Revised September 2016

Field Identification Guide to the Threatened Corals of the U.S. Pacific Islands

Douglas Fenner and David Burdick

Contents

1.0 Introduction

In September, 2014, the National Marine Fisheries Service (NMFS) listed 15 Indo-Pacific coral species as "threatened" under the U.S. Endangered Species Act. Many Indo-Pacific corals are quite difficult to identify to species, but identification is necessary for implementation of the listings. This guide is intended to help with identification of colonies of these species living on the coral reefs of U.S. Pacific areas, namely American Samoa, Guam, the Commonwealth of the Northern Marianas Islands, and the U.S Pacific Remote Island Areas (PRIA).

In all but a few cases, most coral species are defined based on their skeletal structure. Luckily, the tissues are thin on most species, so some skeletal features can be observed in the living corals. Living corals also have some clues that skeletons don't have, such as colors. Corals in the Indo-Pacific are difficult to identify because colony morphology of a species can be variable and morphological differences between colonies of different species can be small. Coral species vary in colony shape and the features of the "corallites", which are the cups the polyps sit in ("calices" are the insides of the cups) and other small features outside the corallites. Almost every coral species in the Indo-Pacific has one or two other species that are very similar and hard to distinguish from it, and some have many.

We are still learning about coral species, although we know vastly more than just a few decades ago. At present, we know little about most of the threatened Pacific species. We have relatively complete lists of coral species present for few places in the Indo-Pacific. These lists provide guidance on the likelihood of finding a particular species in a certain location; if a species is not listed, this indicates that the taxon is less likely to be found in that particular region. Notwithstanding, because corals species can be hard to identify some reports can be incorrect by mistakenly identifying one species for another similar one. As such, while known species ranges and local reports are usually good indicators of the coral fauna in a specific area, they are not perfect, and finding unreported species is possible if not likely. In time, as we learn more and refine our ability to discriminate between similar taxa, our knowledge regarding species distribution and their geographical ranges will continue to improve.

Here, we present a guide to the field identification of the ESA-listed, threatened corals of the U.S. Pacific. Species are presented in an order that groups similar corals together as much as possible, and will present more common or widespread species at the start. In addition, other similar species will be presented to highlight the differences between taxa.

ESA-listed coral species confirmed in U.S. Pacific waters so far:

	Species	Known from
1.	*Isopora crateriformis* (Gardiner, 1898)	American Samoa
2.	*Acropora globiceps* (Dana, 1846)	American Samoa, Guam, CNMI, PRIA
3.	*Acropora retusa* (Dana, 1846)	American Samoa, Guam, CNMI(?), PRIA
4.	*Acropora speciosa* (Quelch, 1886)	American Samoa, Guam, PRIA
5.	*Acropora jacquelineae* (Wallace, 1994)	American Samoa
6.	*Seriatopora aculeata* (Quelch, 1886)	Guam, CNMI
7.	*Euphyllia paradivisa* (Veron, 1990)	American Samoa

ESA-listed coral species not confirmed in U.S. Pacific waters:

1. *Pavona diffluens* (Lamarck, 1816)
2. *Acropora tenella* (Brook, 1892)
3. *Anacropora spinosa* (Rehberg, 1892)
4. *Acropora lokani* (Wallace, 1994)
5. *Porites napopora* (Veron, 2000)
6. *Montipora australiensis* (Bernard, 1897)

This guide provides detailed descriptions of the seven species confirmed in U.S. waters, while the species not confirmed in U.S. waters are covered more briefly at the end of the guide.

2. *Isopora crateriformis* American Samoa

2.1 Species Description

This species forms colonies that are encrusting or plates. Colonies on slopes usually form plates on their lower edge. The colonies commonly have some low irregular ridges on the surface of the plate, but no branches are formed. Colonies are usually about 1-2 feet diameter. The surface is covered with small round cylindrical corallites close together. Colonies usually are a light rusty color, and some colonies have green centers in their corallites. Colonies are most common on upper reef slopes but can be in other reef zones. This species is rare most places within its range, but is common in parts of American Samoa, especially the southwest coast of Tutuila. Where it is most common, it is most abundant at about 5 m depths, and less common with decreasing or increasing depth from there.

The most similar species to *I. crateriformis* are *I. cuneata*, *I. palifera*, and *A. palmerae*. *Isopora cuneata* is usually cuneiform (wall-like) or branching, but has corallites that are identical to *I. crateriformis*. Sometimes *I. cuneata* is reported to be encrusting, which would be indistinguishable from *I. crateriformis*. Although *I. crateriformis* is recognized as a valid species by Wallace (1999) and Veron (2000), both write that its status is somewhat uncertain. In Tonga there are encrusting colonies, branching colonies, cuneiform colonies, and intermediate colonies.

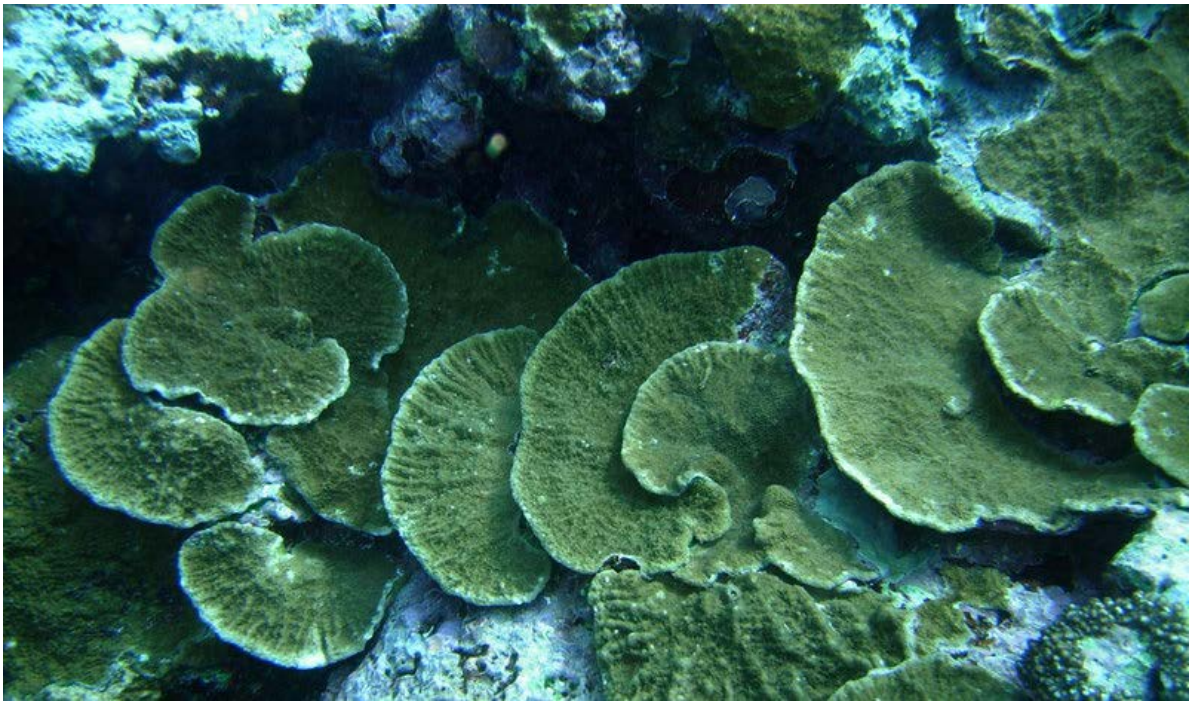


Figure 2.1.1. Colonies of *I. crateriformis* on a slope, forming plates in American Samoa. The true color is a light tan or rusty color. The green in this photo is due to the photo taken in natural light. Photo taken in American Samoa, copyright by Douglas Fenner.

Figure 2.1.2. An encrusting colony of *I. crateriformis* in American Samoa. This shows the typical color, and the small ridges. Photo taken in American Samoa copyright by Douglas Fenner

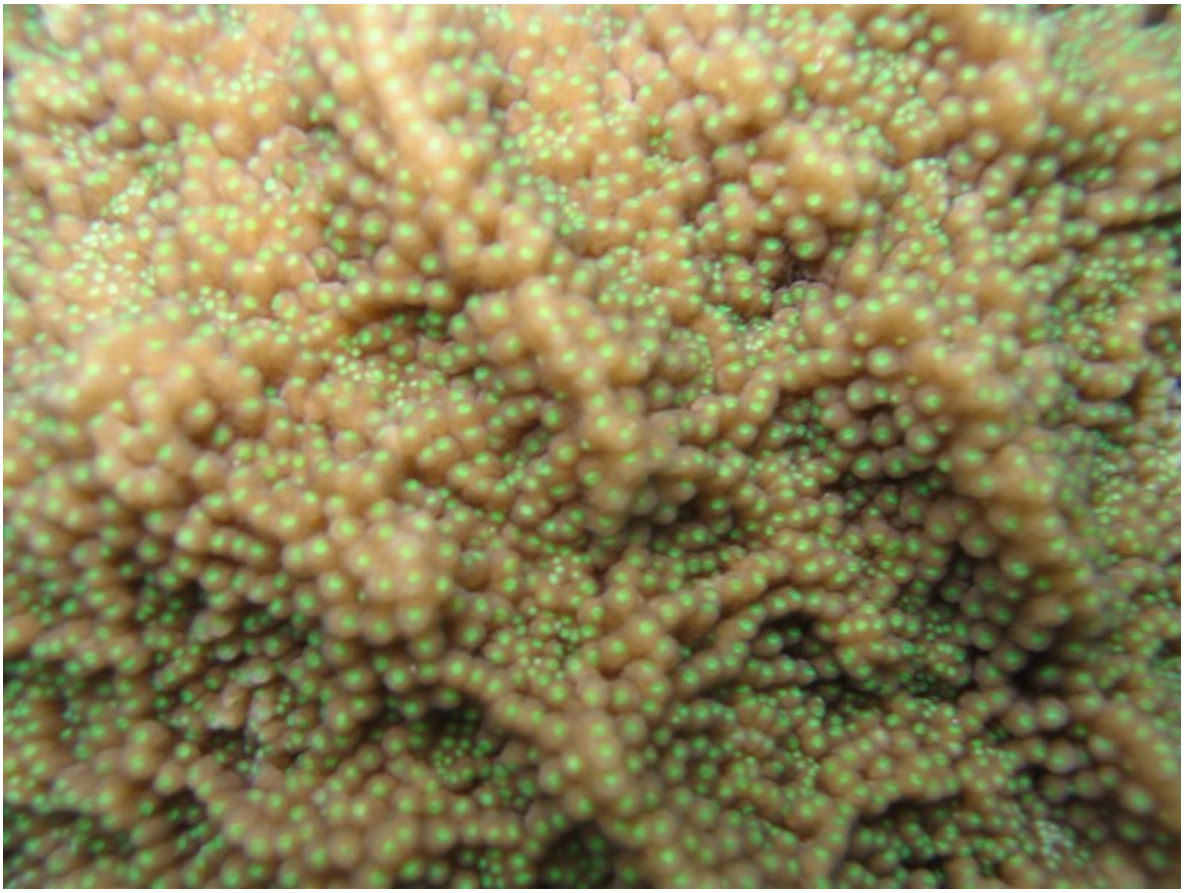


Figure 2.1.3. This is an close-up photo of an *I. crateriformis* colony in American Samoa that has green corallite centers. Note the ridges. Colonies with green corallite centers are uncommon. Photo taken in American Samoa copyright by Douglas Fenner.

2.2 Similar Species

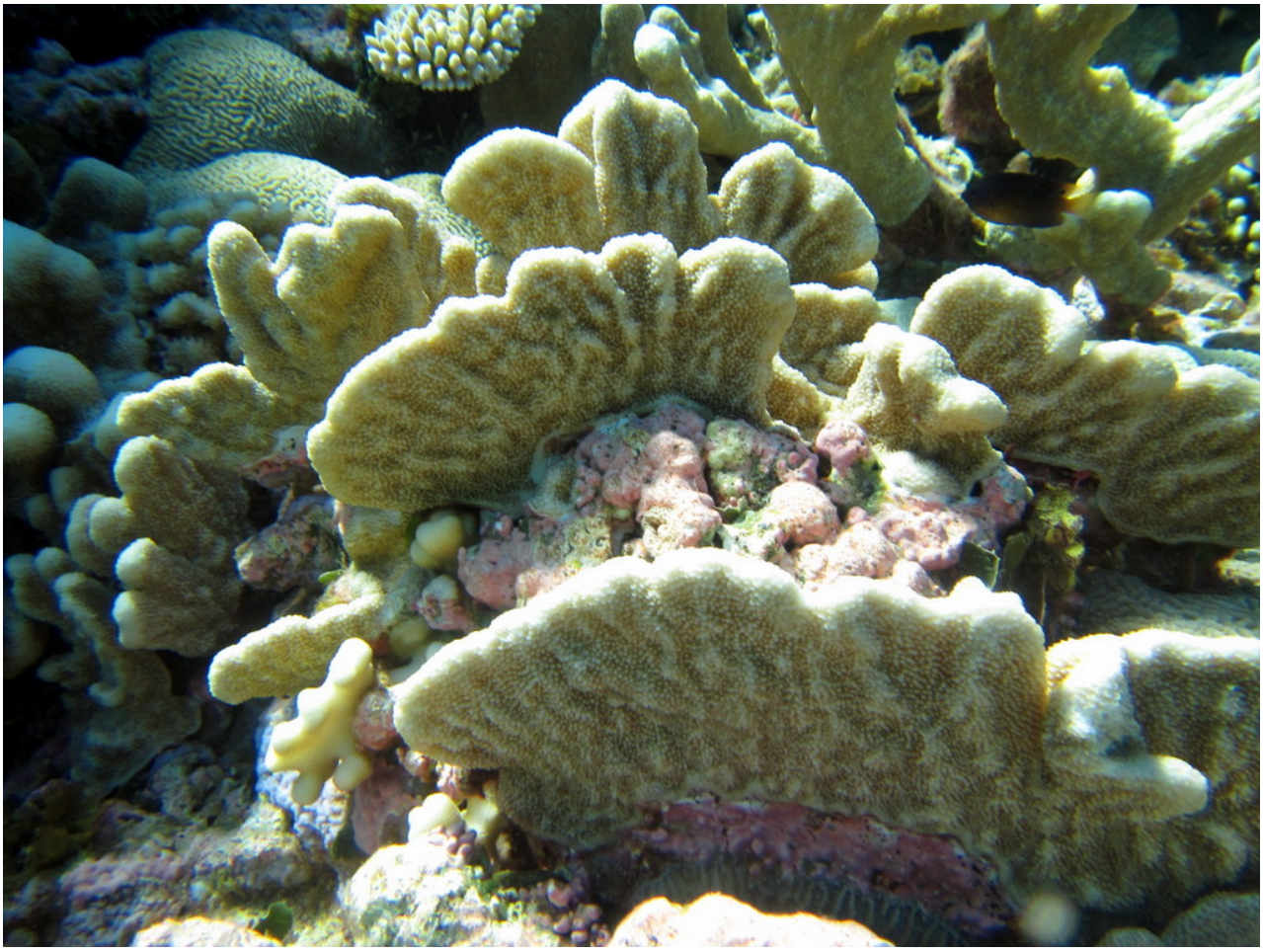


Figure 2.2.1. These colonies in Tonga are *I. cuneata*, the most similar species to *I. crateriformis*. Note the wall-like "cuneiform" colonies. Photo copyright by Douglas Fenner.

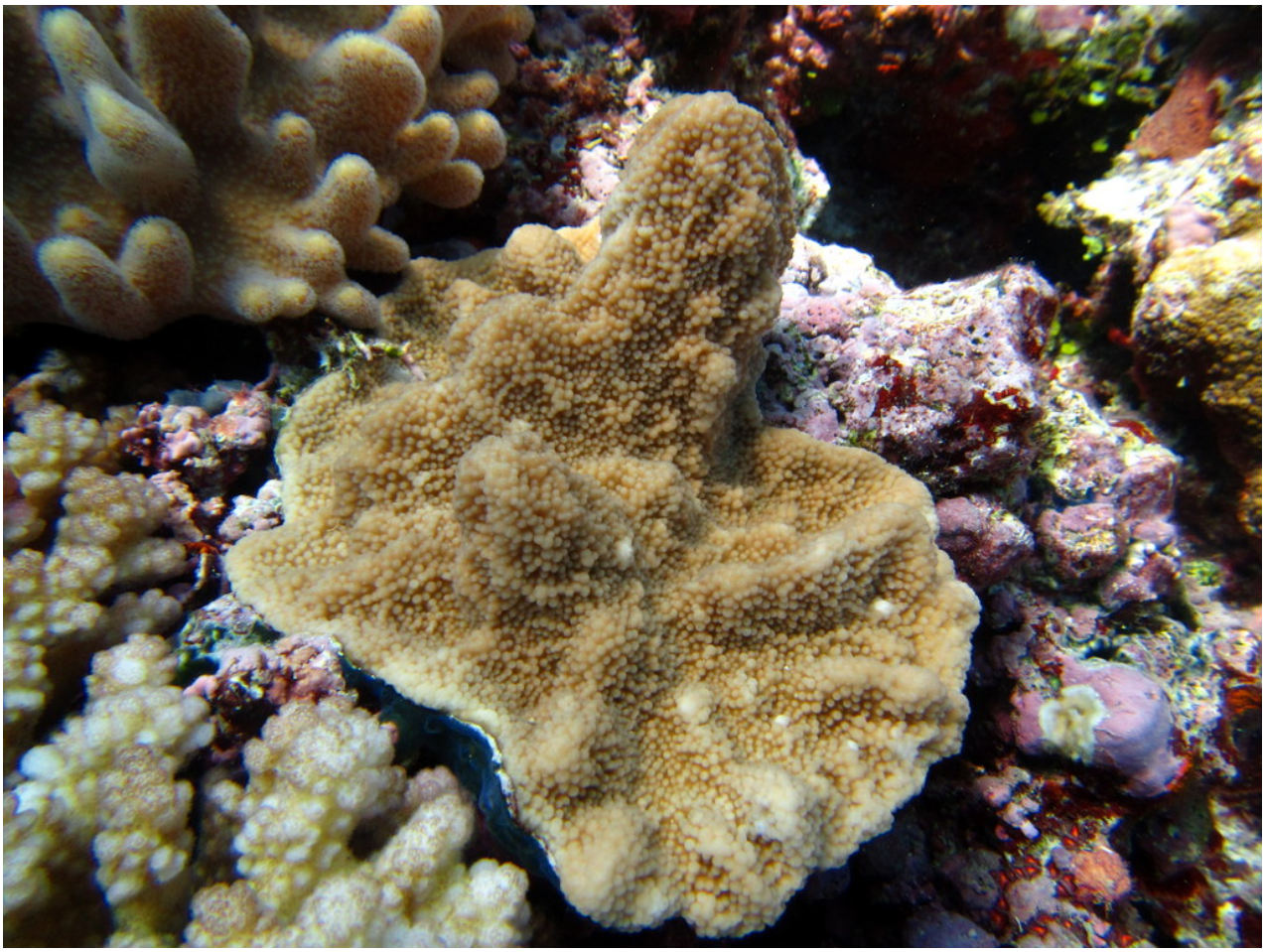


Figure 2.2.2.This colony in Tonga has an encrusting base but has low ridges which appear to be young cuneiform walls, and one branch. *Isopora cuneata* can have branches and encrusting bases as well as cuneiform walls. So this colony appears to be *I. cuneata*. The color and corallites appear identical to *I. crateriformis*. *I. crateriformis* does not have branches or cuneiform formations. Photo copyright by Douglas Fenner.

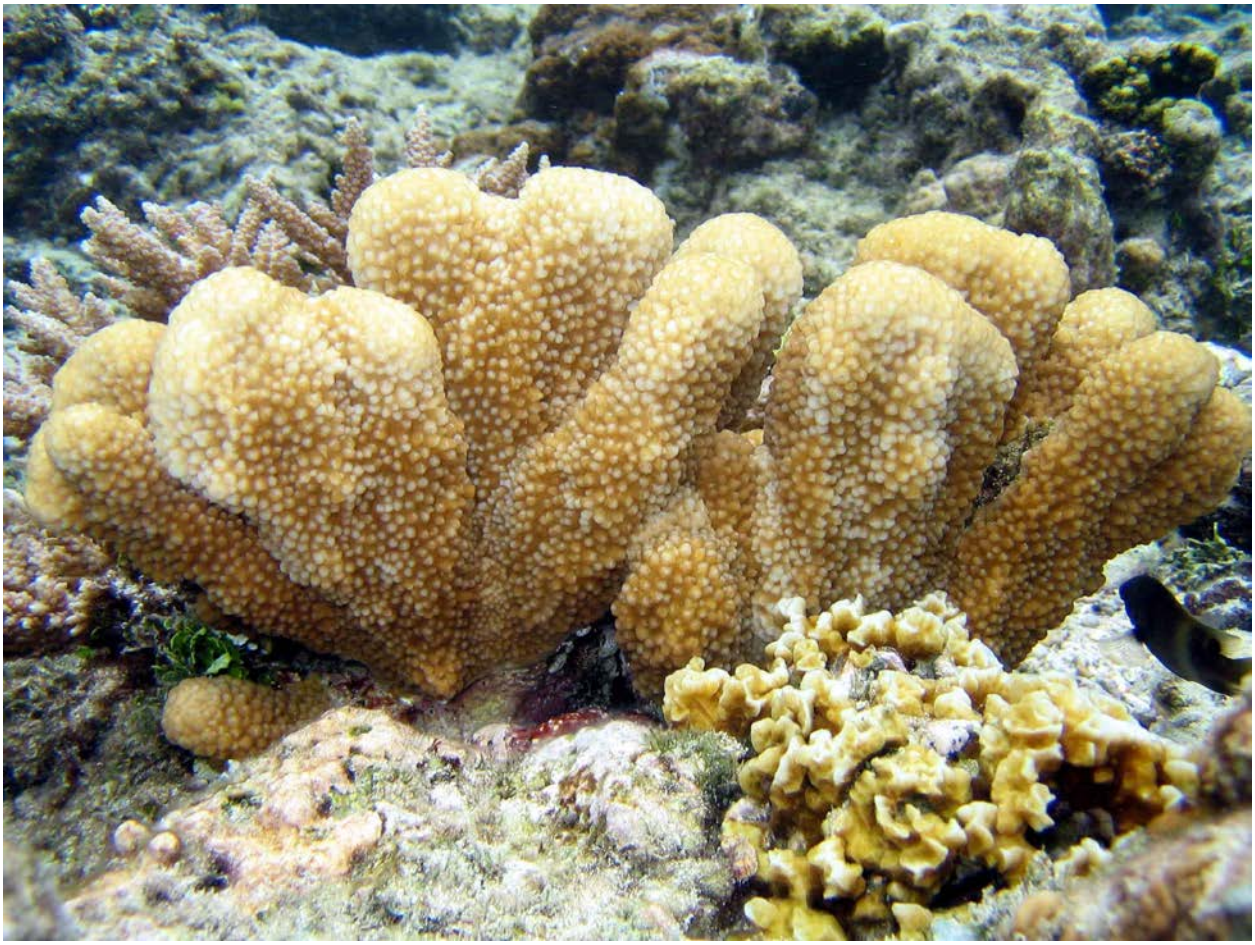


Figure 2.2.3. Colonies of *I. palifera*. *Isopora palifera* is almost always branching, with oval or round thick branches. It can be encrusting, but encrusting colonies have not been documented in American Samoa. *I. palifera* has larger corallites than *I. crateriformis*, but the difference in sizes is not easy to see underwater unless they are next to each other.

Figure 2.2.4. The larger corallites on *I. palifera* seen in a close-up photo.

Encrusting colonies of *A. palmerae* can resemble *I. crateriformis*. However, they are often colors like green which *I. crateriformis* does not have, and usually has at least a few short branches, which *I. crateriformis* does not have. Close examination of the colony reveals that the corallites are quite different, some being tubular and others being rasp-like.

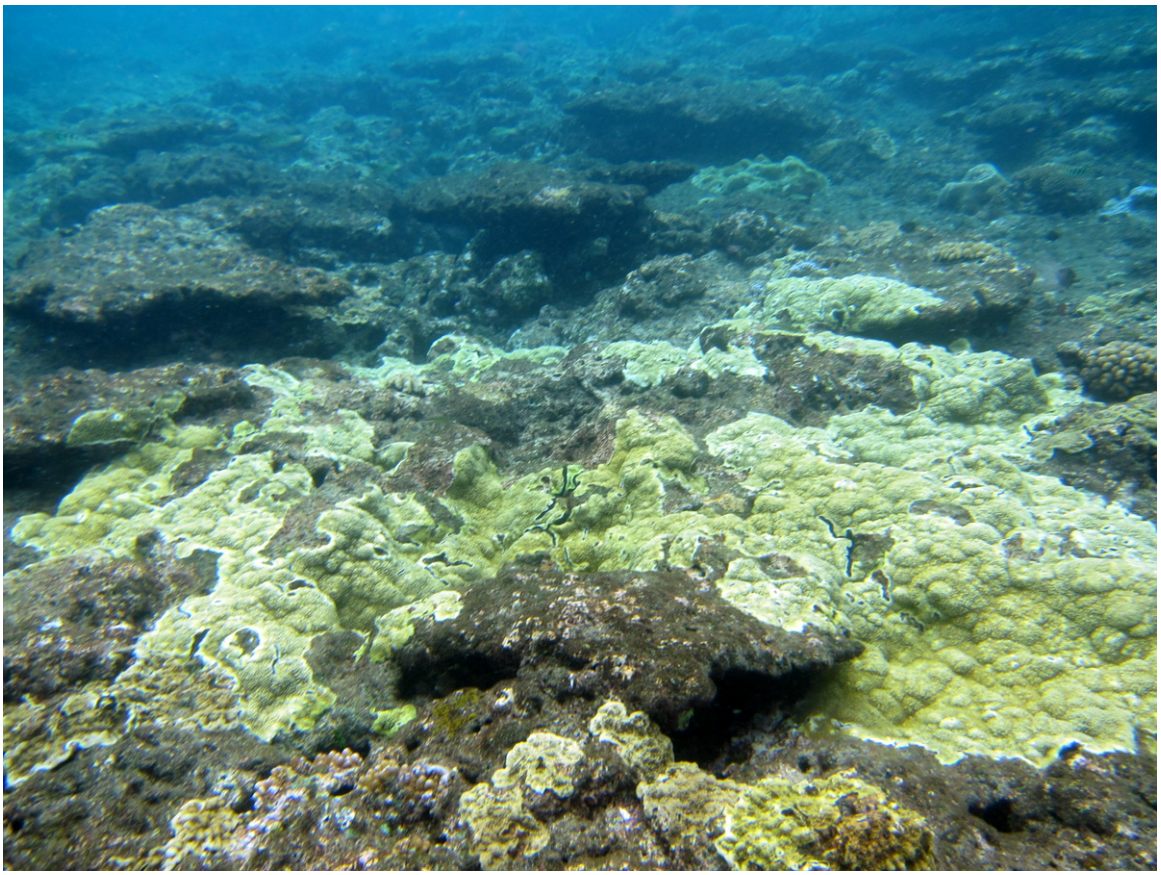


Figure 2.2.5. Encrusting colonies of *A. palmerae* in American Samoa. This species is also common in areas of the Marianas at about 2-3 m deep and virtually never has branches. In American Samoa, however, it almost always has at least a few stubby branches and is commonly green. The branches and corallites of this species are virtually identical to *A. robusta*, which is a branching species.

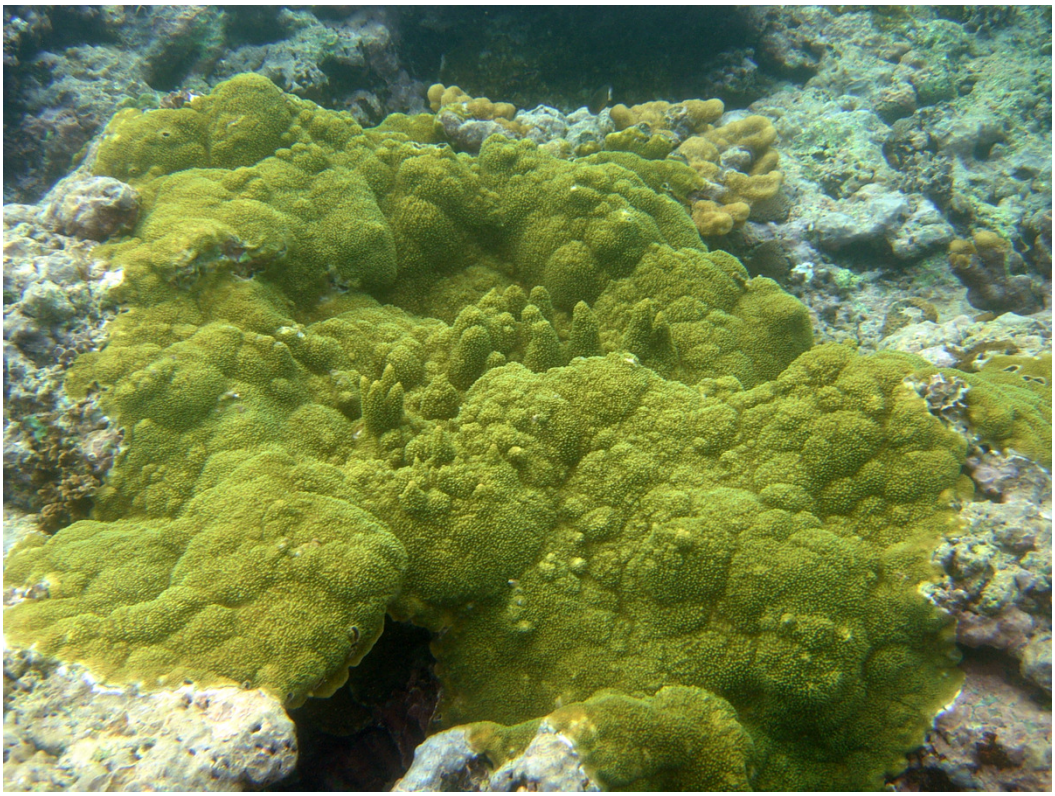


Figure 2.2.6. A typical colony of *A. palmerae* in American Samoa. Note the stubby vertical branches.

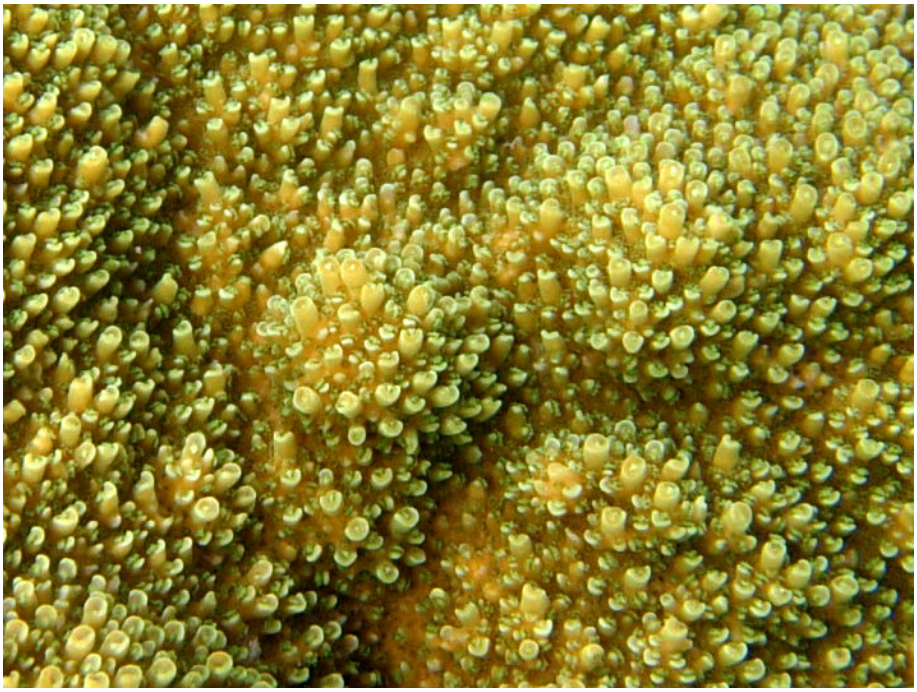


Figure 2.2.7. A close-up photograph of *A. palmerae* in American Samoa, showing the corallites, some of which are tubular and others are rasp-like.

3. *Acropora globiceps* American Samoa, Guam, CNMI, PRIA

Acropora is the genus of corals with the largest number of species. *Acropora* generally has branches, and there are two kinds of corallites on the branches of: Axial corallites on the tips of branches, and radial corallites on the sides of branches. There is always one, and only one, axial corallite on the end of a branch of *Acropora*, while other kinds of corals have more than one corallite on the ends of their branches. *Acropora* corallites are small, with the inside of the corallite (called the "calice") usually only about 1 mm in diameter.

3.1 Species Description

This coral forms digitate colonies with finger shaped vertical or radiating branches. The axial corallite is a small short raised tube. Radial corallites are tubular, may have upward facing openings, are nearly uniform in size, and are often in rows. Colonies are brown or fluorescent green in American Samoa and yellow-brown in the Northern Marianas (at least on Tinian and Rota), and ranging from brown to yellow-brown and green-brown to light tan to gray-green in Guam. It is much more abundant on Tinian, Rota, and Saipan than in American Samoa. It is most common on Tinian and Rota at 5 m depth, and decreases in abundance with increasing or decreasing depth from that depth. Colonies have been found as deep at 60-70 feet in the Marianas (Lyza Johnston, personal comm.). This species has probably been frequently mistaken for *A. humilis* previously, which it resembles closely, except *A. humilis* either has large, dome-shaped axial corallites with very thick walls or longer, thinner, diverging branches of variable length. *Acropora globiceps* also resembles *A. gemmifera*, *A. monticulosa*, and *A. digitifera* (all illustrated below) and also *A. cophodactyla sensu* Veron (illustrated under *A. retusa* below).

Revised September 2016

Comparison of *A. globiceps* information from original description (Dana 1846), Wallace (1999), and Veron (2016):

Original description	**Wallace, 1999**	**Veron et al, 2016**
Cespitose, convex colony	Rounded digitate to caespito-corymbose clumps	Colonies digitate and usually small
Branchlets digititiform; crowded (1/4" apart), somewhat angular, obtusely rounded or almost truncate at tips	Branches terete, with thick tips; 12-25 mm dia., up to 60 mm long; sometimes fused in groups of up to 5	Branches short, closely compacted, with dome-shaped ends; pyramid-shaped with greater wave exposure
Axial small, not prominent	Axial corallites 3.0-4.5 mm dia.	Axial corallites small and sometimes indistinguishable
Radial corallites crowded, short, tubiform or tubo-nariform, opening elliptical	Radial corallites "wide open"; tubular or appressed tubular to tubo-nariform, with dimidiate openings which can be rounded to compressed, not touching or some touching	Radial corallites irregular in size, sometimes arranged In rows down the sides of branches

Note: "terete" means not tapering

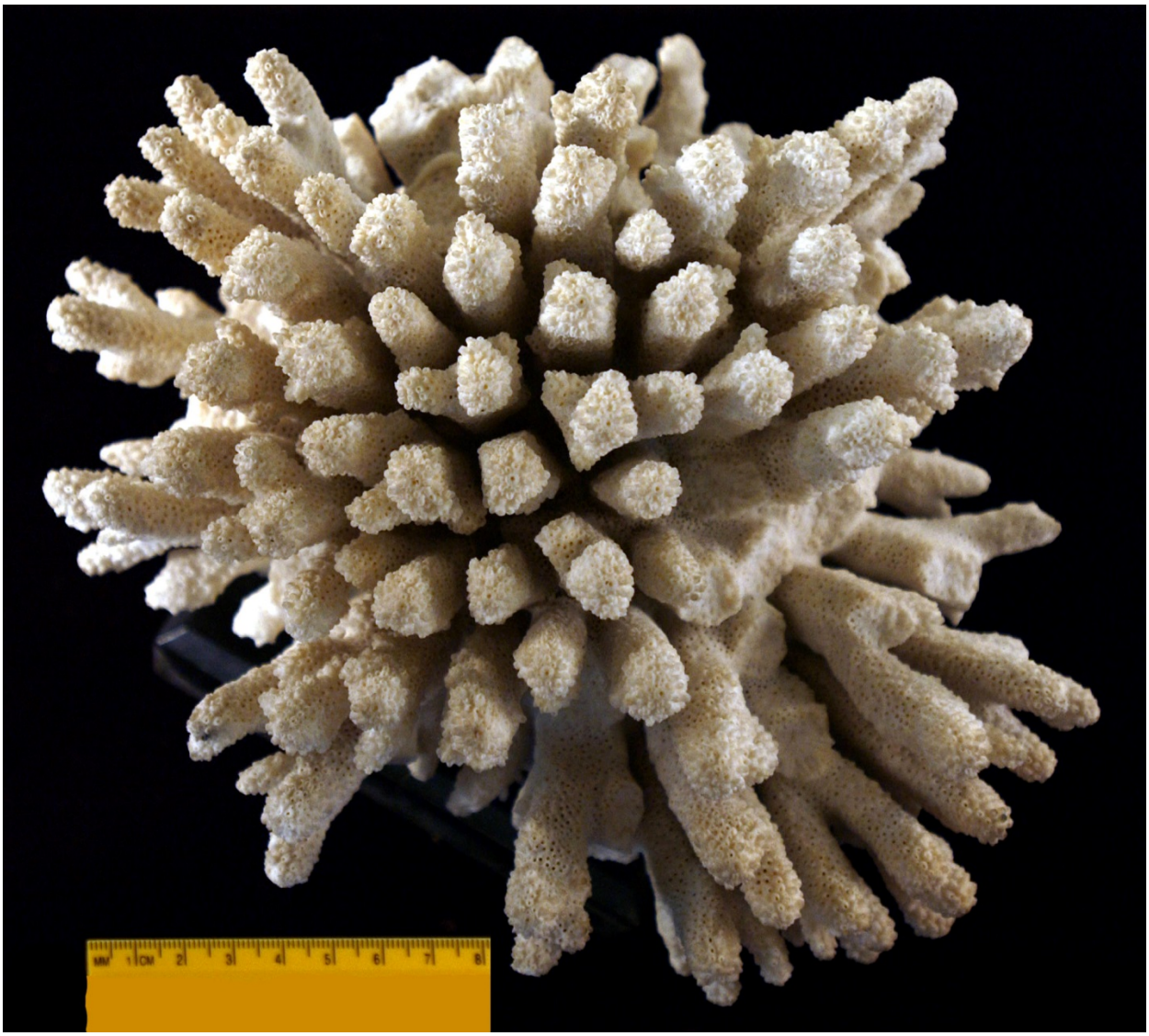


Figure 3.1.1. The type specimen of *A. globiceps*. Photo Smithsonian Institution website.

Figure 3.1.2. A close-up of the type specimen of *A. globiceps*. Photo Smithsonian Institution website.

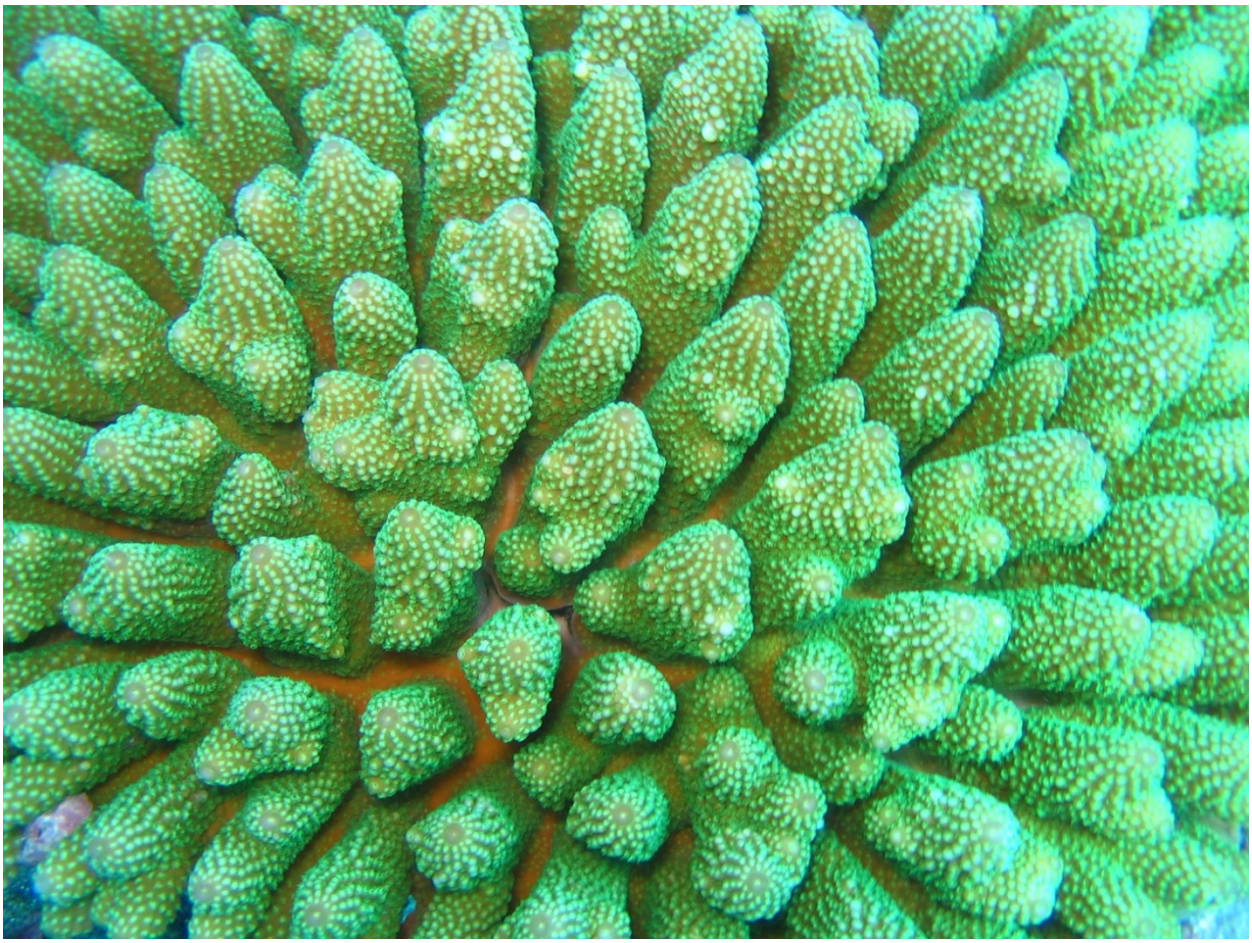


Figure 3.1.3. A colony of *A. globiceps* from American Samoa. Photo copyright by Douglas Fenner.

Figure 3.1.4. A close-up of *A. globiceps* from American Samoa. Notice the small tubular axial corallites. Photo copyright Douglas Fenner.

Figure 3.1.5. A colony of *A. globiceps* from Rota. Photo copyright Douglas Fenner. Burdick (2016) presents many more photos of colonies in Guam, showing the range of variation there.

3.2 Similar Species

Acropora humilis

Acropora globiceps has often been mistakenly called *A. humilis* and many records of *A. humilis* are likely of *A. globiceps*. *Acropora globiceps* has branches that are thicker and closer together and more uniform in length and less divergent than some *A. humilis* colonies, and has a smaller axial corallite than other *A. humilis* colonies. The type specimen of *A. humilis* has relatively small axial corallites (about 3-4 mm diameter) that appear to be dome-shaped not tubular and somewhat diverging branches that are thinner than on *A. globiceps*, which do not taper and are variable in length. Wallace and Veron have interpreted the biological species *Acropora humilis* as having variation that includes colonies with much larger axial corallites, as well as colonies with widely diverging branches, less diverging branches, branches close together or far apart, and variable length branches, in various combinations, as seen in Wallace (1999) and Veron et al (2016). Veron and Wallace (1984) write that *A. humilis* "is very polymorphic and difficult to distinguish as a single discrete species unit." Wallace (1999) writes that "specimens vary in the following ways: radial corallite openings from rounded dimidiate to elongate dimidiate; radial corallite shapes from tubular to nariform and length of lower wall from very short (less than 1 mm) to long (5 mm); branch shapes from terete, to conical to hexagonal in cross section. Different morphs (sometimes with distinctive colors) have been seen to co-occur and in some cases to spawn at different times (B. Kojis, pers. comm.)." Wolstenholme (2003, 2004) and Wolstenholme et al. (2003) investigated species in the *A. humilis* group in American Samoa and Lizard Island on the Great Barrier Reef in Australia. She found three morphs within *A. humilis*, two within *A. digitifera*, and two within *A. monticulosa*. She did not report *A. globiceps*, saying it was morphologically not distinguishable from *A. humilis*. She found seven morphs that were intermediate between the species at Lizard Island. She found all of the species to be distinguishable morphologically, and all distinguishable genetically except *A. humilis* was not genetically distinct from *A. gemmifera*. All species had high rates of fertilization within species and very low rates of hybrid fertilization with other species, supporting their validity. She reports *A. humilis* had large or very large axial corallites, but her photographs of skeleton branches from American Samoa seem to show small axials on all morphs (but are not clear enough to be sure). She does not present photographs of living colonies of any of the species or morphs, and does not present photographs of skeletons from Lizard Island, making recognition of her morphs uncertain. She does not report several features such as branch spacing and divergence. But she found the study of morphs to be extremely useful in the study of species and hybrid taxonomy and identification.

There are coral colonies in the Marianas that have diverging branches which are thinner than those of *A. globiceps*, often variable in length, and which have relatively small axial corallites. These colonies are illustrated below. Most colonies have short radial corallites but some have longer radial corallites. These colonies are most similar to the type of *A. humilis*. The only difference appears to be the axial, which is slightly raised instead of dome shaped as appears to be the case on the *A. humilis* type. Wallace and Veron both treat the biological species *A. humilis* as a group of slightly different morphologies, such as colonies that have large dome axials and those that have small dome axials, those

with more diverging branches and those with less diverging branches, and a wide range of radial corallite lengths. These features may cluster together in colonies that form morph groups, and some of those morph groups may spawn at different times. That would suggest that the group of colonies with varying morphology that we currently consider to be *A. humilis* may consist of a species complex. The diverging branch morph of *A. humilis* found in the Marianas is less common than the typical *A. globiceps* colonies in shallow water in the Marianas and is more common than *A. globiceps* in deeper water (Lyza Johnston, personal comm.), and has not been found in American Samoa yet.

Figure 3.2.1. The type specimen of *A. humilis* viewed side on. Photo Smithsonian Institution website.

Figure 3.2.2. The type specimen of *A. humilis*. Note the diverging branches and moderate size axial corallites. Photo Smithsonian Institution Website.

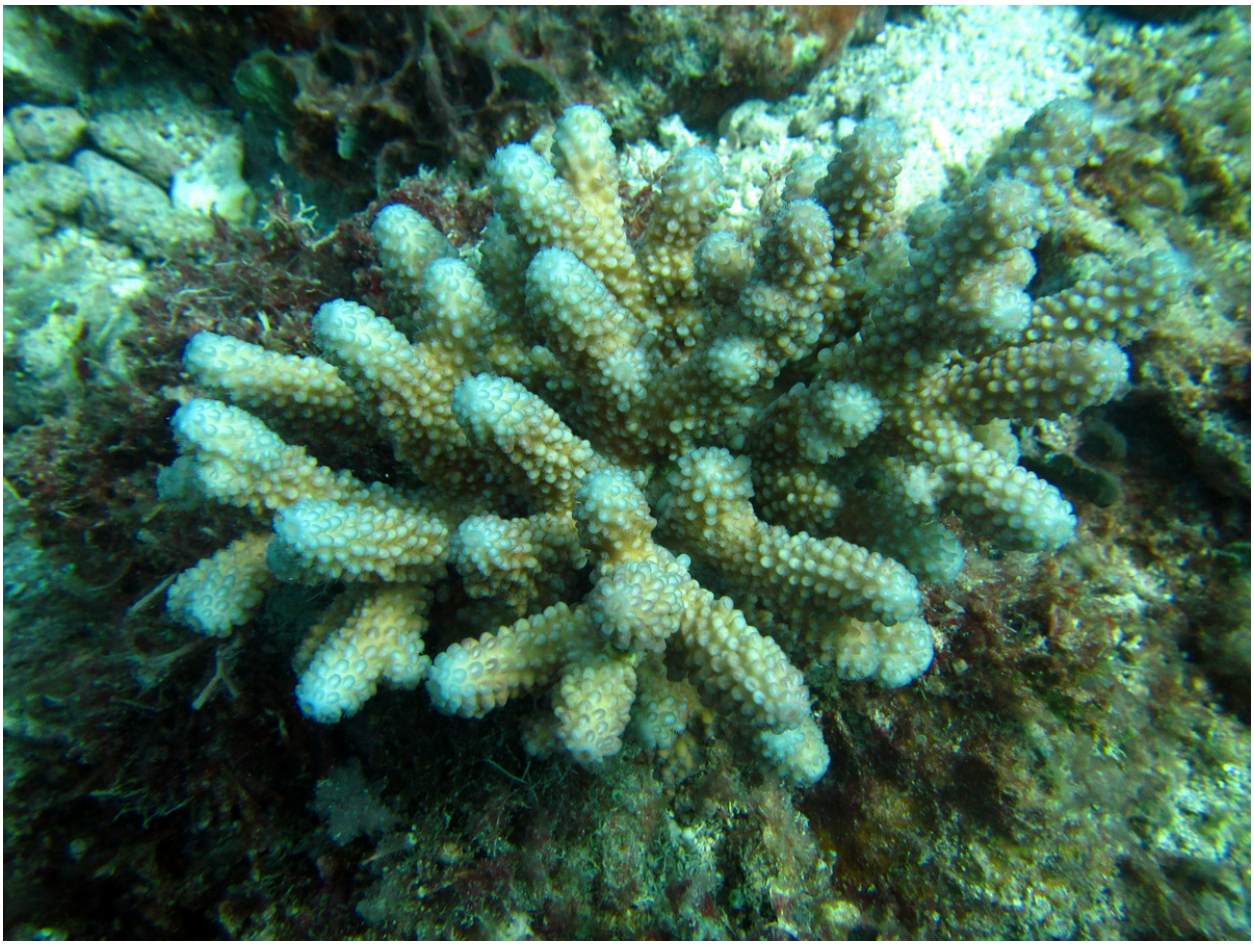


Figure 3.2.3. A colony of the divergent-branch, small axial size morph of *A. humilis* in the Marianas. The photo was taken in Tinian and is copyright Douglas Fenner. Burdick (2016) shows many more photos of this, showing the range of variation in Guam and Micronesia.

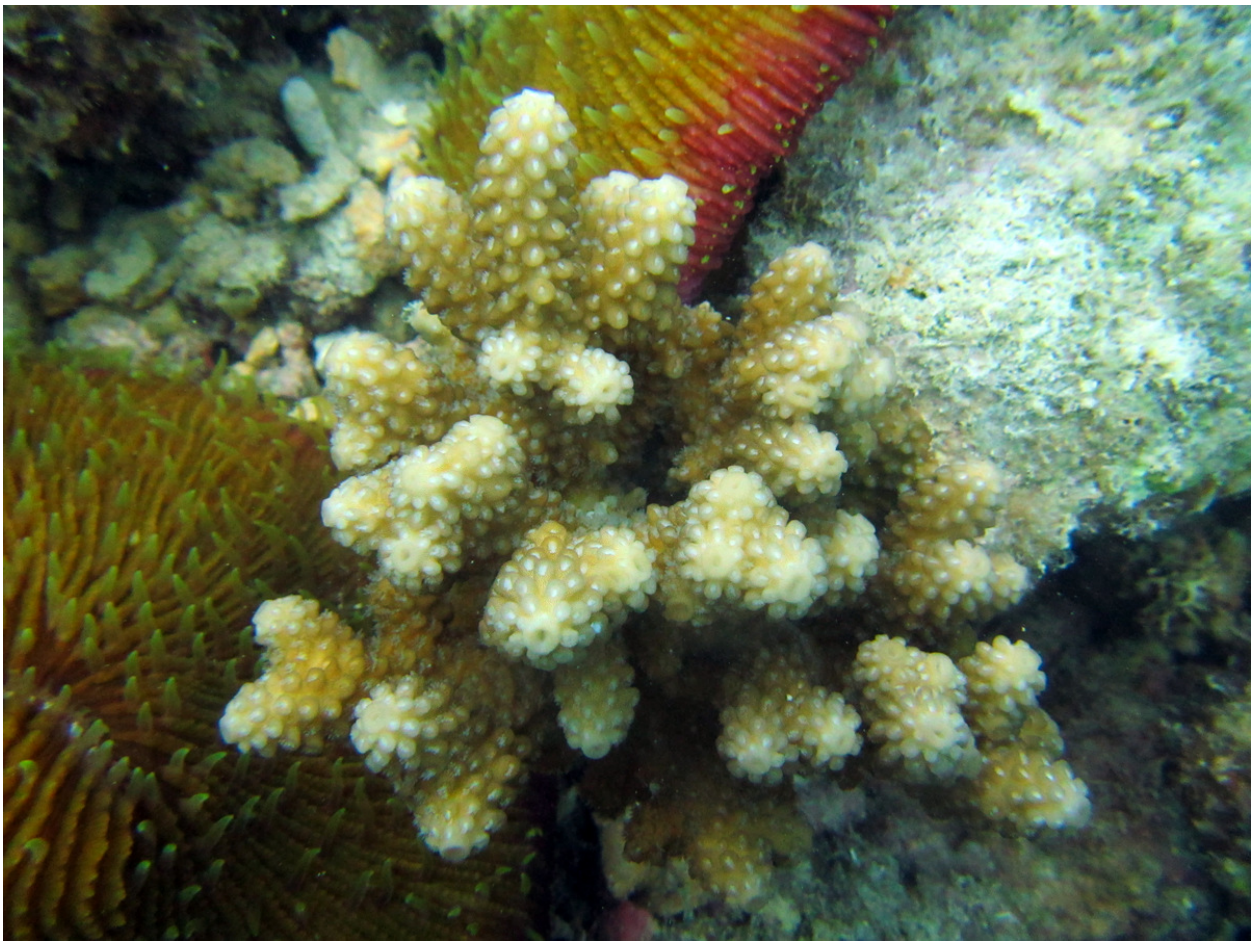


Figure 3.2.4. Another colony of the divergent branch morph of *A. humilis* from Tinian, this one with slightly longer radial corallites. Photo copyright Douglas Fenner.

Some colonies of *A. humilis* have very large axial corallites with very thick walls. All features are quite similar to *A. globicpes* except for the size of the axial corallite. Also, the axial corallite on *A. globiceps* is a tube which extends about 0.5-1 mm from the branch tip (Figure 3.2.4), while on this morph of *A. humilis* it *is* the branch tip and is not tubular (Figure 3.2.4?).

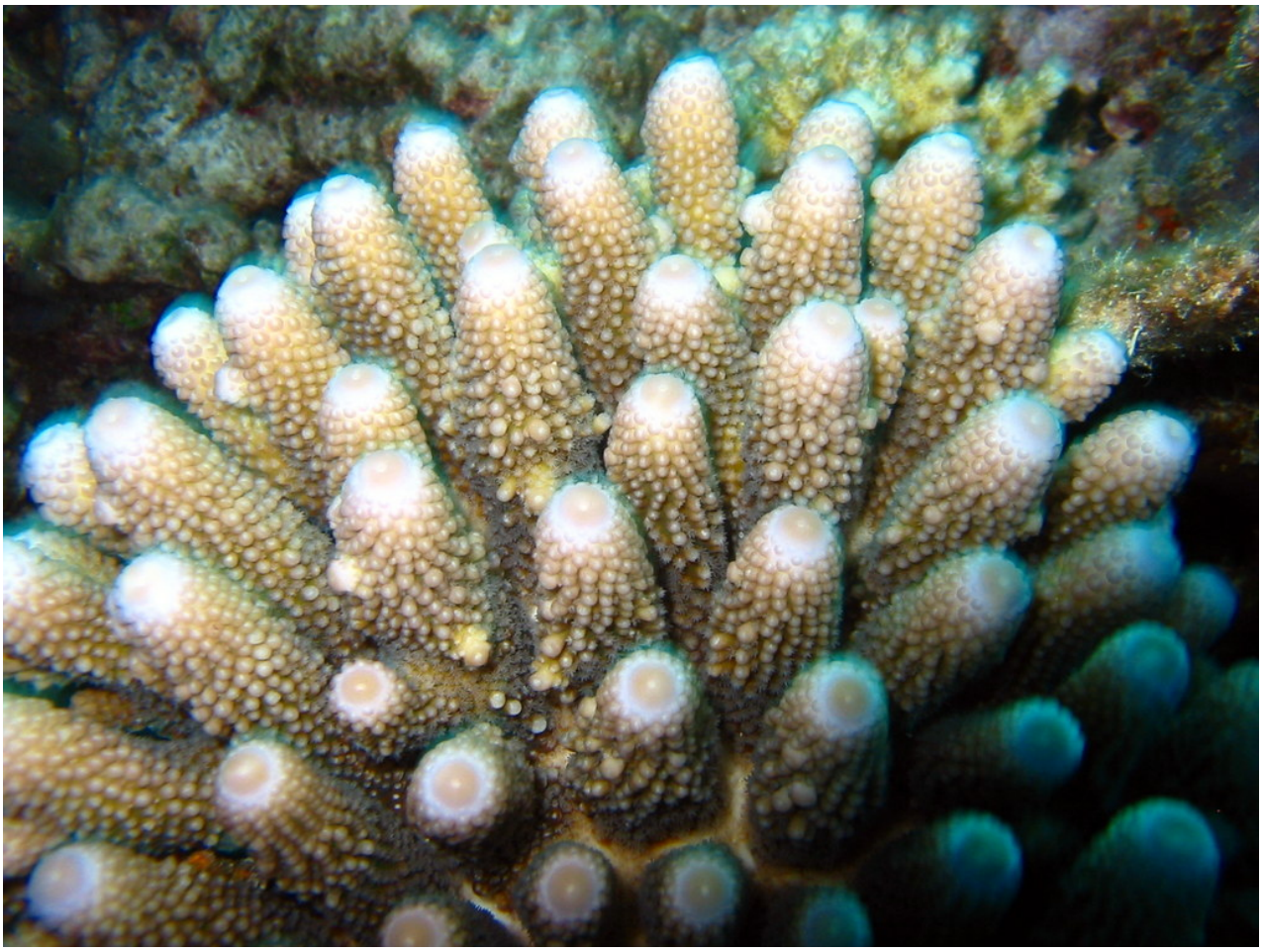


Figure 3.2.5. A photo of *A. humilis* taken on the Great Barrier Reef. Notice the large axial corallites. Photo copyright by Douglas Fenner.

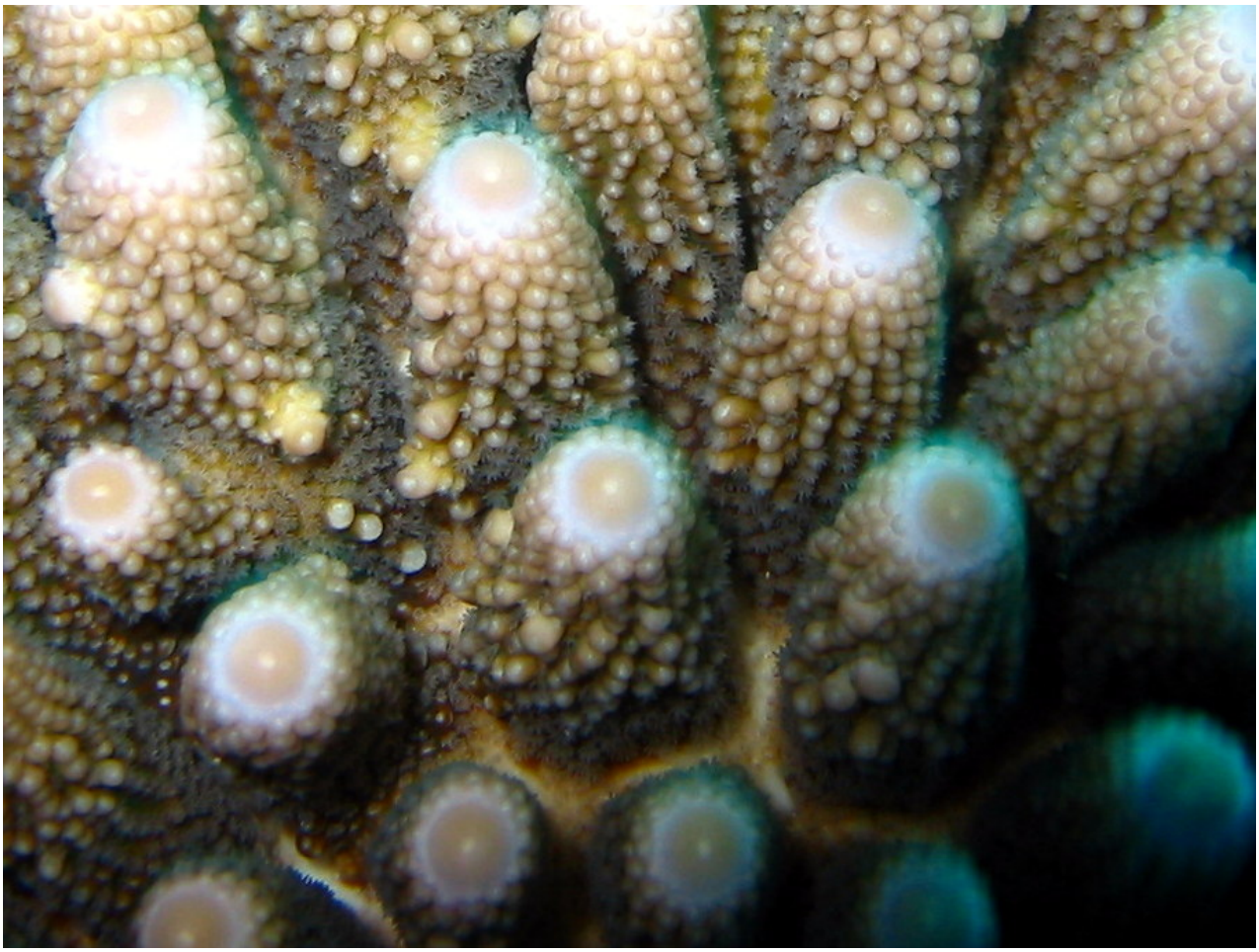


Figure 3.2.6. A close-up of *A. humilis* on the Great Barrier Reef. The white dot in the center is the calice (inside of the corallite), and the tan around it is the very thick wall of the corallite (with white in turn around it). Photo copyright by Douglas Fenner.

Acropora gemmifera

Another species which is similar to *A. globiceps* is *A. gemmifera*. *A. gemmifera* has a small axial and radial corallites increase in size down the branch and are usually in rows, but branches may not be parallel, and radial corallites are short and have thick walls.

Figure 3.2.6. A close-up of *A. gemmifera* from American Samoa. Note the branches are variable in length and not parallel, the small axial, the radial corallites increasing in size down the branches and in rows, and the thick walls of radial corallites.

Acropora monticulosa

Acropora monticulosa also bears some resemblance to *A. globiceps*. Branches on a morph in American Samoa are strongly tapered along their full length. Branches vary greatly in width, but the largest are very wide at their base. Wolstenholme (2003, 2004) and Wolstenholme et al. (2003) refer to this morph as “digitate monticulosa”.

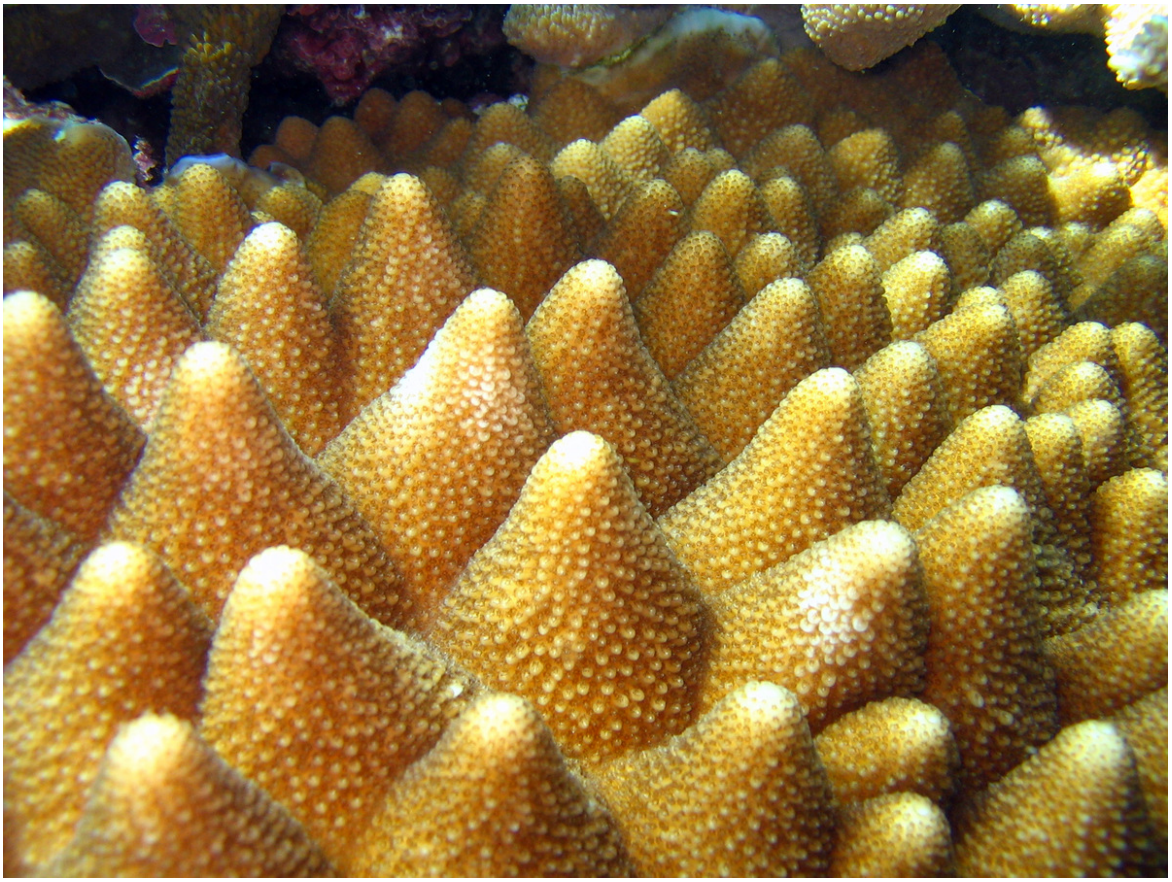


Figure 3.2.7. A close-up photo of *A. monticulosa* (digitate morph) from American Samoa.

Acropora digitifera

Still another species that is similar to *A. globiceps* is *A. digitifera*. *Acropora digitifera* has smaller, shorter branches. In some colonies, there are black dots on the radial corallites. *Acropora digitifera* strongly prefers shallow water at reef crests. There are at least two morphs, one in American Samoa and one in the Marianas. Wolstenholme (2003) called the American Samoa morph, illustrated below, "Samoan digitifera."

Figure 3.2.8. A colony *of A. digitifera* from American Samoa. Note the small, short branches with small axial corallites. Also note the brown or black spots or circles in the centers of radial corallites. Branches have white tips with no blue in the American Samoa morph (tips are typically blue in the Mariana Islands morph).

Figure 3.2.9. *Acropora digitifera* from Tinian. In the Marianas, most colonies have blue tips, which are much lighter in digital photos than they appear underwater. The branches are closer together and taper less than in American Samoa. This is likely to be the morph which Wolsenholme called “encrusting digitifera.”

3.3 Ambiguous Colonies

Following are photos and descriptions of colonies that may represent atypical colonies of *A. globiceps* and/or similar species. Below is morph of *A. monticulosa* (referred to as *A. smithi* in Randall and Myers, 1983) in the Marianas has branches that can look like *A. globiceps*. However, the branches are highly variable in size, reaching lengths of at least 20 cm, widths at the base of around 5 cm, and can form mounds up to several meters across. Also, living colonies are often in clusters with dead areas between the living areas. Such clusters appear to often be clones that were originally united in a single colony. Larger branches can branch further. Colonies are light yellow-brown and branch tips are often blue. This morph is also present in American Samoa, but it is rare and green. Wolstenholme (2003; 2004) and Wolstenholme et al. (2003) refer to it as "branching monticulosa." The two morphs of *A. monticulosa* appear so different that it is not obvious in the field that they could be the same species.

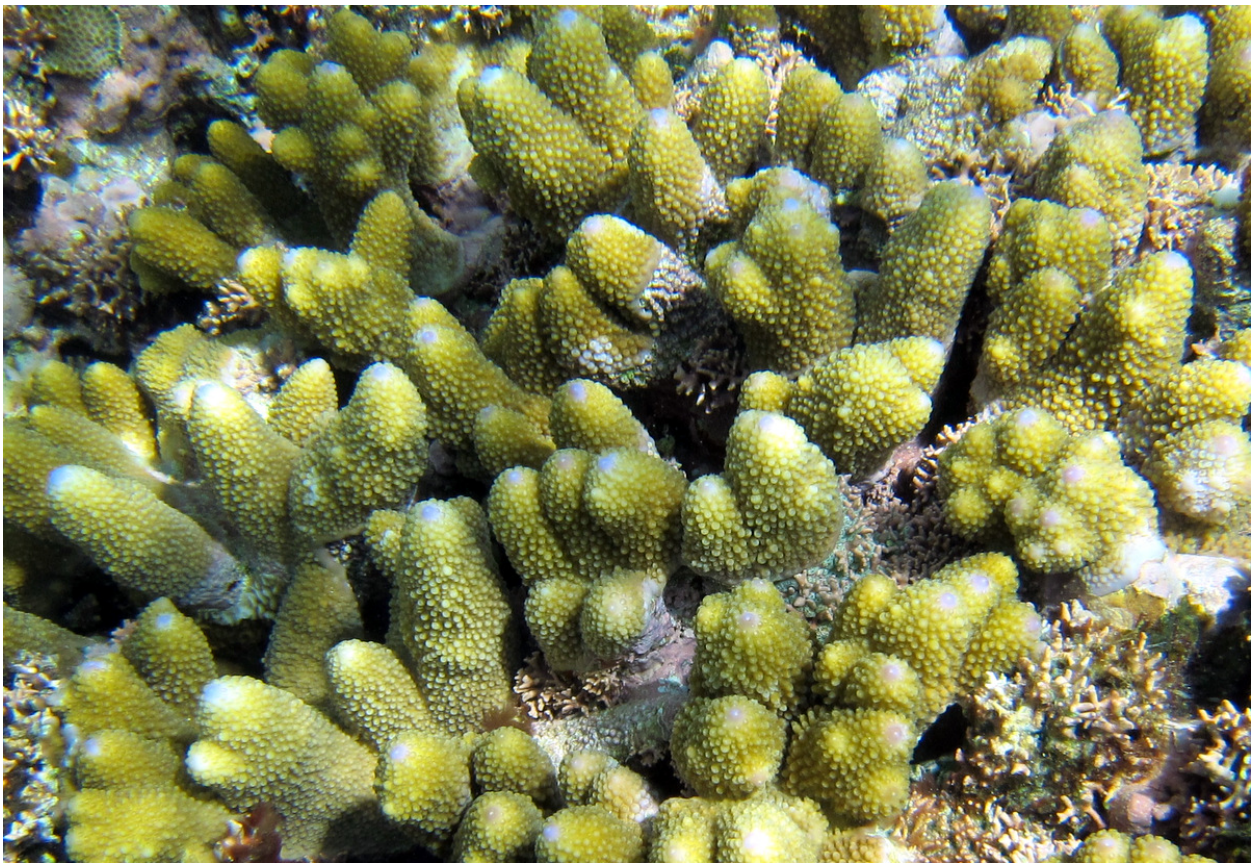


Figure 3.3.1. *Acropora monticulosa* on Tinian in the Marianas. Note the typical areas with other life between clusters of branches, and note the variation in branch size.

Figure 3.3.2. Dividing branches on *A. monticulosa* on Tinian. Note the variation in branch sizes. Photo copyright Douglas Fenner.

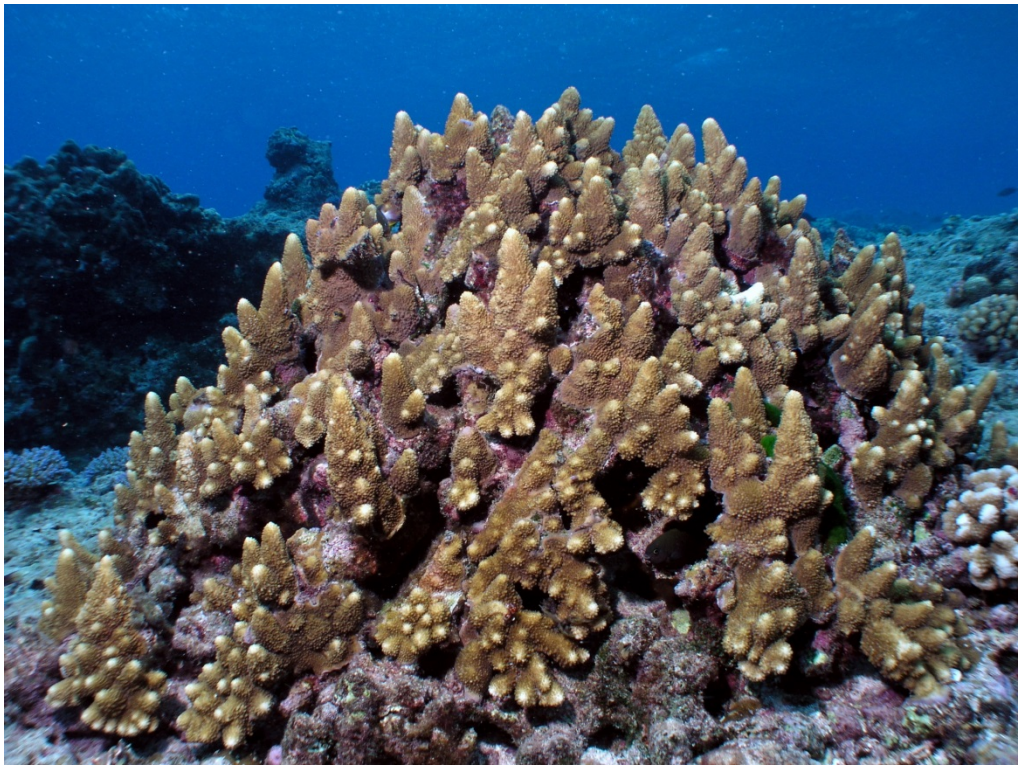


Figure 3.3.3. A large colony of *A. monticulosa* on Guam. Photo copyright David Burdick.

There is also a coral that has small digitate branches. It occurs commonly as clusters of colonies with dead areas between them. Something similar is present in both the Marianas and American Samoa, but it is not known if the two are actually the same species. In Randall and Myers (1983), the Marianas colonies were called *A. ocellata*, but Randall now considers it an undescribed species. It has smaller branches than *A. globiceps*, and forms clusters of colonies with dead areas between them unlike *A. globiceps*.

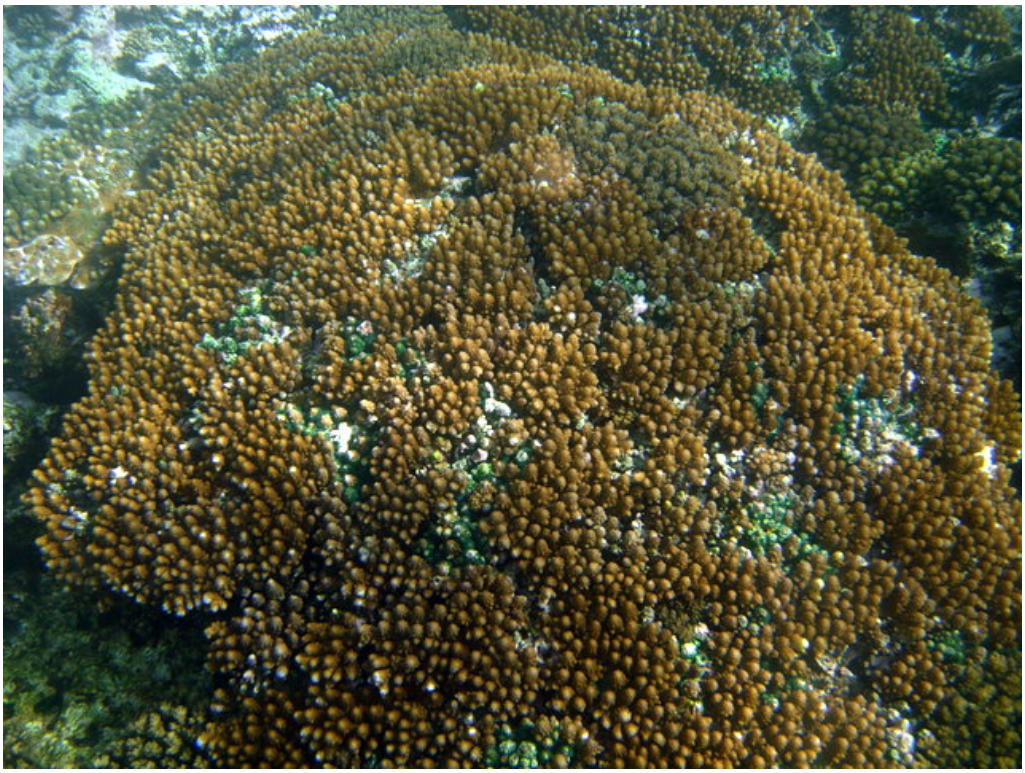


Figure 3.3.4. This coral in American Samoa may be *A. ocellata*. Photo copyright Douglas Fenner.

Figure 3.3.5. *Acropora ocellata* in Guam. Photo from Randall and Myers (1983).

Figure 3.3.6. This coral in American Samoa may be *A. ocellata*. Photo copyright Douglas Fenner.

Figure 3.3.7. *Acropora ocellata* on Tinian. Photo copyright Douglas Fenner.

4. *Acropora retusa* American Samoa, Guam, CNMI(?), PRIA

4.1 Species Description

This species forms colonies consisting of "digitate" (finger-like) branches. Both the axial corallite and radial corallites are cylindrical in shape, and the axial corallite is about the size of one of the largest radial corrallites. Radial corallites vary in size, giving the branches a "spiny" or "prickly" look. This species has not been distinguished among living colonies until recently, and so it is particularly poorly known. It is on reef slopes and may be in other reef zones as well. It appears to be rare in U.S. waters. *Acropora cophodactyla sensu* Veron can appear to be virtually the same, except the axial corallite is larger.

Comparison of *A. retusa* information from original description (Dana 1846), Wallace (1999), and Veron (2016):

Original description	**Veron 2000; Veron et al. 2016**	**Wallace 1999**
Cespitose	Flat plates	Low sturdy corymbose colonies
Branches 1/2 inch thick, Not terete, tips flattened	Short thick digitate branchlets	Branches terete, 8-18 mm diameter, 30 mm long, some branches appear broader at tips because of proliferating branchlets around axial corallite
Radial corallites thin, tubiform, very unequal and crowded at branch tips	Radial corallites appressed, becoming nariform near branch ends	Mix of radial corallite sizes (branches appear "prickley"), dimidiate or tubular with dimidiate openings
Difficult to discern axial corallite	Axial corallites are indistinct	
	Corallites have thick rounded walls and wide openings	

Figure 4.1.1. A colony of *A. retusa* from American Samoa. Photo copyright Douglas Fenner.

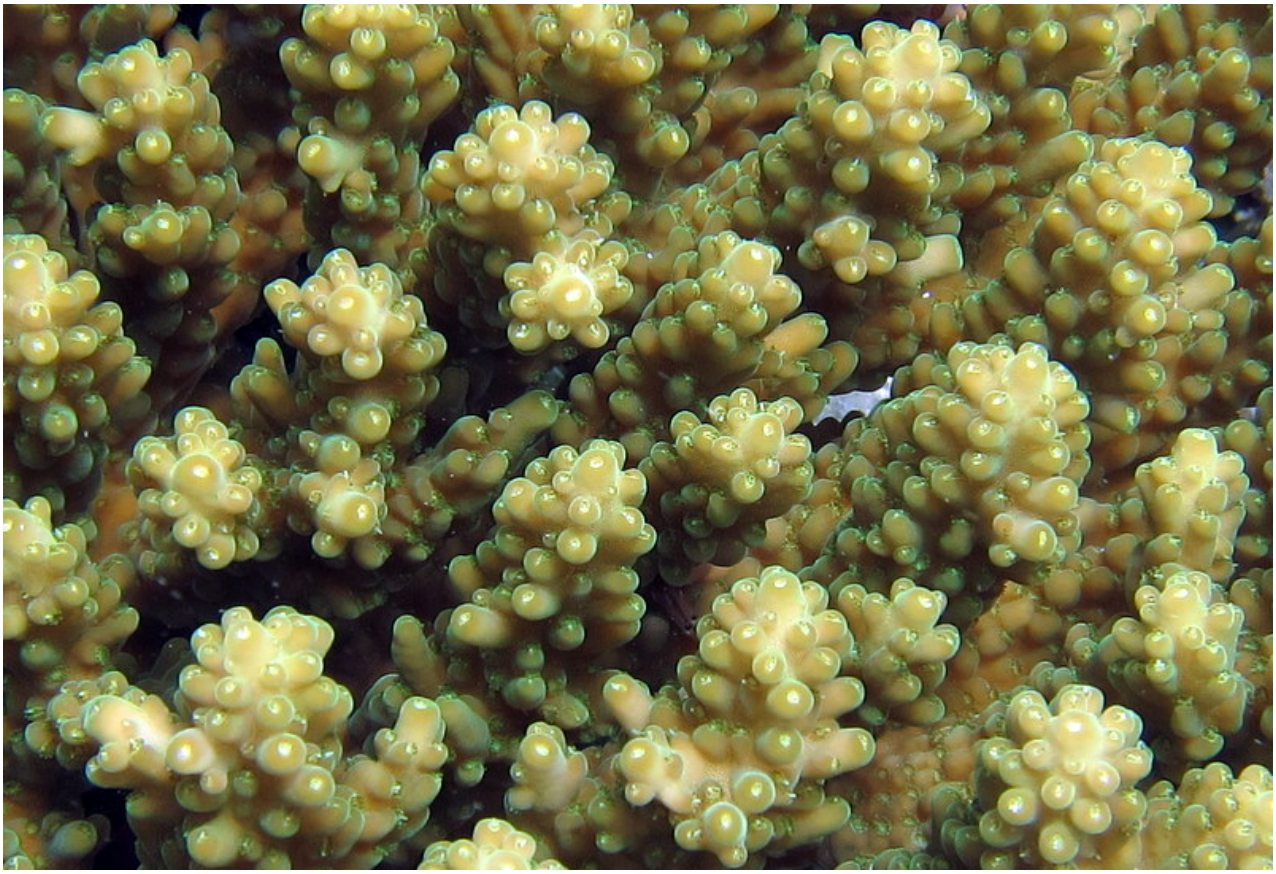


Figure 4.1.2. A close-up of *A. retusa* from American Samoa. Copyright Douglas Fenner.

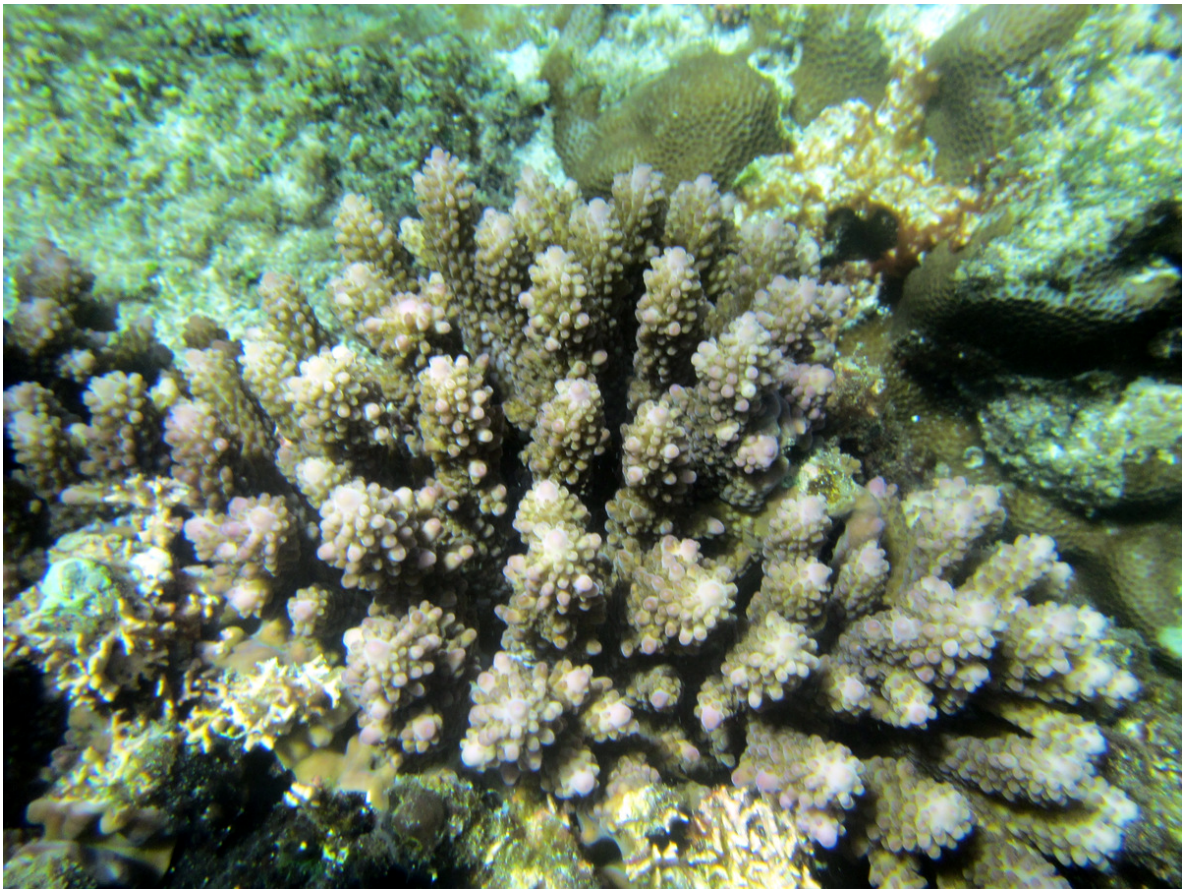


Figure 4.1.3. A colony of *A. retusa* from Rota, showing the usual irregularly spiky look. Photo copyright Douglas Fenner.

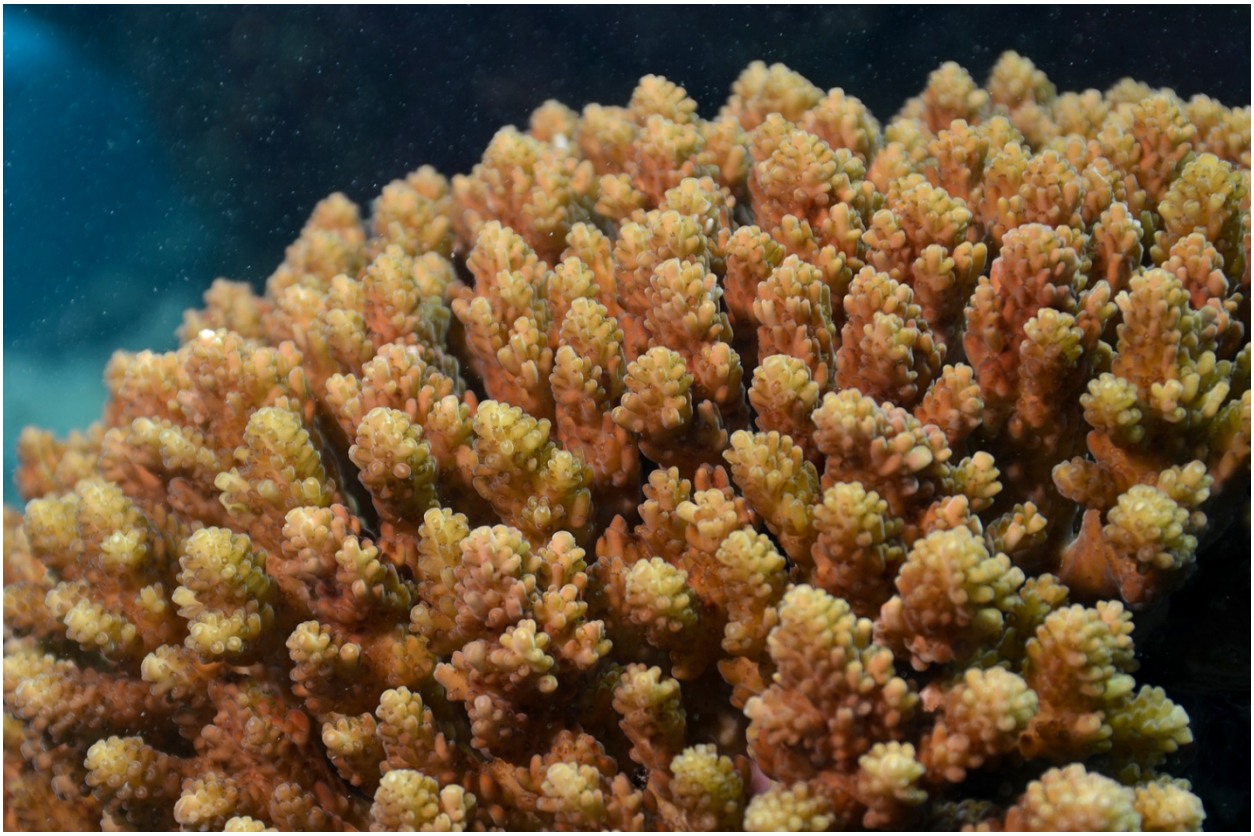
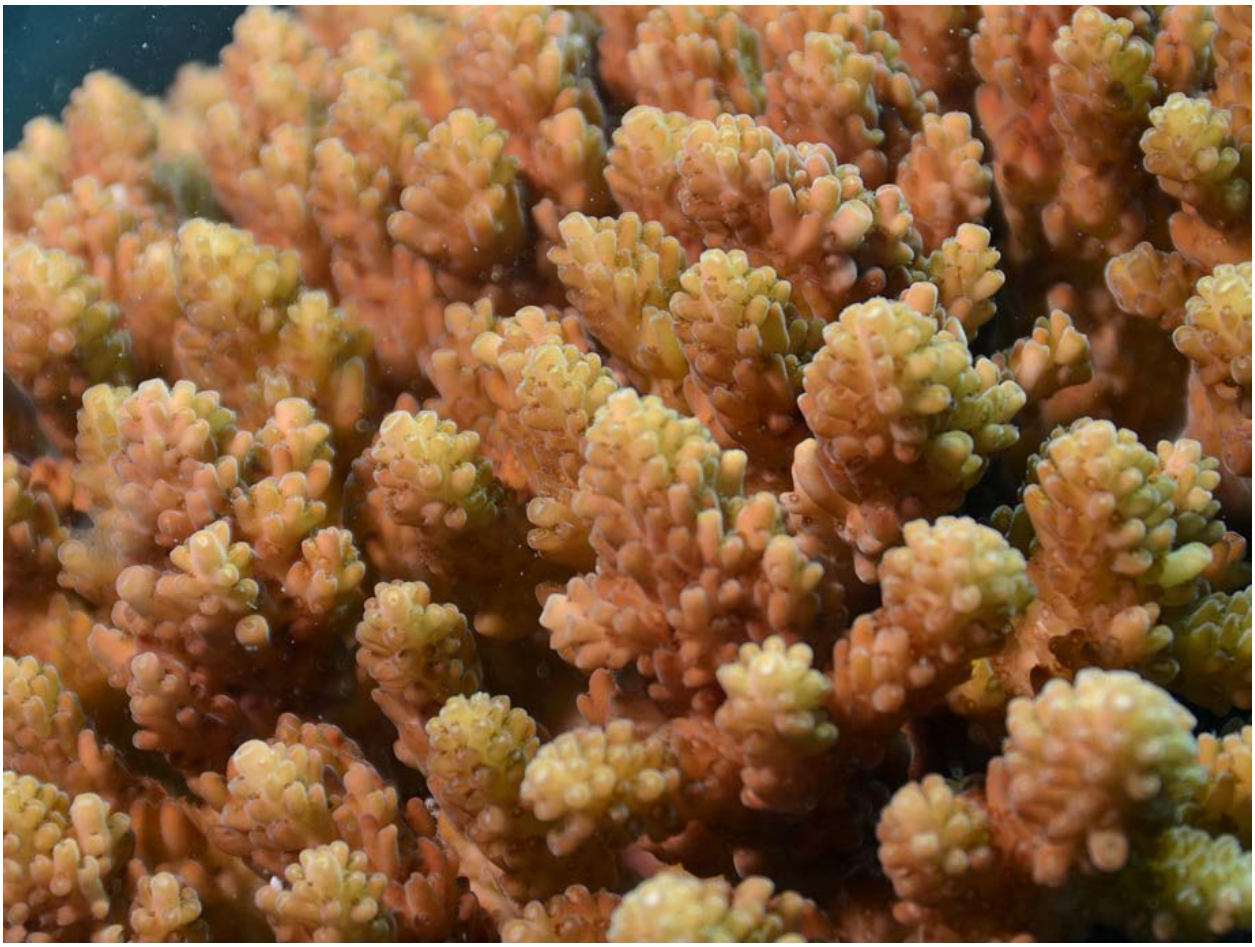


Figure 4.1.4. *Acropora retusa* from Guam. Photo copyright David Burdick.

Figure 4.1.5. The type specimen of *A. retusa* in the U.S. National Museum of Natural History (Smithsonian).



Figureure 4.1.6. Close-up of *A. retusa* from Guam. Photo copyright David Burdick.

4.2 Similar Species

A species which looks similar to *A. retusa* is *A. cophodactyla sensu* Veron. *Acropora cophodactyla sensu* Veron has digitate branches, but has a large, tall axial corallite that may taper. As Veron et al. (2016) point out, the biological species he illustrates is different from the type specimen for this name (which he also illustrates), and thus may need a new name. The differences between *A. retusa* and *A. cophodactyla sensu* Veron need to be studied further.

Figure 4.2.1. A photo of a whole colony of *A. cophodactyla sensu* Veron in American Samoa. Note the large axial corallites. Photo copyright Douglas Fenner.

Figure 4.2.2. *Acropora cophodactyla* sensu Veron from Rota, CNMI. Photo copyright Douglas Fenner.

Figure 4.2.3. A close-up photo of *A. cophodactyla sensu* Veron showing the large, tall axial corallites. Note that some of the axials taper.

5. *Acropora speciosa* American Samoa, Guam, PRIA

5.1 Species Description

This coral forms small flat-topped colonies with thin scraggly branchlets and many thin, long, smooth axial corallites. Many radials are similar to the axials. All have blunt ends with thick walls. Usually rust colored, uncommon to rare, lower reef slopes.

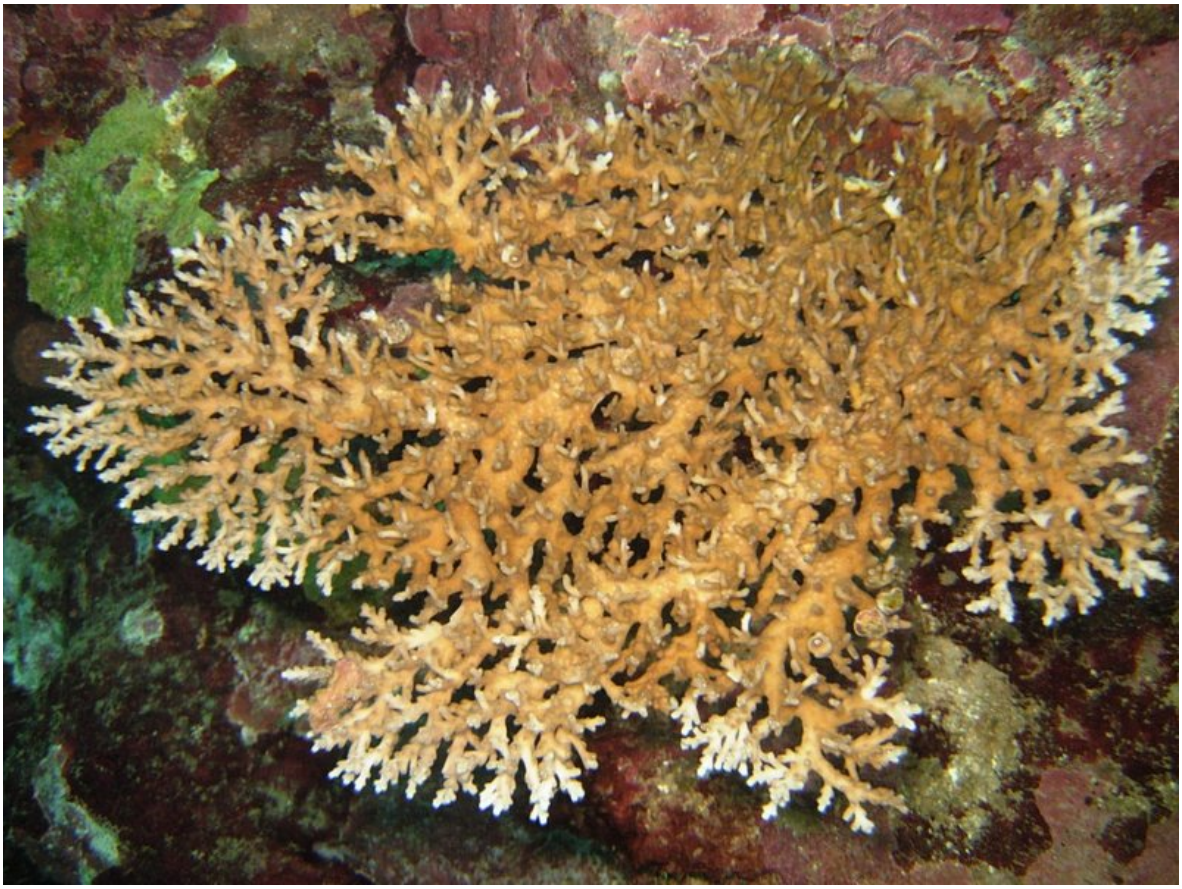


Figure 5.1.1. A colony of *A. speciosa* from American Samoa. Photo copyright Douglas Fenner.

5.1.2. A close-up of *A. speciosa* in American Samoa. Photo copyright Douglas Fenner.

5.2 Similar Species

Axial corallites on *A. speciosa* are similar to *A. granulosa* but thinner. Also, they are similar to *A. jacquelineae*, but slightly larger. Unequivocal distinction between *A. speciosa* and *A. jacquelineae* requires microscopic examination of the corallite surfaces which have uniform spines on *A.* speciosa and ridges on *A. jacquelineae*. *Acropora paniculata* forms larger tables, and axial corallites may be along separated horizontal branches, and/or radiate from short vertical branchlets.

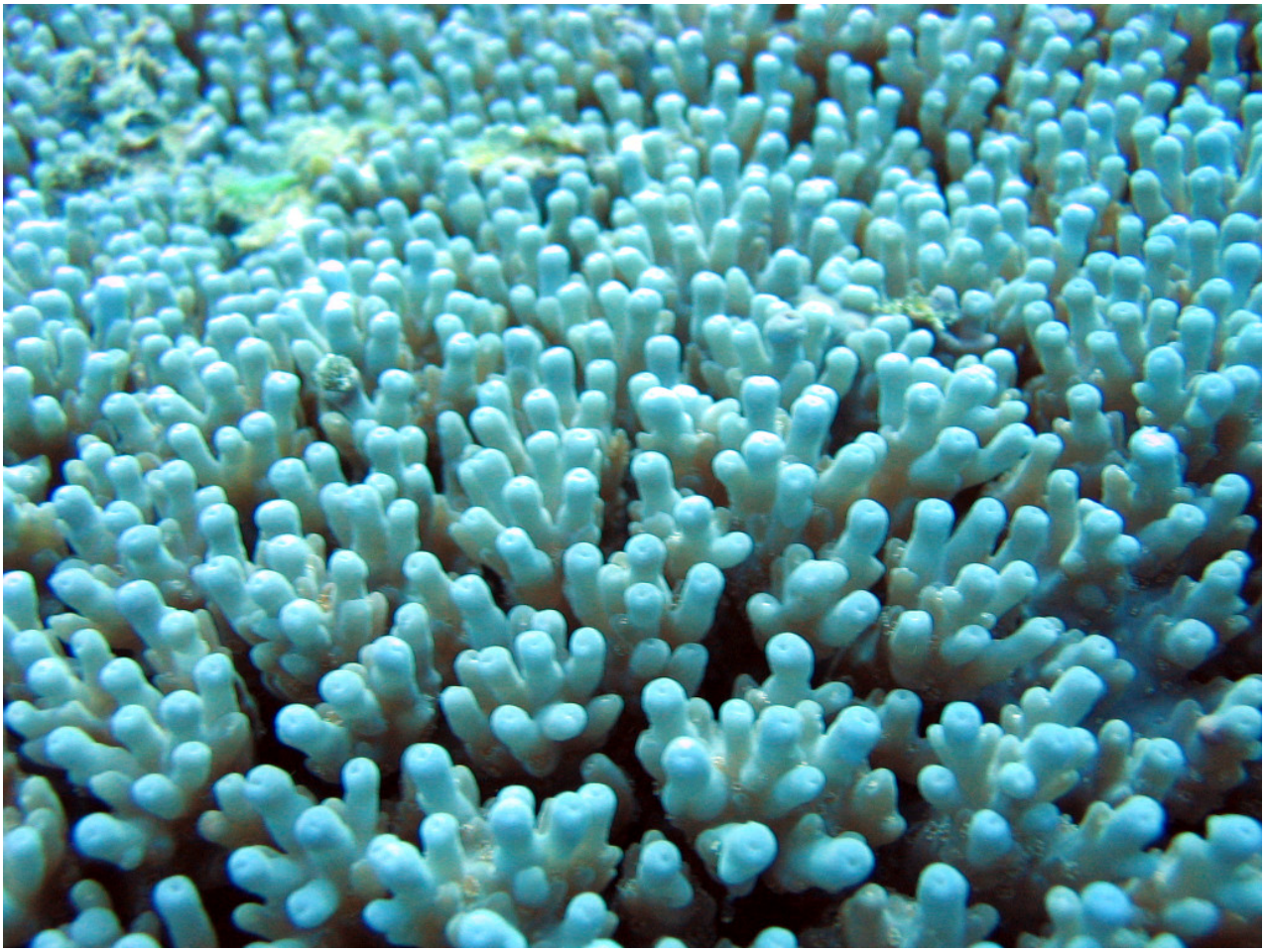


Figure 5.2.1. A close-up of *A. granulosa* from American Samoa, showing the thicker axial corallites. Photo copyright Douglas Fenner.

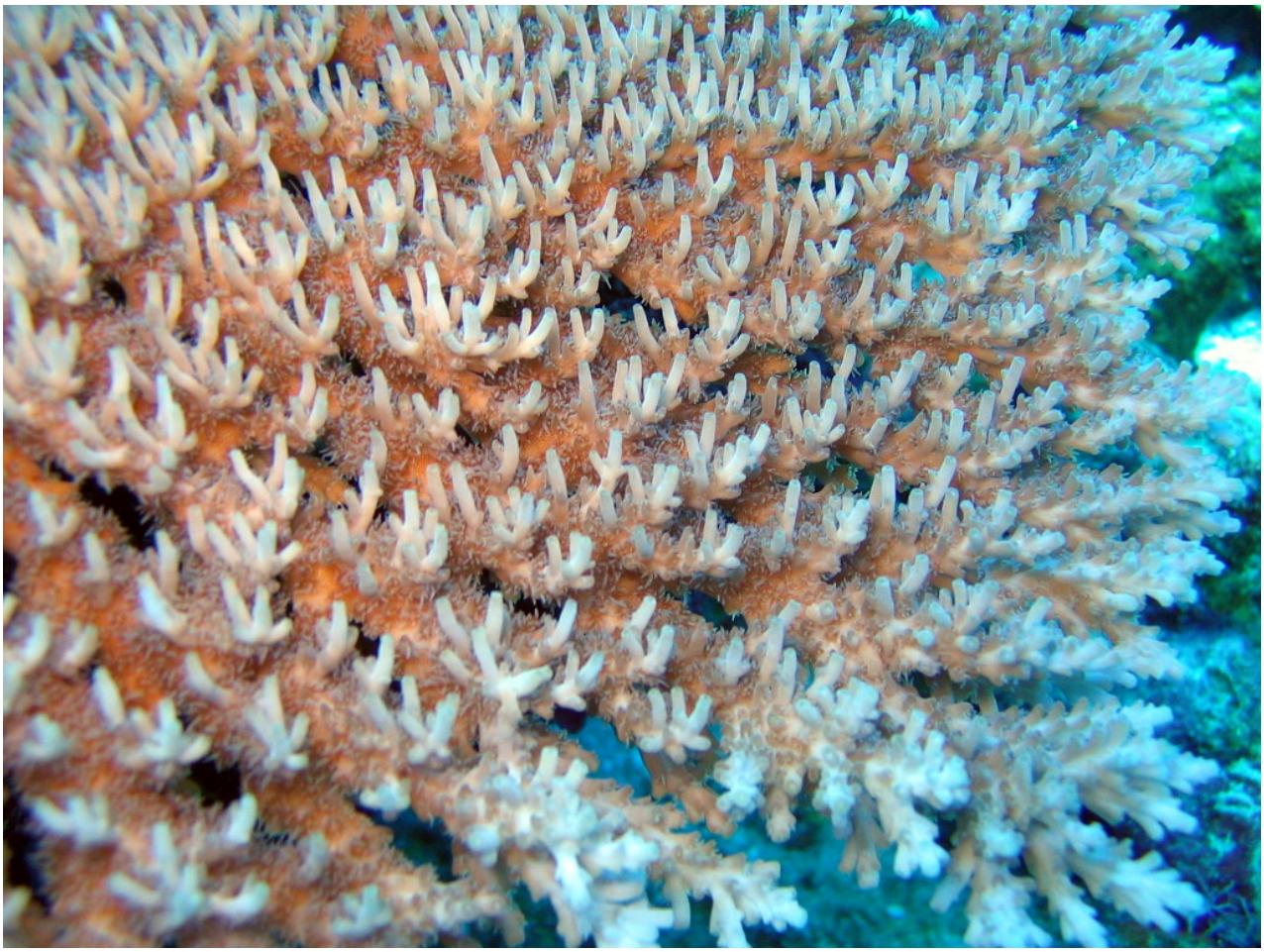


Figure 5.2.2. A close-up of *A. paniculata* from American Samoa. Photo copyright Douglas Fenner.

6. *Acropora jacquelineae* American Samoa

6.1 Species Description

This coral forms small flat-topped colonies with many thin long axial corallites growing upward. Axials have thin walls and are only about 1 mm thick. Found on lower reef slopes, rare.

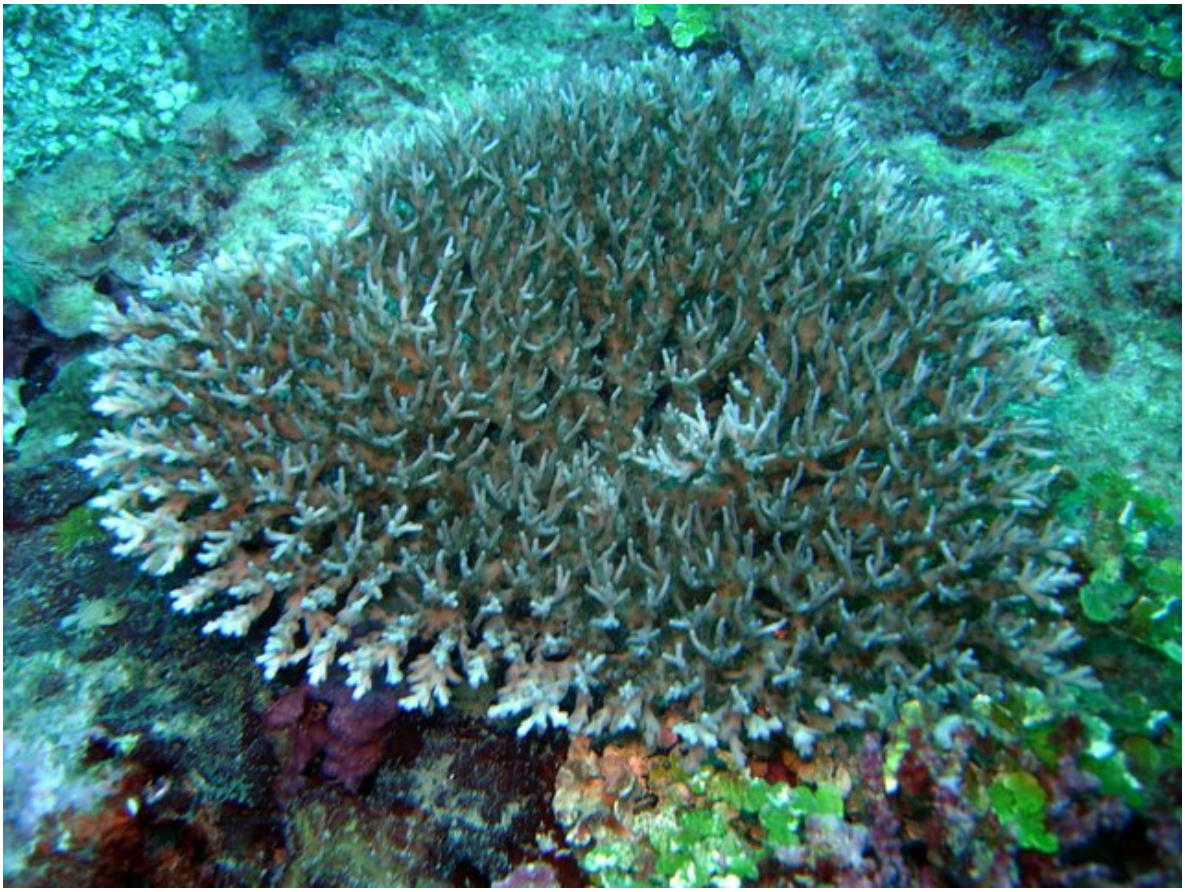


Figure 6.1.1. A colony of *A. jacquelineae* from American Samoa. Photo copyright Douglas Fenner.

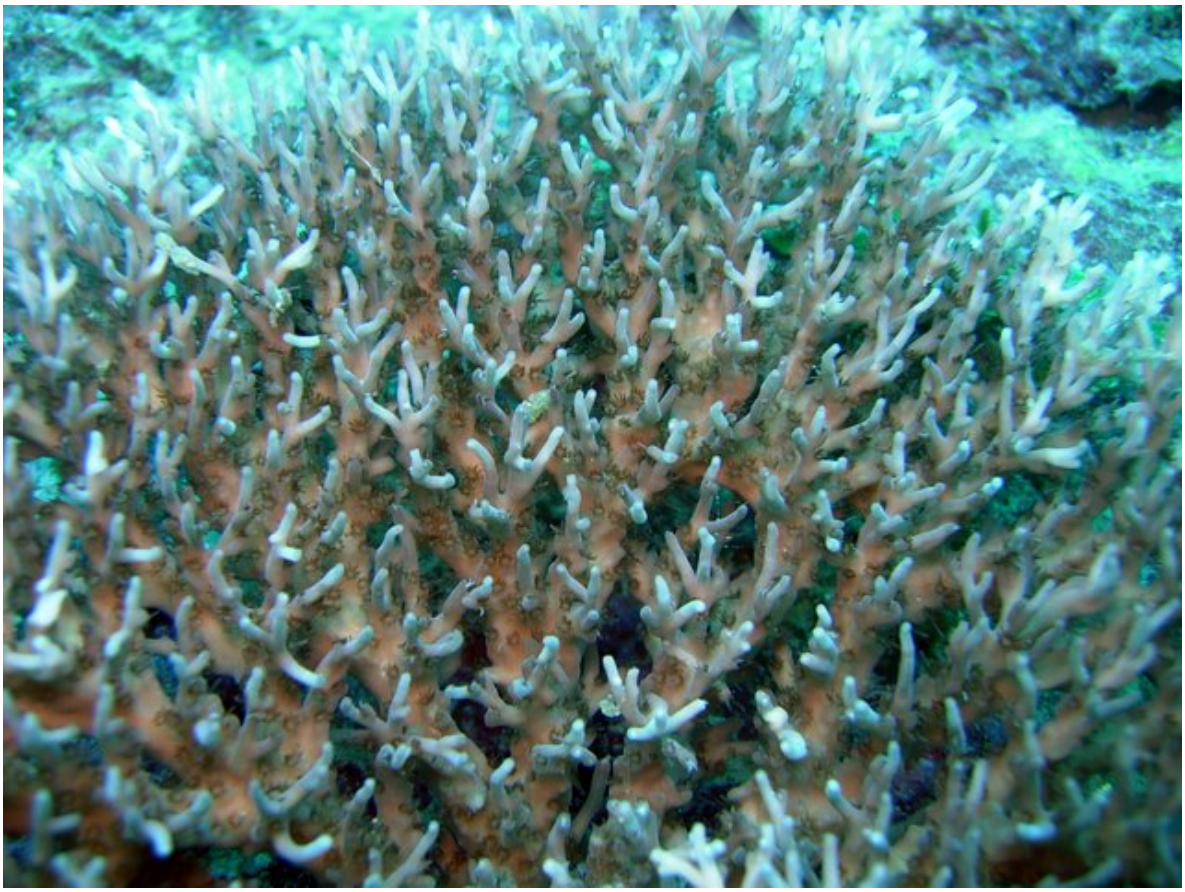


Figure 6.1.2. A close-up photo of *A. jacquelineae* in American Samoa. Photo copyright Douglas Fenner.

6.2 Similar Species

This species is similar to *A. speciosa*, but the axials are slightly thinner. Unequivocal distinction from *A. speciosa* requires microscopic examination of the corallite surfaces which have ridges.

7. *Seriatopora aculeata* Guam, CNMI

7.1 Species Description

This species makes colonies of pencil-diameter branches, which are usually short and always taper sharply at the end to a relatively sharp tip. The corallites on the branch sides are neither in rows nor raised. *Seriatopora aculeata* has been found on Upolu, Independent Samoa, which lies west of Tutuila, American Samoa.

Comparison of *S. aculeata* information from original description (Quelch 1886), Randall and Burdick (in prep.), and Veron (2000):

Original description	**Randall and Burdick, in prep.**	**Veron, 2000**
Branches short, thick, sharply acuminate	Closely set, short, thick (>5 mm dia.) branches that quickly taper to blunt conical tips	Branches thick (5-9 mm), short and strongly tapered; usually in fused clumps
Calices arranged in rows on terminal branchlets	Corallites weakly arranged in rows	Corallites are irregularly distributed on branches
Prominent upper walls ("hoods")	Conspicuous spinulose hood on the upper wall margin	

Figure 7.1.1. *Seriatopora aculeata* from Guam. Photo copyright by David Burdick.

Figure 7.1.2. *Seriatopora aculeata* from Guam. Photo copyright David Burdick.

7.2 Similar Species

Seriatopora stellata has pencil-diameter branches which taper strongly at the tip. However, branches are not necessarily short, and the corallites on the sides of branches are raised and in rows.

Figure 7.2.1. *Seriatopora aculeata* from Guam. Photo copyright David Burdick.

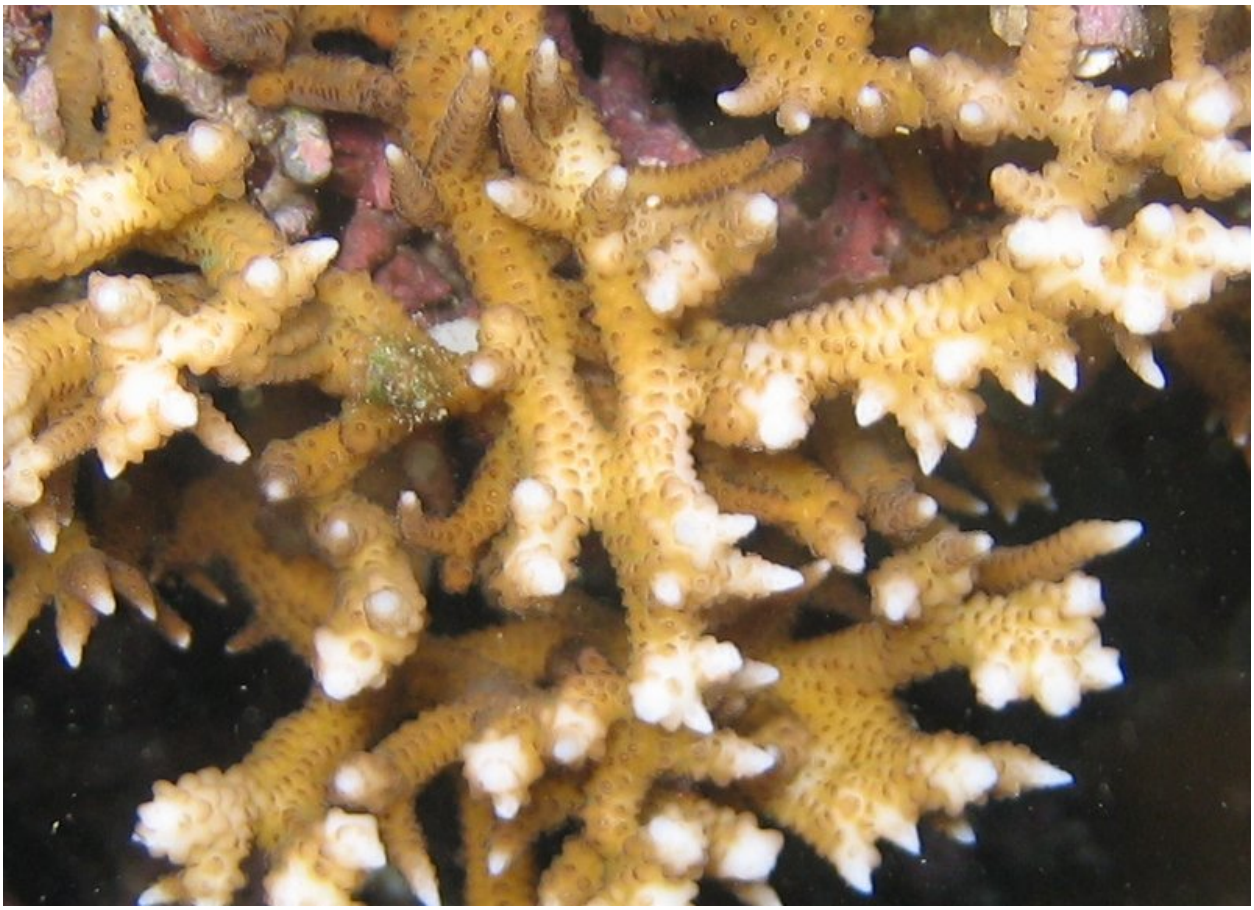


Figure 7.2.2. A close-up photo of *S. stellata* from Independent Samoa showing the raised corallites in rows. Photo copyright Douglas Fenner.

Seriatopora hystrix is the most common and widespread *Seriatopora* species by far. It has long, gradually tapering, pencil-diameter branches with sharp tips. Corallites are in rows, but not raised.

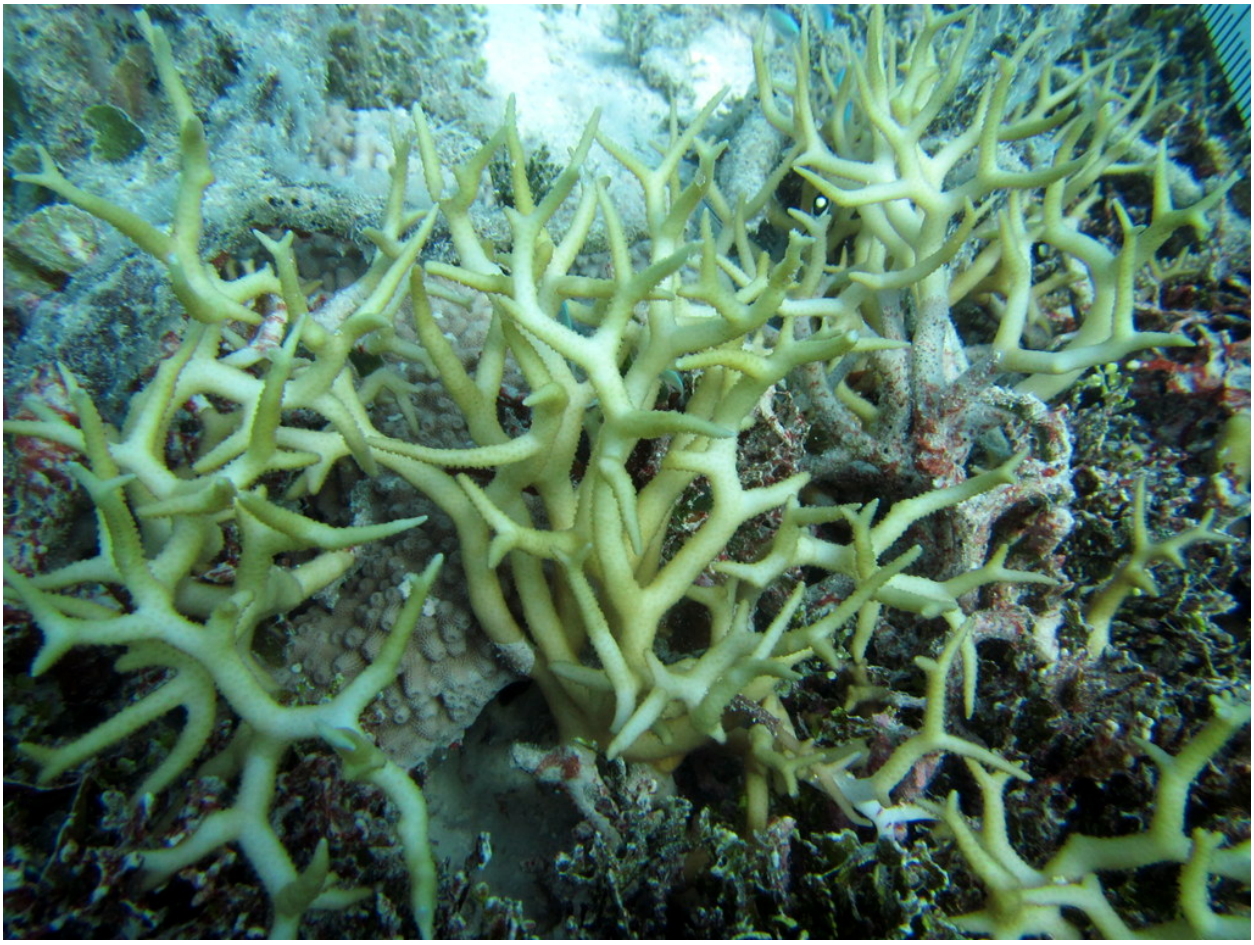


Figure 7.2.3. A photo of *S. hystrix* from the Marshall Islands. Photo copyright Douglas Fenner.

8. *Euphyllia paradivisa* American Samoa

8.1 Species Description

This species makes branching colonies, with branches about an inch in diameter. Polyps are only on the ends of branches, and branches are close enough together that they may be hard to distinguish. If the tentacles are in rounded circles, then they are on the ends of branches, instead of on long meandering valleys. The polyps on the ends of branches are fairly large, with only one polyp on the end of each branch, usually. The tentacles have round knobs on the ends. The tentacles also branch, and side branches usually have smaller knobs on the ends. Tentacles may be extended or contracted. Colonies are usually brown, but can be reddish-brown. The reddish-brown colony was found in fine sediment at about 25 m depth, and several brown colonies were found on an offshore mound at about 48 m depth (A. Mongomery, pers. comm.). These are the only colonies that have been found so far.

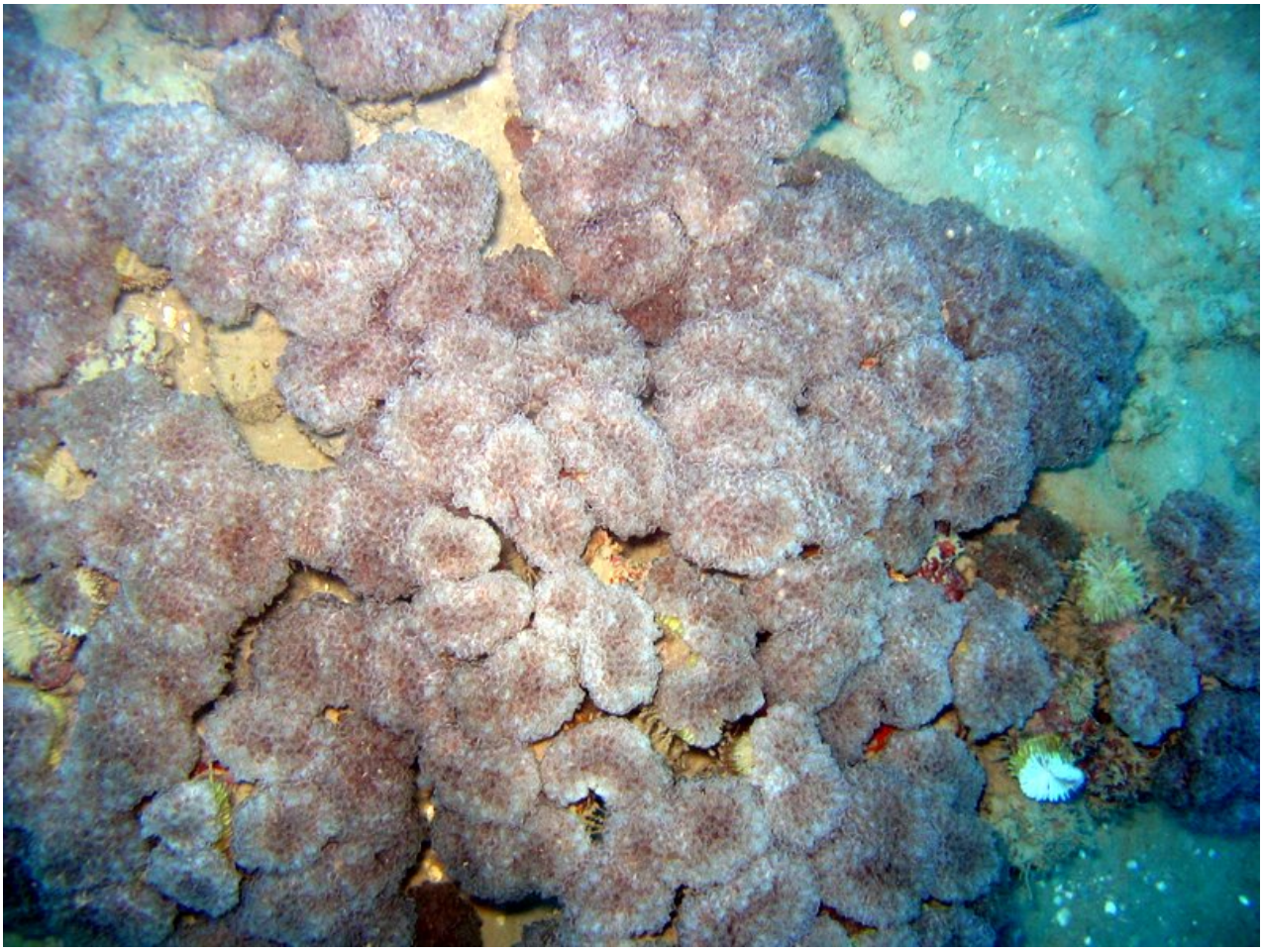


Figure 8.1.1. A colony of *E. divisa* from American Samoa. The rounded or oval polyps indicate that they are on the ends of branches, not on extended meandering valleys. Photo copyright Douglas Fenner.

Figure 8.1.2. A close-up of *E. paradivisa* from American Samoa. The tentacles on this colony were retracted, making it harder to see the side branches which the small knobs are on. Photo copyright Douglas Fenner.

Figure 8.1.3. A colony of *E. paradivisa* from American Samoa, with inflated tentacles which can easily be seen to be branching. Photo copyright Anthony Montgomery.

8.2 Similar Species

Euphyllia divisa has the same shape tentacles which divide. However, the skeleton is meandering instead of branching as in *E. paradivisa*.

Living colony of *Euphyllia divisa*. The tentacles are identical to those on *Euphyllia paradivisa*, but the skeleton has long meandering structures instead of branches. *Euphyllia divisa* has not been reported from American Samoa or elsewhere in the US Pacific.

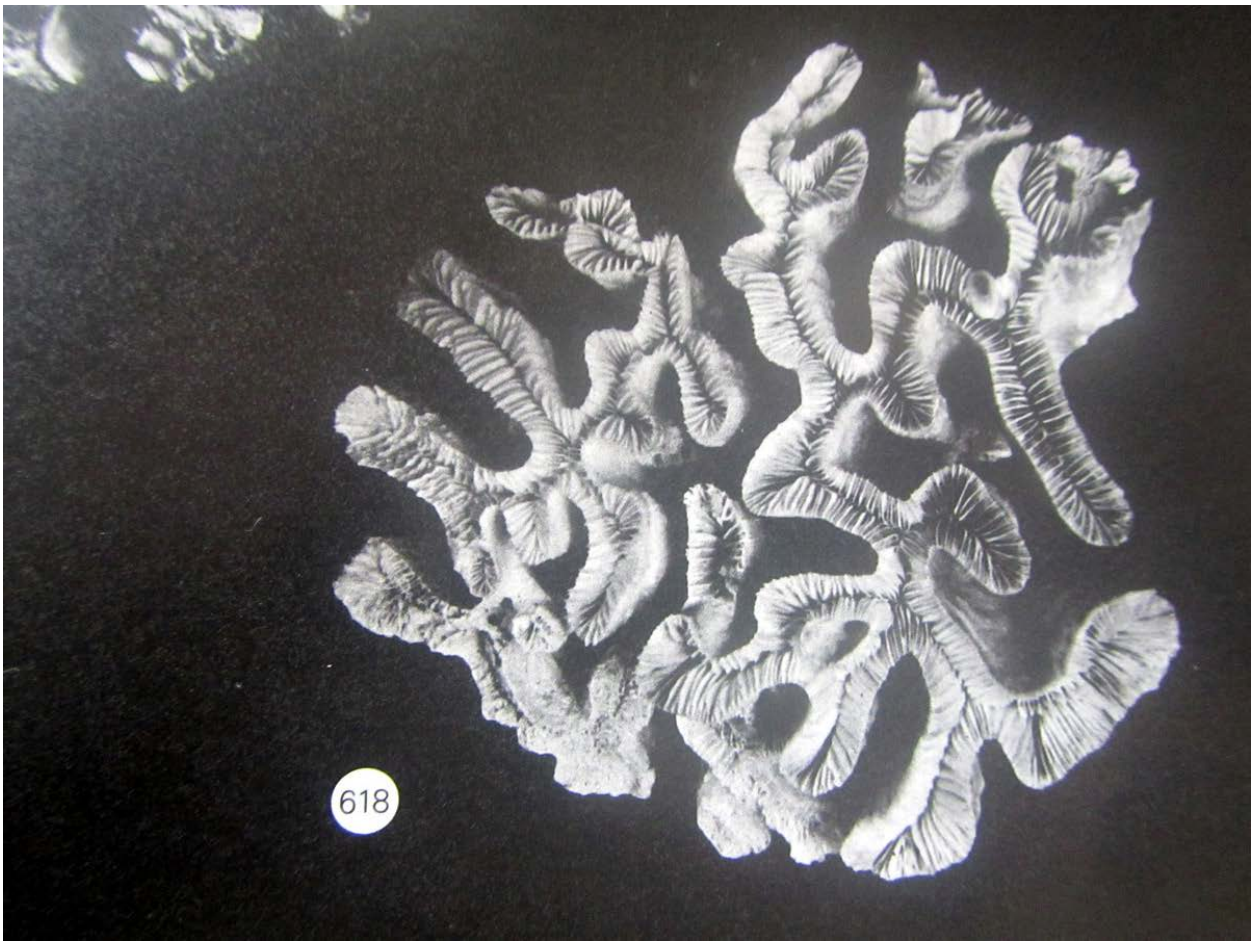


Photo of the skeleton of *Euphyllia divisa*, from Veron & Pichon, 1979. Note the long, meandering structures, instead of the branches which are present on *Euphyllia paradivisa*.

9. Listed Corals Not Confirmed in U.S. Pacific Waters

There are six threatened coral species that have not yet been confirmed from the U.S. Pacific areas. Our knowledge of which corals are located where is very incomplete, so it may be that one or more of these species is actually in U.S. Pacific waters even though it has not been found there yet. These species are presented here so that users may be ready in case they spot any of these species.

9.1 Pavona diffluens

Colonies of *P. diffluens* are lumpy and tan colored. Corallites have a deeper and larger center than in other species of *Pavona*. This species is only known for sure from the Red Sea and parts of the western Indian Ocean. Randall has reported colonies in Guam and American Samoa that may or may not be this species; Veron thinks that Pacific colonies are another, similar species with a different corallite size.

Figure 9.1.1. A close-up photo of *P. diffluens* in the Red Sea. Photo copyright J.E.N. Veron.

Figure 9.1.2. A close-up photo of *P. diffluens* in the Red Sea. Note the ridges radiating from the corallite center are relatively tall. Photo copyright J.E.N. Veron.

Figure 9.1.3. A close-up photo of a *Pavona* colony from American Samoa that bears some similarity to *P. diffluens*. Photo copyright Douglas Fenner.

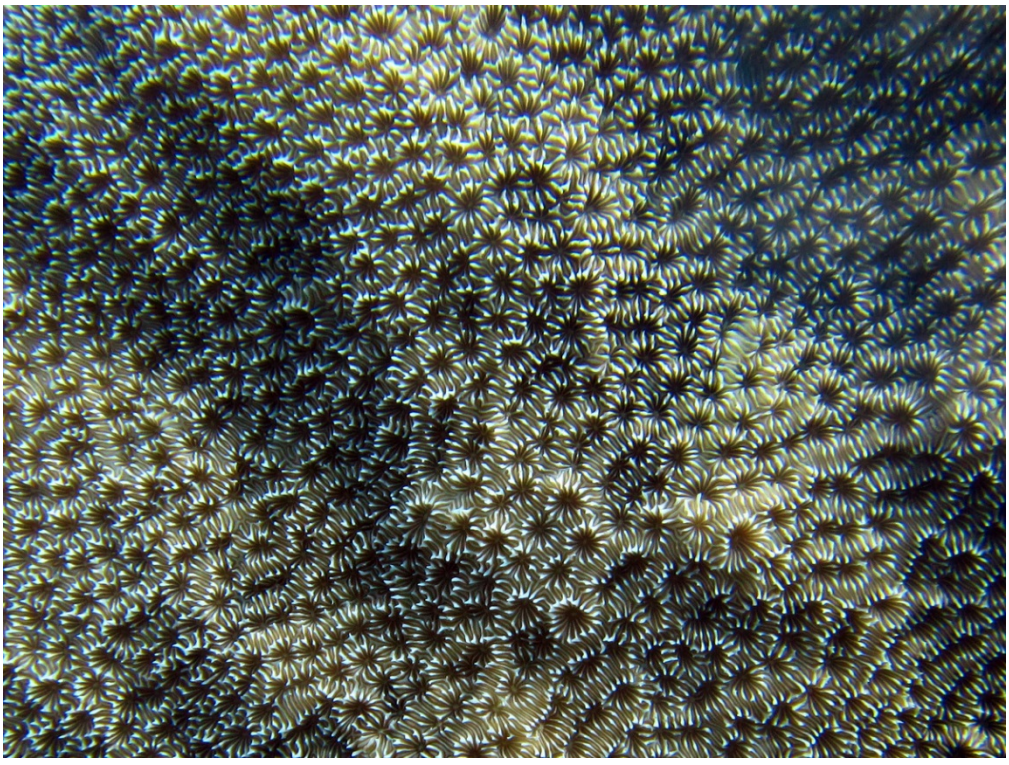


Figure 9.1.4. A close-up photo of a *Pavona* colony from Rota that bears some similarity to *P. diffluens*. Photo copyright Douglas Fenner.

Pavona diffluens has corallites that are larger than on *P. duerdeni* and *P. minuta*. *Pavona maldivensis* has corallites that are raised higher, space between raised corallites and does not have a large deep corallite center. *Pavona diffluens* has lumpy colonies instead of plates like *P. explanulata*. Tentacles are not extended as they are on *P. gigantea*, and colonies do not get very large. Also, corallite centers are deeper and wider than on *P. gigantea* and *P. explanulata*. *Pavona bipartita* and *P. clavus* have deep corallite centers, but the ridges radiating from the centers are not as large and high. Also, *P. clavus* forms large colonies of uniform columns.

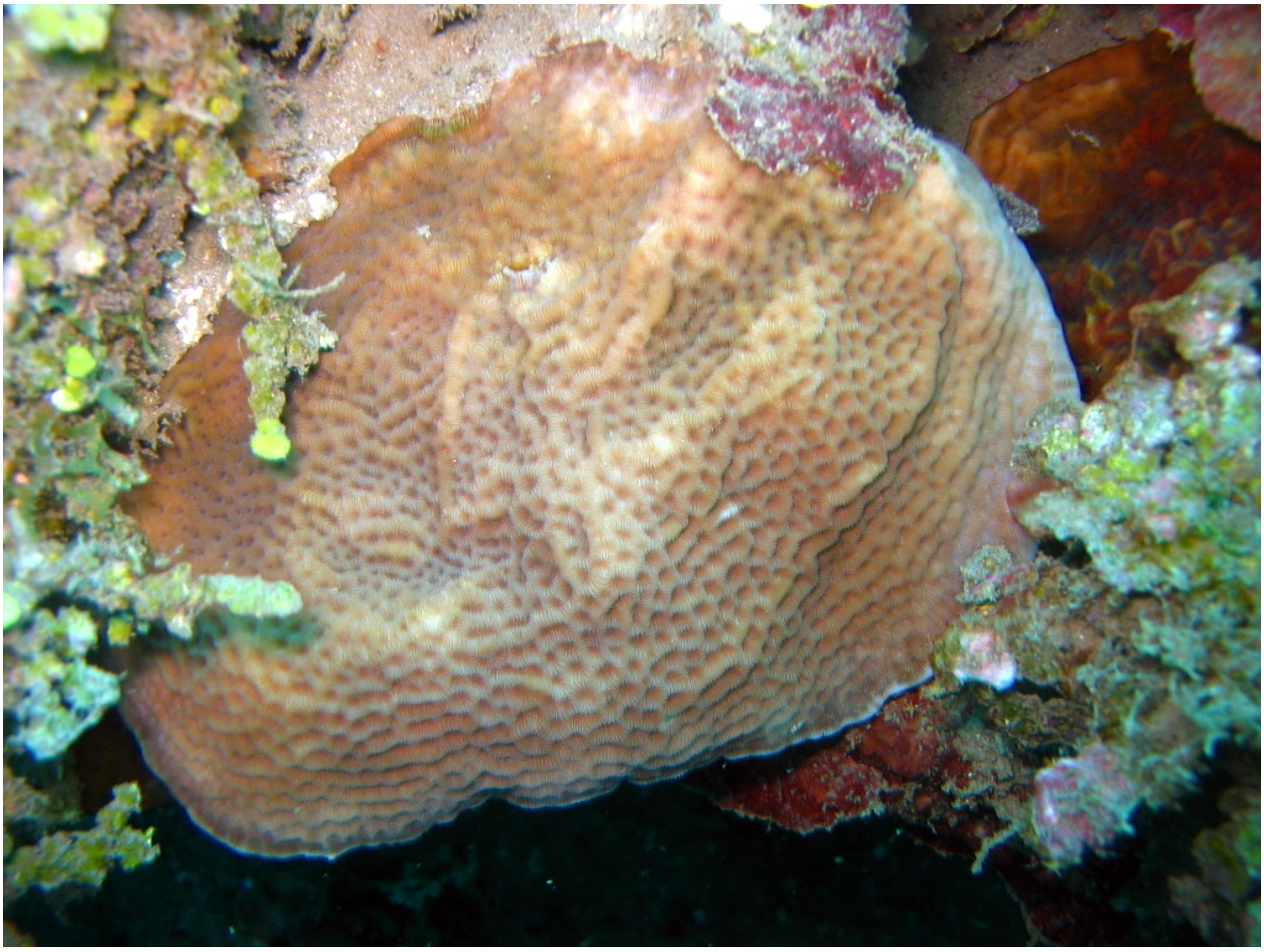


Figure 9.1.5. A photo of a colony of *P. bipartita* from American Samoa. The radiating ridges (septa) are not large enough to see in this photo. Photo copyright Douglas Fenner.

Figure 9.1.6. A close-up photo of *P. maldivensis* from American Samoa. Note the spaces between corallites. This is an unusual colony shape, usually the branches are round. Photo copyright Douglas Fenner.

Figure 9.1.7. A photo of *P. explanulata* from American Samoa. Note that there are low ridges and tentacles or tentacle lobes in rings around corallite centers, instead of radiating high ridges as on *P. diffluens*. Photo copyright Douglas Fenner.

Figure 9.1.8. A close-up photo of *P. gigantea* from American Samoa. Note the extended tentacles; this photo was taken from the top of the colony where tentacles are extended. Photo copyright Douglas Fenner.

9.2 Acropora tenella

Acropora tenella forms horizontal colonies of thin branches with many small side branches in a lacy and very regular pattern. Larger branches usually have a central ridge. Wallace (1999) and Veron et al. (2016) now agree on this species.

Figure 9.2.1. A photo of *A. tenella*. Photo copyright by P. Muir.

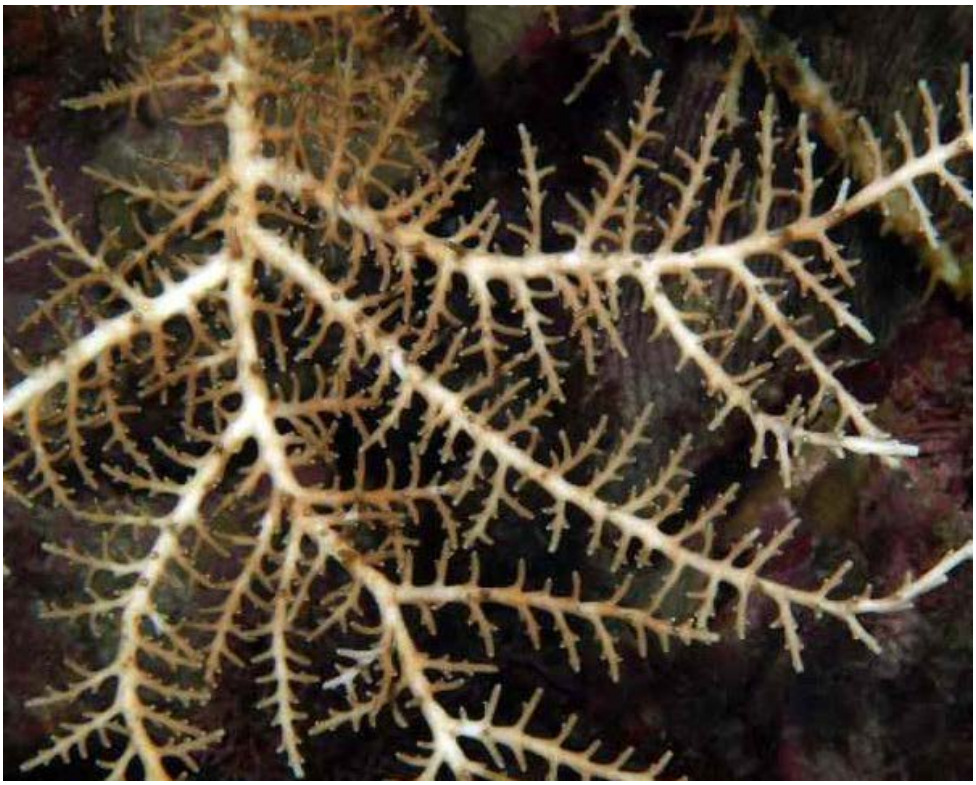


Figure 9.2.2. A close-up photo of *A. tenella*. Photo copyright by Paul Muir.

9.3 Anacropora spinosa

This coral often forms thickets of thin branching colonies that are covered with many spines of varying size. Branches are only about 3 mm thick. There is no axial corallite.

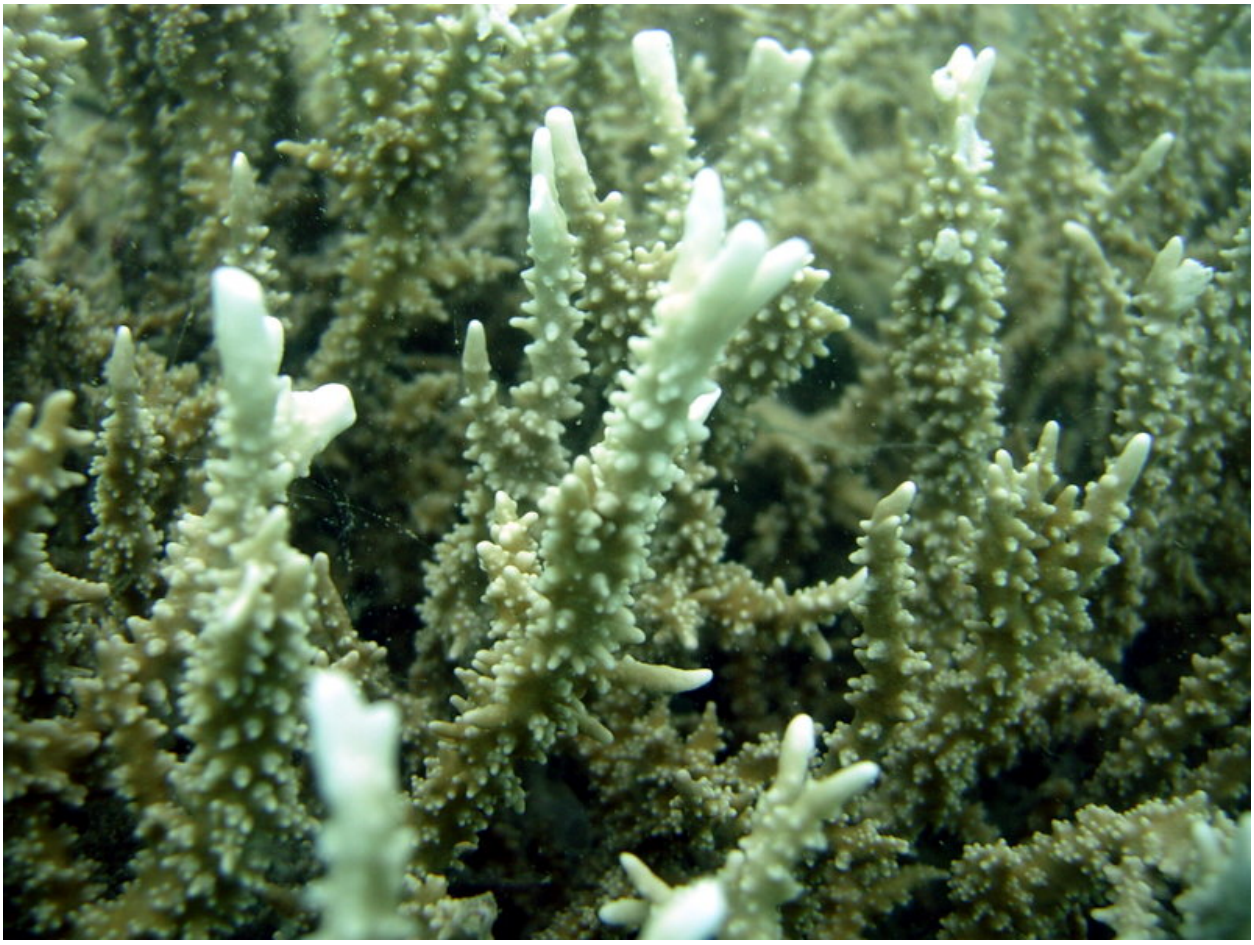


Figure 9.3.1. A close-up of *Anacropora spinosa* from New Caledonia. Photo copyright Douglas Fenner.

Figure 9.3.2. A close-up of *Anacropora spinosa* from New Caledonia. Photo copyright Douglas Fenner.

Anacropora puertogalerae is similar to *A. spinosa*, except it has fewer spines, which may be smaller.

Figure 9.3.3. *Anacropora puertogalereae* from New Caledonia. Photo copyright Douglas Fenner.

9.4 Acropora lokani

This species forms small colonies with near-vertical,branching, smooth corallites. Branching is dichotomous and it does not have corallites radiate from a central corallite. The corallites are larger than on *A. speciosa* and *A. jacquelineae*.

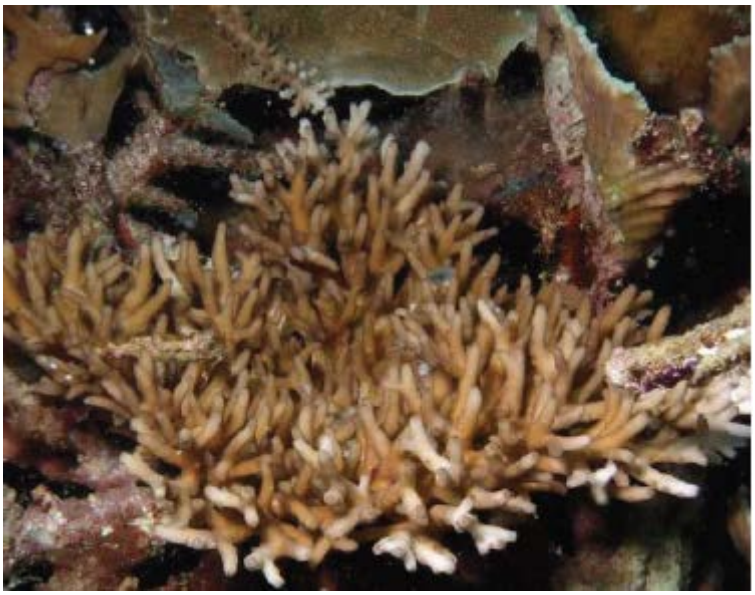


Figure 9.4.1. A photo of a colony of *A. lokani*. Copyright Paul Muir.

Figure 9.4.2. A close-up photo of a colony of *A. lokani*. Notice the branching corallites. Copyright Paul Muir.

Acropora carolineana is very similar to *A. lokani*, however, some of the corallites have other corallites radiating from them, forming "Christmas tree-like" shapes.

Figure 9.4.3. A close-up photo of *A. carolineana* from American Samoa. Notice the "Christmas tree-like" formations with radiating corallites. Photo copyright Douglas Fenner.

9.5 Porites napopora

Porites napopora forms branching colonies, with irregular branches. Colonies may also have plates. Corallites are surrounded by tiny thin ridges. Colonies are brown with white corallite centers.

Figure 9.5.1. A photo of *Porites napopora*. Photo copyright J.E.N. Veron.

Figure 9.5.2. A close-up photo of *Porites napapora* showing both branches and plate formation. Photo copyright by J.E.N. Veron.

Porites sillimaniani has similar colony shapes but does not have thin ridges between corallites and corallites are not white. *Porites horizontallata* can have branches but more often is just plates. Corallites on *P. horizontallata* are indented into thick, rounded ridges.

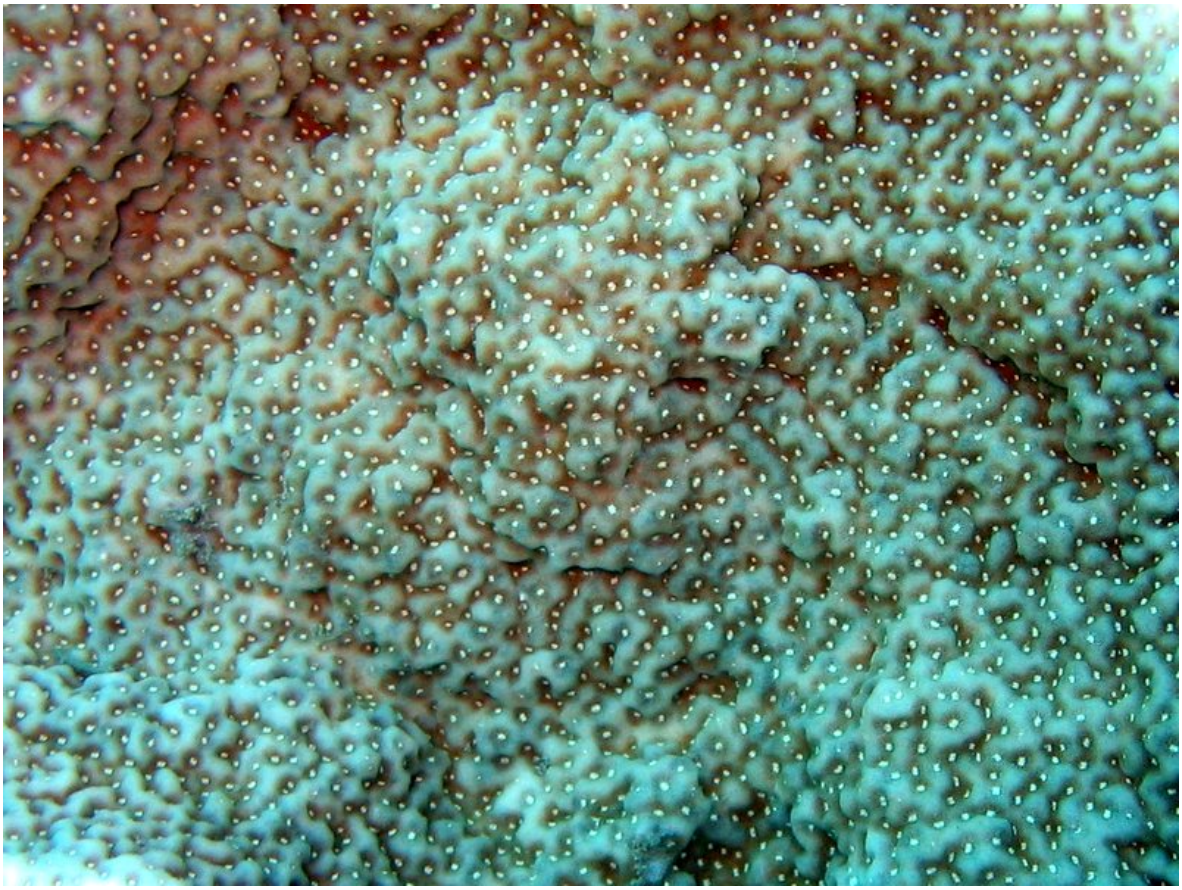


Figure 9.5.3. *Porites horizontallata* from American Samoa. Notice the thick, rounded ridges between corallites. Photo copyright Douglas Fenner.

9.6 Montipora australiensis

This species forms thick plates and irregular columns, and is a pale to dark brown.

Figure 9.6.1. A photo of a colony of *Montipora australiensis*. Photo copyright J.E.N. Veron.

10. Key References

Burdick, D. 2016. Identifying ESA-listed coral species from the Mariana Archipelago. Presentation at June 26-27, 2016 Species Identification Workshop, Honolulu, HI.

Fenner, D. in prep. A taxonomic monograph on the shallow-water stony corals of the Samoan Archipelago.

Fenner, D. 2013. Field guide to the coral species of the Samoan Archipelago: American Samoa and (independent) Samoa. Version 1.0. Dept. Marine & Wildlife Resources, American Samoa. 422 p.

Hoeksema, B.W. 1989. Taxonomy, phylogeny, and biogeography of mushroom corals (Scleractinia: Fungiidae). Zool. Verh. Leiden 254: 1-295.

Randall, R, and D. Burdick. In prep. A comprehensive account of the zooxanthellate scleractinian corals of the Mariana Islands.

Randall, R. and R. Myers. 1983. Guide to the coastal resources of Guam: Vol. 2 The Corals.

Veron JEN, Stafford-Smith M, Turak E, DeVantier L 2016. Corals of the World. http://www.coralsoftheworld.org/page/home/

Veron JEN 2002. New species described in corals of the world. Australian Institute of Marine Biology (AIMS) Monograph.

Veron JEN 2000. Corals of the world, Vol. 1-3. Australian Institute of Marine Science.

Veron JEN et al. 1976-1984. Scleractinia of eastern Australia. Vol. I-V.

Wallace, C.C. 1999. Staghorn corals of the world. CSIRO Publishing, Australia.

Wallace C C, Done BJ, Muir PR 2012. Revision and catalogue of worldwide staghorn corals *Acropora* and *Isopora* (Scleractinia: Acroporidae) in the Museum of Tropical Queensland. Memoires of the Queensland Museum Nature 57: 1-255.

Wolstenholme JK 2003. Species boundaries in scleractinian corals: A case study of the *Acropora humilis* species group. Thesis, James Cook University.

Wolstenholme JK 2004. Temporal reproductive isolation and gametic compatibility are evolutionary mechanisms in the *Acropora humilis* group (Cnidaria: Scleractinia). Marine Biology 144(3): 567-582.

Wolstenholme JK, Wallace CC, Chen CA 2003. Species boundaries within the *Acropora humilis* species group (Cnidaria: Scleractinia): a morphological and molecular interpretation of evolution. Coral Reefs 22: 155-166.