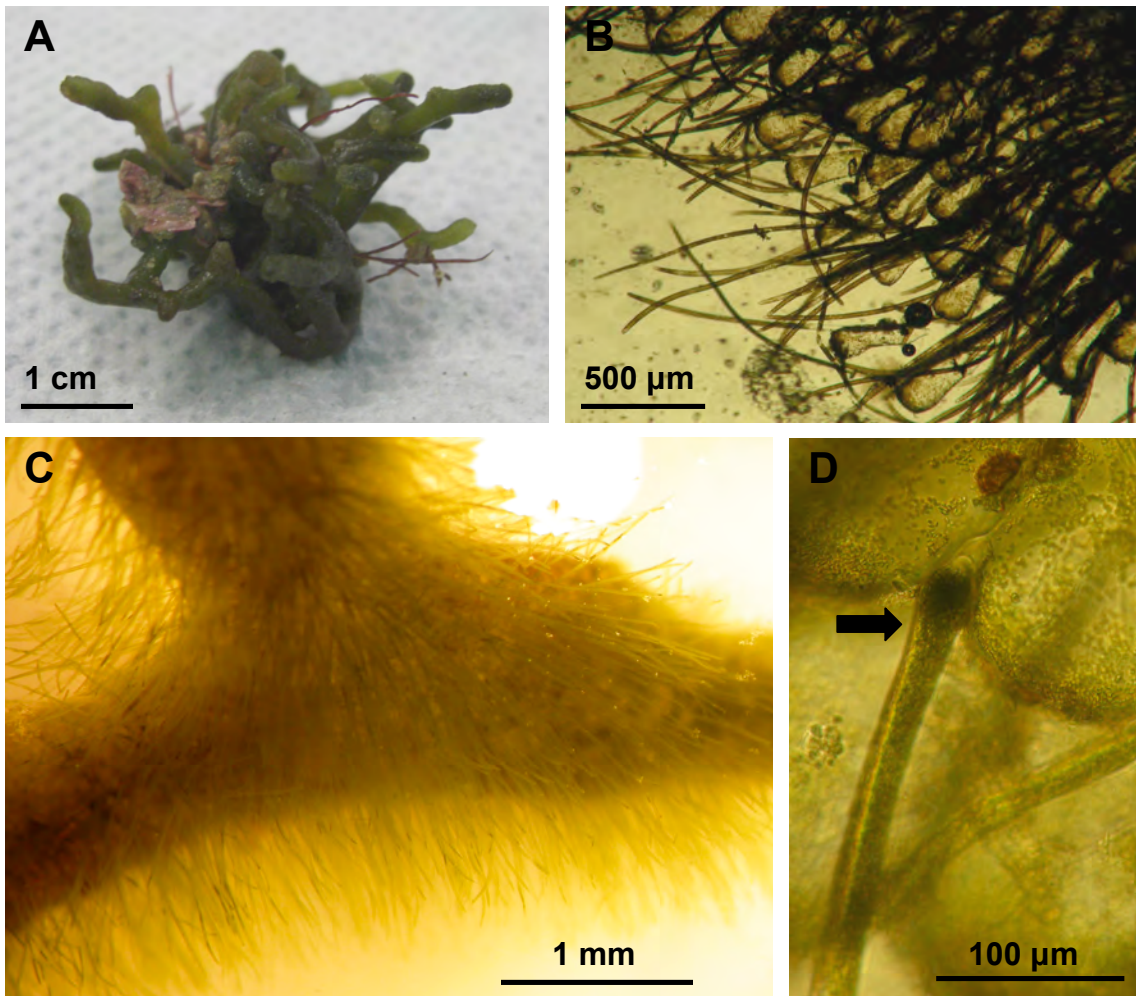
•**BdT Distribution**

Swan Cay, Flat Rock Beach

•**Worldwide Distribution**

Europe, Atlantic Islands (Ascension, Canary Islands, Cape Verde Islands), North America (Florida, Mexico), Caribbean Islands (Cuba), Central America (Panama), South America (Brazil), Africa (Algeria, Cameroon, Egypt, Equatorial Guinea, Gabon, Libya, Mauritania, Morocco, São Tomé & Príncipe, Tanzania, Tunisia), Asia (Southwest, Korea), Australia & New Zealand, Pacific Islands (Micronesia).

Thallus gregarious or solitary, cartilaginous, purple-green to olive-brown. Branching alternate or irregular, branches proximally 1-2 mm diameter, distally densely covered with perpendicularly arranged branchlets. Branchlets short, crowded, knobby, club-like; apices tufted with inconspicuous fine filaments forming in terminal depression. Medullary cells 100-150 μm in diameter, tetrasporangia tetrahedrally divided, tetrasporangial clusters near apical depressions.



***Codium repens*** Vickers (Bryopsidophyceae, Bryopsidales, Codiaceae). (A) Specimen for herbarium collection (TFP08-0345), (B) Surface view of utricles with photosynthetic “hairs”, (C) Close-up of branch showing dense covering of surface “hairs” on utricles, (D) Close-up of pigmented “hair” formed subapically and laterally (arrow) on utricle, growing thallus outward.

•**Habitat**

Found growing on rocky substratum inside tide pool on seaward side.

•**BdT Distribution**

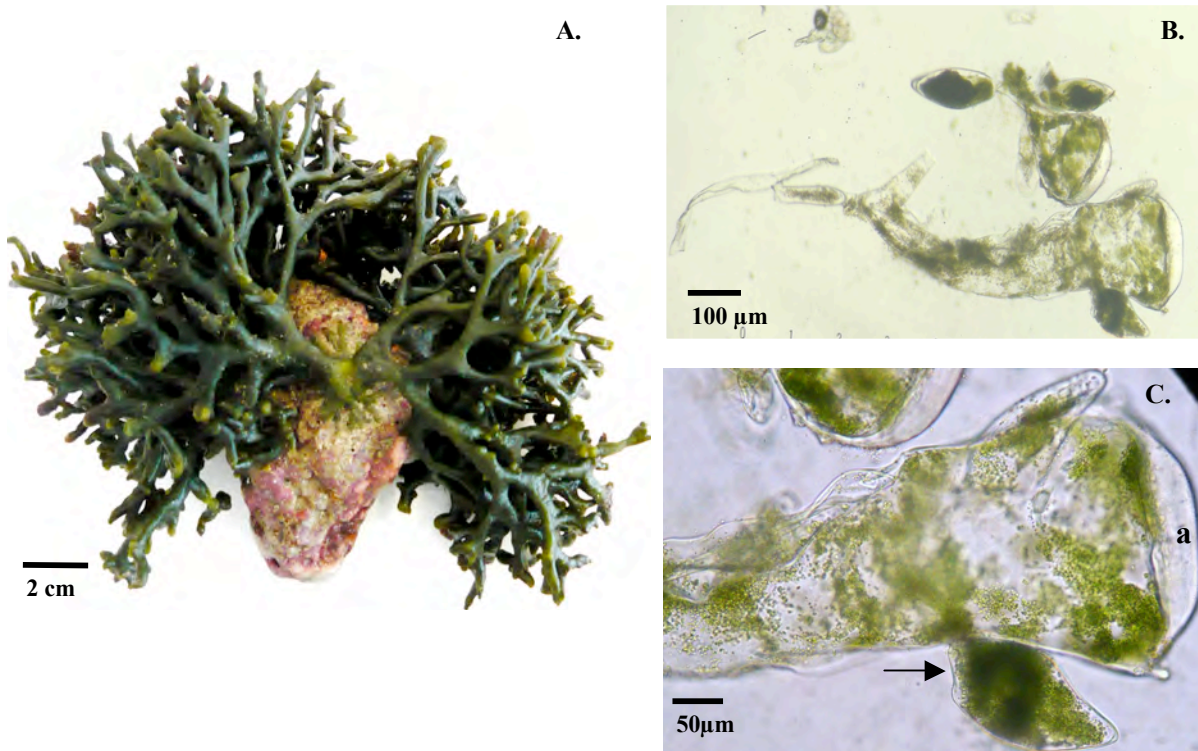
Swan Cay.

•**Worldwide Distribution**

Atlantic Islands (Bermuda, Canary islands, Cape Verde Islands), North America (Florida, Gulf of Mexico), Central America (Belize, Panama), Caribbean Islands (Barbados, Caribbean, Cuba, Lesser Antilles, Netherlands Antilles, Trinidad & Tobago), South America (Brazil, Venezuela), Africa (Egypt), Indian Ocean Islands (Reunion, Seychelles), Asia, Pacific Islands (Micronesia).

Thallus spongy, consisting of cylindrical branches, mostly creeping, loosely following substratum contour, attached at random points (branches occasionally fusing together). Branching mainly pseudichotomous, branches 1-3(-5) mm in diam. Hairs common, generally one (occasionally two) per utricle.





**Figura 1.** *Codium taylorii* P.C. Silva (Bryopsidophyceae, Bryopsidales, Codiaceae) TFP08-0403. **A.** Hábito del espécimen preservado para el herbario; **B.** Utrículos cilíndricos y ovales; **C.** Gametangios ovales desarrollándose en el ápice del utrículo (a).

•**Habitat**

Sobre rocas u otras superficies duras. Pueden establecerse hasta 60 m de profundidad.

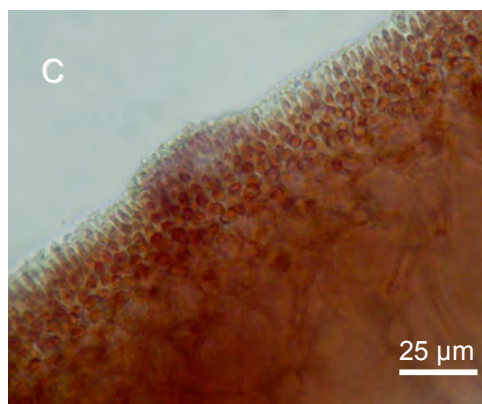
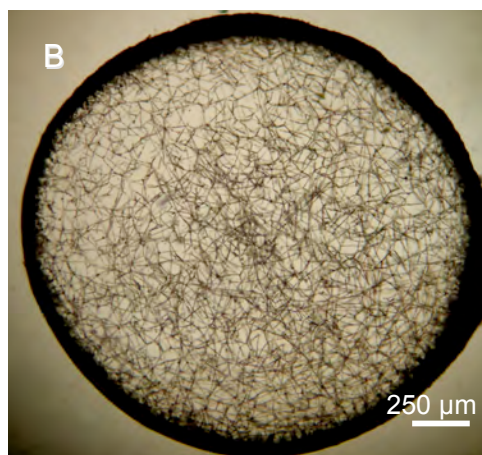
•**Distribución BdT**

Wild Cane Cay (TFP08-0403, TFP08-0050).

•**Distribución mundial**

Islas del Atlántico, Florida, Carolina del Norte, Belice, Islas del Caribe, Colombia, Venezuela, Brasil, Uruguay, Africa, Seychelles, Suroeste de Asia, Tailandia.

Talo erecto de color verde oscuro y consistencia firme. Ramificación subdicotómica con ángulos amplios. Ramas cilíndricas, aplanadas hacia la base y con ápices redondeados. Utrículos ovales y cilíndricos. Gametangios ovales (1-2 por utrículo) hasta 50  $\mu\text{m}$  de diámetro y 730  $\mu\text{m}$  de largo. El grosor del ápice del utrículo (30  $\mu\text{m}$ ) la diferencia claramente de *C. decortcatum* (4-8  $\mu\text{m}$ ).



***Corynomorpha clavata*** (Harvey) J. Agardh (Florideophyceae, Halymeniales, Halymeniaceae). A. Hábito (TFP 0290), B. Corte transversal del talo, C. Células de la corteza.

•**Hábitat**

En sustrato rocoso. Hasta 10 metros de profundidad

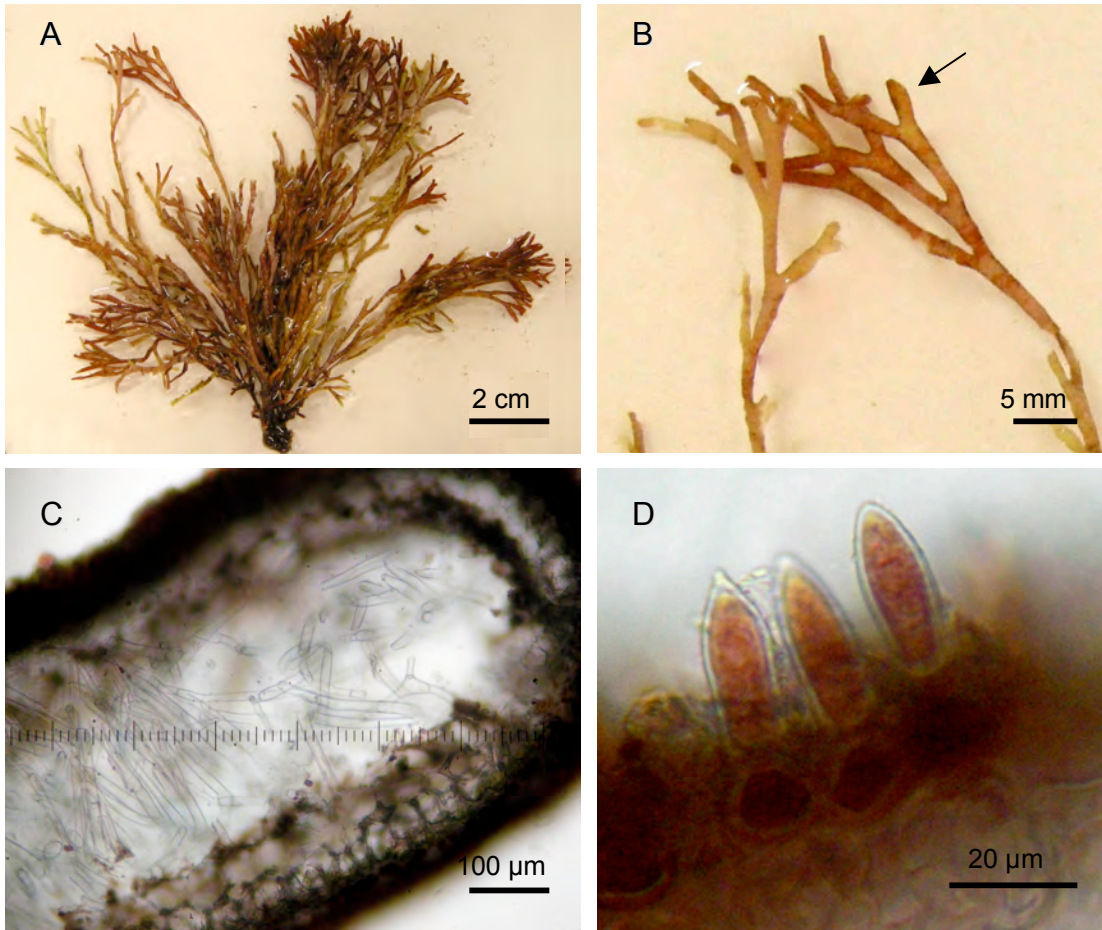
•**Distribución BdT**

Long Bay Point 4

•**Distribución Mundial**

Islas Caribe, Florida, Colombia, Costa Rica

Talo de 7 cm de alto, disminuye gradualmente el diámetro del talo desde el ápice a la base (clavatus), solitario o gregario, rojo oscuro. No ramificado. Células superficiales en filas y presenta filamentos esparcidos en la médula.



***Dichotomaria marginata*** (J. Ellis & Solander) Lamarck (Florideophyceae, Nemaliales, Galaxauraceae). A. Hábito (TFP 0034), B. Ramificación dicotómica aplanada, C. Corte transversal del talo: presenta células de la corteza y filamentos medulares, D. Células superficiales del gametangio

•**Hábitat**

En sustratos arenosos adheridas a rocas. Se encuentra desde pozas intermareales hasta 10 m de profundidad. En arrecifes coralinos y pastos marinos.

•**Distribución BdT**

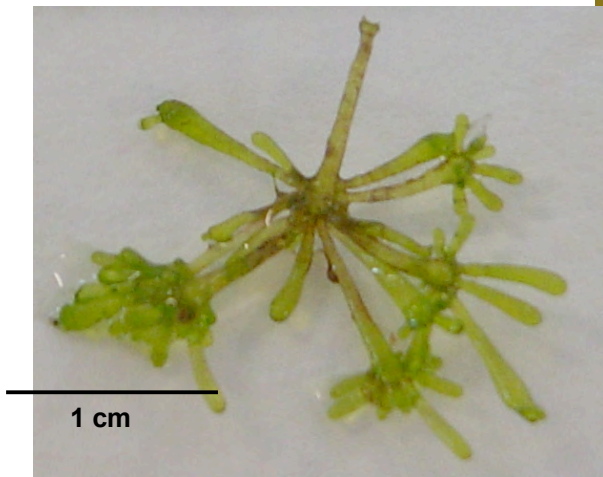
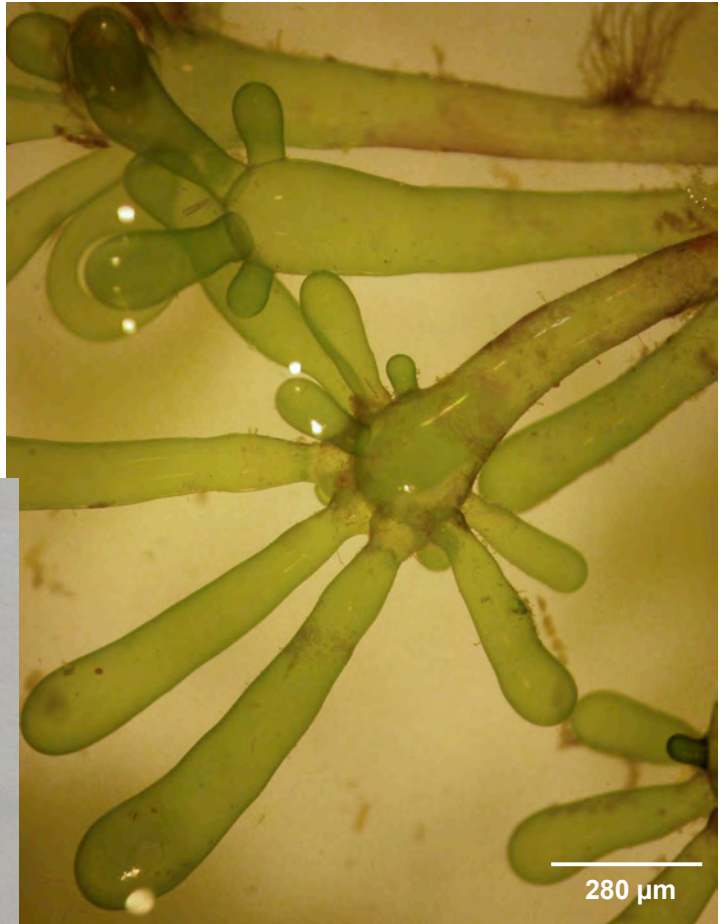
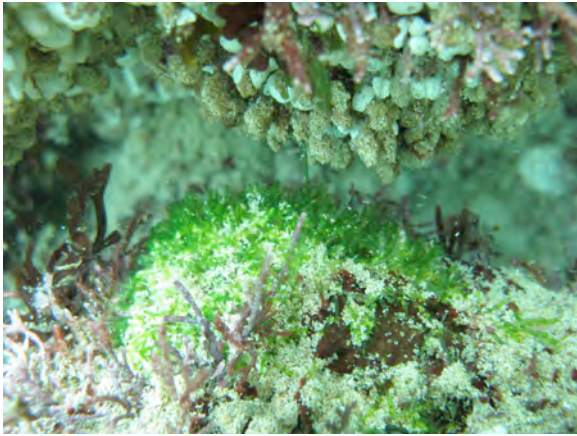
Bahía cerca del STRI, Este de la Isla Carenero, Wild Cane Cay.

•**Distribución Mundial**

Islas Caribe, Panamá, Brasil y Venezuela, Golfo de México y Florida, Taiwan, Filipinas, Hawaii, Islas Galápagos, Pacífico Costa Rica, Mauritius, China

Talo entre 5 y 14 cm de alto, ligeramente calcificado. Filamentos superficiales escasos. La principal característica es la ramificación dicotómica, con ramas delgadas y aplanadas. Algunas veces presentan bandas cerca de los ápices (especímenes del Pacífico: Costa Rica y El Salvador). Células superficiales de la corteza estrechas, ovaladas o columnares. Filamentos medulares dispersos en un mucílago gelatinoso.

*Preparado por C. Fernández & A. Planas*



**Figure 1.** *Ernodesmis verticillata* (Kützing) Boergesen (Bryopsidophyceae, Cladophorales, Valoniaceae) TFP08-349 A. Field image. B. Habit. C. Microscopic surface view

•**Habitat**

•**BdT:** in shallow water (1-2 m) on rubble and in rock pools

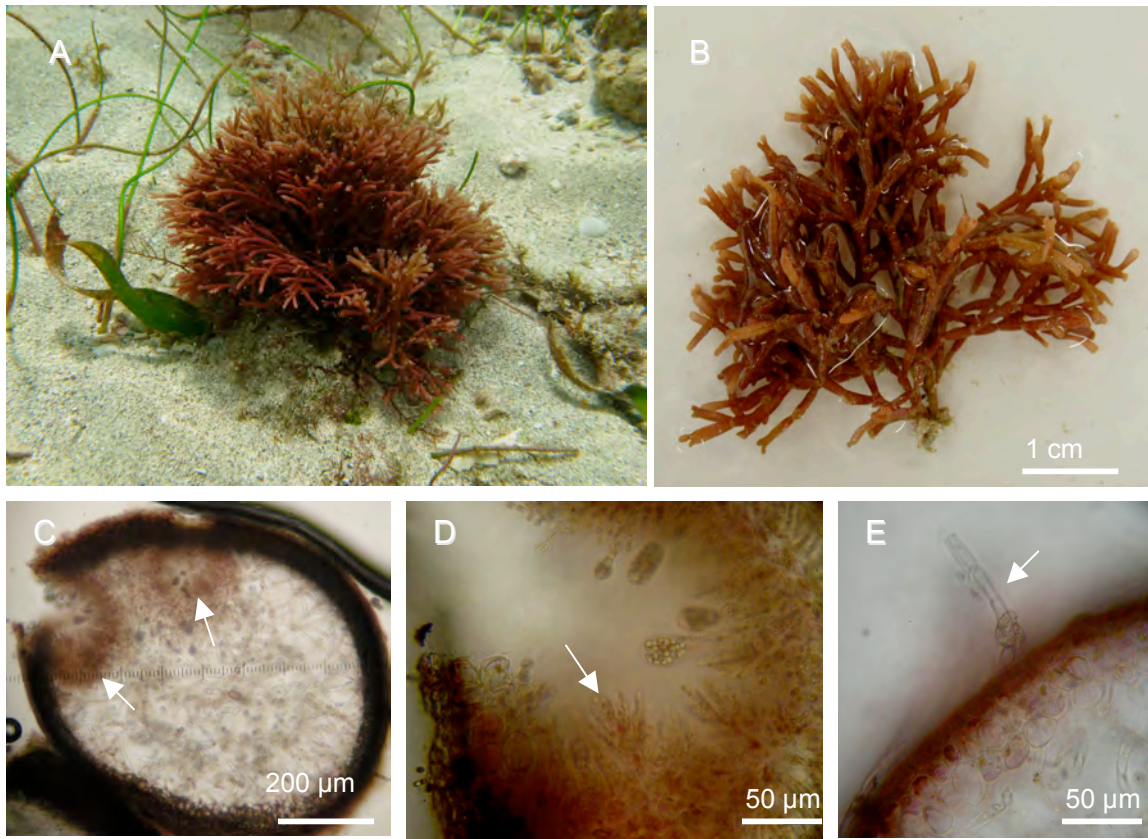
**General:** on mangrove prop roots or other firm objects in shallow protected bays; rock pools; tp 45 m depth

•**Distribution**

**BdT:** Tervi Bight (TFP08-151), Long Bay Point (TFP08-381), Swan Cay (TFP08-349)

**General:** Bermuda, Florida, Bahamas, Greater Antilles, Lesser Antilles, Southern Caribbean, Western Antilles, Gulf of Mexico, Brasil

Thallus light-green, bushy;; cells coenocytic and clavate; clusters of branches arising from the distal ends of stalks; each order of branching slightly smaller and narrower than the preceding set. Thallus often heavily epiphytized.



***Galaxaura rugosa*** (J. Ellis & Solander) J.V. Lamouroux (Florideophyceae, Nemaliales, Galaxauraceae). A. Hábito (0076), B. Talo ramificado dicotómicamente, C. Corte transversal con conceptáculos (flecha), D. Conceptáculo con estructuras masculinas jóvenes (flecha), E. Filamentos de la superficie.

•**Hábitat**

En sustrato rocoso. A 2 m de profundidad

•**Distribución BdT**

Wild Cane Cay, Lado este de Isla Carenero.

•**Distribución Mundial**

Islas Caribe, Florida, México, Caribe: Panamá, Costa Rica, Belice, Colombia, Venezuela, Brasil, África, Japón, Taiwán, Corea, Australia, Nueva Zelanda, Islas del Pacífico Central.

Talo entre 5 y 7 cm de alto, ligeramente calcificado. Uniones no calcificadas y flexibles. Filamentos superficiales escasos. Ramificación dicotómica, con ramas delgadas y cilíndricas. La diferencia con *G. subverticillata* es que esta última presenta anillos con filamentos pequeños mientras que *G. rugosa* es lisa.



**Figure 1. *Gayliella flaccida* (Kützinger) T.O. Cho et McIvor** (Florideophyceae, Ceramiales, Ceramiaceae). TFP # 0042. **A.** Habit of thallus; **B.** Cortication produced from periaxial cells. Two cortical cell growing acropetally (c1 and c2) and one basipetally (c3); **C.** Tetrasporangia tetrahedrally divided, spherical and in a straight series.

#### **Habitat**

Epiphyte on seagrass *Thalassia testudinum*. Common on this and other seagrass and macroalgae species in shallow waters.

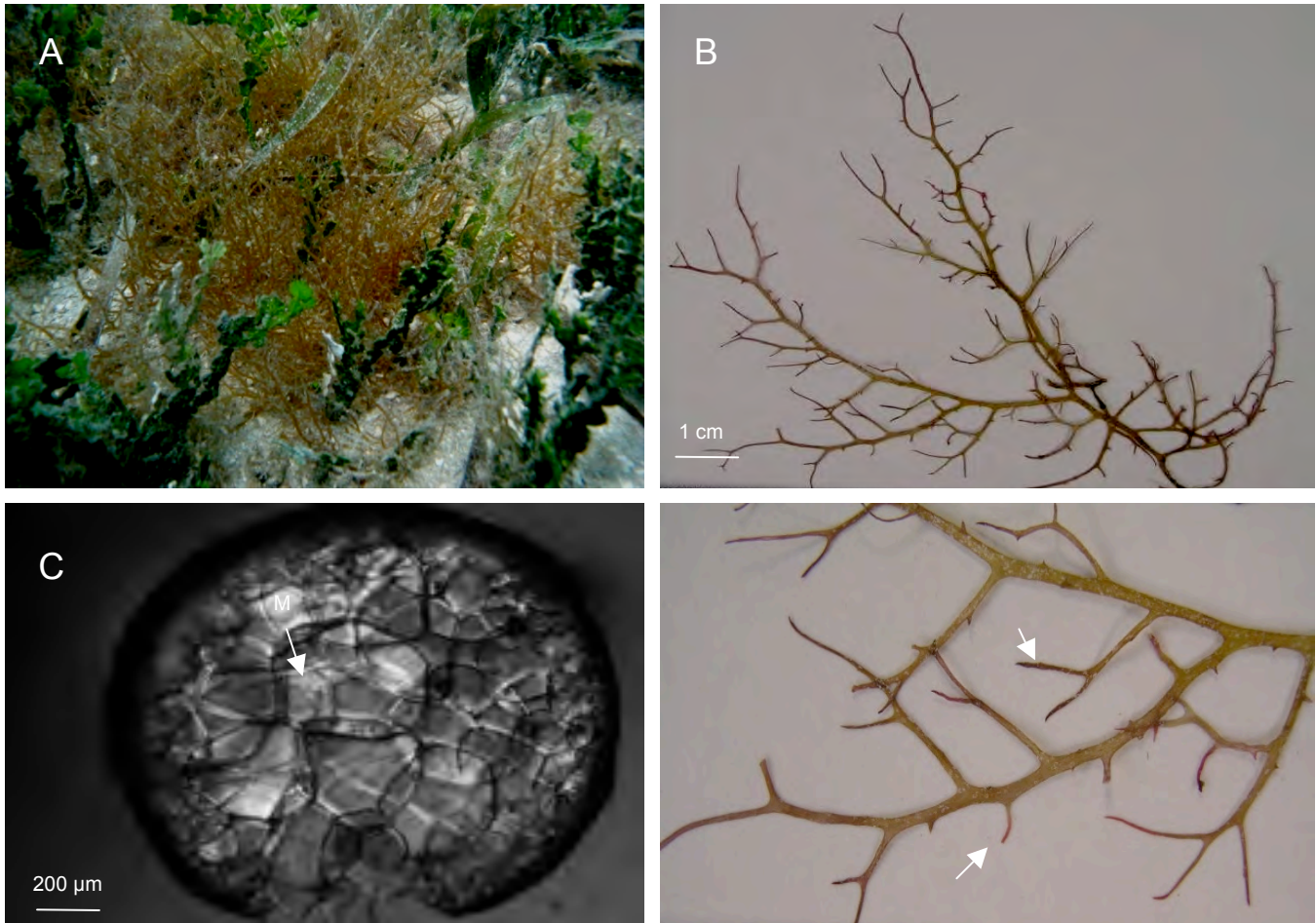
#### **•BdT Distribution**

Wild Cane Cay

#### **•Worldwide Distribution**

New Caledonia, Ireland, Adriatic, Balearic Islands, Black Sea, Britain, France, Greece, Italy, Malta, Portugal, Sardinia, Scandinavia, Slovenia, Spain, Turkey, Atlantic Islands, Florida, western Caribbean, Chile, Africa, Indian Ocean Islands, Southwest Asia.

Formerly known as *Ceramium flaccidum*, the species is characterized by uniseriate filaments in delicate tufts to 115 µm tall., with incurved tips. Branching at every 7-9 nodes of main axes. Axial cells cylindrical or spherical (Fig. 1A). Three cortical initials produced from each periaxial cell at nodes. The first two cortical initials (c1 and c2) are cut off obliquely from the periaxial cells and grow acropetally, transversely elongated cortical initial (c3) is cut off horizontally from the posterior end of the periaxial cell and grows basipetally (Fig. 1B). Tetrasporangia spherical and tetrahedrally divided. A single tetrasporangium develops at each node in a straight series (Fig. 3B). *Gayliella* is distinguished from *Ceramium* by its alternate branching pattern, pericentral and cortical cell arrangement, and unicellular rhizoids produced from periaxial cells.

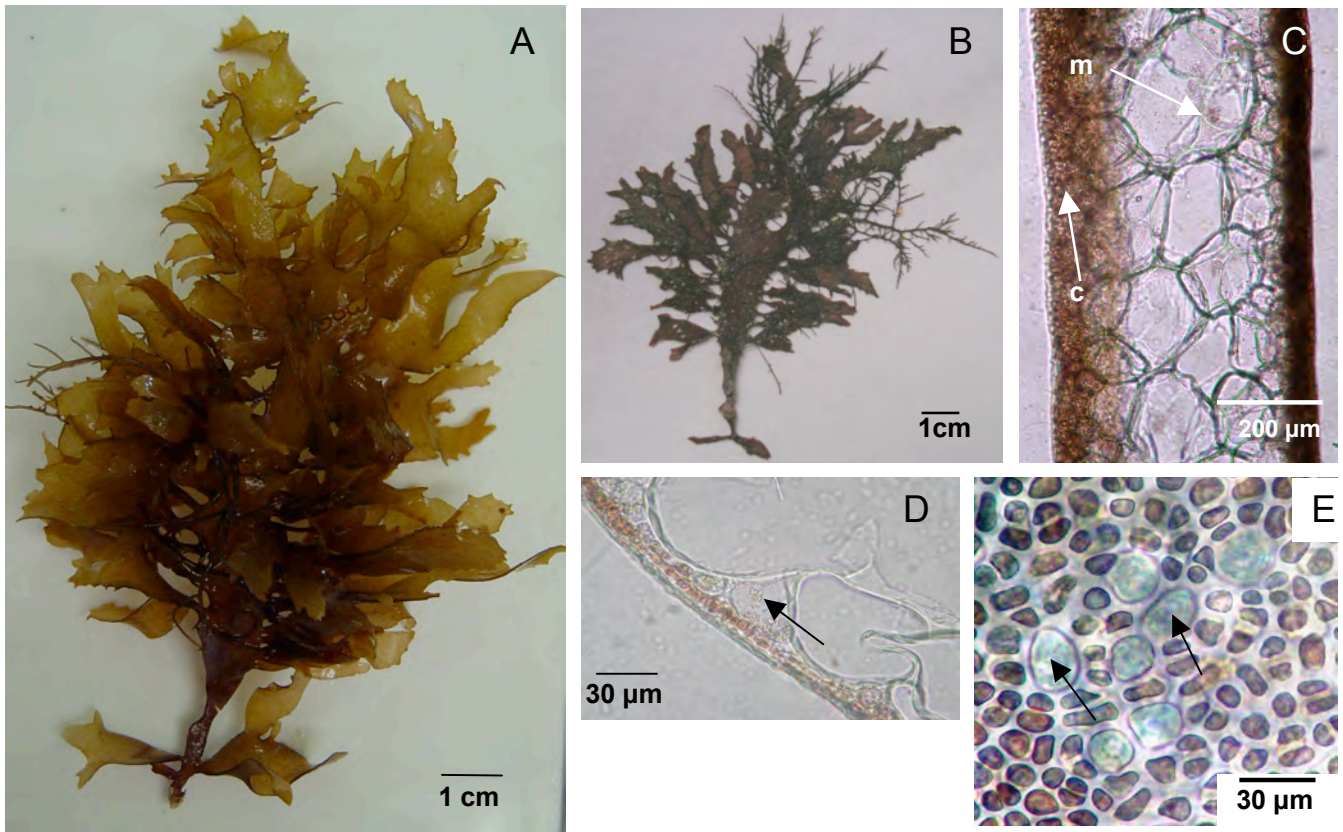


***Gracilaria* aff. *cervicornis*** (Florideophyceae, Gracilariales, Gracilariaceae). A. Specimens growing on rubble in sand, B. Habit of pressed herbarium specimen (TFP08-0146), C. Transverse section through main axis showing large roundish medullary cells (M), D. Branch with short, cylindrical branchlets terminating in acute tips

**BdT Distribution:** Found in the intertidal attached to rocky substratum at Flat Rock Beach (TFP08-0313), and on rubble in the Bastimento Solarte Channel (TFP08-0146).

**Worldwide Distribution:** Central America (Caribbean Panama)

Panama plants thin, brittle, reddish brown; branching pseudodichotomous below and irregular above. Main axes terete to compressed (< 2 mm wide), branchlets short, cylindrical with acute tips. Medullary cells large, 320-400 µm in diam., roundish. Transition from medullary to cortical cells gradual. Cortex of 4 cell layers, inner cortical cells 45 µm diam., surface cells ~12 µm. (in comparison, *Gracilaria cervicornis* (Turner) J. Agardh has smaller, irregularly-sized medullary cells.) All specimens in BdT vegetative only, reproductive structures unknown.



***Gracilaria curtissiae*** J. Agardh (Florideophyceae, Gracilariales, Gracilariaceae) (TFP08-0014). A. Habit. B. Herbarium specimen epiphytized by *Hypnea musciformis*. C. Transverse section showing large medullary cells (m) and smaller cortical cells (c). D. Transverse section showing subsurface cells of intermediate size (arrow). E. Surface view showing circular gland cells (arrow).

#### Habitat

**BdT:** found on coral rubble at 2-5 m depth

**General:** in moderately wave-exposed to protected areas

#### BdT Distribution

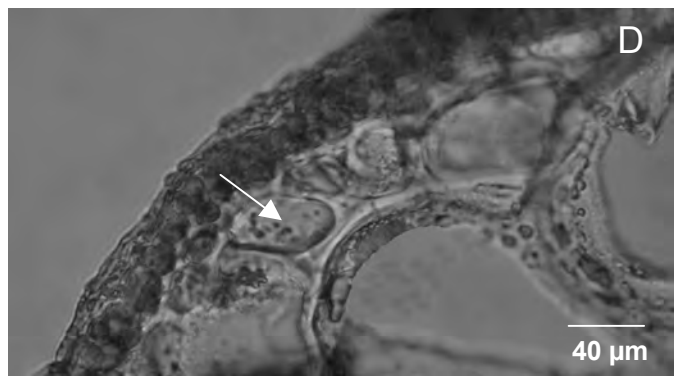
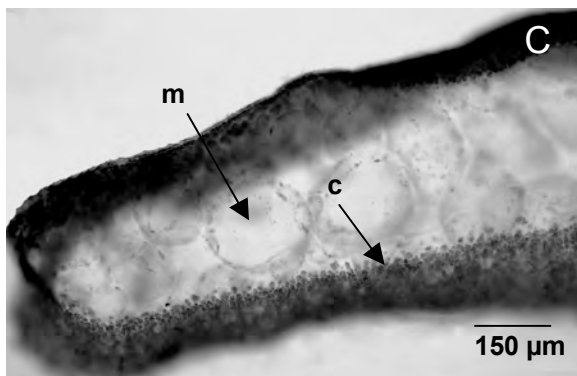
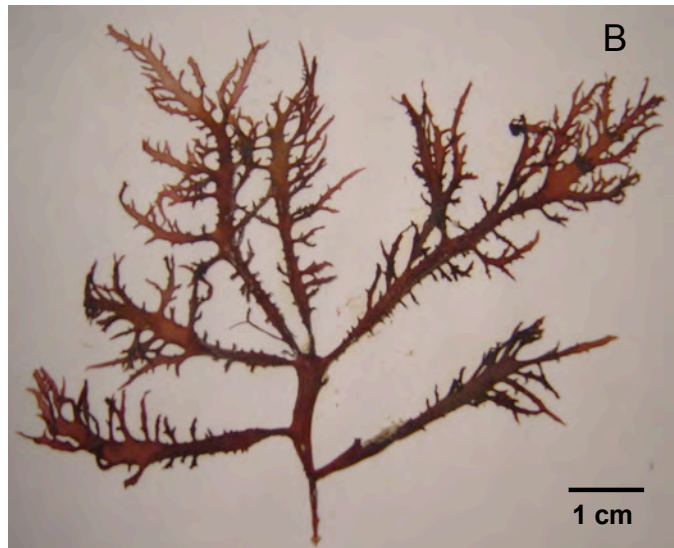
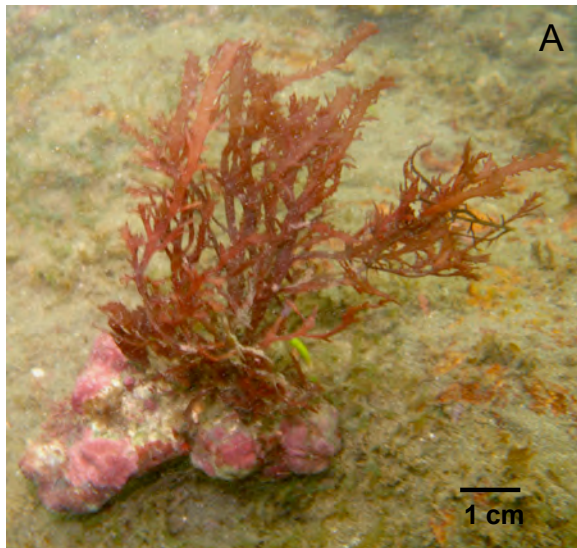
Wild Kane Cay (TFP08-0014), Swan Cay (TFP08-0102), Tervi Bight (TFP08-0164)

#### Worldwide Distribution

North America (Florida, North Carolina), Caribbean Sea (Cuba, Jamaica, Lesser Antilles, Trinidad, Trinidad & Tobago), South America (Panama, Venezuela).

Plant foliaceous, yellow-brown, erect to 26 cm tall. Blades strap-shaped with palmate branches. Base of blades constricted. Panamanian specimens with well defined main axis. Cortex of 1-2 cell layers with gradual transition between medullary and cortical cells. Medullary cells 100-200  $\mu\text{m}$  diam., cortical cells 7.5-12.5  $\mu\text{m}$  diam.





***Gracilaria domingensis*** (Kützinger) Sonder ex Dickie (Florideophyceae, Gracilariales, Gracilariaceae), TFP08 – 0031. A. Habit of specimen attached to rubble. B. Herbarium specimen. C. Transverse section through main branch showing large medullary cells (m) and smaller cortical cells (c). D. Transverse section through main branch showing subsurface cells of intermediate size (arrow).

#### Habitat

**BdT:** found on coral rubble to 3 m deep on rubble in sandy environments.

**General:** on coral fragments and other hard substrata.

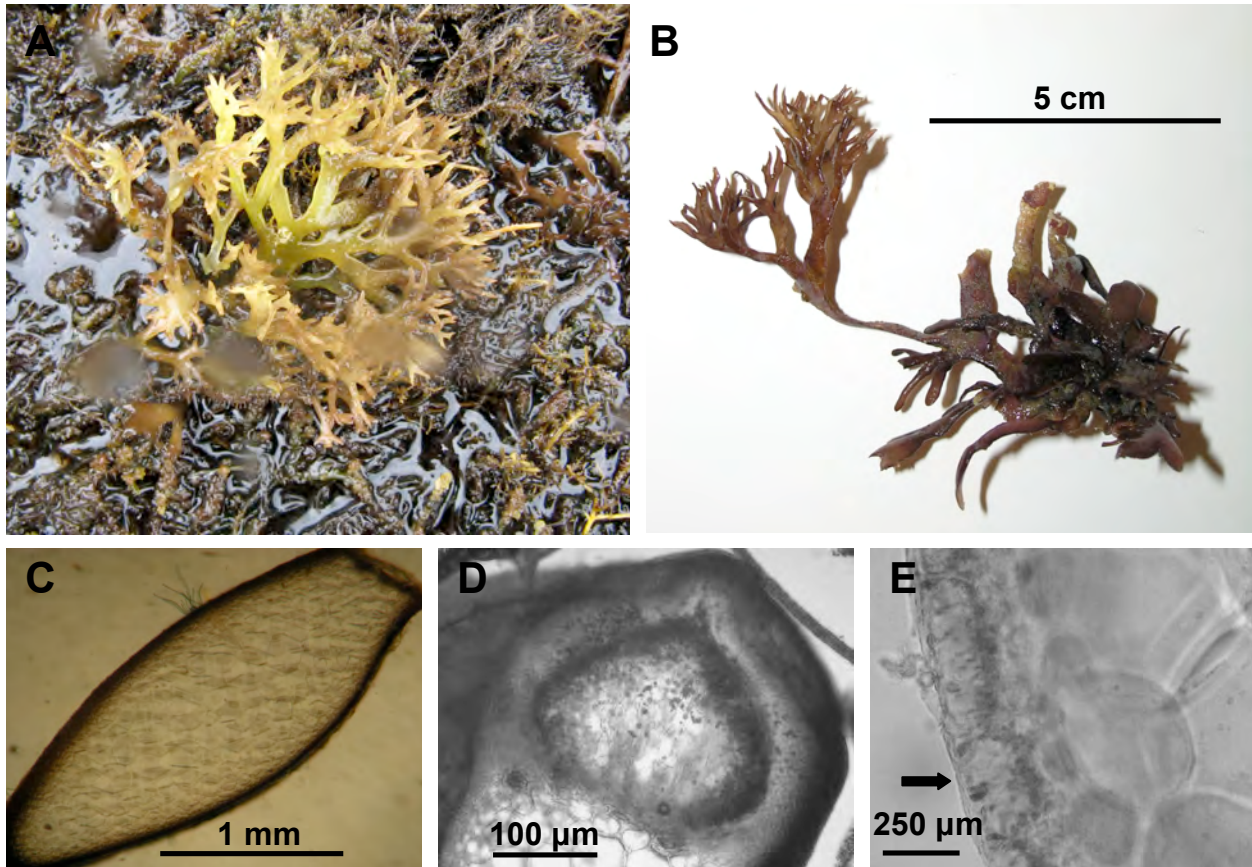
#### BdT Distribution

Wild Kane Cay (TFP08–0031), Swan Cay (TFP08–0132), Tervi Bight (TFP08 0160, TFP08–0280), Drift in front of STRI beach (TFP08 0241)

#### Worldwide Distribution

Central America (Costa Rica, Panama), Caribbean Sea (Barbados, Cuba, Hispaniola, Jamaica, Lesser Antilles, Trinidad & Tobago), South America (Brazil, Colombia, Venezuela).

Plants bushy, 10 (-35) cm tall, rose-red to green brown. This flattened species with a dentate or pinnulate thallus margin in Panama, has cortical cells of 5-10 µm in diam., medullary cells of 150-170 µm in diam., and subsurface cells of intermediate size.



***Gracilaria flabelliformis*** (P. et H. Crouan in Mazé & Schramm) Fredericq & Gurgel (Florideophyceae, Gracilariales, Gracilariaceae). (A) Specimen growing intertidally on rocky substratum (Flat Rock Beach, Bocas del Toro, Panama), (B) Pressed specimen for herbarium collection (TFP08-0289), (C) Transverse section through vegetative branch, (D) Transverse section through cystocarp, (E) Transverse section through male spermatangial structures organized in shallow pits (arrow).

**•Habitat**

Found growing in the intertidal zone on rocky substratum intermixed with *Chondrophycus papillosus*.

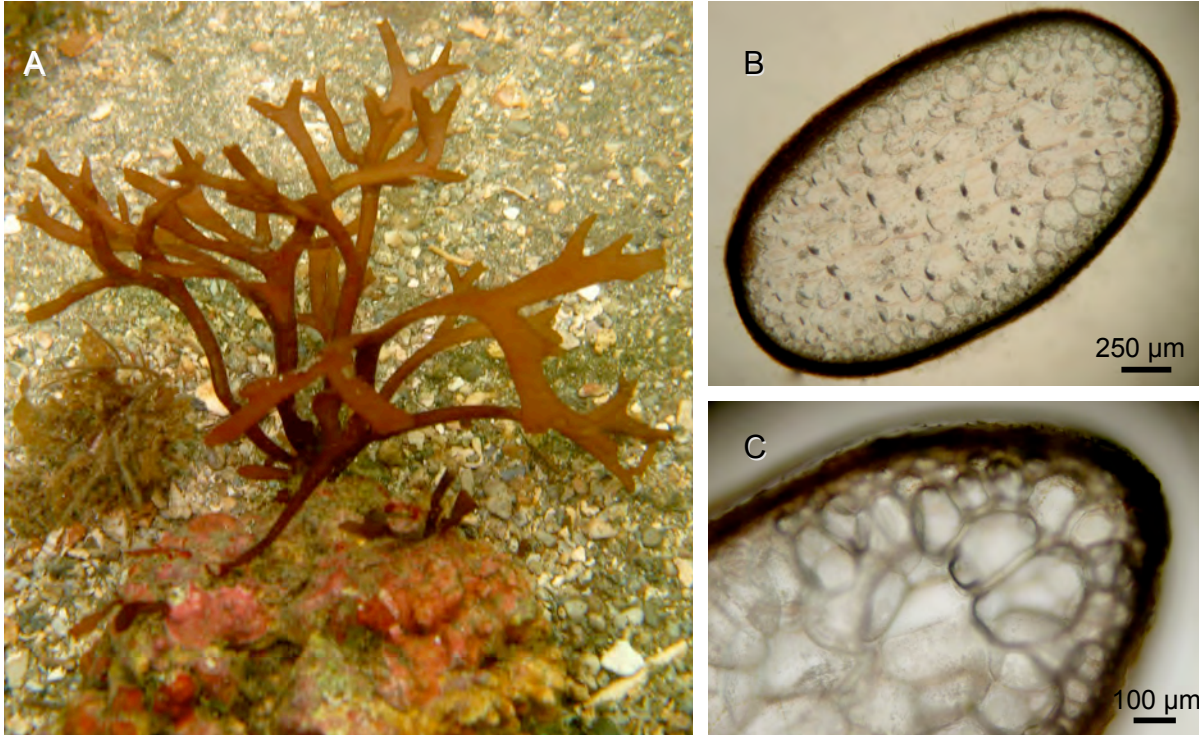
**•BdT Distribution**

Flat Rock Beach, Swan Cay, Isla Carinero, STRI Beach, Bastimente Solarte Channel.

**•Worldwide Distribution**

Central America (Panama), South America (Brazil), North America (Florida), Common throughout Caribbean Sea.

Thallus flat to compressed, strap-like above, arising from a disk-like holdfast. Main axes are indistinct after first or second order branching, which is highly variable.



***Gracilaria intermedia*** J. Agardh. (Florideophyceae, Gracilariales, Gracilariaceae) A. Hábito (TFP 0284), B. Corte transversal del talo, C. Células de la corteza y de la médula.

•**Hábitat**

En sustrato rocoso, arenoso, grava de coral y sobre la arena en la playa

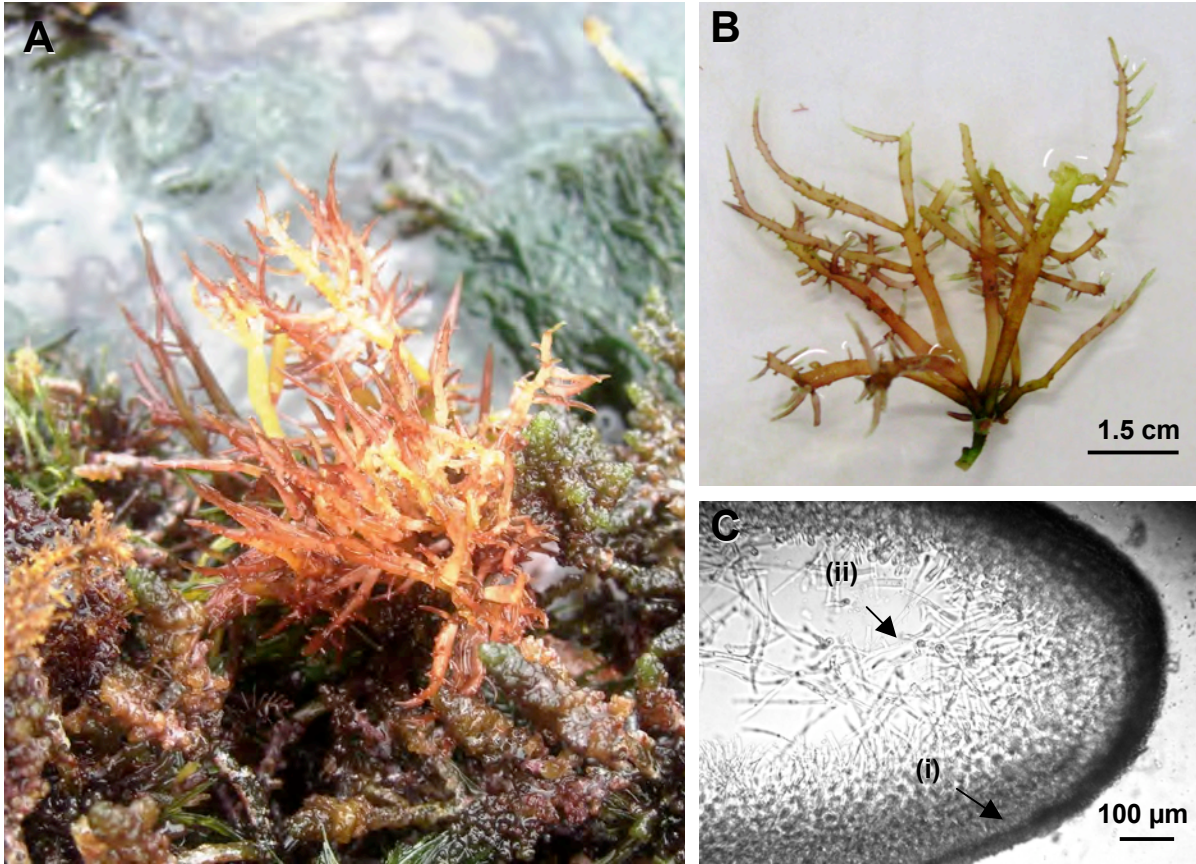
•**Distribución BdT**

Playa en frente de la estación del STRI, Tervi Bight, Wild Cane Cay, Flat Rock Beach.

•**Distribución Mundial**

Florida, Venezuela, Panamá

Talo completamente aplanado, entre 6 y 18 cm de alto. Ramificación de las zonas terminales dicotómica o pseudodicotómica en un mismo plano. Corteza con 2 a 3 filas de células.



***Grateloupia* sp.** (Florideophyceae, Halymeniales, Halymeniaceae). (A) Habit of specimen attached to rocky substratum in high wave area (Flat Rock Beach, Bocas del Toro, Panama); (B) Specimen for herbarium collection (TFP08-0361); (C) Cross section through thallus with typical organization of cortical cell layers (i) surrounding sparse filiform medullary filaments (ii).

### Habitat

Found on hard substratum (rock and dead coral) in high energy site in the intertidal to one meter depth.

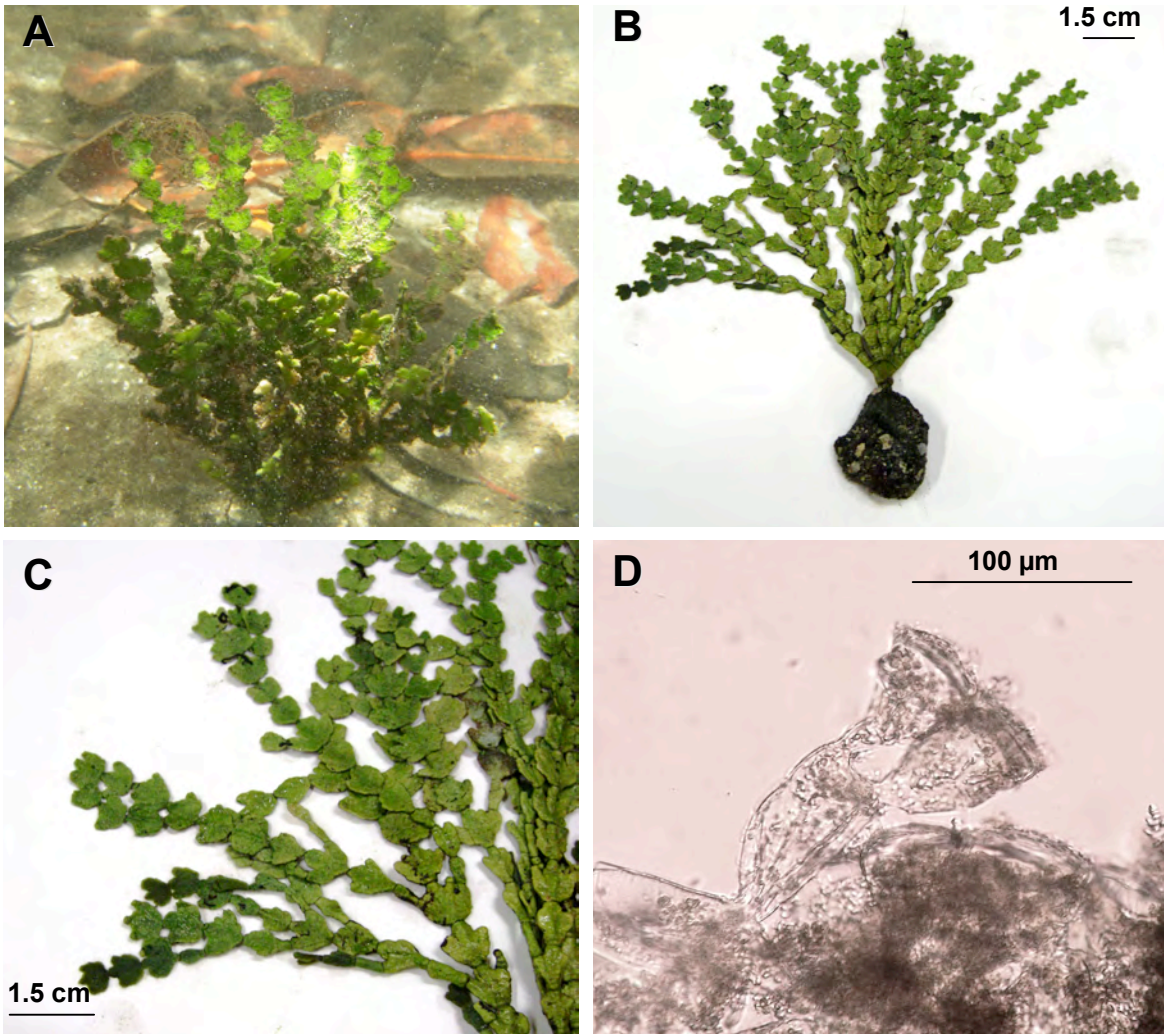
### BdT Distribution

Flat Rock Beach.

### Worldwide Distribution

Species probably common throughout the Caribbean.

Thallus erect with a slippery or gelatinous texture, yellow to red, cylindrical to compressed with irregular lateral branching. Branchlets to one cm long, thallus up to 6 cm tall. Medullary filaments loosely entangled in mucilage. This species has been referred to as *Grateloupia filicina* in other areas of the Caribbean, because of its branching pattern and thallus form.



***Halimeda incrassata*** (J. Ellis) J.V. Lamouroux (Bryopsidophyceae, Bryopsidales, Halimedaceae). (A) Habit of specimen in sandy-muddy substratum near edge of mangrove and seagrass areas (Smithsonian Research Station Bay, Bocas del Toro, Panama); (B) Specimen for herbarium collection (TFP08-102); (C) Close up of segments on herbarium specimen (TFP08-102); (D) Utricle from decalcified segment.

**Habitat**

Sandy and mixed sandy-muddy substrata near mangroves and seagrass beds. From 1 to 3 meters depth.

**BdT Distribution**

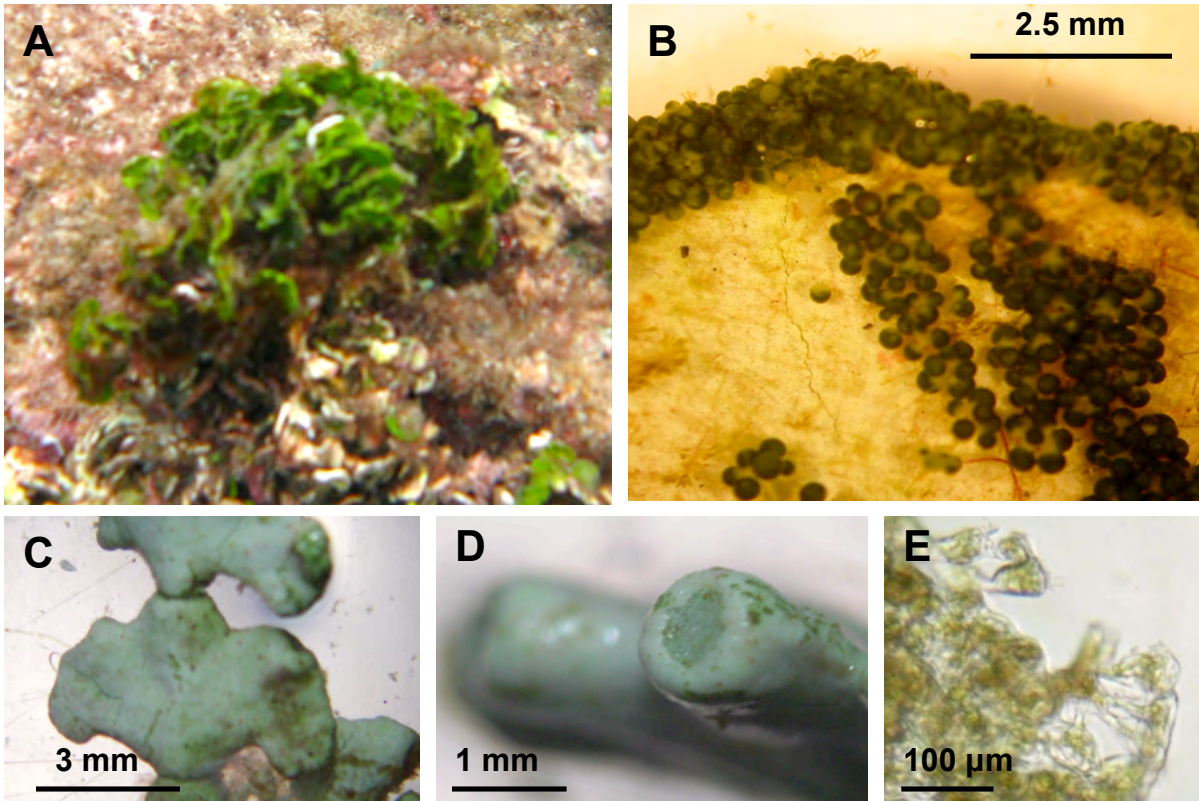
Smithsonian Research Institute Bay; Bastimentos Solarte Channel.

**Worldwide Distribution**

Atlantic Islands (Bermuda), North America (Florida, Mexico), Central America (Belize, Panama), Caribbean Islands, South America (Venezuela), Indian Ocean Islands, Asia, Pacific Islands, Australia, New Zealand.

Thallus erect, branching in one plane. Segments calcified, flattened, ribbed, forming branches with more than one siphon at joint (versus *Halimeda cryptica* that has one siphon at joints), segment margins not thickened (versus *Halimeda gracilis* which has thickened segment margins). Surface utricles angular after decalcification (versus spherical in *Halimeda simulans*).

*Prepared by Jimena Samper-Villarreal*



***Halimeda opuntia*** (L.) J.V. Lamour. (Ulvophyceae, Bryopsidales, Halimedaceae).  
 (A) Specimen growing on coral fragments (Wild Cane Key, Bocas del Toro, Panama),  
 (B) Close-up of reproductive thallus with gametangia, (C) Lobed calcified segment,  
 (D) Close-up of apical segment, (E) Photosynthetic surface utricles.

•**Habitat**

Found growing in sandy substratum near the edge of patch reefs.

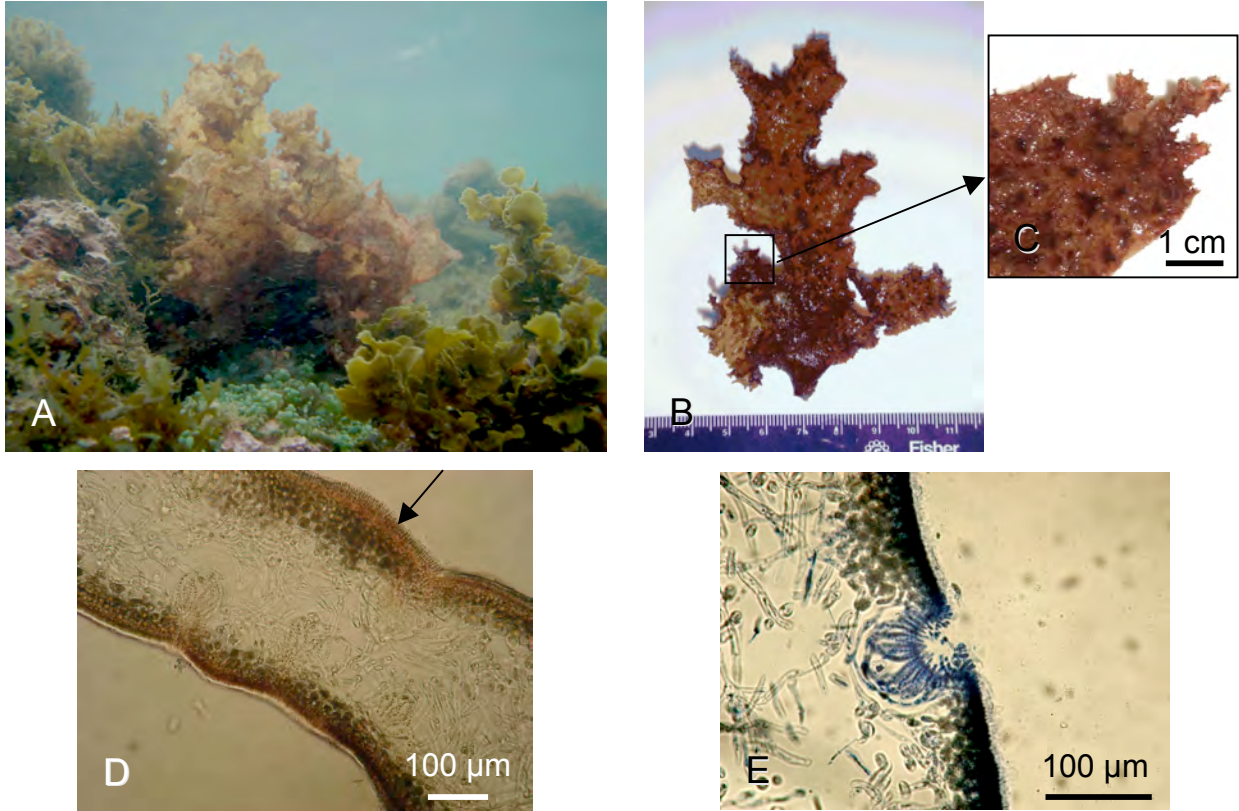
•**BdT Distribution**

Wild Cane Key, Tervi Bight, STRI Bay, Flat Rock Beach.

•**Worldwide Distribution**

North America (Florida, Isla Guadalupe, Mexico), Central America (Belize, Costa Rica, Honduras, Panama, Islas Revillagegados), Caribbean Islands (Bahamas, Barbados, Caicos, Cayman Islands, Cuba, Hispaniola, Jamaica, Lesser Antilles, Netherlands Antilles, Puerto Rico, Trinidad & Tobago, Virgin Islands), South America (Aves, Brazil, Colombia, Venezuela), Africa, Europe, Indian Ocean Islands, Asia, Australia & New Guinea, Pacific Islands.

Segments flattened (or contorted), generally greater than 5 mm. Branchlets random, generating thallus of multiple planes, forming dense clumps or mounds (versus *Halimeda opuntis* f. *triloba* is similar but thallus segments are organized in loose clumps or scattered chains).



***Halymenia duchassaingii* (J. Agardh) Kylin** (Florideophyceae, Halymeniales, Halymeniaceae). TFP08-0189 (A) Female specimen growing on hard substratum. (B) Herbarium specimen showing prominent female reproductive surface papillae. (C) Close-up of female papillae. (D) Transverse section through marginal mid-region showing filiform medullary cells and cortical cell layers. (E) Transverse section through female papilla at the thallus surface showing simple organization of the basket comprising the ampullary filaments.

•**Habitat**

Individuals are attached to hard bottom substrata, mostly around reefs.

•**BdT Distribution**

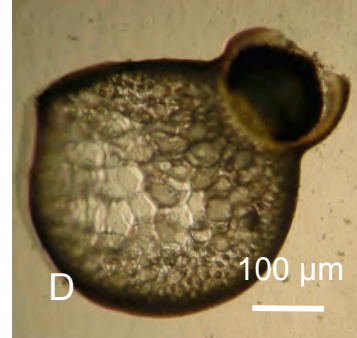
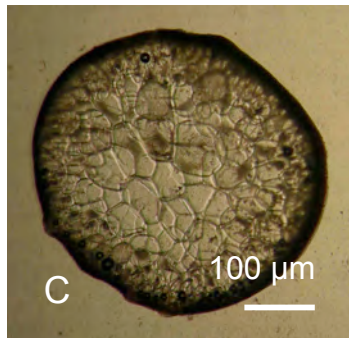
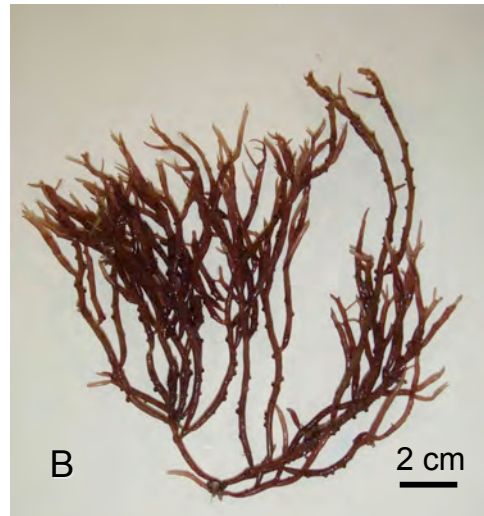
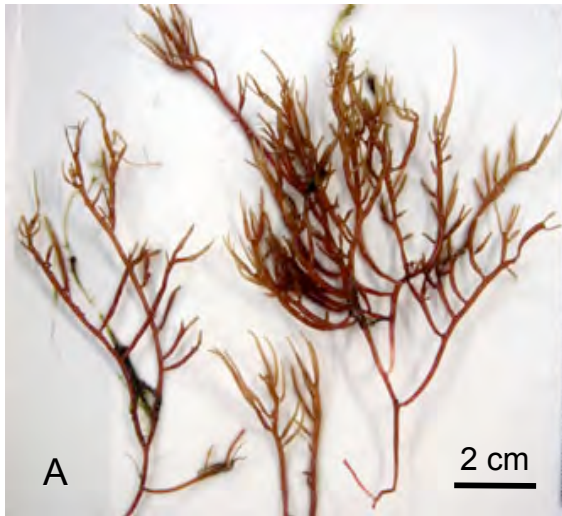
Wild Cane Cay, Tervi Bight, Flat Rock Beach.

•**Worldwide Distribution**

Africa (Cameroon, Gabon), Bangladesh, Cape Verde Islands, Caribbean Sea (Panama, Cuba, Greater Antilles, Lesser Antilles).

*Halymenia duchassaingii* is a pale-yellow to cream-colored alga with a flat, slippery or rubbery texture characterized by the rough surface of the thallus due to surface projections called papillae. The cortex is composed of four to six cell layers of small cells that surround laxly organized filiform medullary filaments embedded within a mucilaginous substance.

*Prepared by Samantha Schmitt*



***Hydropuntia caudata* (J. Agardh) Gurgel & Fredericq** (Florideophyceae, Gracilariales, Gracilariaceae). TFP08-0238 (A) Vegetative specimens. (B) Female specimen showing fruting bodies (cystocarps). (C) Cross-section through cystocarp and branch. (D) Cross-section through main branch showing medullary and cortical cell arrangement.

•**Habitat**

Attached to hard substratum and driftwood.

•**BdT Distribution**

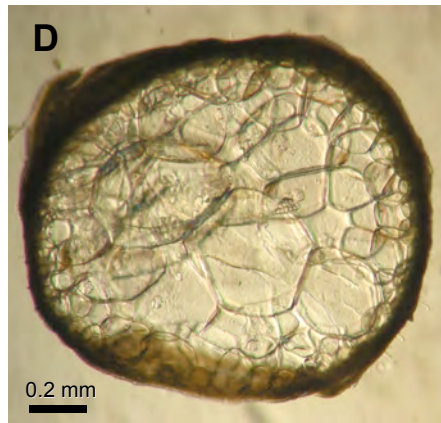
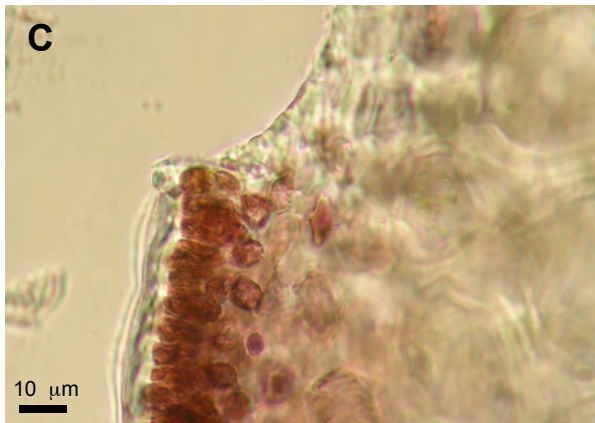
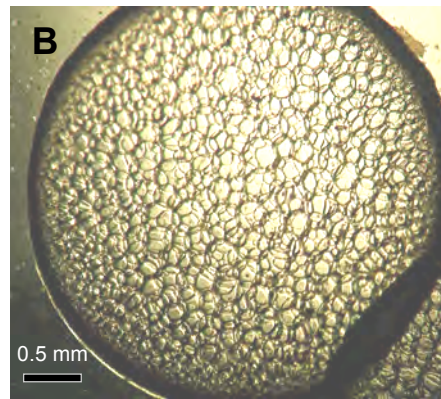
Bastimento Solarte Channel, Isla Carenero.

•**Worldwide Distribution**

Panama, Brazil, Caribbean Islands, Florida, Trinidad and Tobago.

*Hydropuntia caudata*, whose species epithet translates to “with a tail” in Latin, is the thinnest of the three common *Hydropuntia* species found in the vicinity of BdT. The cartilaginous plants may consist of a few or many equally-sized terete axes that are sparingly or densely branched; branches typically terminate in acute tips. Cystocarps are characterized by multinucleate tubular nutritive cells that originate from the lowermost spore-bearing cells and fuse with gametophytic cells at the base of that fruting body. Male structures are organized within deep pits with the spermatangial parent cells connecting to neighboring vegetative cells.





***Hydropuntia crassissima* (P. & H. Crouan) M. J. Wynne (Florideophyceae, Gracilariales, Gracilariaceae), TFP08-0291. A) Habit, B) Cross section through branch showing medulla of small and large cells, C) Close-up of cortex, D) Cross section showing the medulla of *Gracilaria cervicornis* for comparison.**

**•Habitat**

On hard substratum in exposed areas, intertidal to 9 m deep.

**•BdT Distribution**

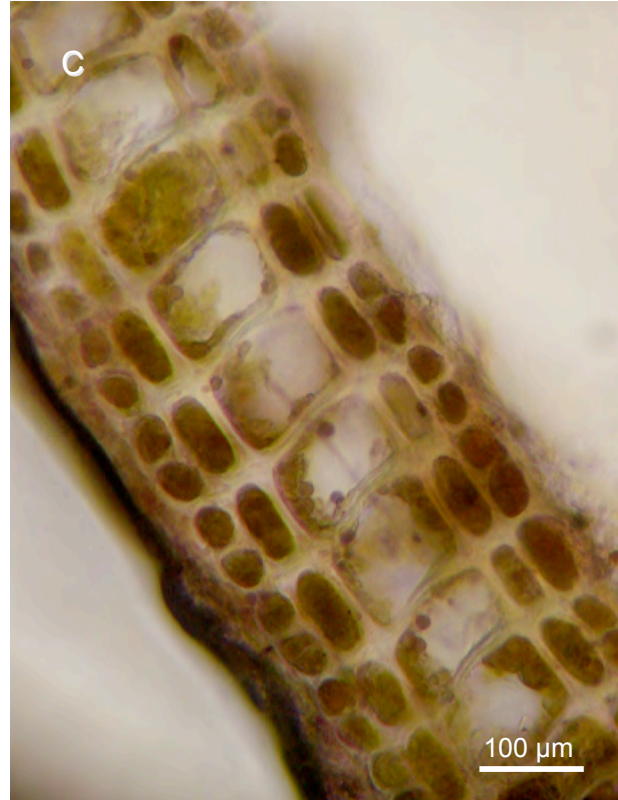
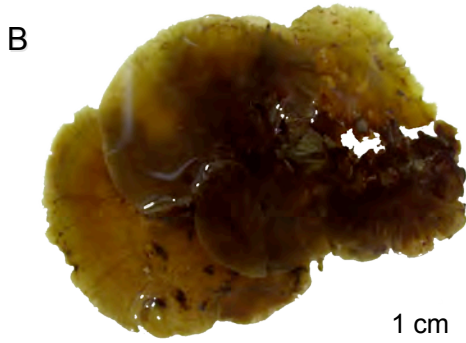
Flat Rock Beach; Beach across from STRI (drift)

**•Worldwide Distribution**

Tropical Eastern American coastline

*Hydropuntia* is distinguished from *Gracilaria* by the development of reproductive structures, but the alga photographed here is vegetative. *Hydropuntia crassissima* has an expansive medulla of many mixed-sized cells with a gradual transition to the cortex (B), while *Gracilaria* may be characterized by a few large medullary cells that abruptly decrease in size towards the cortex (D). *H. crassissima* has a distinctive “bear claw” design (A), and is only found in moderately to highly exposed areas. Molecular data has linked this species with the closely related *H. cornea* (Fredericq, pers. comm.) which lives in protected areas and has an erect thallus. The outward differences in appearance may be attributed to developmental plasticity.

***Prepared by Kevin Miklasz***



***Lobophora variegata*** (J.V. Lamouroux) Womersley ex E.C. Oliveira. (Phaeophyceae, Dictyotales, Dictyotaceae) A. Hábito (TFP 0259), B. Superficie de la lámina, C. Corte transversal del talo.

•**Hábitat**

En sustrato rocoso entre pastos marinos y sobre corales muertos. A 2 m de profundidad.

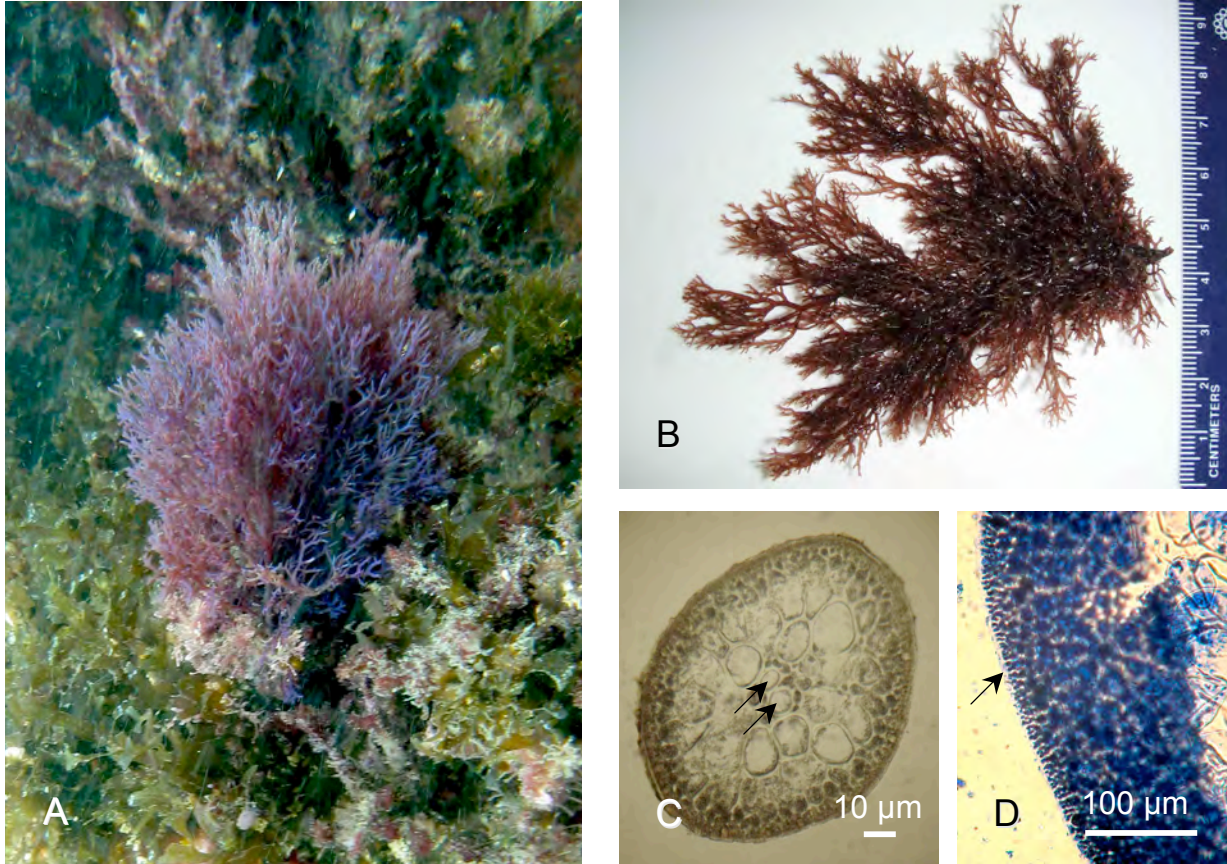
•**Distribución BdT**

Tervi Bight

•**Distribución Mundial**

Grecia, España, Italia, Islas Atlánticas Orientales, Islas del Caribe, Venezuela Panamá, Colombia, Costa Rica, Venezuela, Africa, Islas del Océano Índico, Japón, Taiwan, Indonesia, Vietnam, Suroeste de Asia, Australia, Nueva Zelanda, Islas del Pacífico Central, Pacífico: Chile, Costa Rica.

Talo costroso de hasta 15 cm de diámetro, color café oscuro. Láminas delgadas y sobrepuestas. La diferencia con el género *Pseudolithoderma* es que este último forma una costra completamente adherida al sustrato, *Lobophora* presenta los márgenes de la lámina levantados del sustrato. No tiene el margen enrollado (como *Padina*).



***Ochtodes secundiramea* (Montagne) M.A. Howe.** (Florideophyceae, Gigartinales, Rhizophyllidaceae. TFP08-0335 (A) Typical iridescent specimen growing on hard substratum. (B) Vegetative herbarium specimen. (C) Transverse section through branch showing two central axial filaments (arrows). (D) Grazed section through branch showing cortex composed of tightly packed spherical cells arranged in radial chains (arrow).

•**Habitat**

Grows on hard substratum in relatively high energy waters.

•**Bocas del Toro Distribution**

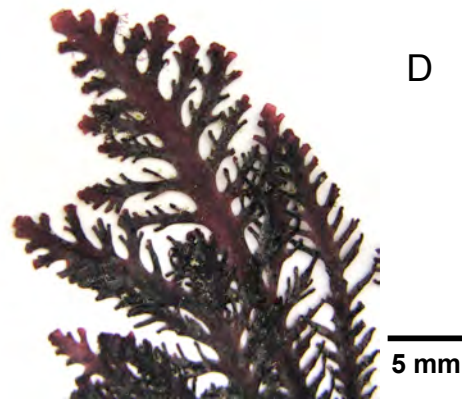
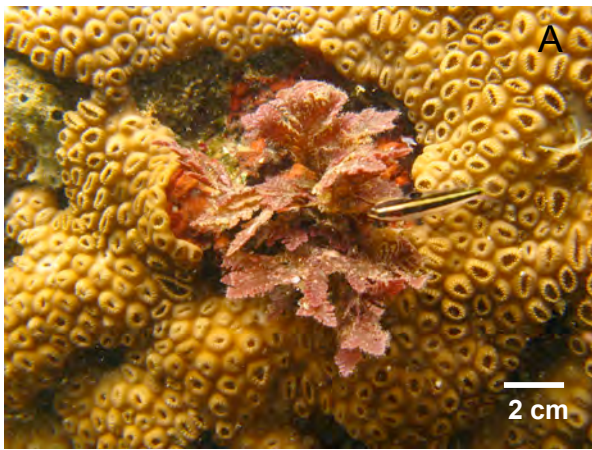
Isla Carenero, Swan Cay, Wild Cane Key, Mimbi Timbi.

•**Worldwide Distribution**

Throughout Caribbean Sea (Bahamas, Greater Antilles, Lesser Antilles)  
Southern Gulf of Mexico.

*Ochtodes secundiramea* is a densely bushy red algal species that is highly recognizable in the field. The thallus color ranges from iridescent bright blue, purple or red. Once removed from its habitat, the thallus color generally turns dark-maroon. The species is further uniquely characterized by **two** apical cells per branch which, when viewed in cross-section, reflects the two axial filaments seen in the center of the medullary region. The cortex is arranged in radial chains of five to ten cell layers.

*Prepared by Samantha Schmitt*



***Osmundea pinnatifida*** (Hudson) Stackhouse (Florideophyceae, Ceramiales, Rhodomelaceae) TFP08-0090. A. Specimen growing between zoanthids in intertidal pool, B. Herbarium specimen, C. Longitudinal section through main branch showing apical region with blunt tip in depression, and trichoblasts, D. Main axis with oppositely branched laterals..

•**Habitat**

**BdT:** On rocky substrata, and in intertidal pools and coral rubble in sandy substratum to 2 m deep.

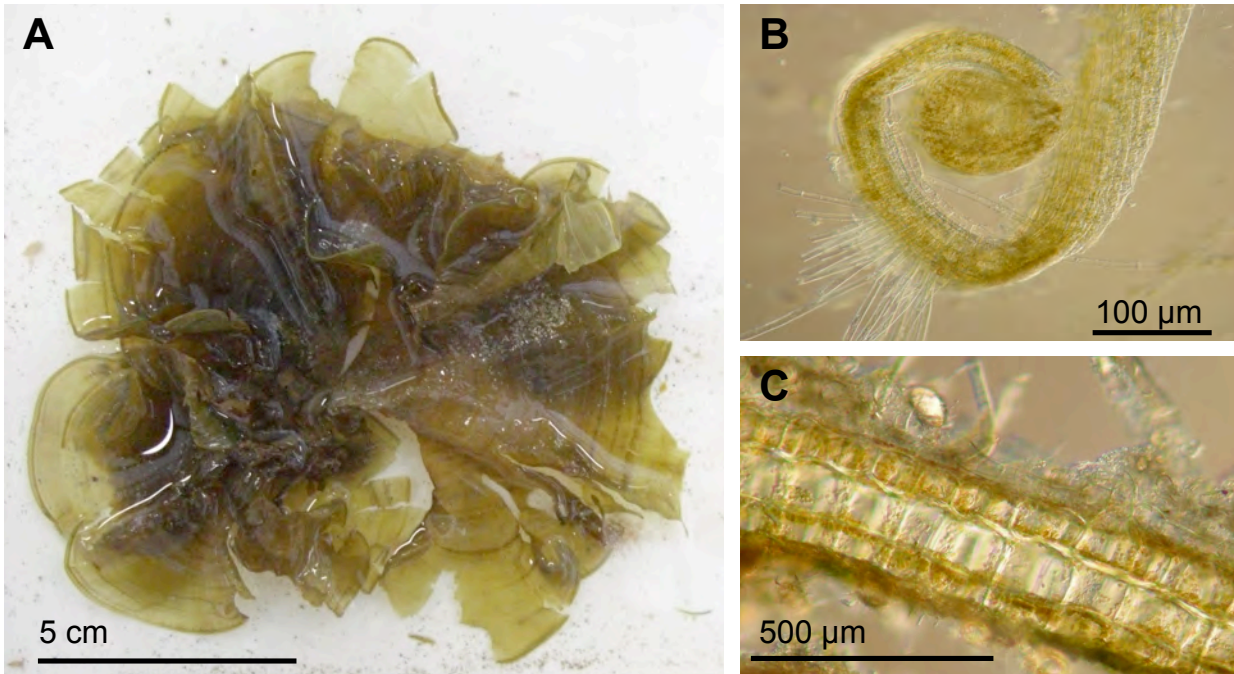
•**Distribution in BdT**

Wild Kane Cay (TFP08-0052), Swan Cay (TFP08-0090, TFP08-0150, TFP08-356)

•**Worldwide distribution**

Europe, Atlantic Island, Africa, South-west and East Asia, North America, South America, Australia and New Zealand.

Plants bushy, cartilaginous, flat to 15 cm tall, purple to rose red. Branching pinnate and opposite. Branchlets short, 2-3 mm long. Tips blunt, with trichoblasts in a terminal pits. Surface cells 30-40 µm in diam.



***Padina pavonica*** (L.) Thivy (Phaeophyceae, Dictyotales, Dictyotaceae). (A) Pressed specimen for herbarium collection (TFP08-0098), (B) Longitudinal section through blade showing inrolled margin with tufts of surface hairs, (C) Longitudinal section through blade showing single medullary cell layer flanked by single cortical cell layers.

•**Habitat**

Found growing attached to rocky substratum in moderately wave-exposed area at a depth of approximately one meter.

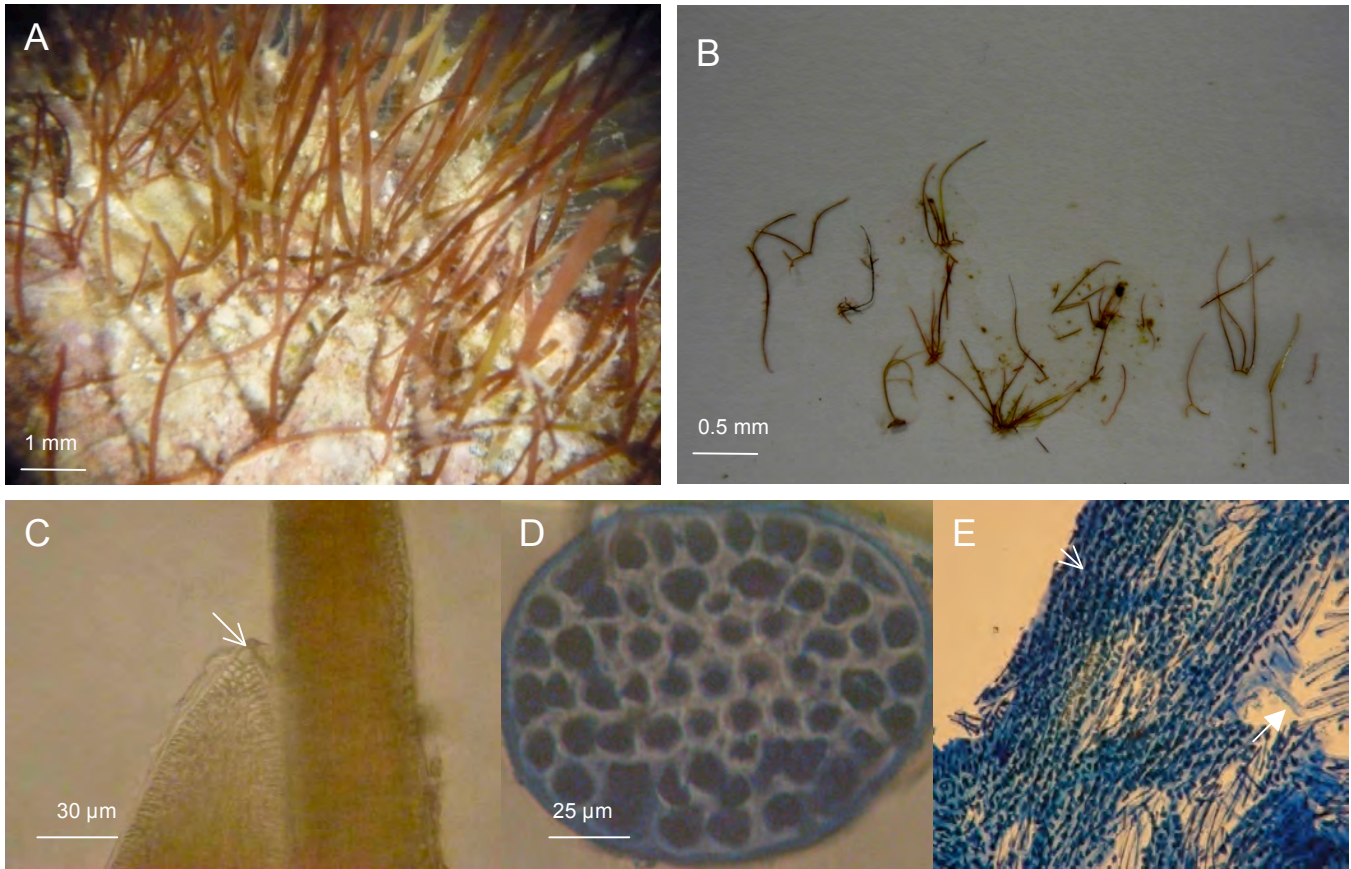
•**BdT Distribution**

Carinello Island

•**Worldwide Distribution**

Europe (Britain, Corsica, France, Greece, Ireland, Italy, Portugal, Spain, Turkey), Atlantic Islands (Canary Islands, Cape Verde Islands, Madeira, St. Helena), South America (Brazil), Africa (Morocco), Australia and New Zealand (Lord Howe Islands, Queensland), Central America (Panama)

Thallus in leaf-like clusters, brown to tan. Blades fan-shaped, with edges strongly incurved, banded, moderately calcified above, lighter calcification below. Margin of blade two cell layers thick, base of blade three cell layers thick, outer margins enrolled. Surface hairs 15-25 µm diameter, occurring in concentric bands 1.5- 6.0 mm apart.



***Parviphycus* sp.** (Florideophyceae, Gelidiales, Gelidiellaceae). A. Growing on rubble in sand, B. Habit of herbarium specimens (TFP08-0315), C. Single apical cell (arrow) of main axis, D. Transverse section through main axis showing distichously arranged second order cell rows, E. Single-celled rhizoids (right arrow) and parallel orientation of surface cells (left arrow).

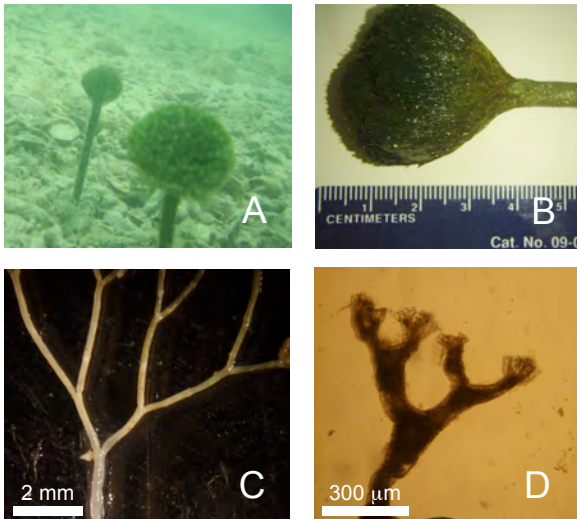
**BdT Distribution:** Growing on the rocky intertidal at Flat Rock Beach (TFP08-0313) and on rubble in the Bastimento Solarte Channel (TFP08-).

**Worldwide Distribution:** Central America (Caribbean Panama)

Thallus firm, erect branch systems (100-165  $\mu\text{m}$  diam.) arising from entangled creeping axes (175  $\mu\text{m}$  diam). Growth initiated by single apical cell (7.5  $\mu\text{m}$  diam). Medulla consisting of thick-walled cells (10  $\mu\text{m}$  diam.) surrounded by several layers of cortical cells, rhizines absent. This species is here placed in *Parviphycus* because the second order cell rows are distichously arranged, and unicellular rhizoids extend from surface cells.

***Penicillus capitatus* Lamarck**

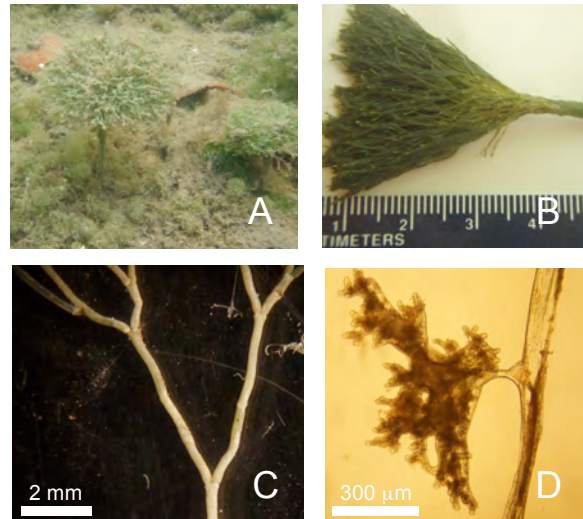
(Bryopsidophyceae, Bryopsidales,  
Udoteaceae), TFP08-0282



***Rhypocephalus oblongus* (Decaisne)**

**Kützing**

(Bryopsidophyceae, Bryopsidales,  
Udoteaceae), TFP08-0281



**A) In situ. B) “U” vs. “V”-shaped cap. C) First dichotomy of cap siphons is constricted for both species. D) Laterals of stipe siphons.**

**•Habitat**

On sand or mud bottoms,  
intermixed with seagrass, to 12 m  
depth

**•BdT Distribution**

Bay side of STRI Bocas Lab, Isla  
Carenero, Bastimento Solarte  
Channel

**•Worldwide Distribution**

Throughout Atlantic coastlines

**•Habitat**

On sand bottoms, intermixed with  
seagrass, to 40 m depth

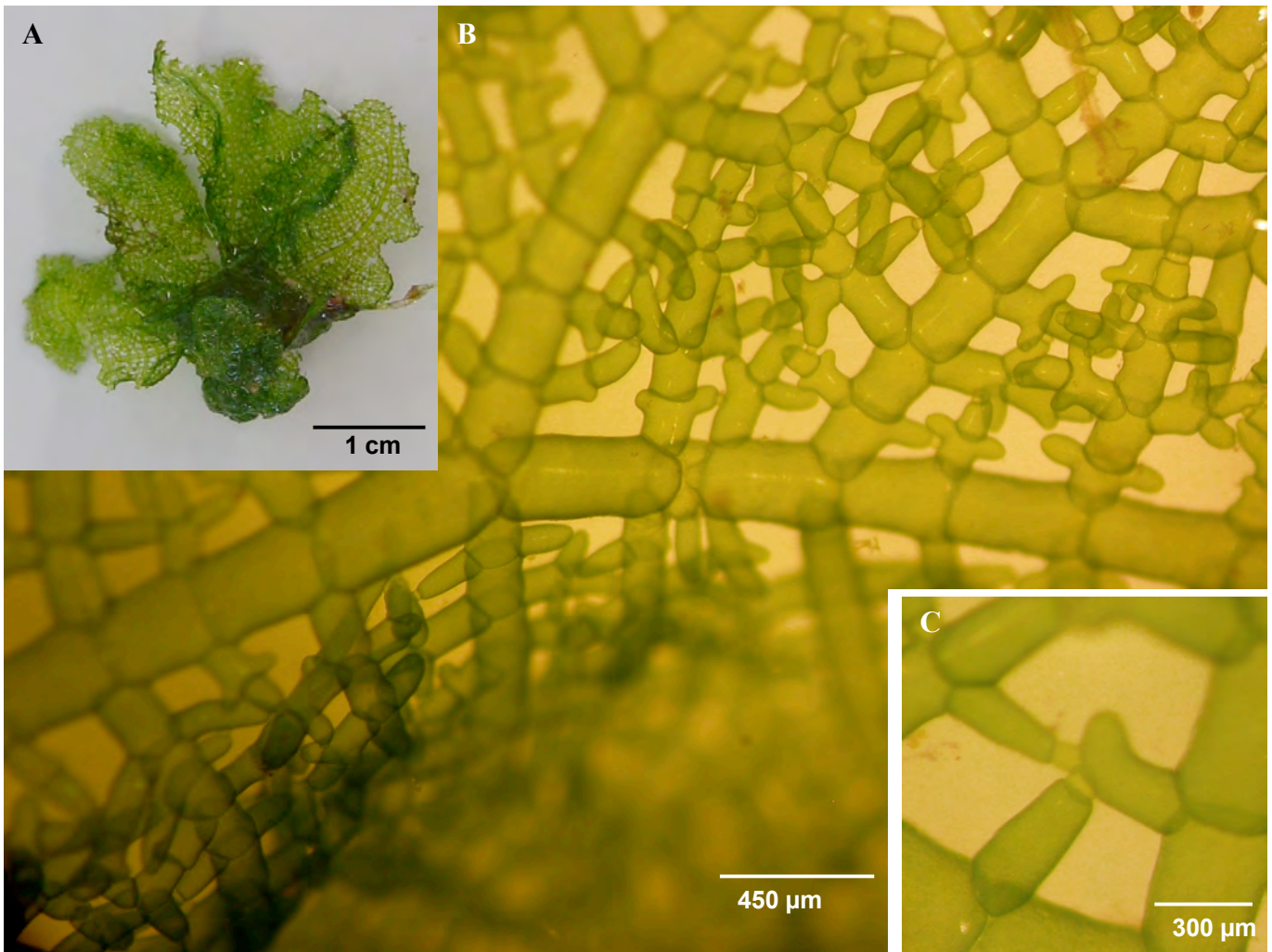
**•BdT Distribution**

San Cristobal mangrove cove

**•Worldwide Distribution**

Florida, Bahamas, Caribbean,  
Greater Antilles, Lesser Antilles,  
Southern Caribbean, Western  
Caribbean, Gulf of Mexico

*Penicillus capitatus* and *Rhypocephalus oblongus* are both calcified, paintbrush-shaped green algae that are nearly indistinguishable in the field (A). Both algae exhibit three similar characteristics: **1)** a slight tapering from base to tip of the cap siphons, **2)** unfused cap siphons that branch in one plane and are constricted at all dichotomies (C), and **3)** relatively similar stipe lateral siphons (D). Although similar on a microscopic level, the differences are macroscopic. *P. capitatus* has cap siphons with short, dense branches (C) leading to a tightly-packed cap that forms a “U” shape on its underside (B). *R. oblongus* has a looser cap that spreads out to form a “V” shape on its underside (B). The writers speculate that such differences may reflect plastic growth responses to different environmental conditions, and that these two algae may be one species.



**Figure 1. *Phyllodictyon pulcherrimum* J.E.Gray** (Bryopsidophyceae, Cladophorales, Boodleaceae ) TFP08-352. A. Habit. B. Microscopic surface view. C. Specialized tenacular cells connecting with cells of adjacent filaments.

•**Habitat**

•**BdT:** in intertidal rock pools

•**General:** Attached on mangrove prop roots, below low tide line, or growing epiphytically on other marine plants, normally 1 to 5m depth but reported from deeper depths.

•**Distribution**

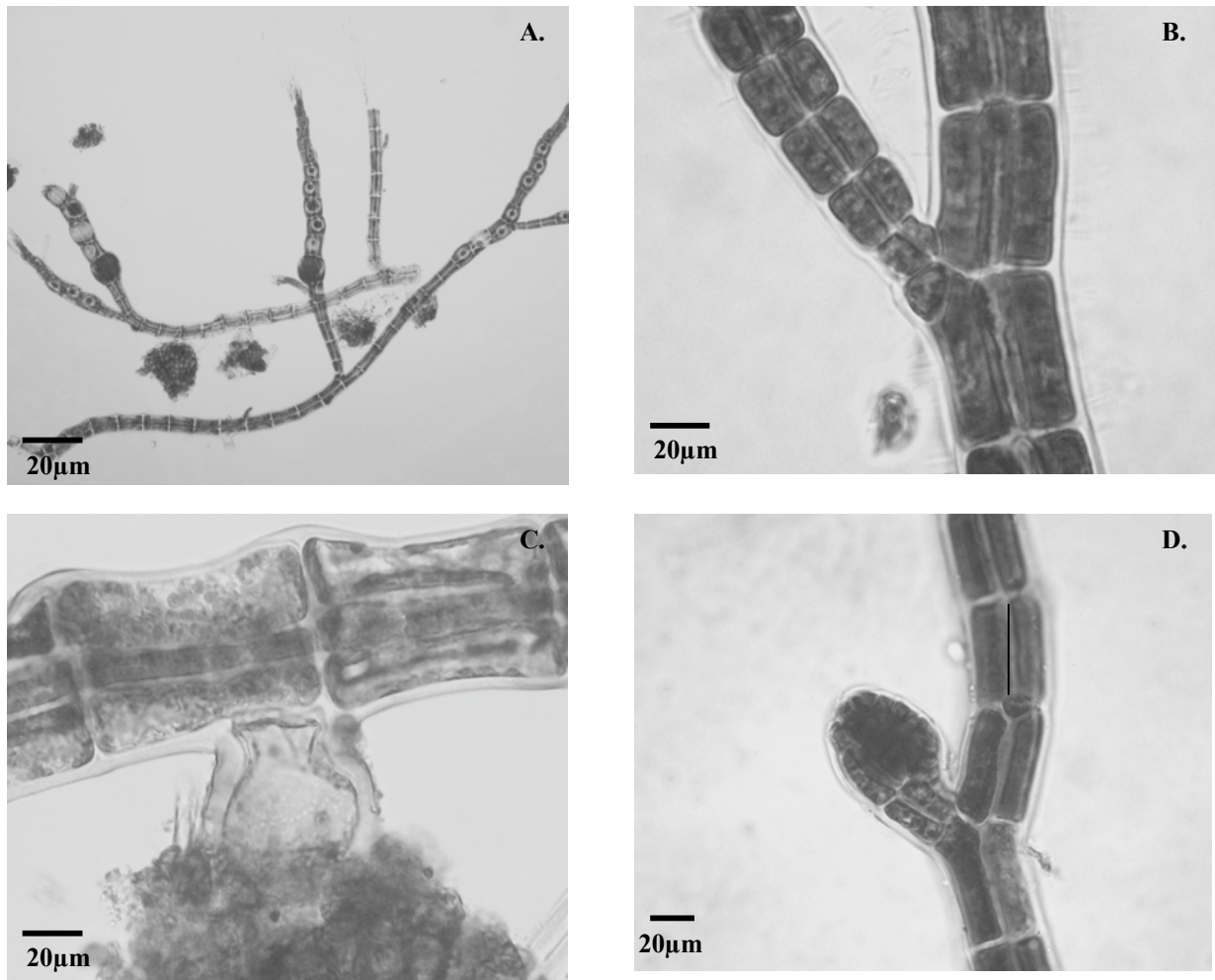
**BdT:** Swan Cay (TFP08-352)

**General:** North Carolina, Florida, Bermuda, Bahamas, Puerto Rico, Lesser Antilles, Gulf of Mexico, Madeira Archipelago, Canary Islands, Philippines, Belize

Delicate, fine blades, iridescent pale-green. Uniseriate stalks (inconspicuous in older thalli), and lobed basal attachment cell. Mesh-like blade of oppositely branched uniseriate filaments, interconnected by specialized hapteroid cells, also called tenaculae (see Fig. C).

*Prepared by Anna Fricke*





**Figura 1.** *Polysiphonia flaccidissima* Hollenberg (Florideophyceae, Ceramiales, Rhodomelaceae). TFP08-0041. **A.** Hábito del espécimen fijado en lámina; **B.** Ramificaciones estrechas hacia la base; **C.** Rizoides presentando conexión cerrada con la célula pericentral; **D.** Cistocarpio ovalado inmaduro.

•**Hábitat**

Epífito de *Thalassia testudinum*. También se encuentra como epífito de otras algas. Entre 1 a 20 m de profundidad.

•**Distribución BdT**

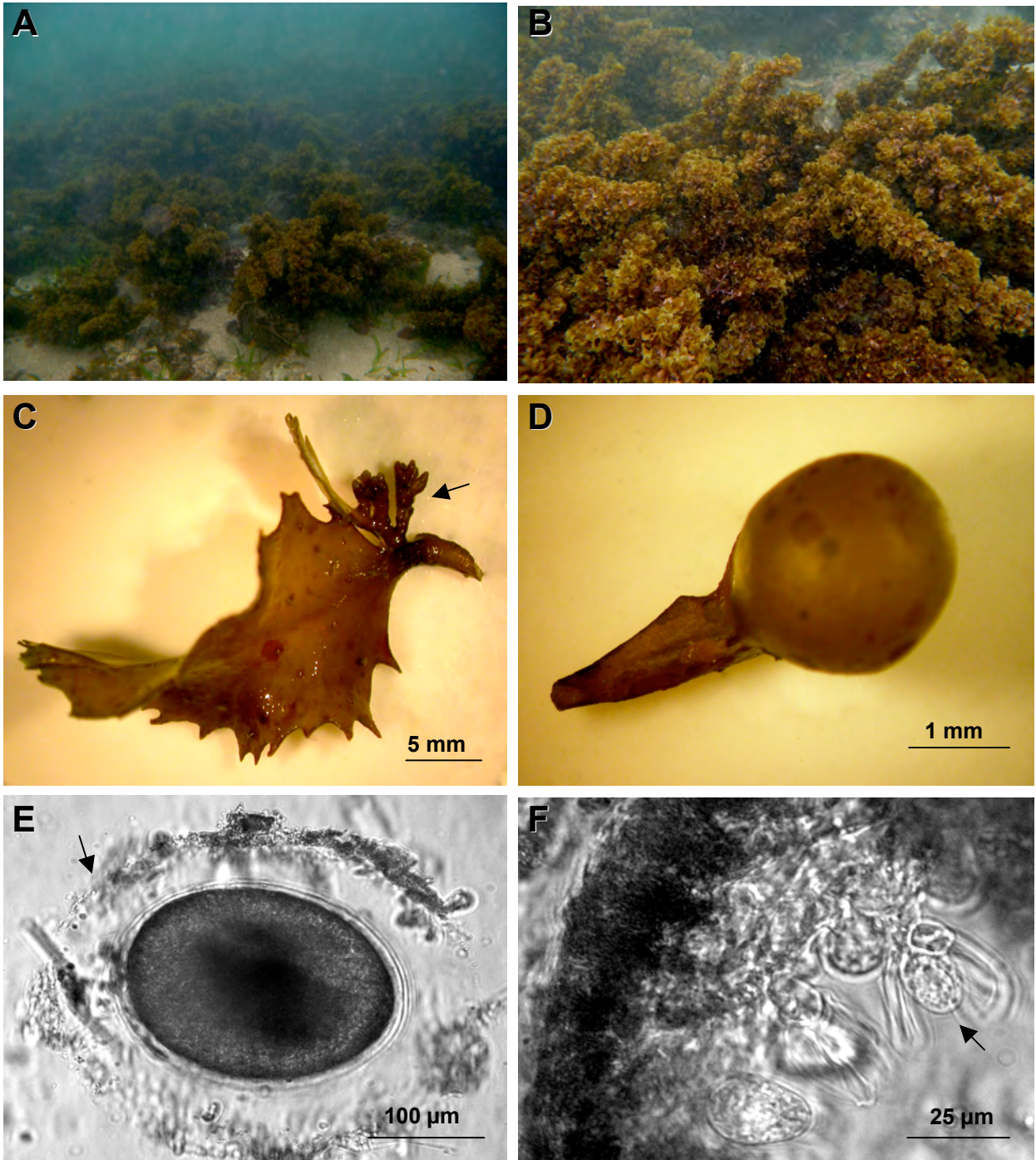
Wild Cane Cay.

•**Distribución mundial**

Bermuda, California, Carolina del Norte, Belize, Caribe, Chile, Peru, Hawaii

Talo pequeño con un eje postrado sobre el cual surgen filamentos erectos de hasta 820 µm de alto. Con cuatro células pericentrales (Fig. 1A). Las ramificaciones son estrechas hacia la base y se desarrollan en las axilas de los tricoblastos (Fig. 1B). Los rizoides presentan conexión cerrada con la célula pericentral (Fig 1C). Los tetrasporangios (hasta 40 µm de diámetro) son apicales y se distribuyen en espiral (Fig. 1A). Pericarpio oval (Fig. 1D). Posiblemente sinónimo de *Polysiphonia sertularioides* (distribuida en el Mediterraneo y Australia)

*Preparado por Margarita R. Albis Salas*



***Sargassum polyceratium* var. *ovatum*** (Collins) W.R Taylor (Phaeophyceae, Fucales, Sargassaceae). (A) & (B) Habit of specimen on rocky substratum in high energy area (Carenero Island, Bocas del Toro, Panama); (C) Blade with axial receptacle (arrow) of specimen for herbarium collection (TFP08-0277); (D) Spherical air bladder with alate pedicel (TFP08-0277); (E) Oogonium with mucilaginous layer (arrow); (F) Antheridia (arrow) in male conceptacle.

**Habitat**

On rocky substratum, from the intertidal to 3 m dept.

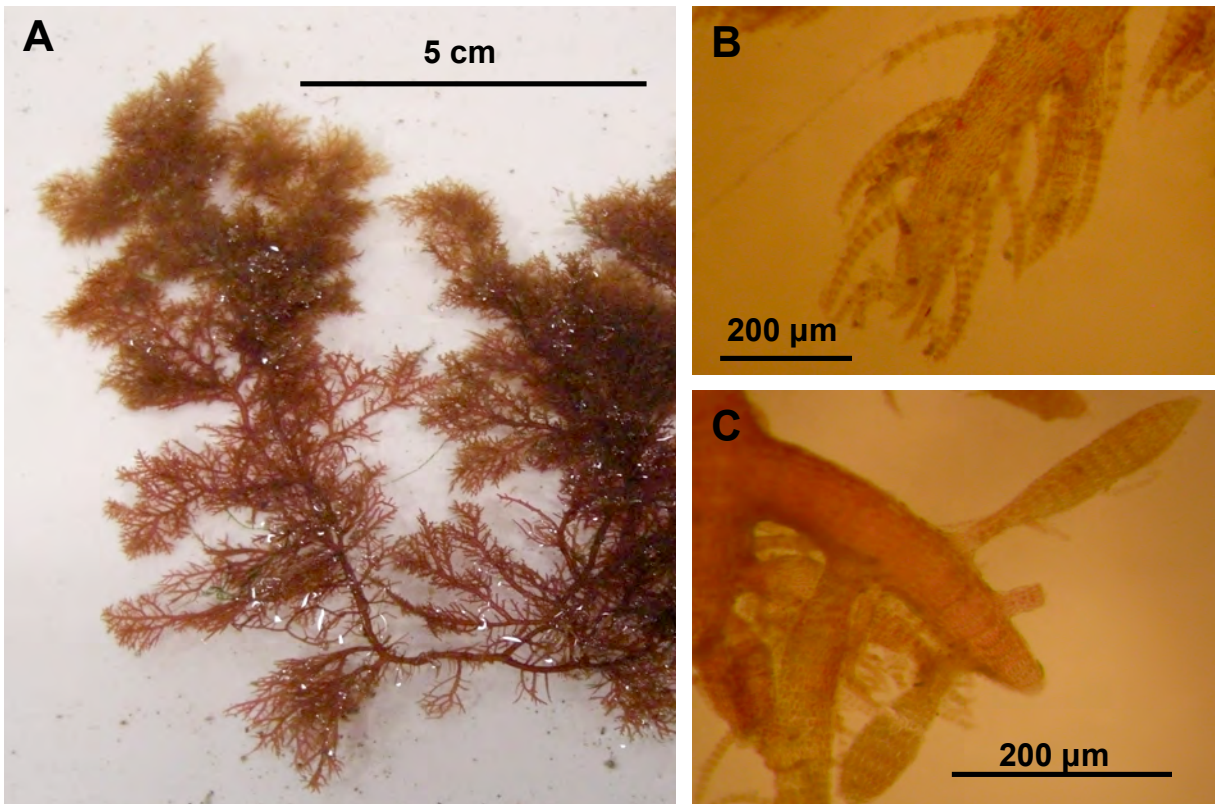
**BdT Distribution**

Isla Carenero (TFP08-0222), Flat Rock Beach (TFP08-0277, TFP08-0277, TFP08-0362, TFP08-0368).

**Worldwide Distribution**

Europe (Turkey), North America (Florida), Central America (Panama), Caribbean Islands (Bahamas, Barbados, Caicos Islands, Cayman Islands, Cuba, Hispaniola, Jamaica, Lesser Antilles, Puerto Rico, Trinidad & Tobago, and Virgin Islands), South America (Brazil, Colombia, Venezuela), Southwest Asia (Turkey).

Plants brown, crowded, leathery, densely branched to 60 cm high. Distinct holdfast, firmly attached to rocky substratum. Main axis developing from holdfast, and up to 3 cm in length. One to several lateral branches developing from main axis, with secondary branching and sometimes tertiary branching as well. Specimens found do not all have spines on lateral branches, a characteristic of the species. Blades closely crowded, curved, with serrated margin, and dispersed surface cryptostomata. Younger branches with blades to 2.5 cm long and 1 cm wide. Fertile branches with blades to 2.0 cm long and 0.8 cm wide. Air bladders without spines to 4 mm diameter, on short alate stalk to 3 mm in length. Receptacles axillary on blades, dichotomously branched, to 6 mm in length. Specimens analyzed were monoecious, with female and male gametangia in separate conceptacles on the same receptacle.



***Spyridia clavata*** Kützing (Florideophyceae, Ceramiales, Ceramiaceae). (A) Specimen for herbarium collection (TFP08-0116), (B) Corticated uniseriate determinate branches, (C) Short lateral branches club-shaped, constricted at base.

•**Habitat**

Found growing in seagrass beds on protected side, attached to hard substratum.

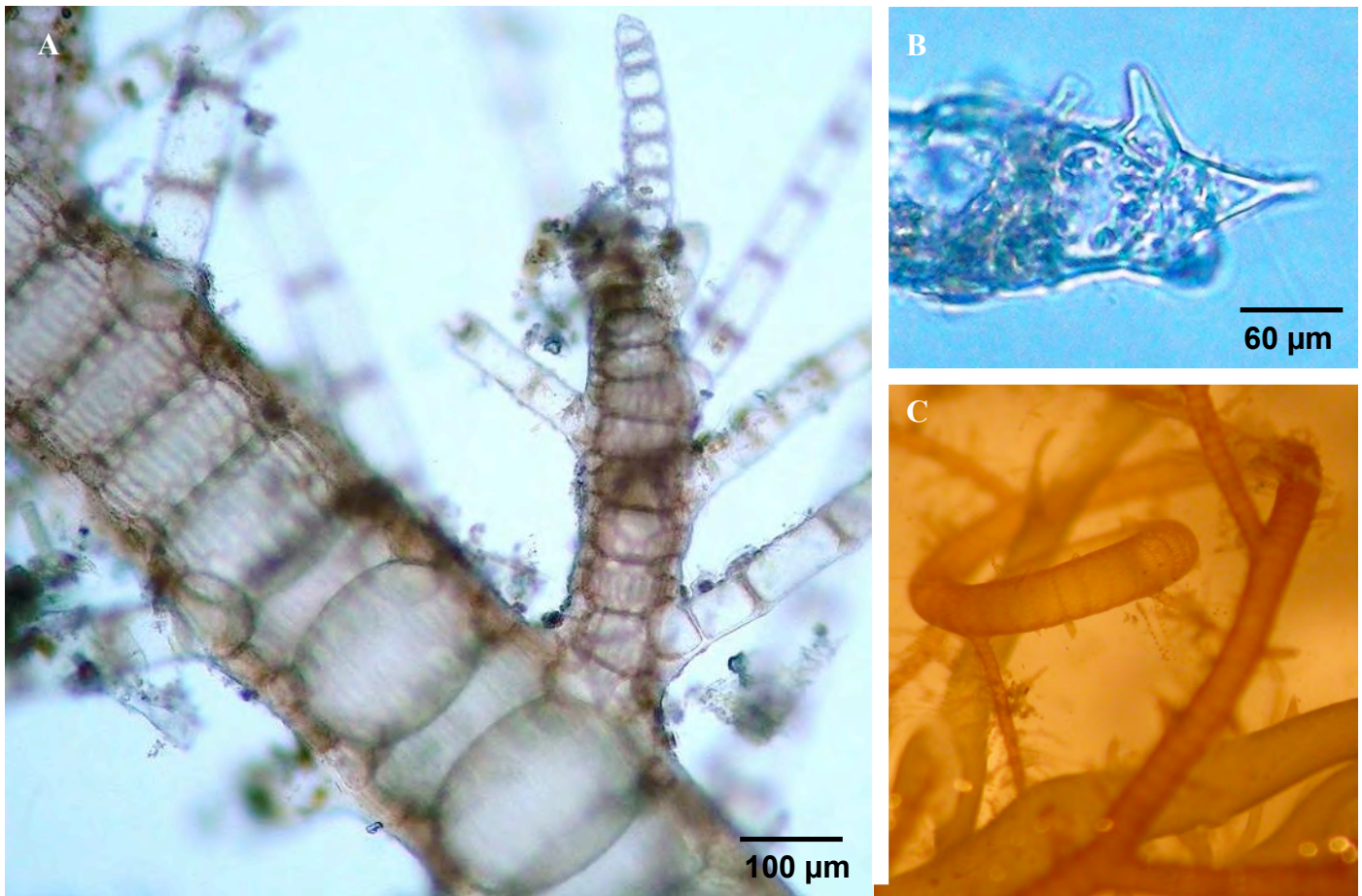
•**BdT Distribution**

Swan Key

•**Worldwide Distribution**

Atlantic Islands (Cape Verde Islands), North America (Florida, North Carolina, South Carolina), Caribbean Islands (Barbados, Cuba, Curaçao, Hispaniola, Jamaica, Lesser Antilles, Trinidad & Tobago, Virgin Islands), Central America (Panama), South America (Brazil, Colombia, Venezuela), Africa (Angola, Egypt, Gabon, Gambia, Ghana, Mauritania, San Tomé & Príncipe, Senegal), Southeast Asia (Indonesia).

Plants slender to robust, 8-20 cm long, pale pink in color. Main branches somewhat firm, axes terete below, somewhat compressed, distichously alternate, sometimes oppositely branched with larger and smaller branches intermixed, cortication up to apical region. Smaller branches clavate or spindle-shaped, markedly tapering towards base. Younger branches beset with short determinate branchlets, sometimes curved, reduced or absent at swollen tips.



**Figure 1. *Spyridia hypnoides* (Bory de Saint-Vincent) Papenfuss** (Florideophyceae, Ceramiales, Ceramiaceae) TFP08-136. A. Microscopic view. B. Branchlet apex showing spines. C. Branchlet terminating in hook.

**•Habitat**

**BdT:** epiphytic on *Hypnea musciformis*, seagrass, *Bryothamnion triquetrum*; to 3 m depth.

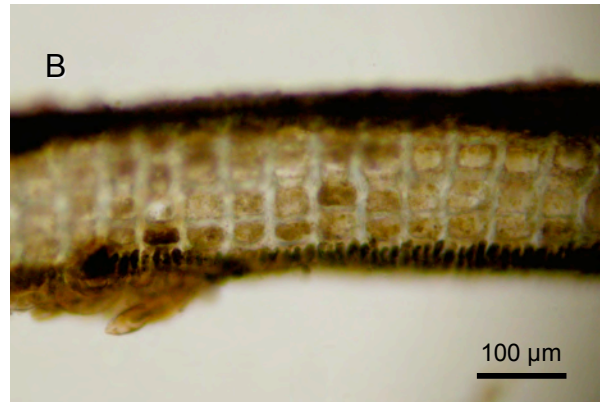
**General:** in calm protected areas.

**•Distribution**

**BdT:** Swan Cey (TFP08-70, TFP08-161), Isla Carenero (TFP08-136), Tervi Bight (TFP08-146, TFP08-224)

**General:** Florida, Bahamas, Greater Antilles, Lesser Antilles, Southern Caribbean, Gulf of Mexico).

Thallus pink to red, fuzzy, filamentous, densely bushy; branching alternate in all directions; apices normally terminating in large hooks (Figure C); cortication is complete and continuous in main axis, restricted to nodes in determinate branchlets; small surface cortical cells at nodes altering with long narrow surface cells at internodes (Figure A). Apical cells with 1-2(3) recurved spines (Figure B).



***Styopodium zonale*** (J.V. Lamour.) Papenfuss (Phaeophyceae, Dictyotales, Dictyotaceae) A. Hábito (TFP 0112), B. Corte transversal del talo, C. Rama del talo en forma de abanico.

•**Hábitat**

En sustrato rocoso y arenoso. Se encuentra desde zonas intermareales bajas hasta 10 m de profundidad.

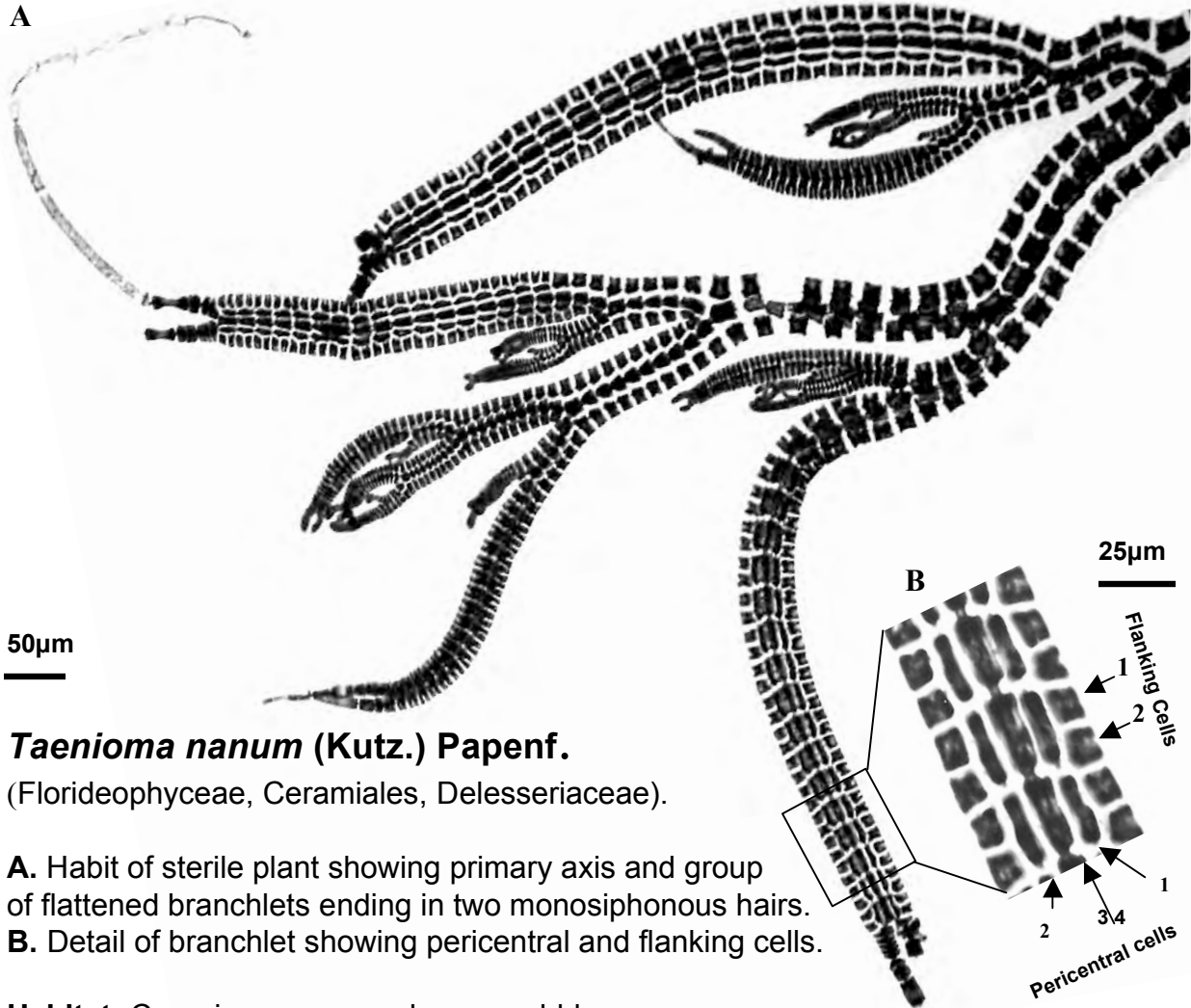
•**Distribución BdT**

Swan Cay

•**Distribución Mundial**

Islas Caribe, Islas Canarias, Madeira, Florida, Caribe: Panamá, Brasil, Colombia y Venezuela, Egipto, Kenia, Sur Africa, Pakistan, Sri Lanka, Japón, Indonesia, Vietna.

Talo erecto en forma de abanico hasta 30 cm de alto. Color amarillento dentro del agua y café cuando se saca de esta. Sin márgenes enrollados (como *Padina*) y lámina sin ondulaciones en la base (como *Zonaria*). Cuatro células medulares en las secciones viejas o en la base.



***Taenioma nanum* (Kutz.) Papenf.**  
 (Florideophyceae, Ceramiales, Delesseriaceae).

- A.** Habit of sterile plant showing primary axis and group of flattened branchlets ending in two monosiphonous hairs.
- B.** Detail of branchlet showing pericentral and flanking cells.

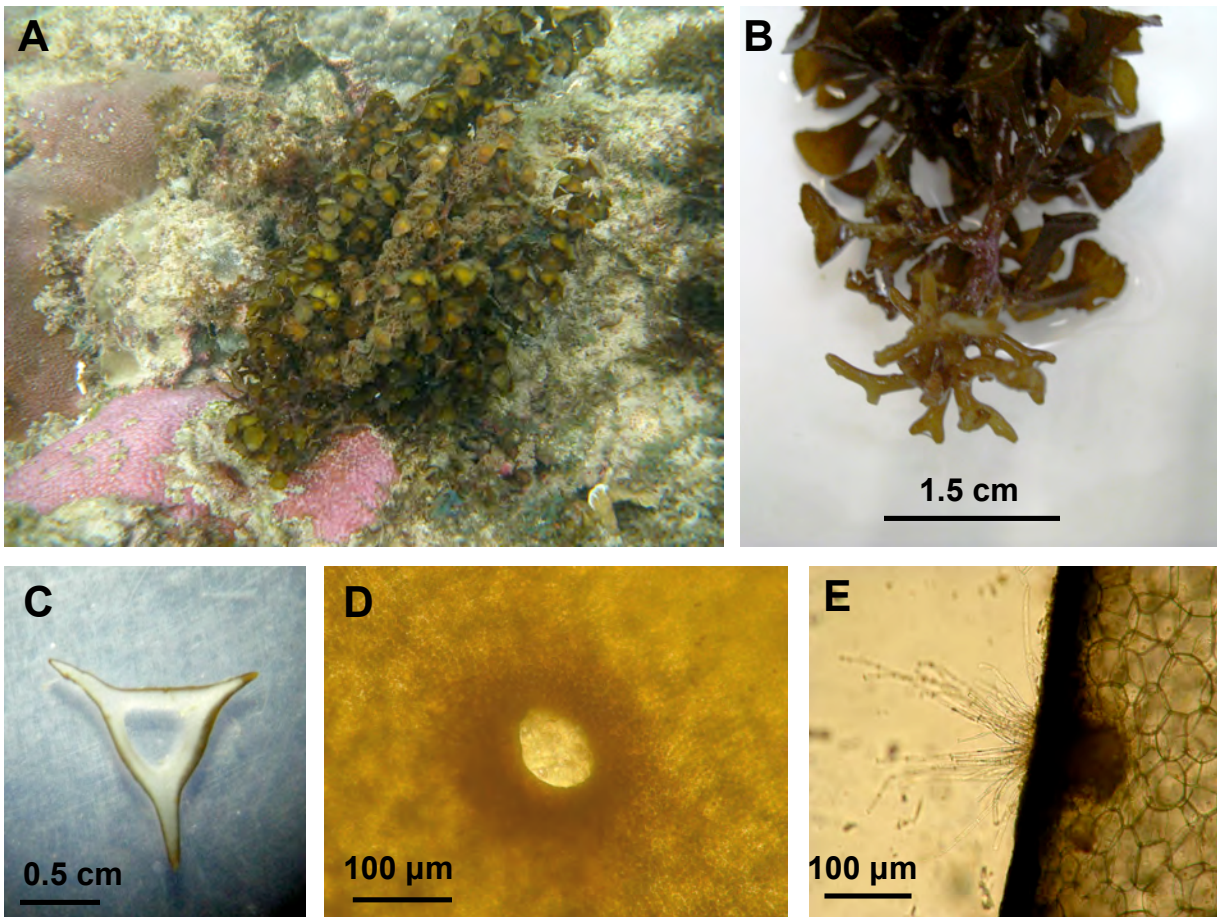
**Habitat:** Creeping on macroalgae or rubble.

**BdT distribution:** STRI Bay (Depth <10m) (Specimen TFP08 #0008).

**Worldwide distribution:** Mediterranean (Type locality: Naples, Italy), Florida Keys, Bermuda, Bahamas, Caribbean, Brazil, Eastern Atlantic, Atlantic, Indo-Pacific, Australia.

**Note:** *Taenioma* is characterized by a primary creeping axis bearing compressed to flattened branchlets exhibiting a midrib. Axial cells bear 4 pericentral cells. Lateral pericentral cells of the branchlet bear 2 flanking cells (each a half length of the pericentral cells), resulting in branchlets 5 cells wide. Large cells at the apex divide transversely to produce hairs that grow basally.

There are currently 2 recognized species, *T. nanum* and *T. perpusillum*. Separation is based on the counts of hairs at branchlet apex, 2 for *T. nanum* and 3 for *T. perpusillum*; however, variation in the number of hairs has been reported indicating that this character might be insignificant. The two species also seem to share a common biogeography.



***Turbinaria turbinata*** (L.) Kuntze (Phaeophyceae, Fucales, Sargassaceae). (A) Specimen on coral rubble (Wild Cane Key, Bocas del Toro, Panama), (B) Close-up of holdfast on specimen for herbarium collection (TFP08-0017), (C) Longitudinal section through blade showing triangular shape and hollow interior, (D) Surface view of blade with cryptostome, (E) Transverse section through embedded cryptostome with sterile hairs.

**•Habitat**

Found growing on coral rubble.

**•BdT Distribution**

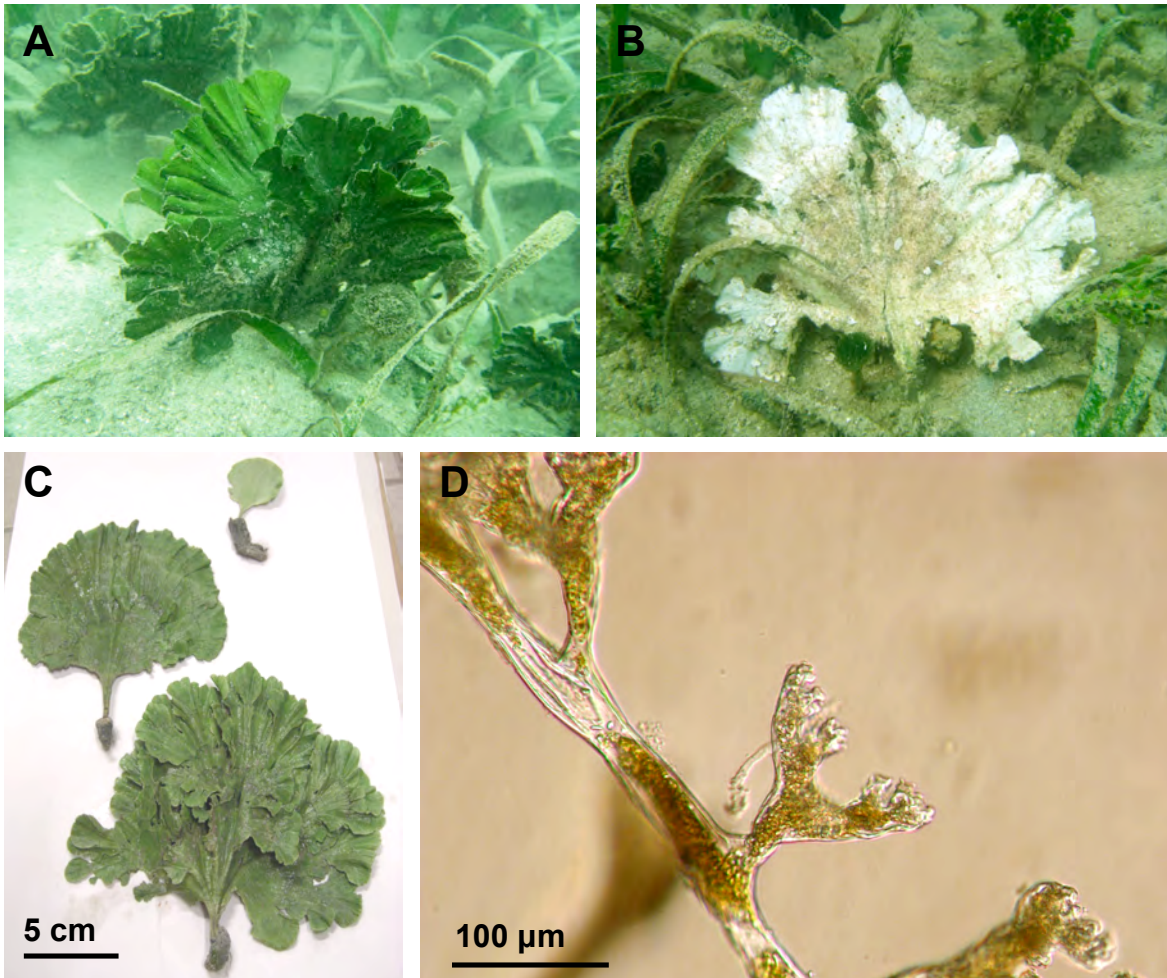
Wild Cane Key

**•Worldwide Distribution**

North America (Florida), Central America (Belize, Panama), Caribbean Islands (Bahamas, Caicos Islands, Cuba, Hispaniola, Jamaica, Lesser Antilles, Netherlands Antilles, Puerto Rico, Virgin Islands), South America (Brazil, Colombia, Venezuela), Indian Ocean Islands (Andaman Islands, Laccadive Islands, Seychelles), Southwest Asia (India, Philippines, Sri Lanka), Southeast Asia (Indonesia)

Thallus tough, leathery, erect, cylindrically shaped, dark brown. Blades clustered, apex flat or convex, pyramid-shaped. Transverse section through blade triangular, margins toothed. Cryptostomata numerous, scattered, uniporate.





***Udotea flabellum*** (J. Ellis & Sol.) J.V. Lamour. (Ulvophyceae, Bryopsidales, Udoteaceae). Specimen growing in sandy substratum in seagrass bed (Wild Cane Key, Bocas del Toro, Panama), (B) Holocarpic individual having shed gametes, (C) Specimens for herbarium collection (TFP08-0262), (D) Blade siphon with lateral appendages.

**•Habitat**

Found growing in sandy substratum within seagrass bed (*Thalassia*).

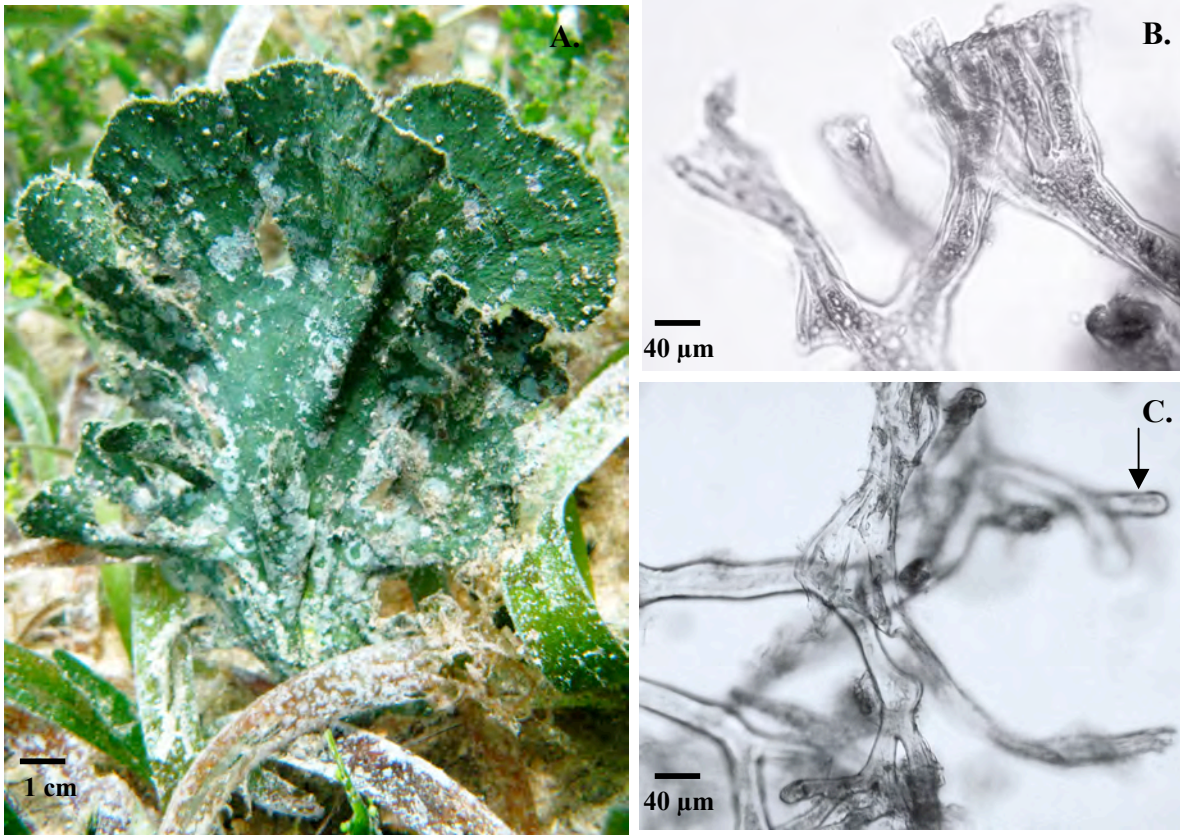
**•BdT Distribution**

Wild Cane Cay, Isla Carenero, Bastimento Solarte Channel.

**•Worldwide Distribution**

Atlantic Islands (Bermuda, Cape Verde Islands), North America (Florida, Mexico, North Carolina), Central America (Belize, Panama), Caribbean Islands (Bahamas, Barbados, Caicos Islands, Cayman Islands, Hispaniola, Cuba, Jamaica, Lesser Antilles, Puerto Rico, Trinidad & Tabago, Virgin Islands), South America (Brazil, Colombia, Venezuela), Africa, Indian Ocean Islands, Asia (Southwest, Southeast), Australia & New Zealand.

Thallus fan-shaped (often lobed), undivided to highly divided, thick, leathery, moderately calcified, solitary. Blade siphons with lateral appendages. Lateral blade appendages random, sparsely scattered, forming continuous cortex.



***Udotea flabellum*** Ellis & Solander (Ulvophyceae, Bryopsidales, Udoteaceae) TFP08-0375. **A.** Creciendo en praderas de pastos marinos; **B.** Apéndices laterales del ápice de la hoja formando un cortex continuo **C.** Apéndices laterales del estípote redondeado

•**Hábitat**

Ampliamente distribuida. Común sobre litoral arenoso y praderas de pastos marinos. Hasta 23 m de profundidad.

•**Distribución BdT**

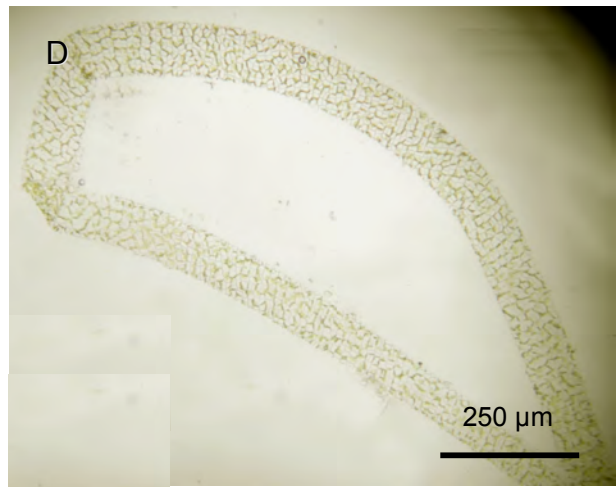
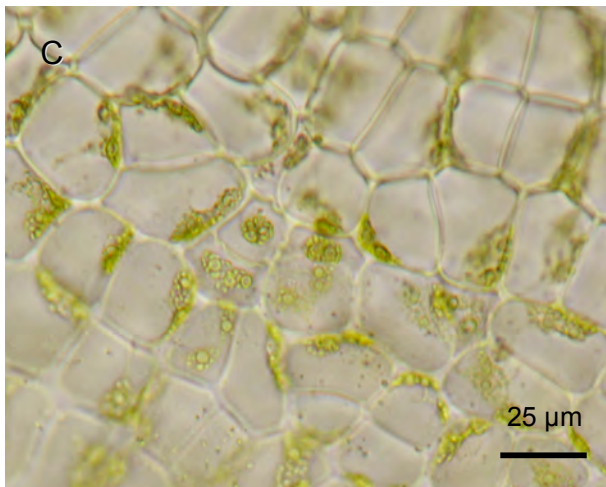
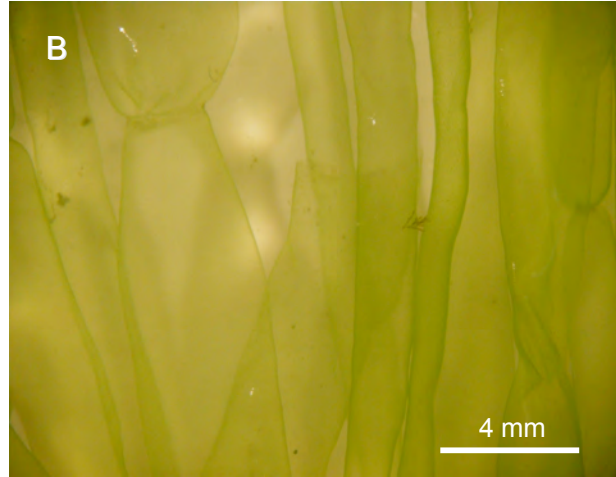
Bastimento Solarte Channel (TFP08-0251, TFP08-0375); Isla Carenero (TFP08-0138, TFP08-0174)

•**Distribución Mundial**

Islas del Atlántico, Florida, Mexico, Carolina del Norte, Belice, Panamá, Islas del Caribe, Brasil, Colombia, Venezuela, Africa, Seychelle, Suroeste de Asia, Australia y Nueva Zelanda.

Talo en forma de abanico, moderadamente calcificado y con zonación evidente. Hojas simples con surcos profundos (Fig 1A). Apéndices laterales en los sifones de las hojas espaciados e irregularmente distribuidos. Los sifones (con apices redondeados) presentan ramificación dicotómica, con ángulos pequeños que forman un cortex continuo. (Fig 1B). Estípote cilíndrico con apéndices laterales en los sifones, similares a los encontrados en las hojas (Fig 1C).

*Preparado por Margarita R. Albis Salas*



***Ulva flexuosa*** Wulfen (Bryopsidophyceae, Ulvales, Ulvaceae) A. Hábito (TFP 0025), B. Talo tubular, C. Células de la superficie de la lámina, D. Corte transversal del talo

**•Hábitat**

En sustrato arenoso. A 2 m de profundidad.

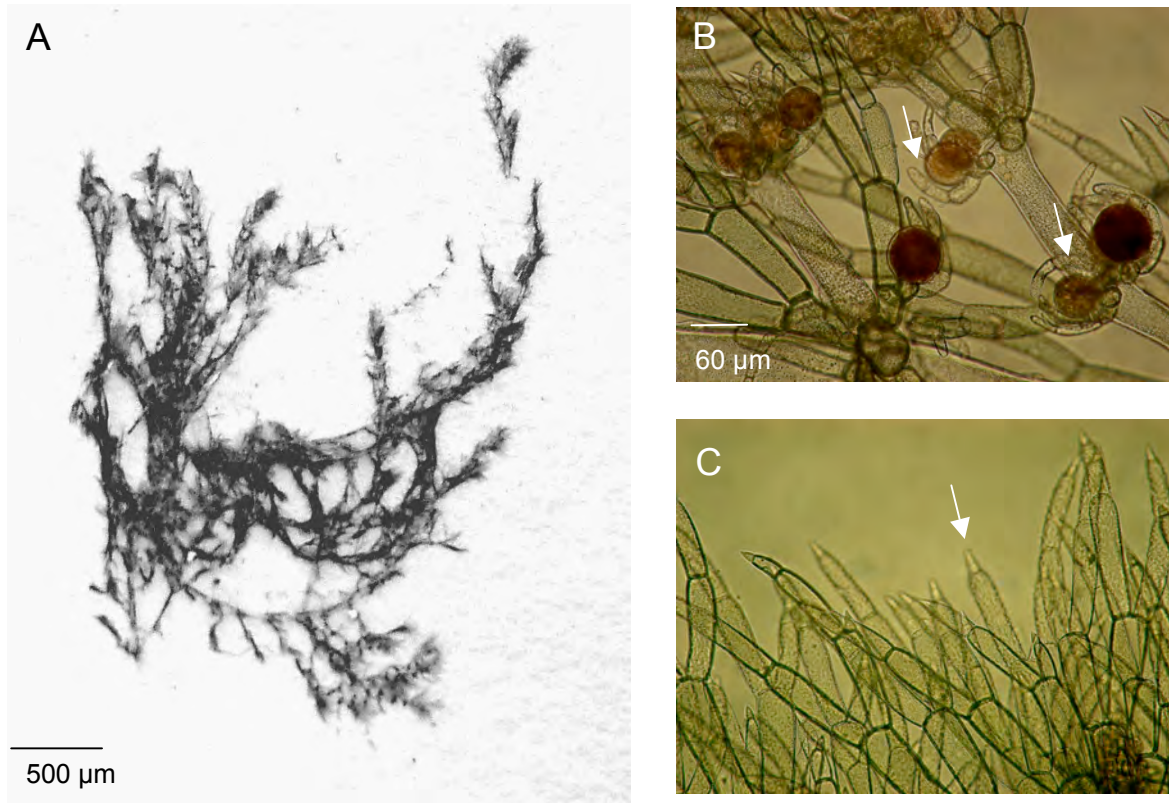
**•Distribución BdT**

Wild Cane Cay

**•Distribución Mundial**

Inglaterra, España, Suiza, Turquía, Islas Canarias, Florida, Islas Caribe, Caribe: Panamá, Costa Rica, Africa, Israel, Australia, Nueva Zelanda, Pacífico: Costa Rica, El Salvador, Islas Revillagigedo (México)

Talo entre 5 y 9 cm de alto, verde claro. Láminas de una célula de grueso, agregadas en forma tubular y huecas. Talo generalmente no ramificado, pero si presenta ramificaciones se dan en la base. La diferencia con *U. intestinalis* es que esta última tiene el talo comprimido y contorcionado mientras que *U. flexuosa* presenta estas características.



***Wrangelia argus* (Mont.) Montagne** (Florideophyceae, Ceramiales, Ceramiaceae).  
 A. Habit of pressed herbarium specimens (TFP08-0103) B. Tetrasporangia surrounded by involucre filaments (arrows) C. Branchlet apices with pointed tips (arrow).

### Hábitat

**BdT:** Epiphytic on macroalgae, intertidal to 2 m depth.

**General:** Frequently on rocky substrata, or epiphytic on coarser plants, to 10 m depth.

**BdT Distribution:** Carenero (TFP08-0103, TFP08 -0118).

**Worldwide Distribution:** Atlantic Islands, throughout the Americas, Caribbean Islands, South Africa, Tanzania, Togo, Indian Ocean Islands, Southwest Asia, Asia Pacific Islands.

Thallus forming iridescent, purple-red fuzzy turfs (1.5 cm high); branching irregular. Main filaments cylindrical (to 400 µm diam.). Branchlets soft, thin, arranged in whorls at joints. Tetrasporangia spherical (60 µm diam.), surrounded by short, incurved involucre filaments.