Fungia fungites

Oxypora lacera

Field Guide to the Corals of the Samoan Archipelago

American Samoa and The Independent State of Samoa
Version 2.7

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Tubastraea coccinea

Montipora

This is a field guide for the identification of 217 species in 62 genera of hard or stony corals.

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All photographs were taken in American Samoa by the author, unless stated otherwise.

To Peter Craig, Chuck Birkeland, Alison Green, Austin Lamberts, Alfred Mayor, and Edward Hoffmeister for all you have done to advance the study and management of reefs and corals in American Samoa.

Other coral field guides by the same author:

Fenner, D. 2023. The Corals of Hawai'i, 2nd Edition: Field Guide, Coral Diseases, Coral Biology, Coral Reef Ecology, Hawaiian Reefs. Mutual Publishing, Honolulu. 400 pp.

Fenner, D. 2022. Field Guide to the Corals of the Marshall Islands. Marshall Islands Marine Resources Authority.

Fenner, D. 2005. Corals of Hawai'i, A Field Guide to the Hard, Black and Soft Corals if of Hawai'i and the Northwest Hawaiian Islands, including Midway. Mutual Publishing, Honolulu. 143 pages.

Sheppard, C., Fenner, D. and Sheppard, A. 2017. Corals of Chagos. http://chagosinformationportal.org/corals

Fenner, D. 2018. Field Guide to the Corals of Nauru. Pdf.
Fenner, D. 2018. Field Guide to the Corals of the Marshall Islands. Pdf.
Fenner, D. 2019. Field Guide to the Corals of Saipan. Pdf.
Fenner, D. 2019. Field Guide to the Corals of the Federated States of Micronesia. Pdf.
Fenner, D. 2019. Field Guide to the Corals of Palau. Pdf.
Fenner, D. 2019. Field Guide to the Corals of Tonga. Pdf.
Fenner, D. 2019. Field Guide to the Corals of Fiji. Pdf.
Fenner, D. 2019. Field Guide to the Corals of Wallis Island (Uvea). Pdf.
Fenner, D. 2019. Field Guide to the Corals of Vanuatu. Pdf.
Fenner, D. 2019. Field Guide to the Corals of Wake Atoll. Pdf.
Fenner, D. 2020. Field Guide to the Corals of the Northern Marianas Islands. Pdf.
Fenner, D. 2020 Field Guide to the Corals of the Marianas. Pdf.
Fenner, D. 2022. Field Guide to the Corals of New Caledonia. Pdf.

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Here, families are listed alphabetically, genera within each family are listed alphabetically, and species with each genus are listed alphabetically. The species names used are those of the new taxonomy, based on DNA sequencing. There are quite a few changes in which genera species are in and which families genera are in. The old families were based completely on morphology, and morphology had little to base families on. It was impossible to visually identify families. So it is not surprising that DNA sequencing has indicated new groupings of genera into families. What is surprising is that several genera are indicated by the DNA sequencing to be in families that are morphologically very different. So for instance, *Alveopora* which has polyps almost identical to *Goniopora*, is moved from the Poritidae to the Acroporidae to join *Acropora*, *Montipora*, *Astreopora*, *Isopora*, and *Anacropora*, none of which have polyps or skeleton like *Alveopora*. However, under the electron microscope, *Alveopora* is seen to have minute scales on its skeleton like all the other genera in Acroporidae (and a few other species in other genera and families). And, that result has now been replicated using a method that uses much more DNA. Also, the Faviidae in the Pacific and Pectinidae are no more, species in those genera have been moved into the Merulinidae. The faviids, pectinids, and merulinids are all quite different morphologically but all are now in the Merulinidae. The former *Favia* in the Pacific have been renamed *Dipsastrea*, except *Favia stelligera*, which was moved into *Goniastrea*. *Diploastrea* and *Plesiastrea* get their own families. *Montastraea* in the Pacific was divided into *Astrea*, *Phymastrea*, and *Paramontastrea*, which is not surprising, Veron has commented that it seemed to be a collection of different things. The families Mussidae and Echinophyllidae are no more, their species have been moved into a new family, the Lobophyllidae. The morphology of the species in Muissidae and Echinophylliidae are quite different. The genus *Symphyllia* is no more, all the species in *Symphyllia* have been moved into *Lobophyllia*. *Psammocora explanata* and *Coscinaraea wellsi* have been placed in *Cycloseris*, which they don't remotely resemble. *Fungia concinna* and *Fungia repanda* are moved out of *Fungia* which they closely resemble, into the genus *Lithophyllon*, which they don't remotely resemble. Several species in *Fungia* have been moved into *Pleuractis*, and several others into *Danafungia*, and one into *Lobactis*. Only one species remains in *Fungia*, *Fungia fungites*.

Learning to identify corals is less difficult when similar species are compared, and the old taxonomy based on morphology tended to group corals together that had more similar morphology. So the order that corals are presented in this guide is more similar to the old taxonomy than the new systematics. The order of families, genera, and species in the new systematics as shown below is derived from Montgomery et al (2019) which was based on WoRMS (World Register of Marine Species, marinespecies.org). It is said that convergent evolution has produced similar appearances in species that are not closely related.

Preface

The author gathered much of the information for this book during his work for the Department of Marine & Wildlife Resources in American Samoa from late 2003 to 2013, and has continued to study them to the present. Almost all the work was done in American Samoa and most of the description of reefs is of reefs in American Samoa, with much less from Independent Samoa. However, they are one archipelago, built by the same geological processes (except Rose Atoll which is called "Muliava" in Samoan, and Swains), with the same traditional Samoan culture, and with almost all of the same coral species. So this book applies equally to both areas. All photographs were taken in the Samoan archipelago, and almost all were taken in American Samoa.

Studying coral species is not for the faint-hearted. It is a formidable task, especially where diversity is high. Corals are relatively easy to learn in a place like Hawaii (Fenner, 2005) or the Caribbean (Humann, 2002; Sheppard, 2007), where there are only about 60 species. Over 260 coral species have been seen by the author in the Samoan archipelago and over 400 species names have been reported previously by others (an unknown number of which are correct). This is much less than the number of fish species, with 945 reef fish species now known from the Samoan archipelago. But corals are highly variable, with variation within species often very great, making it very hard to tell species apart, since the differences between species may not be easily discerned among the riot of variation. Variation occurs within a single colony as well as between colonies within a species, and between locations within a species. Hybridization between some species is easy to produce in the lab and has been proposed to be common, and the amount of genetic connectivity between corals at different islands may change over longer periods of time due to changing currents that change connectivity (Veron, 1995, 2000). Looking at living corals in the water has advantages and disadvantages. One advantage is that you can see the whole coral not just a fragment like a sample in a museum. Another is that you can see many colonies (if it isn't rare) and learn what the variation is within the species. A third is that you can see the typical tissue color and any tissue clues like tentacles. The disadvantages include the fact that the skeleton on which the taxonomy is based is covered by living tissue you usually can't see through so you can't see the things the taxonomy is based on. In addition, you can't see the fine skeletal details because you have no microscope underwater. Add to that being thrown around by waves, condensation in your mask making things blurry, and running out of air and having to surface. All of which make it especially difficult to distinguish species when working at a new location, where many species look different from elsewhere.

Because coral identification is so difficult, you need all the help you can get, giving you that help is the primary objective of this guide. Although there are much more comprehensive coral identification books such as that by Veron (2000), many of the species in that book may not occur in American Samoa (and at the very least are not common), and you have to search through pictures of many corals you haven't seen to find the ones you have seen. That is very distracting. A book that only has the corals found in the Samoan Archipelago will be much easier to work with. Further, the photos in a comprehensive book like Veron (2000) or website (Veron, 2020) were not taken in the Samoan archipelago. Because some corals look different in different locations, the corals in such a guide book may not look like those in the Samoan archipelago. All the photos in this book were taken in American Samoa except for two species photographed in independent Samoa, and the descriptions give what they look like here, not other places. And last, encyclopedic guides like Veron (2000) and Veron (2020) are unwieldy and heavy, a huge set of three volumes, or you need internet access, while the present guide is more easily portable (depending on the computer you have it on). Mind you, Veron (2000; 2020)'s guides are marvelous accomplishments and a huge step forward. This book benefits greatly from the Veron book and others such as Wallace (1999), Hoeksema (1989) and Randall and Myers (1983). Because many coral species have wide distributions, many of the species in this book will not only be in the Samoan archipelago, but widespread in the Pacific. Many of the species illustrated may look very similar on nearby archipelagos particularly. Unfortunately, there are very few English common names or Samoan names for most of these coral species, and the English names at least are not applied consistently. For most species, it will be necessary to learn the Latinized scientific names, but then these are the only accurate names.

To help in identification, the description of most species includes both a picture of a whole colony and a close-up of the details of the coral surface. Also, more than one picture of a species was included to illustrate some of the different shapes and colors of the species. In addition, common colors are illustrated in addition to beautiful colors which are rare. The text indicates what the differences are between each species and the species that appears most similar to it, as well as how common the species are, and which colors or shapes are the most common for that species. Also, the species within a genus are placed in an order to try to place similar looking corals one after another, to facilitate comparisons. Genera are also placed in an order within a family in order to try to place similar looking corals together, even though at times the order does not correspond to the conventional taxonomic ordering.

Because you need all the help you can get, there is a section showing photos of eight of the most common species on the island, followed by list of the most common species by reef zone, and then a coral genus directory showing thumbnails of each of the genera. For a large genus like *Acropora*, a few of the different types of shapes are illustrated. These directories refer to the pages on which the genera are found, and can help you find the coral you are looking for. A good way to study corals is to look in the book before getting in the water, and then review the book after getting out of the water and getting dry.

This book was produced in part to help workers better monitor the reefs in coming years, as well as to build pride in the Samoan people for the richness of their biological heritage and a desire to see to it that the reefs are handed to the next generation in as healthy a condition as the present generation received them or even healthier. Of course, the book is also intended for amateur naturalists, snorkelers and divers of all ages and levels of familiarity with coral reefs. Enjoy!

Coral nomenclature is currently in a state of flux, with genetics studies producing results that do not always correspond to the results of morphological studies, or at times with each other. The author has chosen to use the taxonomic system of Veron (2000) as modified by Veron et al (2020), as we await the resolution of various contraditions. The species are also listed by the way genetics indicates in a table near the end of the book.

On a personal note, the author likes to relate that he lives on a volcanic rock about 17 miles (27 km) long that lies near the center of an ocean that covers nearly half of the planet, and the nearest big university library is as far as Seattle is from Chicago. The Samoan archipelago lies about 14 degrees south of the equator in the tropics, and American Samoa is the only U.S. territory south of the equator. It is a beautiful and fascinating place where few outsiders have ventured, and which still has a relatively healthy reef.

The opinions expressed in this book are entirely those of the author, and not necessarily those of the Dept. of Marine & Wildlife, the American Samoa Government, or NOAA. Photographs appearing in this book have been color corrected and/or cropped by the author, but not otherwise modified.

Acknowledgements

I stand on the shoulders of giants: this guide would not have been possible without the work of many coral taxonomists who went before me: J.E.N. "Charlie" Veron, Carden Wallace, Bert Hoeksema, Richard Randall, Francisco Nemenzo, John Wells, and Austin Lamberts to name but a few.

I would like to thank Ray Tulafono and the Department. of Marine & Wildlife Resources (DMWR) of the American Samoa Government for the opportunity to study the coral reef in the American Samoa Coral Reef Monitoring Program, and Chris Hawkins and Leslie Whaylen for their role in initial grant writing for that program. I thank the NOAA Coral Reef Conservation Program and the Coral Reef Initiative (CRI) for the funding to carry out the monitoring program, and for encouraging coral taxonomic work as part of that program. I thank Jenny Waddell at CRI for all of her support. I thank dive boat pilots Lemuelu Kitiona, Mika Letuane, Terry Lam Yuen, and Peter Eves and dive shop operator Ekueta Schuster for their expert support, and monitoring team dive buddies Leslie Whaylen, Emmanuel Tardy, Marlowe Sabater, and Benjamin Carroll for their support. I thank the Fagatele Bay National Marine Sanctuary for the use of their (first) boat. I thank Emmanuel Tardy for the discovery of two specimens of the tiny coral *Endopsammia regularis* under rubble on the outer reef flat of Fagaitua Bay, and Dr. Stephen Cairns for identifying them. I thank Dr. Bernardo Vargas Angel for the observation that some *Pavona* colonies in American Samoa look like *P. gigantea* in the Eastern Pacific and alerting me to the description of *Pavona chirquiensis*, Dan Barshis for pointing out *Montipora nodosa*, and Charles Birkeland for pointing out *Stylaraea punctata*, a cryptic coral if ever there was one, originally found here by Richard Randall (who was the first to learn where to find it, in Guam). I thank Paul Brown for showing me the *Leptoseris gardineri* which he collected. I thank Bert Hoeksema for pointing out the differences between *Halomitra pileus* and *H. clavator*. I thank Emily Lundblad and many others in NOAA for benthic maps of Tutuila based on multibeam sonar data from the the National Oceanic and Atmospheric Administration (NOAA) Coral Reef Ecosystem Division (CRED) cruise program. I thank Dr. Scott Ferguson for stimulating discussions about the benthic deepwater topography of the American Samoan area and its possible geology. I thank Dr. Stan Hart for answering many questions about the volcanic geology. I thank Dr. Peter Craig, Dr. Charles Birkeland, Marlowe Sabater, Benjamin Carroll, Mike King, Dr. Karl Brookins, Dr. Domingo Ochavillo, Dr. Timothy Clark, and Dr. Wendy Cover for many stimulating discussions on fish and benthic ecology in American Samoa, Eva Didonato for discussions of coral identification, and Dr. Zac Forsman for stimulating discussions of *Porites* and coral genetics and taxonomy. I thank Dr. J. E. N. Veron for support and stimulating discussions during my previous work at the Australian Institute of Marine Science (AIMS). I thank Peter Raines and Coral Cay Conservation for the opportunity to work with them in the Philippines where I learned to identify many corals, and Helge Vogt and the Center for the Establishment of Marine Reserves in Negros Oriental for the same. I thank Leslie Whaylen for organizing much of the American Samoa Coral Reef Monitoring Program and collecting fish data for that program. I thank Dr. Greta Aeby and Dr. Thierry Work for the opportunity to assist them in their coral disease work which also provided me with opportunities to observe and study corals, and the same for Dr. Rusty Brainard and the NOAA CRED program. I thank Dr. Dawn Wright for inviting me to accompany her on two days of dives in the Hawaii Undersea Research Laboratory (HURL) submersible Pisces V at Taema Banks. I thank Chuck Birkeland for support and sharing his insights gathered over a longer period than anyone else who keeps coming back to American Samoa, and his general wisdom accumulated during a long and illustrious career working on coral reefs. I thank Peter Craig for many stimulating discussions and insights from his many years working on reefs in American Samoa, and his support. I thank Dr. Russel Brainard for inviting me to join two National Oceanic and Atmospheric Administration (NOAA) Coral Reef Ecosystem (CRED) cruises through all of the islands of American Samoa. I thank Dr. Wendy Cover and the superintendent of the American Samoa National Marine Sanctuary for inviting me to join an expedition to Swains Island. I thank Dr. Domingo Ochavillo for his strong support, as well as the Coral Reef Advisory Group. I thank Lance Smith in the Protected Resources Division of the Pacific Islands Regional Office (PIRO) of the National Marine Fisheries Service (NMFS) of NOAA for the opportunity to work on the coral species that were proposed for listing under the Endangered Species Act (ESA), and learn more about corals in the process. I thank Alice Lawrence for a photograph of *Plerogyra simplex*.

The author bears sole responsibility for any errors in this book.

Introduction

This field identification guide was written to help identify corals in the Samoan archipelago, consisting of American Samoa and the Independent State of Samoa. All the photos were taken in the Samoan archipelago, so the photos look like the corals there. Corals look different from each other on a wide range of scales from near to each other to different reefs to different archipelagoes close together to archipelagos very far apart. No species are included in this guide that are not present in the Samoan archipelago, so you don't have to pick your way through many species that aren't in the Samoan archipelago. This is an early version of this and so some rare corals that are in the Samoan archipelago are not yet in this guide, but with additional dives by the author more species will be added. The order in which genera are presented is one that has been commonly used in the past (e.g., Veron, 2000) because it tends to put species together that look similar, which hopefully aids learning to distinguish them. The order of genera and species has been modified slightly here to try to put similar-looking species close together in the order, to assist identification. Veron et al (2020) has been followed in most cases with name changes noted.

Charles Darwin (1842) famously and correctly hypothesized that atolls are formed when coral reefs grow along the shorelines of oceanic volcanic islands, and that the volcanic islands slowly subside while the coral reefs keep growing up to the surface, eventually submerging the volcanic island leaving only a ring of coral reef in the ocean. Darwin also correctly predicted that his hypothesis could be tested by drilling down through an atoll to see if volcanic rock was beneath the coral rock. The first confirmation of the theory came after the U.S. had tested atomic weapons on Bikini and Enewetok Atolls in the Marshall Islands, and drilled deep wells to determine where the radioactivity ended up. The drill holes went through coral rock until they hit volcanic basalt at a depth of about 1.6 km. That is still well above the abyssal plane depths of about 4 km, supporting the view that the atoll is on top of a volcano presently about 2.4 km tall. Dating of coral rock just above the basalt gave an age of 60 million years. The volcano is 76 million years old. Deep in the coral rock, there was evidence those rocks had been above sea level. The oceans have never been 1.6 km shallower than present since the oceans formed, the lowest they have ever been was probably around 125 m below present sea level during ice ages, so the evidence of exposure to air 1.6 km deep is strong evidence that the volcanic mountain has subsided at least 1.6 km. All of this fits with Darwin's hypothesis.

The Samoan island chain was formed in a manner similar to the Hawaiian Island chain. The Hawaiian Island chain is a linear chain that has active volcanoes at the southeast end (Kilauea and Mauna Loa on the Big Island of Hawaii and Lohi seamount just south of Hawaii) with a series of volcanic islands with ages increasing with distance to the northwest from Kilauea. These are the "Main Hawaiian Islands" which are inhabited. Beyond those relatively large volcanic islands, a string of tiny volcanic islands surrounded by barrier reefs, and then atolls, extends northwestward. Beyond that there is a long line of the seamounts called guyots, which are flat-topped undersea mountains that are likely sunken atolls. Those atolls were unable to keep up with the subidance of the volcanoes because they were in water too cold for corals to grow fast enough or survive at all. The Hawaiian chain neatly illustrates Darwin's series of events. Today, geologists consider the active volcanos to be the surface expression of a volcanic "hotspot" that is a vertical hole or crack carrying hot magma up through the crust to feed the volcano with lava to erupt. The series of volcanoes is produced by the movement of the hard plate that forms the floor of the ocean (the earth's crust), which moves slowly, about 7-10 cm a year, across the ocean towards the northwest, over a nearly stationary hotspot. The lava erupting from the hotspot builds a volcano but the plate motion carries the volcano away from the hotspot, and then the hotspot builds a new volcano.

The islands of the Samoan archipelago represent the track of a hotspots in the South Pacific, south of the equator. As in Hawaii, the oldest atoll should be to the northwest, and the youngest to the southeast. The ages of islands are in a linear sequence, with an active volcano still underwater, Vailulu, to the east of Ta'u, Ta'u about 100,000 years old, Ofu-Olosega about 300,000 years old, Tutuila 1.5 million years old, Upolu 2.5 million years old. Savai'i, the westernmost island in the chain, has erupted as recently as 1906-1911, and is completely covered with relatively recent lava flows. However, dredging deep on the side of the island underwater yielded pieces of basal that are 5 million years old. So Savai'i is older than Upolu as expected from the hotspot chain theory, but is covered with recent lava flows. Actually, the western half of Upolu has very gentle slopes and a row of cinder cones along its crest, indicating that it is covered with relatively recent lava flows. This is likely the first stage of Upolu becoming covered with new lava, much as Savai'i has, as the plate moves westward, carrying the islands westward. The Tonga trench just south of

Savai'i extends north and then makes a right angle turn and goes west. Where it turns, the Pacific Plate south of there is subducted down into the earth, but north of that bend, it remains at the surface. That implies that it must tear at the bend. That could put stress on the plate, and perhaps open passages for magma to rise through the plate and erupt from the volcano.

American Samoa also includes two small atolls that are not part of the Samoan hotspot chain of islands. One is Swains Island, which is well north of the hotspot chain, and is neither part of the Samoan hotspot chain nor the Tokelau atoll chain. Although it is an atoll, the one entrance into the lagoon has been blocked by rubble, and the lagoon now is a brackish lake. Rose Atoll (Muliava) is a normal but small atoll with a lagoon, a pass from the lagoon to the ocean, and two small islands. Although it is in a position suggesting it is part of the Samoan hotspot chain, it is not, atolls are much older, at least 12 million years old, and these two atolls may be as much as 40 million years old, though their age is not yet known. They are not part of any hotspot, much as the islands of Niue and Nauru are, as well as many seamounts on the Pacific Ocean floor.

In addition, we should realize that over the long spans of the lifetimes of these islands, sea level has not been constant. Far from it. When ice ages happen, snow falls on continents and does not completely melt in winter, building up. The weight of the snow as it gets thicker and thicker compresses the deeper snow into ice. Eventually the ice in an ice cap during an ice age reaches thickness of as much as a kilometer or more. All or almost all of this is above water. Ice caps remain today on Greenland and Antarctica that are similar to ice caps that covered Canada and Alaska, and northern Europe. Ice that remains above water was produced from water that evaporated from the ocean surface and then fell as snow. Thus, the ice caps that built up on continents were produced from water removed from the oceans. The result of that was that the sea levels fell during ice ages. At the peak of the last ice age, about 22,000 years ago, the oceans were about 400 feet (125 meters) below their current level! That means that all places where coral reefs are currently alive were left high and dry and very dead at that time. This happened slowly enough that it was easy for coral larvae to settle farther and farther down the outer island slopes. The coral communities were reconstituted lower and lower on the slopes while those in shallow water ended up out in the air and dead. Eventually the ice melted and the oceans rose and coral larvae settled on substrates that had been exposed to air and died. The coral communities moved up and down and survived, and kept on building reef rock, and on most atolls kept up with sea level rise. Tutuila has a large underwater shelf around it, varying mostly between 100 feet (30 m) and 300 feet (100 m) deep, and about 1 mile wide, though at the west end of the island it extends about 3 miles from land. The shelf is made of calcium carbonate. That is clear because on the outer edge of it where the dropoff occurs, there is a cliff made of layers of solid white material, calcium carbonate. Basalt lava is black. The shelf was likely built by corals. On the shelf, there is a ring of reefs which include Taema Banks out from the mouth of the harbor, and Nafanua Banks to the east of that, connecting with Aunu'u Island. This appears to be a partly drowned barrier reef.

Most of the reefs of American Samoa are fringing reefs, although Swains Island and Rose Atoll (Muliava) are atolls. Fringing reefs are right along the seashore. A shallow reef flat often starts right at the shore at the level of low tide and extend out from shore to where the waves break, which is the reef crest. Beyond the reef crest, the fore reef slope slopes steeply at about a 45-degree angle down. On Tutuila, the reef slope ends at the beginning of the shelf, which usually begins at a depth of about 70 feet, but can begin anything from 30 to over 100 feet deep. Ofu-Olosega also has a shelf, though it is not as wide as on Tutuila. On Upolu and Savai'i, the reefs are also fringing, and some have an outline that is apron-shaped, curving from near land out from land and then curving back in. The reef flat area also is often about 1-2 meters deep and as much as twice that in southeast Upolu. This may be because Upolu and Savai'i are subsiding faster than the plate due to the heavy weight of relatively new lava.

The fore reef slope typically has wave surge that decreases with depth, and may have currents at times, such as tidal currents (which likely reverse during a tide cycle). The reef flat has waves coming across it after they break at the crest, and anything extending above the reef flat may be exposed to air at extreme low tides. Reef flats and reefs slopes typically host different species of coral, and species that live on one often don't live on the others or are less common on the others. Depth also affects corals, probably from both decreasing light and wave surge with depth. Many coral species show some depth zonation, being most abundant at one depth and less abundant deeper or shallower than that. Some may even not be present at some depths. A few species have very wide depth ranges, others have narrow depth ranges. Corals usually become less common below about 100 feet (30 m) depth, though in some places there are lots of corals below 100 feet (30 m) depth. Reef building, zooxanthellate corals (coral containing algae cells) rarely extend below 400 feet (100 m) deep. Below about 40 m depths, the coral communities are called “mesophotic” since they have intermediate levels of light between shallow areas and even deeper areas (where there is not enough light for photosynthesis). Where there is hard substrate corals can grow, though they typically grow slower. The shelf around Tutuila has many lumps on it that are likely to have coral on them. In a few places in the world reef corals are abundant at mesophotic depths, but usually species diversity decreases below about 30 m depth. Non-reef building coral that do not have zooxanthellate (and are called “azooxanthellate”) extend below 400 feet (100 m), sometimes much deeper, but are usually small.

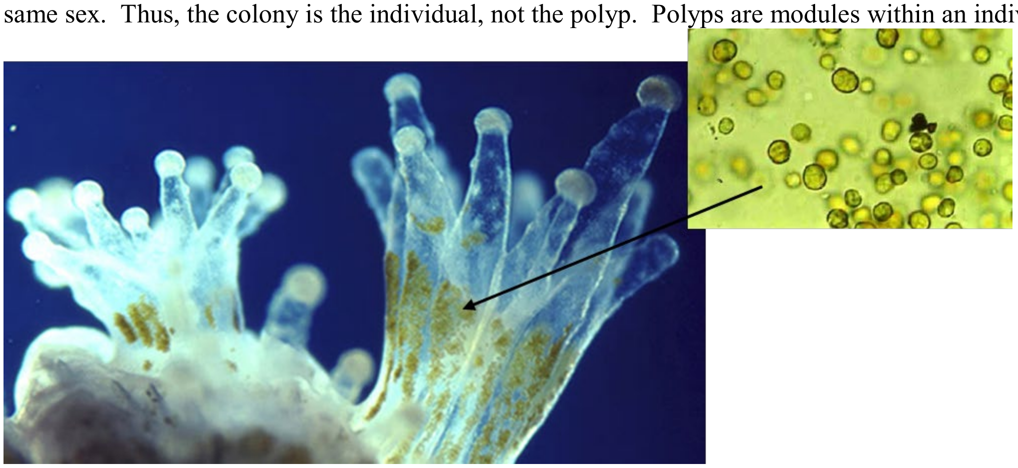
For more background information on marine environments and on coral reef ecosystems and habitats in the Samoan archipelago, see Craig et al (2005), Fenner et al (2008), Birkeland et al (2008), and Fenner (2021). For more information on coral reefs and corals in general, see Veron (1995; 2000), Wallace (1999), Goldberg (2013), Sheppard et al (2018), Sheppard (2021) and Fenner (2022).

Coral Anatomy and Biology: what are corals? Corals 101.

Corals are animals made up of units or modules called "polyps." A polyp is a bag full of seawater, with a thin wall made of 3 layers, an outer layer of cells called the "epidermis," a middle layer of connective tissue called the "mesoglea." and an inner layer of cells called the "gastroderm." The opening of the bag is the mouth, and it is actually turned inside the opening of the bag. There is a ring of tentacles around the mouth. Each tentacle is a hollow tube much like the finger on a glove, filled with water that is continuous with the water inside of the polyp. The water-filled space inside the polyp is called the "gastrovascular cavity" because it serves the function of both a digestive cavity and a circulatory system. Polyps are very simple and lack organs like a heart, blood vessels, and a brain. The gastrovascular cavity has only one opening, the mouth, unlike the tube digestive systems of higher animals, which have two openings and can digest things in a sequence like an assembly line. Anything that is indigestible has to be spat out the mouth. The inner two layers of the body wall project in a series of curtains called "mesenteries" that extend into the gastrovasuclar cavity. Hard corals have ether six mesenteries or multiples of six, and they have as many tentacles as mesenteries. Usually they have multiples of six. Coral polyps vary in size between species, ranging from less than 1mm diameter up to as much as 30 cm diameter.

Corals and their relatives are carnivores, sit and wait predators. They have a remarkable and unique type of stinger in their tentacles, called a "nematocyst." Nematocysts are actually sub-cellular structures inside cells, secreted by the cell, and not alive. They are oval capsules, with a coiled thin tube inside them. The opening of the tube connects to the end of the capsule which touches the cell surface that is exposed to the water. When an animal touches the trigger on the surface of the cell, it provides a chemical that is only found in animals, a short polypeptide. In addition, the movement of the animal provides a mechanical stimulus. Both chemical and movement are necessary to trigger the nematocysts off. Corals and their relatives eat animals. When the nematocyst is triggered, water from the cell moves into the capsule, but the capsule is rigid and does not stretch. So the pressure goes up very high, about that of a scuba tank, the highest in any organism. There are 3 spines inside the tube which are attached to the tube and their sharp points are against the capsule where the capsule touches the cell surface that is exposed to the outside water. The pressure pushes the spines through the capsule wall, releasing the pressure, which then pushes the tube inside out, and outside the capsule and pushes the spines into the prey. The tube has many tiny spines attached inside it, initially pointing inward. As the tube turns inside out like a sock, the tiny spines are thrust out the end where the tube is being turned inside out, and stick into the prey. As the tube turns inside out, then they stick into the prey backwards, holding the tube in the prey. The spines poke into the prey and anchor the tube in the prey, and pull the tube into the prey. The tiny tube is very long, vastly longer than the capsule in which it was tightly wound up. Thus it can go well into the prey. The capsule is filled with a wide variety of nasty venoms, which attack nerve cells, blood and body cells. The end of the tube is open, so it serves as a hypodermic needle, invented by evolution probably over 500 million years ago. The prey is then pushed into the mouth and on into the gastrovasucular cavity by the tentacles. The layers of cells in the body wall have muscle cells in it which can cause the tentacles or body wall to contract. Once in the gastrovacular cavity, the food item is surrounded by the edges of the mesentery curtains, which have cells on the edge which secrete enzymes that digest the prey. The digested juice of the prey leaks out from between the mesentery edges into the gastrovascular cavity and diffuses through it, sped by body wall contractions that move the water inside it, so the juice reaches cells throughout the body wall and tentacles and feeds them.

The gastrodermis also has single algae cells in it, living inside the coral animal cells. They are called "zooxanthellae" which simply means "colored algae cells that live in animal cells." The zooxanthellae are in a group of single cells called "dinoflagellates" which when they are in water, have two flagella (hairs) that beat, one on the end of the cell, and one in a groove around the equator of the cell. When they beat, the cell swims and spins. The cells have chloroplasts in them that have chlorophyll, and can do photosynthesis in light. They also have other pigments that are red, orange or yellow, and together with green chlorophyll they always look brown. When they build glucose sugar in photosynthesis, some of it leaks out into the coral cell and feeds it. Thus, corals have two sources of food, animals they eat, and sugar from photosynthesis. The sugar is high in energy and low in nutrients, and supplies much of the coral's energy needs. The animals that corals eat are mostly small, and called "zooplankton." They provide the nutrients like nitrogen and phosphorus the coral animal cells need. The algae living inside the animal cell gets the waste products of the animal which are nutrients, fertilizer for plants. Plus, it gets a very well defended, stable spot in the sun. This is a mutualistic symbiosis, two different organisms living together, both benefitting, and it produces tight recycling of nutrients in low-nutrient water. The polyps are all connected by continuous tissue, and the gastrovascular cavities are all connected. The nervous system consists of nerve cells connected together like a net, with no brain or ganglion to control it. All the polyps behave as one connected individual coral organism. In addition, the polyps are all genetically identical and all the same sex. Thus, the colony is the individual, not the polyp. Polyps are modules within an individual.



Coral polyps on the left have tentacles. The white on the end of the tentacles and white bumps on the sides of tentacles are large cells called "nematocyst batteries" because they have many nematocysts. (Image: ocean.si.edu) The brownish-green spots are zooxanthellae, seen in a microscope photo on the right. (Image: www.captivereefs.com).

Sexual maturity comes when the colony reaches a certain size, not when polyps reach full size. Eggs and sperm are produced by groups of cells which form gonads on the sides of the mesenteries. In a majority of species, the eggs and sperm are released into the water in what is called "broadcast spawning", where sperm from other colonies of the same species fertilize the eggs. The eggs and sperm are released together in egg-sperm bundles, which float to the surface and then break apart. Once the eggs are fertilized, they begin to divide and it takes about a week for them to divide enough to form a little larva, about the size of the head of a pin, called a "planula' larva. It is then capable of settling if it can find a suitable surface. If not, it can continue to float in the water. Over time, if they don't find a substrate, more and more die, and the last ones may live up to 100 days or so. In some places like the Great Barrier Reef, most coral species all spawn on the same night every year. The floating eggs are so numerous there they can form slicks on the surface so large they can be seen by aircraft. Most larvae probably don't go very far, with fewer and fewer going farther and farther with the currents. In other coral species the eggs are retained in the parent and sperm released, and sperm enter through the mouth to fertilize the eggs inside the parent. Then the egg divides and develops into a larva inside the parent, before being released. These are called "brooded larvae." Brooded larvae are able to settle immediately after being released, or they can float with the currents like other larvae. Some brooders release a few larvae every night, with more during some moon phases and times of the year. In addition, a majority of coral species are hermaphroditic, producing both eggs and sperm in one colony. A minority of species have separate sexes. Broadcast spawning and brooding are types of sexual reproduction.

When a coral planula larva settles, it then metamorphoses into a coral polyp of the same, tiny, size. The polyp then grows until it reaches a mature size. The mature size of polyps differs between species. Once the founding polyp reaches the mature size, it starts to divide. It can divide equally into two new polyps. It divides by the two polyps slowly growing and pulling away from each other. But they don't finish the job of dividing, they continue to stay attached to each other by a thin connection. So all corals start out as one tiny polyp which then grows to a mature size and divides into two. As those two grow, they reach the mature size and then they divide into 4. Then 4 into 8, 8 into 16, and so on until there may be hundreds, thousands, or millions of polyps.

Corals also can reproduce asexually, mainly by fragmentation. If something breaks a coral colony, the pieces can survive and grow if they are stable on a hard surface which they can attach to. In some relatively fragile branching species, this is the primary way they reproduce. In other, sturdier colonies, asexual reproduction by fragmentation is rare. Colonies can also have partial colony mortality which may leave islands of tissue living. In that case, as the islands of living tissue grow, they may reach each other and fuse. Only genetically identical tissue will fuse, when different colonies grow until they touch, they do not fuse. All fragments broken off of one colony are genetically identical and can be called “clone mates.” Some species like staghorns form extensive thickets of these clones and are called “clonal.” Branching corals like staghorns grow fast at the tip and slow on the sides. At the tip, only thin walls are secreted between corallites so the skeleton is highly porous and weak. Then with time the tissue keeps adding calcium to thicken the walls, until low on the branch not only is the branch thicker but it is nearly solid and very strong. If you think about it, leverage means that pressure near the end of the branch produces much more breaking force low on the branch than near the tip. The fact that the low part of the branch is thicker and more solid and thus much stronger, guards against breakage at the base. Thus, it appears that evolution has actually selected branching corals to resist breakage. That is probably because many fragments do not get stabilized on hard substrate and do not survive. Asexual reproduction by fragmentation can come at a high price. Mushroom corals have a few additional variations on these asexual fragmentation themes. When the larva of a mushroom coral settles, the polyp it forms, grows larger and then taller, and then the top surface with the corallte and septa starts widening beyond the stem-shaped part of the corallite. Then the tissue dissolves a crack in the skeleton under the wide top of the polyp. Then only the tissue holds the top on, and something like wave surge breaks the tissue and it falls off. That top that falls off is the shape of a mushroom coral, and grows much larger without ever attaching to anything. In the two species of “*Diaseris*” mushroom corals, the mature corallite dissolves a crack in its skeleton across the disc, and then the two halves are held together only by tissue. Something breaks the tissue and now there are two, half-disc mushroom corals which proceed to regenerate the other half and then dissolve another crack to do it all over again. As a result, those species can form large numbers of clone mate mushroom corals.

Coral polyps are very similar to sea anemone polyps, but reef building corals are usually colonial with several to many polyps, while anemones are solitary with single polyps that can, in some species, grow quite large. Reef building corals can grow large and have many polyps, and they almost always have zooxanthellae. Other corals are usually small, often solitary, don’t have zooxanthellae, and live often in the dark, often in deeper water, and those that live in deep water are in very cold water and a few species live in cold polar waters. Reef-building corals live only in warm, shallow water and usually live in clear water. Thus, coral reefs are all in warm, shallow water. All corals build what we call a skeleton, made of calcium carbonate. Calcium and carbonate are abundant in sea water and actually have a higher concentration than needed to precipitate (but precipitate slowly). Corals take calcium carbonate out of the water and secrete it beneath themselves in a single structure that is external, underneath the living polyps, and not alive. So it is different from our skeleton, which has many separate pieces which are inside and have cells in them and are alive (and our skeletons are made of a complex phosphate compound, “hydroxyapatite”). Calcium carbonate can exist in at least two solid forms, one called “calcite” which forms thick crystals, and another called “aragonite” which forms long thin fiber-like crystals. Corals only build aragonite skeletons. After the larva settles on a surface, it secretes skeleton that is cemented to the substrate. Most coral species are firmly attached to hard substrate, but a few are not. Because the skeleton is not alive, it doesn’t matter if other organisms like sponges burrow in the skeleton. As long as it doesn’t break, it makes no difference to the living coral which is only on the surface of the skeleton. Each polyp sits in a cup in the skeleton called a “corallite.” The inside surface of the cup has walls of skeleton that project into the cup and are called “sclerosepta” with “sclero” meaning hard and “septa” means walls. The corallite shape fits very closely to the polyp and reflects all the fine details of the polyp size and shape. The skeleton is much more permanent than the polyp and can retain its shape indefinitely out of water in a museum, and so is used for identification and taxonomy. All the taxonomy with only one exception is based on the skeleton shape. The irony is that a species is a group of living organisms, but we define coral species based on their skeletons, which are not alive. Both the shapes of colonies and the fine details of the corallites and other details of the skeleton, usually observed under a microscope, are used to separate species. Identification of living corals is not definitive, it requires confirmation by examining skeleton. Living corals in the water have some advantages for studying species, since you can see the whole colonies instead of pieces in a museum, and you can see large numbers of colonies, and it is non-destructive. Skeletons in a museum have the advantage that living tissues are not in the way of you seeing the skeleton details, and you can use a microscope, and you can see the same skeletons other people see.

There are a few general things about coral morphology that may be of help to you as you go along. The main unit in coral morphology is the polyp, and the corresponding cup in the skeleton which a polyp sits in.

The cup in which a polyp sits is called a "corallite" and includes both the inside and the outside surfaces of the cup. The inside of the cup is called a "calice." There are walls that extend from the inside wall of a corallite into the central space of the corallite, which are called "septa." Each corallite has at least six septa. Septa come in sets, the first set having six septa, the second set also having six which are between the first set of six and usually smaller than the first set of six. The third set is 12 and is smaller still, and is in between the existing 12 septa, the next set is 24, etc. In the center of the corallite there is a small structure called a "columella" which may be a single solid column or more often many small columns, or curving, twisted columns. The septa commonly extend up over the rim of the corallite and down the outside surface of the corallite, where they are called costae (costa is singular). Septa and costae may have teeth or granules on the edge and granules on their sides. Corallites can come in many different sizes and shapes. They range in size from about 0.5 mm to about 30 cm diameter. Some are circular, others oval, some quite elongated. Each elongated corallite corresponds to an elongated polyp which has several or many mouths but shares a single gastrovascular cavity. The corallite walls in that case are elongated and usually meander, forming a "meandroid" coral, commonly called a "brain coral." There are many other details.

Coral Identification

Coral species are notoriously difficult to identify. Coral identification and taxonomy are not for the faint hearted. You need all the help you can get. We all do. The purpose of this identification guide is to help you to learn to identify coral species you see in the the Samoan Archipelago. This is a preliminary version of the guide, as the author gets more time underwater and finds and photographs more corals, more species will be added. The goal is to present photographs of the corals taken in the Samoan archipelago, and have clear and helpful text that points out the features of the corals that can help in identification and how each species differs from others. One of the advantages of a pdf is that it can easily be updated as often as desired. Another is that photographs can fill the whole screen. The larger the photographs, the better you can see the corals that you are trying to identify. This guide attempts to show both pictures of the whole colony shape, and of close-ups of the corals, and some of the variation between corals. There are valuable identification clues in both the colony shapes and in the features of the corallites and areas in between corallites. You need to be able to see as many of these features as possible to help you identify the corals you see.

At any one reef, only a portion of the Samoan archipelago's coral fauna will be present, and an even smaller portion of that fauna will be common enough that you encounter it frequently. The more often you see a coral, the more chance you have to practice your identification skills. The author recommends looking at the guide as often as possible, including before you get in the water. Then it is good to look again after you get out of the water. Going between the guide and looking underwater, back and forth, is one of the best ways to learn coral species. You will see corals in the water that don't fit well with the species in this guide. You will also see things in the guide that you won't initially see in the water, but with more and more time in the water you will see more and more of them. The author is doing the same thing, finding more species with time spent underwater in more places, and using pictures taken to add to the guide. But a local guide has several advantages over a guide that presents all species from all over the world (such as Veron's "Corals of the World"). For one thing, many of the species in a worldwide guide aren't at your location. That means you have to look through many photos of all sorts of things that aren't on your reef. For another, not all coral species look the same everywhere. Some can look quite different in different parts of the world or on different archipelagoes. Some look virtually identical, but others don't. Most or even all of the pictures taken in a worldwide guide weren't taken in the Samoas, and so many of them may look quite different than corals in the Samoas. This guide helps you by only showing you coral species that are in the Samoas, and only showing you photos of corals in the Samoas, so the photos look as much as possible like the corals you see.

Unfortunately, there are only a few common names that have been applied to coral species consistently, and most of those apply to groups of corals. So some corals are called "staghorns" and others "table corals" and others "brain corals." But there are several staghorn species and several table coral species. In this guide, similar looking species are presented together as far as possible. Genera are presented in a traditional order, which tends to put corals that look similar together. In addition, within genera corals that appear similar are put together, so all the "staghorn corals" are together, and all the "table corals" are together, and so on. But the species are all labelled with the scientific (Latinized) names, because only those names correspond (as far as possible) to the actual biological species. Common names in widespread use are also given, but usually there are several species that have the same common name. So there is no easy way around using the scientific names.

There are two major reasons that corals are difficult to identify. The first is a naming problem, and the second is a problem of figuring out what group of organisms is the species you are studying. Names are arbitrary human inventions, while the group of organisms is something that exists in nature whether we give it a name or not. We need species names in order to be able to communicate to each other what we are talking about, but the name itself is arbitrary, any name would do, and everybody has a different idea of what name they would like to call it. The solution is a set of rules invented by Carl Linnaeus. You probably know some of the rules. One of the most important is that the first name correctly applied to a species is the one that is correct. This is called "priority." A second rule is that species names must have two words, the first is the genus and is capitalized, the second is the species and is not capitalized, and both are in italics. Any words can be used, from any language, but the words must be Latinized, making them look like Latin. So the word in English, "bushy", taken from a reef in the Great Barrier Reef where a coral was first discovered, was converted to Latin and became "bushyensis" and the species was named

"Acropora bushyensis". Another rule is that the name and a description of the species must be published. The rule book does not specify where the name must be published. There are other rules, which are contained in a rulebook, "The International Code of Zoological Nomenclature" (which is available online open-access). This is in effect the rulebook for a game played by taxonomists, that is, naming species. There are a variety of problems with this, but one of the worst come from the publications that commonly are used for new species. Very few people are interested in the original descriptions of new species, mostly just other taxonomists that work on the same group of animals, and usually there are only a few of those in the whole world. No widely read journal that publishes papers that many people think are important will publish original descriptions of new species, because almost no one will be interested and read it. So almost all descriptions of new species are published in obscure little journals that almost no one reads, and almost no libraries subscribe to them, since almost no one uses them. One result is that most coral taxonomists have not read most original descriptions, primarily because they can't find copies of them. So many taxonomists have described as new species, species that were described before, sometimes many times. These are called "synonyms", when two names refer to the same species. Taxonomists occasionally write "revisions" of groups of organisms, in which they give new descriptions, and they list all the names that have been previously applied to what is now all considered one species. This requires considerable taxonomic knowledge and skill, because you have to look at lots of old descriptions to figure out which are all the same species. Yet a single species varies between individuals and locations, so original descriptions from different places are often a little different even though it is the same species, and everyone uses different words and sentences, making this a difficult task.

In addition, the rules do not specify which language must be used in original descriptions. At first, most were written in Latin, because that was the scholarly language of the time in Europe where taxonomy originated. Then they were written mostly in a variety of European modern languages, and now most are written in English. Even in English, the language has changed over time, particularly in coral taxonomy. Older publications in English use terms that they didn't define, and which we don't use now. That makes it harder even in English. I have seen an original description of a coral species that consisted of two sentences in Latin. Your Latin better be very good, the whole definition could hang on the meaning of one word in Latin.

Originally there were no samples of the new species, or photographs (photography had not been invented!) or even drawings of the new species. Then people started including drawings in their new species descriptions. The drawings were often made from a particular piece of the species, and slowly those pieces, in a museum, were taken to be "type specimens" that helped define new species. In time, photographs were added. In 2000, the rules were revised to require the description of a new species to include designating a type specimen (usually in a museum). Type specimens are extremely helpful, because if an original description leaves out something that you now think is important, you can look at the type specimen and find out what that is. Further, it is often difficult to imagine what a species looks like from a description. The saying goes that "a picture is worth a thousand words." Of course, we are handicapped by the fact that for the species that were named long ago, there are no type specimens. Another problem is that some old type specimens are in terrible shape. One that Veron has a picture of on his website (Corals of the World) looks like it was dragged behind a car on beach for a couple miles, all the surface is worn off. You can't even tell what genus it is in. This may not be quite as bad a problem as that, most type specimens are not in bad condition. Another problem is that the type specimen doesn't have to be typical of the species, and the original description doesn't either. That's in part because a wide range of samples of a species are almost never available when a new species is being described, and a large collection of samples is needed to determine the variation within the species and what is typical. At this time, for most coral species, we still don't know the range of variation over the geographical range of the species. No one can go to everywhere there are corals and sample many colonies from every site of every species. But we know they vary from site to site. So some or many type specimens may not be typical, and for most species we don't even know whether they are typical or not.

It has been said that the main job of 20th Century taxonomists was to try to clean up the mess left to them by earlier taxonomists. Much of that comes from the arbitrary naming rules, but some comes from the variability in the organisms themselves.

The second great hurdle for recognizing coral species and doing taxonomy on them, is the question of what group of individual organisms comprise a species. This is an empirical question. With some species, it is easy. For Homo sapiens, we have the advantage that no other human species is alive today. Our nearest living relatives, chimpanzees and bonobos, are so different from us no one would ever confuse one with a human, and many people don't believe we're related at all. If Neanderthals were alive, it would be much more difficult.

Almost all species ever named and described were named and described based on their morphology and anatomy alone. Originally, only morphology was known and could be included. Plus, morphology until recently has been the quickest and easiest thing to use to describe species. And it makes it possible to identify species in the field. About 1-2 million species of all types of life on earth have been described, but it is estimated that there are 10-30 million species on earth (and other estimates that run from 3 million to a billion; nobody really knows). After about 250 years, we may have only named and described about 10% of the organisms on earth, and we have little prospect of speeding that up substantially. It is not immediately obvious how large the anatomical differences need to be between individuals for them to be different species. There is lots of variation within some species, so something that is different might be a new species or just a variation within a species. How do you tell? Not easy. One thing is that it is helpful to have at least two different features that are different between two species, and that the two go together. So species 1 has features A and B, and species 2 has features a and b. and individuals that have A and b or a and B are rare or can't be found. Another rule of thumb is that in a single feature that has variation between individuals within a species as well as between species, the distribution of that feature (such as length or body weight) has two modes (one for each species) and at least a small gap in between with no individuals. Of course these things require a lot of knowledge about many individuals within a species. That sort of information is very rarely available when describing a new species, but sometimes is available later on when much more is known about the species. Describing new species remains a fairly intuitive thing.

For corals, the morphology that is used in coral taxonomy is the morphology of the skeleton. Originally, the only thing available to taxonomists was the skeleton. Long sailing voyages of creaky old wooden European sailboats went long distances, sometimes around the world. Along the way the crew would pick up all kinds of curiosities, sometimes including corals. Months or even years later, the ship would return to Europe, and by then the coral had long had all the tissue rot off, and only the skeleton was left. If the taxonomist was lucky, the skeleton had not been broken into many pieces or ground against other pieces as the ship rocked. In time, deliberate collecting voyages were organized, financed, and crewed with people whose purpose was to collect. Corals were usually collected by dredging, pulling a dredge behind a boat which broke many corals and gathered many broken pieces of coral. But only within the lifetime of older people living now, has it become possible to dive into the water with scuba gear and view living corals in their natural state. Pieces of coral in museums are exactly that, they are almost always just pieces, and the overall colony shapes usually can't be seen. Further, it is possible now to see large numbers of living, whole colonies underwater, many more than can be seen in museums. Plus viewing corals is non-destructive. I know one coral taxonomist who has collected over 30,000 coral specimens in his lifetime. That is still tiny compared to the hundreds of millions of colonies destroyed by a single, natural, hurricane. But still it is significant. The colony shape of corals is one of the more useful cues that can be used to identify species, but it is usually only available when they are viewed alive on a reef. So viewing corals alive on a reef has its advantages for identifying coral. One disadvantage is that viewing a living coral is ephemeral and in and of itself you usually can't show it to a variety of colleagues. Now, underwater photography fills that gap, and it is possible to show pictures of whole living colonies and close-ups of smaller features to as many people as you wish. Another disadvantage with living corals is that the skeleton on which the taxonomy and secure identification rests, cannot be seen directly, usually, because it is covered with living tissue. The living tissue obscures many of the features you need to use in identification, such as skeletal septa, spines, etc. Further, underwater you can't use a dissecting microscope, your mask fogs up, waves or currents throw you around, you have to do a lot of other things to stay safe like watch your buddy and check your dive computer and air gauge, all the while you are trying not to break coral and to handle the camera and perhaps collecting tools. So there are advantages to working on a piece of skeleton in a lab or museum as well. But it is good to remember that an identification of a coral in the water is a hypothesis, and firm identification requires examination of skeletal samples under a microscope. The present guide is not yet backed up with examination of skeleton under a microscope by the author, but that is planned for the future. Identification of living corals is guesswork, hopefully well educated guesses, which can be checked against skeleton.

Discovering or studying species requires some idea of what a species is. Darwin wrote that many scientists differ in how they define what a species is, they have an intuitive feel for what it is. By now, about 30 different definitions of species have been offered. What I was describing in the previous paragraph is something like a definition of a species based on morphology, which has been called a "morphospecies." Another famous definition is what is called the "biological species". That defines a species as a group of organisms that interbreed within the group, but not with other groups. Reproductive isolation from other species is the hallmark of a "biological species." Reproductive isolation makes sense of some major problem cases for the morphological definition of species. For instance, dogs have enormous morphological variation. The differences between many dog breeds is far greater than that between many wild species. Yet we are sure all dogs are one species. Why? Because they can interbreed freely. Humans also have lots of variation, yet all modern humans are the same species, we can all interbreed. Another problem with morphospecies is illustrated by parrotfish. There are parrotfish that were described as different species because they are different sizes and have different color patterns. But subsequently, they were seen to be interbreeding, they were different sexes of the same species. Many (but not all) species are dimorphic to some degree, with different morphology in males and females. Sexual dimorphism is an example of polymorphism. There are some species, such as some butterflies, that have multiple morphs that look different, but interbreed freely, they are the same species. So the reproductive isolation definition of species handles these problems well. Intuitively we know that reproductive isolation is a better definition of species than morphology alone. However, one problem with reproductive isolation is that it takes a LOT more time and effort to gather the information needed to define species this way than by morphology alone, and we have millions of species left to describe so we don't have the luxury of testing reproductive isolation with each new species (or most of the old species).

There are at least two other major problems with the reproductive isolation definition of species. One is that a majority of all species are extinct and we know them only through fossils. Yet we can't record in fossils which organisms interbreed with each other and which don't. All we have is morphology. Second, there are some species that don't interbreed at all. Rotifers are entirely unisexual and do not interbreed, and have not been interbreeding for about 200 million years, it is thought. Some microorganisms don't interbreed. Bacteria exchange genetic material, but that's not interbreeding in the sense we mean, and bacteria can easily exchange DNA between different species. So interbreeding isn't much help there. In zooxanthellae, interbreeding has never been observed except in the original description of Symbiodinium. So it is in some cases not possible to use the reproductive isolation, and in most or almost all cases it is impractical. There is one study with about 20 species of Acropora which spawn all on the same night on the Great Barrier Reef, where reproductive isolation was studied. All possible crosses of these species were made, and whether the crosses would produce fertilized eggs. Several were able to cross, including at least one pair of species that had nearly as high frequency of fertilization success and within species. But most did not cross, and most that did cross had fairly low fertilization success.

The newest challenger is of course genetics. It is possible now to quickly get DNA sequencing data from large numbers of samples. One problem is simply handling the enormous volume of information when more than just single genes or small stretches of DNA are sequenced. Interpretation of the results in some cases is not always clear. For many types of animals, there is a relatively small stretch of DNA that is highly variable between species. The DNA sequence in that locus is unique for each species. This is the technique called "DNA finger printing" or "bar coding." If you define a species by morphology and then sequence this locus in the DNA, then you can sequence that locus in many individuals blindly and the results are "fingerprints" or "bar codes" that can identify the species for you. Thus, for the first time, large volumes of samples and species can be separated into species groups without the laborious task of identifying based on morphology. It is easy to sequence large numbers of individuals and use the fingerprints to divide the samples into species. Then matching to databases of known species sequences, you can identify species. You can only get a species name if a taxonomist has identified a species and it has had its DNA sequence fingerprint taken. Further, you have to sample each individual you want to identify, which would be impractical for some types of ecological surveys or monitoring. For most corals, the problem is that there is not enough variation in these markers to separate species (though it may work for genera), and no one has yet found a new stretch of DNA that works. Markers that do work for species have been found for Pocillopora and the Agariciids. So genetic fingerprinting doesn't work with all corals at this time, but it does for some. Note that if you compare a DNA sequence for an individual coral with a database, you have to assume that the specimen for which the sequence appears in the database was correctly identified. That assumption may not be warranted for corals, people without significant training in coral ID may get ID's wrong.

The main problem with morphology for corals, is that corals are so highly variable in morphology within species. There is variation at every possible level. Variation between spines in a single corallite.

Variation between neighboring corallites on a single colony. Variation between regions (like top and side) of a single colony. Variations between adjacent colonies (in the same environment). Variation between colonies in different zones of the same reef. Variations between reefs, between islands within the same archipelago, between adjacent archipelagoes and between distant archipelagoes. When you're trying to tell two species apart, they both have variations at all these levels, with all the different morphological features they have, all at the same time and perhaps independently. The variation within species is large, and often the variation between species is small. Some studies have quantitatively measured many features in the same individual coral, on the order of 30 or more features, on several corallites or locations of each coral. Do that on more than a few colonies and the work quickly becomes enormous, do it on all the archipelagoes within a species range and it has never been done and may never be done because the work is way out of proportion to the value of the end product, it is too inefficient.

For more on the results of DNA sequencing of corals, see the section after "Contents" on "Corals by the New Systematics: DNA-sequencing (PCR) Phylogeny' and Kitahara et al (2016). For more on the conflict between DNA sequencing and morphology, see Losos et al (2012). For more on the problems of morphological taxonomy with corals, see Veron (1995; 2000) and Veron et al (2022).

Yet we still very much need to be able to identify corals to species, for studies of ecology, monitoring, and conservation. So we struggle along, doing the best we can. My suggestion is to concentrate on enjoying the feeling of accomplishment each time you learn to identify one more species. Don't dwell on the fact that there are many to go, enjoy learning to identify coral species as you progress.

There are a few general things about coral morphology that may be of help to you as you go along. The main unit in coral morphology is the polyp, and the corresponding cup in the skeleton which a polyp sits in. The cup in which a polyp sits is called a "corallite" and includes both the inside and the outside surfaces of the cup. The inside of the cup is called a "calice." There are walls that extend from the inside wall of a corallite into the central space of the corallite, which are called "septa." Each corallite has at least six septa. Septa come in sets, the first set having six septa, the second set also having six which are between the first set of six and usually smaller than the first set of six. The third set is 12 and is in between the existing 12 septa, the next set is 24, etc. In the center of the corallite there is a small structure called a "columella" which may be a single solid column or more often many small columns, or curving, twisted columns. The septa commonly extend up over the rim of the corallite and down the outside surface of the corallite, where they are called costae (costa is singular). Septa and costae may have teeth or granules on the edge and granules on their sides. Corallites can come in many different sizes and shapes. Some are circular, others oval, some quite elongated. Each elongated corallite corresponds to an elongated polyp which has several or many mouths but shares a single gastrovascular cavity. The corallite walls in that case are elongated and usually meander, forming a "meandroid" coral, commonly called a "brain coral." There are many other details.

The Corals

About 439 names have been applied to the hard corals of American Samoa. Only two published papers have been based on collected corals, and were published by coral taxonomists (Hoffmeister, 1925; Lamberts, 1983), both based on collected samples which can be examined in museums (Smithsonian and University of California at Berkeley, respectively). The rest are unpublished reports produced largely from visual observations, usually by non-taxonomists. Some of the names used are junior synonyms of other names, and others were likely incorrectly identified or applied. There are no coral collections from these studies that can be used to verify those species names, and they will remain doubtful until samples can be collected. Some studies have included photographs of the living corals, as in this document, which provide some evidence, though secure identification requires confirmation from skeletal examination. All the species names that have been used for corals in American Samoa are listed and examined in Montgomery et al (2019).

The present study involved photographing live corals, studying corals in the DMWR collection and collecting samples of as many additional species as possible. Also, Hoffmeister's collection in the Smithsonian Institution was studied. Lamberts' collection in the Berkeley Museum will hopefully be studied in the future, and Richard Randall has collected a large number of corals from American Samoa and will hopefully be publishing a study of those. However, his American Samoa corals are intermixed with a very large collection of other corals he has in Guam, which are in wooden crates and not catalogued yet. They are in practice inaccessible, and so have not been studied.

A companion work on the skeletal samples will be published, documenting almost all of the species illustrated here, plus a few others.

The corals are presented in a conventional taxonomic order because it tends to put similar-looking corals together, but within a genus, similar-appearing species are grouped together as much as possible. The author suggests learning the most common corals first, or maybe some lifeforms. Then maybe learn some of the corals you see most commonly or remember easiest. Looking at the book before getting in the water and then after getting out is a good idea. Each description gives a rough estimate of how common a coral is. If you see a coral, it is most likely to be one of the most common, less likely to be uncommon, and very unlikely to be rare. So if you concentrate on learning common corals first, it will make it much easier. Learning corals is not easy, don't get discouraged, keep feeling good about the ones you have learned and forget how many others there are left to learn. It's the only way to stay sane and keep learning. Remember, you won't have to learn many to know more than other people! A set of "practice modules" for American Samoa coral genera and species are available from the author. They provide the fastest and easiest way to learn to identify the corals.

There is a "Directory to Coral Genera" that shows a thumbnail photo of a common species in each genus, and gives the page number for the genus. If you pick the one most like what you see, hopefully you will find out what it is quickly. Just looking at every species in the book will take quite a while, though if you are familiar with what they look like you can probably learn to identify them faster. If you know the species name, just look in the directory to coral species on pages 3-5, or the index to find the page. In the descriptions, the most common color is listed first, and an attempt was made to show species in the most common colors as well as pretty colors (which may be rare).

Lifeforms (colony shapes)

Corals have some shapes that are easily recognized by beginners. Many are referred to in the species descriptions. Here are some of them.

Encrusting = a thin layer on the bottom like a coat of paint.
Branching = has branches. (Now, that was easy, wasn't it! You're off and running!)
Massive = rounded, dome shaped, spherical, but any size (here, massive doesn't mean heavy).
Foliose = plate = like a plate with a top and bottom surface above the substrate. Most often near horizontal but can be at any angle, including vertical.
Columnar = has columns that go nearly vertically, and don't branch much.
Staghorn = looks like deer antlers, can form huge thickets, always Acropora.

Table = looks like a circular table, has a pedestal in the middle or side, may have more than one tier, usually has little branchlets on the upper surface, always Acropora.
Bushy = lots of branches going in all directions, much like a bush. Usually Acropora.
Digitate = branches are finger-like and short, and do not branch further, always Acropora.
Sub-massive = looks massive at first, then you realize there are thin cracks between the polyps, and find out it is actually branching. Usually Lobophyllia or Caulastrea.
Corymbose = similar to digitate, but thinner branches, which are often growing up from larger horizontal branches (always in genus Acropora).
Caespitose = bushy, branches going in all directions.
Hispidose = in the shape of a bottlebrush, with short thin branchlets radiating from a central larger branch (always in genus Acropora).

The identifications in this guide are primarily based on Veron (2000), Veron et al (2018), Wallace (1999), Wallace et al (2012), Hoeksema (1989), Randall and Cheng (1984) and references therein.

The words in bold red on the same line as the species name are the categories for endangered species. Some coral species have been listed as "threatened" under the U.S. ESA (Endangered Species Act), and some listed as "vulnerable" under the IUCN (International Union for the Conservation of Nature) Red List, (www.iucnredlist.org), and some both.

The Most Common Corals

By learning just eight corals, you can recognize many of the corals on our reefs, and luckily the eight most common corals are very easy to distinguish from each other.

Porites cylindrica – Finger Coral forms masses of finger shaped branches in the backreef pools. P. 216

Montipora grisea forms brown encrusting patches all over the reef slopes and is the most common coral on the reef slopes. P. 92

Acropora muricata – Staghorn Coral forms thickets of deer-antler shaped branches with blue tips in the backreef pools. This is the most common staghorn, but there are others. P. 116

Porites rus forms masses of irregular columns growing up from thin plates on reef slopes. Smaller individual columns and plates are common as well. P. 225

Pavona varians forms small brown masses or encrusting colonies covered with small ridges. P. 310

Lobophyllia hemprichii forms large mounds of many large polyps- polyps are about 1-2 inches (3-5 cm) diameter.
SE Tutuila mid slope. P. 387

Acropora hyacinthus forms "table corals" and is most common on the upper-mid reef slope. P. 193

Isopora crateriformis is encrusting, often with lifted lower plate edges.
Most common on upper reef slopes on the SW of Tutuila. P. 108

The Most Common Corals by Zone
For Tutuila

Backreef Pools
Porites cylindrica……………. 202
Acropora muricata………….. 102
Acropora pulchra……………. 104
Acropora intermedia (=*nobilis*)111
Pocillopora damicornis…….. 29

Reef Flat
Acropora hebes (= *aspera*)…. 113
Montipora grisea…………….. 78
Pavona frondifera…………...304

Crest
Acropora nana………………. 194
Pocillopora verrucosa………. ..90
Pocillopora damicornis…….. 70

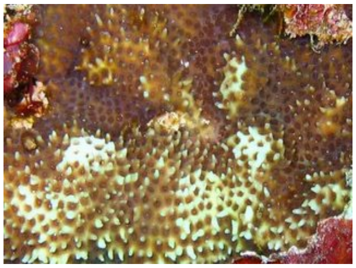
Upper slope
Montipora grisea……………. 78
Isopora crateriformis………. 94
Porites rus…………………… 210
Pavona varians………………. 295
Acropora hyacinthus………. 179

Middle slope
Montipora grisea…………… 78
Lobophyllia hemprichii……. 372

Lower slope
Mycedium sp………..…….. 360

Banks
Acropora clathrata………….. 188

Directory to Coral Genera


Stylocoeniella p. 39


Montipora verrucae p. 85


Astreopora p. 204

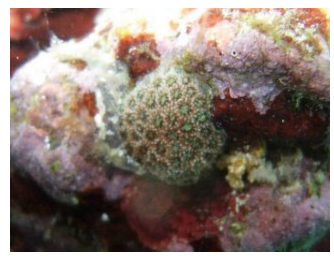

Pocillopora p. 43


Acropora staghorn p. 115


Porites p. 216


Stylophora p. 79


Acropora table p. 193


Stylaraea p. 253

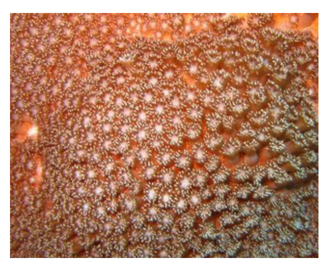

Seriatopora p. 81

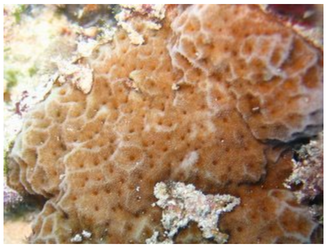

Acropora bushy p. 115


Alveopora p. 255


Montipora encrust p.85


Isopora p. 108


Goniopora p. 257


Psammocora p. 261


Coscinaraea p. 274


Gardineroseris p. 278


Leptoseris p. 280


Pavona p. 292


Pachyseris p. 321


Cycloseris p. 328


Fungia & similar p. 332


Ctenactis p. 347


Herpolitha p. 350


Polyphyllia p. 352

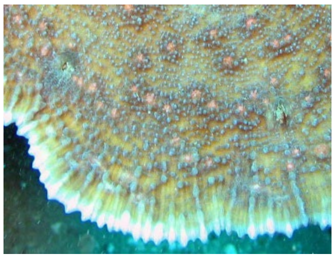

Halomitra p. 354


Sandalolitha p. 356


Galaxea p. 360

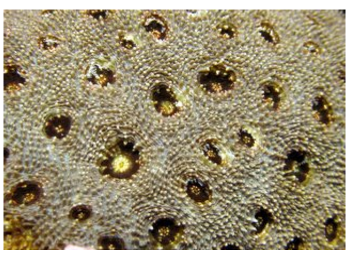

Echinomorpha p. 364

Echinophyllia p. 366



Oxypora p. 371

Mycedium p. 375



Acanthastrea p. 379

Lobophyllia p. 398

Lobophyllia/Sym p. 398

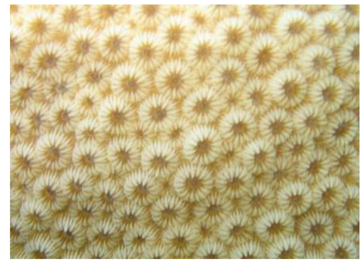
Hydnophora p. 403

Merulina p. 409

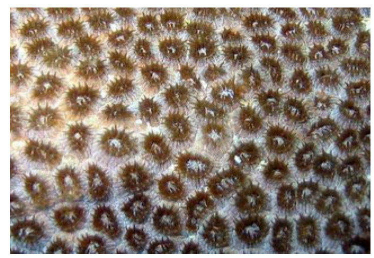
Scapophyllia p. 413

Caulastrea p. 415

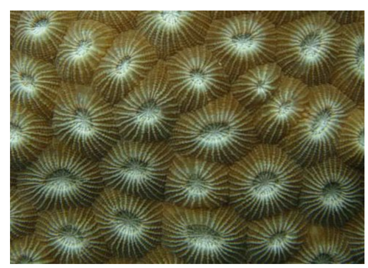
Dipsastrea Favia p. 418



Astrea p. 422



Plesiastrea p. 425



Diploastrea p. 428

Cyphastrea p. 430


Echinopora p. 432


Platygyra p. 471


Tubastraea p. 504


Favites p. 439

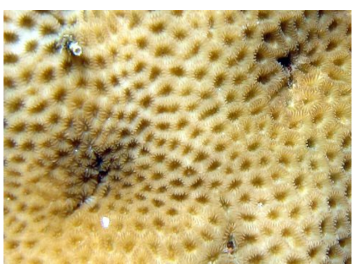

Leptoria p. 481


Rhizopsammia p. 506


Oulophyllia p. 467


Fimbriaphyllia p. 366


Endopsammia p. 508

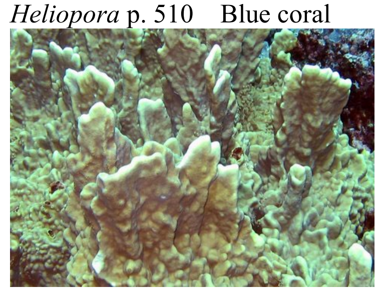

Goniastrea p. 445


Plerogyra bubble p. 489


Heliopora p. 510 Blue coral


Leptastrea p. 457


Turbinaria p. 494


Millepora p. 513
Fire coral


Stylaster p. 532   Lace


Distichopora p. 534

The Coral Species

If a description does not state where a coral is located, then it is found on the reef slope.

Phylum Cnidaria

This phylum contains animals that have a very simple sack-shaped body with three layers of cells and no organs. It has a mouth that leads to a gastrovascular cavity, but the mouth is the only opening to the cavity. It has a ring of hollow tentacles around the mouth, which are extensions of the body wall. The body shape can be a polyp which has an upward facing mouth and the downward end of the body is attached to a surface, or a medusa, which is a jellyfish which is free swimming. In some classes, polyps and jellyfish (= medusa) alternate, in one (Anthozoa), only polyps are present.

Subphylum Anthozoa

This subphylum contains animals that have only a polyp stage (no jellyfish = medusa stage). It has two main groups in it, those with exactly 8 tentacles (Octocorals: soft corals, gorgonians, and sea pens), and those with multiples of six tentacles (Hexacorals).

Class Zoantharia or Hexacorallia 'hexacorals'

The hexacorals have six tentacles or multiples of six. If they have lots of tentacles, then it is often not an exact multiple of six. Hexacorallia includes the Scleractinia (which literally means "hard anemones") which are most of what we call "hard corals." It also includes anemones, black corals, corallimorphs, zoanthids and ceranthids (burrowing anemones). See the "Benthic identification for reef monitoring in American Samoa" for the anemones, black corals, zoanthids and corallimorphs.

Order Scleractinia

This order contains animals that build calcium carbonate (aragonite) skeletons underneath themselves. In the corallites ("polyp cups") that polyps sit in, there are "sclerosepta" that are thin walls made of skeleton that project into the calice (the inside of the corallite). This includes almost all of the reef-building hard or stony corals. The reef-building corals have zooxanthellae (single-celled algae inside the coral cells), though there are almost as many scleractinian corals that don't have zooxanthellae and live in deep dark and/or cold water or a few that live in shady locations on reefs. Those that have zooxanthellae are called "zooxanthellate" and those that don't are called "azooxanthellate." Most azooxanthellate species are small, many have only one polyp, but a couple of species that live on reefs are large enough to be reef builders (and have many polyps).

Most reef-building Scleractinia are attached to a hard surface, but a few like most of the mushroom corals are not attached. Most reef-building Scleractinia have multiple to many polyps and corallites, but a few are solitary, with only one polyp. For those that have many polyps, the colony is the individual, and polyps are modules not individuals. In a sense a polyp could be considered an individual, but the polyps in a colony are all connected together with continuous tissue. Further, all polyps are the same sex in a colony, all are genetically identical, and their digestive systems and nervous systems are connected. They reach sexual maturity when the colony reaches a minimum size, not when polyps reach a minimum size. They function and behave as a single individual with modular units, from which a piece can break off and regrow. Polyps vary greatly in size between species from less than 1 mm diameter to as large as 30 cm (1 foot) diameter, and they vary greatly in shape and other details. Colonies also vary greatly in shape and size, which are helpful in identification.

Stylocoeniella

Stylocoeniella is an uncommon genus that has just two species in the Samoan archipelago. They tend to be encrusting but can have small bumps, and have very tiny polyps (a half millimeter in diameter!). The distinctive feature is tiny spines on the colony surface, usually one per polyp. The "style" in the genus name refers to the spines.

Stylocoeniella armata (Ehrenberg, 1834)

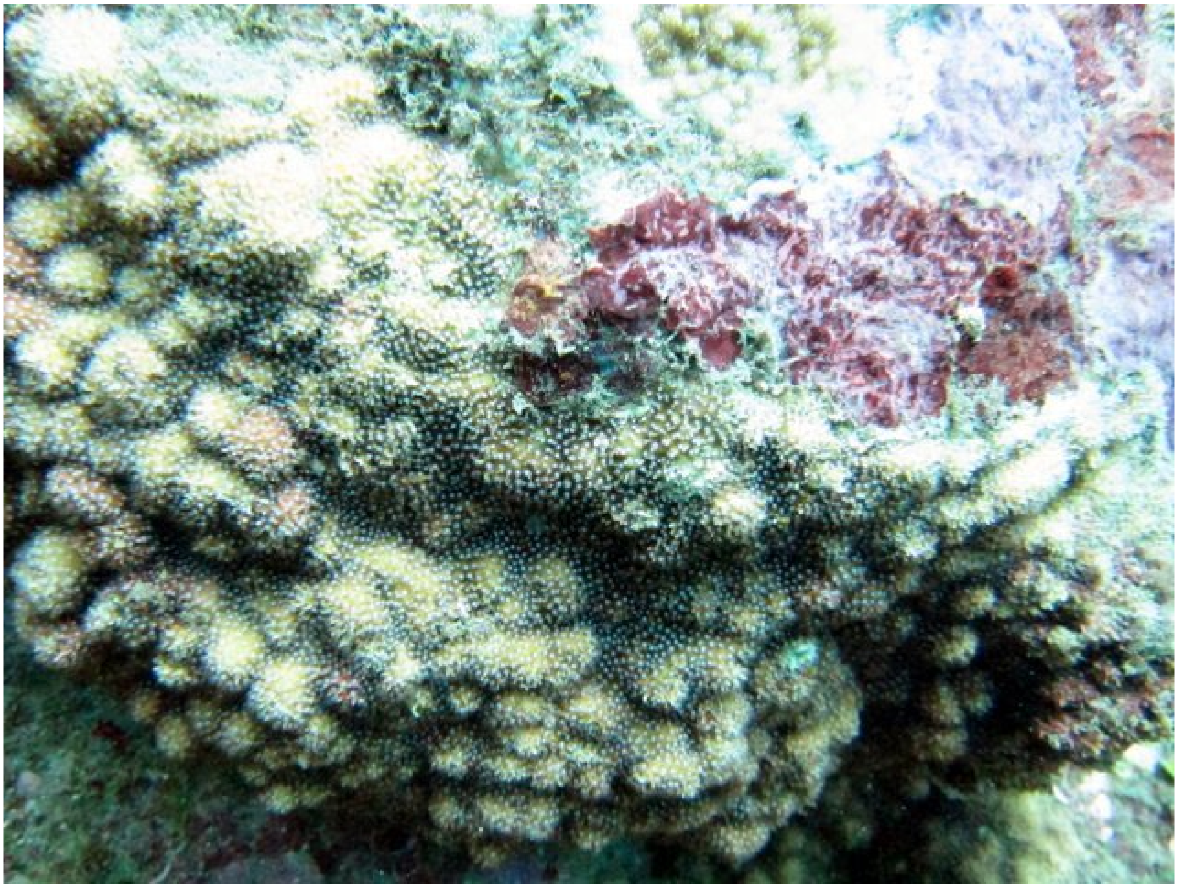
This species forms small encrusting colonies, never more than 5-7 cm diameter, usually only about 1 inch (3 cm) diameter. Colonies are brown-green with cream mottling and the spines are relatively easily visible (but tiny). Colonies are smaller than *Stylocoeniella guentheri,* do not have lumps, and are mottled. Found on reef slopes, rare. Found so far on Tutuila, Ofu-Olosega, Muliava (Rose Atoll), Upolu, and Savai'i.

A close-up picture of *Stylocoeniella armata*.

A magnified picture of *Stylocoeniella armata* (larger than life).

Stylocoeniella guentheri Bassett-Smith, 1890

This species forms larger encrusting colonies. Colonies commonly have uniform rounded lumps about 1 cm (1/3 in) in diameter. Colonies are commonly red, orange, or tan, and may have white dots which are the polyps. The spines are not easily seen but can be easily felt. Colonies are larger and bumpier than *Stylocoeniella armata* and lack mottled colors. Found on reef slopes, uncommon. Found so far on Tutuila, Aunu'u, Muliava (Rose Atoll), Upolu, and Savai'i.



A colony of *Stylocoeniella guentheri*.

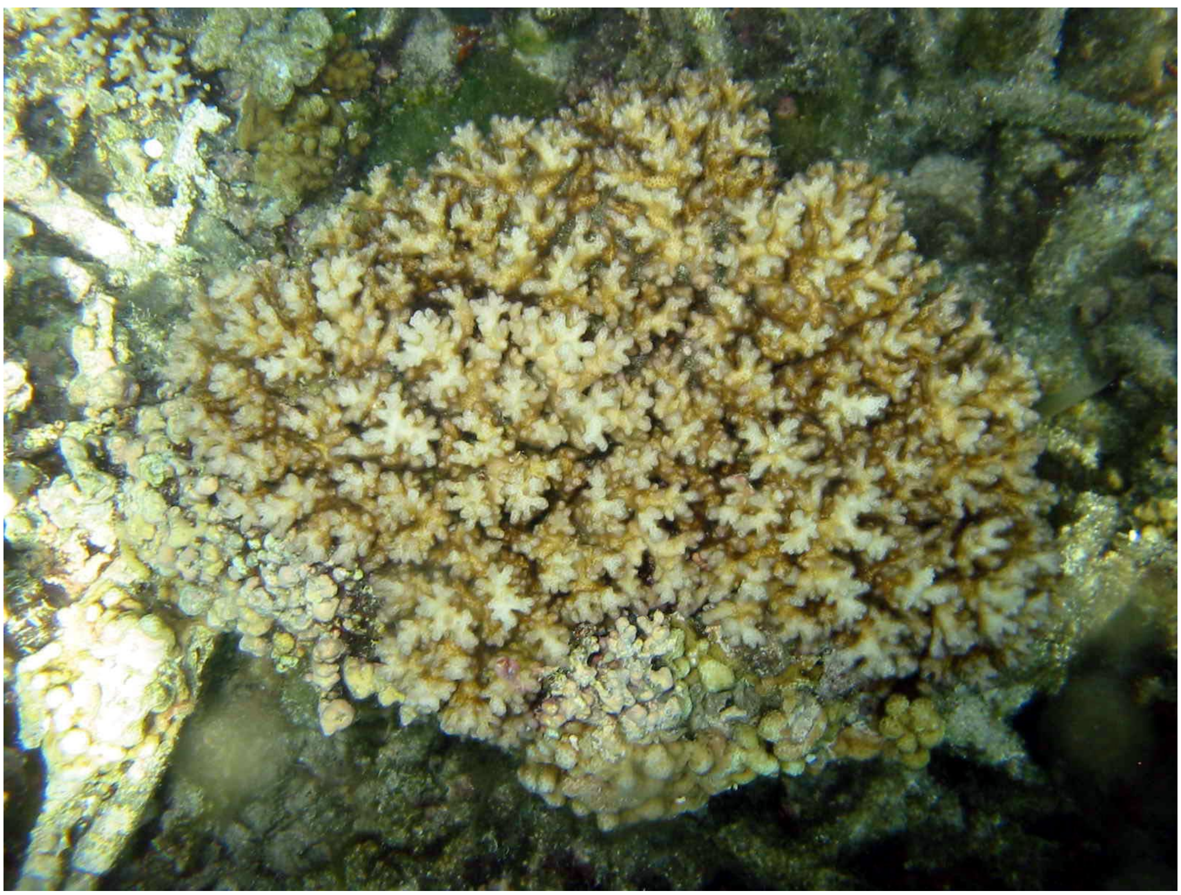
A close-up of *Stylocoeniella guentheri*.

Pocillopora

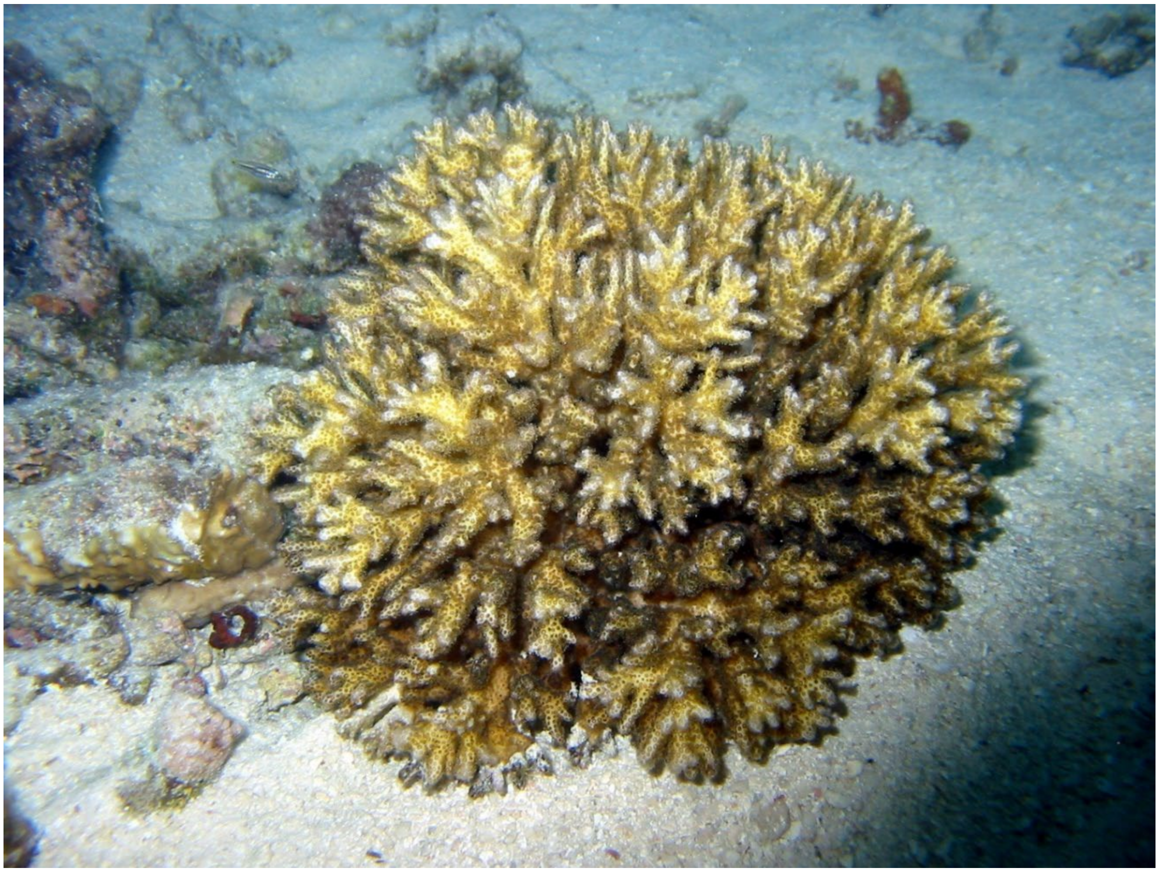
Pocillopora is branching, and has small bumps all over the surface called "verrucae." The corallites are small, only about 1 mm diameter, so hard to see. The bumps are larger than the corallites, and easy to see, in fact the corallites are all over the bumps as well as between the bumps. Branches can be cylindrical or flattened or thin enough that it is hard to tell a bump from a short branch. Colonies commonly are up to a foot (30 cm) in diameter, but a few can get to be 2-3 feet (60-100 cm) in diameter. Common, sometimes dominant. Has rounded bumps like some *Montipora*, but corallites are all over the bumps. Some have branch shapes like *Stylophora*, but have bumps instead of spines.

Pocillopora damicornis (Linnaeus, 1758)

This species forms small bushes. Branches sub-branch such that there is no clear distinction between branches and verrucae. Branches are usually close together and very knobby. Branches are closer together than on *Pocillopora acuta*, and smaller than on any other species. Branch tips are always round. Brown, rarely pink, often with lighter branch tips, common in back reef pools and reef crest. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Muliava (Rose Atoll), Swains, and Upolu.



A colony of *Pocillopora damicornis*.

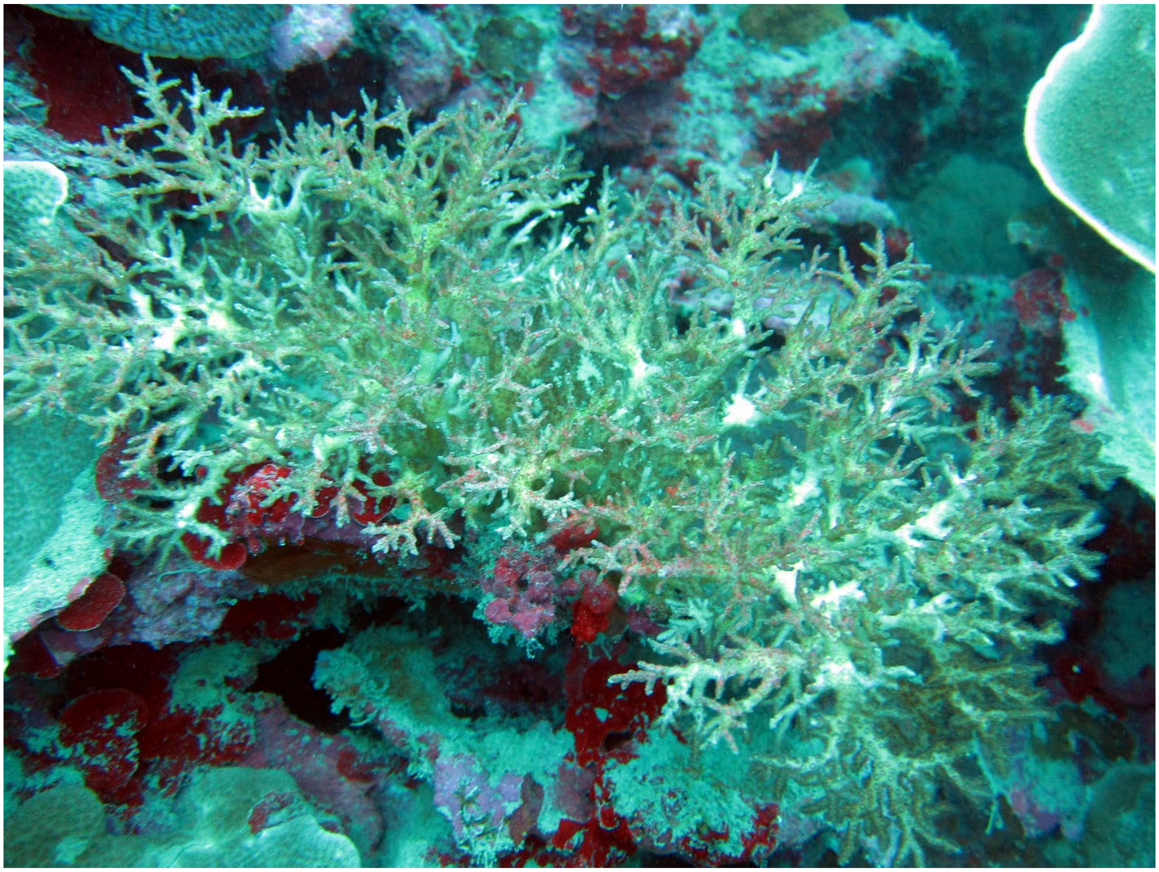


A colony of *Pocillopora damicornis* with slightly more diverging branches.

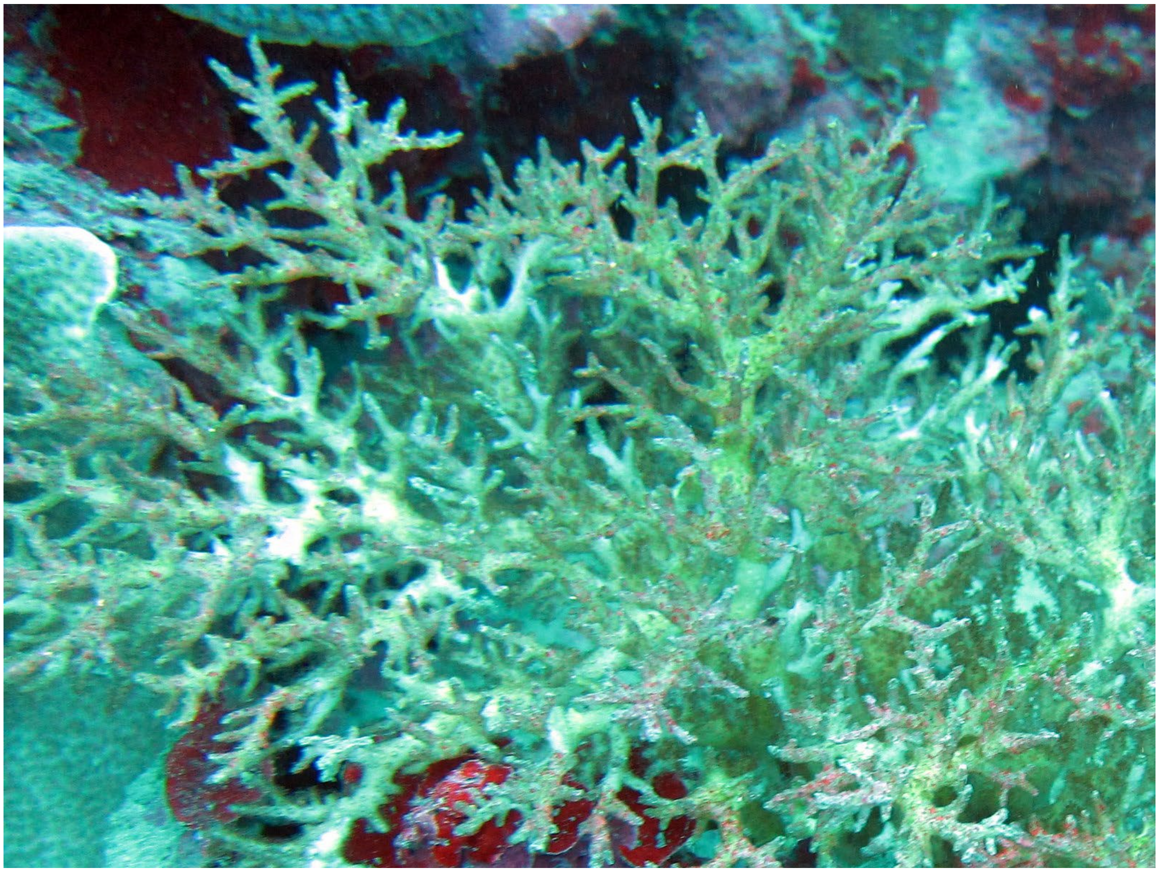
A close-up photo of *Pocillopora damicornis*.

Pocillopora acuta Lamarck, 1816

Colonies are bushy with thin branches that are widely spread and taper to a relatively sharp tip. Likely to be deep on reef slopes, rare. Branches are more widely spread than on *Acropora damicornis* and branch tips are sharper. All other species have thicker branches than these two.



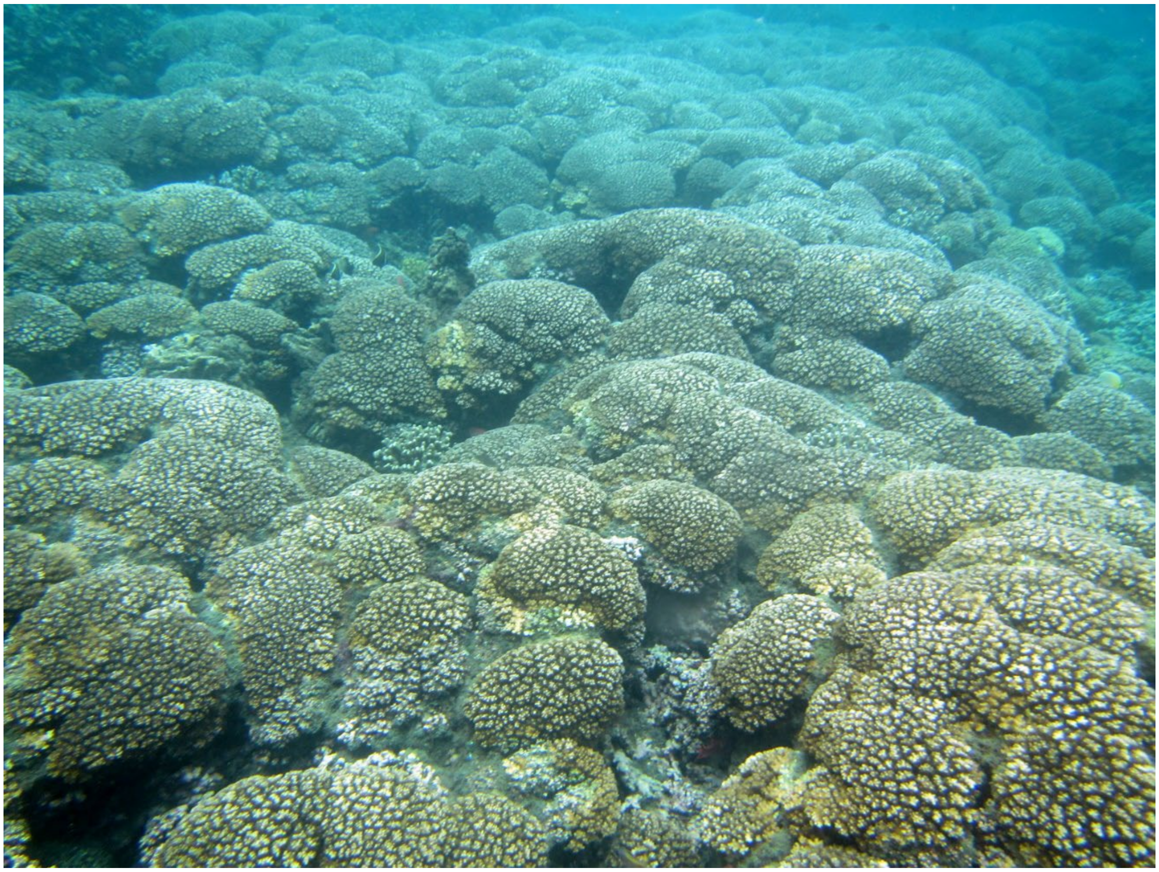
A colony of *Pocillopora acuta*.



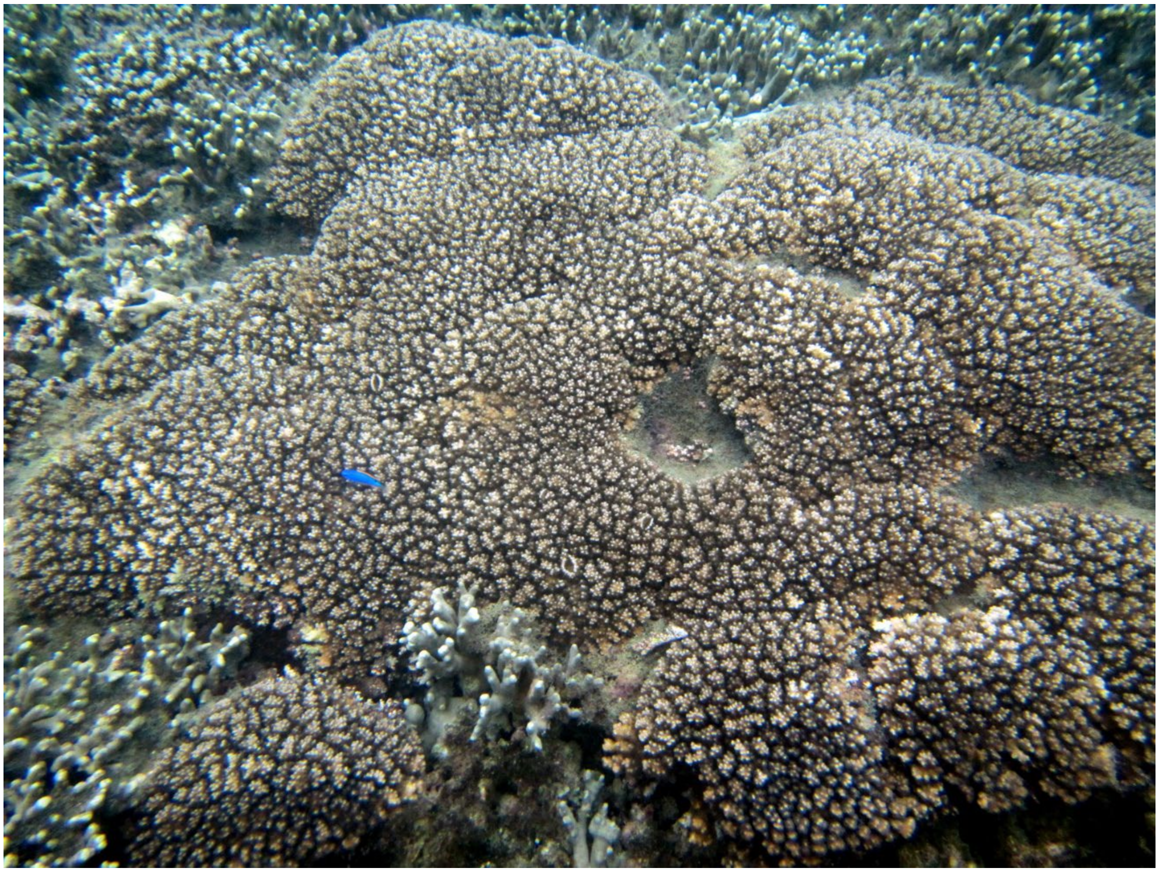
A close-up photo of *Pocillpora acuta*.

Pocillopora brevicornis Lamarck, 1816

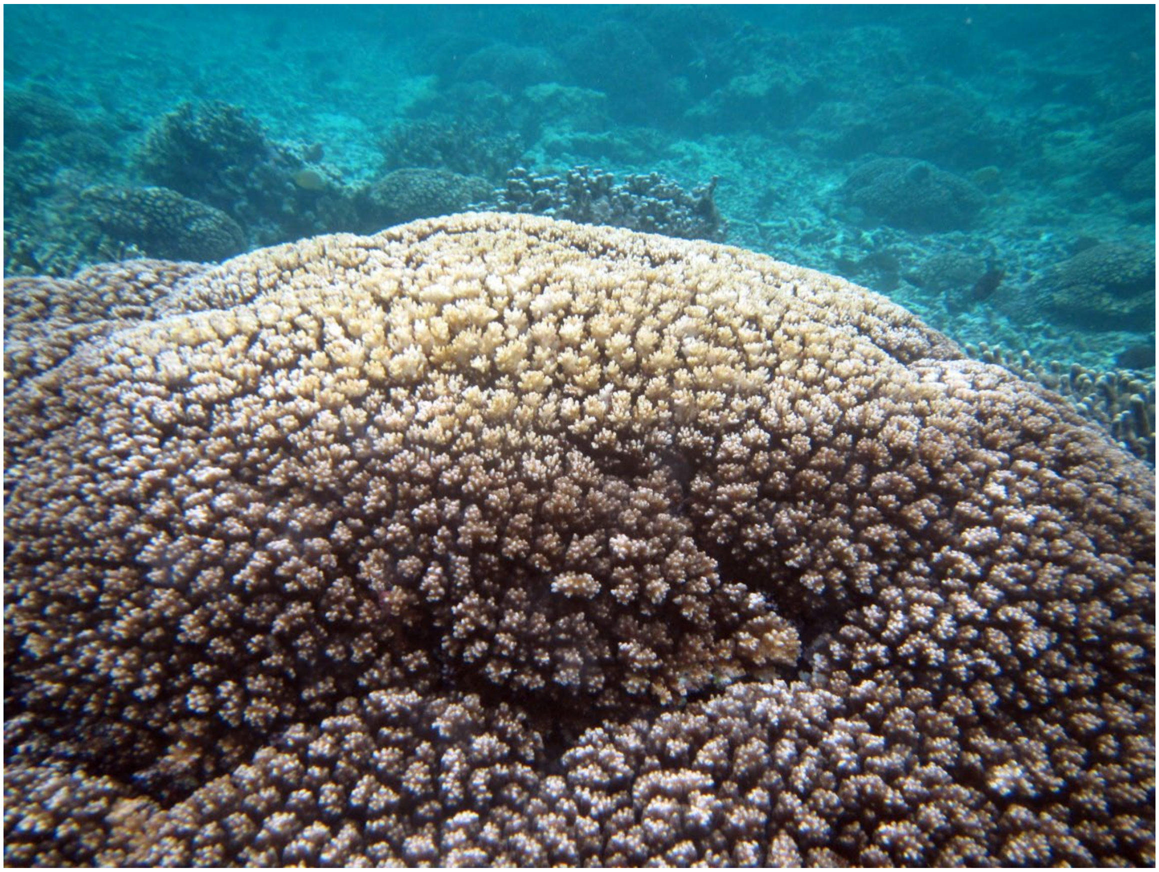
Colonies consist of branches which are close together, with irregular, bumpy verrucae on their tops. Branches are not flattened. Colonies can grow large, up to about 3 feet across. Colonies can be close together and nearly continuous, and only distinghished by their low mounding shape. Colonies are usually on reef flats where they are patchy and uncommon. Branches are larger than on *Pocillopora damicornis*, *P. acuta*, and *P. aliciae*. Branches are closer together than most *Pocillopora* species other than *P. setchelli*, but colonies are much larger than *P. setchelli*, and branches do not fit together in a puzzle-like pattern.



A field of *Pocillopora brevicornis* colonies.



A group of *Pocillopora brevicornis* colonies.



A closer photo of colonies of *Pocillopora brevicornis*.

A close photo of *Pocillopora brevicornis*.

A close-up photo of *Pocillopora brevicornis*.

Pocillopora ligulata Dana, 1846

This coral forms small branching colonies. Most branches are flattened like *P. meandrina* and *P. grandis*, but are thinner. Branches can be irregular, and look rough as the verrucae are as large as on *P. meandrina*. Prefers shallow water of reef flats. Tan. Found so far on Tutuila.

A colony of *Pocillopora ligulata.*

A close-up of *Pocillopora ligulata*.

Pocillopora meandrina Dana, 1846 Cauliflower Coral

This coral forms small bushes. Branches are medium sized for *Pocillopora*, and most are flattened and curved on their ends. The verrucae are normal size. Branches are smaller and closer together than on *Pocillopora eydouxi* (=*grandis*) and more branches are flattened than on *Pocillopora verrucosa*. Branches are thicker than on *Pocillopora ligulata* and *Pocillopora bairdi*, and the verrucae are larger than on *Pocillopora elegans*. Can be brown, green or perhaps pink, uncommon. See taxonomic note. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Muliava (Rose Atoll), Swains, South Bank, and Upolu.

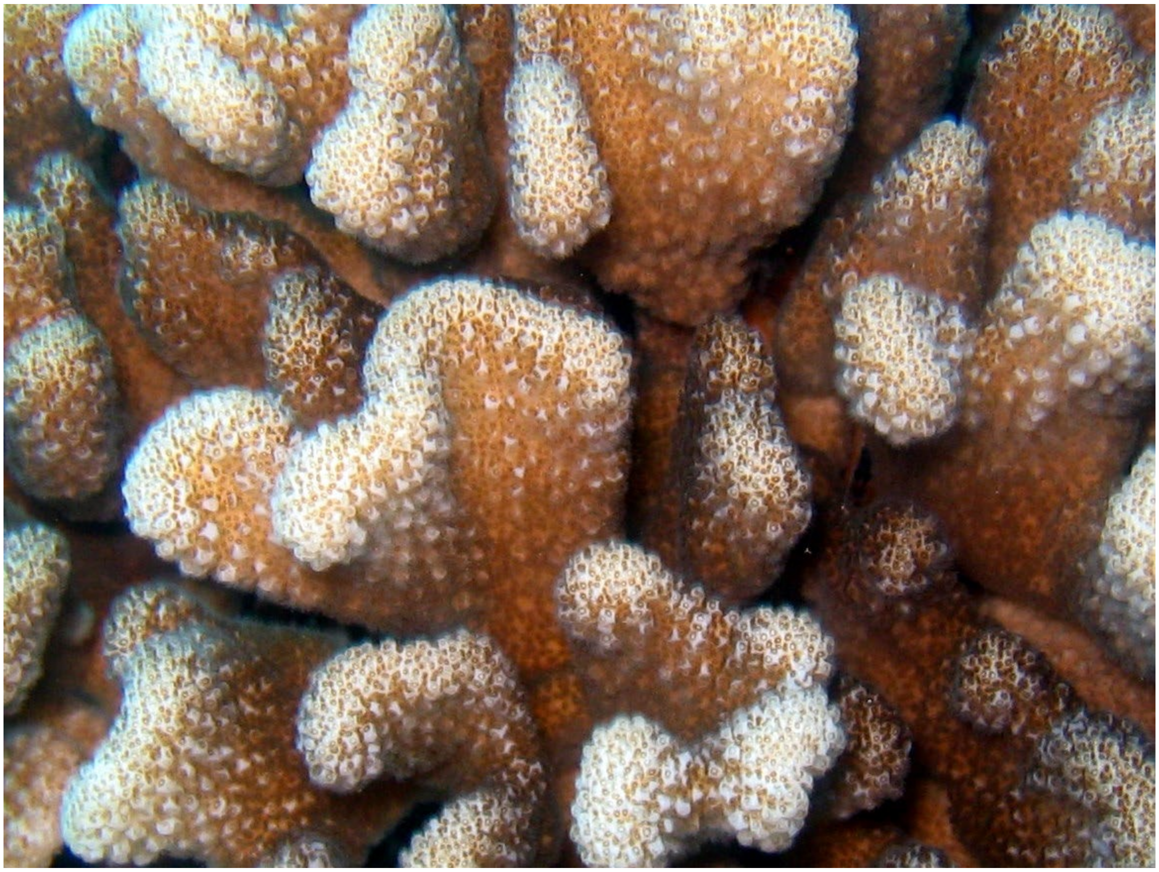
A colony of *Pocillopora meandrina.*

A close-up of *Pocillopora meandrina*.

Pocillopora cf. elegans Dana, 1846

Colonies have some cylindrical and some flattened branches. The verrucae are short. Rare. Colonies are quite similar to *Pocillopora meandrina* but the verrucae are smaller so it looks smoother.

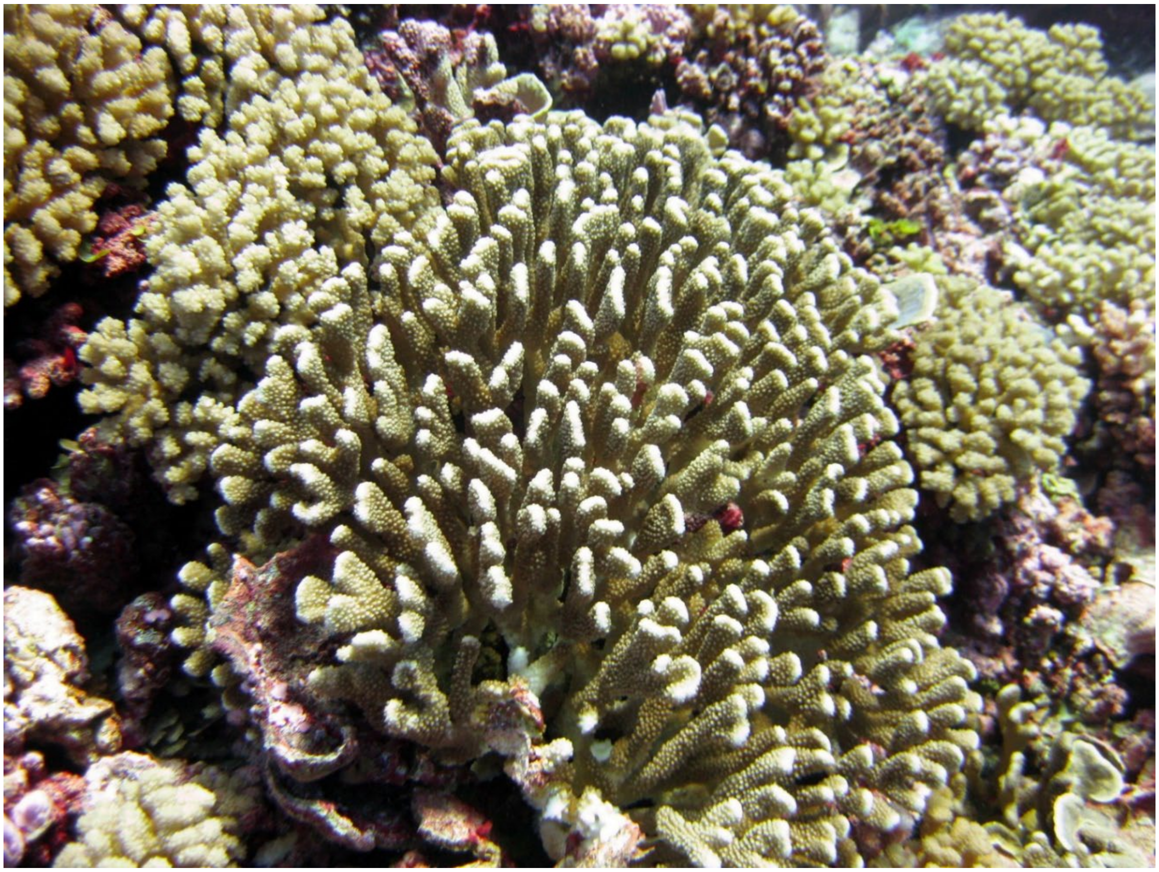
A colony of *Pocillopora* cf. *elegans*.



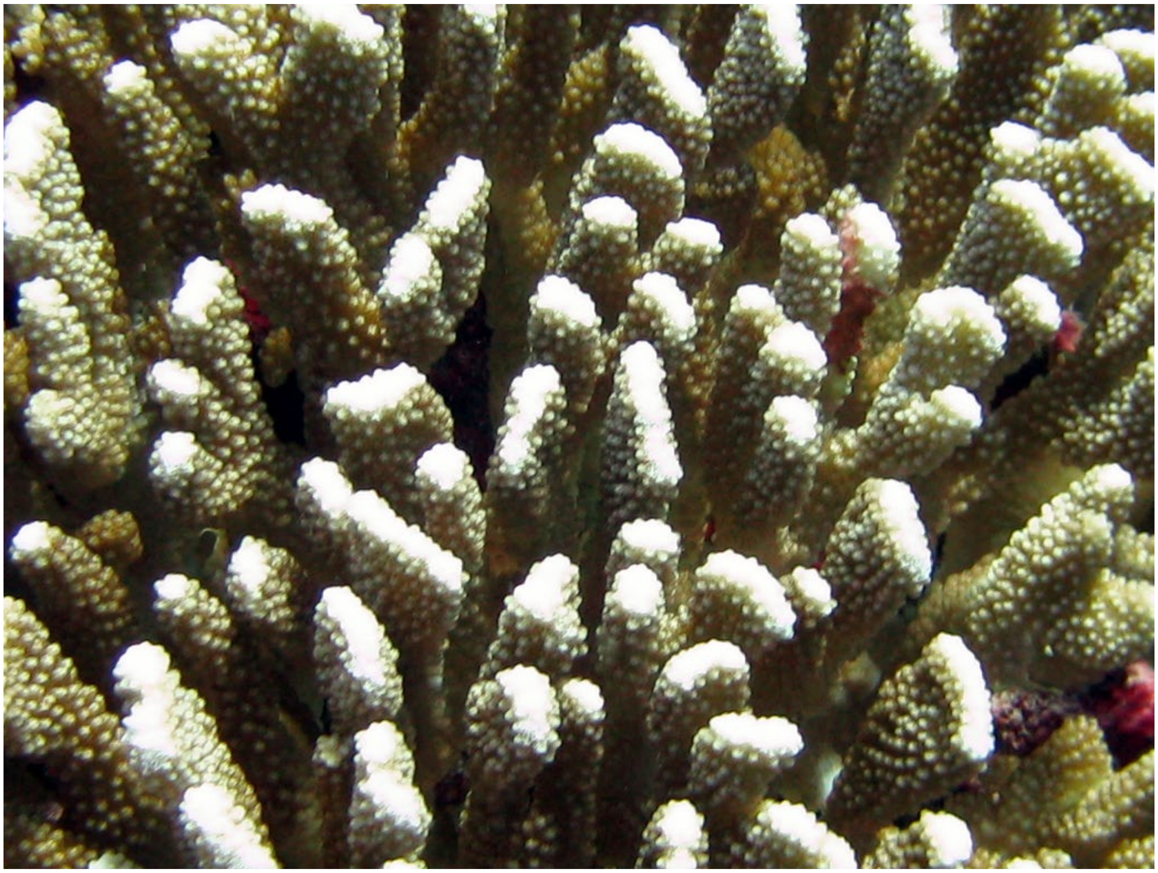
A close-up photo of *Pocillopora* cf. *elegans*.

Pocillopora cf. *bairdi* Schmidt-Roach, 2014

Colonies have long thin branches that are very uniform, not close together, some of which are cylindrical and others flattened. The branches are thinner than on *Pocillopora meandrina*, smoother and longer than on *Pocillopora ligulata*.



A *Pocillopora* cf. *bairdi* colony.



A closer photo of *Pocillopora* cf. *bairdi*.

Pocillopora setchelli Hoffmeister, 1929

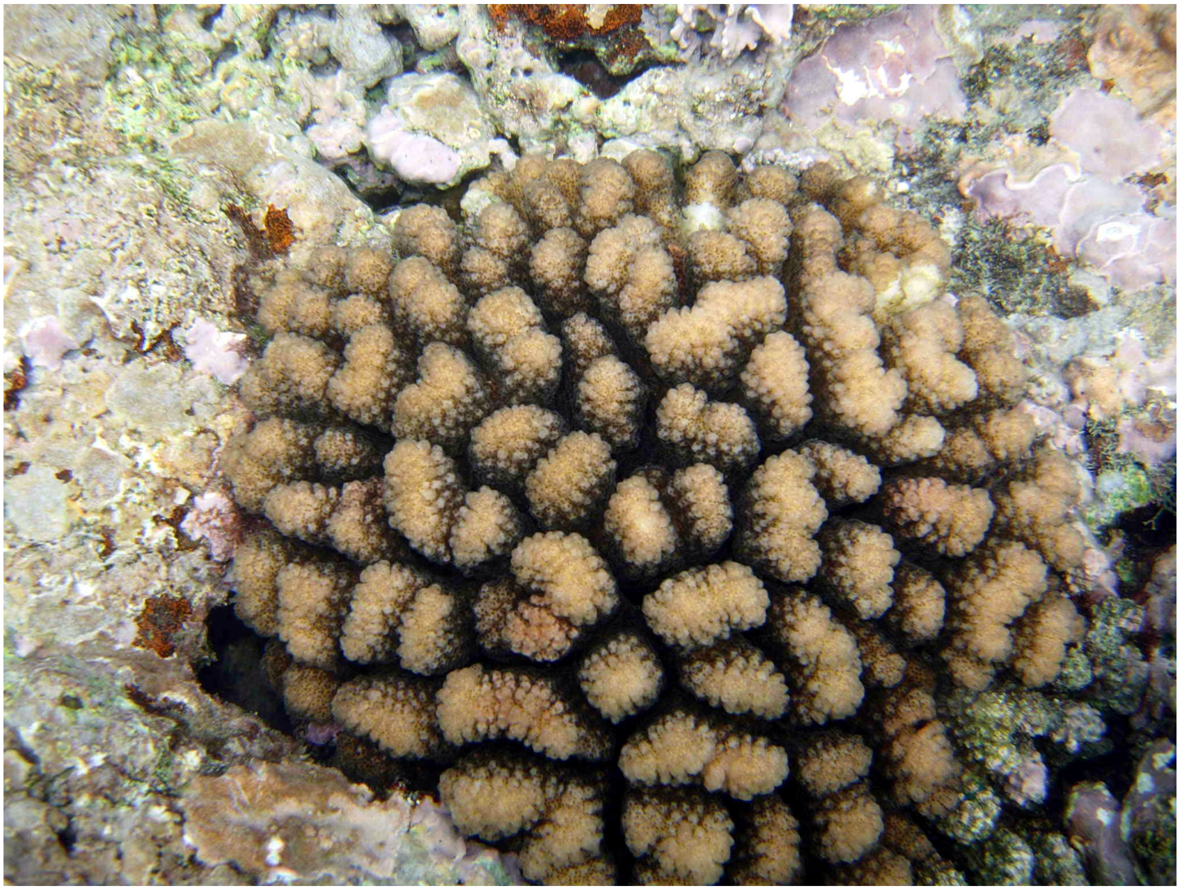
This coral forms small clumps. Branches are medium sized for *Pocillopora*, but are closer together than for other similar species. Branch tips are commonly flattened instead of rounded, making the colony surface smooth with narrow uniform cracks between branches. Branches are usually flattened and meandroid. Branches are closer together than on *Pocillopora meandrina* or *Pocillopora verrucosa*, colonies are smaller and it is restricted to near the crest surf zone. Usually brown but can be pink, restricted to the reef crest area, but can be common there. See taxonomic note. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Muliava (Rose Atoll), and Swains.

A colony of *Pocillopora setchelli.*

A close-up of *Pocillopora setchelli*.

Pocillopora verrucosa (Ellis & Solander, 1786)

This coral forms small bushes. Branches are medium sized for *Pocillopora*, but are not flattened or curved on their ends. The branches are smaller than on *Pocillopora grandis*, and fewer branches are flattened than on *Pocillopora meandrina*, and verrucae are larger than on *Pocillopora elegans.* Branches are thicker and rounder than on *Pocillopora ligulata* and shorter and less flattened than on *Pocillopora bairdi*. Branches are longer, farther apart and more rounded than on *Pocillopora setchelli*. Brown, green or pink, common, particularly on the reef crest. Found on all islands.



A colony of *Pocillopora verrucosa.*

A close-up of *Pocillopora verrucosa*. The tiny circles are the corallites where the polyps live.

Pocillopora ankeli Scheer and Pillai, 1974

Colonies are generally short, with branches close together. Branches are rounded. Verrucae are very close together with almost no space between them. This species is rare in American Samoa. The verrucae are closer together than on any other *Pocillopora* species and branches are more rounded than on *Pocillopora setchelli* and shorter than on *Pocillopora verrucosa*.

A colony of *Pocillopora ankeli*.

A closer photo of a colony of *Pocillopora ankeli*.

A close-up photo of *Pocillopora ankeli*.

Pocillopora molokensis Vaughan, 1907

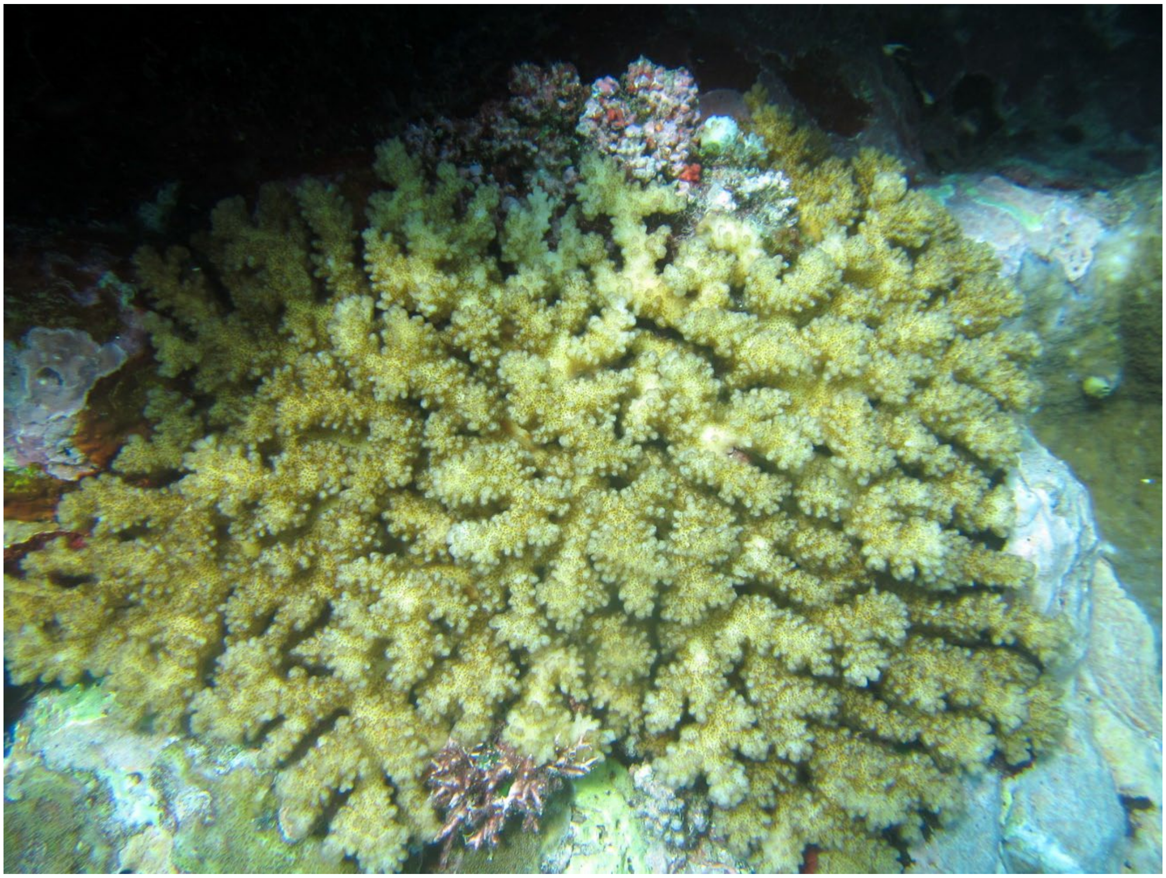
Colonies have relatively straight cylindrical branches that radiate horizontally. *Pocillopora kelleheri* is very similar, but branches are more zig-zag shaped. Branches are similar to those on *Pocillopora verrucosa* but horizontal instead of vertical. Very rare.

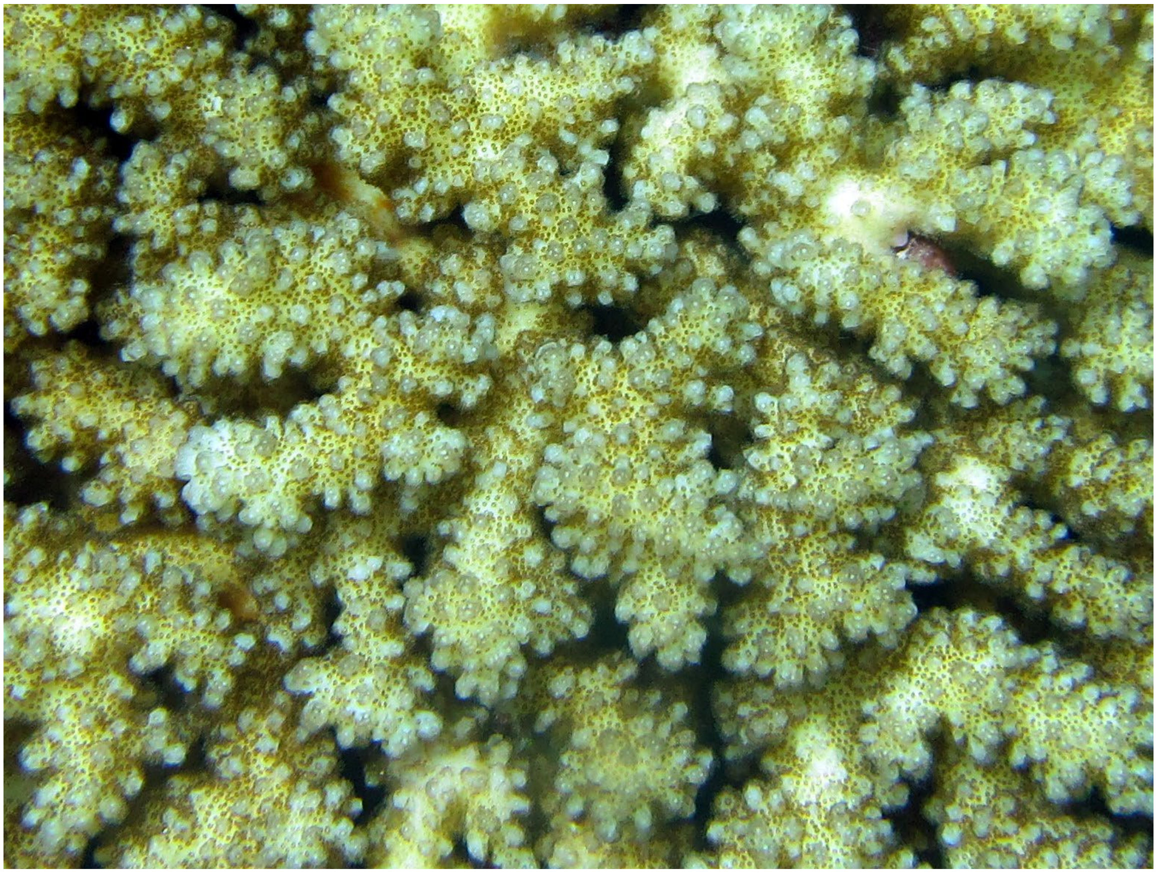
A small colony of *Pocillopora molokensis*.

A close-up photo of *Pocillopora molokensis*.

Pocillopora danae Verrill, 1864

Colonies have cylindrical branches that are mostly horizontal and usually not straight. Verrucae are not close together and may be variable in size. Branches are less straight and verrucae are farther apart than on *Pocillopora molokensis*. Branches are more horizontal and irregular in shape than on *Pocillopora verrucosa*. Rare.

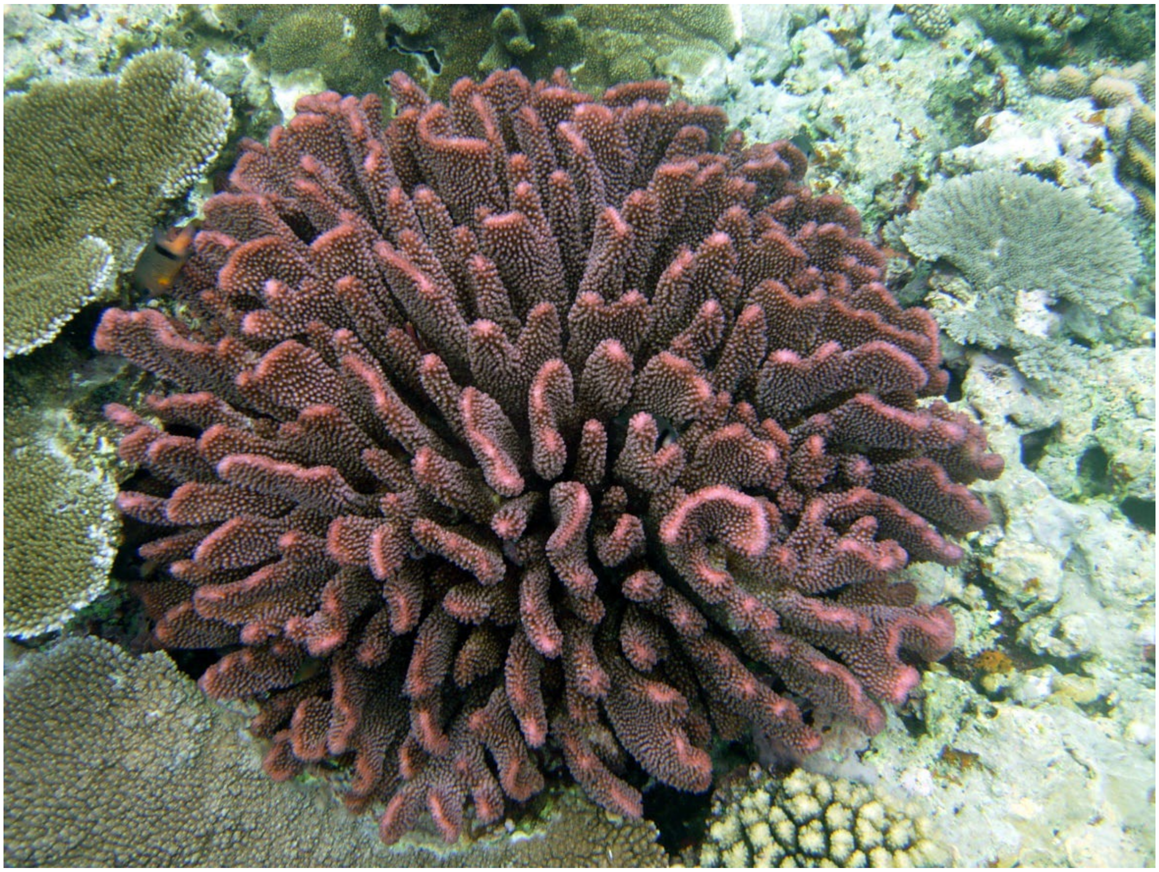




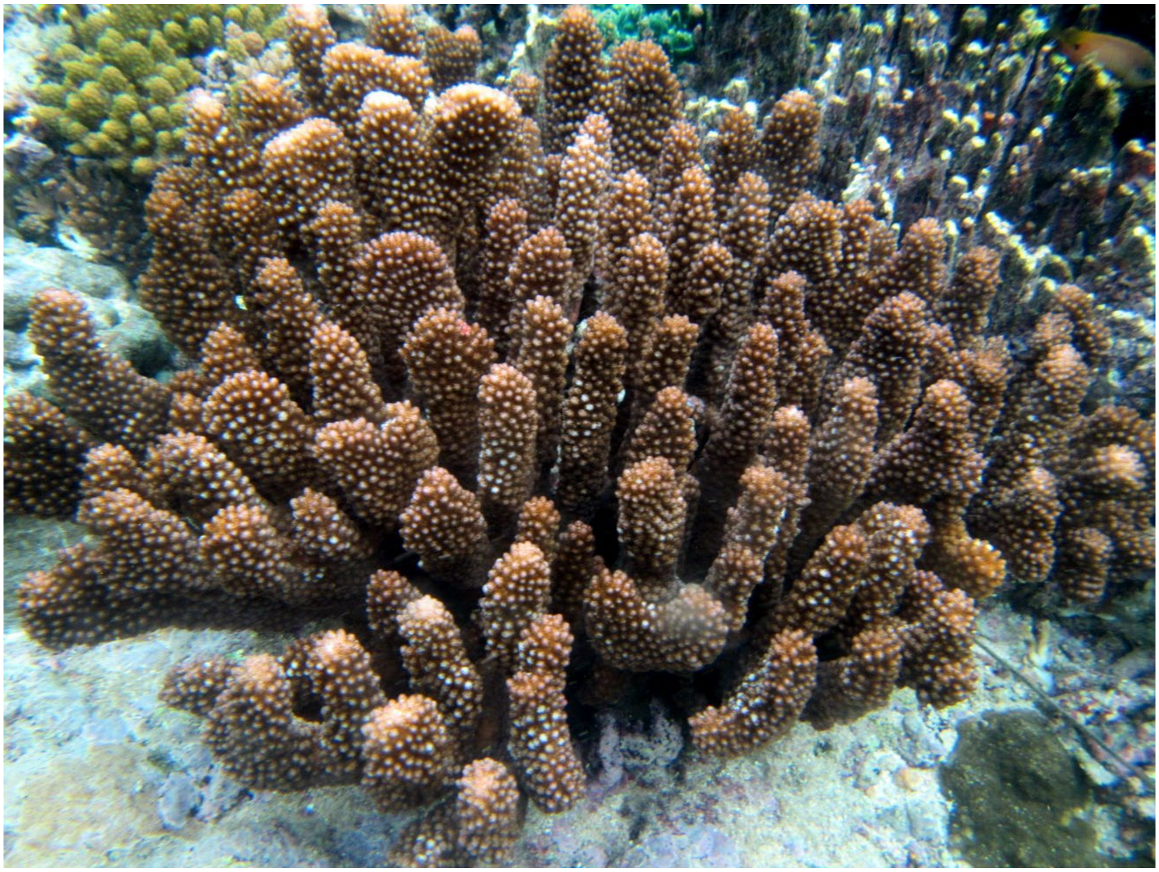
A close-up photo of *Pocillopora danae*.

Pocillopora grandis Dana, 1846 (=Pocillopora eydouxi Milne Edwards 1860)

This coral forms small to medium to large sized colonies made of branches. Branches are larger and farther apart than on other species of the genus except *Pocillopora woodjonesi*. Branch ends are commonly flattened and may be curved or even meandroid; rarely the branches may be cylindrical. Can look like a larger *Pocillopora meandrina* or a *P. meandrina* with wider branches or branches farther apart. Commonly brown but can be pink, purple or green. Common on reef slopes, also present on reef flats. *Pocillopora eydouxi* which has long been used, is considered a junior synonym. Found on all islands.

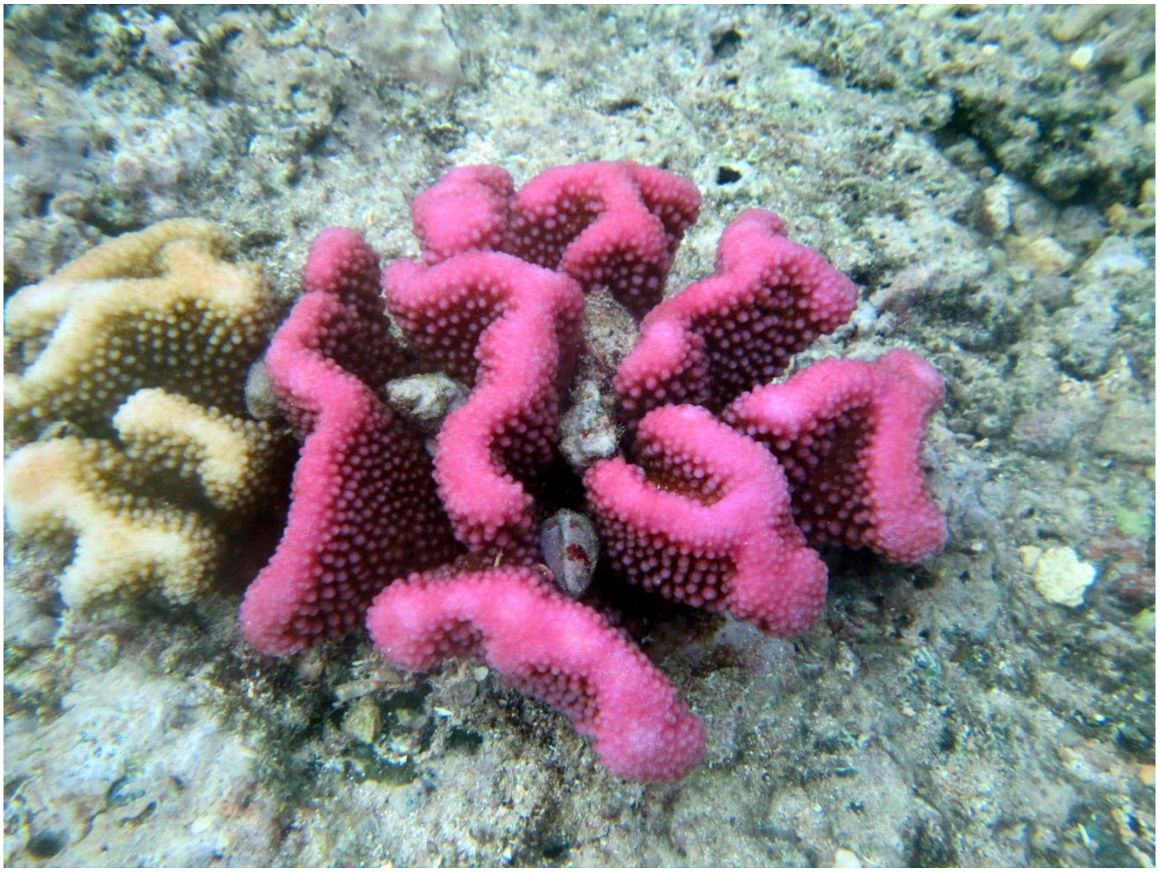


A large colony of *Pocillpora grandis*.

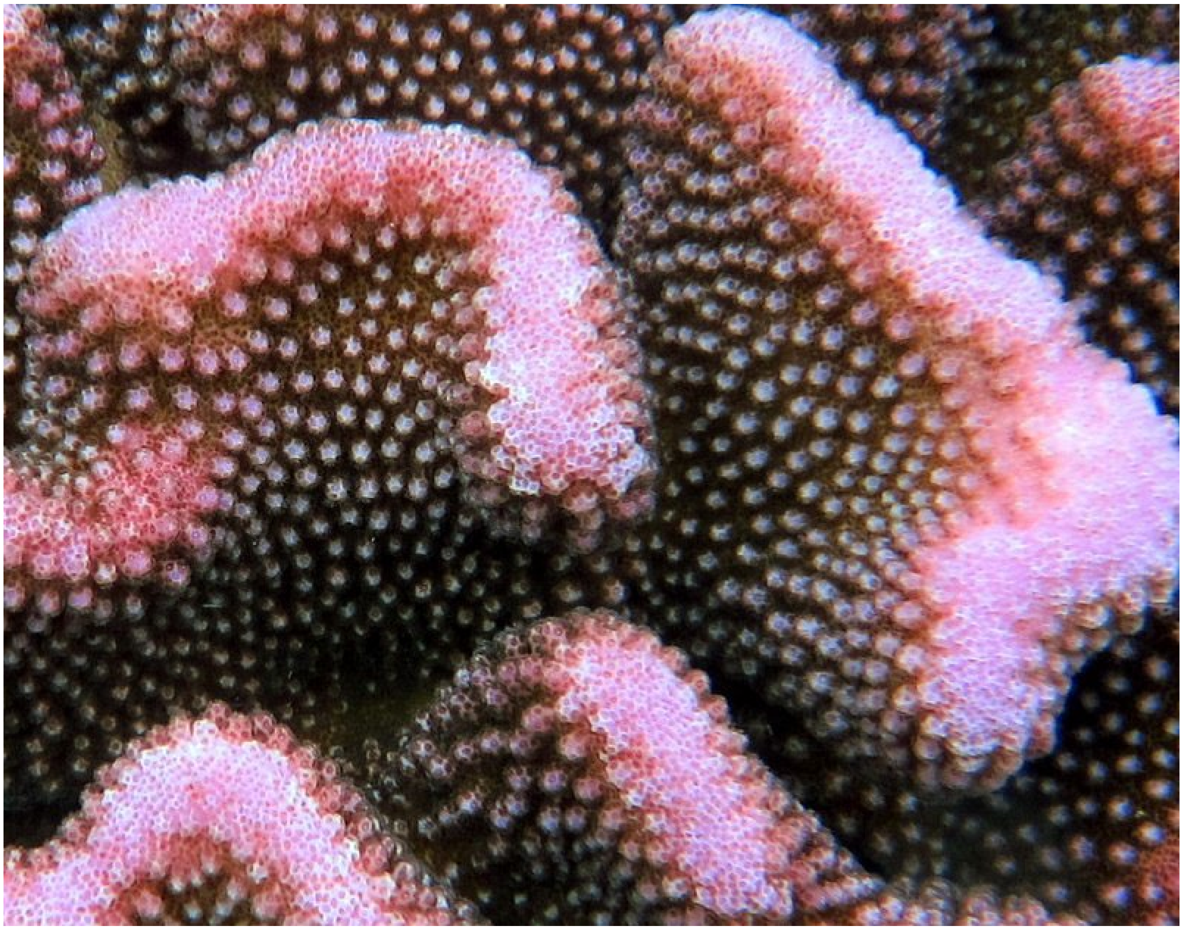


A colony of *Pocillopora grandis* with mostly cylindrical branches.

A colony of *Pocillopora grandis.*



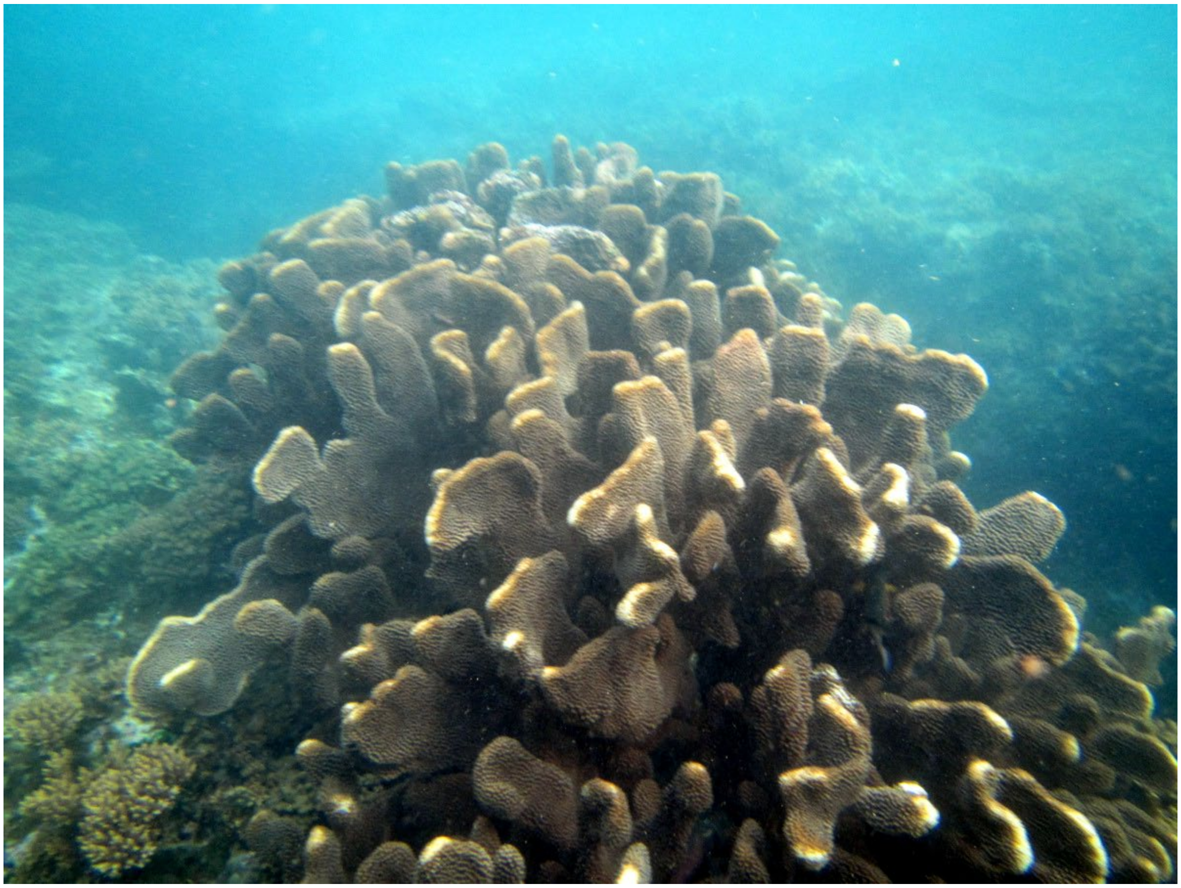
Pocillopora eydouxi colonies with very short branches.



A close-up of *Pocillopora eydouxi*.

Pocillopora woodjonesi Vaughan, 1918

This coral forms very large branching colonies with flattened branches. Colonies are larger than *Pocillopora eydouxi* but are similar in shape. Brown or green, rare. Found so far on Tutuila, Aunu'u, Ofu-Olosega, and Ta'u.



A colony of *Pocillopora woodjonesi* from near the Goat Rock point in the harbor on the reef flat.

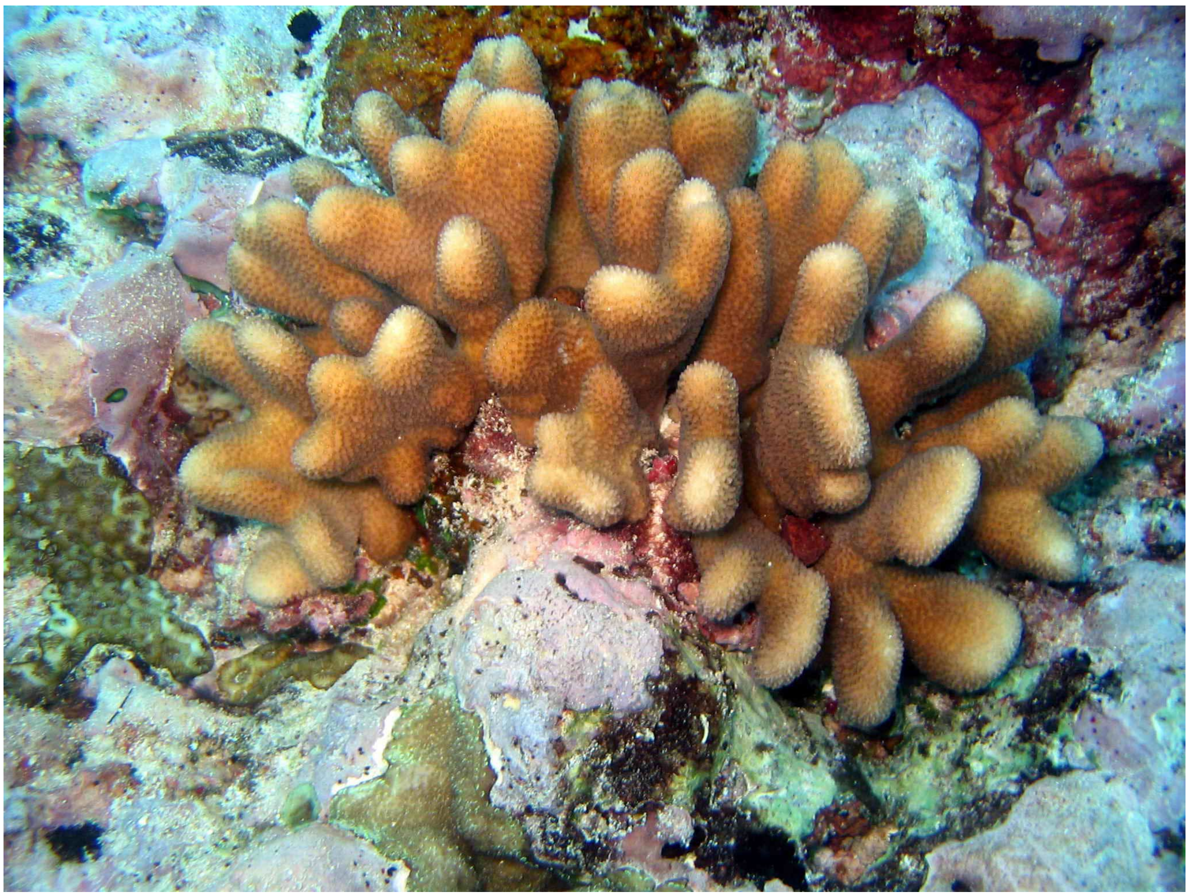
A closer photo of *Pocillopora woodjonesi*.

Stylophora

Stylophora is a genus represented by just one species in the Samoan archipelago. It forms forms branching colonies, usually less than a foot (30 cm) in diameter. Corallites are small, only about 1 mm diameter, and each corallite has a tiny sharp hood partway over it, giving the branch a fine spiny appearance and feel. Species differ in the diameter of their branches.

Stylophora pistillata Esper, 1797

This coral forms small bushes. Branches are medium sized and commonly flattened and may be curved. Branches are covered with tiny spines and lack the larger verrucae of *Pocillopora.* Each spine is actually a sharp hood over a corallite. Branches have tiny spines instead of larger bumps as on *Pocillopora meandrina, Pocillopora elegans*, or *Pocillopora verrucosa*. Tan, uncommon, on reef slopes. Found so far on Tutuila, Ofu-Olosega, Muliava (Rose Atoll), Swains, and Upolu.



A colony of *Stylophora pistillata*.

A close-up of the branches of *Stylophora pistillata* showing the spines.

Seriatopora

Seriatopora has only been seen by the author in Independent Samoa so far, but may well be in American Samoa as well, but would surely have to be rare. *Seriatopora* forms thin branches with rows of small corallites about 1 mm diameter. Branch tips do not have axial corallites like *Acropora* nor bumps (verrucae) like *Pocillopora*. Colonies are usually under a foot (30 cm) in diameter, and are commonly a light cream color.

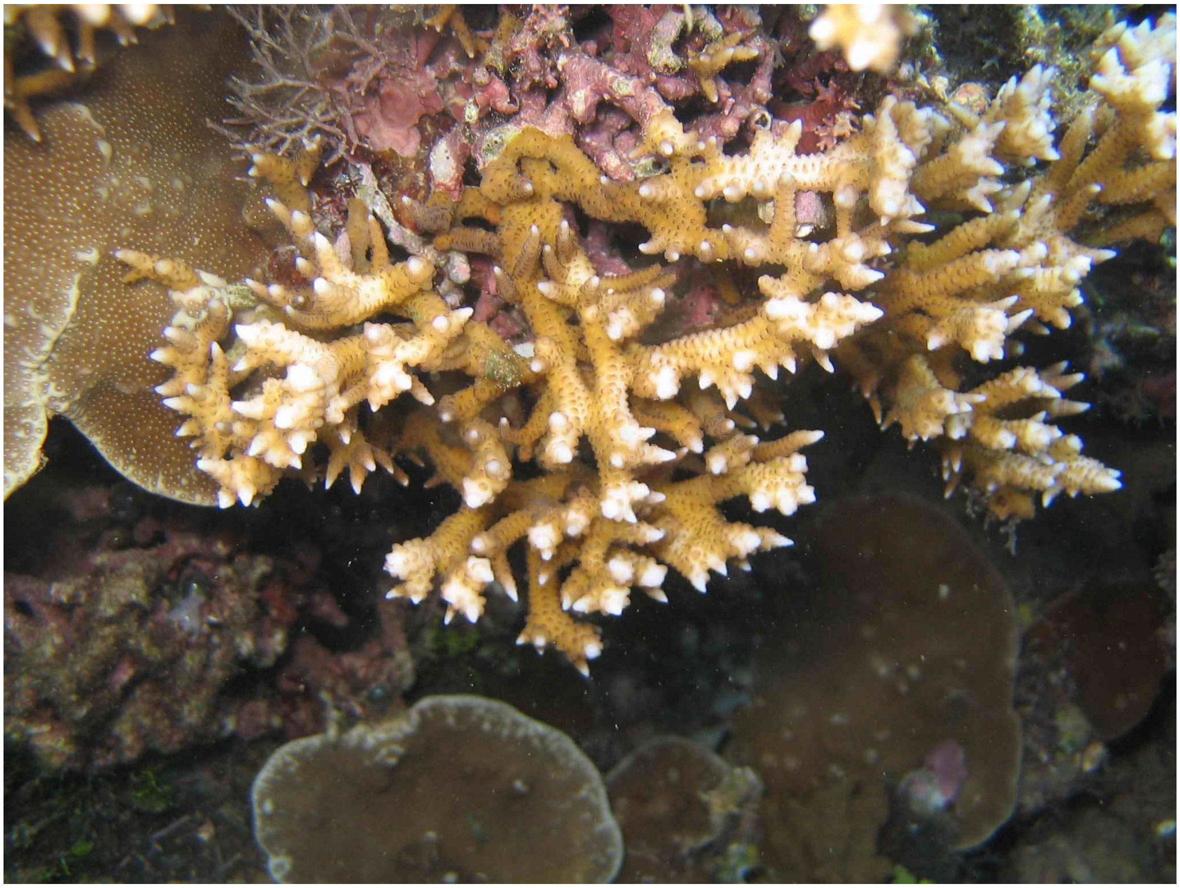
Seriatopora aculeata Quelch, 1886

This coral forms small bushes of thin branches that are always short and taper quickly to sharp ponts. Corallites are scattered and not raised. Branches are about 3-5 mm diameter. Colonies are commonly light yellow or cream or sometimes pink. Seriatopora stellata has corallites in raised rows and can have much longer branches. Seriatopora caliendrum has longer branches with rounded tips. Seen only in Independent Samoa.

A colony of *Seriatopora aculeata*.

Seriatopora stellata Quelch, 1886

This coral forms small bushes of thin branches that abrupty taper to sharp points. Branches are usually not short. Corallites are in raised rows. Branches are about 3-5 mm diameter. Colonies are commonly cream colored, but may have pink coloration particularly out near the ends of branches. *Seriatopora caliendrum* has rounded branch tips and corallites are not raised in rows. Seriatopora aculeate has shorter branches and lacks raised corallites. Not yet found in American Samoa in recent times, found in a backreef pool on Upolu (Palolo Deep), rare. Found so far on Upolu.

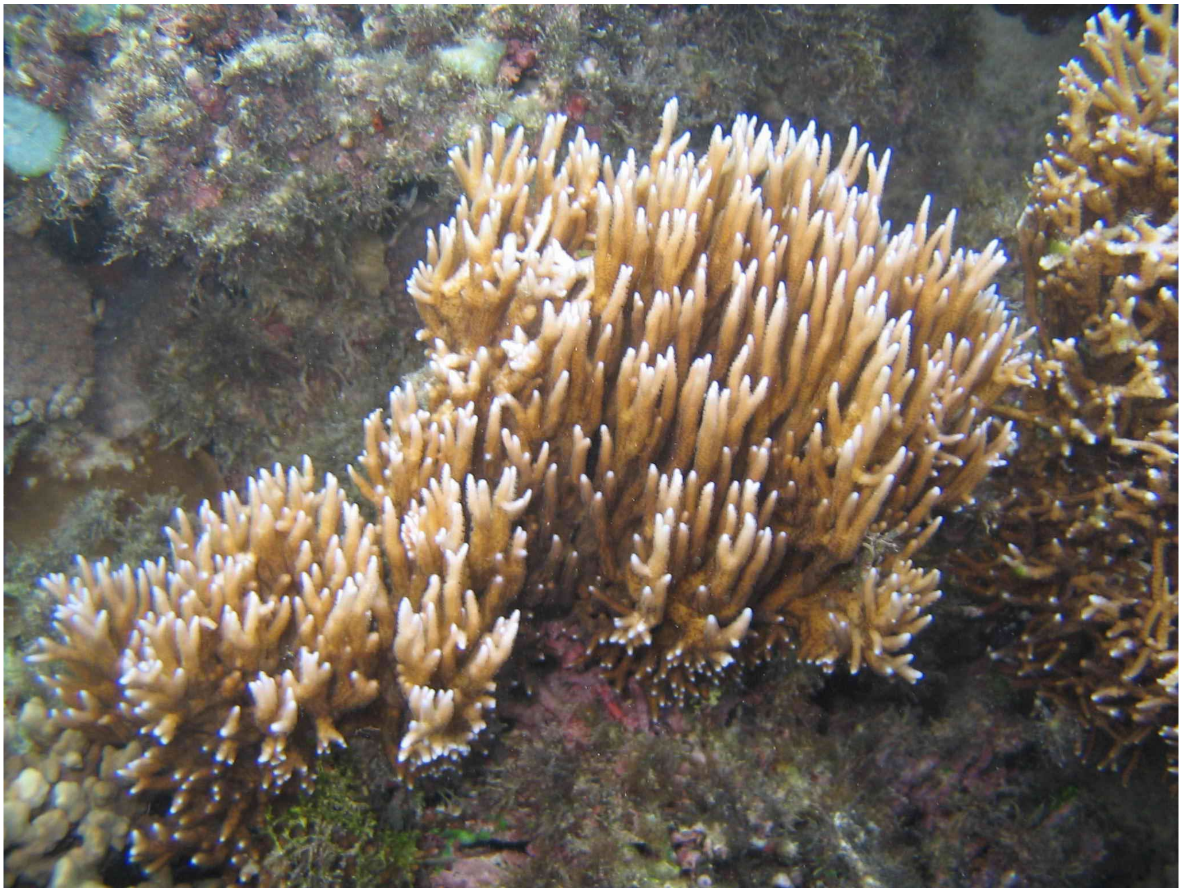


A colony of *Seriatopora stellata*, photo taken on Upolu, Independent Samoa.

A close-up of *Seriatopora stellata*, photo taken on Upolu, Independent Samoa.

Seriatopora caliendrum Ehrenberg, 1834

This coral forms small bushes of thin branches that have rounded tips. Branches are about 3-5 mm diameter. Colonies are commonly cream colored, but may have pink coloration particularly out near the ends of branches. The tips are rounded not tapered sharply as on *Seriatopora stellata*, and the corallites are not rased in rows. Not yet found in American Samoa in recent times, found in a backreef pool on Upolu (Palolo Deep), rare. Found so far on Upolu.



A colony of *Seriatopora caliendrum*. photo taken on Upolu, (independent) Samoa

Montipora

Montipora is the most common genus in Tutuila, and is almost always encusting here. It is the second largest genus in terms of number of species following *Acropora*. It has very small corallites that are hard to see underwater, and usually has a forest of tiny spines that look and feel like the surface of sandpaper. There are a few less common species that have larger corallites that can be seen as holes, or the spines are larger and look like little bumps. If the spines are smaller than the corallites they are called "papillae," if they are about the same size as corallites or larger they are called "tuberculae," and if they are larger than the corallites and uniform and rounded they are called "verrucae" (which means "blisters" in Latin). Most colonies are some shade of brown, but a few are bright orange or purple, and a few have green polyps on a brown background. When *Monitpora* has verrucae, which is rare here, the verrucae are smooth, not covered with corallites like in *Pocillopora*, and the colony is not branching. In rare instances a colony can have recessed larger polyps and no spines, and then it is very difficult to distinguish from one or two species of *Porites* without knowing what the species is.

A close-up showing *Montipora* sp. with the tiny polyps extended. The species is not known for this colony.

Montipora cf. *turtlensis* Veron & Wallace, 1984 Vulnerable

This species forms thin plates which slope downward. The surface is smoother than other species, though it can have concentric rings, and has a finely grainy texture. Colonies can have lumps or columns on top. Colonies are always brown, but are uncommon to rare. *Montipora aequituberculata* is similar, but does not have concentric rings or lumps in the center of the colony, and has tiny radiating ridges near the edge of the plate. It is also rarer. *Montipora grisea* is encrusting without raised plate edges. The plates of *Montipora* sp. 1 slope upward, they don't have concentric rings, and they are only known from Swains Island so far. Found in shallow water in the Ofu pools and near shore at Amouli on Tutuila. Found so far on Tutuila and Ofu-Olosega.

Part of a large colony of *Montipora turtlensis* in the Ofu pools.

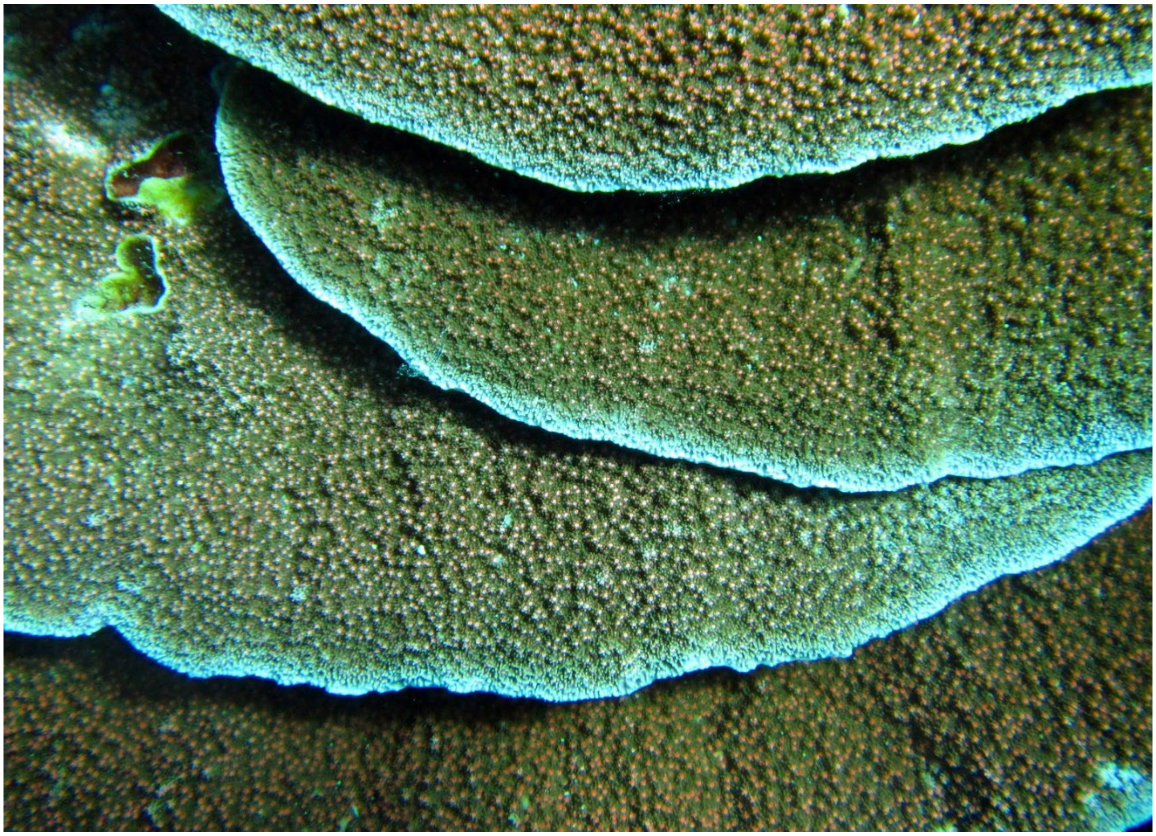
A smaller colony of *Montipora turtlensis* on the reef flat at Amouli.

Close-up of a colony of *Montipora turtlensis* in the Ofu pools, showing the characteristic concentric rings on the thin downward sloping plates.

Montipora aequituberculata Bernard, 1897

This coral forms thin plates, covered with tiny spines. The outer edges of the plates have tiny radiating ridges. *Montipora turtlensis* often has concentric rings and lumps towards the center, and doesn't have tiny radiating ridges. *Montipora grisea* is encrusting without raised plate edges. *Montipora* sp. 1 slope upward, they don't have radiating tiny ridges, and they are only known from Swains Island so far. Colonies are usually brown, with pink polyps. Rare. Found so far on Tutuila, Ofu-Olosega, Muliava (Rose), and Upolu.

A very large colony of *Montipora. aequituberculata*, the largest I have seen.

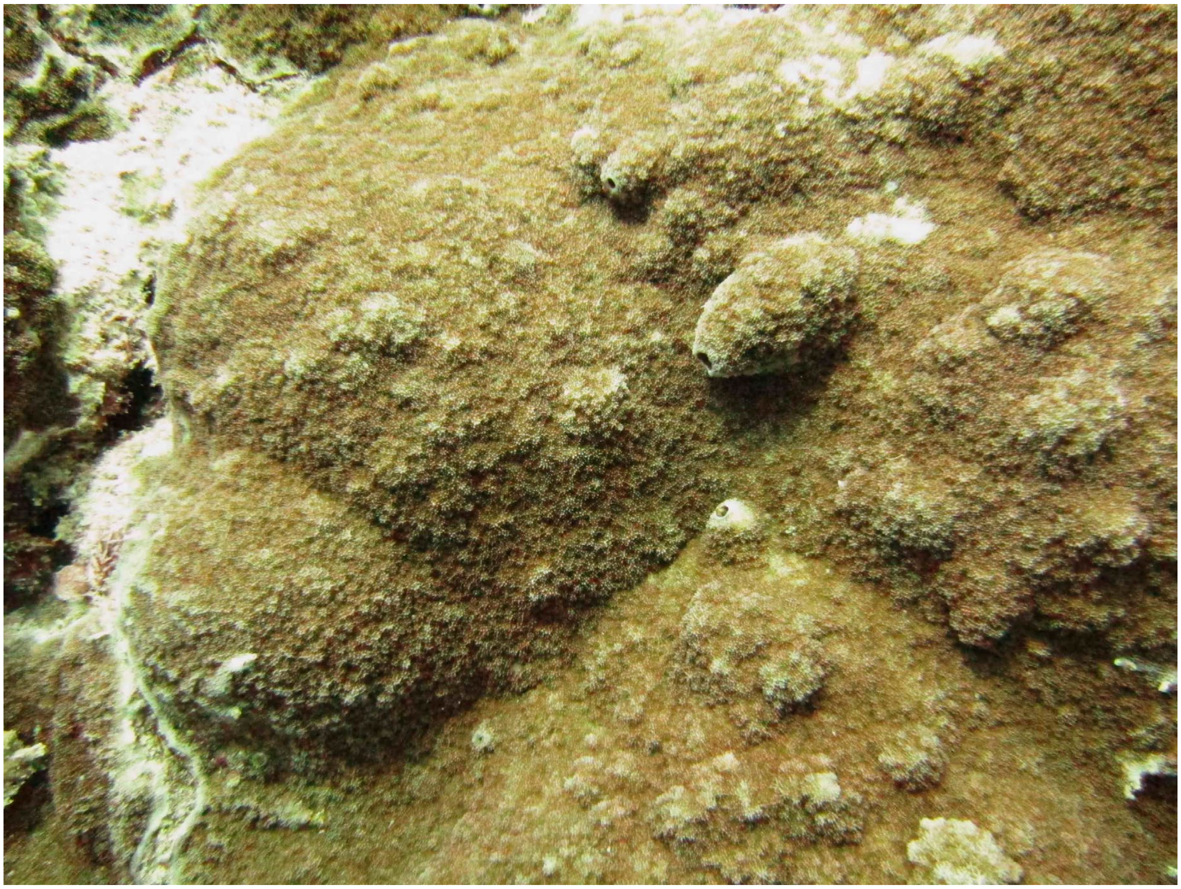


A closer photo of *Montipora aequituberculata*.

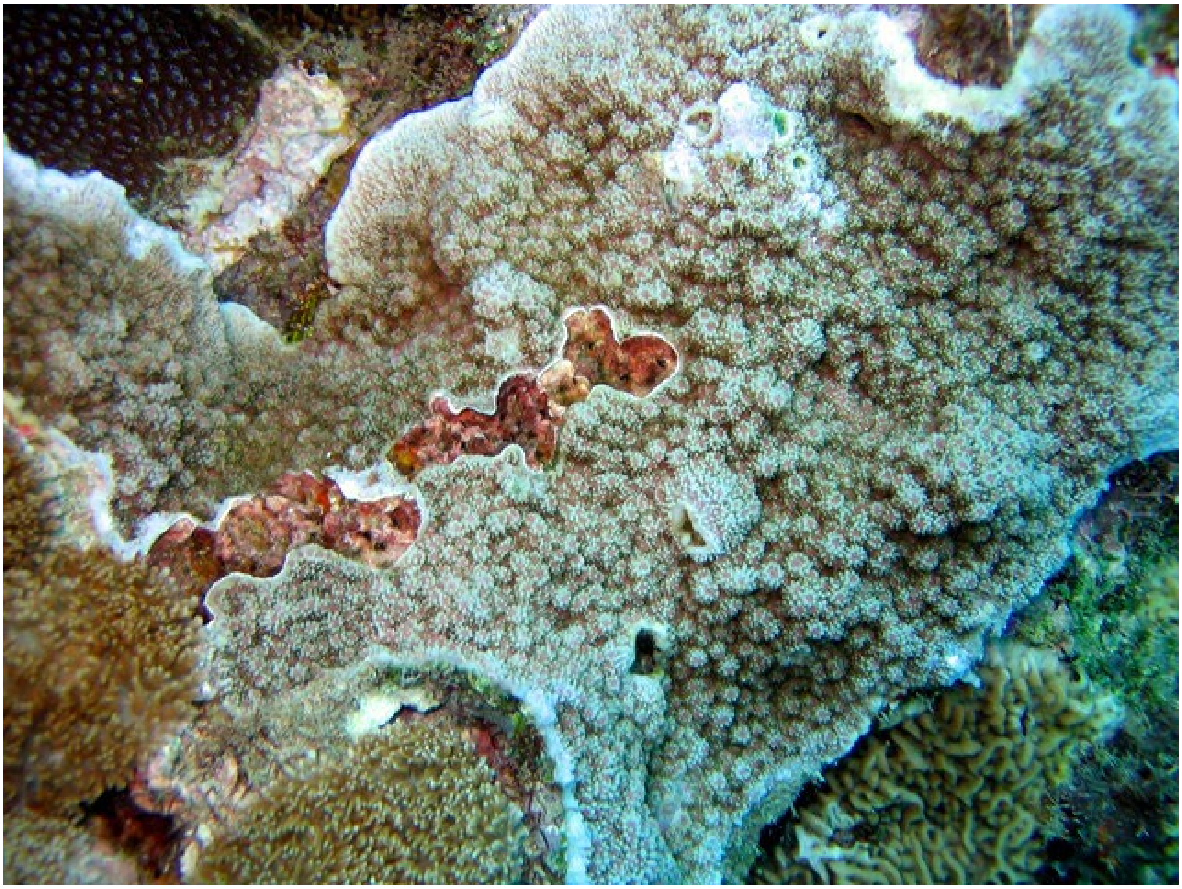
A close-up of *Montipora aequituberculata*.

Montipora grisea Bernard, 1897

This coral forms thin encrusting sheets. The surface has many tiny spines that are so small they are hard to see. Some corallites are usually raised. *Montipora turtlensis*, *Montipora aequituberculata* and *Montipora* sp 1. are all plate corals with the edge lifted off the substrate, while *Montiora grisea* is encrusting. *Montipora informis* is also encrusting, but the surface is covered with uniform tiny papillae, which are usually white. *Montipora tuberculosa* has tuberculae which are larger than the papillae on *Montipora grisea*. Brown, sometimes green, most abundant of all corals on reef slopes of Tutuila. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Muliava (Rose Atoll), Swains, and Upolu.



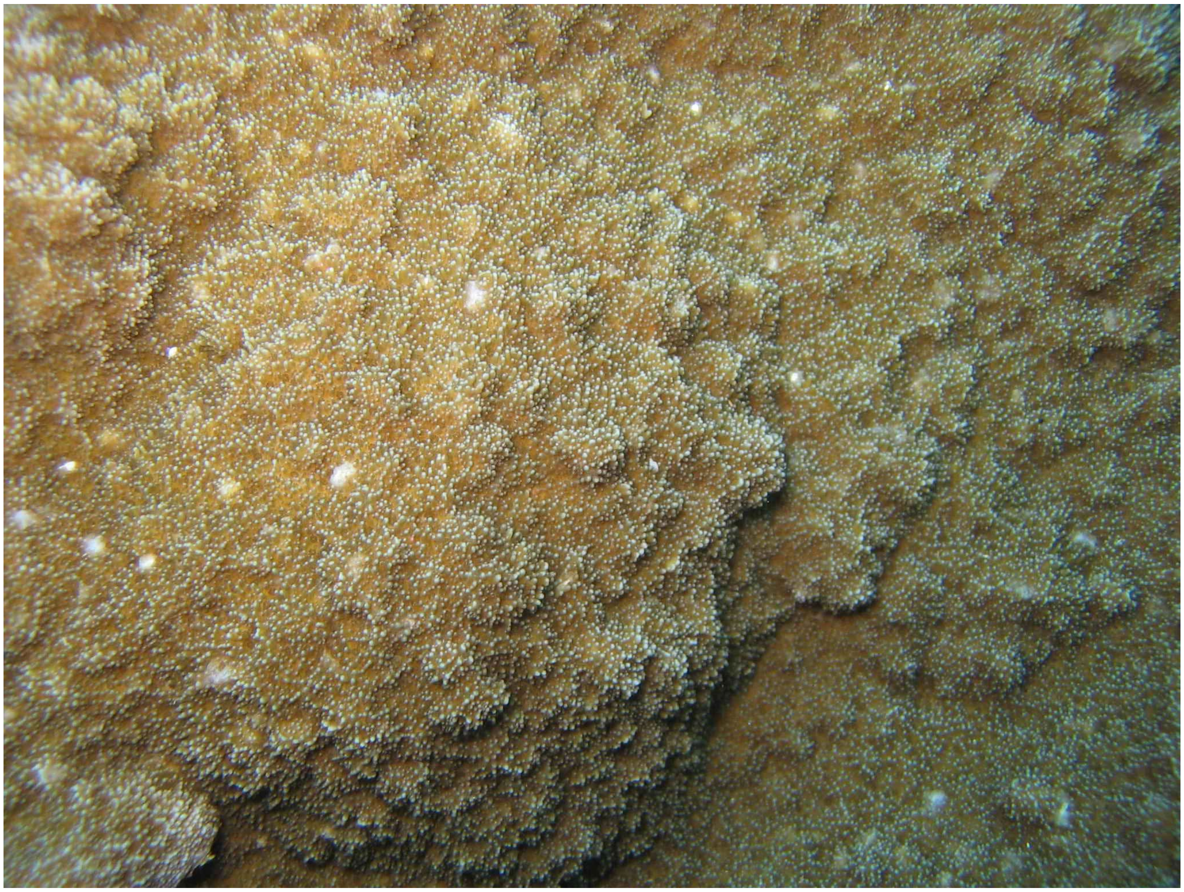
A colony of *Montipora grisea*.



A close-up of *Montipora grisea*, showing the tiny circles of papillae around polyps, which are elevated to different degrees.

Montipora informis Bernard, 1897

This coral forms thin encrusting sheets covered with a dense cover of uniform tiny spines called papillae. The spines have rounded tips but are so small this is hard to see. Corallites are often raised on *Montipora grisea*, while they are not on *Montipora informis*, and the uniform papillae on *Montipora informis* are usually white. *Montipora tuberculosa* has tuberculae which are larger than the papillae on *Montipora informis*. Brown or grey, and spine tips are usually white, uncommon to rare, reef slopes. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, and Muliava (Rose).

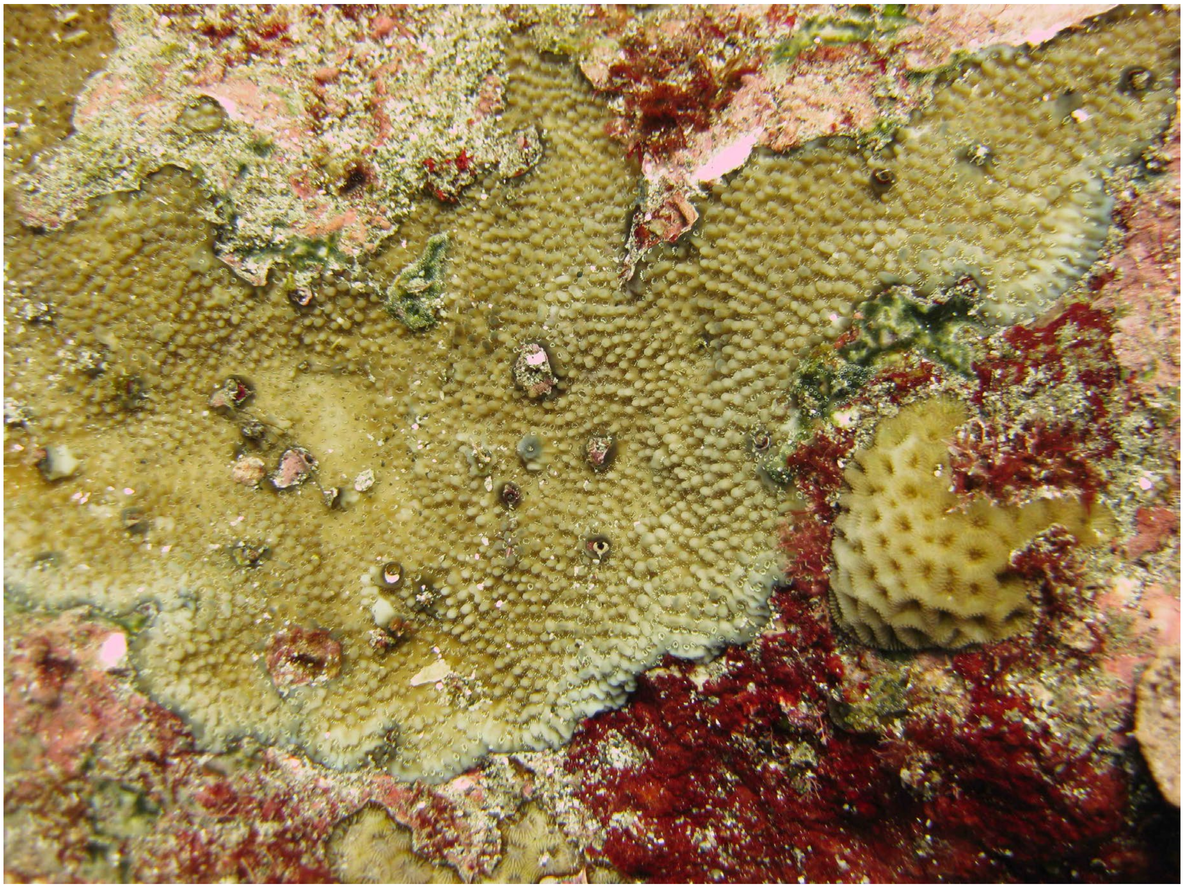


A colony of *Montipora informis.*

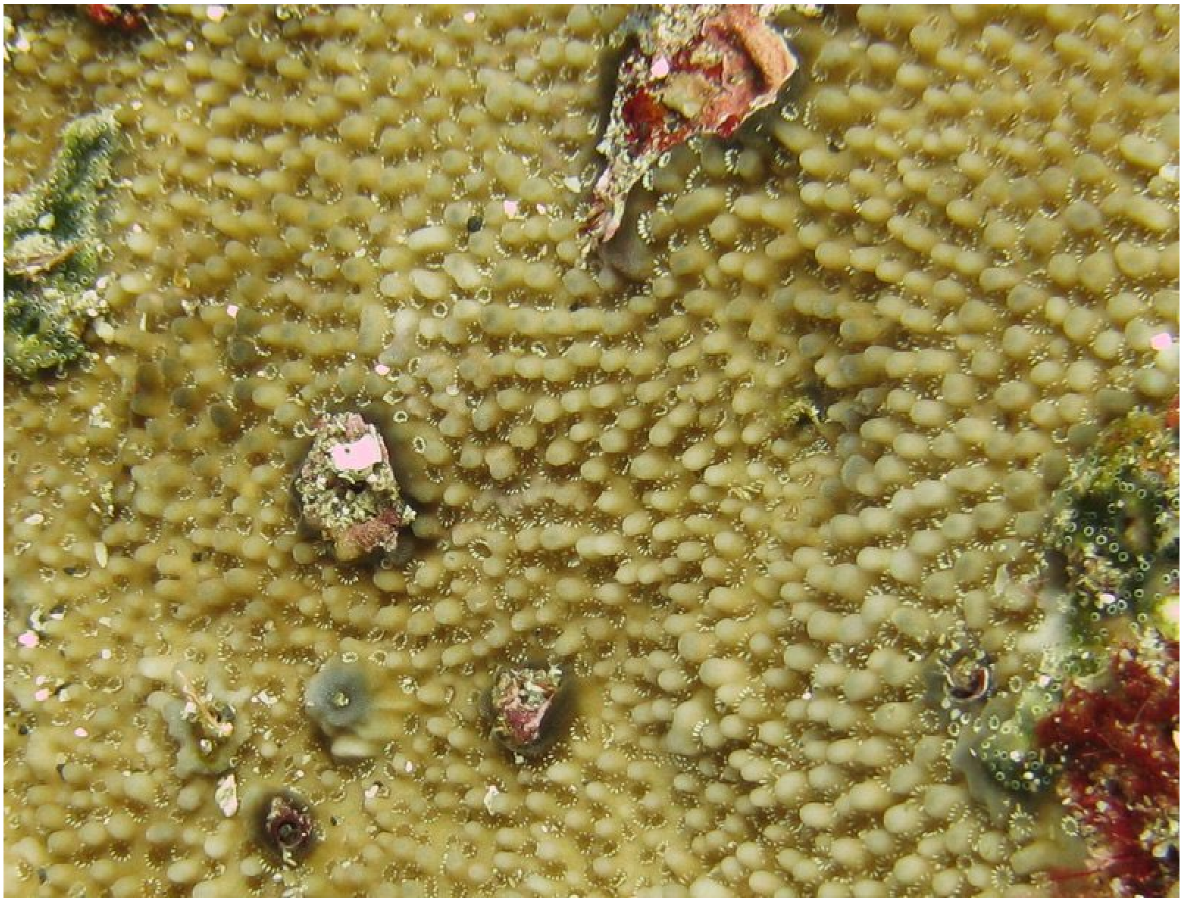
A close-up of *Montipora informis*.

Montipora tuberculosa (Lamarck, 1816)

This coral forms encrusting colonies covered with small bumps called tuberculae which are about the same size as the polyps. The tuberculae are much larger than the papillae (spines) on *Montipora grisea* and *Montipora informis*, but smaller than on *Montipora capitata*. Brown, rare. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Muliava (Rose Atoll), and Upolu.



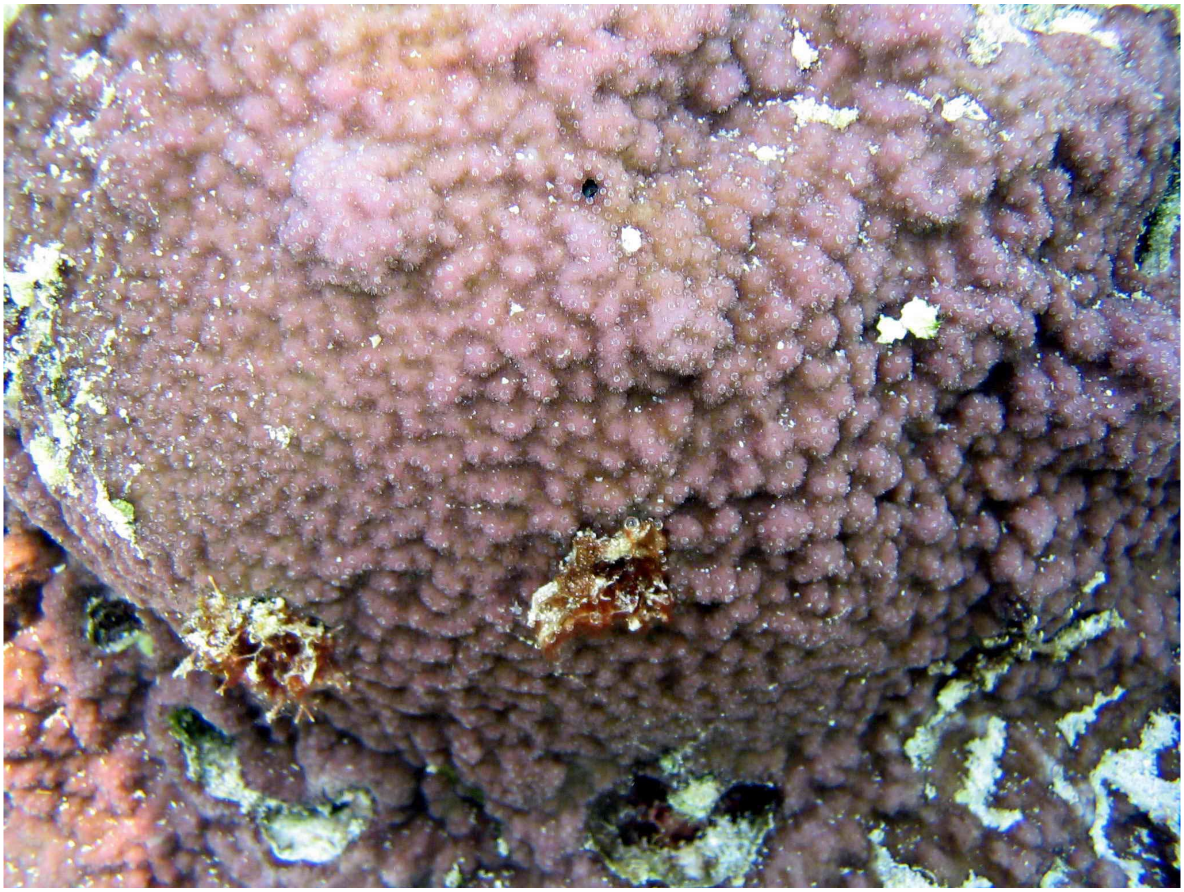
A colony of *Montipora tuberculosa.*



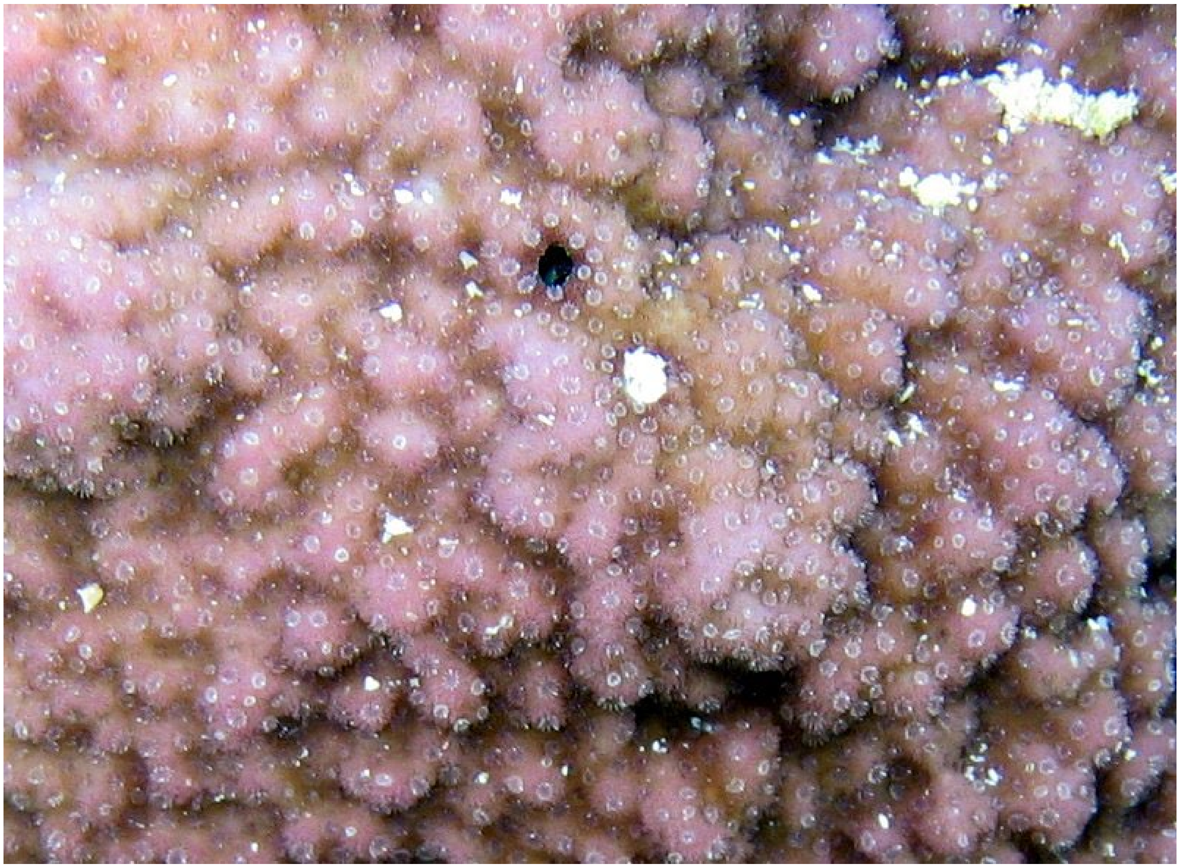
A close-up of *Montipora tuberculosa*. Tiny rings of polyp tentacles can be seen between the tuberculae.

Montipora turgescens Bernard, 1897

This coral forms encrusting or massive colonies that are covered with small irregular lumps. The lumps are irregular in size, most around 3-5 mm diameter, and have polyps on them as well as between them. They look like lumps of the colony surface. *Montipora capitata* has smaller, more uniform and smooth verrucae, which do not have corallites on them. Purple or brown, uncommon. See taxonomic note. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Swains, and Apolima.



A colony of *Montipora turgescens.*



A close-up of *Montipora turgescens*.

Montipora caliculata (Dana, 1846) Vulnerable

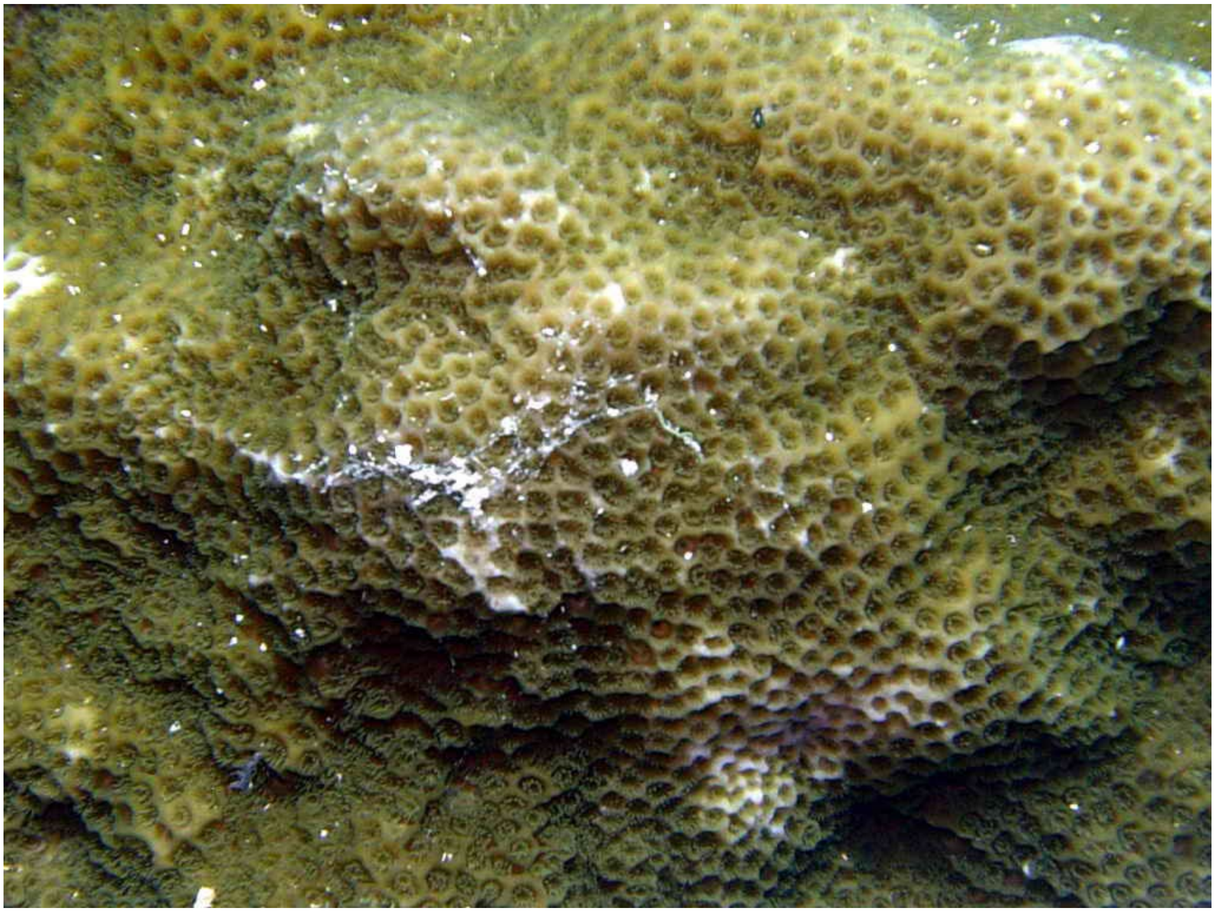
This coral forms encrusting colonies which have thin sharp ridges between the polyps, and no bumps or spines. The thin ridges completely surround some polyps, but only partially surround others, and in some areas there may be no thin ridges. It differs from *Montipora venosa* by not having the ridges around all polyps, and walls separating the polyps in *Montipora venosa* are thicker. *Montipora vaughani* has thicker walls between corallites and some corallites united in groves. Usually brown, uncommon, reef slopes. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, and Upolu.

A colony of *Montiopra caliculata.*

A close-up of *Montipora caliculata*.

Montipora venosa (Ehrenberg, 1834)

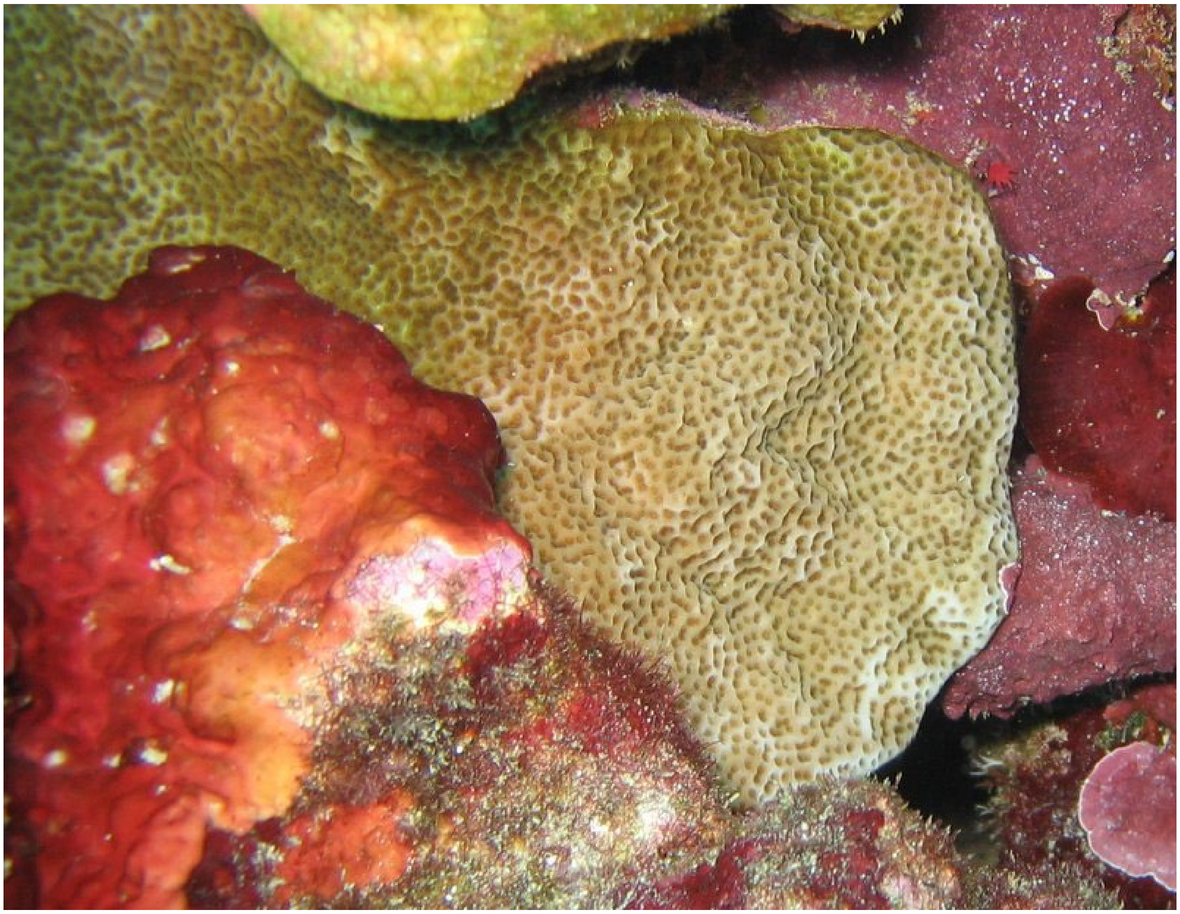
This coral forms encrusting colonies with ridges between polyps, and no bumps or spines. The corallites are slightly recessed between the ridges. They may look like they are recessed in the continuous coral surface. The ridges completely surround all polyps, unlike on *Montipora caliculata* and the ridges are thicker. Some corallites are more clearly in grooves together on *Montipora vaughani*. Brown, rare. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, and Muliava (Rose Atoll).



A close-up of *Montipora venosa.*

Montipora vaughani Hoffmeister, 1925

This coral forms thick encrusting colonies that have thick rounded ridges between polyps, but several polyp cups are commonly in a row in a single valley surrounded by the ridges. Ridges often surround a row of polyps unlike on *Montipora venosa* and *Montipora caliculata*, and, ridges are not broken into sections as in *Montipora caliculata*. Brown, rare, reef slopes. See taxonomic note. Found so far on Tutuila.



A colony of *Montipora vaughani*.

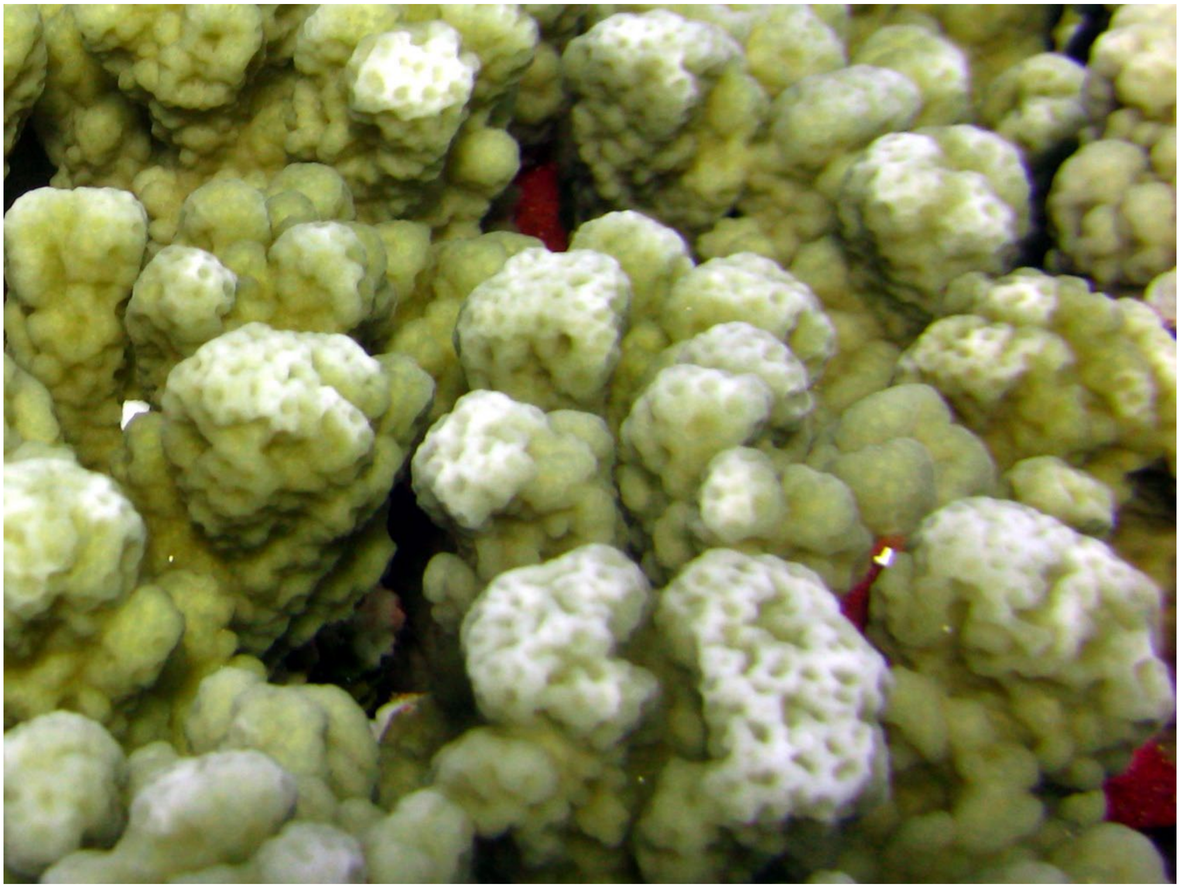
A colony of *Montipora vaughani*.

A close-up of *Montipora vaughani*.

Montipora incrassata (Dana, 1846)

This coral forms colonies with thick columns on its upper surface. Columns are about 3-4 cm (1- 1 ½ in) diameter, and around 5-15 cm (1-6 in) tall. The edges of the colony may be extended in a short plate about 2-5 cm (1-2 in) wide. Surfaces are irregularly bumpy, and the tops of columns may be white and are rounded, with recessed polyps. Colonies are brown or grey-green, so far only found on the outer slope on Rose Atoll. Colonies are very similar to those in Hawai'i, and the same type of colonies have also been seen by the author in New Caledonia, Papua New Guinea and Wake Atoll and shown by Veron for the Great Barrier Reef. This is the only branching species of *Montipora* found in the Samoas so far. Colonies have a slight superficial resemblance to *Porites annae*, but *P. annae* is dark brown, usually doesn't have a base plate, and polyp tentacles are extended. Colonies with other morphologies are also considered to be *M. incrassata* by Veron. Found so far only on Muliava (Rose Atoll).

A colony of *Montipora incrassata*, showing both plate and columns.



A close-up of *Montipora incrassata*, showing the tops of columns.

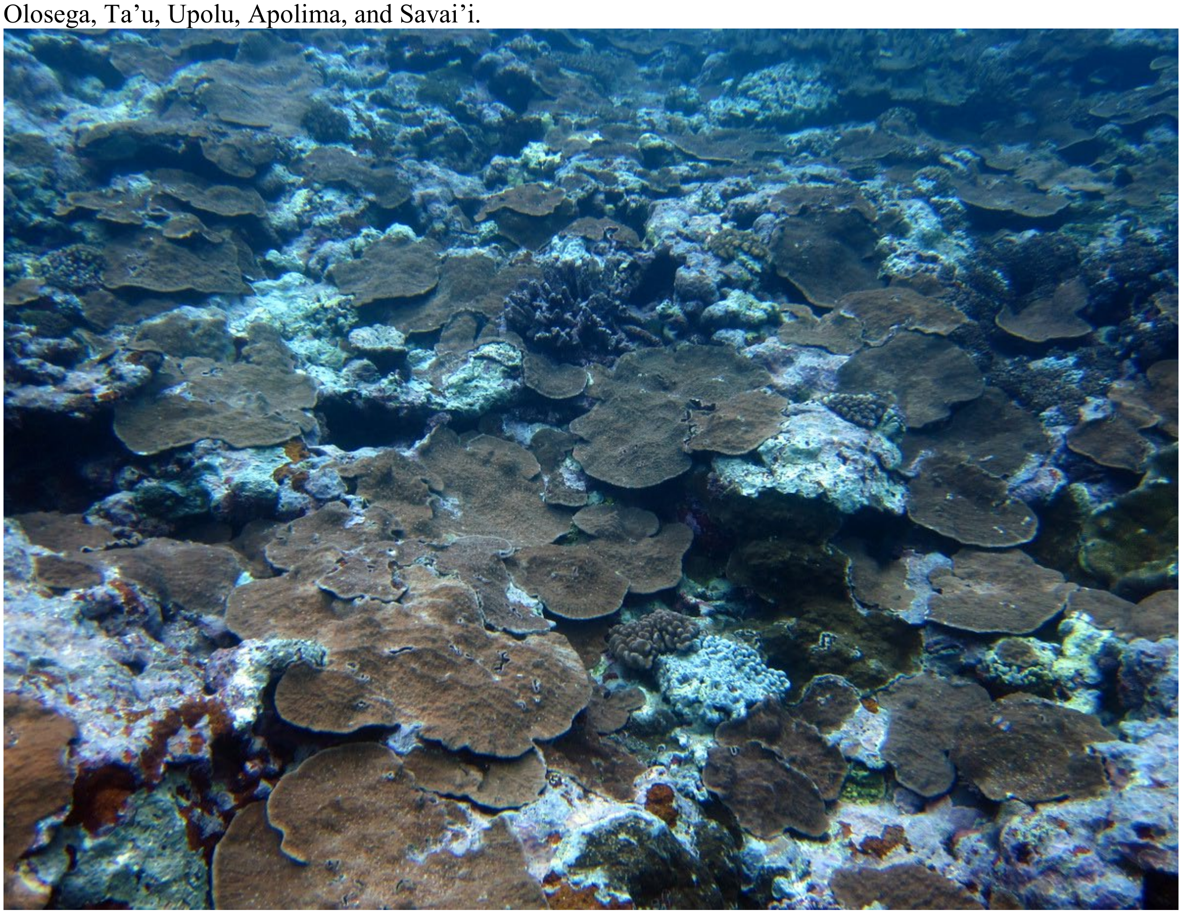
Isopora

Isopora used to be considered a sub-genus of *Acropora*, but the evidence mounted that they are actually a separate genus (Wallace et al. 2007), though closely related to *Acropora*. They do not have a single axial corallite and polyp like *Acropora*. If they have a branch, there will be many corallites on the end. Several other features of their biology, such as brooding larvae and releasing them unlike *Acropora* which broadcasts eggs and sperm, indicate that this is a separate genus. One species here is encrusting, and another forms very thick branches, about as thick as a wrist, and the branches have very rounded, blunt ends, not sharp ends. The encrusting species dominates the upper reef slopes in some areas of the SW of Tutuila. The branching form is uncommon most places. Colonies are light brown or reddish-brown. Encrusting colonies have smaller and smoother cylindrical projecting corallites than *Astreopora*, which is usually massive as well.

Isopora crateriformis (Gardiner, 1898) Threatened Vulnerable

(previously referred to as *Acropora* (*Isopora*) *crateriformis*)

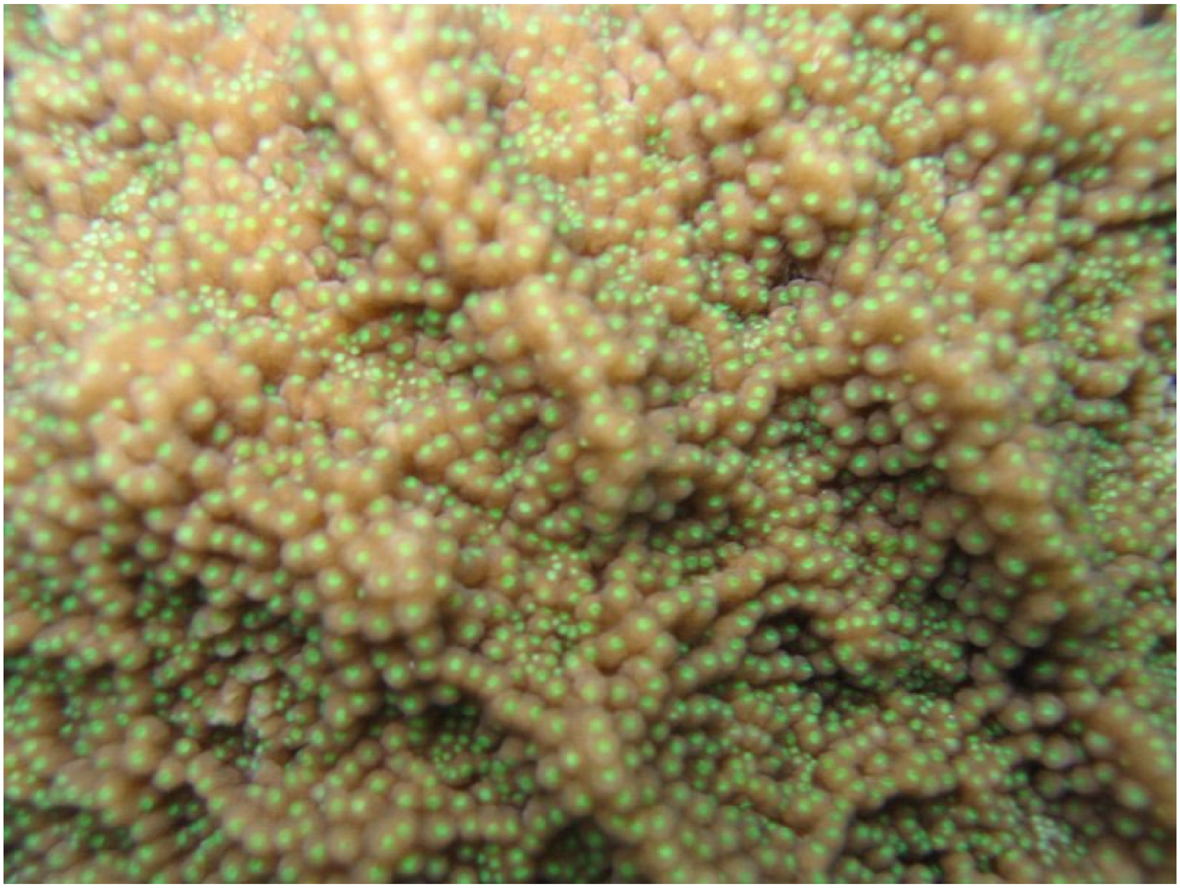
This coral forms encrusting sheets often with the lower edge raised as a plate with thin edges. The surface often has an irregular network of small ridges. Colonies on Ofu have some bumps or lumps on them but no branches. The surface is covered with small round tubular corallites close together. Corallites are smaller than on *Isopora palifera* and no branches are formed, while *Isopora palifera* is entirely branching in American Samoa. Tan to reddish-brown sometimes with green polyps, most common on upper reef slopes, particularly on the southwest section of Tutuila, where it dominates at Leone. This species was designated by NOAA as “threatened” under the U.S. Endangered Species Act. Found so far on Tutuila, Aunu’u, Ofu-Olosega, Ta’u, Upolu, Apolima, and Savai’i.



The upper reef slope at Leone is dominated by *Isopora crateriformis*.

Isopora crateriformis colonies on slopes commonly extend as a plate on their lower edge, and can overlap other colonies.

A colony of *Isopora crateriformis* with the typical color and small ridges.

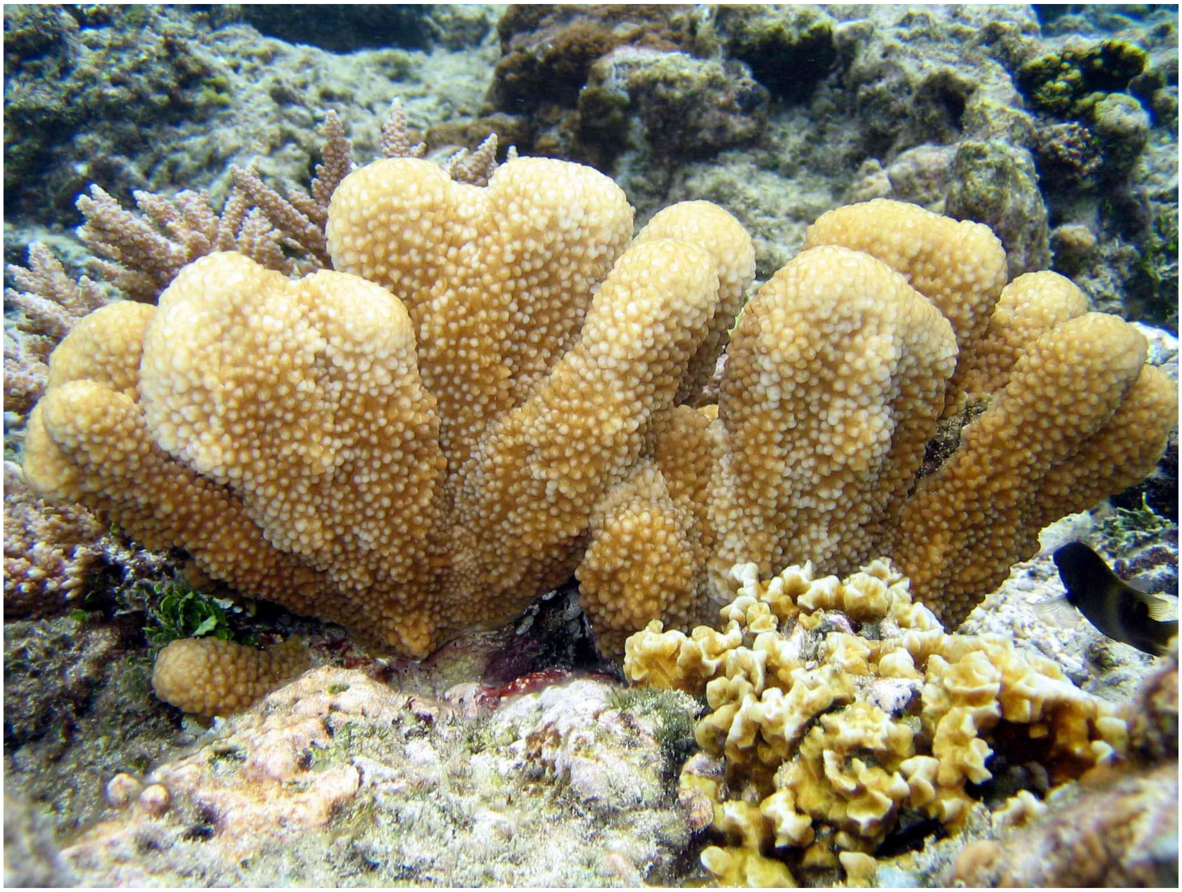


An extreme close-up of *Isopora crateriformis*. The green spots are the contracted polyps inside the corallites. Only a few colonies have green polyps, most have brown.

Isopora palifera (Lamarck, 1816)

(previously referred to as *Acropora* (*Isopora*) *palifera*)

This coral forms clumps of very thick radiating branches about the diameter of a wrist and up to about a foot and a half (50 cm) long (many are shorter). Branches have rounded tips and no single axial corallite. Corallites are large and thick-walled. *Isopora palifera* only forms branches in American Samoa and *Isopora crateriformis* is always encrusting or a plate, with no branches. Corallites are smaller on *Isopora crateriformis* but unless they are side by side this is hard to tell. Brown, uncommon to rare on most upper reef slopes and common on the outer reef flat and upper slope at Alofau. Found so far on Tutuila, Ofu-Olosega, Ta'u, and Muliava (Rose Atoll).



A colony of *Isopora palifera*.

A close-up of the side of a branch of an *Isopora palifera* colony, showing the corallites.

A close-up of the ends of branches of *Isopora palifera*, showing the corallites.

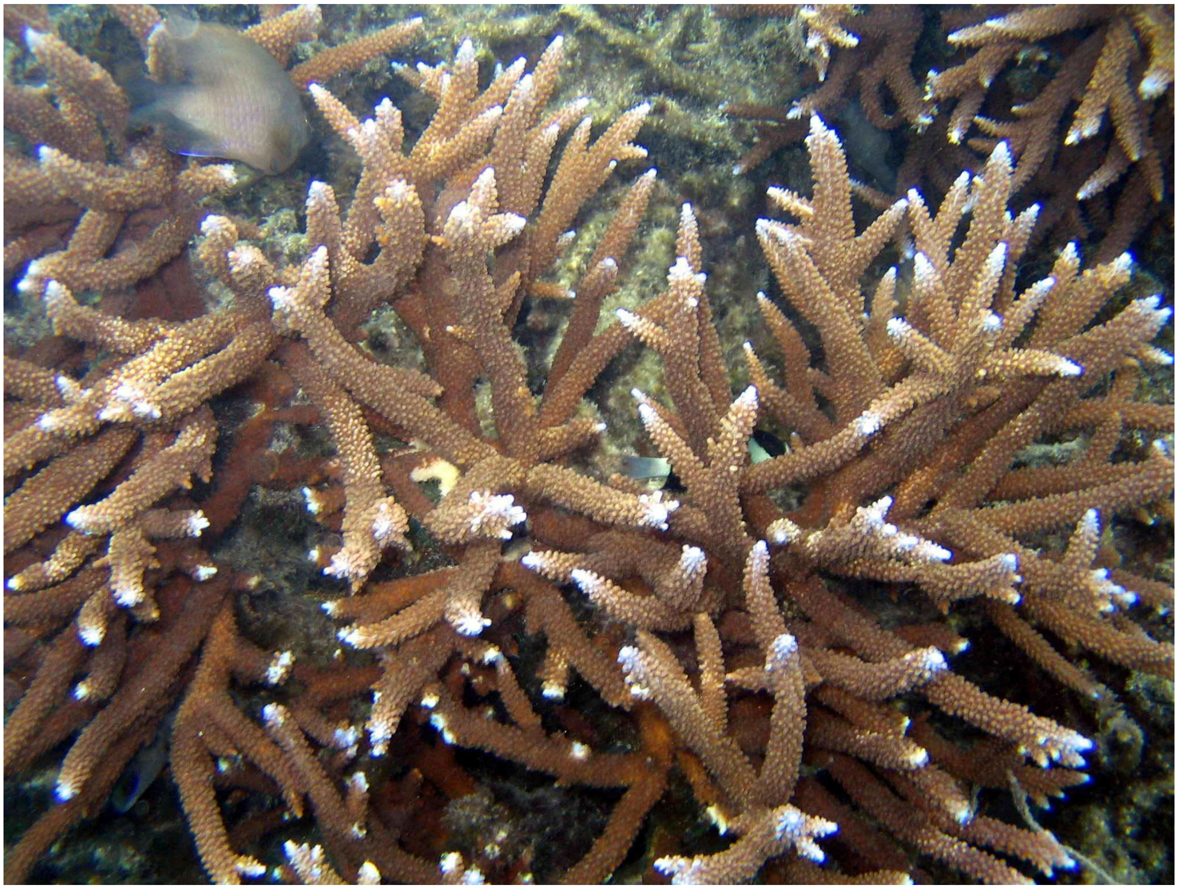
Acropora staghorns, digitate, tables and bushes

Acropora is the largest genus of hard corals with 165 species known, and it dominates many reefs around the world, making it very important. Some of the *Acropora* are the fastest growing corals on earth, and can grow 10 cm (4 in) in branch length in a year. *Acropora* are also among the most easily damaged corals. Many are relatively delicate branching forms which are easily broken in hurricanes. They are also among the most sensitive to bleaching and easily killed that way. They are favorite food for crown-of-thorns starfish, and they are among the most susceptible to disease. The first two coral species which the U.S. has declared as threatened under the Endangered Species Act are both *Acropora* and in Florida and the Caribbean. The thing that reduced them from dominating many reefs there to being uncommon was a disease. So their populations may be fairly unstable, growing fast and then being killed off, and repeating those cycles. Much of our rubble here consists of rounded sticks that came from staghorns, and pieces of table corals.

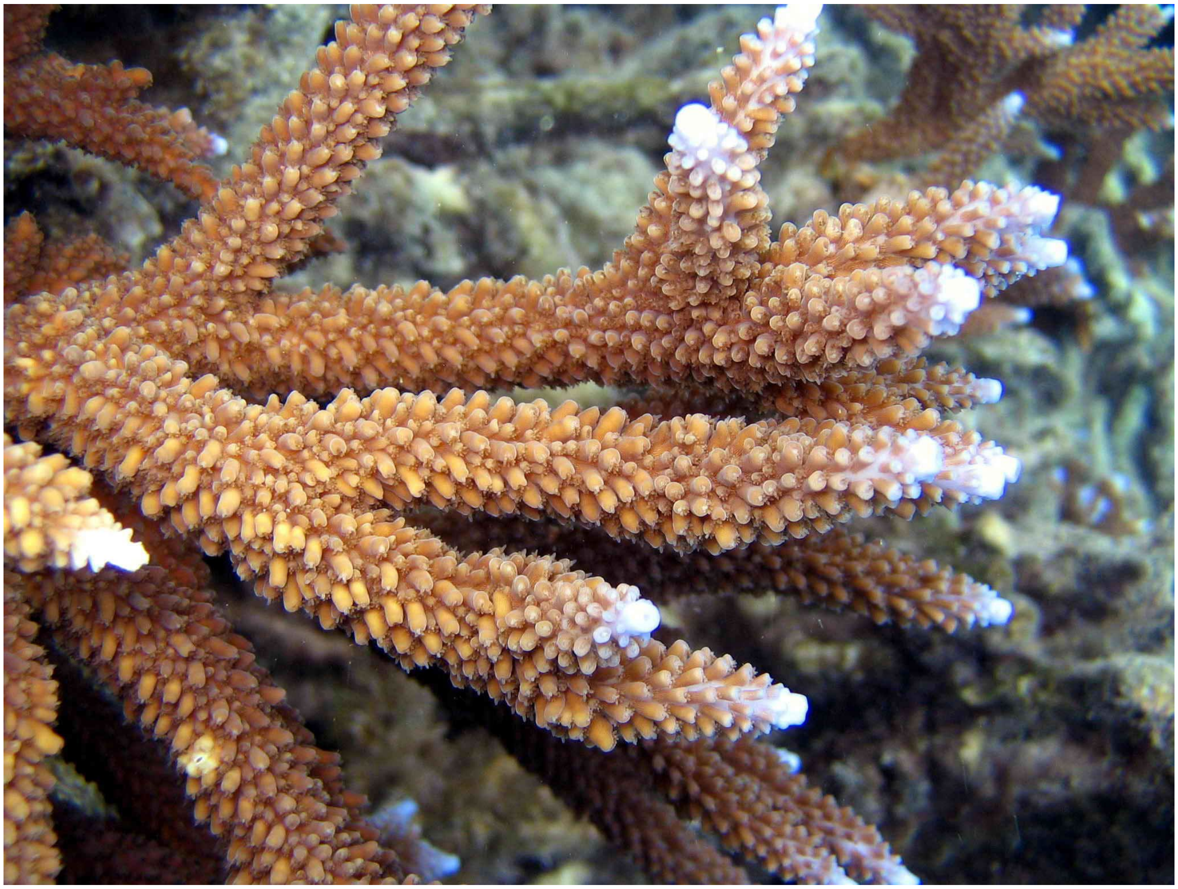
Acropora is **always** branching, and branch tips usually look pretty sharp. They have small polyps about 1 mm diameter, and all have a single polyp at the end of a branch, which distinguishes them from all other corals except one. The corallite on the tip of the branch is called the "axial" corallite, because it is like an axis on a wheel in that it is in the center of a circular structure, since the branch has a circular surface. The axial corallite is often larger than the radial corallites that are on the sides of the branches, though not always. Radial corallites are named that because they radiate on the circular branch surface. Common colony shapes include staghorns that look like deer antlers, tables that have a flat (but rough) upper surface, colonies with short, parallel branches that look like fingers and are called "digitate," bushy colonies of a wide variety of shapes, and everything in between. On table corals, the upper surface and edge of the colony have small branchlets, which have the axial polyp on the end. Colonies are often some shade of brown, but can be grey, or bright green, or other colors. Abundant, sometimes dominant. No other genus has one corallite at the end of each branch. We will begin with staghorn species, then digitate, bushy, and tables.

Acropora muricata (Linnaeus, 1758) "staghorn"
(Previously referred to as *Acropora formosa*)

This coral forms staghorn colonies in the backreef pools. Branches can be widely spaced or clustered tightly, and are about 1-1.5 cm (1/3 to 12 in) diameter. Radial corallites are small and tubular with the lower wall extending some. It has thinner branches than *A. intermedia*, rougher branch surfaces than *A. pulchra* produced by tubular radial corallites instead of flat lower lip radial corallites, and is the only staghorn with blue tips here. Brown with blue branch tips which are diagnostic here, co-dominates backreef pools, not found on slopes. Found so far on Tutuila, Aunu'u, Ofu-Olosega, and Upolu.



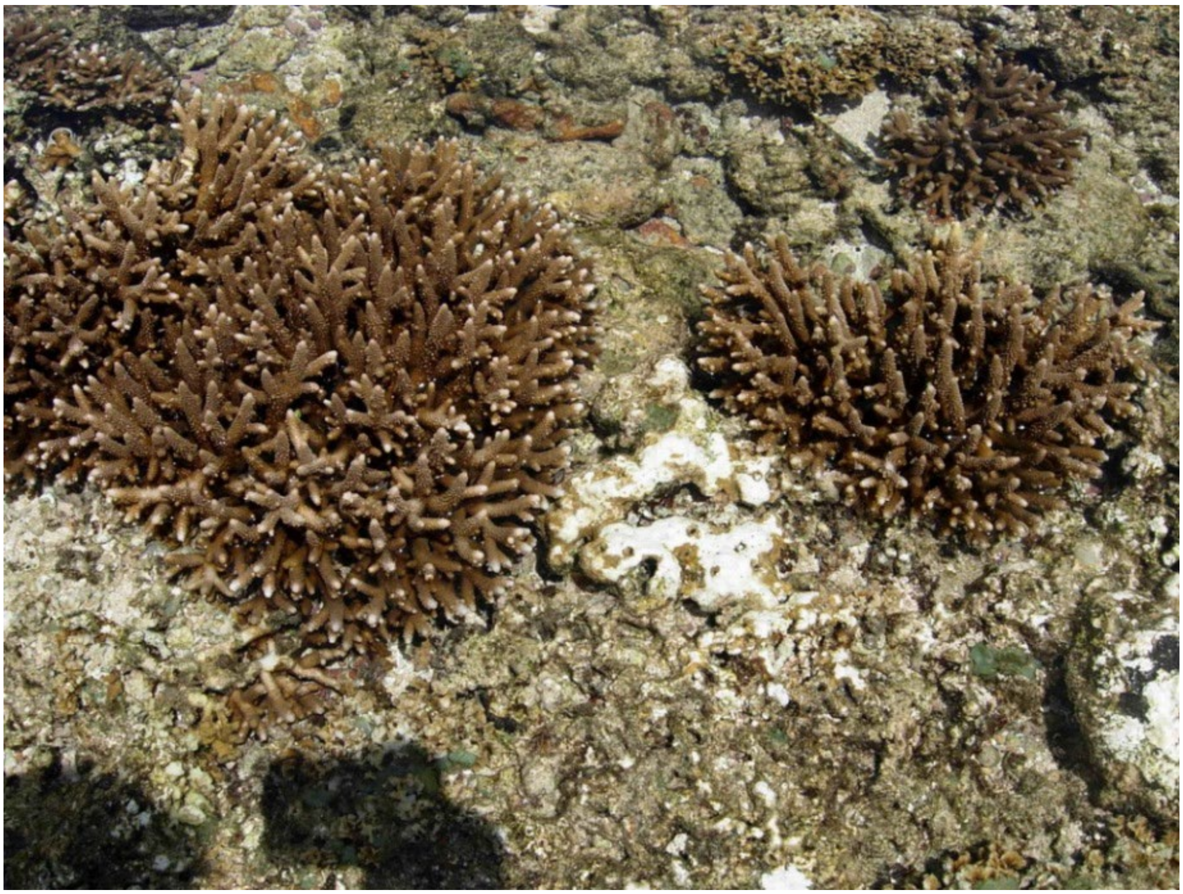
A thicket of *Acropora muricata*. Digital cameras do not capture the blue on branch tips well.



A close-up of *Acropora muricata*.

Acropora pulchra (Brook, 1891) "staghorn"

This coral forms staghorn corals made of branches about 1-1.5 cm (1/3 to ½ in) diameter. Branches may appear smooth, due to many short tentacles that cover most of the radial corallites. The larger radial corallites have an extended lower lip, and a few extend through the tentacles. Sometimes the tentacles are retracted making the corallites easily visible. It has two morphs, one on reef flats and one in backreef pools. The morph on reef flats looks much like *Acropora aspera* but the latter usually has thicker branches, and radial corallites are larger, complete circles, close together. *Acropora muricata* has tubular corallites, tentacles do not cover corallites, and branch tips are blue. *Acropora intermedia* has thicker branches, tentacles not extended, and corallites have thicker walls. Brown, light yellow, or green with white tips sometimes purple, many small to large patches on reef flats, uncommon in backreef pools. This is a "species complex" and will take some work to get that figured out. Found so far on Tutuila and Ofu-Olosega.



Acropora pulchra on a reef flat.

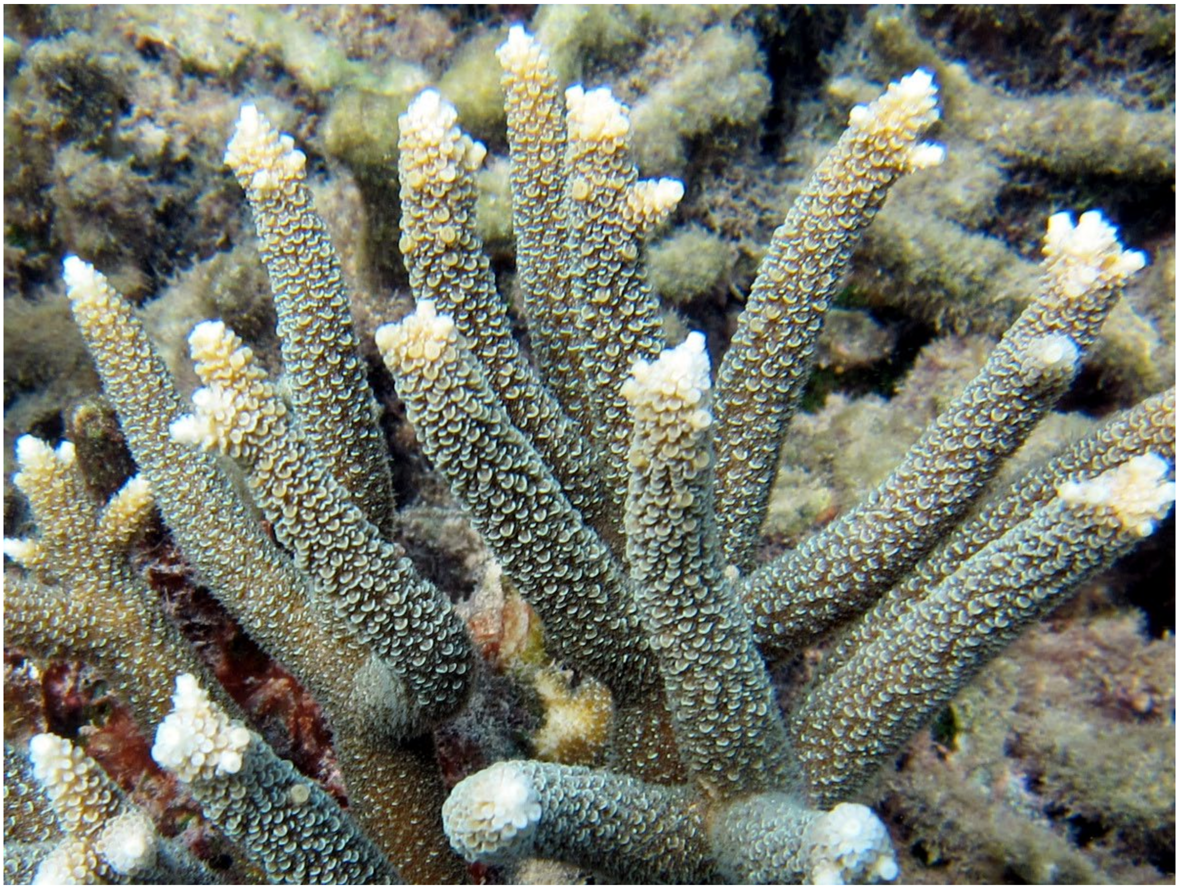
This is the reef flat morph of *Acropora pulchra*, which is present as small to large patches of small size staghorn on reef flats. It looks like this on reef flats, except that it is usually brown instead of purple.


This is the reef flat morph of *Acropora pulchra*, which is present as small to large patches of small size staghorn on reef flats.

Acropora pulchra, with tentacles extended, making it looks smooth with corallites hard to see. This is the backreef pool morph.

A close-up photo of *Acropora pulchra* with tentacles partway extended.

A photo of *Acropora pulchra* with tentacles retracted.



A photo of *Acropora pulchra* with tentacles retracted, showing the leafy corallites and dots where small corallites are located.

Acropora intermedia (Brook, 1891) "staghorn"

(referred to in the past as *Acropora nobilis*)

This coral forms staghorn colonies that have thicker branches back from the tips than either *Acropora muricata* or *Acropora pulchra*. Radial corallites near the branch tip are uniform, with openings at an angle pointing toward the tip, and farther down on the branch they become irregular in size and shape. *Acropora muricata* has blue branch tips and more tubular corallites, and *Acropora pulchra* often has tentacles extended and lower lips of corallites barely poking through the tentacles. Light brown to brown with white tips, uncommon in back reef pools and reef slopes. See taxonomic note. Found so far on Tutuila, Aunu'u, Ofu-Olosega, and Upolu.

Branches of *Acropora intermedia*.

A close-up of *Acropora intermedia*.

Acropora hebes (Dana, 1846) (used to be called *A. aspera*) Vulnerable

This coral forms bushy colonies on reef flats. Branches are about 1 cm (13 in) diameter and often radiate from the center of the colony or grow vertically. Radial corallites have a large lower "lip" or wall which can make a funnel shape with the upper part of the wall short and fused to the branch. *Acropora muricata* has blue branch tips and tubular corallites. *Acropora pulchra* thin lower lips on corallites and may have tentacles extended. *Acropora intermedia* has thicker branches and variable size corallites that tilt toward the branch tip. Brown, on some reef flats (not on slopes), but easily killed by extra low tides. The type specimen of *A. hebes* is more similar to this coral than that of *A. aspera*. Found so far on Tutuila, Ofu-Olosega, and Muliava (Rose Atoll).

A colony of *Acropora hebes*.

A close-up of *Acropora hebes*.

Acropora austera (Dana, 1846)

This coral forms branching staghorn-like colonies. Branches are closer together, more irregular and fused than most staghorns, and radial corallites are tubular and have thick walls. *Acropora muricata* is less fused, has thinner walled tubular corallites and blue branch tips. *Acropora verweyi* is corymbose (vertical thin branchlets) or bushier with thinner branches, and corallites are more uniform and pocket-like. Brown or purple, uncommon, slopes and reef flats. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Upolu and Savai'i.

Two colonies of *Acropora austera*, one purple and the other brown.

Close-up of branches of *Acropora austera*, showing the corallites.

Acropora robusta (Dana, 1846)

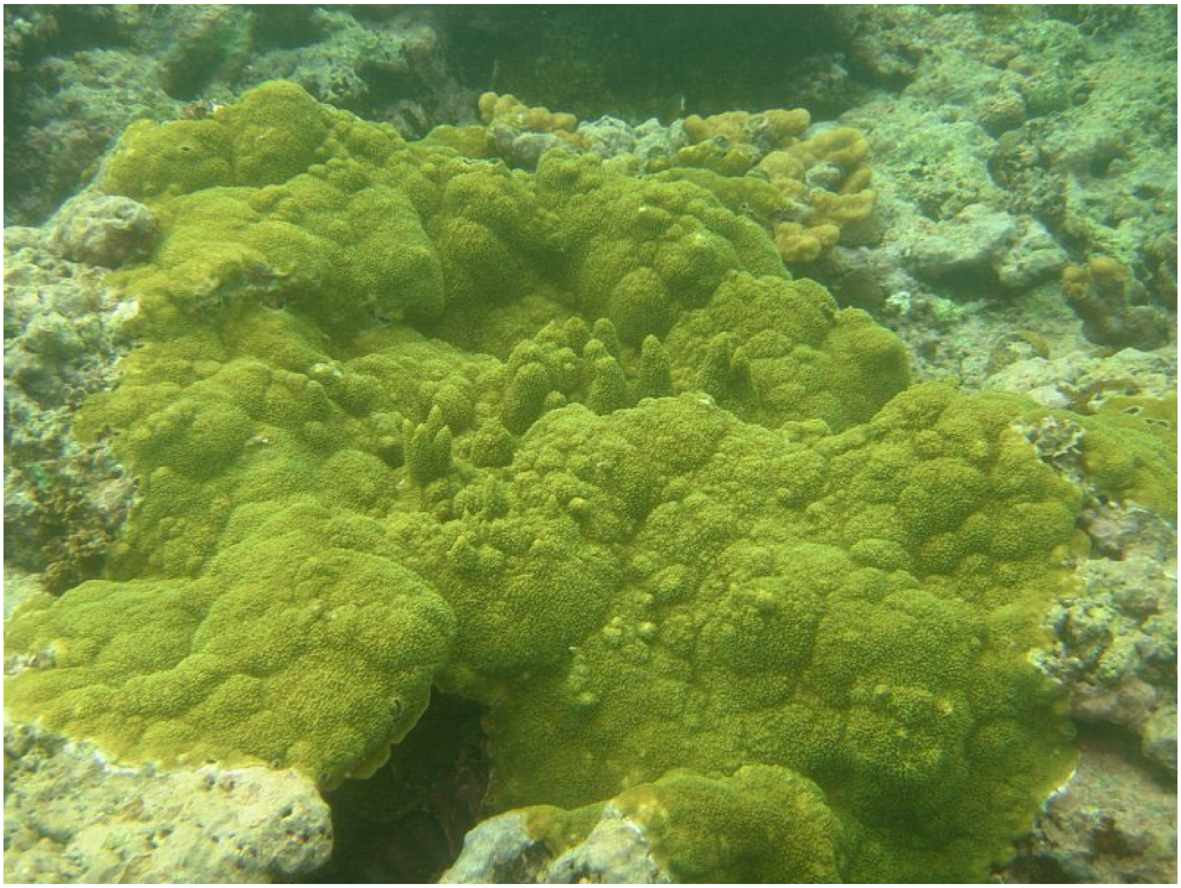
This coral forms large staghorn branches that can be quite thick at the base (hence the name) but taper towards the tip. Branches are fairly widely spaced, very unform and regular, and on the edges of colonies may radiate nearly horizontal and then curve upwards. The branches are usually all connected together at the base so they form discrete colonies instead of thickets of unlimited size. Radial corallites are small and the opening is at an angle pointing toward the tip, looking like rasping teeth on a file. A few longer more tubular corallites may be at the tip. Most staghorns can form thickets of indeterminate size. Tentacles are not extended unlike *Acropora pulchra*, corallites are not tubular like *Acropora muricata* or *Acropora austera*, and the corallites are narrow unlike on *Acropora aspera*, *Acropora pulchra* or *Acropora intermedia*. Colonies do not produce horizontal fans of branches like *Acropora abrotanoides*, which also has long tubular radials near branch tips. Brown, grey, or bright green, uncommon, prefers reef flat near the reef crest. On reef flats the branches may be short, stubby and vertical. Found so far on Tutuila, Aunu'u, and Ofu-Olosega.

A colony of *Acropora robusta*. Notice the upward curving branches with the even tapering.

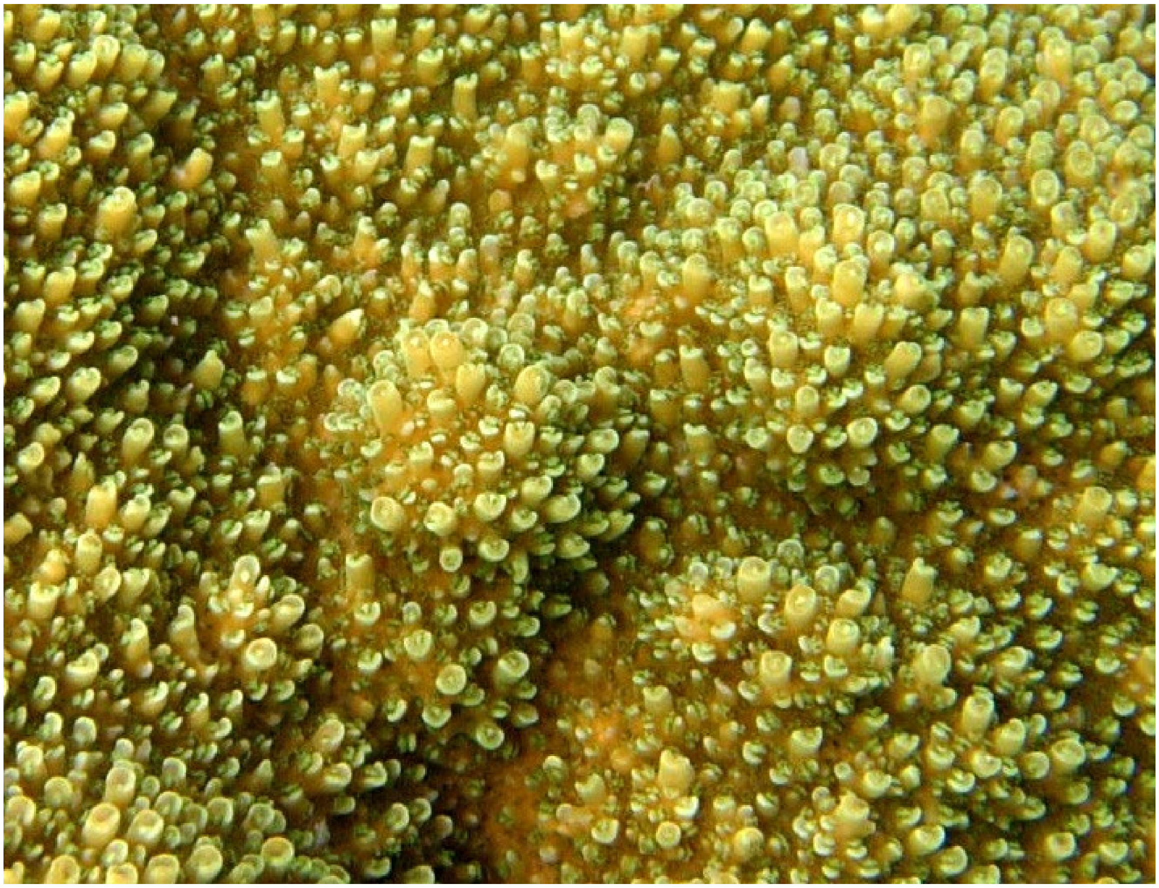
A close-up of *Acropora robusta*. Notice the leaning corallites like teeth on a file.

Acropora palmerae Wells, 1954 Vulnerable

This coral forms thin encrusting colonies which may have a few bumps or stubby branches. The colony is covered with small radial corallites that are short and tubular and have angled openings that point in various directions. Brown or bright green, rare, on reef flat or upper reef slope. Corallites are the same as on *Acropora robusta*, as are the branches, but the branches are much shorter. This species is dominated by the encrusting colony with just a few stubby branches, while *Acropora robusta* is dominated by the branches with a small encrusting base hidden under the branches. See taxonomic note. Found so far on Tutuila.



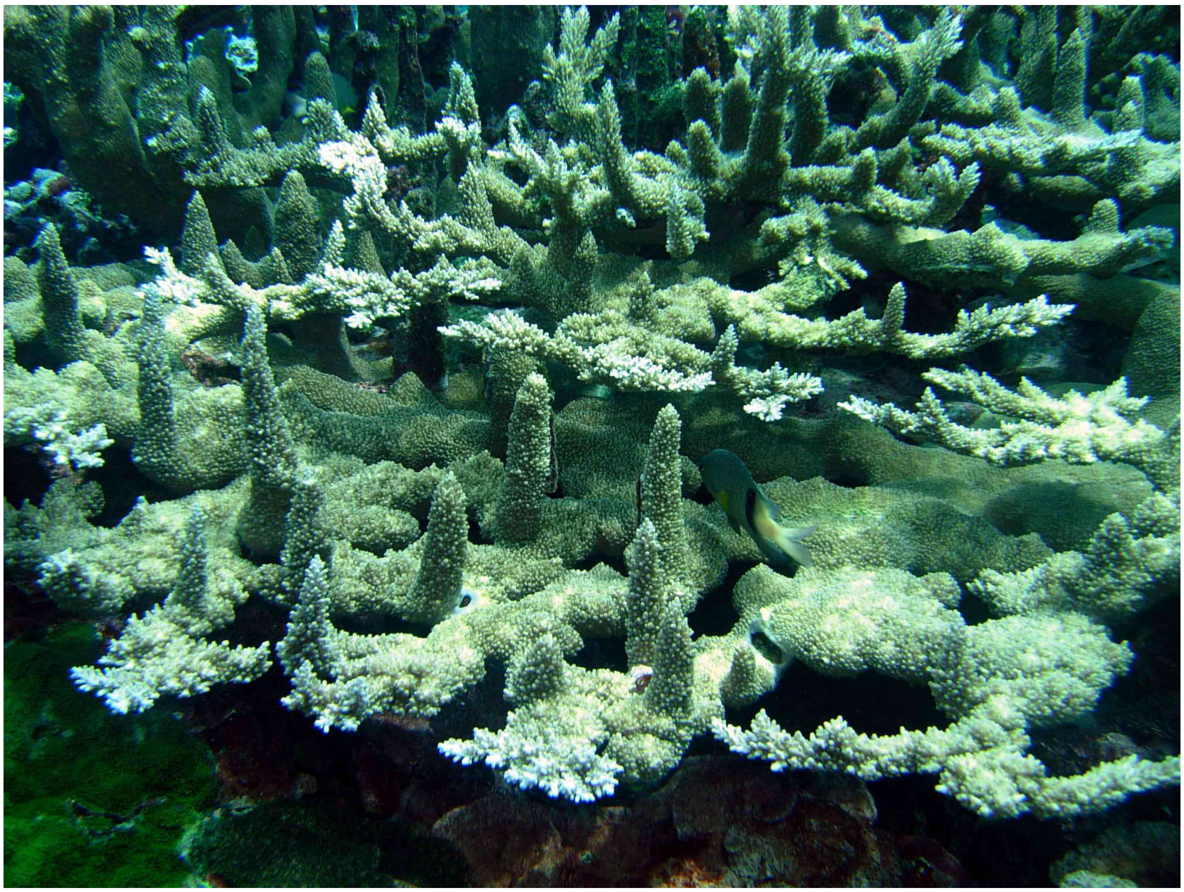
A colony of *Acropora palmerae*.



A close-up of *Acropora palmerae*.

Acropora abrotanoides (Lamarck, 1816)

This coral forms large colonies of sturdy branches that may be staghorn-like along part of their length, colonies are often 1-2 m (3-6 feet) diameter and branches up to 3-4 cm (1-1.5 in) in diameter. Most branches extend either near vertically or near horizontally, and often curve irregularly. Horizontal branches often end in a horizontal fan of branch tips. Corallites near the branch tips are long and tubular and inclined toward the point. Like *Acropora robusta* it forms discrete colonies not thickets of indefinite size. Branches curve upward near the edges of colonies and usually aren't separated into vertical and horizontal on *Acropora robusta*. Corallites are rasp-like nearly to the branch tip on *Acropora robusta* and are not long, while the tubular corallites near branch tips on *Acropora abrotanoides* are long. Branch tips often make horizontal fans on *A. abrotanoides* but not on *A. robusta*. Grey-brown, fairly common above 10 m depth on slopes. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Muliava (Rose Atoll), and Upolu.

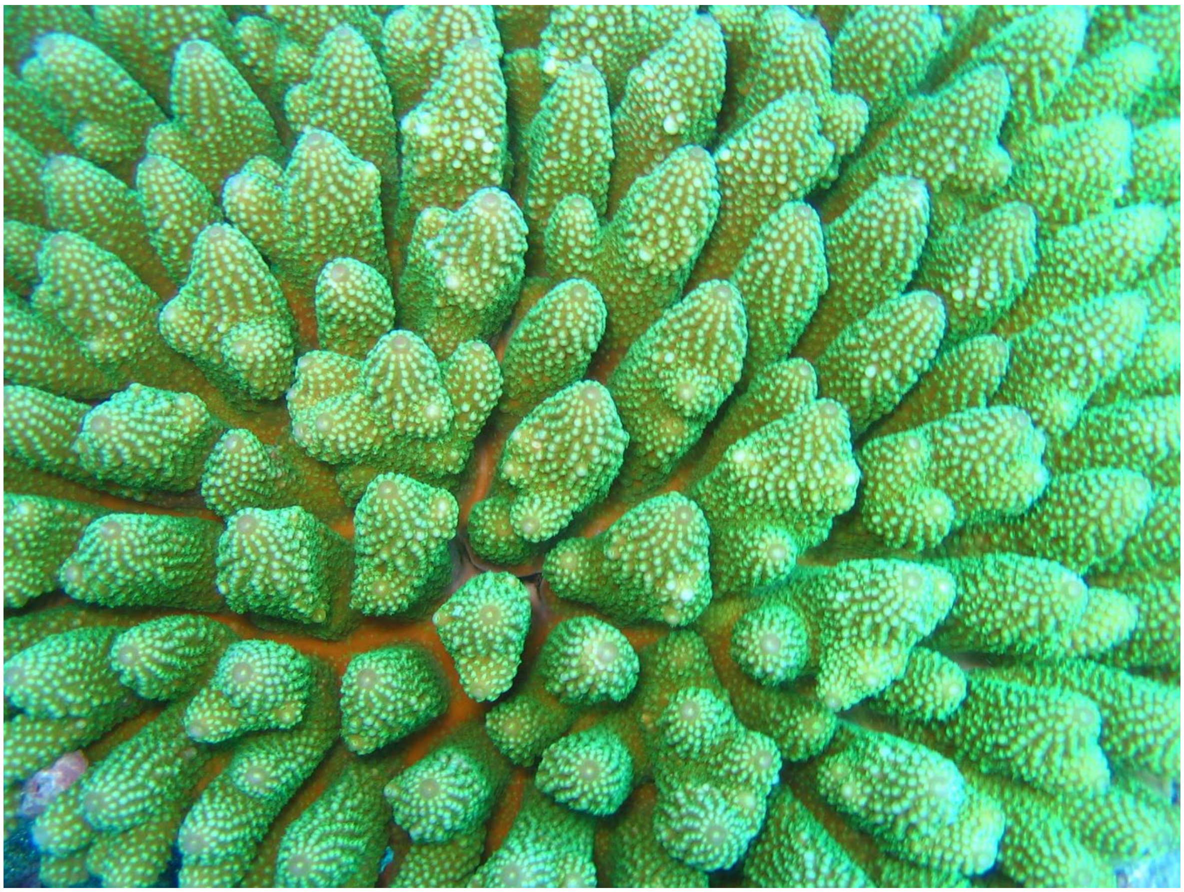


Part of a colony of *Acropora abrotanoides* showing the vertical branches and the horizontal branches that tend to fuse and produce fans at their ends.

A fan of branch tips produced at the end of a horizontal branch on *A. abrotanoides*. Notice the relatively long tubular radial corallites.

Acropora globiceps (Dana 1846) Threatened Vulnerable

This coral forms digitate colonies with finger shaped 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. *Acropora digitata* has shorter branches which taper more strongly, and corallites have a lower lip. *Acropora gemmifera* has larger corallites with thicker walls. *Acropora monticulosa* has branches that are thicker at the base and taper more strongly. *Acropora retusa* has larger, longer, more irregular length corallites. Brown or fluorescent green, common, upper reef slope. This species has been mistaken for *Acropora humilis* previously, which it resembles somewhat except *Acropora humilis* has longer, thinner, variable length, diverging, branches that do not taper and have more short side branches near branch bases. The author has not found *Acropora humilis* in American Samoa. *Acropora gemmifera* has larger radial corallites with thick walls. *Acropora digitifera* has smaller, shorter branchlets. Found so far on all islands.



A colony of *Acropora globiceps*.

A close-up of *Acropora globiceps*. Notice the small tubular axial corallites.

Acropora retusa (Dana, 1846) Threatened Vulnerable

Acropora retusa forms small digitate colonies, with branches that look rough or spiky because of radial corallites that extend variable distances from the branches. *Acropora globiceps* and *Acropora digitifera* have branch ends that taper to a point and the radial corallites are smaller and more uniform. *Acropora monticulosa* has branches that are thick at the base and taper strongly. *Acropora gemmifera* branches taper more and have more uniform corallites that are shorter. Often green, rare. Found so far on Tutuila, Ofu-Olosega, Ta'u, Muliava (Rose Atoll), and Upolu.

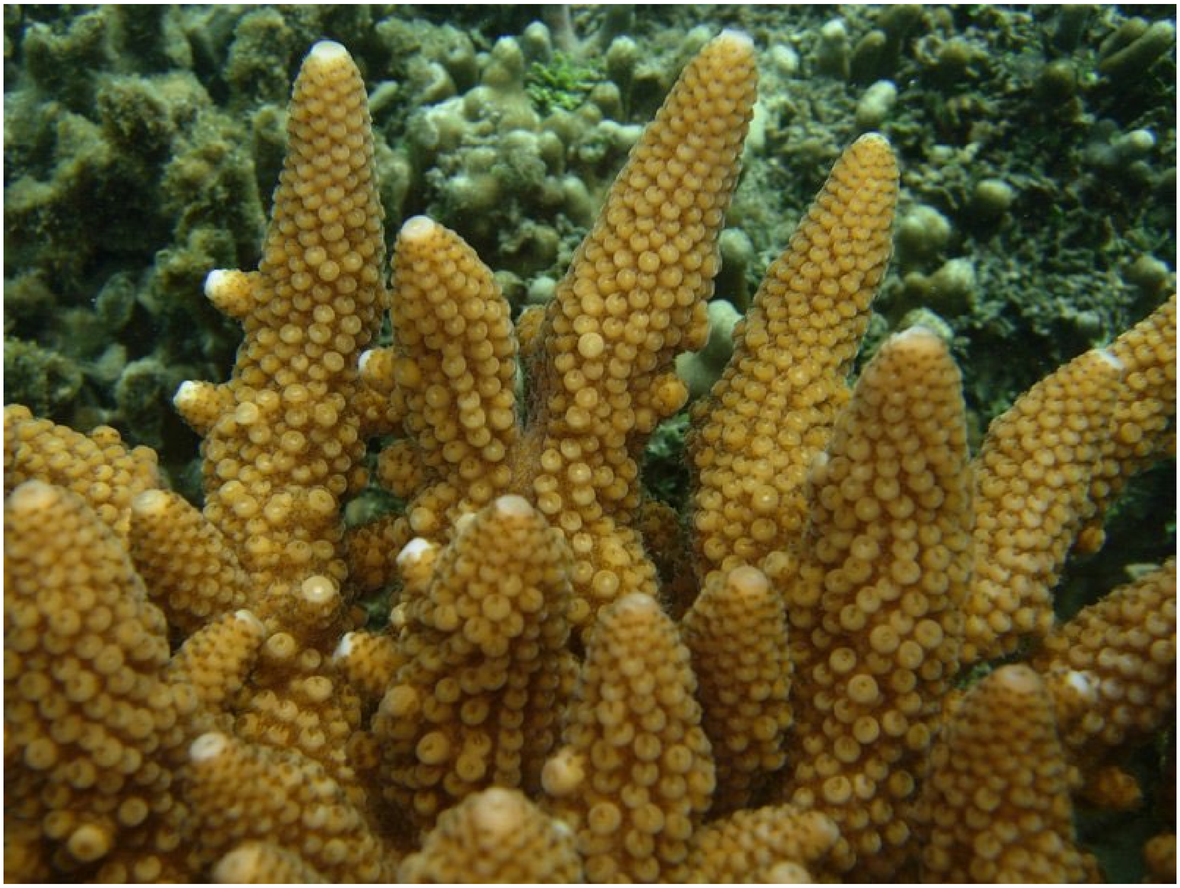
A colony of *A. retusa*. Notice the bumpy or spiky branches.

A close-up photo of *A. retusa*, showing the large radial corallites of variable length.

Acropora gemmifera (Brook, 1892)

This coral forms digitate colonies with moderate length branches that taper. Radial corallites are in rows and have large lower lips and increase in size down the branch. Smaller corallites may be seen between the larger ones. *Acropora globiceps* has smaller corallites and more uniform length branches. *Acropora digitifera* has shorter branches that are more uniform in length and taper more strongly. *Acropora retusa* has corallites that are longer and irregular in length. *Acropora monticulosa* has branches that are thicker at the base and taper much more strongly. Brown, rare, at the Rainmaker on the crest and backreef pool. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Muliava (Rose Atoll), Upolu and Apolima

A colony of *Acropora gemmifera*.

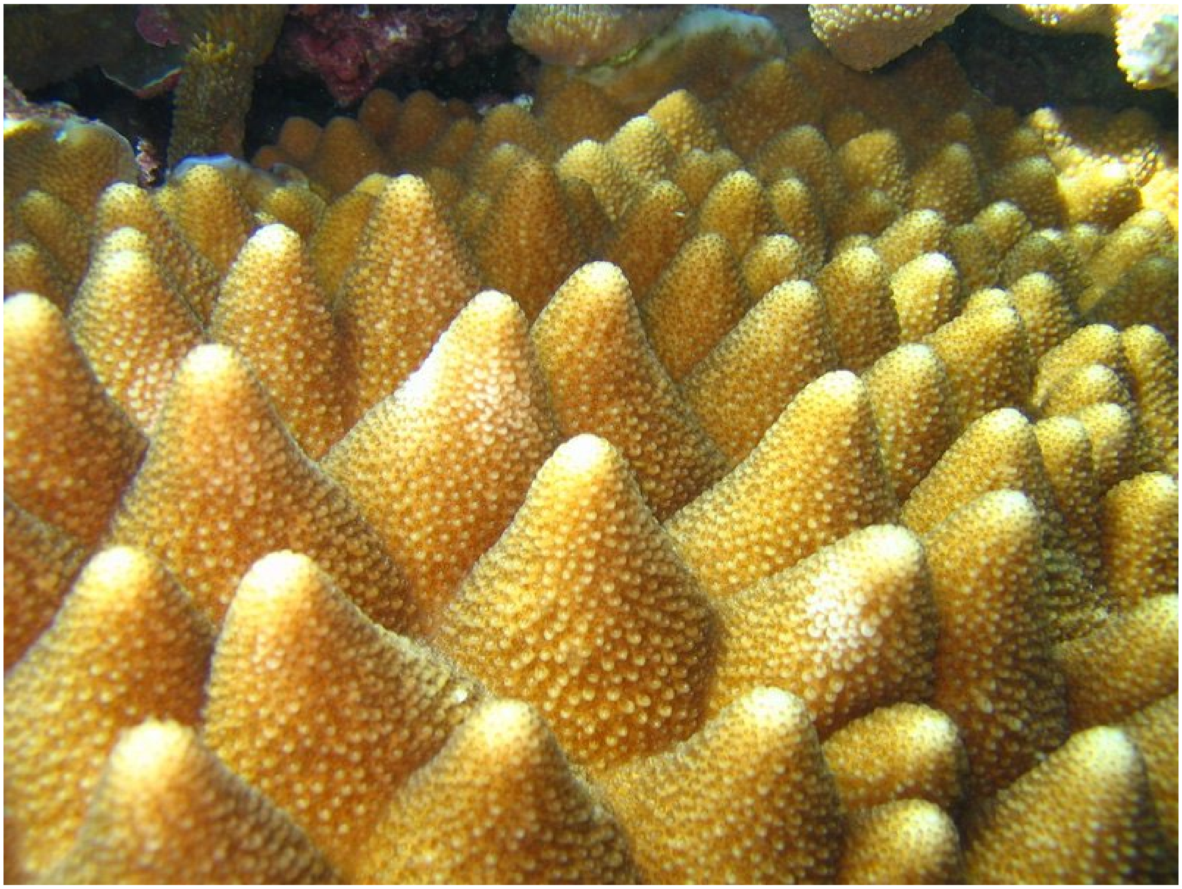


A close-up of *Acropora gemmifera*.

Acropora monticulosa (Brüggemann, 1879)

This coral forms flat digitate colonies with short branches. Branches very strongly taper and form short cones unlike other digitate species. The axial corallite is small, as are the radials. Radials are tubular with a projecting lower lip. No other digitate species has branches that taper so strongly. *Acropora gemmifera* and *Acropora retusa* have larger corallites which in *A. retusa* are irregular in length. *Acropora digitifera* has smaller branches which are more uniform. Acropora globiceps has branches that don't taper as much and often has uuniform cracks between branches. Brown to yellow, uncommon. Found so far on Tutuila, Aunu'u, Ofu-Olosega, and Ta'u.

A colony of *Acropora monticulosa*.



A close-up of *Acropora monticulosa*.

Acropora leptocyathus This used to be known as Acropora digitifera.

This coral forms digitate colonies with short branches, near the reef crest. Branches taper slightly but have a strongly tapered tip with a small tubular axial. Radial corallites appear to have large lower lips from above, and in some colonies a black dot is in each radial corallite. Branches are shorter than most digitate species, and do not taper evenly like a cone as in *A. monticulosa*. *Acropora globiceps* has longer branches and more tuburlar corallites, *Acropora retusa* has large tubular corallites that are irregular in length. *Acropora gemmifera* has longer branches that may be irregular in length and has short, thick-walled corallites. Yellow-brown and may have purple tints, common on reef crests only. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Muliava (Rose Atoll) and Savai'i. *Acropora leptocyathus* was described from American Samoa. It has long been synonyized with *Acropora digitifera*. However, *Acropora digitifera* has longer, rounded tip branches that have blue tips and *Acropora leptocyathus* has shorter, more tapered branches that do not taper. The author has not found *A. digitifera* here.

Three colonies of *Acropora leptocyathus*. Usually they are closer to the substrate than these colonies.

A close-up of *Acropora leptocyathus*.

A close-up photo of *Acropora leptocyathus*.

Acropora cf. *ocellata* Klunzinger, 1879

This coral forms digitate colonies which small branches on reef flat near the reef crest. Colonies can form low rounded mounds several feet (up to about 1 m) across, or small clusters of colonies that are not raised in a dome. Typically, in a single patch of this species there are dead areas between smaller patches of the coral. The branches are small, vertical, taper, and are fairly uniform. Some of the corallites on the sides of branches can often be seen in rows. Corallites are tubular and those near the branch tip are inclined towards the tip. Other digitate species typically have single, larger colonies instead of clusters of small colonies and longer or larger branches. *Acropora digitifera* has more evenly tapering branches and leafier corallites. Brown, uncommon to common. Found so far on Tutuila, only on outer reef flats.

A large colony of *Acropora* cf. *ocellata*.

There are many small branchlets at the bases of the larger branches of *Acropora* cf. *ocellata*.

A close-up of *Acropora* cf. *ocellata*.

Acropora sp. 1 *"cophodactyla"* (Brook, 1842) *sensu* Veron, 2000

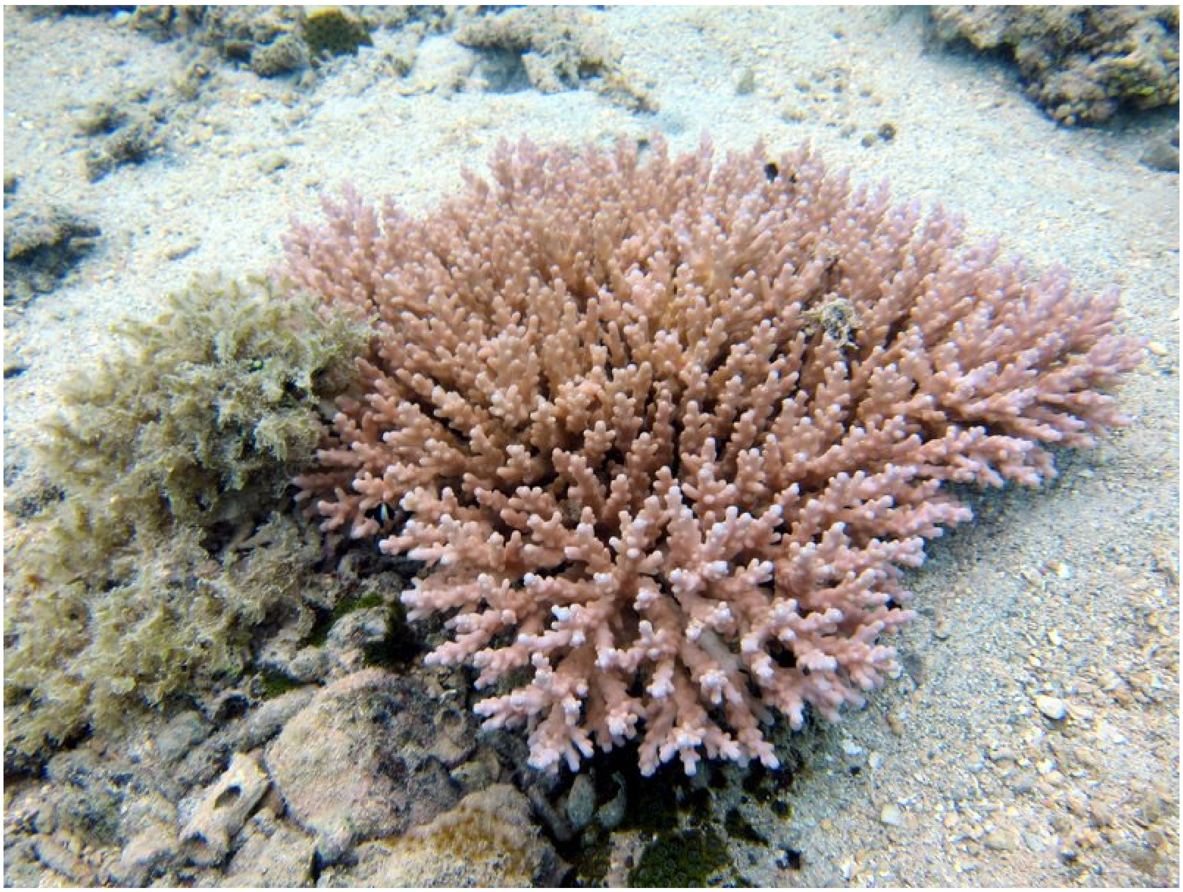
This coral forms digitate colonies on the reef flat near the crest. Branches radiate, are finger-shaped, taper, and have a large tapering axial corallite that is bare for a short ways on its side. Similar species such as *Acropora globiceps*, *Acropora gemmifera*, and *Acropora retusa* have small, tubular axial corallites instead of the larger, tapering axial corallite of *Acropora cophodactyla*. *Acropora globiceps* and *Acropora retusa* also do not have diverging branches. Reddish-brown, brown or tan, uncommon most places, mostly on reef flats. See taxonomic note. Found so far on Tutuila, Aunu'u, and Ofu-Olosega

A colony of *Acropora* cf. *cophodactyla*.

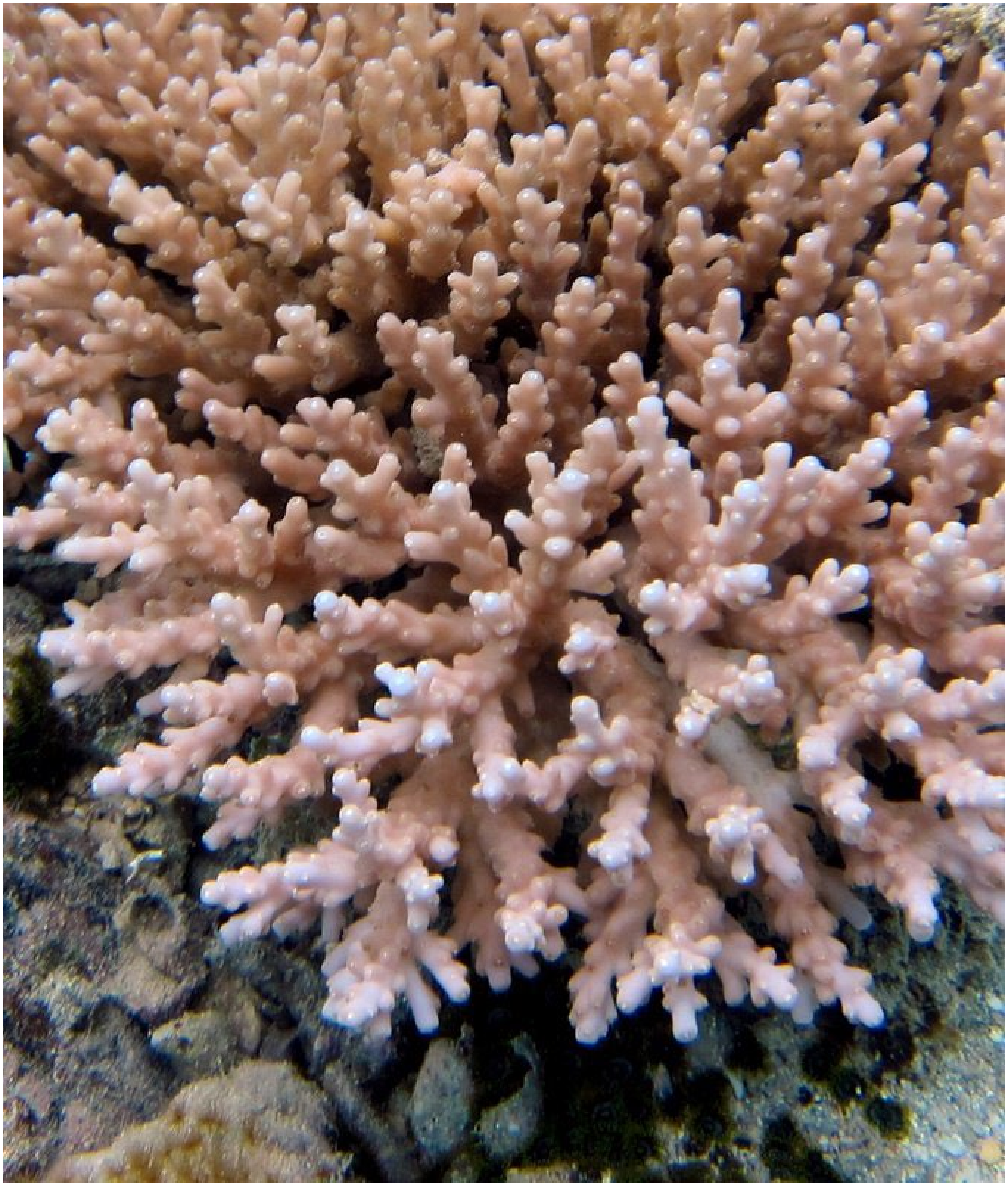
A close-up of *Acropora* cf. *cophodactyla*.

Acropora aculeus (Dana, 1846) Vulnerable

This coral forms small low cushions, about a foot (30 cm) in diameter, and a couple inches (5 cm) tall. Branchlets are relatively thin and tapering, and are vertical except near the edge of the colony where they point outward. Corallites on the sides of branches are short and pressed against the side of the branch pointing toward the tip, but some project as longer tubes, given branches a rough or irregular look. *Acropora latistella* has more uniform corallites on the sides of branches, without the longer tubular corallites that give *Acropora aculeus* branches a rough or irregular look. *Acropora speciosa* has thinner branches and fewer corallites on the sides of branches. Light pink-purple, rare, in pools and on the slope to down deep. Found so far on Tutuila, Aunu'u, and Ofu-Olosega.



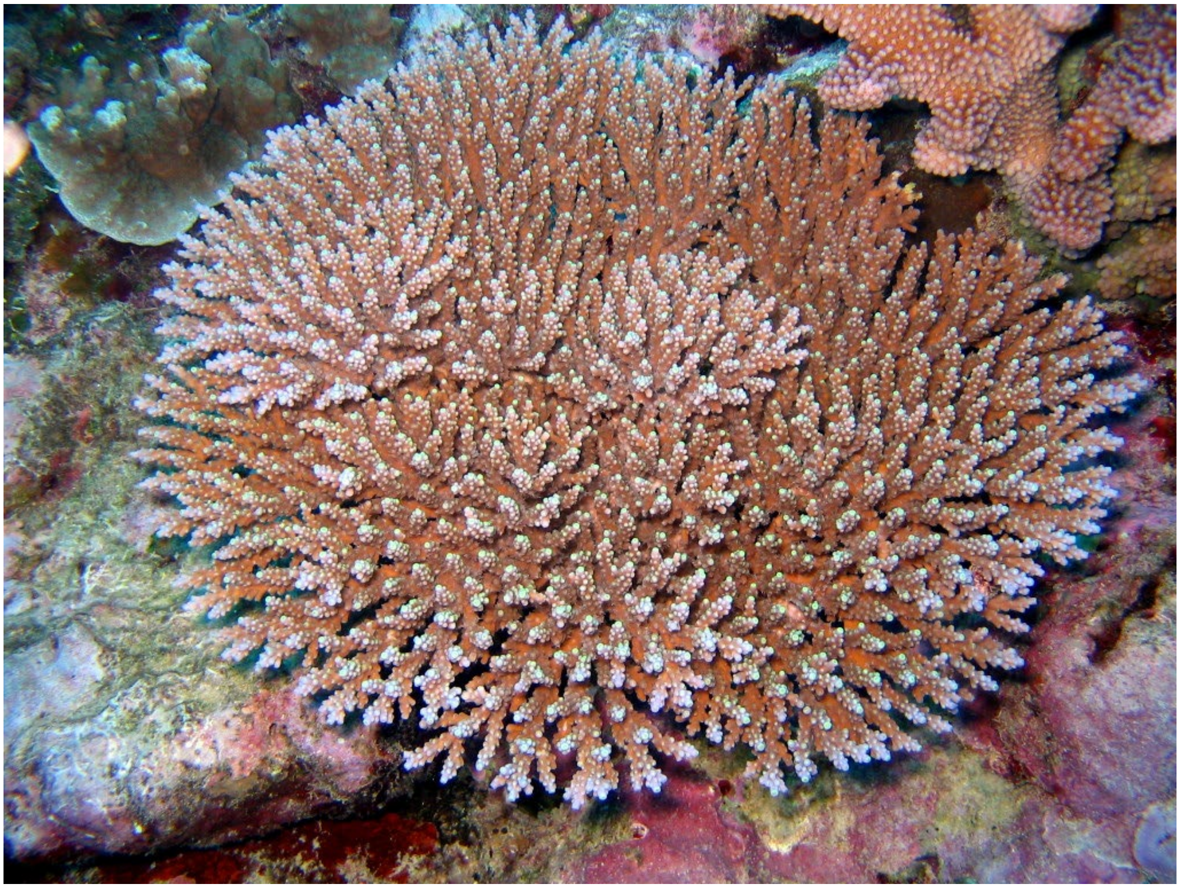
A colony of *Acropora aculeus*.



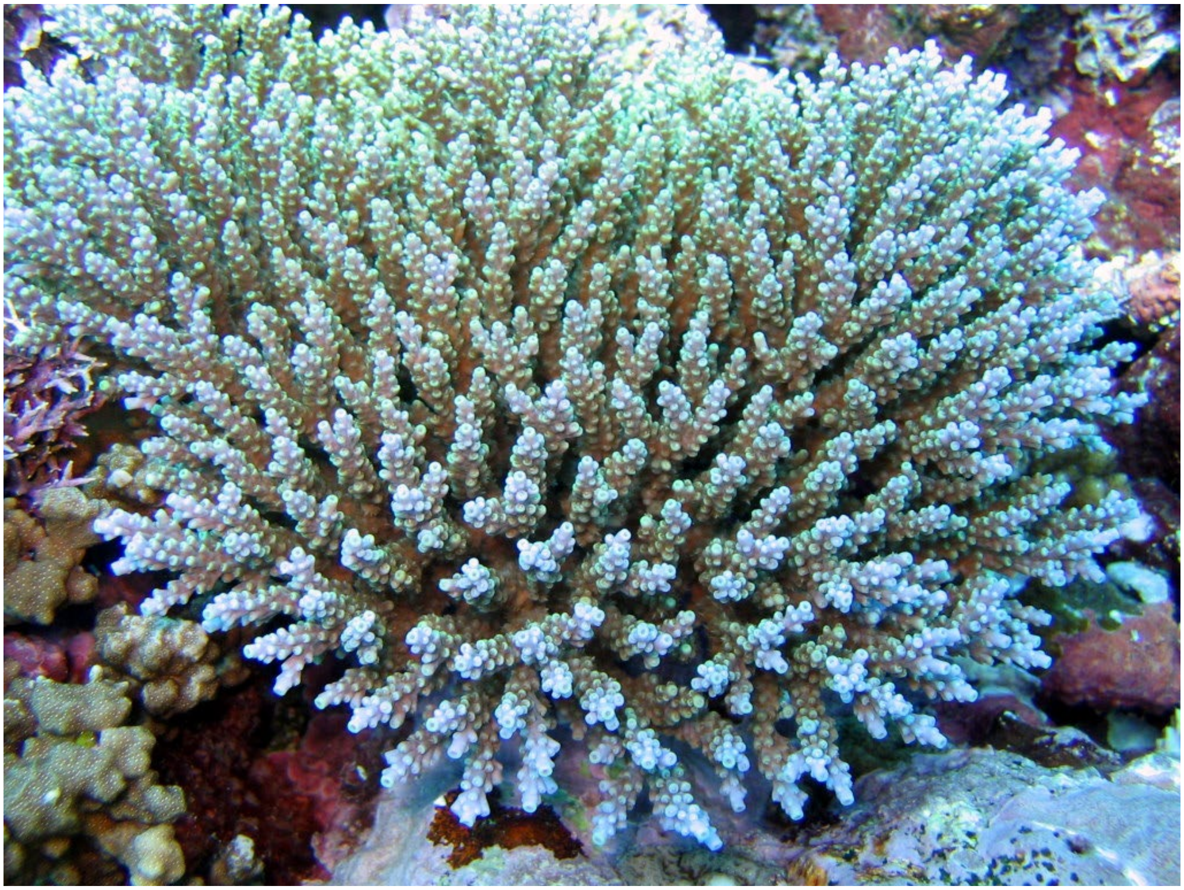
A close-up of *Acropora aculeus*.

Acropora latistella (Brook, 1892)

This coral forms small cushion- or table-like colonies with small, vertical branchlets. Radial corallites appear short, rounded, and uniform. The radial corallites are more uniform than on *Acropora aculeus*, and there are no tubular corallites that extend far from the branchlets. The branchlets are thicker than on *Acropora speciosa* and have more radial corallites. Branches are thicker on *Acropora chesterfieldensis* and are green instead of blue. Axials are larger on *Acropora verweyi*. Colonies often have blue near branch tips.



A large colony of *Acropora latistella*.



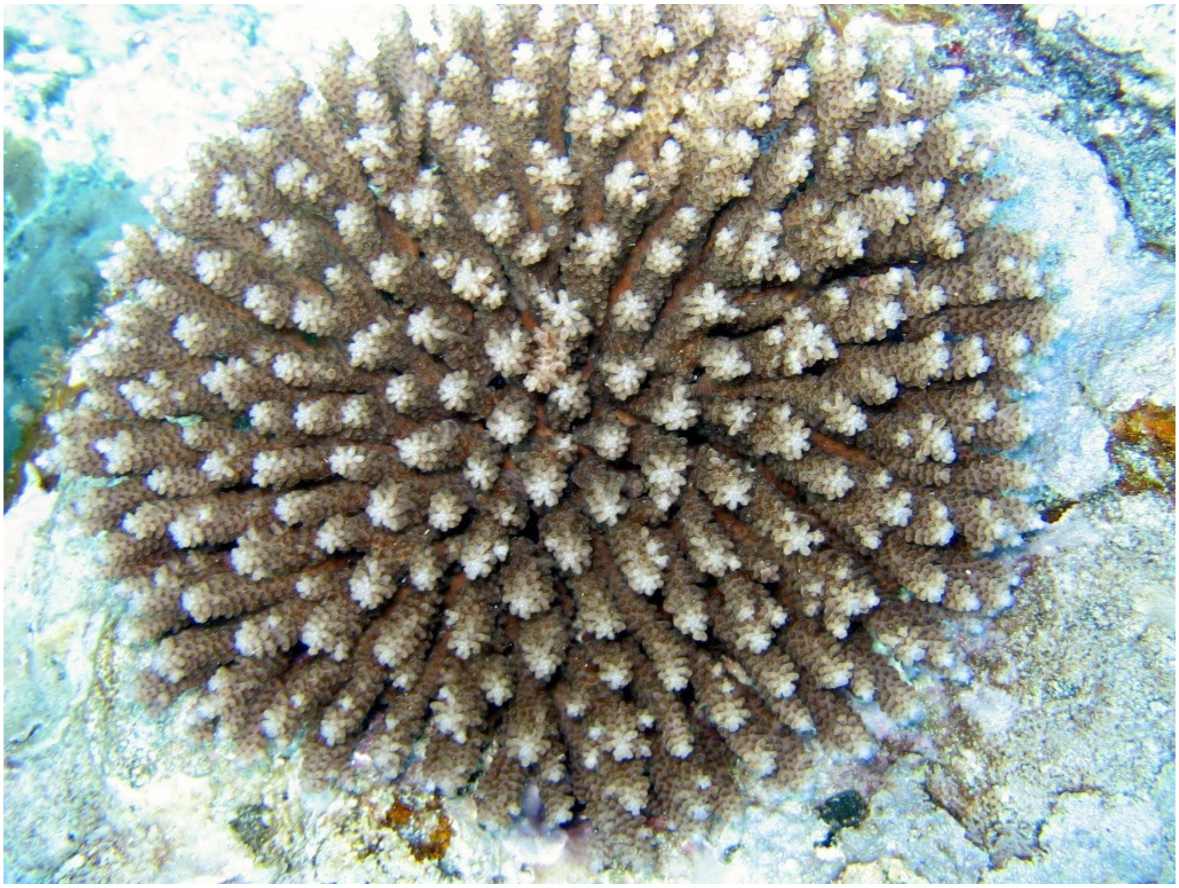
This is a more typical color of *Acropora latistella*.

Here is a section of an *Acropora latistella* colony from the side, where you can see how branches arise from horizontal basal branches.

A close-up of a colony of *Acropora latistella*.

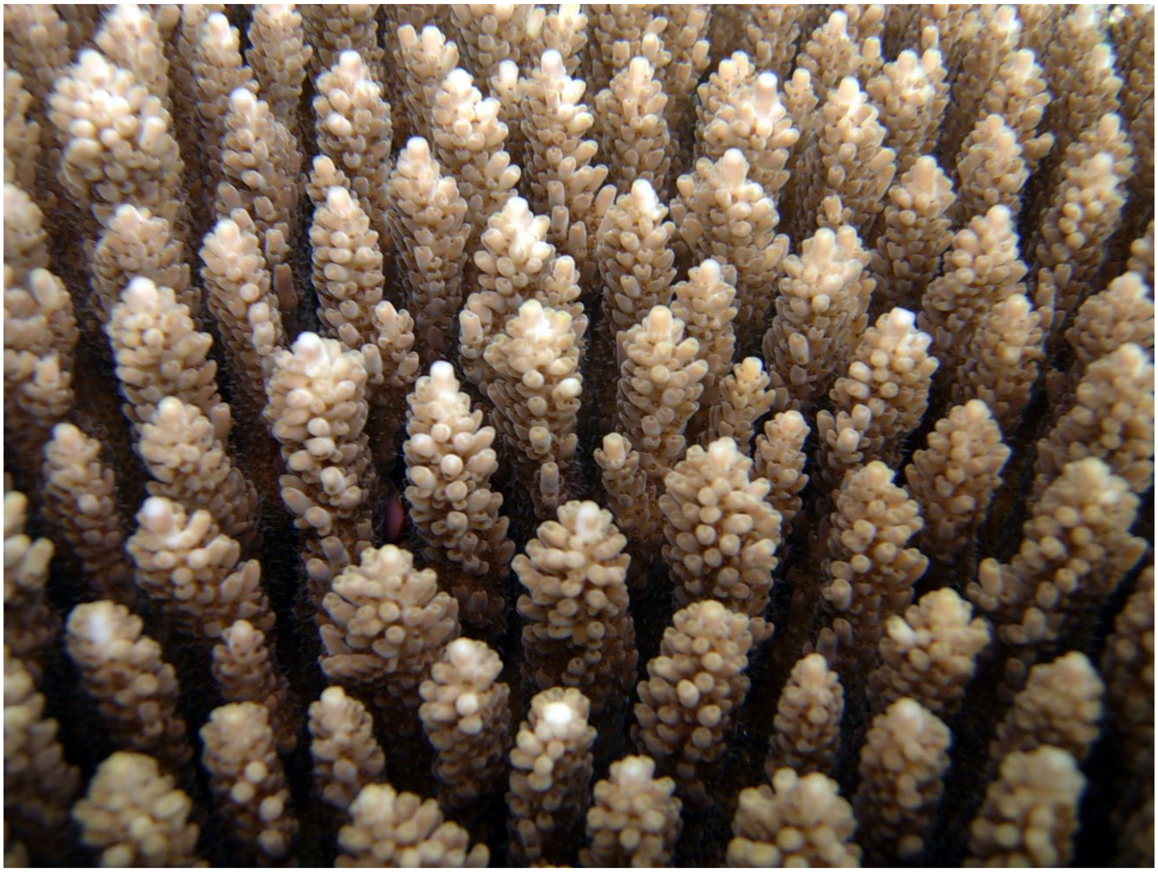
Acropora nasuta (Dana, 1846)

This coral forms bushes of upright branches. The branches are about 1 cm (1/3 in) diameter or slightly less, including the radial corallites. The corallites are tubular and uniform in length, making neat branches. The branches are thicker than on *Acropora latistella* or *Acropora aculeus* and longer than on most of the digitate species. The radial corallites are a smaller part of the branch width than on *Acropora cerealis*. Uncommon to rare in American Samoa. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Muliava (Rose Atoll), and Upolu.



A colony of *Acropora nasuta*.

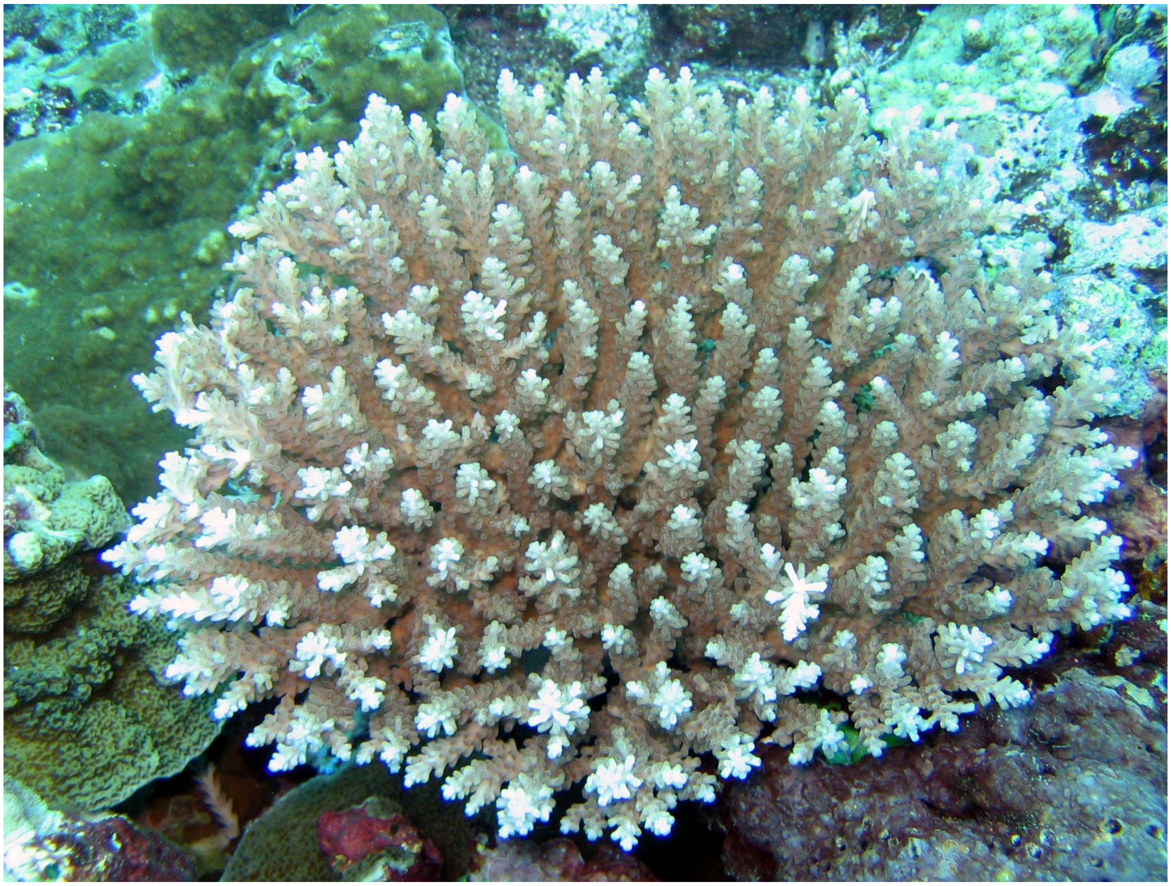
A closer photo of *A. nasuta*.



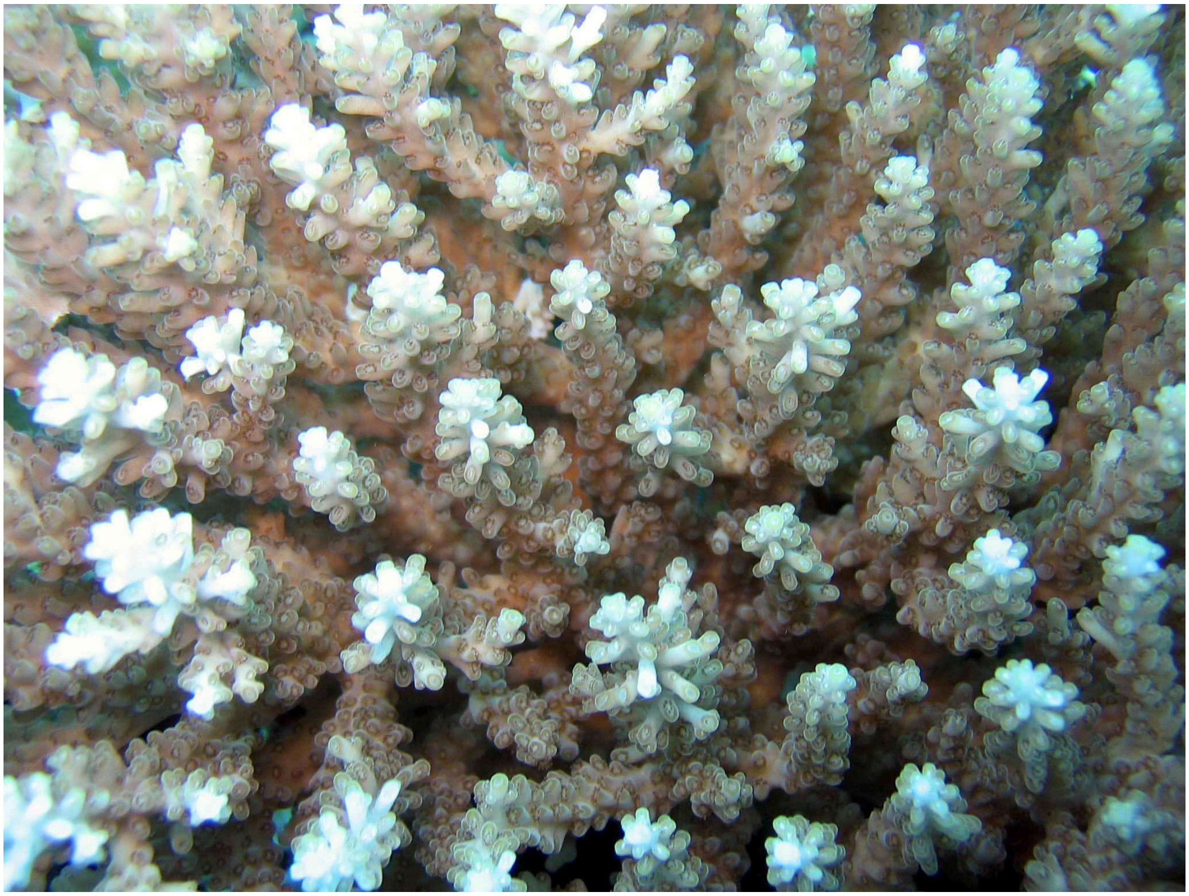
A close-up photo of *Acropora nasuta*.

Acropora cerealis (Dana, 1846)

This coral forms small bushes of upright branches. Branches are thin but have many long tubular corallites, so the corallites make up most of the effective diameter of the branch. The corallites are a larger part of the branch diameter than on *Acropora nasuta*. The corallites are longer and less uniform than on *Acropora latistella*. Branches are thicker and spikier than on *Acropora aculeus*. Radials are longer and colonies are not concentrated on the reef crest like *Acropora nana*. Brown with light branch tips, uncommon. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Muliava (Rose Atoll), Upolu, and Savai'i.



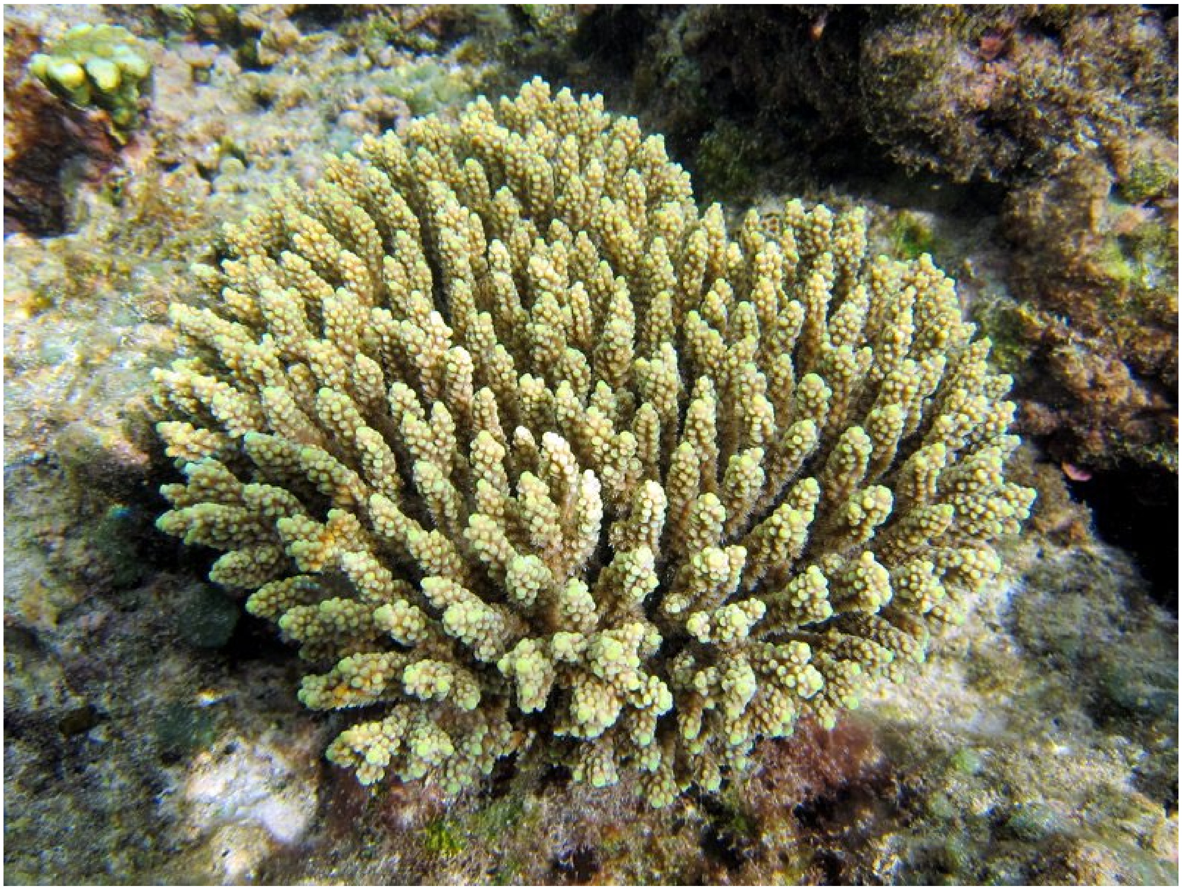
A colony of *Acropora cerealis*.



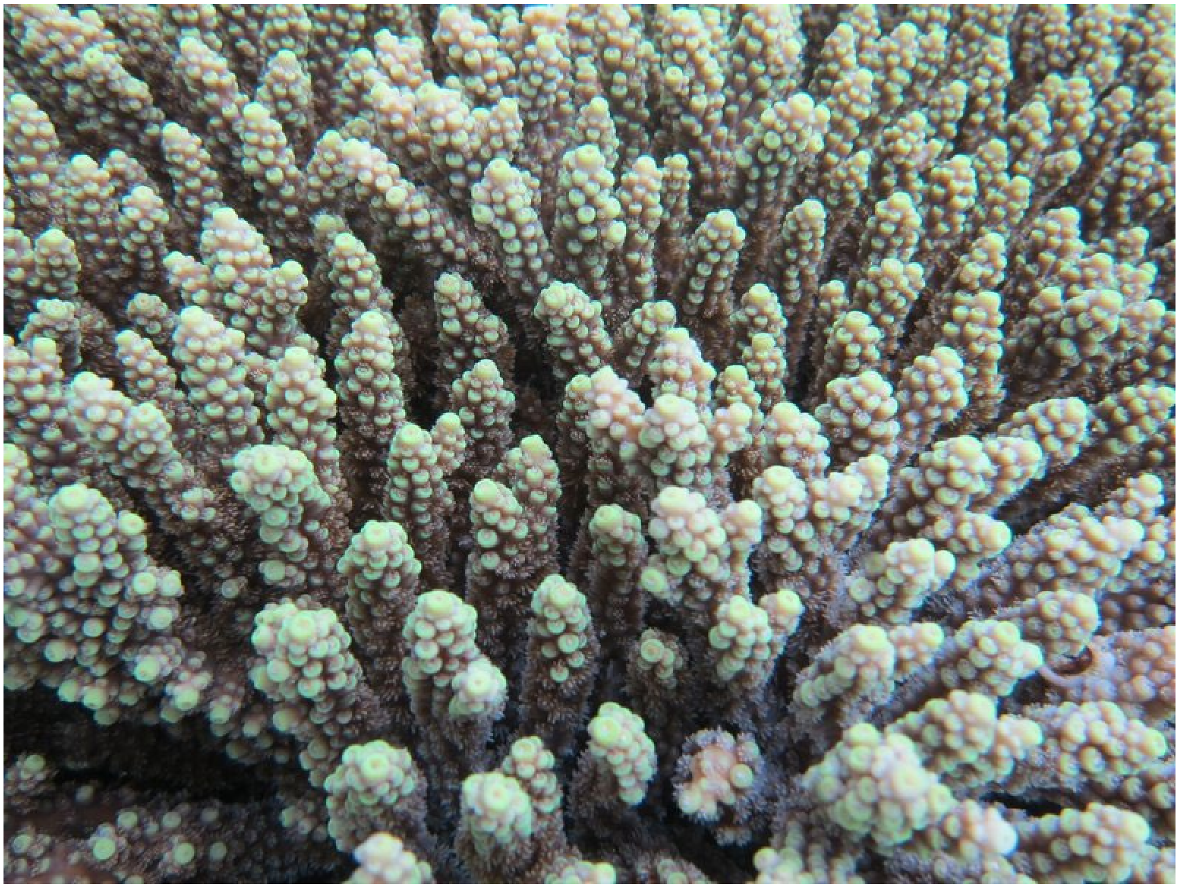
A close-up of *Acropora cerealis*.

Acropora chesterfieldensis Veron and Wallace, 1985

This coral is digitate with upright branches. Branches are long and thin, and parallel with not much side branching. Corallites on the branch sides are uniform, appressed, and some are in rows. The branches are thicker and taper less than on *Acropora latistella*, and the radial corallites more appressed. The axial is much larger on *Acropora verweyi*. The radial corallites are more uniform than on *Acropora aculeus* and *Acropora cerealis*, and not as long tubular as on *Acropora nasuta*. Colonies are yellow-green. Found in Ofu backreef pools. Found so far on Ofu-Olosega.



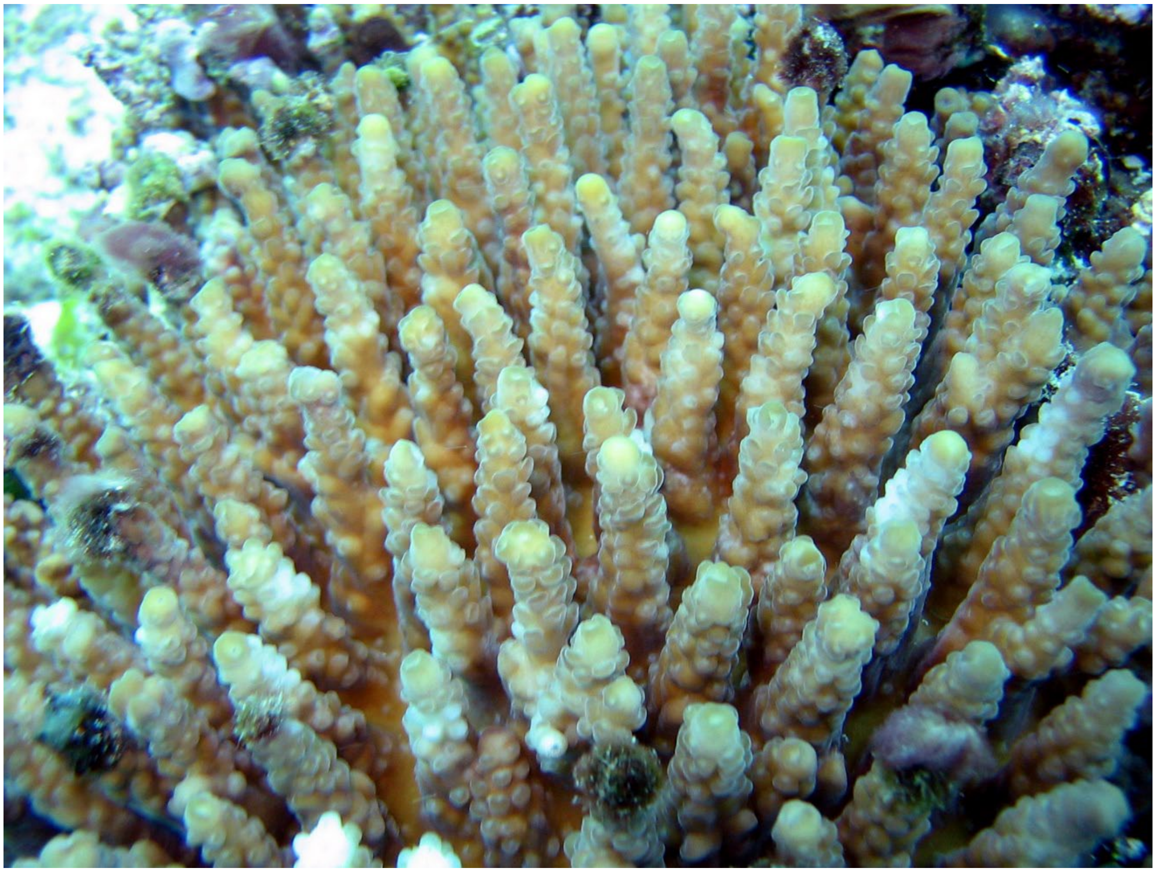
A colony of *Acropra chesterfieldensis*.



A close-up of *Acropora chesterfieldensis*.

Acropora cf. dendrum sensu Veron, 2000

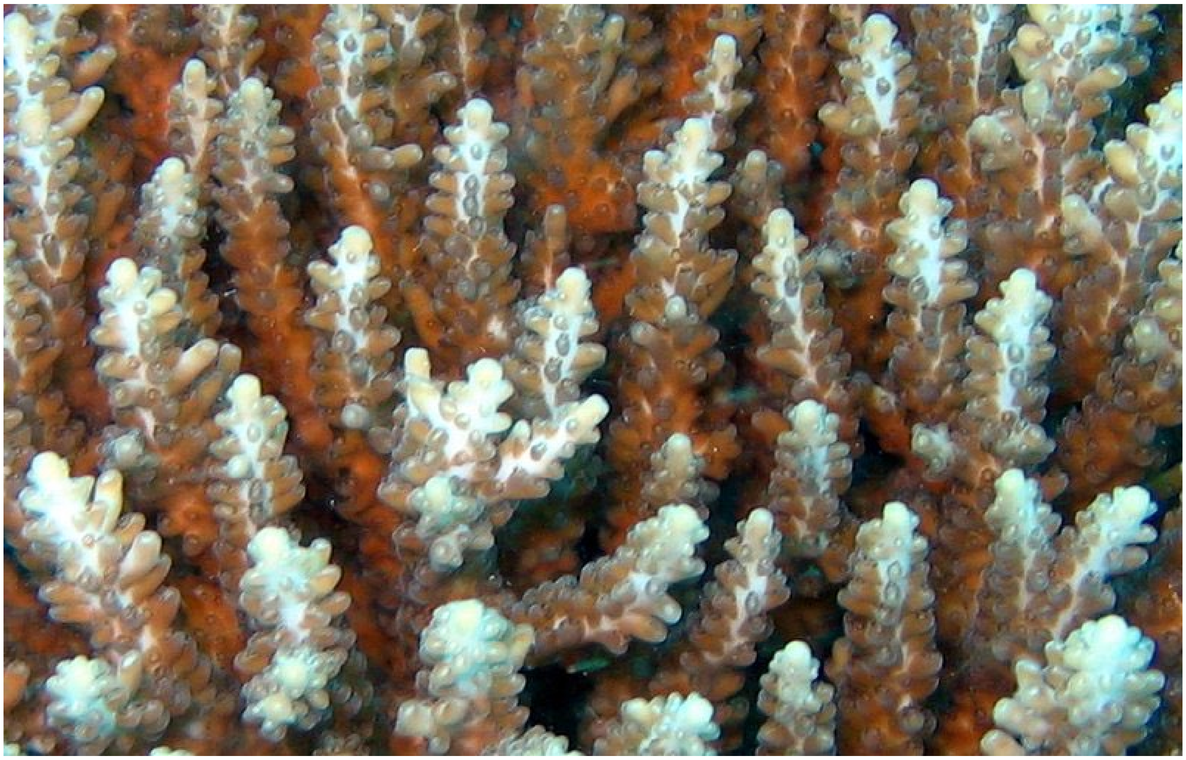
Corals form corymbose colonies with thin vertical branchlets. The radial corallites are short and uniform, looking small. The axial corallite is usually small, but one colony in Veron, 2000 has moderately large axial corallites. This colony appears similar. The type specimen has short radials and appears to have small axials, though most axials are broken off. However, it has horizontally growing branches and so is not corymobse, so this is not that species. The radial corallites are much smaller than on *Acropora verweyi*.



Acropora cf. *insignis* Nemenzo, 1967

This coral forms small bushy colonies. The radial corallites on branch sides are tubular and slanted strongly toward the end of the branch. The radial corallites are colored and contrast strongly with the white of the branch. The radial corallites contrast in color with the branch than on other species. Corallites are longer and more tubular than on *Acropora latistella* and *Acropora chesterfieldensis*. Brown or green, rare. Found so far on Tutuila and Aunu'u.

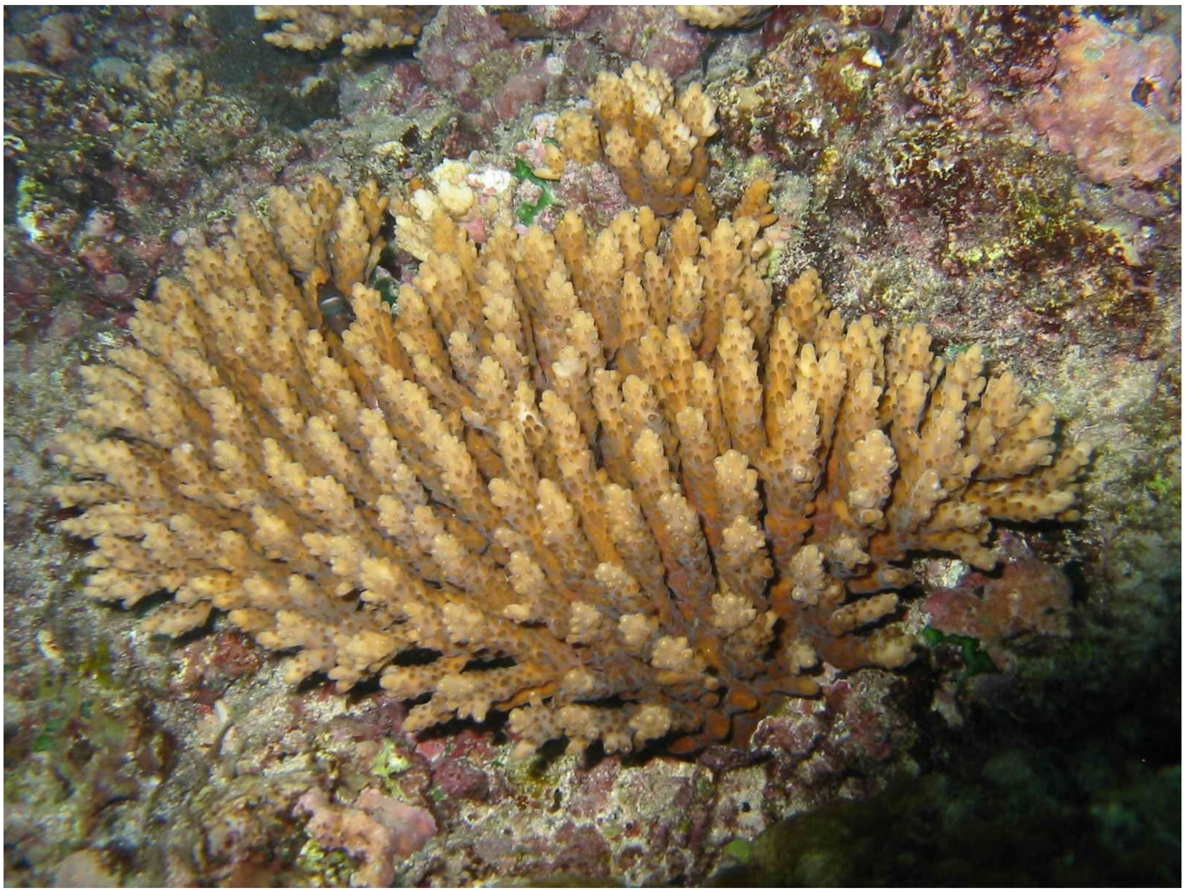
A colony of *Acropora* cf. *insignis*.



A close-up of *Acropora* cf. *insignis*.

Acropora nana (Studer, 1878)

This coral forms small bushes of thin branches on and near the reef crest. Branches are about pencil diameter, and usually are vertical or radiate from the center. Most radial corallites are fused to the branch (appressed) and point toward the end, though some are tubular and project. The branches are thicker on *Acropora nana* than on *Acropora aculeus*. The radial corallites are longer and more irregular than on *Acropora latistella* and *Acropora chesterfieldensis*. Radail corallites are shorter than on *A. cerealis*. *Acropora nana* is more restricted to the reef crest than most other species. Reddish-brown, rarely with light green polyps, usually dominates the reef crest, rare elsewhere. Found so far on Tutuila, Aunu'u, Ofu-Olosega, and Muliava (Rose Atoll).

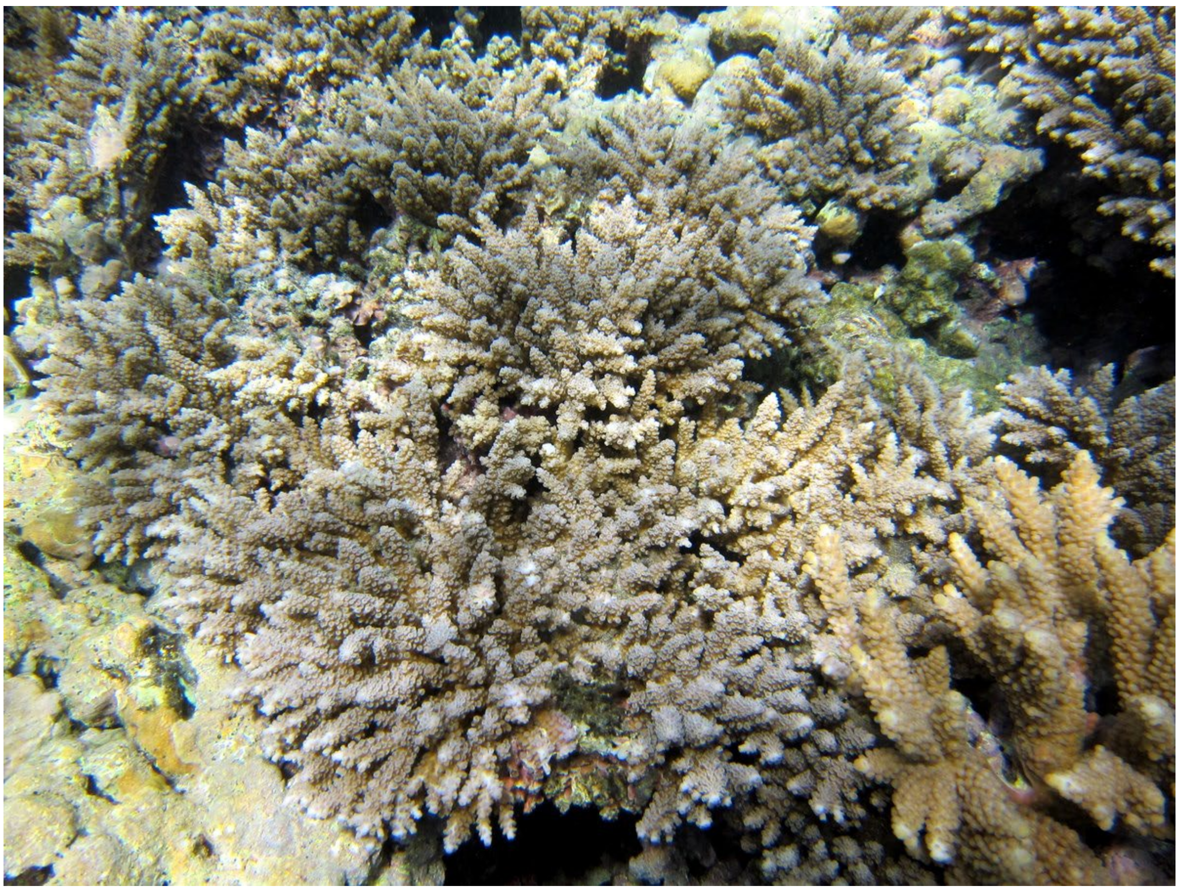


A colony of *Acropora nana*.

A close-up of *Acropora nana*.

Acropora pagoensis Hoffmeister, 1925

This coral forms dense scraggly branching colonies with branches about 1 cm (3/8 in) thick, and has many side branches which are typically close together in shallow water. In a few colonies side branches are uniformly small and short. Radial corallites are close together and have sharp edges and most are short and have an opening slanted toward the branch tip. Some are uniformly a little longer and tubular and some are longer incipient axial corallites. Usually light reddish brown, uncommon on reef slopes and common on the reef flat at Alofau. The radial corallites have thinner walls and not all are tubular, unlike on *Acropora austera*. Branches are usually closer together, radial corallites are closer together, radial corallites have thicker walls, and incipient axials are shorter, and the color is more tan than *Acropora akajimensis*. I believe these are the first color photos of living colonies ever shown in a guide. This species is not recognized in any modern taxonomic works. See taxonomic note. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Upolu, and Savai'i. Abundant on Alofau reef flat, uncommon most places, present on both reef flats and reef slopes. Richard Randall says he has found it in Taiwan, but the author has not seen it outside the Samoan archipelago.



Acropora pagoensis in shallow water with branches close together.

A colony of *Acropora pagoensis*.

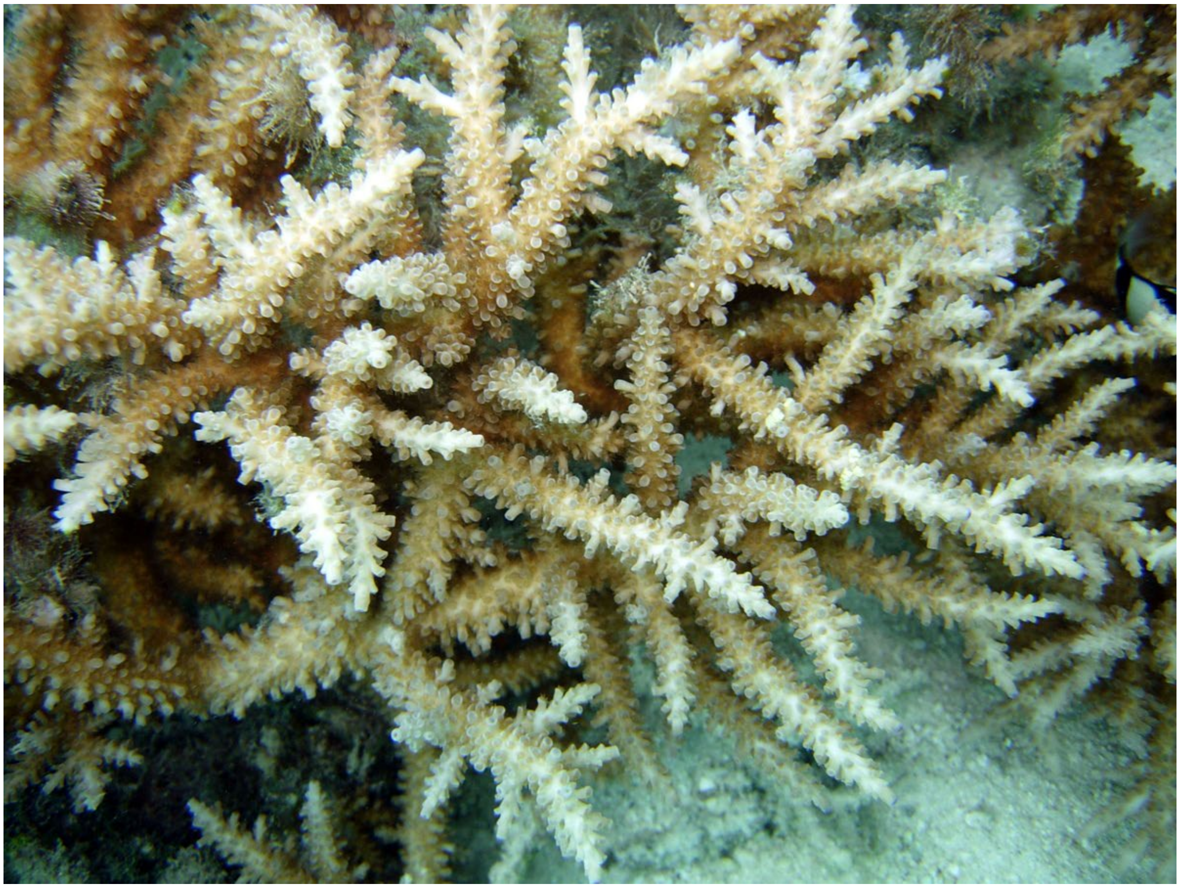
A close-up of *Acropora pagoensis*.

A close-up of *Acropora pagoensis*.

Acropora akajimensis Veron, 1990

This coral makes bushy colonies with branches going in a variety of directions. Branches are not especially close together, and they branch frequently. The axial corallites are tubular, and there are many short radial corallites that have openings slanted towards the branch tips. There are also many longer, tubular, incipient axial corallites along branch sides, and radial corallites near branch tips may be mostly long tubular. Branches are usually farther apart than on *Acropora pagoensis*, and there is more sub-branching. Also, the incipient axial corallites on branch sides are longer and the color is more a light yellow-brown. Rare, found on the reef slope and extends below 100 feet (30 m) deep.

Acropora akajimensis.

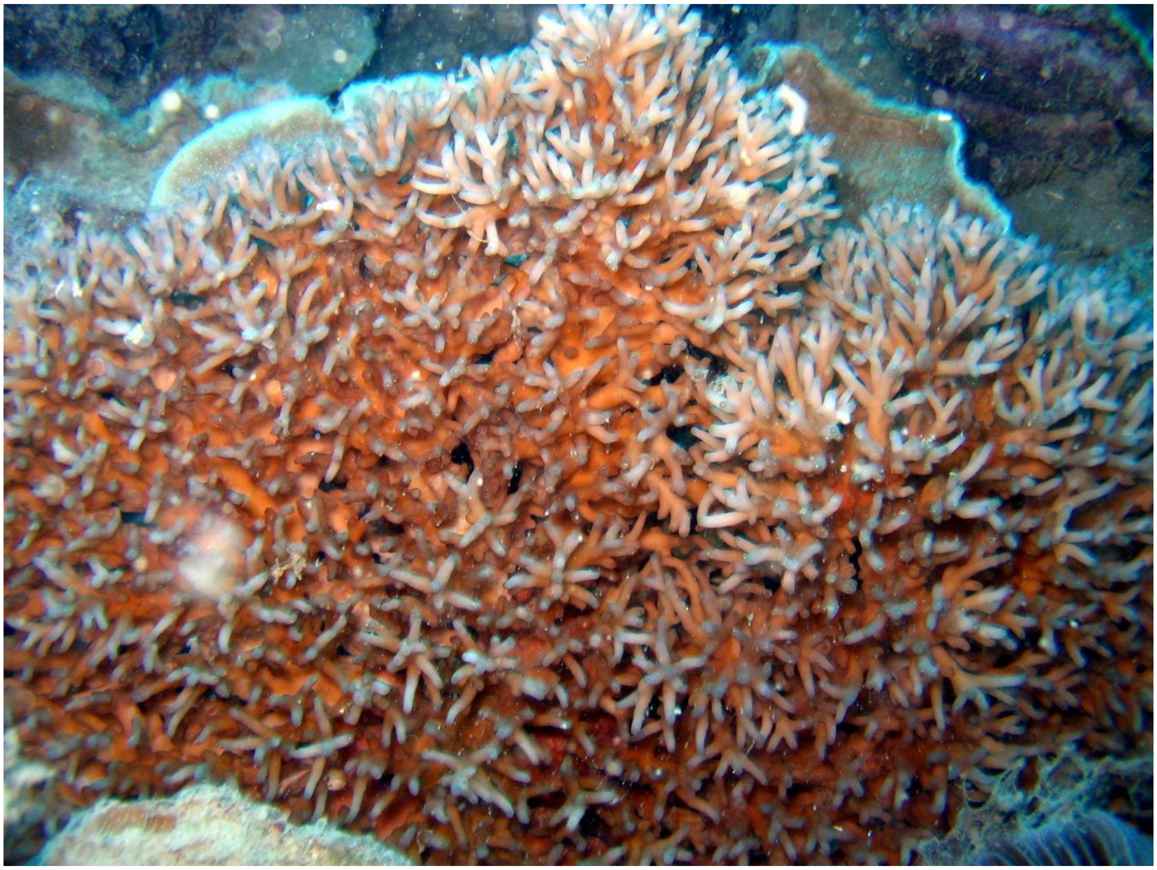


A closer picture of *Acropora akajimensis*.

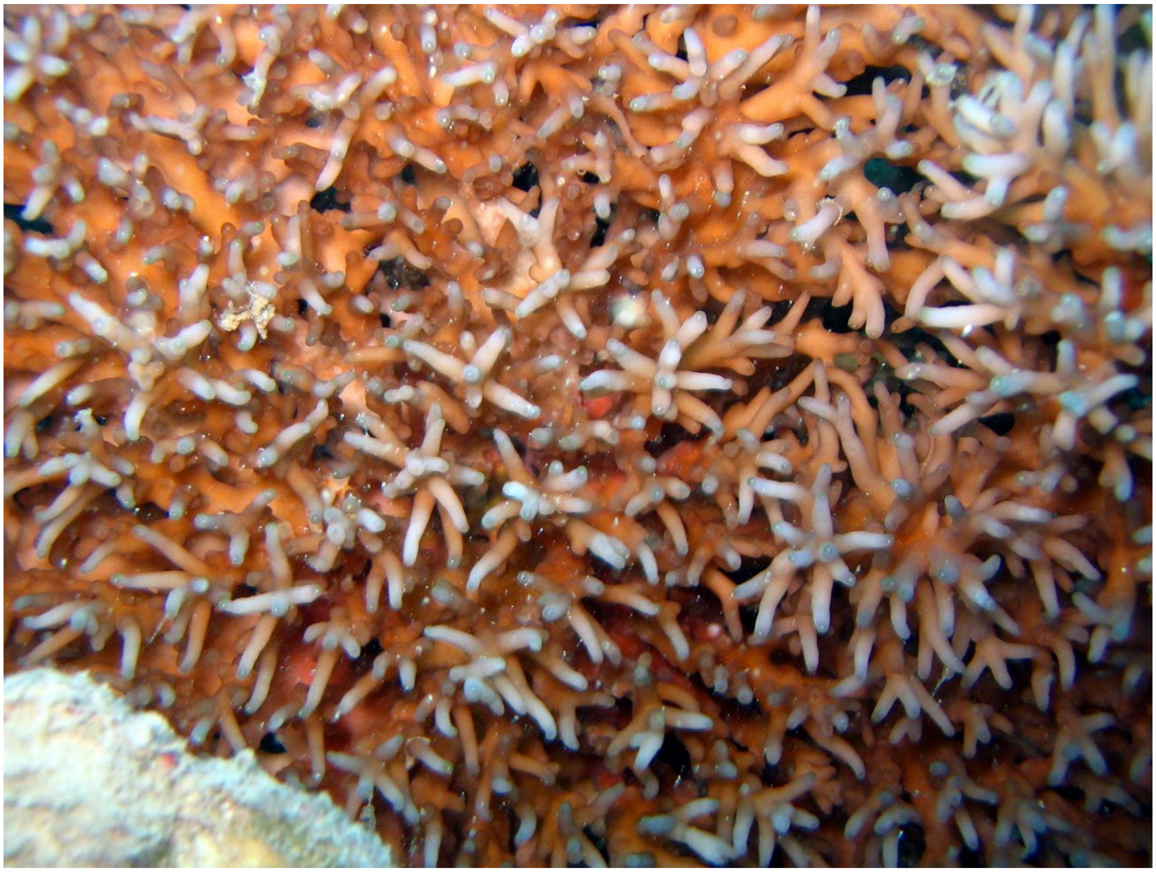
A close-up of *Acropora akajimensis*.

Acopora caroliniana Nemenzo, 1976

Colonies are flat topped, side-attached brackets. The upper surface has long tubular axial and incipient axial corallites and few readial corallites. Some of the axial corallites are nearly vertical and may have radiating incipient axial corallites in a formation that resembles a Christmas tree. Also, the corallites may taper. One or the other or both occur on colonies of this species, and both occur on the type specimen. *Acropora granulosa* is similar but the corallites neither form Christmas tree-like formations nor do the corallites taper. Corallites on *Acropora speciosa* are thinner.



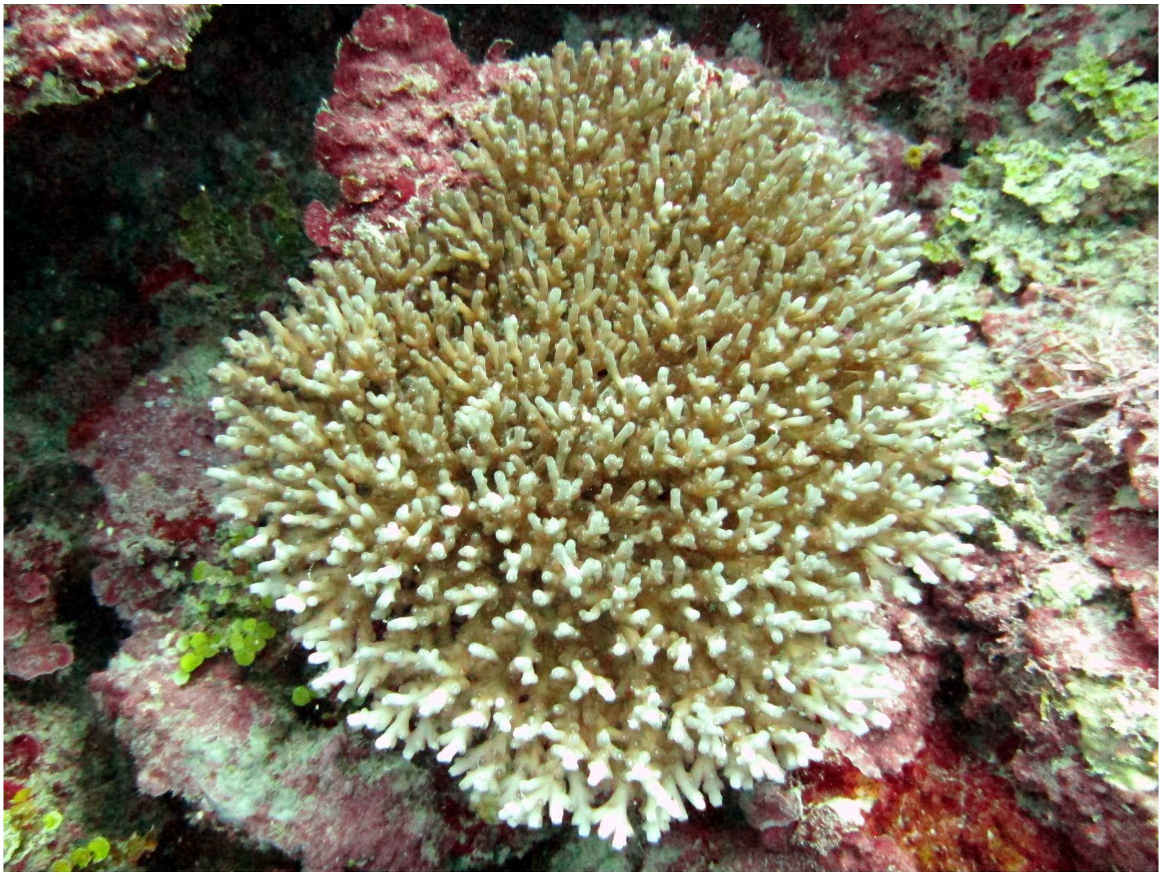
A photo looking down on *Acropora caroliniana*.



A closeup photo of *Acropora caroliniana*.

Acropora granulosa (Milne Edwards, 1860)

Colonies are usually less than 40 cm (1 foot) diameter and flat topped, corymbose-cespitose, with fairly long, smooth, tubular axial and incipient axial corallites extending from small branchlets. Colonies are similar to *Acropora speciosa* but the axial and incipient axial corallites are thicker. *Acropora aculeus* has fewer long tubular incipient axials. Rare.

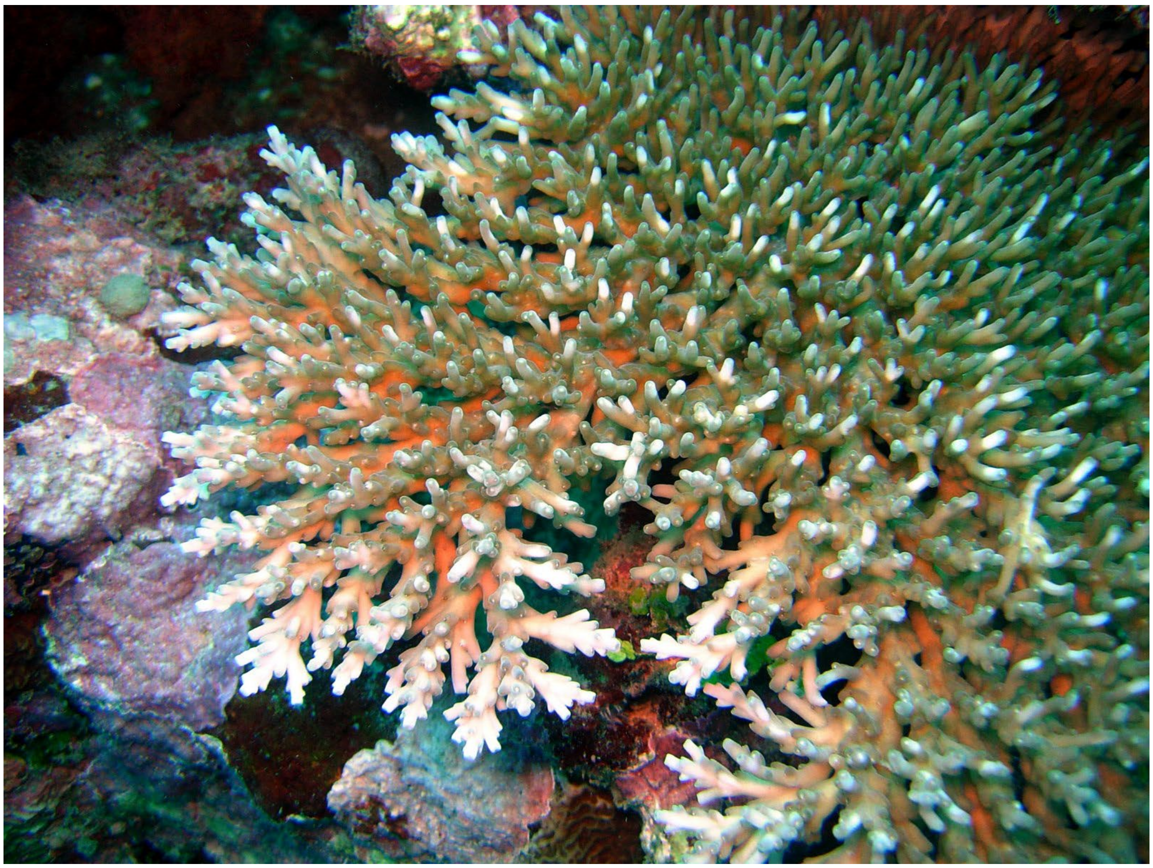


A colony of *Acropora granulosa*.

A close up photo of *Acropora granulosa*.

Acropora speciosa (Quelch, 1886)   Threatened   Vulnerable

This coral forms small flat-topped colonies with scraggly branchlets and many long smooth incipient axials and axials. Many radials are similar. All have blunt ends with thick walls. Axials and incipient axials are similar to *A. aculeus* but thinner, branchlets are thinner and there are many fewer radial corallites. Axials have more rounded ends than the sharp ends on *Acropora jacquelineae* and corallites are farther apart. Axial corallites are thinner than on *Acropora granulosa*. Usually rust colored, uncommon to rare, lower reef slopes. Found so far on Tutuila and Upolu. Found deeper than about 60 feet (18 m), apparently more common below 100 feet (30 m). Www.coralsoftheworld.org (Veron's website) now has a concept of this species the same as Wallace (1999), though Veron (2000) had a different concept. Colonies in American Samoa actually have axial corallites that are intermediate in diameter between *A. speciosa* and *A. granulosa*.

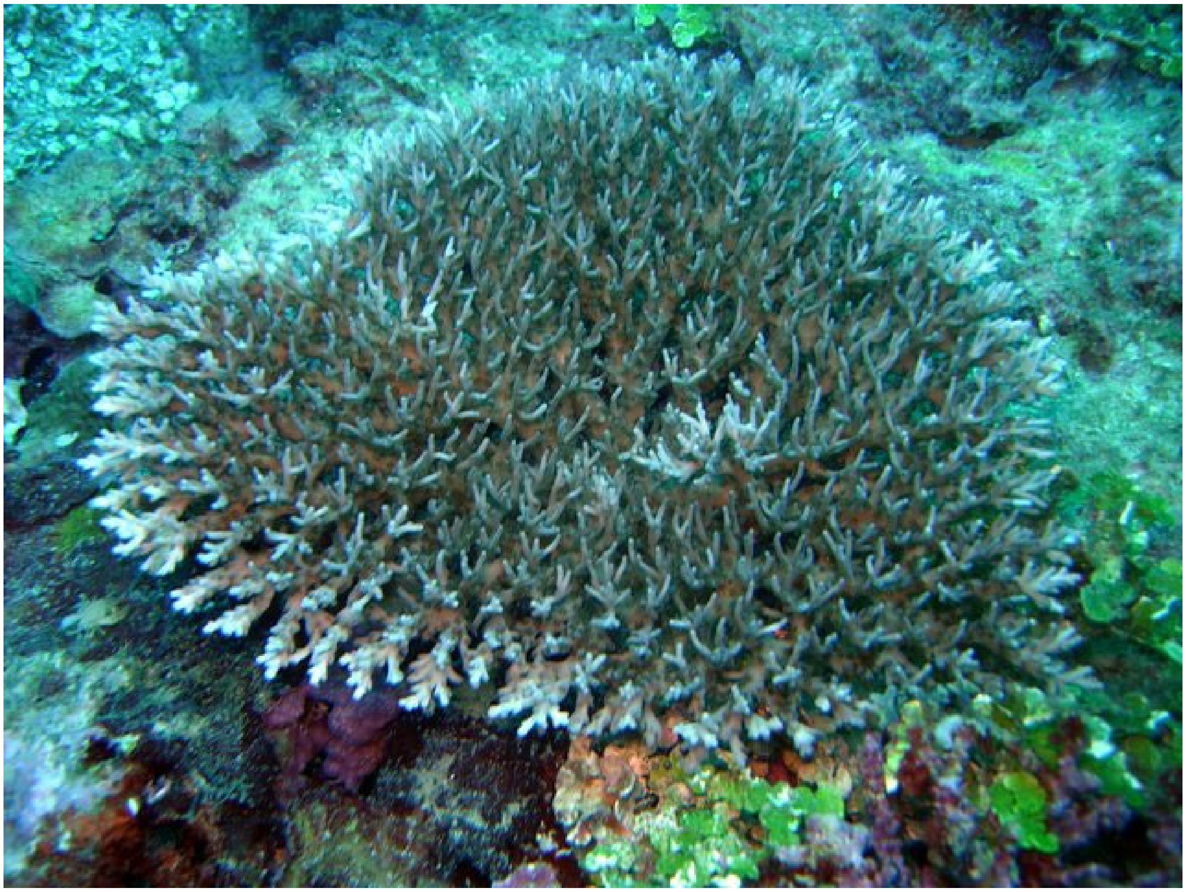


A colony of *Acropora speciosa*.

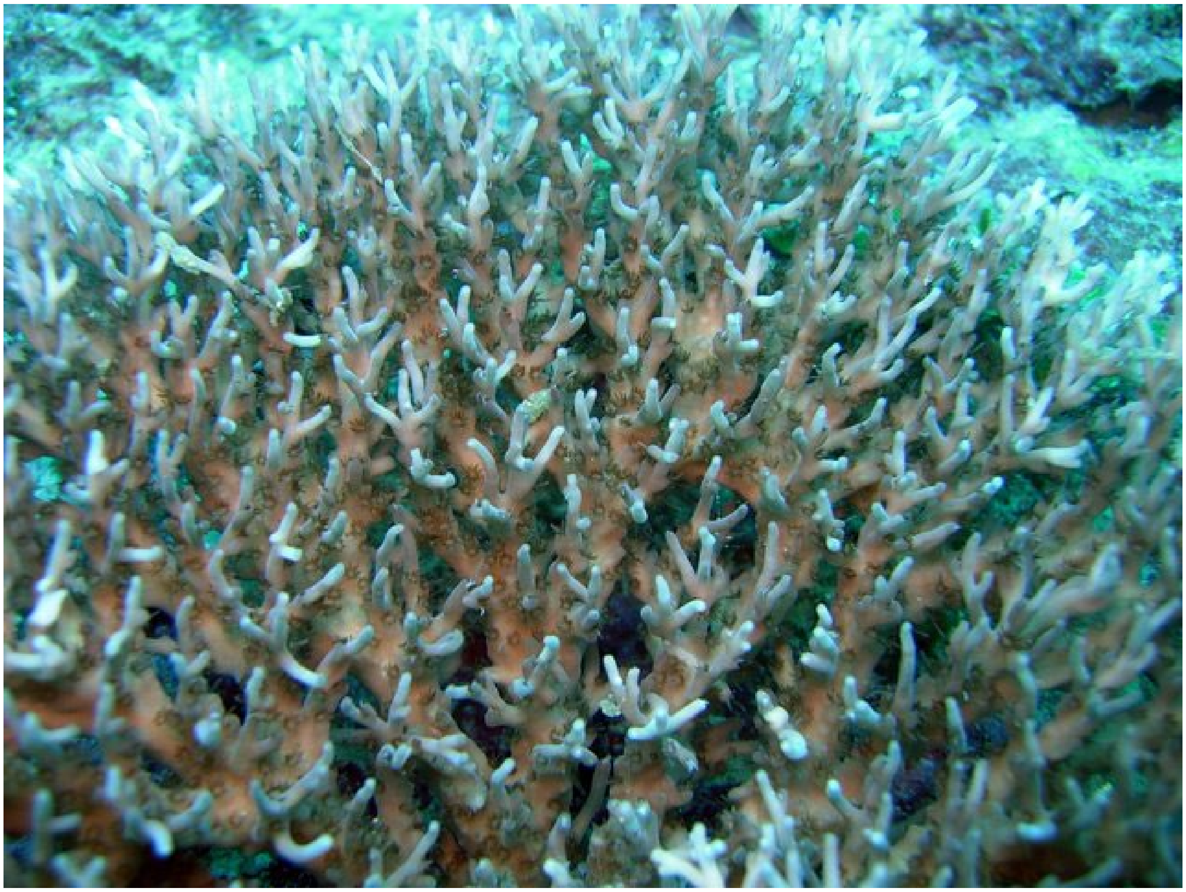
A close-up of *Acropora speciosa*.

Acropora jacquelineae Wallace, 1994 Threatened Vulnerable

This coral forms small flat-topped colonies with many thin long axial and incipient axial corallites growing upward. Axials and incipient axials have thin walls and are only about 1 mm thick. This species is similar to *A. speciosa*, but there are fewer radial corallites, the axials and incipient axials may be slightly thinner, and branchlets and corallites are closer together. They can only be reliably distinguished under the microscope. Found on lower reef slopes, rare. Found so far on Tutuila and Ta'u.



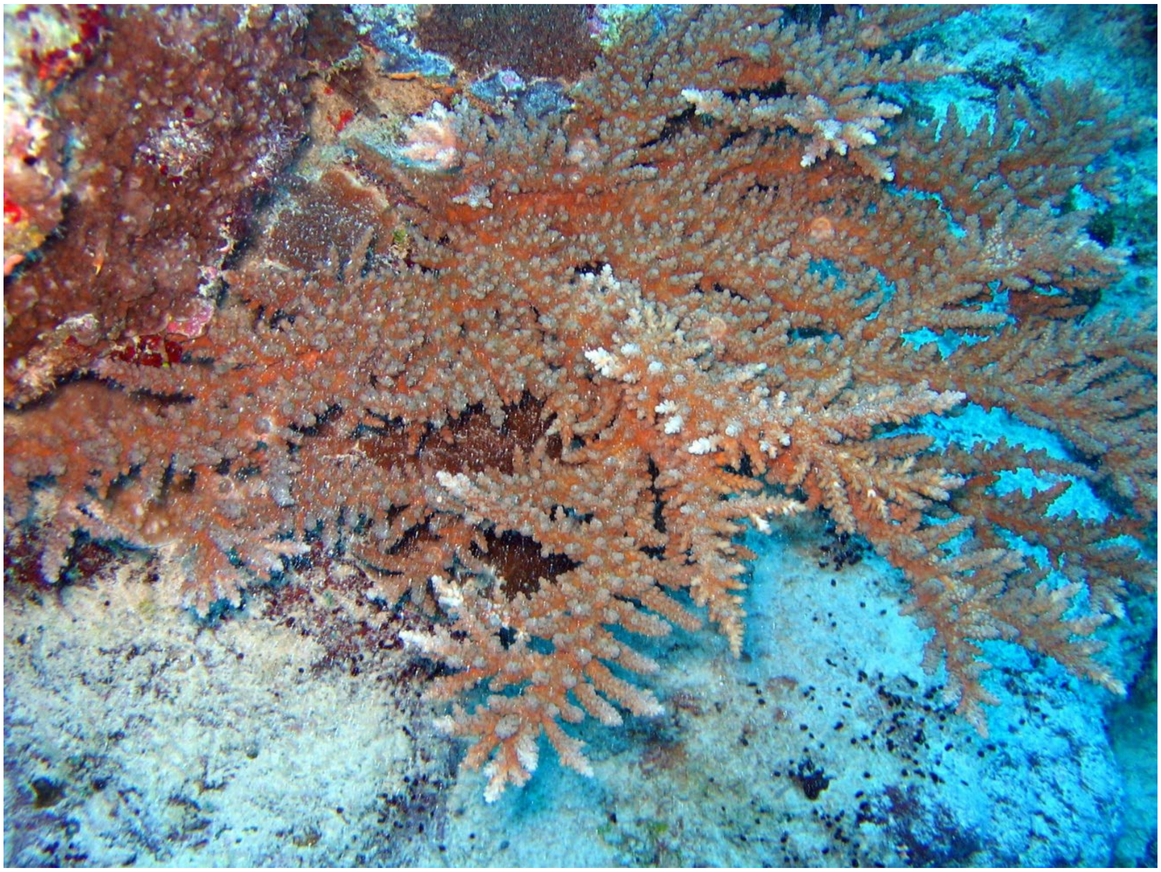
A colony of *Acropora jacquelineae*.



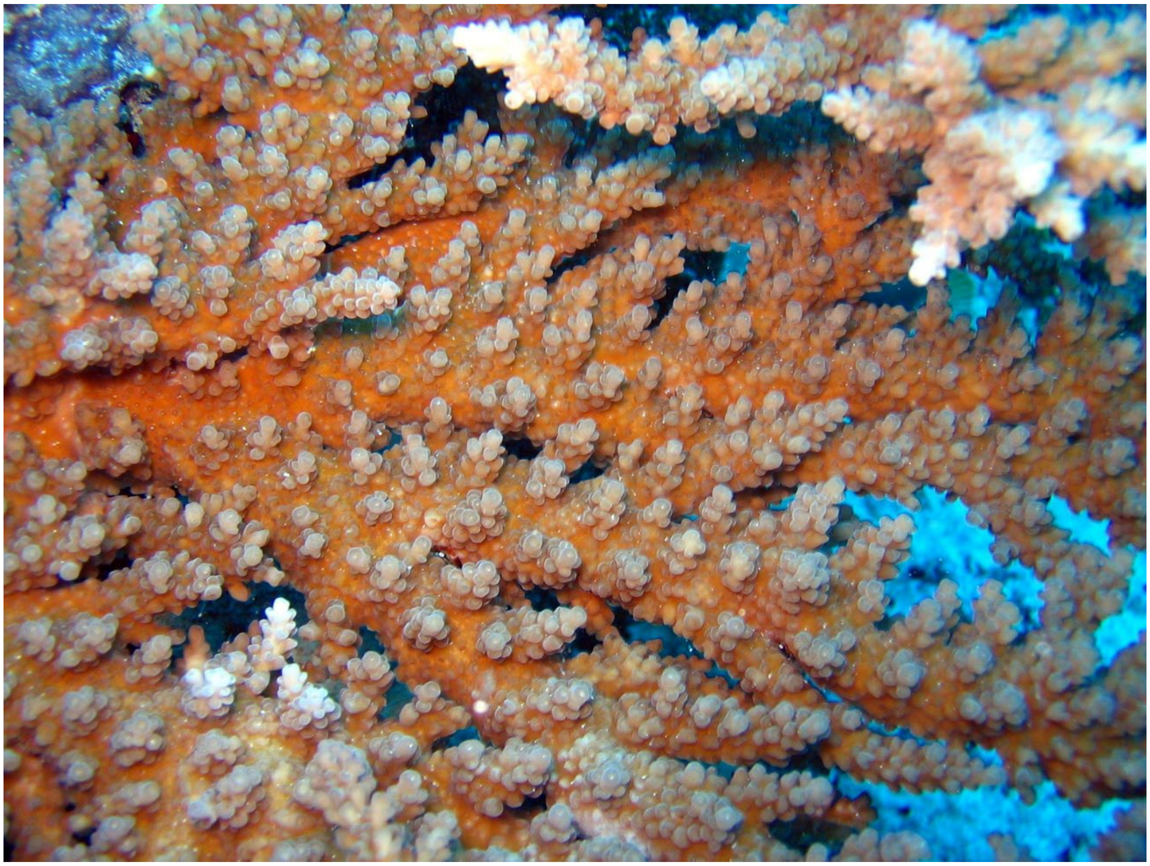
A close-up photo of *Acropora jacquelineae*.

Acropora cf. florida sensu Wallace, 1999

Colonies are branching with uniform short thick branchlets. Branches are fairly large, spread horizontally. In Amnerican Samoa they are cylindrical and tapering with many side branches, but some places they are oval or flattened in cross section with fewer side branches. The axial corallites are thick.



A large colony of *Acropora* cf. *florida sensu* Wallace, 1999.



A closer photo of *Acropora* cf. *florida sensu* Wallace, 1999.

A closeup photo of *Acropor*a cf. *florida* sensu Wallace, 1999.

Acropora verweyi Veron & Wallace, 1984 Vulnerable

This coral forms small bushy colonies with radiating pencil-diameter branches. The axial corallites are very large and flat ended, having very thick walls and a small opening. Radial corallites are very uniform, short, thick walled, and pointing toward the branch tip. The axial corallite is much larger than on *Acropora latistella* or *Acropora chesterfieldensis*. Colonies are corymbose with shorter radials and thinner more uniform branches than *Acropora austera* (which has similar axials). Brown with a yellow branch tip and white centers to radial corallites, rare except in the Ofu pools, where it is uncommon. Found so far on Tutuila, Aunu'u, and Ofu-Olosega.

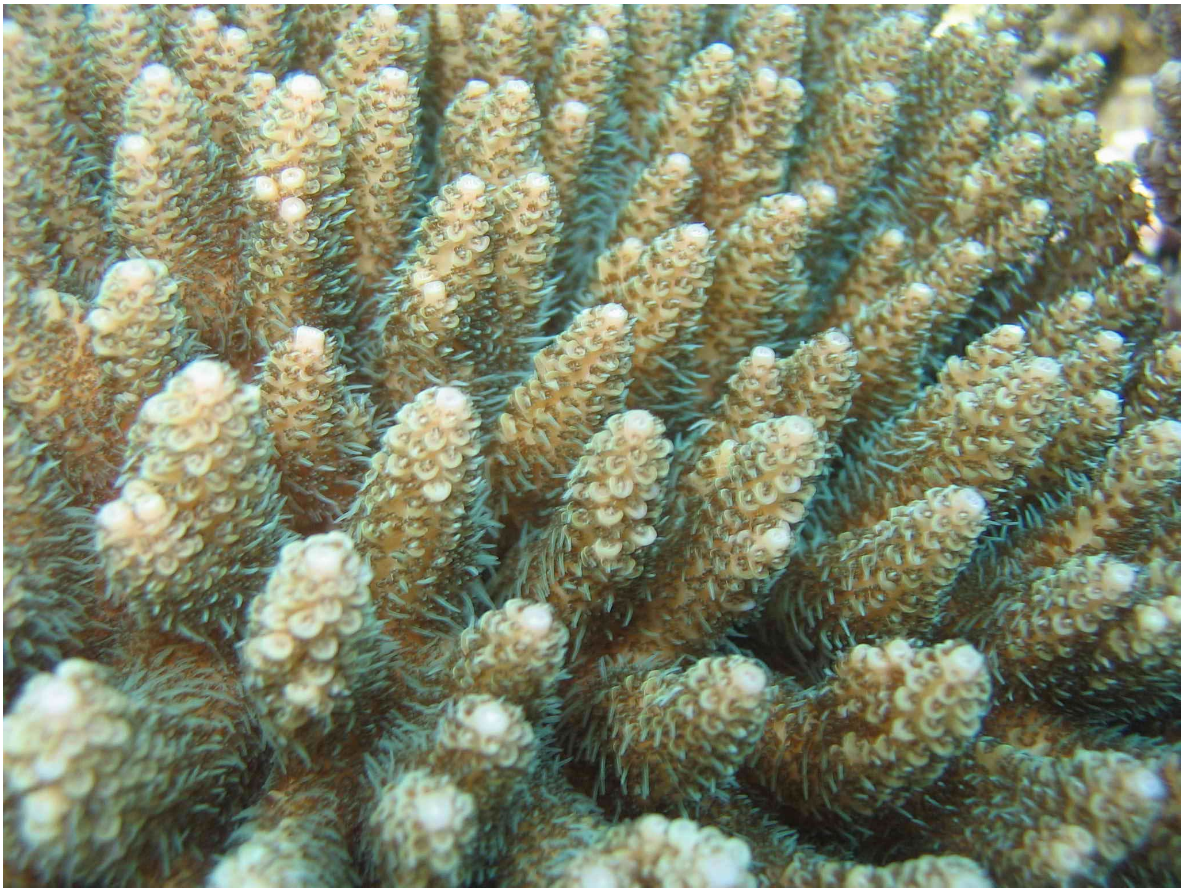
A colony of *Acropora verweyi*.

A close-up of *Acropora verweyi*.

Acropora surculosa (Dana, 1846)

This coral forms small cushions about 10-20 cm (4-8 in) diameter, composed of vertical branchlets. Branchlets are close together, taper from a diameter of up to 1 cm (1/3 in) near the base to a sharp tip only about 1 mm diameter, have little branching and little to no incipient axials, but can divide into two or more vertical branchlets that look like fused branchlets. Lower parts of branchlets have long thin tentacles out in the day. The branchlets are thicker on *Acropora digitifera*, and tentacles on *A. surculosa* are extended more than any other species. Colonies are smaller and not tables and branchlets are longer than on *Acropora hyacinthus*. Branch tips are smaller than on *Acropora verweyi*. Green or reddish brown, uncommon to rare, upper reef slopes and sometimes reef flats or pools. Found so far on Tutuila, Aunu'u, and Ofu-Olosega.

A colony of *Acropora surculosa*.

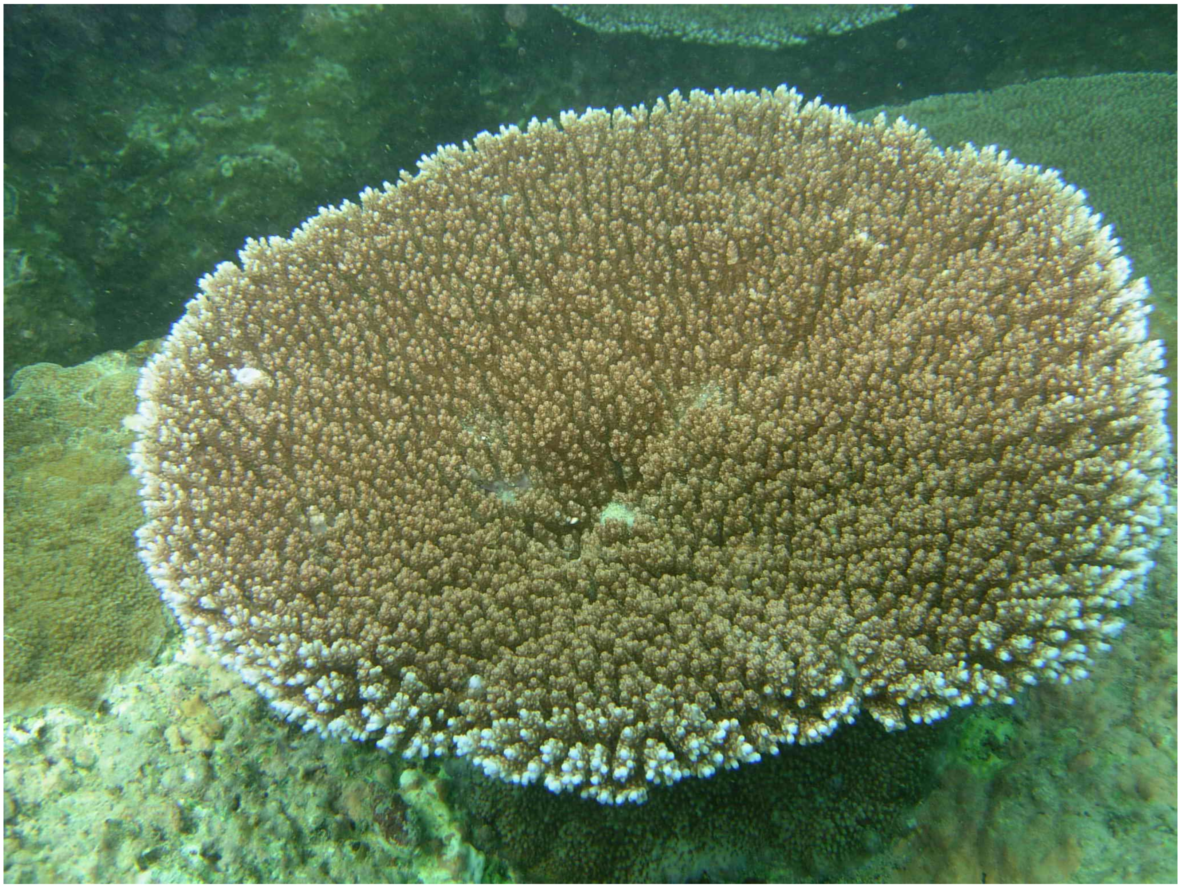


A close-up of *Acropora surculosa*.

Acropora hyacinthus (Dana, 1846) "table coral"

This coral forms tables that can have a second smaller tier. The upper surface is composed of small vertical branchlets which taper strongly and which have radial corallites with projecting lower lips that can look like rose petals from above. Tentacles may be extended. Colonies in backreef pools may have longer branchlets that partly separate near the edge of the table. The branchlets are thick compared to those on *Acropora cytherea*. Colonies form tables or tiers, unlike *Acropora surculosa*, and the branchlets and tentacles are not as long. Reddish-brown, rarely green, common, dominates the center-west section of Fagatele Bay and parts of the crest at Fagasa, most common on upper reef slopes. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Muliava (Rose), Upolu and Apolima.

Several colonies of *Acropora hyacinthus*.

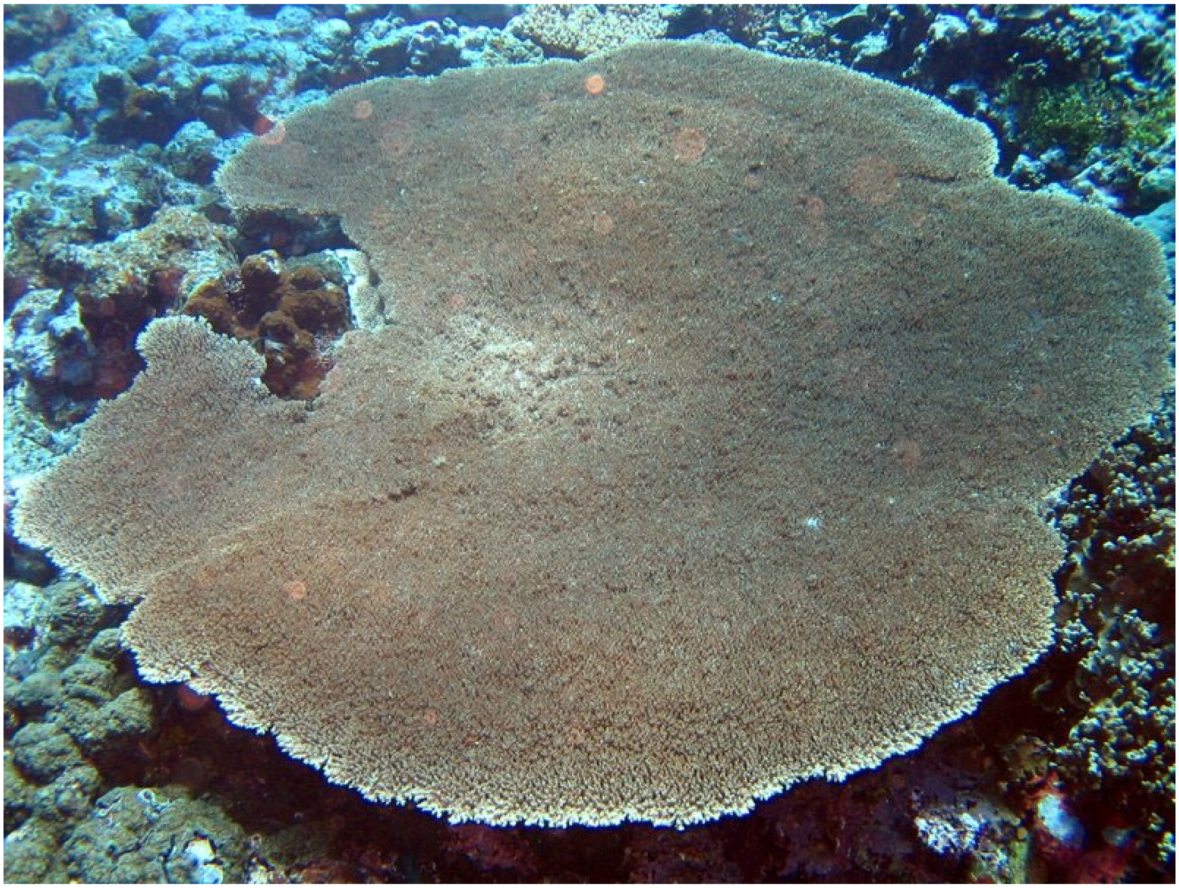


A young colony of *Acropora hyacinthus*.

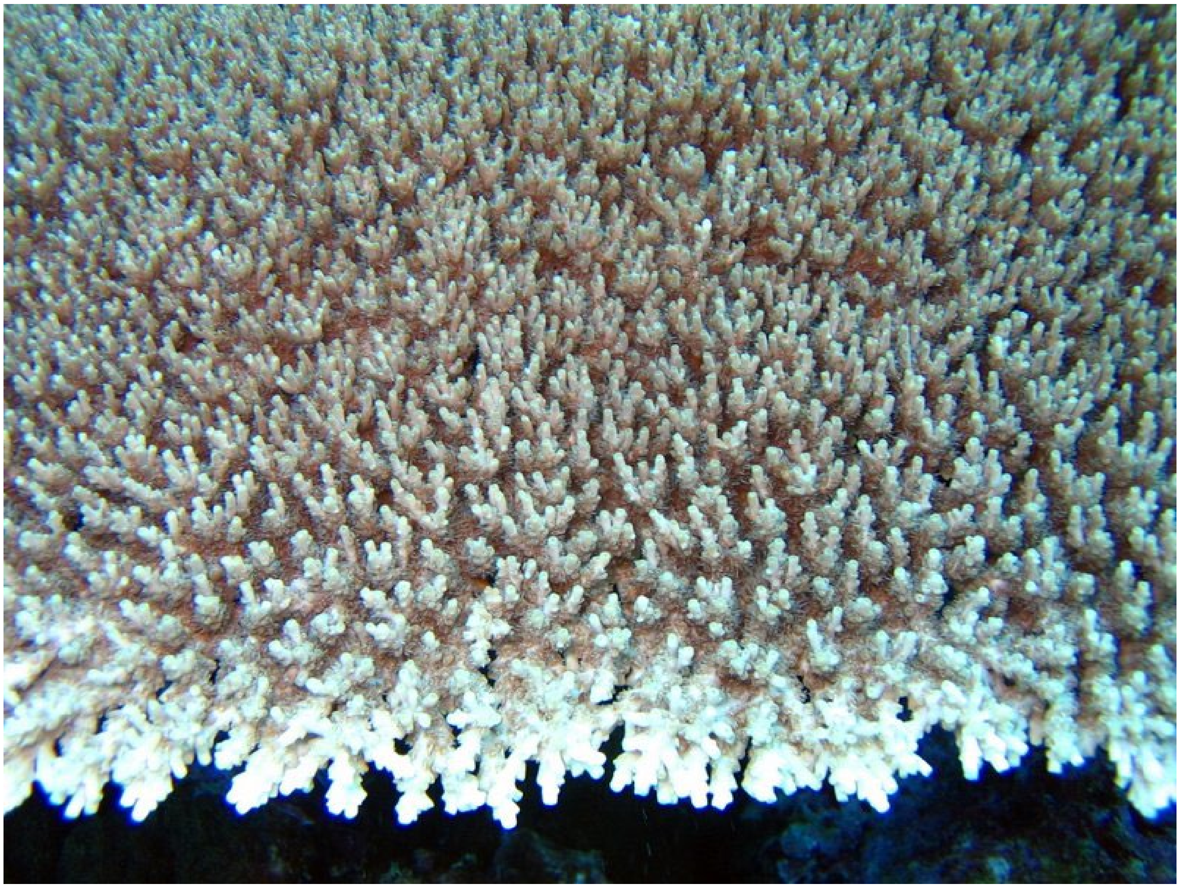
A close-up of *Acropora hyacinthus*.

Acropora cytherea (Dana, 1846) "table coral"

This coral forms large tables which can sometimes have a smaller second tier. The upper surface is covered with a carpet of very small tubular vertical axial tips of small, thin branchlets. Radials on the branchlets are elongated and point toward the tip, not flattened lower lips as on *A. hyacinthus*. The branchlets are thinner than on *Acropora hyacinthus*, and are vertical unlike on *Acropora paniculata*, where long axials radiate from the tips of short branchlets. Grey-brown, uncommon, slopes and reef flats. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Upolu, and Apolima.



A large colony of *Acropora cytherea*.

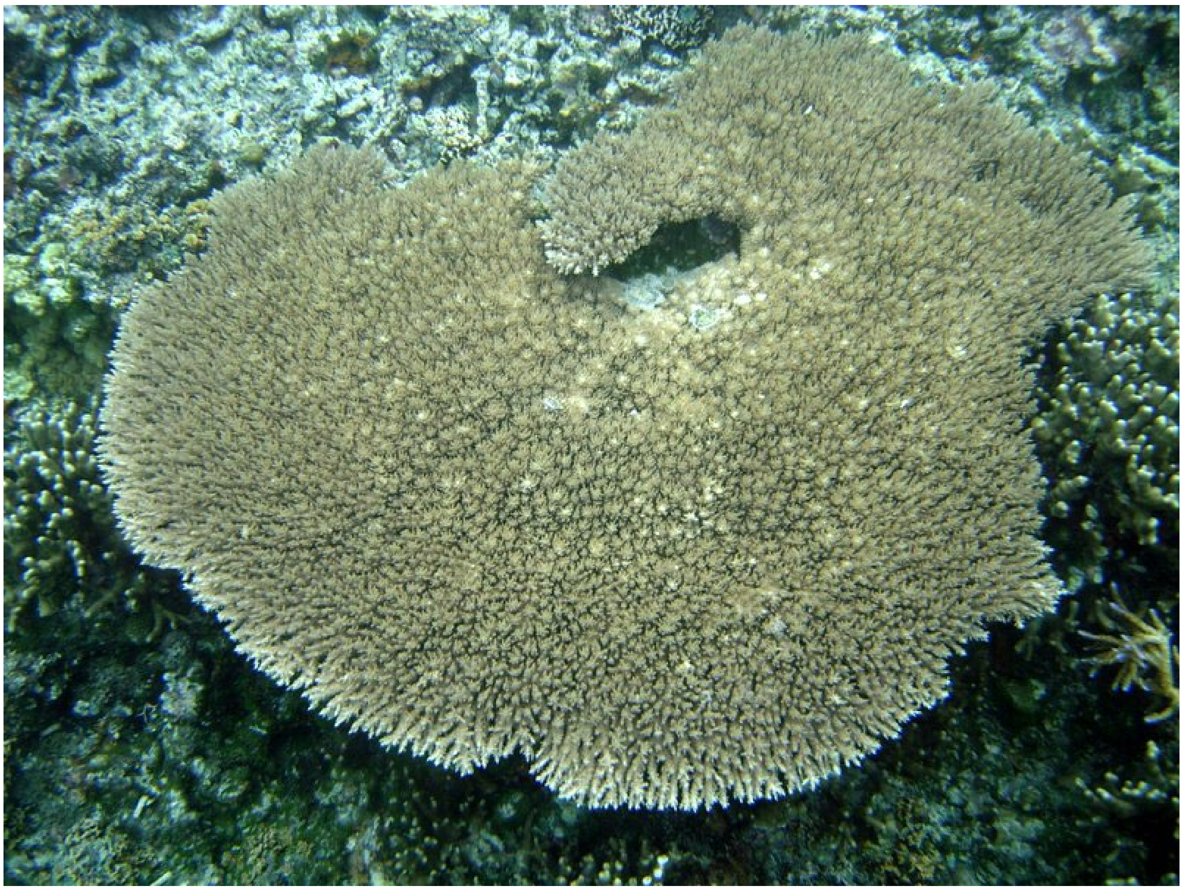


A close-up of *Acropora cytherea*.

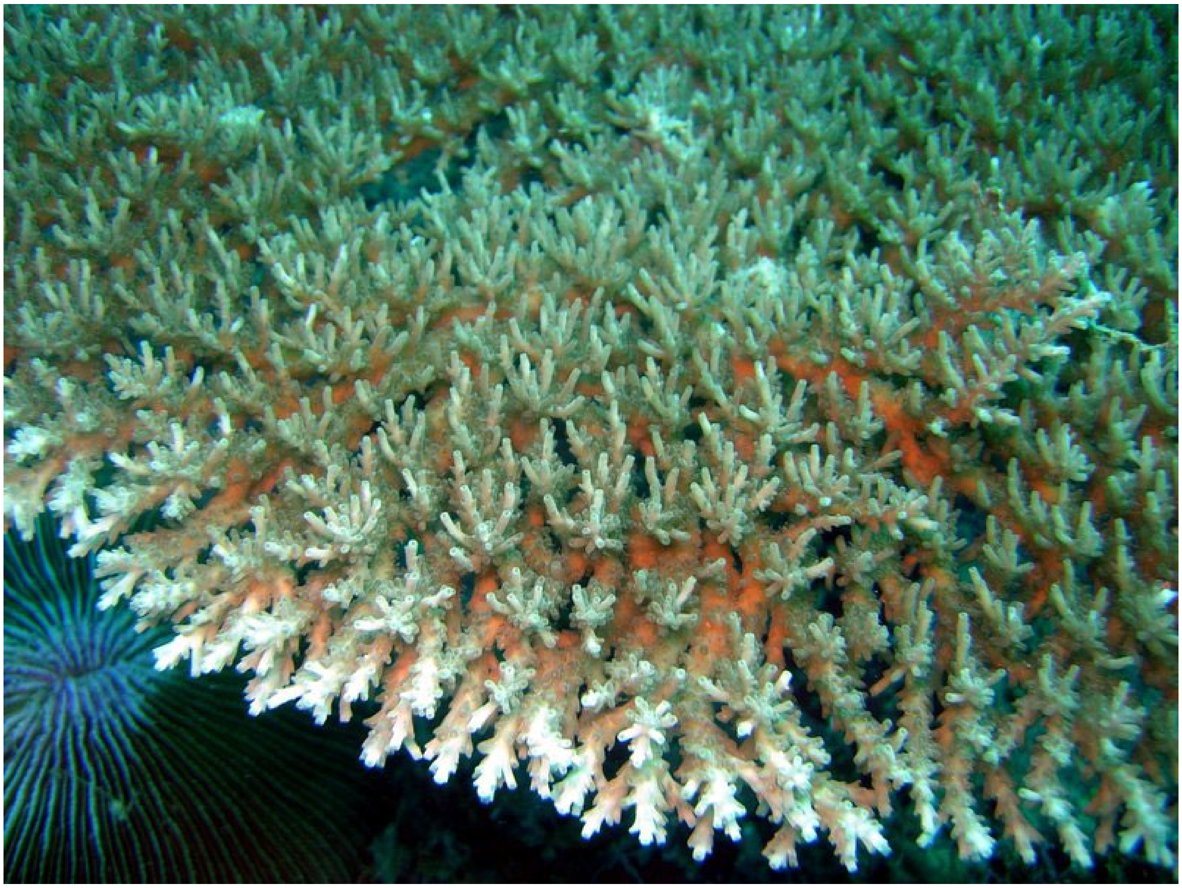
An extreme close-up of *Acropora cytherea*.

Acropora cf. *paniculata* Verrill, 1902 *sensu* Wallace, 1999 "table coral" Vulnerable

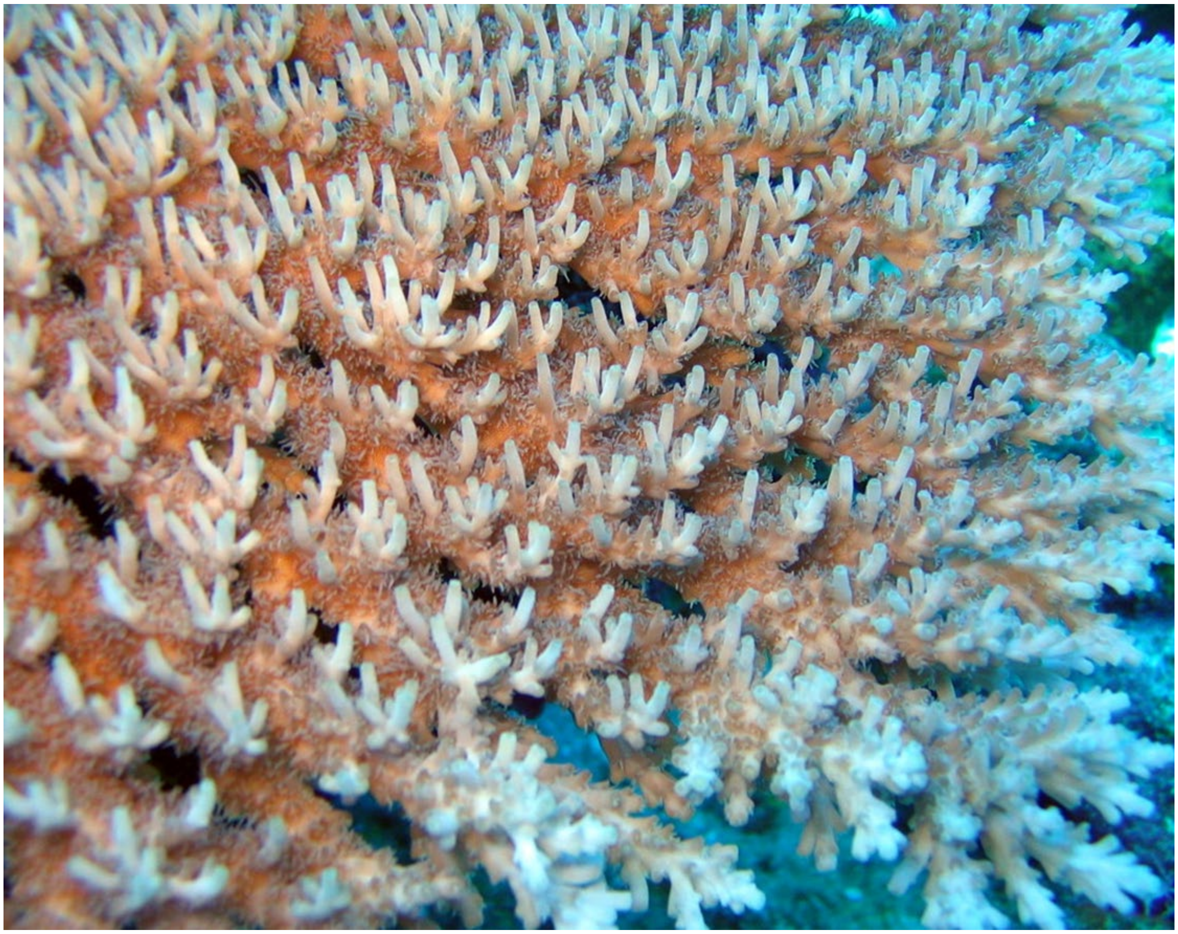
This coral forms large tables, usually with just one tier. Branchlets are usually short and have many radiating long tubular corallites which are axials or incipient axials. Branchlet tips may point outward and upward or curve upward. Axial corallites are radiating and bushy instead of all vertical and close together as on *A. cytherea*. *Acropora paniculata* forms tables which are larger than colonies of *Acropora jacquelineae*. *Acropora paniculata* has more radial corallites than *Acropora jacquelineae* and axials radiate more obviously from branchlet tips than on *Acropora jacquelineae*. Brown, more common in deeper water. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Muliava (Rose), and Upolu. See taxonomic note.



A colony of *Acropora* cf. *paniculata sensu* Wallace (1999)



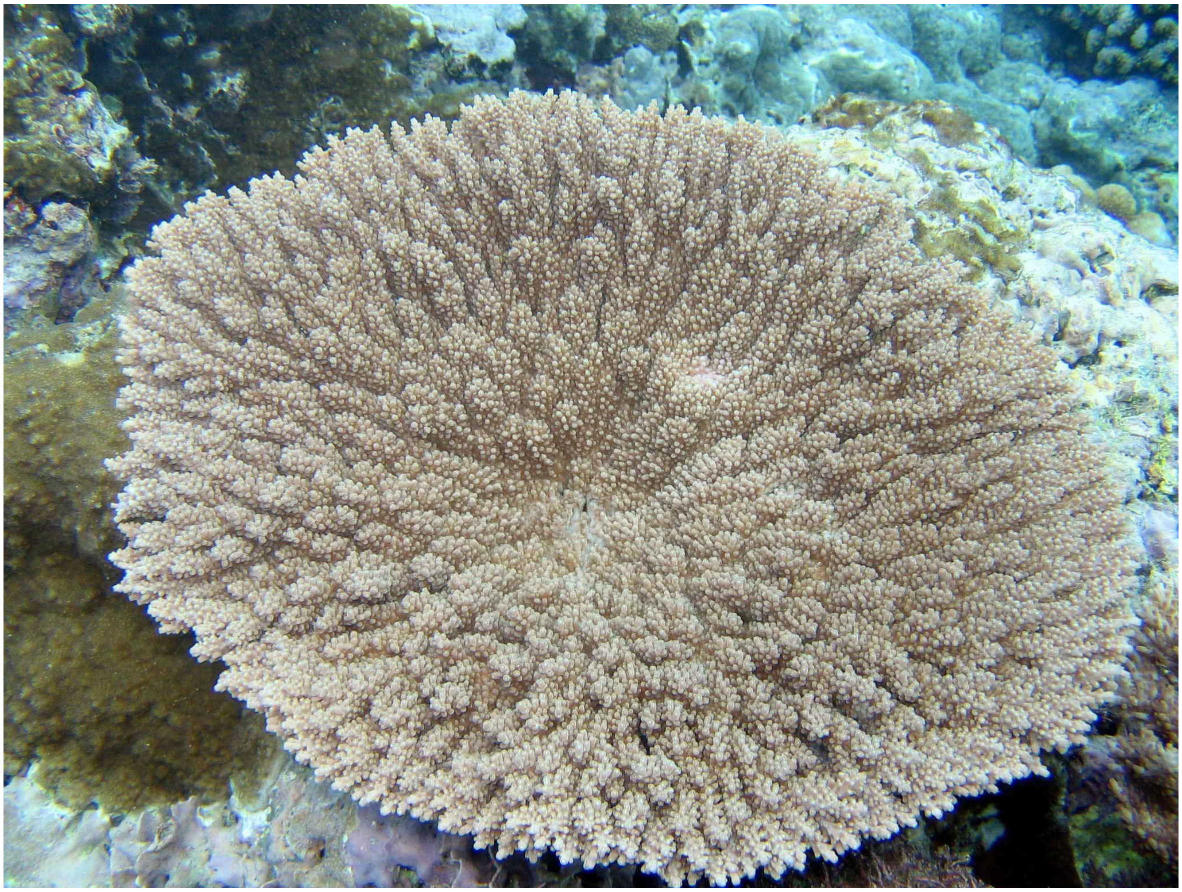
A close-up of *Acropora* cf. *paniculata sensu* Wallace (1999).



Another close-up of *Acropora paniculata sensu* Wallace (1999).

Acropora clathrata (Brook, 1891) "table coral"

This coral forms large table corals formed of branchlets that grow nearly horizontally, with their tips just above the plane of the table pointing outward. Branchlets retain a uniform diameter of about 1 cm (1/3 in) over the entire table, and there are no small vertical branchlets. This is the only table species that has outwardly inclined thick branchlets. Grey, common especially on some offshore banks, present on slopes and a few are in pools. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Upolu, Apolima, and Savai'i.



A colony of *Acropora clathrata*.

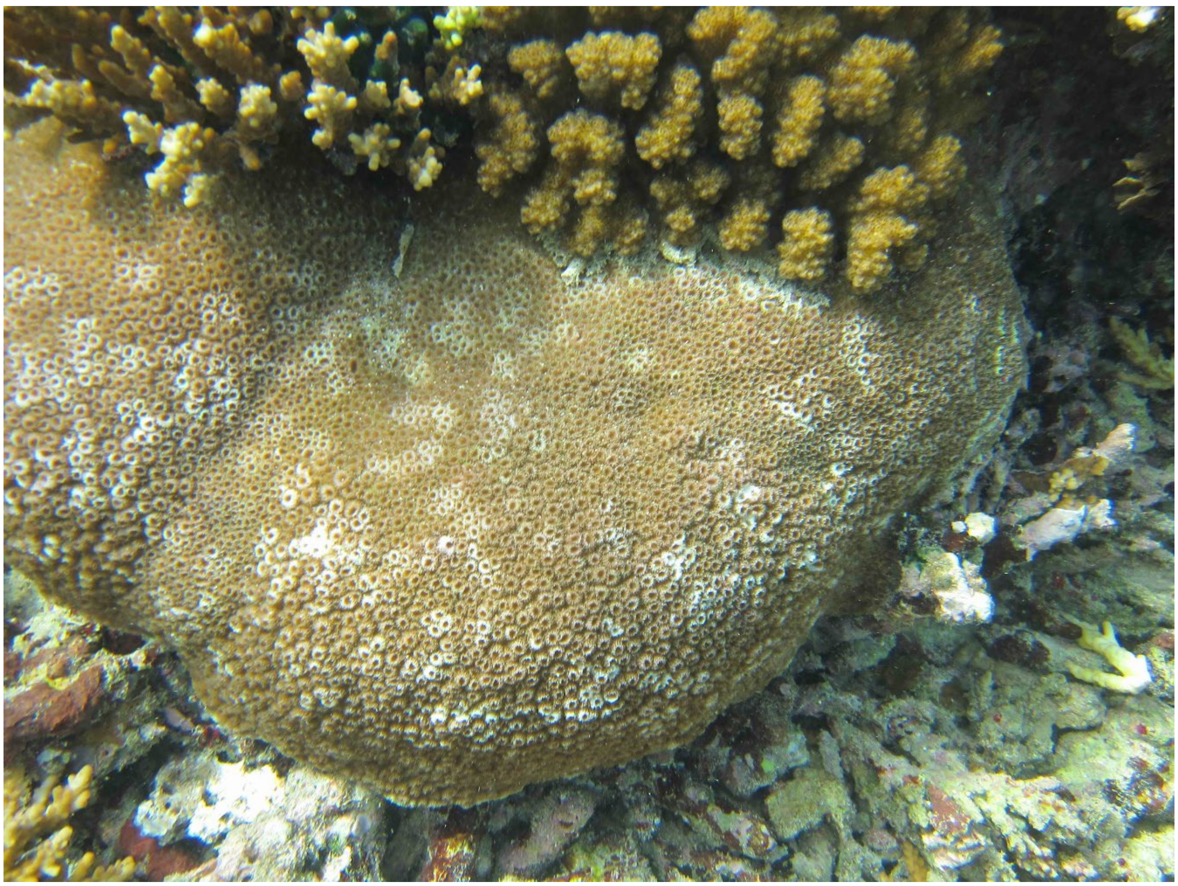
A close-up of *Acropora clathrata*. The outer edge of the colony is to the left.

Astreopora

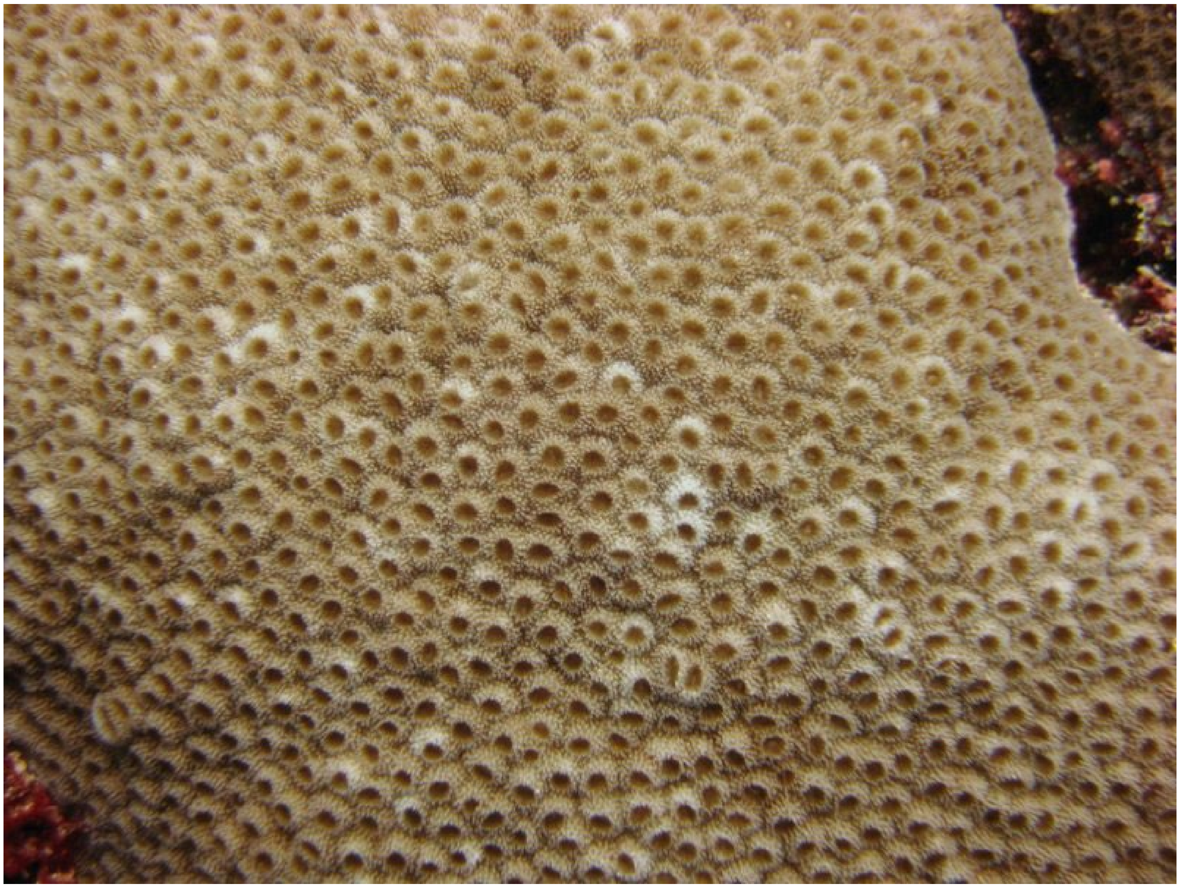
Astreopora is a medium size genus that usually has massive colonies or sometimes encrusting colonies, with small corallites that look a bit like little volcanoes. It is uncommon most places. Corallites are larger and spinier than on encrusting *Isopora* and it is usually massive not encrusting.

Astreopora myriophthalma (Lamarck, 1816)

This coral forms massive colonies with corallites that project and are uniform in size, with all projecting outward from the surface. Corallites project outwards even on the sides of the colony, unlike on *Acropora cucullata*, where corallites on the sides project downwards. Corallites project more than on *Acropora listeri*, are uniform in size and direction unlike on *Acropora gracilis*, and have circular openings unlike on *Acropora elliptica*. Browns, greys, purples, uncommon, reef slopes. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Muliava (Rose Atoll), South Bank, Upolu, Apolima, and Savai'i.



A colony of *Astreopora myriophthalma*.



A close-up of *Astreopora myriophthalma*.

Astreopora gracilis Bernard, 1896

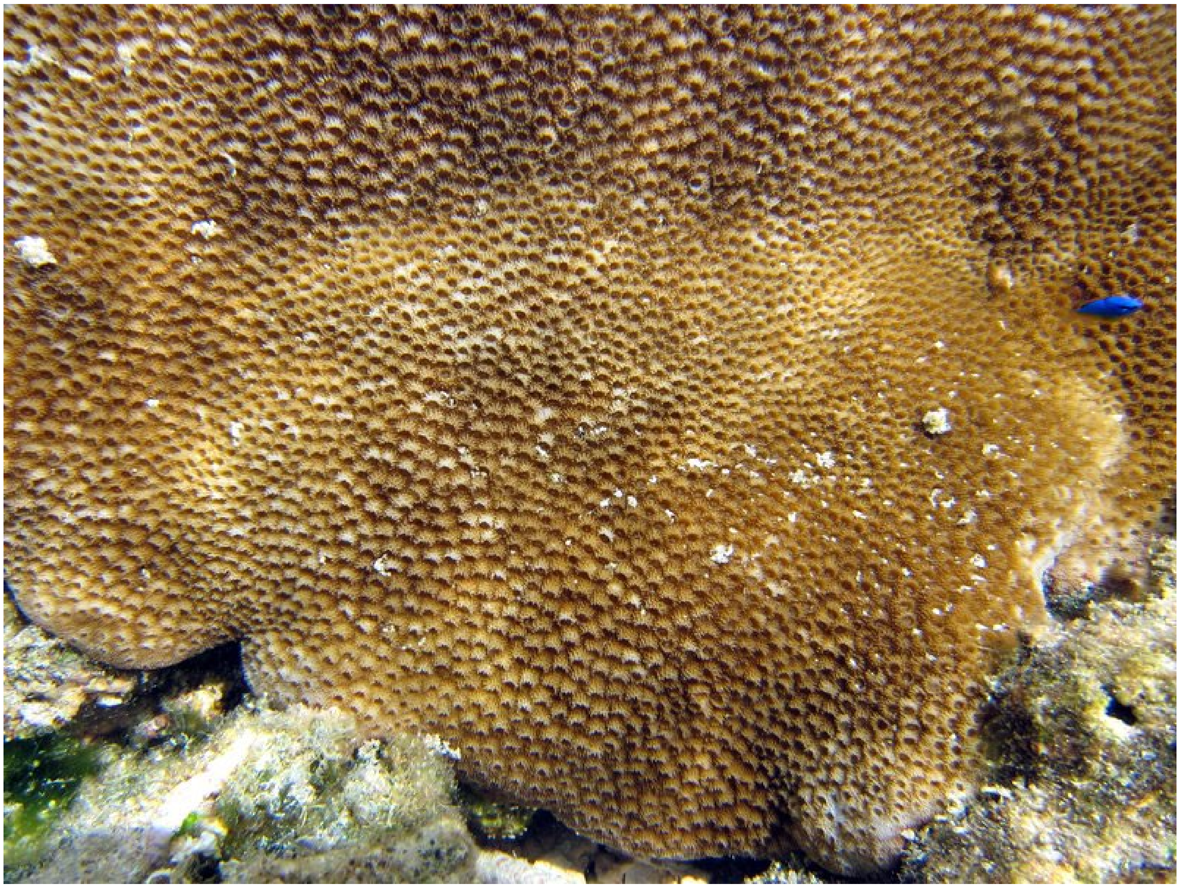
This coral forms massive colonies with corallites that project different amounts and which are pointed in different directions, giving a rough, disorderly surface appearance. Usually brown to reddish brown, uncommon to rare. Corallites are uniform in size and direction on *Astreopora myriophthalma*, all pointing downward on the sides of *Astreopora cucullata*, project little on *Astreopora listeri*, and have oval openings on *Astreopora elliptica*. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, and Savai'i.

A colony of *Astreopora gracilis*.

A close-up of *Astreopora gracilis*.

Astreopora cucullata Lamberts, 1980

This coral forms massive or encrusting colonies, and can have raised plate edges. Corallites are uniform in size, and most or all corallites on colony sides are strongly tilted or inclined downward. Corallites are not inclined on the sides of *Astreopora myriophthlma*. Corallites are uniform unlike on *Astreopora gracilis*, project unlike on *Astreopora listeri*, and have round openings unlike on *Astreopora elliptica*. Reddish brown color, uncommon. Found so far on Tutuila, Ofu-Olosega, Ta'u, Muliava (Rose), Upolu, Apolima, and Savai'i.



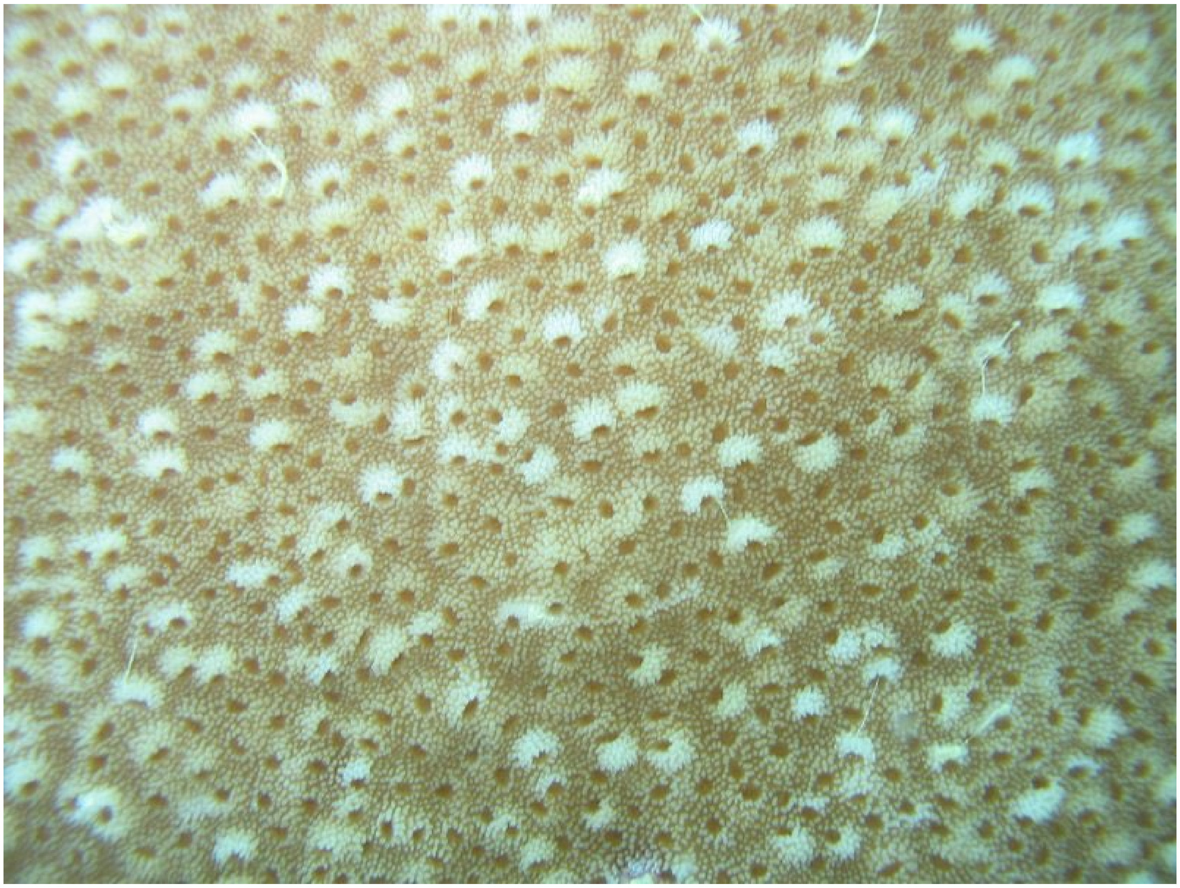
A colony of *Astreopora cucullata*.

A close-up of *Astreopora cucullata*. The green tint is due to the camera, it was actually rust colored.

Astreopora listeri Bernard, 1896

This coral forms massive colonies with corallites that project very little if at all. Corallites project farther on *Astreopora myriophthalma*, are inclined downward on the sides of *Astreopora cucculata*, are irregular in size and inclination on *Astreopora gracilis*, and have oval openings on *Astreopora elliptica*. Browns, greys, or purples, uncommon to rare. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Muliava (Rose), and Upolu.

A colony of *Astreopora listeri*.

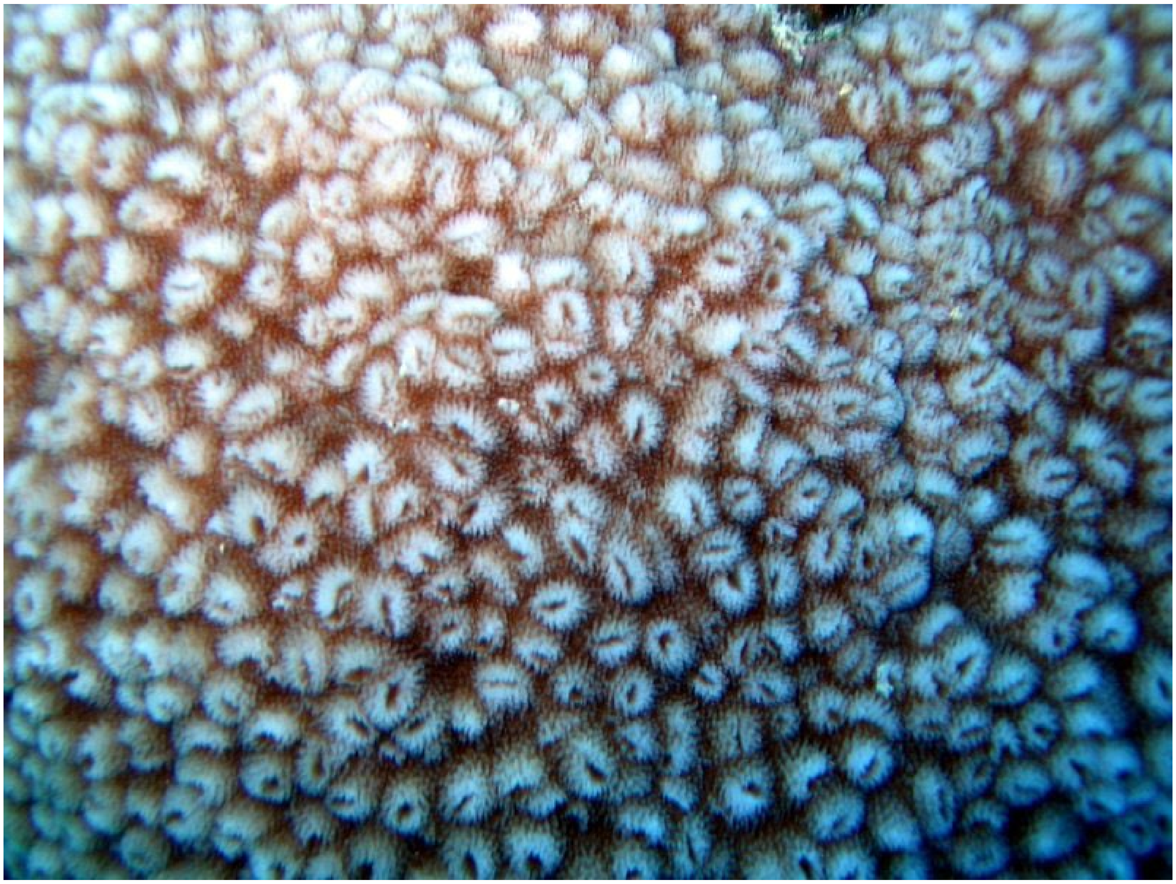


A close-up of *Astreopora listeri*.

Astreopora elliptica Yabe & Sugiyama 1941

This coral forms massive or encrusting colonies, with small round projecting corallites, many or most of which have their opening compressed laterally into a slit. Some corallites have round or oval openings. *Astreopora myriophthalma* have corallites with circular openings, *Astreopora cucculata* has downwardly inclined corallites on the sides of colonies, *Astreopora gracilis* has corallites of variable size and inclination, and *Astreopora listeri* has corallites that project little if any. Brown, uncommon to rare. See taxonomic note. Found so far on Tutuila, Ofu-Olosega, Ta'u, Apolima, and Savai'i.

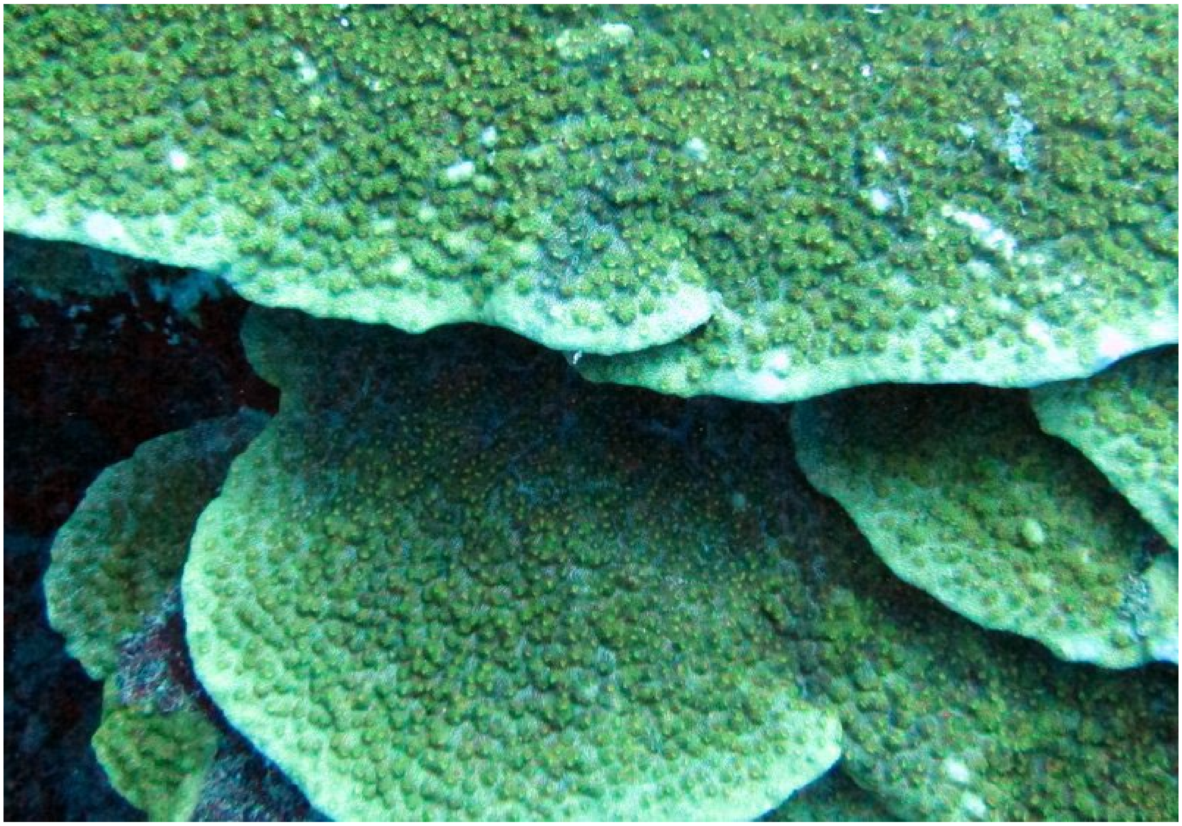
A colony of *Astreopora elliptica*. The grooves were produced by snapping shrimp.



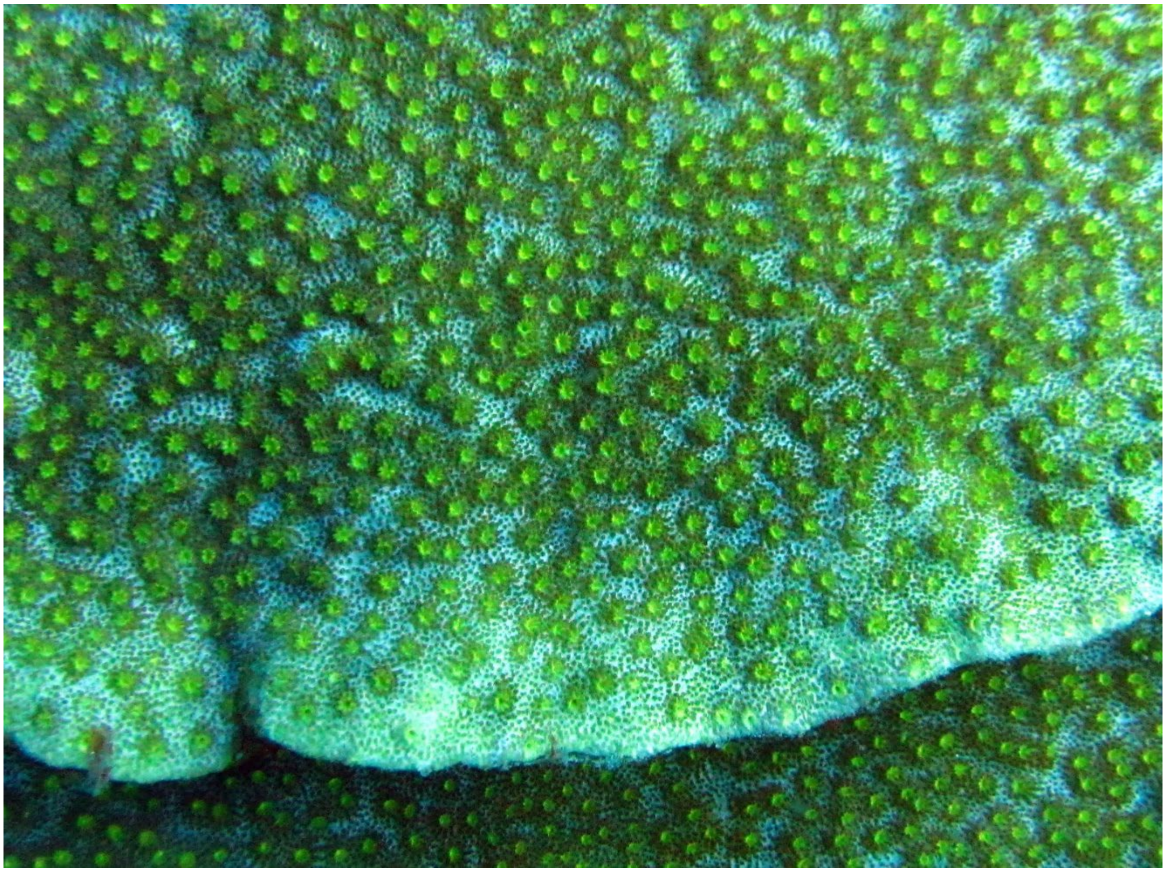
A close-up of *Astreopora elliptica*.

Astreopora randalli Lamberts, 1980

This coral forms encrusting sheets on slopes with the lower edge raised as a plate, or rarely massive. Corallites have some space between them which is spiny. All other *Astreopora* species in American Samoa are massive, and none are green. Greenish-brown with green corallite openings, deeper on slopes, uncommon. Found so far on Tutuila, Aunu'u, Ta'u, Upolu, and Savai'i.



A colony of *Astreopora randalli*.



A close-up of *Astreopora randalli*.

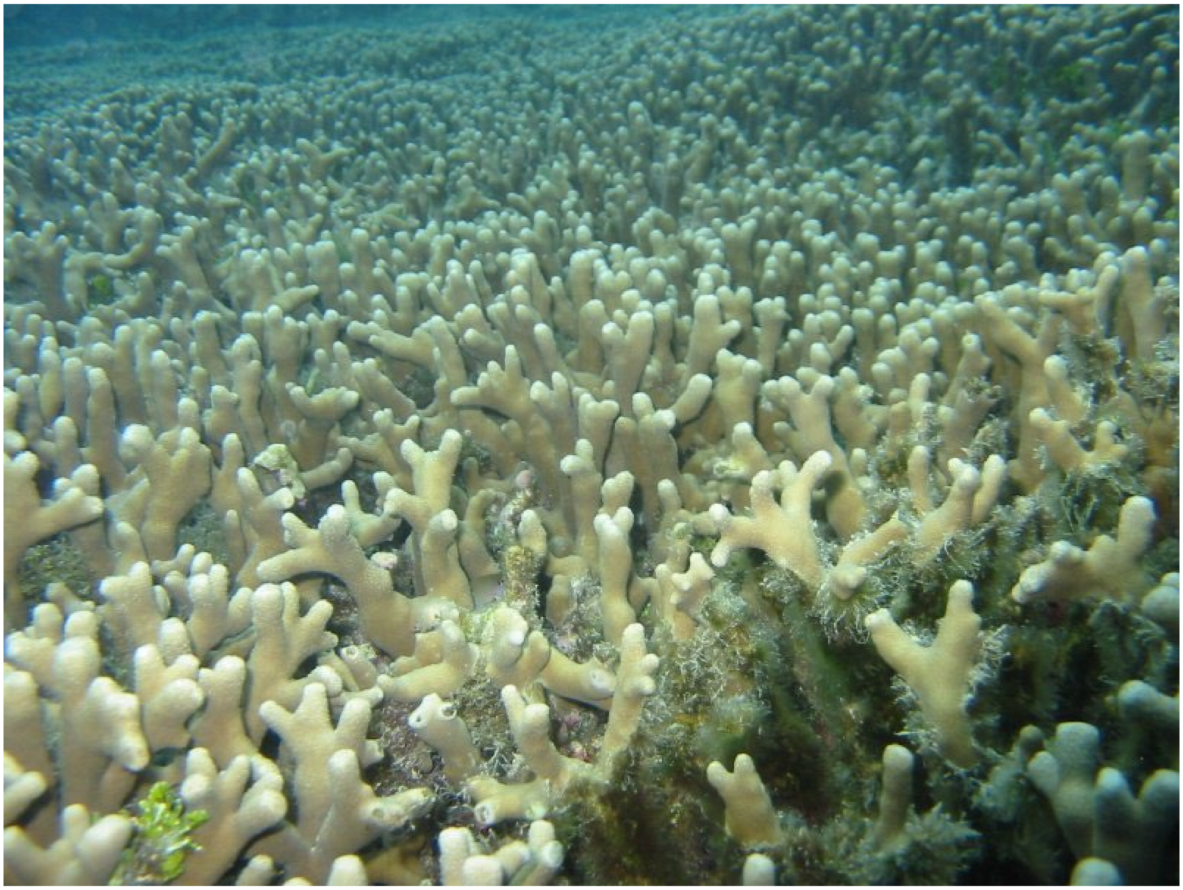
Porites

Porites is the third largest genus in number of species following *Acropora* and *Montipora*, and it produces some of the largest coral colonies in the world, including the giant at Ta'u. These giants have records of the climate of the past hundreds of years in their skeletons. Some species are massive, by which we mean rounded hemispheres, other species are branching or columnar, some form plates and some have both plates and branches or columns. Finger coral which co-dominates back reef pools is a *Porites* species. The second most common species on the slopes is a *Porites* species as well and has columns and plates. Some species are very difficult to tell apart, particularly the massive species. Corallites are tiny, about 1-2 mm diameter, and may give the surface a "cellular" look when examined closely. Polyps are tiny as well, and often aren't extended, though sometimes the tips of the tentacles give the surface a slight fuzzy look. Common to dominant. *Porites* never has spines like *Montipora* and very few species have recessed corallites that can look like *Monitpora*. Polyps are smaller than *Goniopora* and *Alveopora* and not extended.

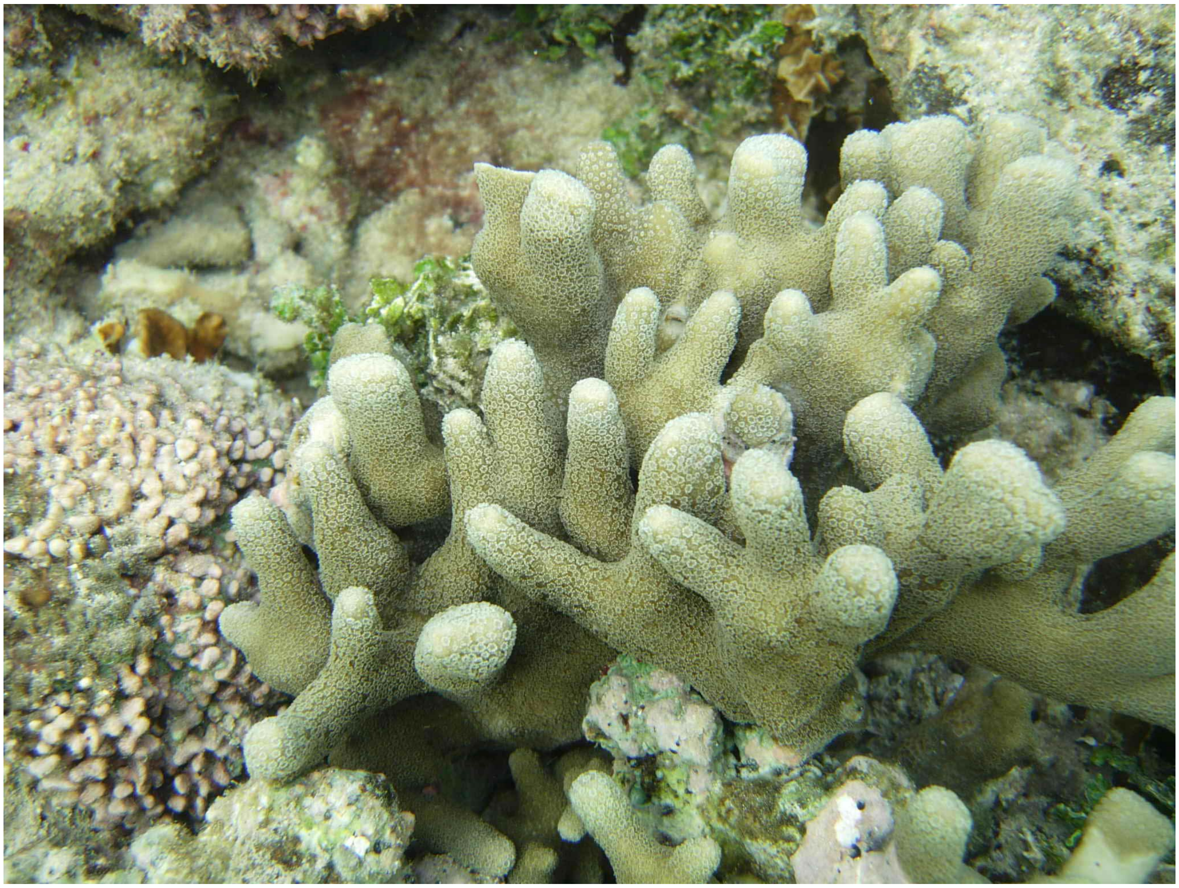
We begin with branching species, then columnar species with basal plates, then plates, and end with massive (boulder) species. *Porites* are among the hardest of all corals to identify to species and the hardest are the massive *Porites*.

Porites cylindrica Dana, 1846 "finger coral"

This coral forms colonies composed of finger-like branches with rounded tips. Colonies can be very large. Branches may be fuzzy with tiny tentacles. *Porites cylindrica* can form much larger colonies than *Porites annae* or *Porites lichen* and is more common. *Porites annae* has partly fused, lumpy columns with white tops and tentacles extended in little tufts. *Porites lichen* either has thin plate bases with finger shaped columns of varying length or highly fused columns, and can have tentacles extended in tufts. Tan or yellow-green, co-dominates backreef pools, common on slopes in Vatia Bay, rare on outer slopes. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, and Muliava (Rose); very likely in Independent Samoa in habitats protected from waves.



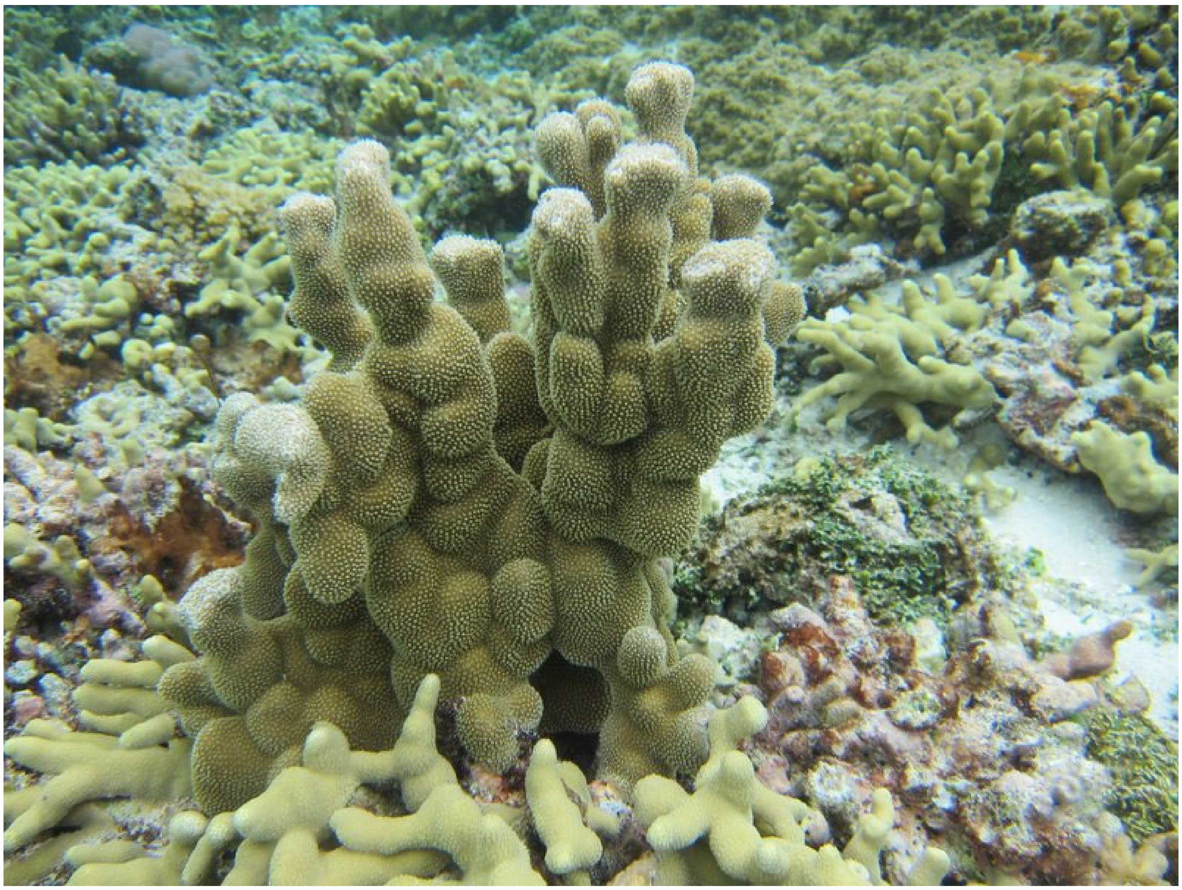
A thicket of *Porites cylindrica*.



A close-up of *Porites cylindrica*.

Porites annae Crossland, 1952

This coral forms small colonies with many lumpy irregular columns or branches. The upper ends of some or most columns are flattened and white. The sides of columns are covered with an even covering of light dots which are tufts of tiny tentacles- each dot is the center of a polyp. *Porites cylindrica* forms colonies which can be much larger and is much more common; also, it doesn’t usually have white branch ends and doesn’t have tentacles extended as tufts. *Porites lichen* either has a thin plate base with columns or has higly fused columns. *Porites evermanni* is brown with tentacles extended as tufts but is massive and can be large. Dark brown, uncommon in lagoons. Found so far on Tutuila, Aunu’u, Ofu-Olosega, Ta’u, Muliava (Rose Atoll), and Upolu.

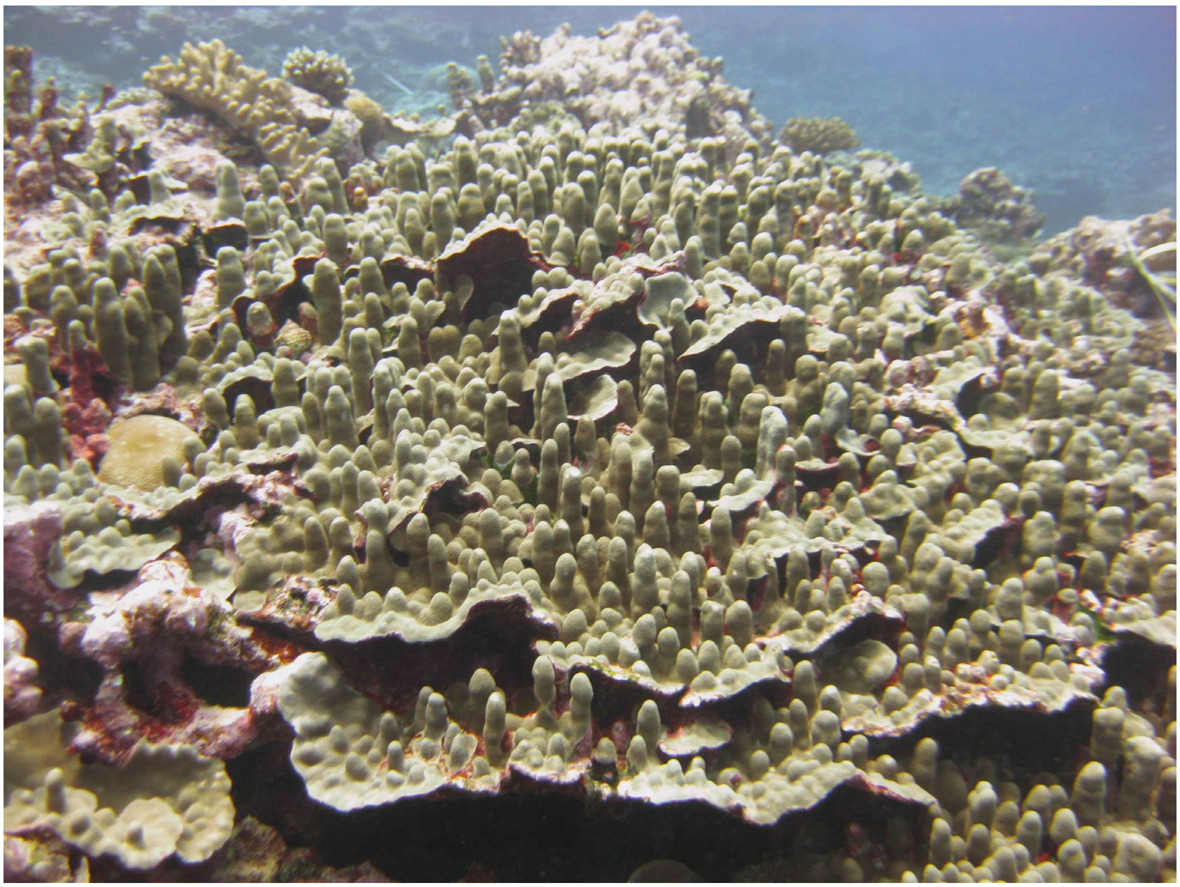


A colony of *Porites annae* illustrating the lumpy columns.

A close-up of *Porites annae* showing the white branch tips and the fufts of tentacles on the branch sides.

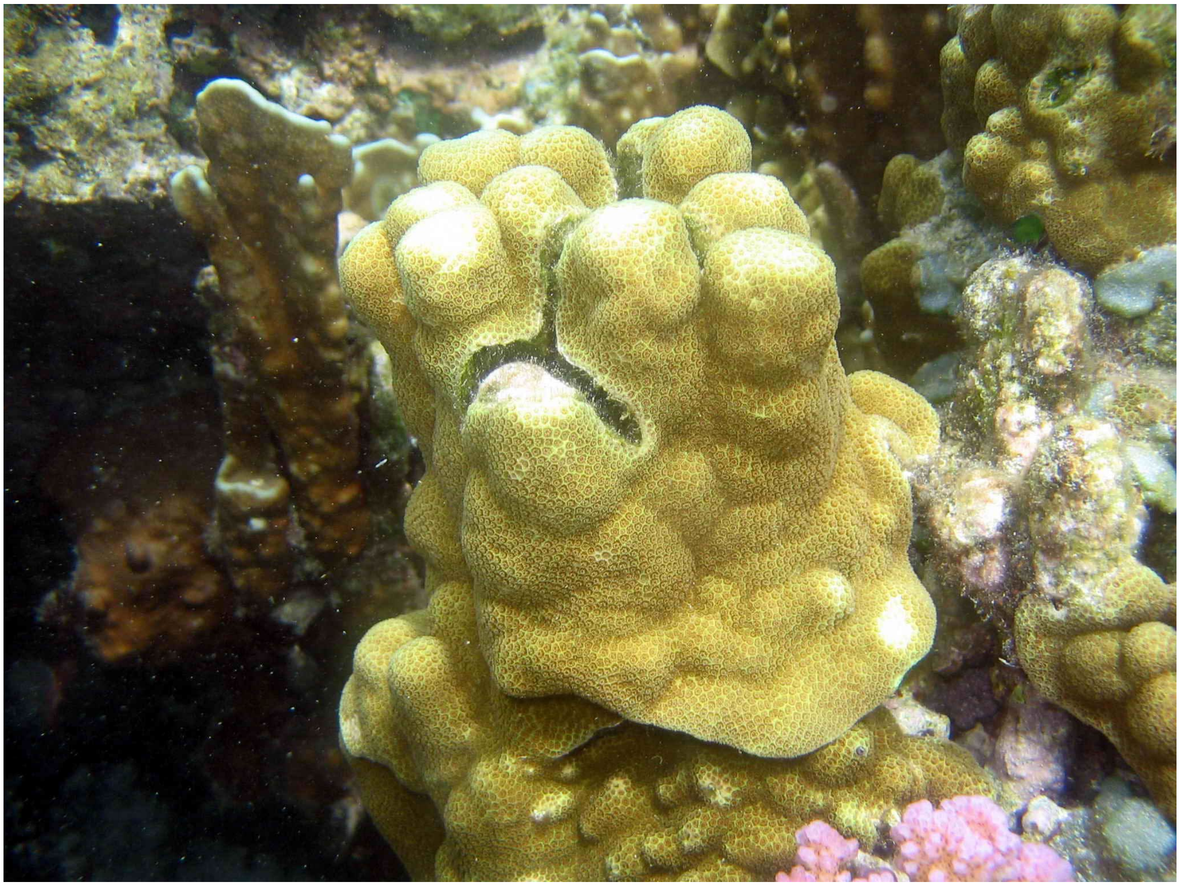
Porites lichen Dana, 1846

This coral on reef slopes forms thin plates with rounded knobs that can grow into finger-like columns, which usually are not fused and typically are different heights. The surface is fuzzy with tufts of tentacles. In backreef pools, the knobs and columns are close together or fused together with just a small plate at the lower edge. Some corallites are in rows, especially on plates. Colonies do not grow as large as *Porites cylindrica* and are not as common. Colonies have thin plate bases and tentcles extend as tufts unlike on *Porites cylindrica*. The tops of columns are not white like on *Porites annae* and colonies are not dark brown. Grey or brown on slopes, green, brown or yellow-brown in pools, common only on the east side of Olosega and in Ofu pools. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Muliava (Rose), Swains, Upolu and Savai'i.

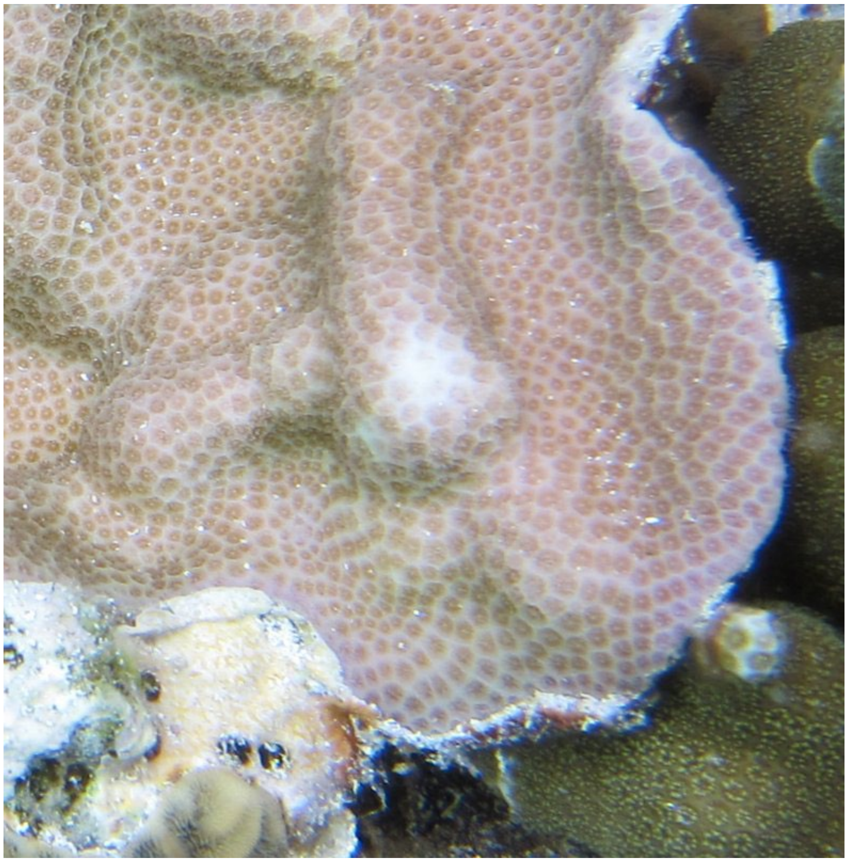


A large colony of *Porites lichen* on the reef slope of Ofu.

A close-up of a colony of *Porites lichen* on the reef slope, showing the tufts of tentacles.



A colony of *Porites lichen* in the Ofu pools.

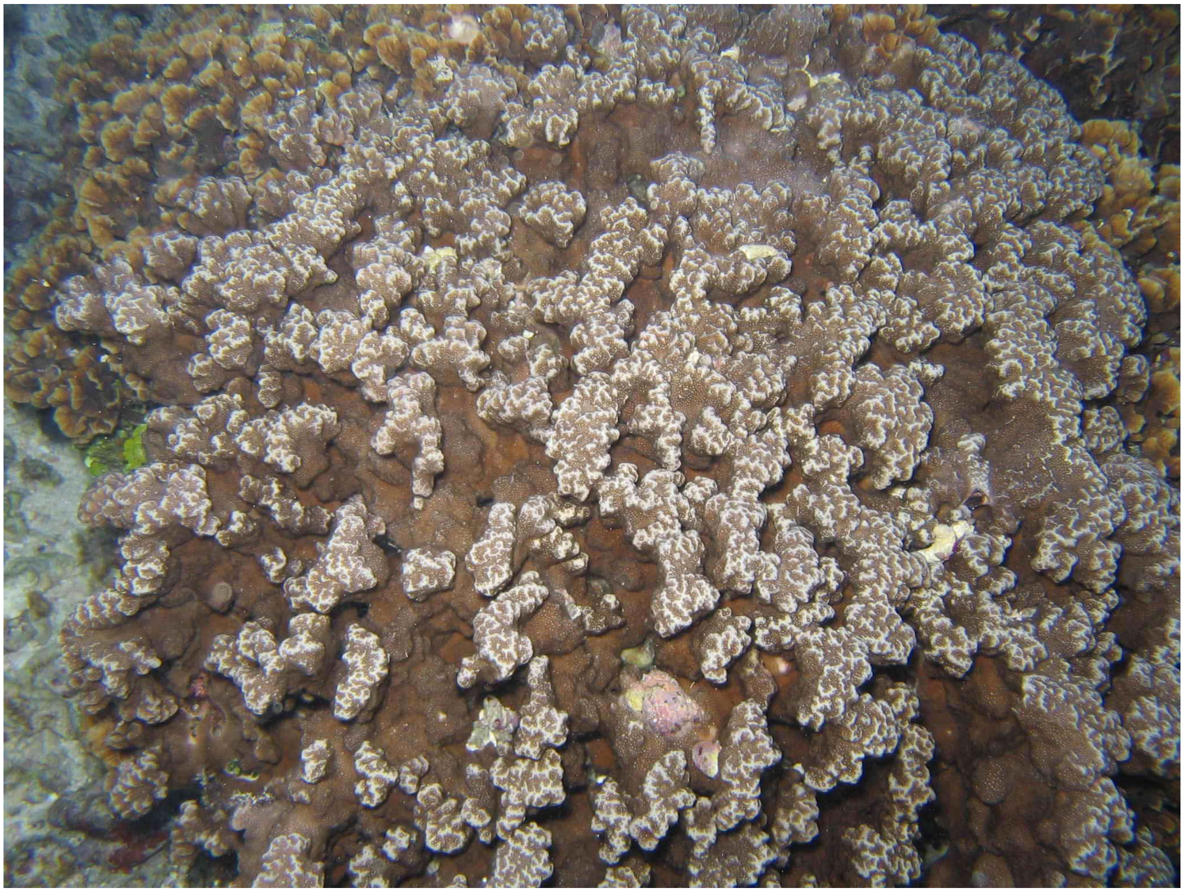


A close-up of the edge of a colony of *Porites lichen* in the Ofu pools. Notice the corallites in rows near the right.

Porites rus (Forskål, 1775)

This coral forms thin plates with irregular columns that fuse to a variable degree. Some areas have small winding ridges, others are smooth. Brown with white column tops, white ridges, and tiny white dots which are polyps, less common green, rarely blue, abundant many places on reef slopes. *Porites monticulosa* has low, thick, rounded lumps instead of taller, thinner columns, and usually is bluish. The columns are more irregular than on *Porites lichen*, with many ridges, and the tops of columns often have white ridges. Colonies often have thin plate bases unlike *Porites cylindrica* or *Porites annae*. Tentacles are not extended, unlike *Porites annae* and *Porites lichen*. Found so far on all islands but not South Bank.

A large, castle-like colony of *Porites rus*.

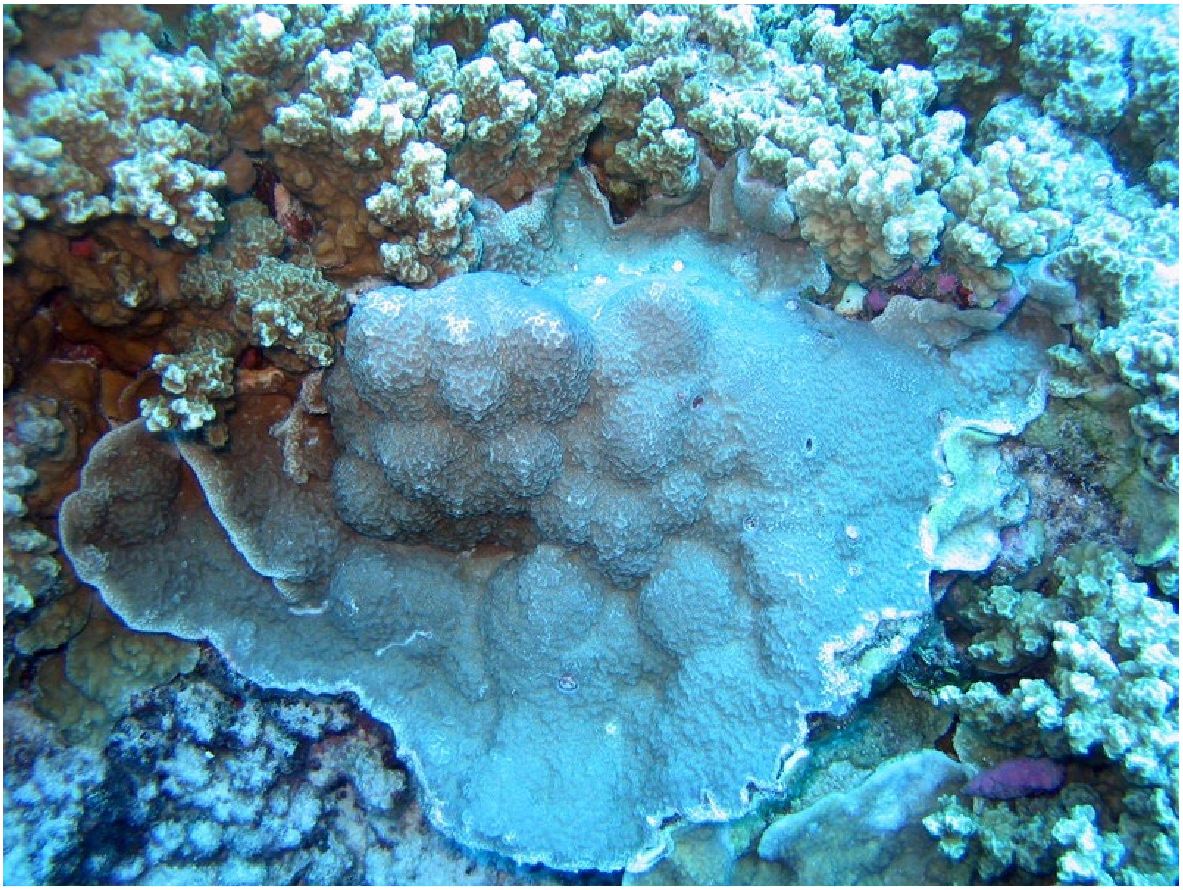


A massive colony of *Porites rus* from a backreef pool.

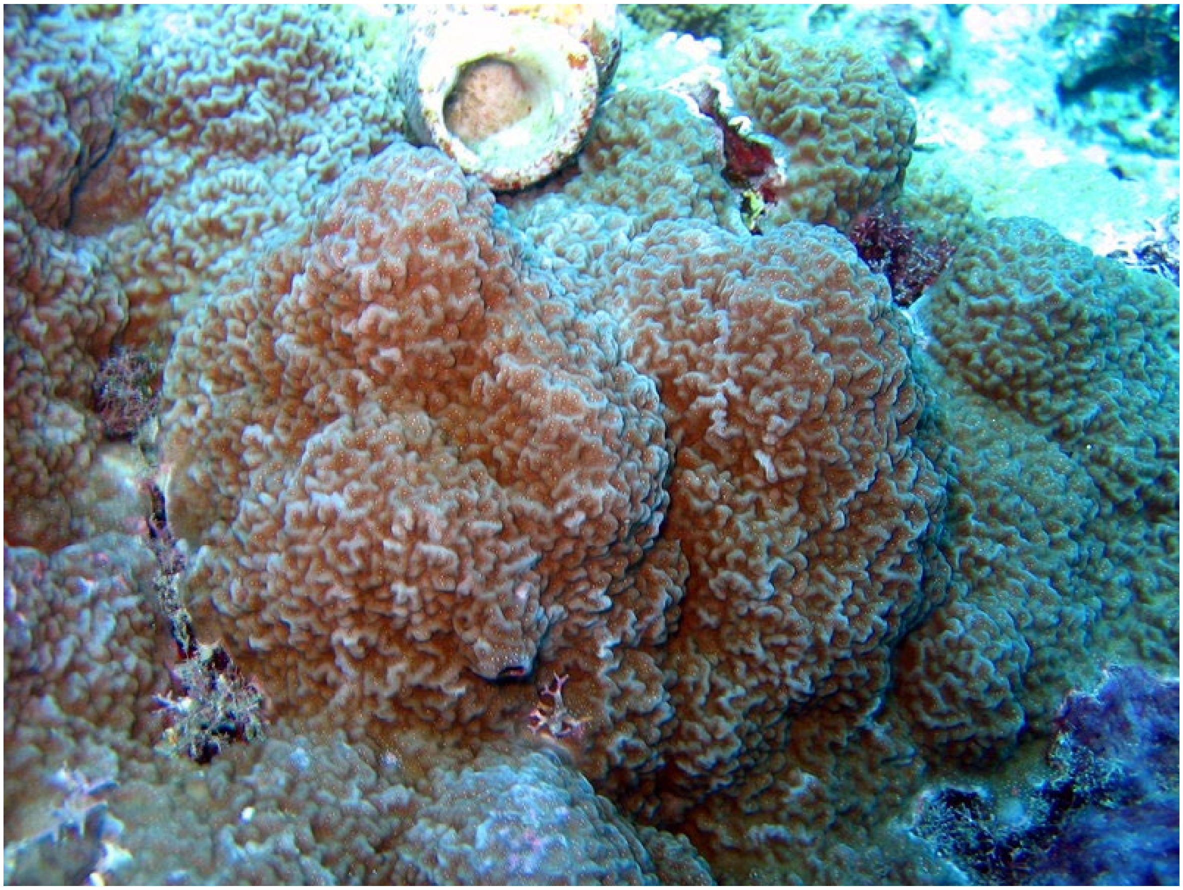
A close-up of *Porites rus*.

Porites monticulosa Dana, 1846

This coral forms encrusting sheets with large, low round lumps about 5 cm (2 in) in diameter. The surface is covered with many small winding ridges, and the polyps are very tiny. Skeleton details are the same as *Porites rus*. Colonies have low, rounded, thick lumps instead of columns as on *Porites rus*, *Porites lichen*, and *Porites annae*. Bluish-grey, uncommon to rare, reef slopes. Found so far on Tutuila, Swains, Upolu, and Savai'i.



A colony of *Porites monticulosa* is in the center, surrounded by *Porites rus*.

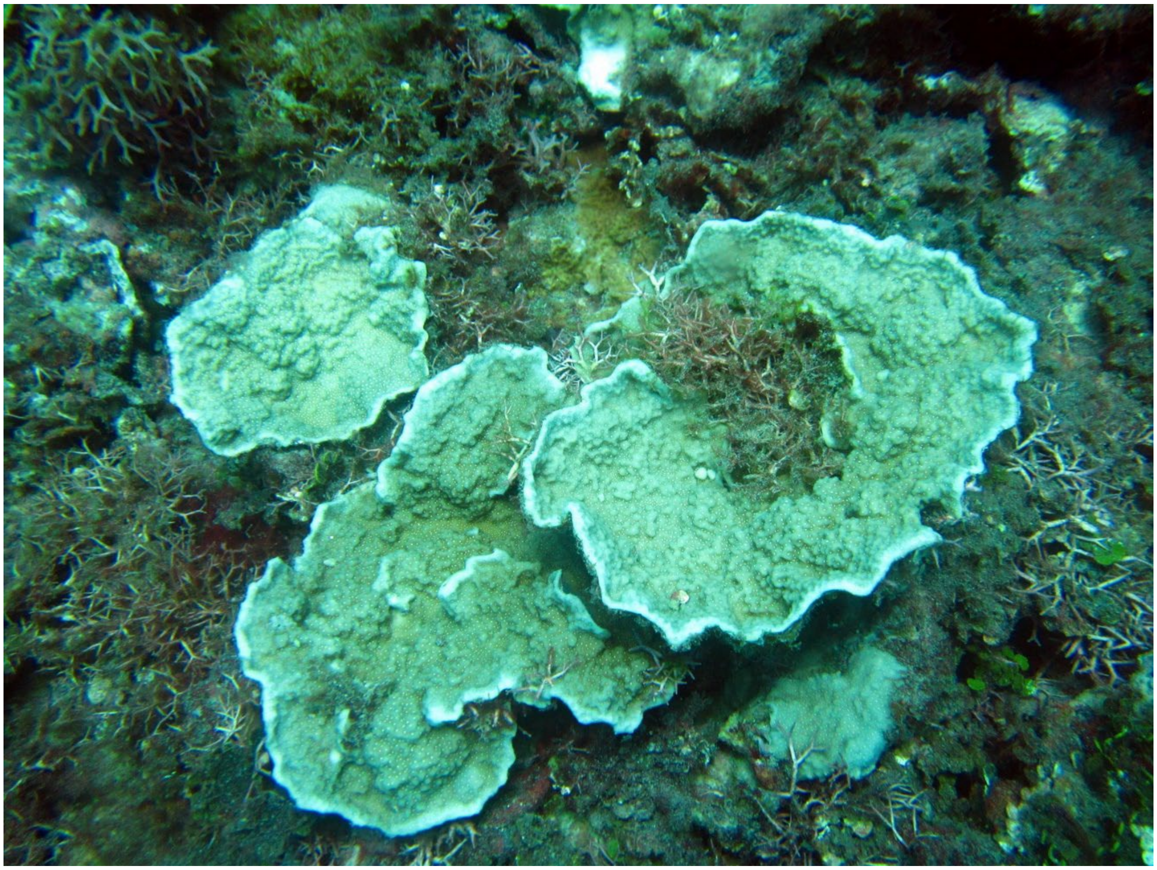


A close-up of *Porites monticulosa*.

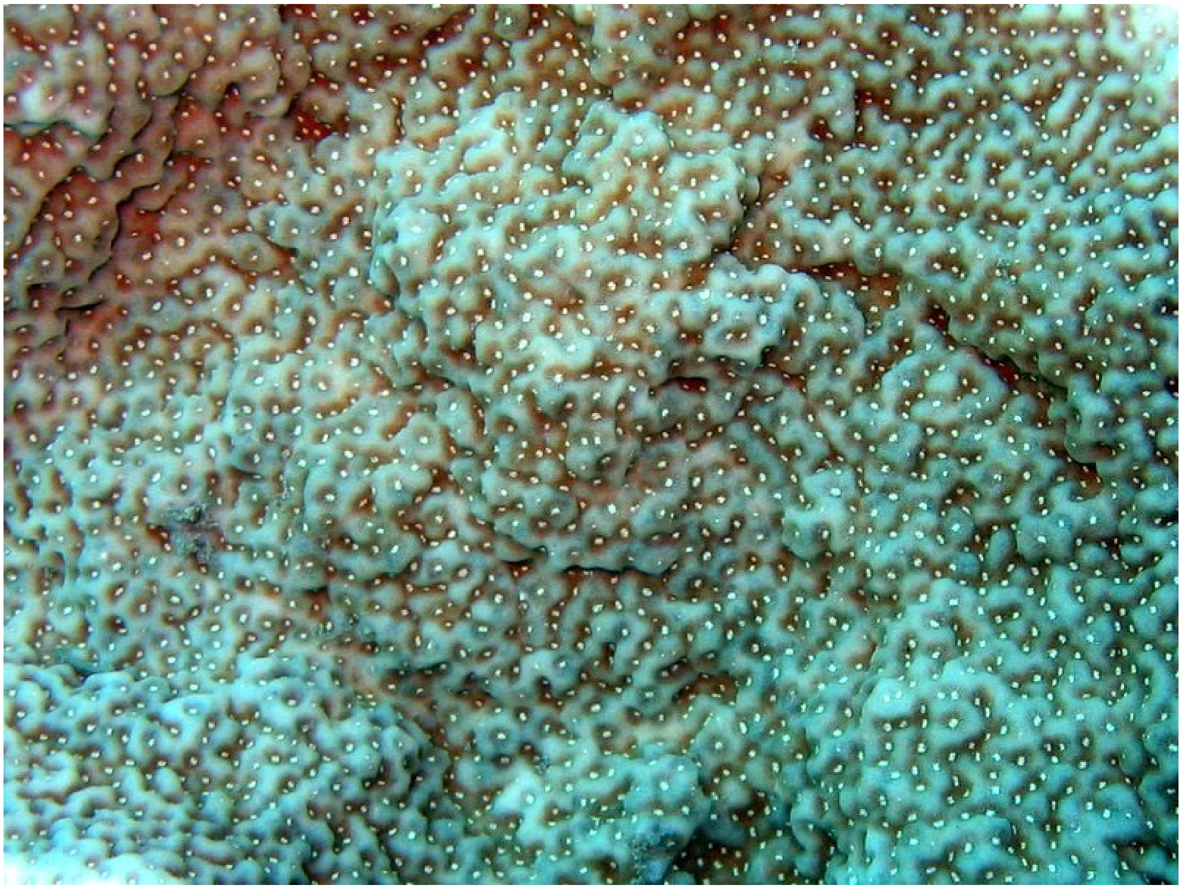
Porites horizontalata Hoffmeister, 1925

This coral forms thin plates which are flat when small but when large form funnel-shaped whorls. The surface has white spots which are the polyps which appear to be indented into the colony, and between the polyps there are small smooth rounded ridges. Rounded smooth lumps (verrucae) on *Montipora* are more uniform and not connected as ridges. Grey, lower reef slope, abundant on lower reef slope at one spot in Gataivai, common at Fagasa, rare elsewhere. Found so far on Tutuila.

A field of large colonies of *Porites horizontalata* on the slope in the harbor at Gataivai. Not all colonies are this large.



Small colonies of *Porites horizontalata*.

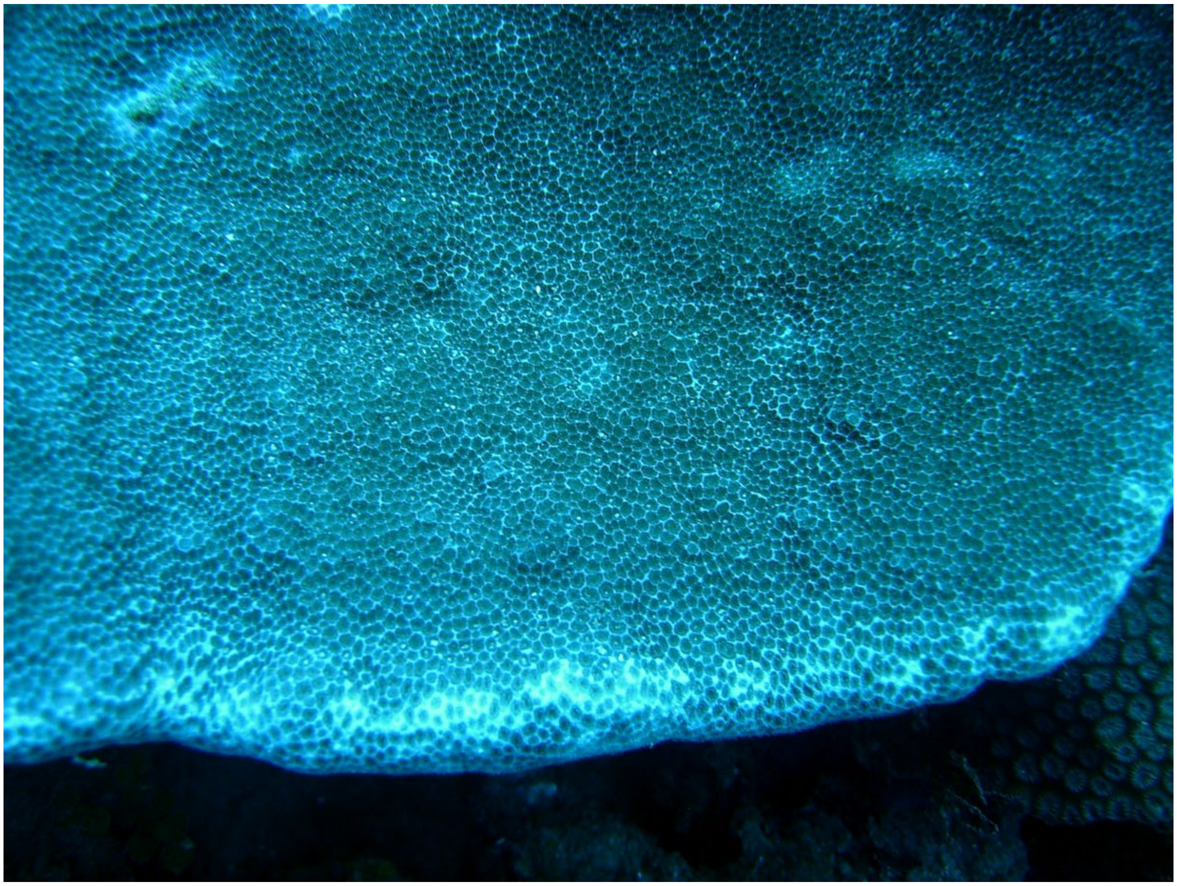


A close-up of *Porites horizontalata*.

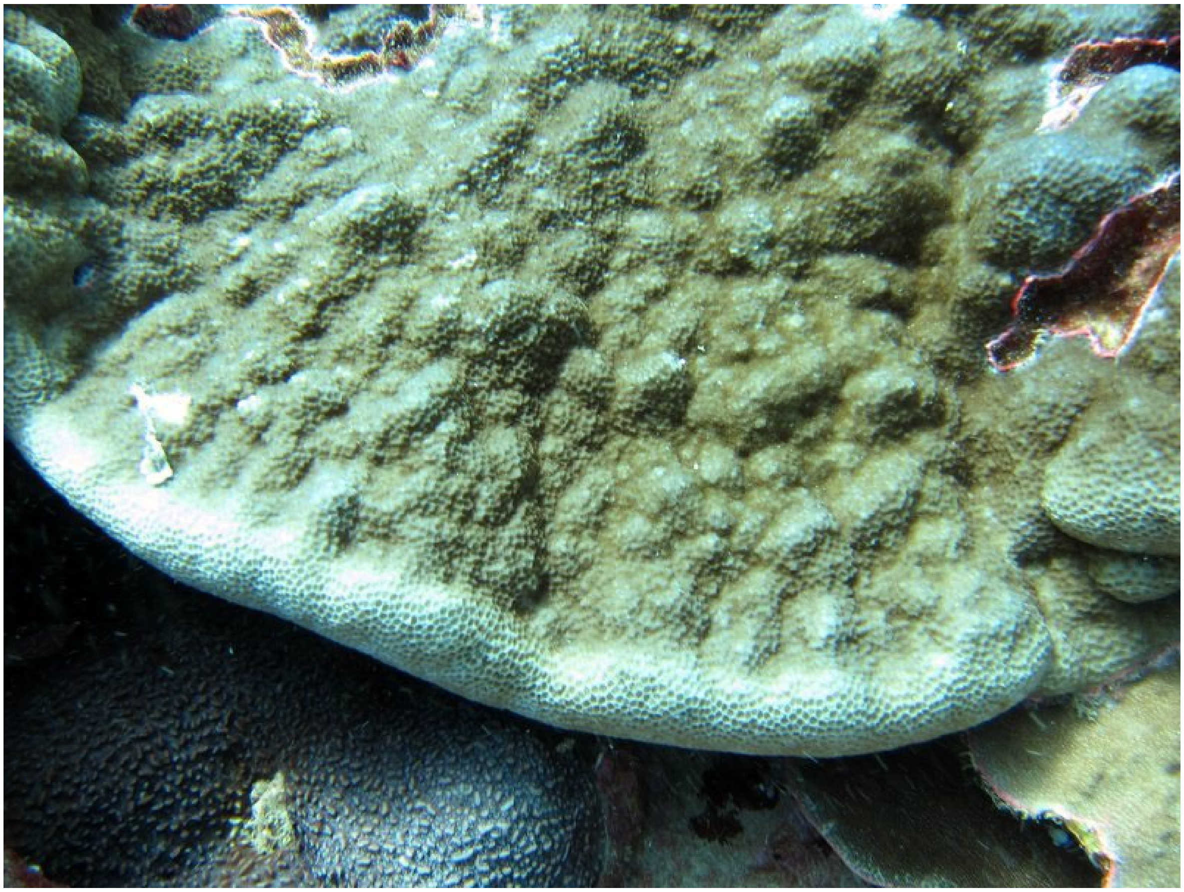
Porites arnaudi Reyes-Bonilla and Carricart-Ganivet, 2000

This coral forms thick plates several feet (up to about 1 m) across with thick edges, about 2 cm (1 in) thick. The plates can be in tiers. The surface is lumpy, and corallites have raised thin sharp ridges between them, which gives the surface a rough look. *Porites arnaudi* forms much thicker plates than *Porites lichen* and *Porites rus*, but doesn't form massive (hemispherical) colonies like several other *Porites* species. Surfaces appear finely rough unlike other *Porites*. Blue-grey or brown, uncommon or rare except on the east side of Olosega, reef slopes. Found so far on Tutuila and Aunu'u.

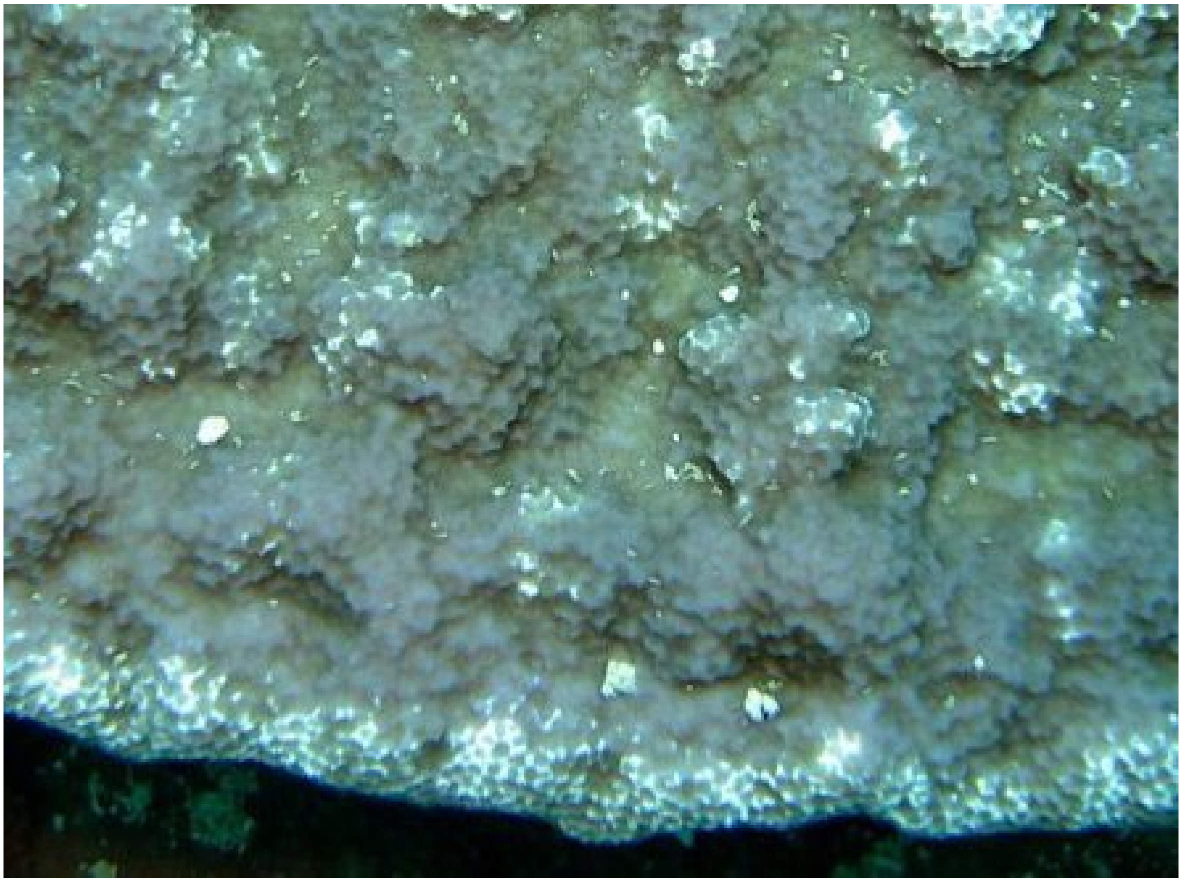
An unusually large colony of *Porites arnaudi*. The rings may be annual rings.



A close-up of the *Porites arnaudi* colony illustrated above.



A colony of *Porites arnaudi*.



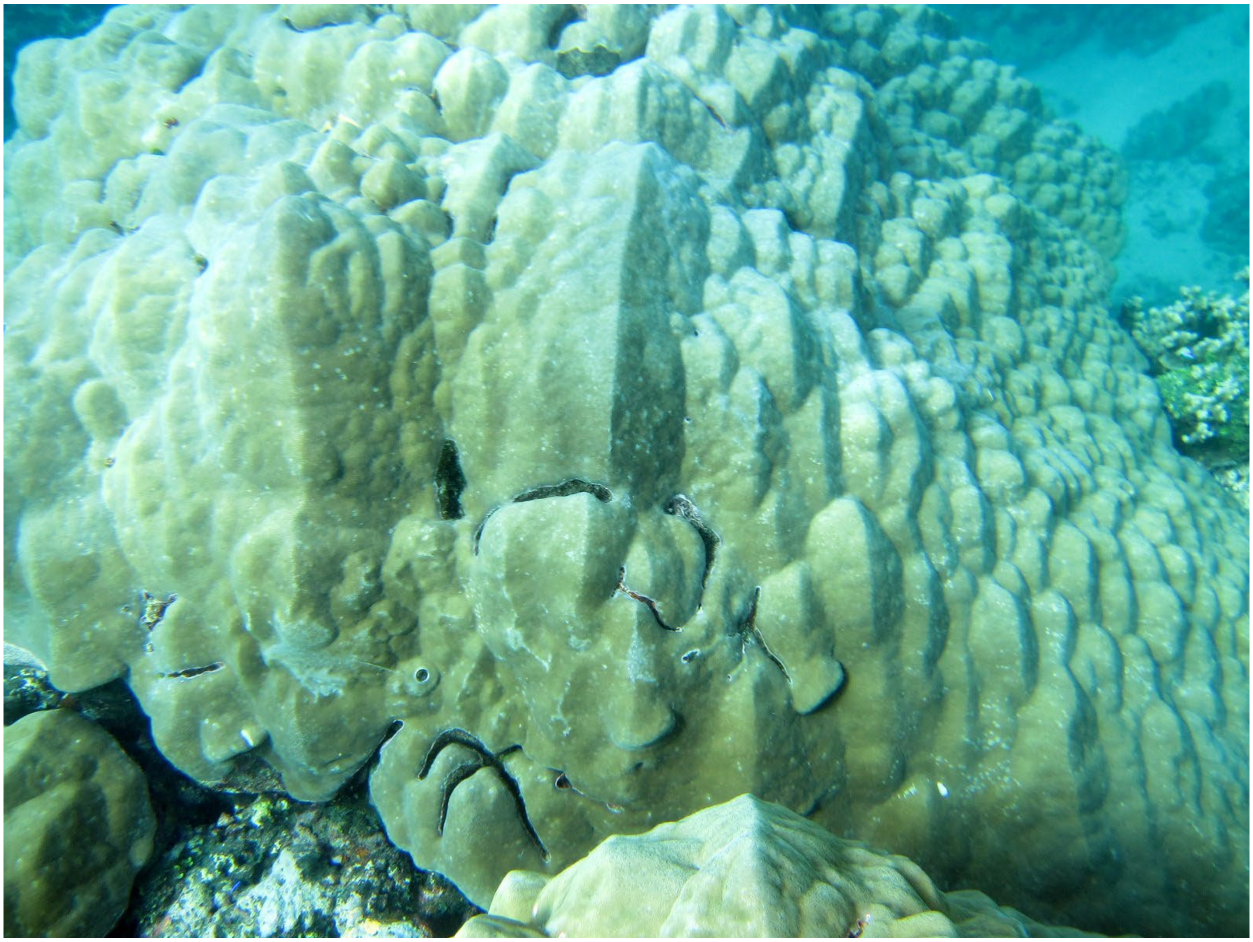
A close-up picture of *Porites arnaudi*.

Porites "massive"

Several species of *Porites* have a massive form, that is, hemispherical, dome, or rounded. They range greatly in size, up to giants. A massive *Porites* colony on Ta'u is 8 m tall and 51 m circumference, one of the largest solid coral colonies in the world. All corals must start out as a single polyp the size of a coral larva, so tiny, thus there is a huge range of colony sizes. Several species grow very large, and some do not grow large, so maximum size differs between species. Massive *Porites* are the most difficult of all coral species to identify, even examining skeleton under the microscope. A few can be identified to species while alive, and are identified in this guide. But that leaves many colonies which cannot currently be identified reliably in the water. Commonly they have bumps on them of various sizes and shapes, and can have ledges on their sides. The tentacles may be completely retracted or extended. Corallites are about 1 mm diameter, and when tentacles are retracted the corallites have a cellular look. See *Porites stephansoni* for a picture of the cellular looking corallites. Colonies grow about 1 m tall in 50 years. Colonies are commonly cored by scientists to study past climate and conditions. The hole that is left is grown over in time and can't be relocated, coring does not damage a colony. They are most often yellow-brown, brown, or brown-green but can be other colors. They are found on all islands.

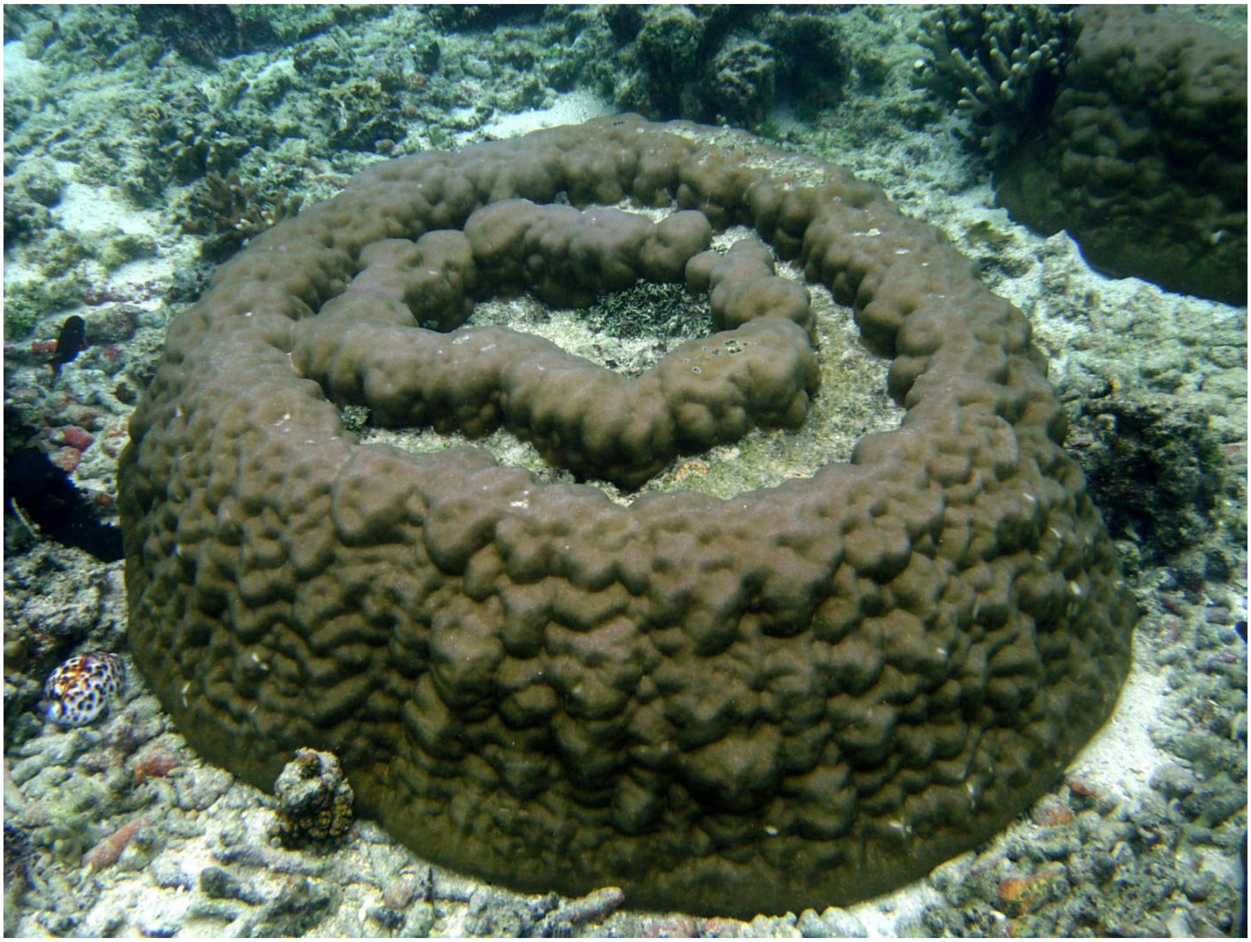
A large massive *Porites* colony in Hurricane House pool on Ofu.

A scene in an area of Hurricane House pool which is dominated by massive *Porites* of various sizes, colors, and shapes.

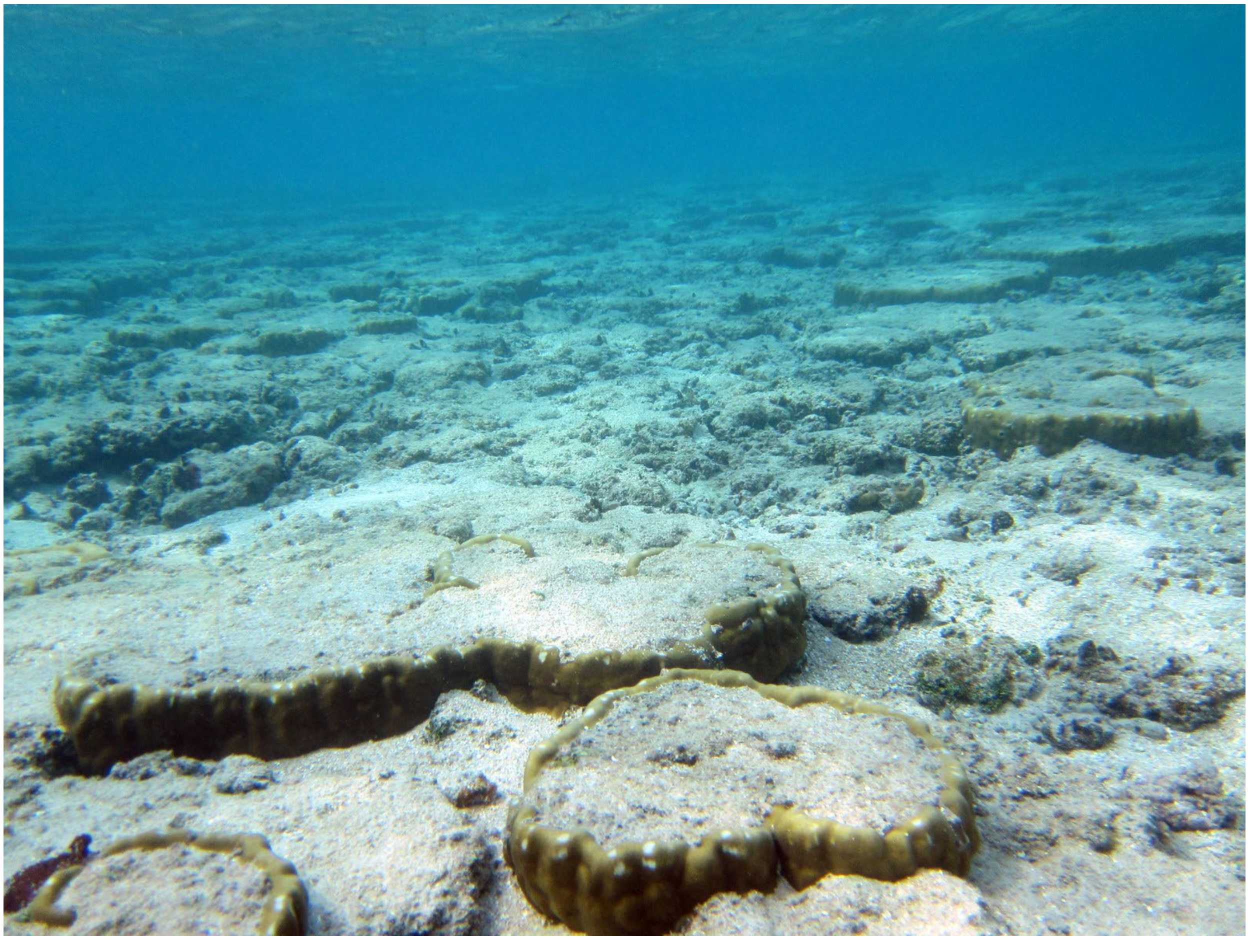


A massive colony with large lumps that have parallel crests. *Porites lobata* can have this, but only a few colonies of it have this in Hawaii. It is not known whether other species can have this.

Ledges on the side of a colony. Here, the lumps appear to form in growth rings and get larger with time.



A microatoll is a colony that has reached the surface and low tides have killed the top of the coral. The sides survive and continue to grow, in time growing above the level of the dead top. The dead top records the level of a low tide which would have been about 3 cm below the now dead top. It is called a microatoll because like an atoll has a ring of coral with a depressed center. This is an unusual micoatoll with two rings.



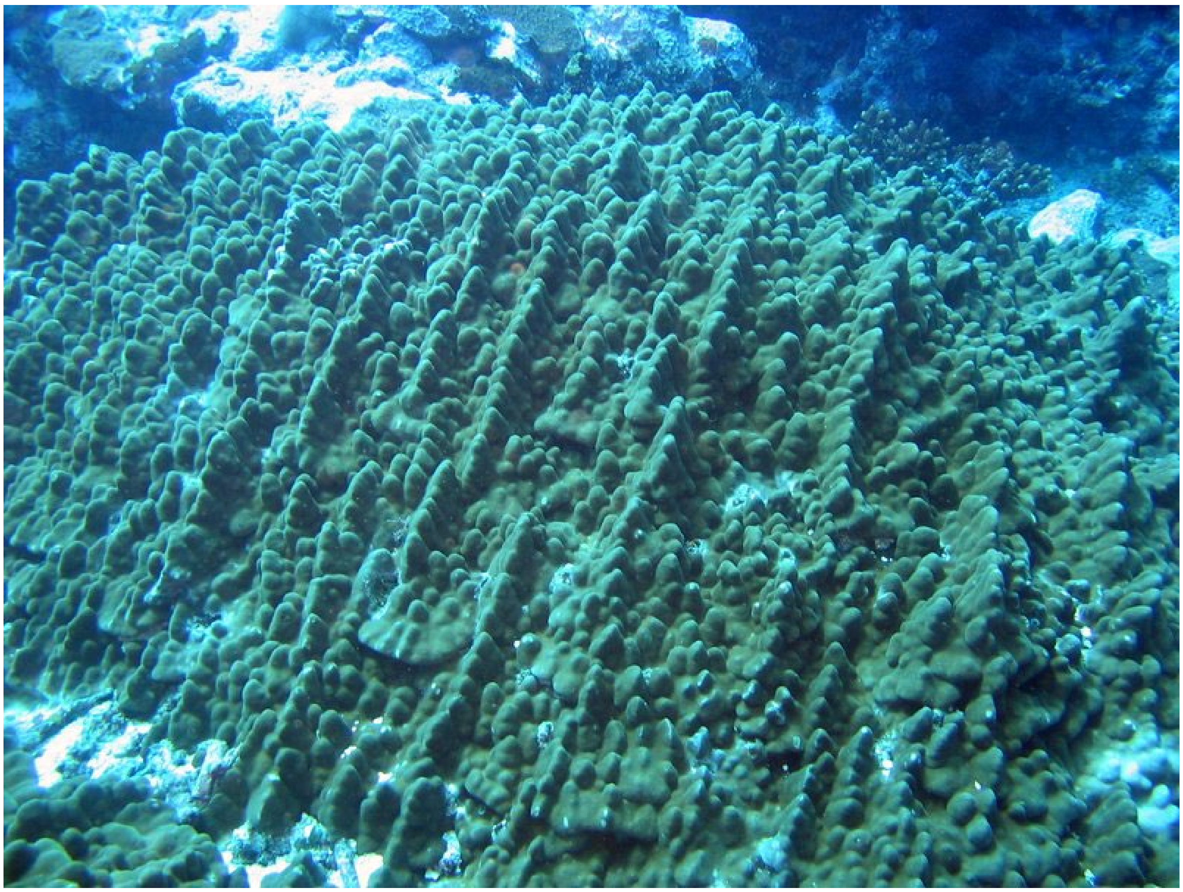
On reef flats where the reef flat is very close to the low tide level, microatolls may be very short, yet continue to live and grow and become very wide, up to at least 5 m wide.

A close-up photo of a massive *Porites* colony with retracted tentacles and a cellular look to the corallites. This is a highly magnified photo.

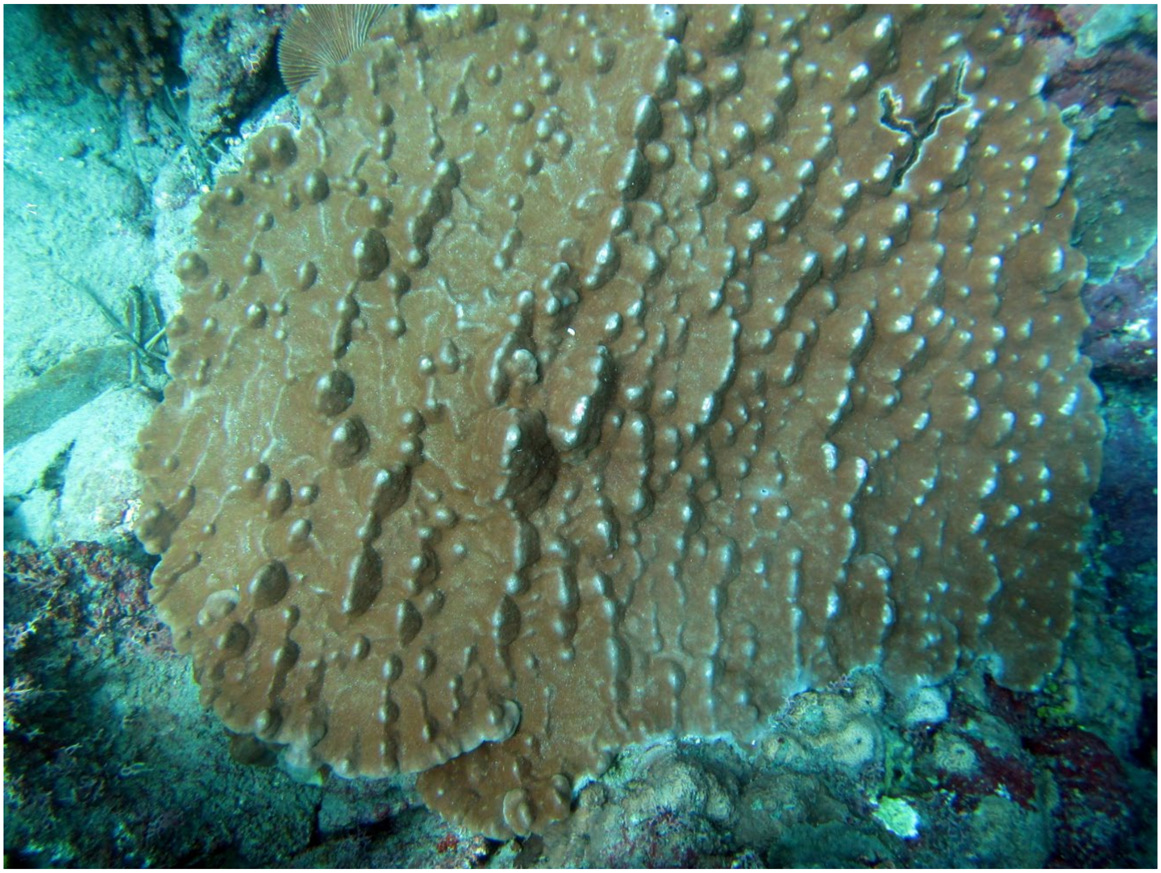
A close up photo of a massive *Porites* colony with tentacles extended in a ring. See *Porites evermanni* for a close-up photo of tentacles extended as a tuft in the center of corallites.

Porites evermanni Vauhan, 1907

This coral forms large massive (hemispherical) colonies which are often wider than tall, and which are covered with rounded lumps about 3-4 cm (1 –1 ½ in) diameter that are uniform and quite tall for massive *Porites*. Rarely, colonies can be nearly flat. The lumps can be in parallel rows on the colony, but aren't always. The surface is fuzzy with tiny tufts of tentacles. The lumps are smaller and more uniform than on other massive *Porites* species, and the tentacles are extended as tufts unlike on other massive *Porites* species, but like *Porites annae* and *Porites lichen*, which are not massive. Brown, reef slopes, uncommon most places but common in Leone. See the taxonomic note. Found so far on all of the islands.



A large colony of *Porites evermanni*.



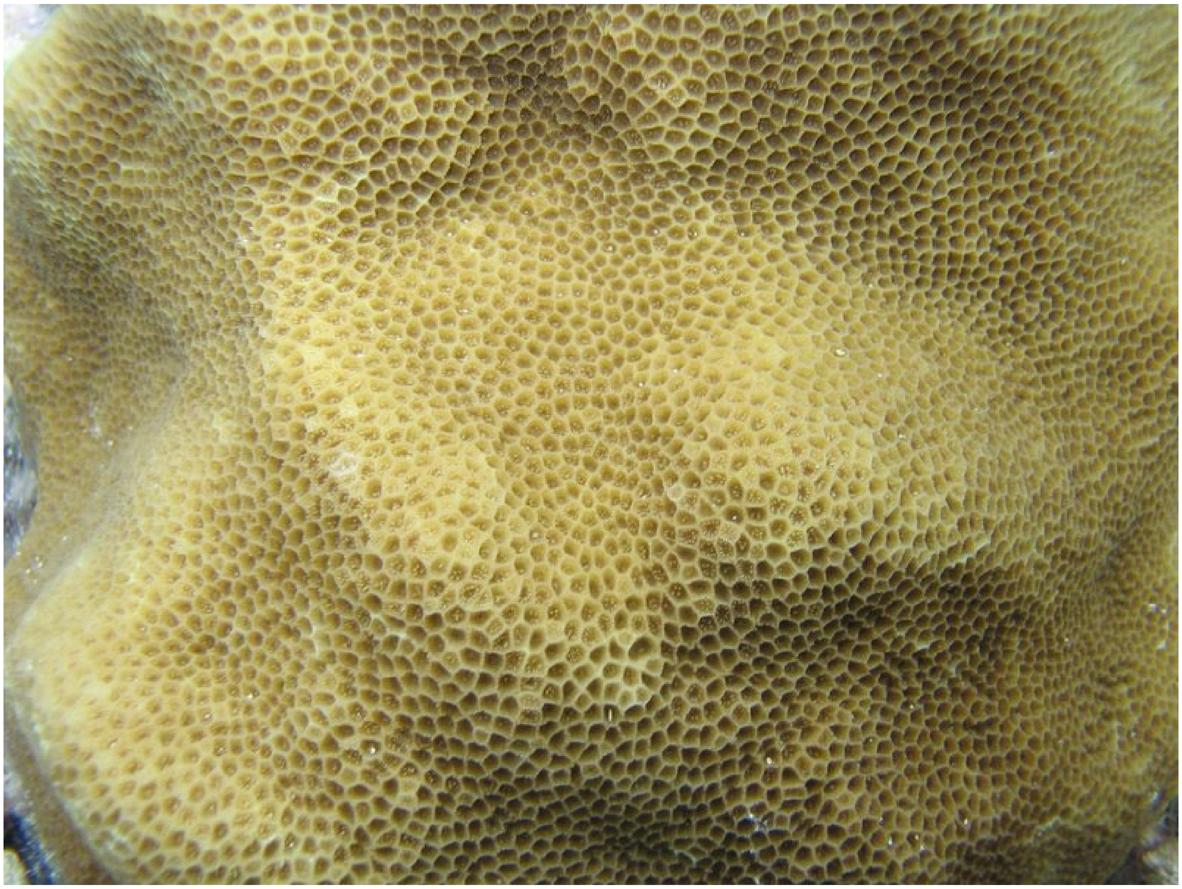
A rare, nearly-flat colony of *Porites evermanni*.

A close-up of *Porites evermanni*.

Porites stephensoni Crossland, 1952

This coral forms small massive (hemispherical) colonies usually 10 cm (4 in) or less in diameter (rarely up to about 40 cm, 16 in), which may be lumpy. Corallites appear deeper than most other massive *Porites*. Many colonies are unattached, with live tissue on all sides, and such colonies are called "coralliths." Colonies are much smaller than most other species of massive *Porites* can grow, the corallites are deeper than in other *Porites*, colonies are often unattached, colonies are only on reef flats, and colonies are always yellow-brown. Yellow-brown, uncommon but can be locally common on reef flats among rubble, reef flats only. Found so far on Tutuila, Aunu'u, and Ofu-Olosega.

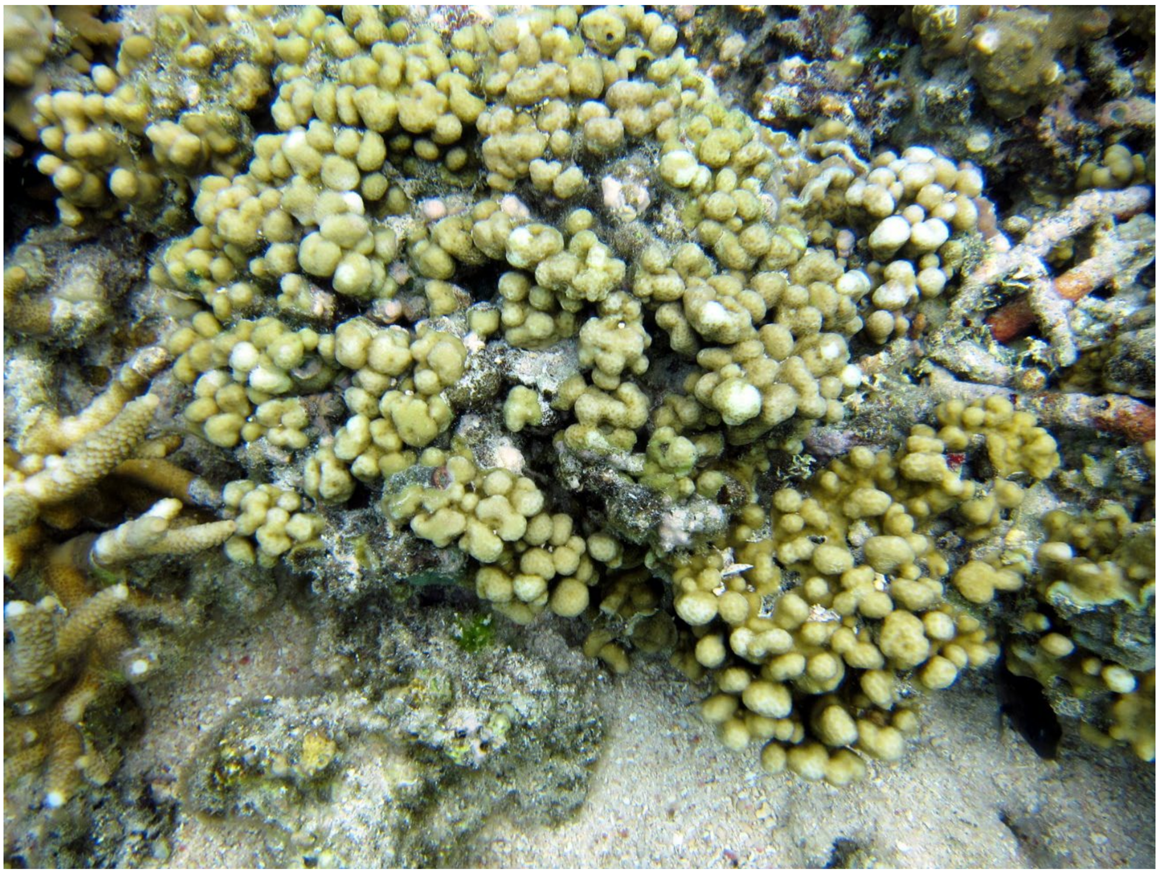
A colony of *Porites stephensoni*.



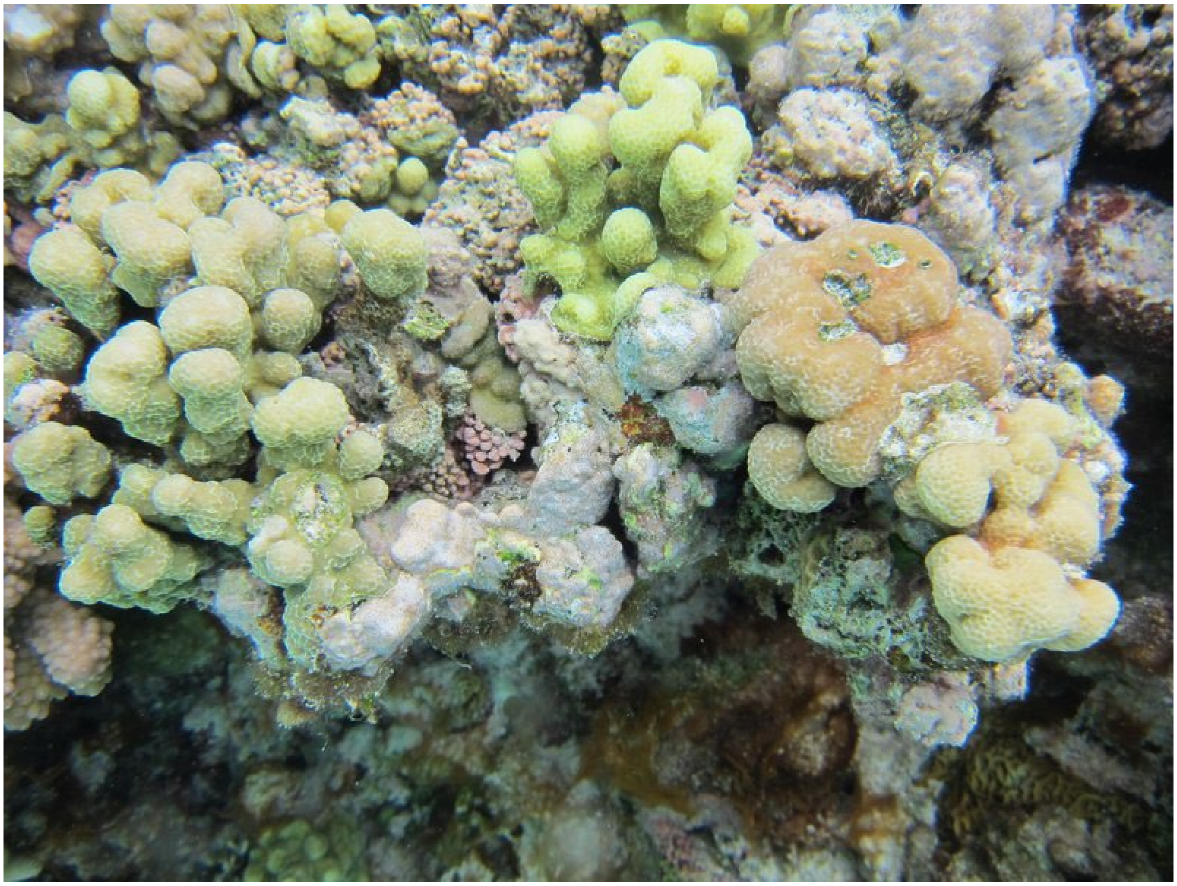
A close-up of *Porites stephensoni*.

Porites randalli Forsman and Birkeland, 2009

This coral forms small colonies 20 cm (8 in) diameter or less (most 5 cm (2 in) or less), made of rounded lumps or short columns. Corallites have a thin narrow ridge between them. Almost all *Porites* species are larger than this species. Colonies are tighter clusters of knobs than the knobby columns of *Porites annae*, do not have extended tentacles, and are not dark brown. Colonies have multiple knobs and are not as tiny as *Stylaraea*, and are not restricted to rubble on reef flats. Yellow, yellow-green, light green, tan, or sometimes purple, common in some backreef pools. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Upolu, and Savai'i.



A large colony of *Porites randalli*.



Three or four colonies of *Porites randalli*.

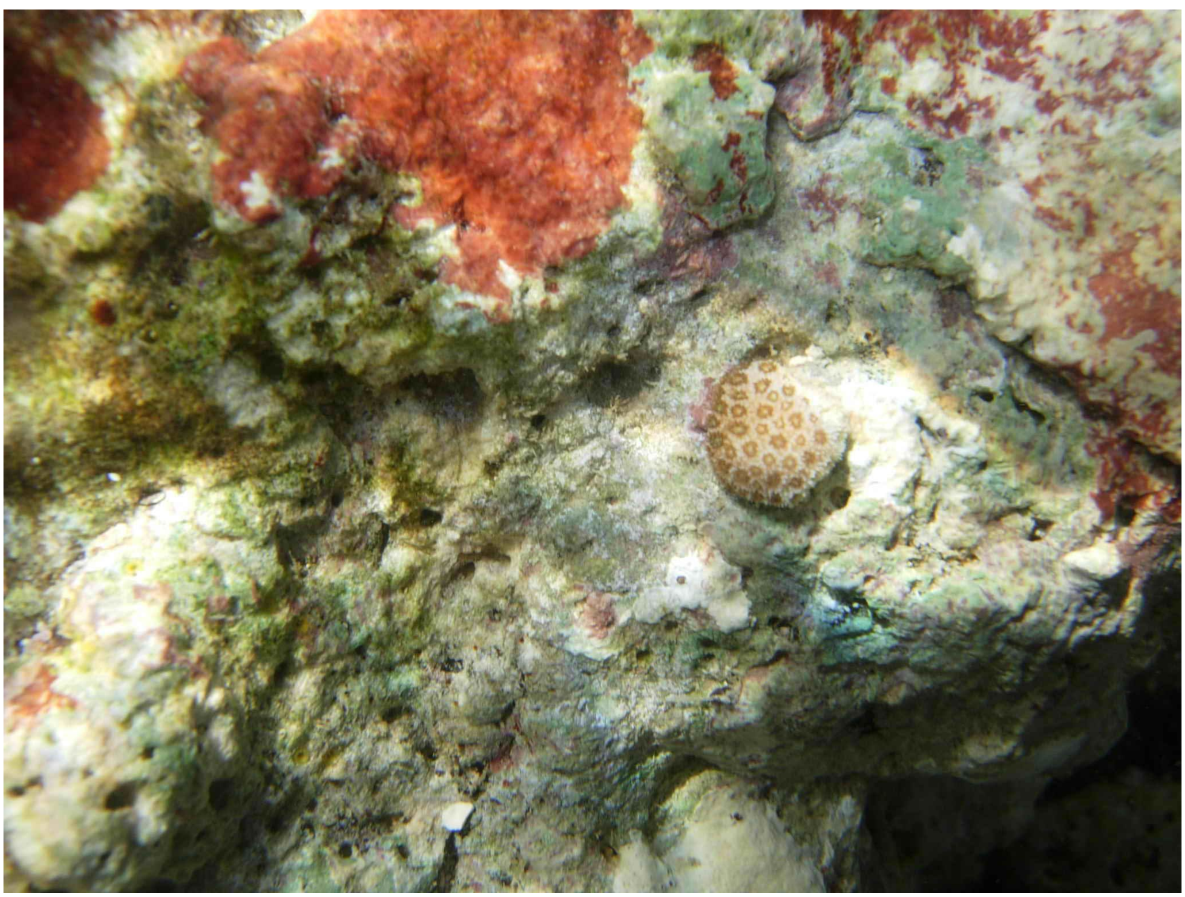
A close-up of *Porites randalli*.

Stylaraea

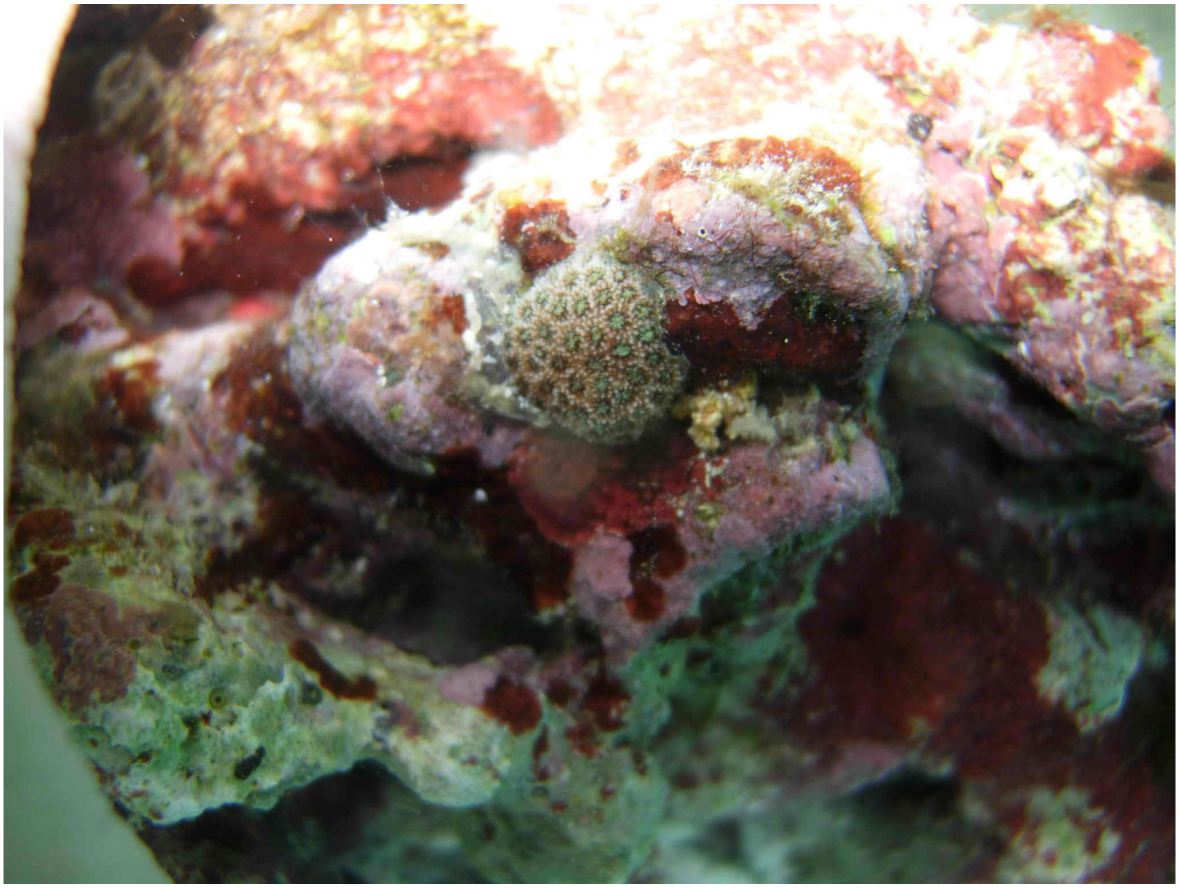
Stylaraea is a genus with only one species, which is so small and hidden, few people have ever seen it. It forms the smallest colonial, zooxanthellate (having algae) colonies of any coral in the world. Many colonies are only about 5 mm (1/4 in) diameter, and the largest colonies anywhere are probably no more than 2 cm (1 in) diameter. They are very cryptic (=hidden or hard to see). They only live on reef flats on rubble. You really have to know what you are looking for to find them, and it may take a lot of patience looking at rubble to find them. They look like tiny *Porites* colonies. The genus was first described by Linneus in 1758, which is when species were first described in the system we use now. But no one knew how to find them reliably until Richard Randall discovered how in Guam. Later, he came here to American Samoa and found them, and taught Chuck Birkeland how to find them, who taught me. If you learn to find them, you will be one of only a handful of people in the world who know how. American Samoa is the easternmost place they are known in the world. I recently found them on Ofu, the easternmost finding yet (they're surely on Ta'u and probably on Rose as well).

Stylaraea punctata (Linneaus, 1758)

This coral forms tiny colonies on rubble on reef flats. Colonies are about 3-10 mm (1/8- ½ in) diameter, and are cushion-shaped, and look just like tiny *Porites*. Tan, may have green polyp centers, rare, found so far only on the reef flats at Aua and Alofau on Tutuila, and Vaoto pool on Ofu, though may well be on rubble on many reef flats. You must search persistently to find this coral. This is the smallest colonial zooxanthellate coral in the world. It looks like a tiny juvenile *Porites* colony. Found so far on Tutuila and Ofu-Olosega.



A close-up of a colony of *Stylaraea punctata*.



A close-up of a colony of *Stylaraea puncata* with green polyp centers.

Alveopora

Alveopora looks much like *Goniopora*, with polyps that look a bit like daisies. However, the skeleton is soft because it is made of very thin tiny rods fused together. So a thumbnail sinks easily into the skeleton, unlike on *Goniopora*. Also, it has 12 tentacles instead of the 24 tentacles on *Goniopora*, though it is very hard to tell the difference underwater since it just looks like a lot of tentacles on both. Polyps vary greatly in size between species in both genera. There is only one common species in American Samoa, which forms clusters of small grey or brown lumps, usually in backreef pools. Rare to common.

Alveopora verrilliana Dana, 1846

This coral forms clusters of knobs or single knobs, about 2-5 cm (1-2 in) diameter. Colonies are covered with a fuzz of polyp tentacles. The polyp column under the tentacles may be seen sometimes. Colonies are small lumps, unlike the larger colonies of *Goniopora*. Grey, common in backreef pools rare on slopes, where it is often a single nodule. Found so far on Tutuila.

A colony of *Alveopora verrilliana*.

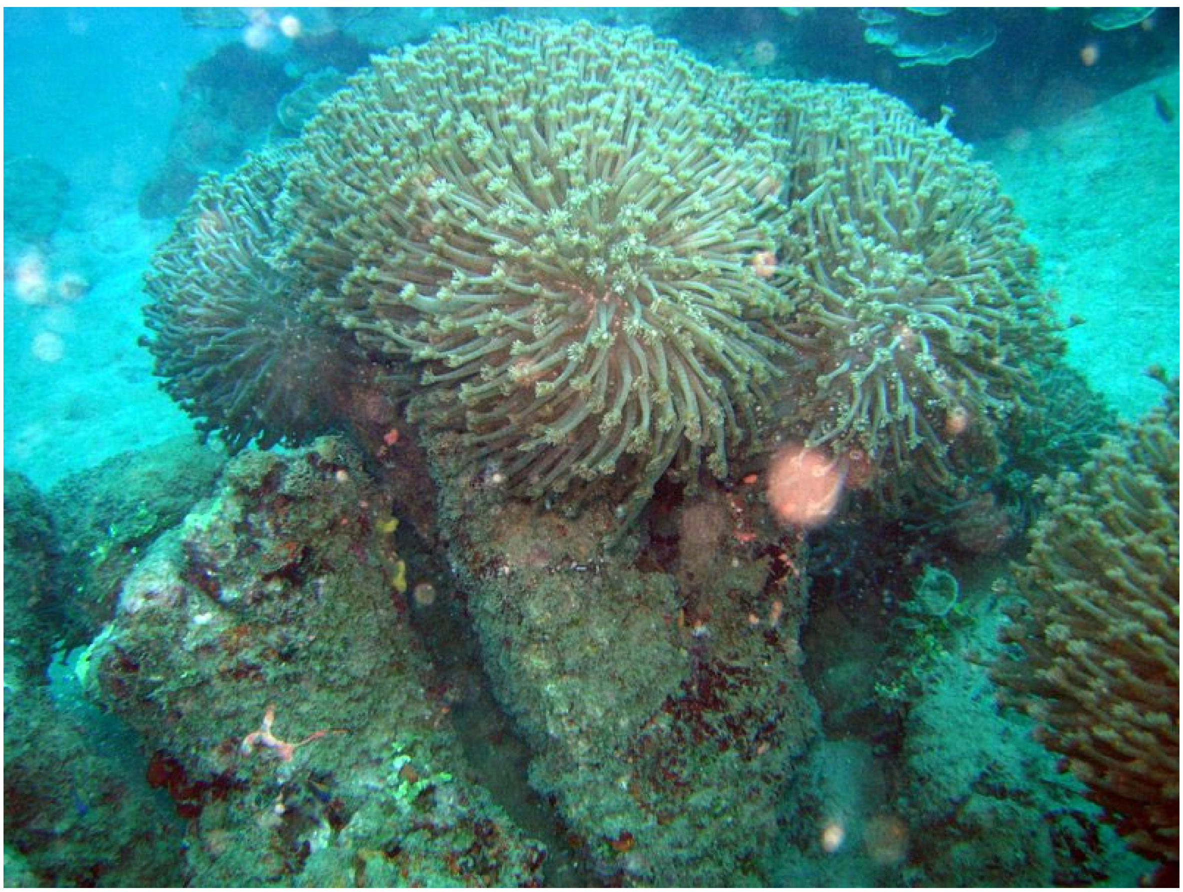
A close-up of *Alveopora verrilliana*.

Goniopora

Goniopora has tall, daisy-like polyps that are usually extended during the day. It has 24 tentacles while *Alveopora* has just 12 tentacles, and it has a solid hard skeleton. Corallites are usually about 2-4 mm diameter, and polyps a similar diameter. In some species the polyps can extend as far as about 10 cm (4 in), but in others they may only extend 2-5 mm, and in one they don't extend at all. The polyps look a bit like daisies, with a tall thin stem (better called a column) and a ring of tentacles at the top like the petals of the flower. Colonies can be encrusting, massive, or columns. The skeleton is relatively hard, if you try to push your thumbnail into it, it won't go into it, unlike *Alveopora*, which can otherwise look similar. *Goniopora* always has exactly 24 tentacles, but you can't count that many tentacles underwater, it is even hard in a photo. Uncommon most places

Goniopora columna Dana, 1846

This coral forms large thick columns close together that may appear to be a solid colony several feet (up to about 1 m) tall and wide. Polyps are daisy-like and the column or "stem" is easily seen, tentacles are very short and fat. *Goniopora columna* polyps are much larger than on *Goniopora fruticosa* or on *Alveopora verrilliana*. Grey with white polyp centers, rare, seen only at Utelei and Faga'alu. Found so far on Tutuila.

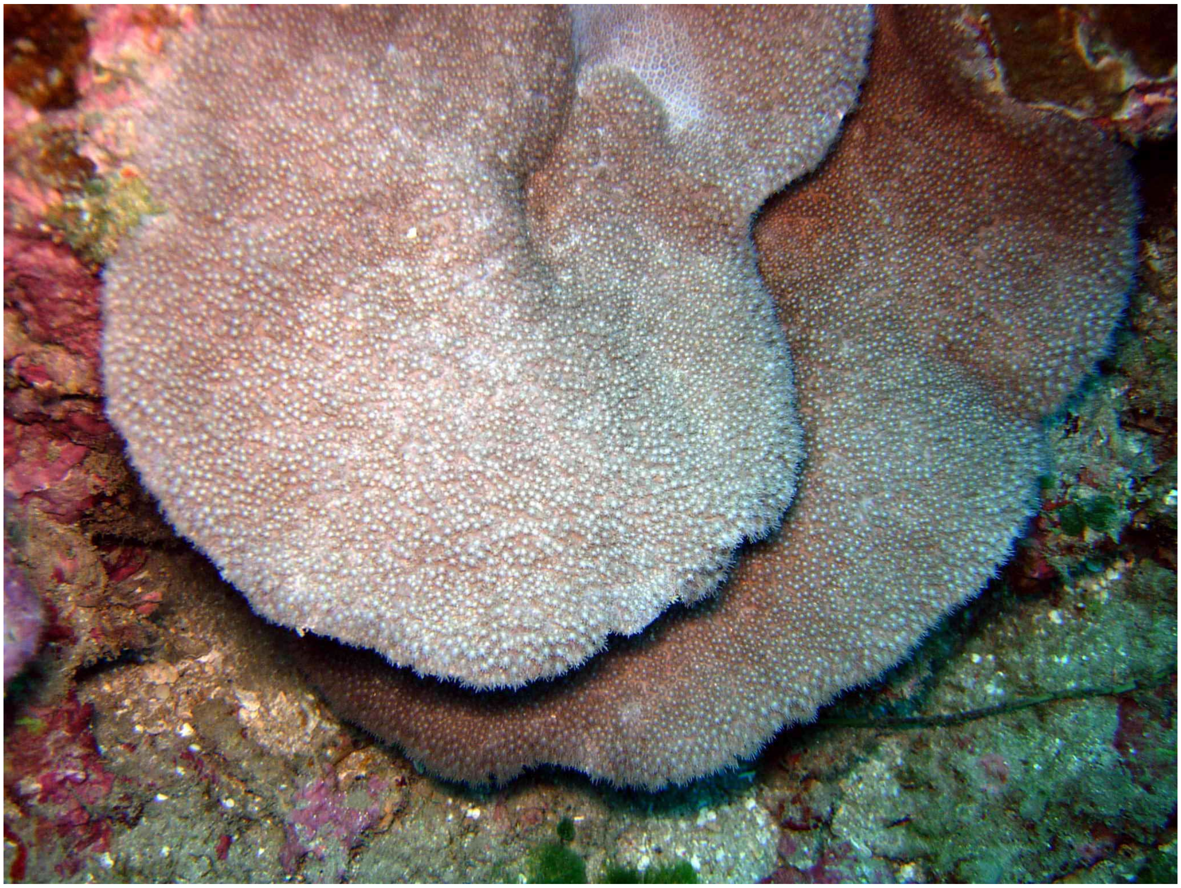


Colonies of *Goniopora columna*.

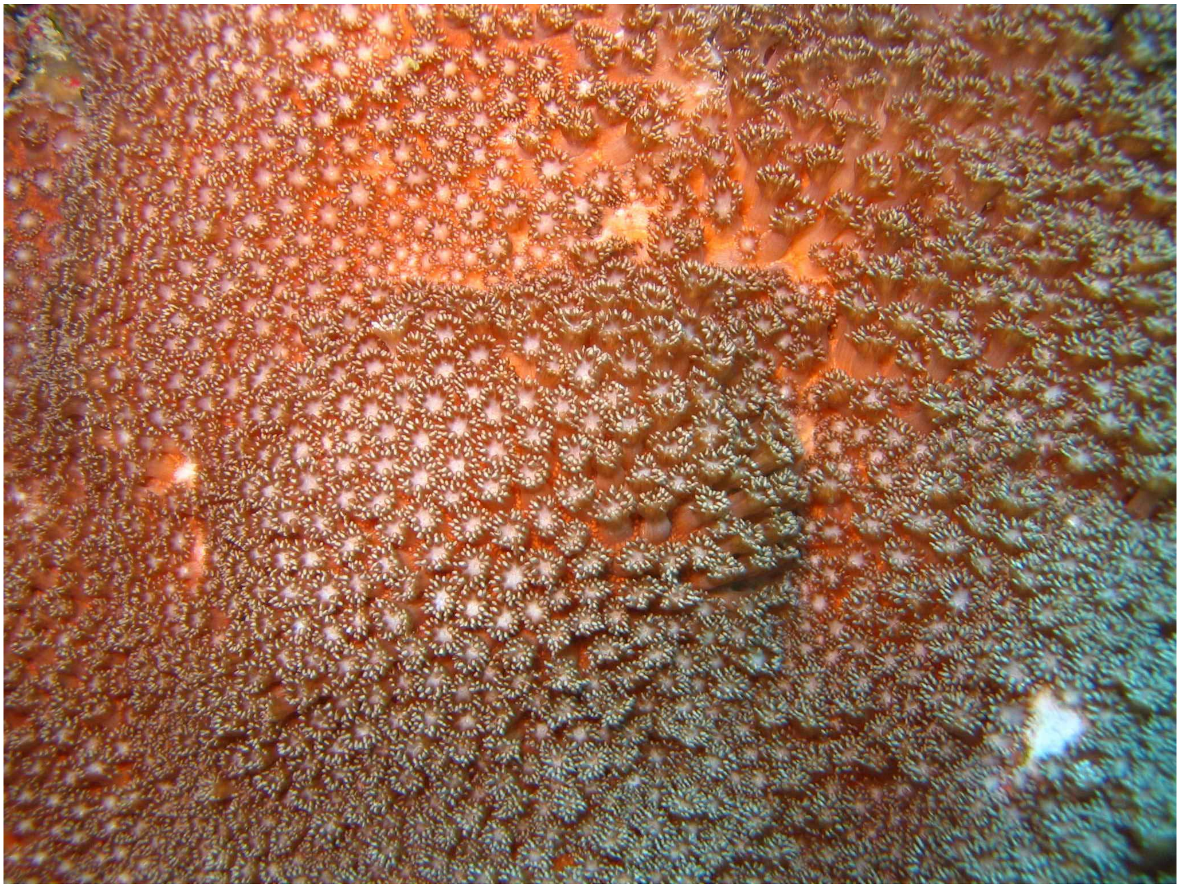
A close-up of the polyps of *Goniopora columna*.

Goniopora fruticosa Saville-Kent, 1893

This coral forms large encrusting sheets which may have some lumps which may be fused to various degrees. Polyps are small and short. Reddish-brown with white tentacles, uncommon on slopes. Found so far on Tutuila, Aunu'u, Upolu, and Savai'i.



A colony of *Goniopora fruticosa*.



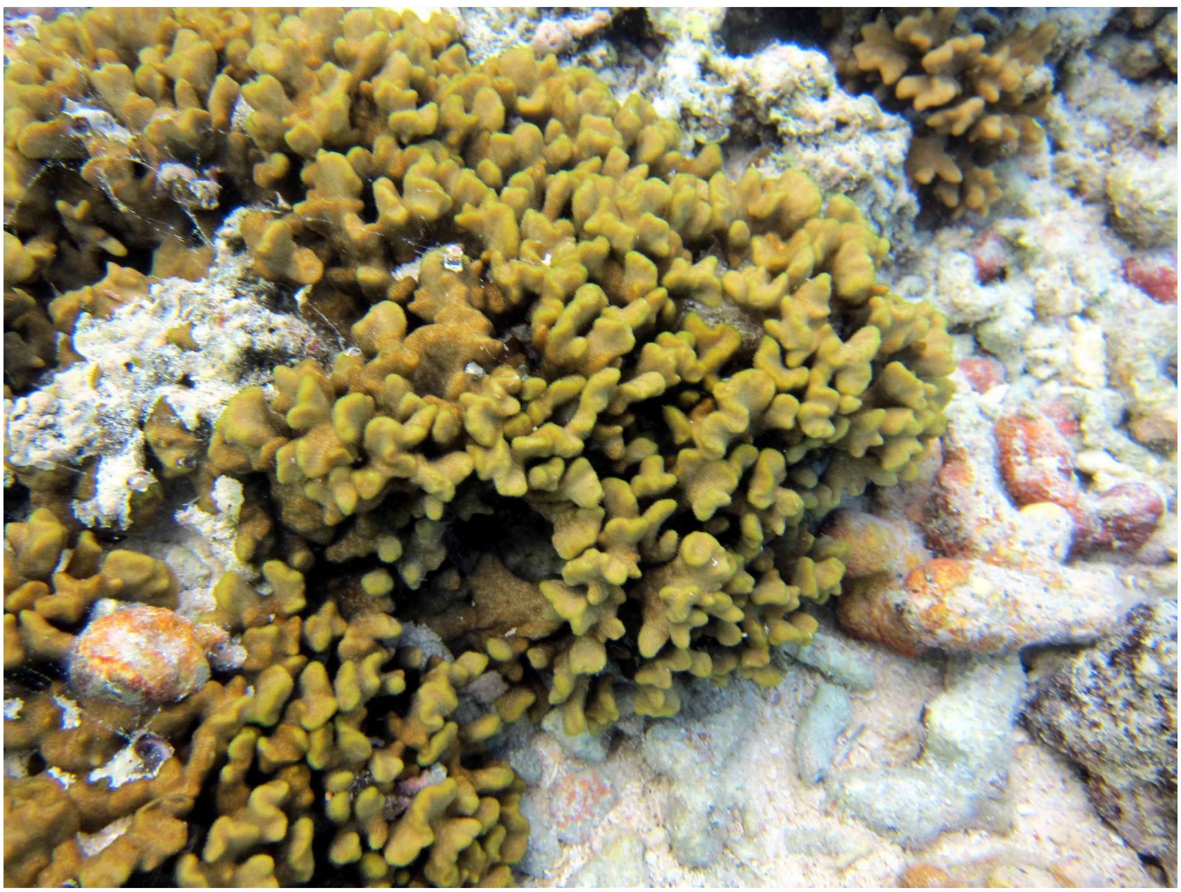
A close-up of *Goniopora fruticosa* polyps.

Psammocora

Psammocora forms colonies that can be encrusting, small massive colonies, or branching. In some species the corallites are too tiny to be seen underwater. In the small massive species the surface is commonly covered with ridges that come to a sharp upper edge and which enclose a funnel-shaped corallite which has a black dot in the center. In the encrusting species there are rounded winding ridges that usually don't intersect, and no sign of septa or corallites. In the branching species, the branch surfaces appear smooth with no corallites visible. Uncommon most places, the branching species can be abundant on some reef flats. Encrusting colonies with ridges can look like one of the species of *Pavona* (*Pavona varians*) which is common, but the *Psammocora* has a smooth looking surface while the *Pavona* has little septa that can be seen on ridge sides.

Psammocora contigua (Esper, 1797)

This coral forms small branching or lumpy colonies. Branches or lumps are about 2 cm (1 in) diameter. Branches or columns are highly irregular and lumpy. Surfaces are nearly smooth. This is the only branching *Psammocora* known from American Samoa. It could be confused with *Porites*, but the flattened branches are unlike on branching *Porites*. Brown, sometimes green, common in some back-reef pool areas, rare elsewhere. Found so far on Tutuila, Ta'u, and Muliava (Rose Atoll).



A colony of *Psammocora contigua*.

A close-up of *Psammocora contigua*.

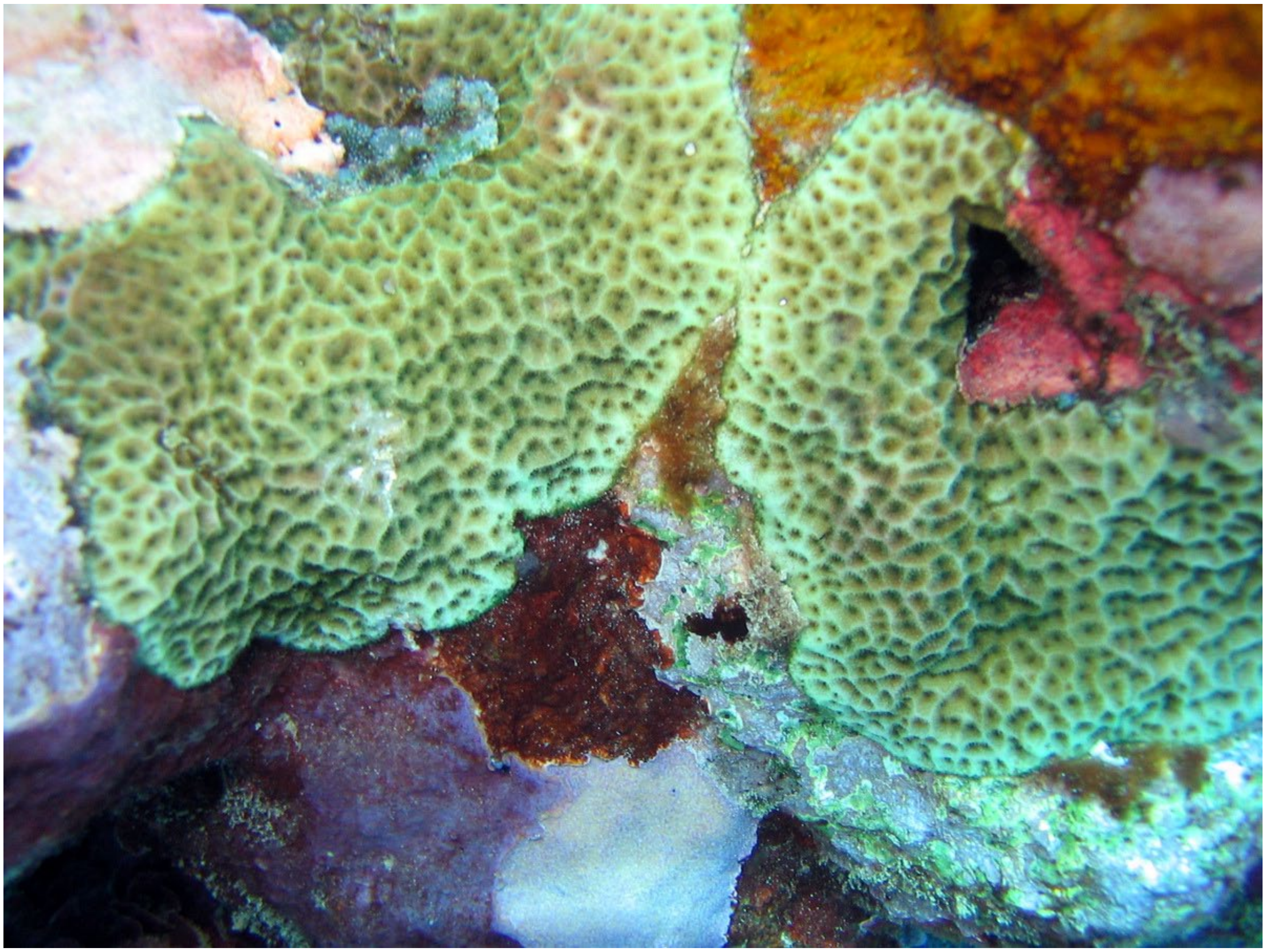
Psammocora profundacella Gardiner, 1898

This coral forms small encrusting, massive or lumpy colonies. The surface has fairly sharp ridges between corallites or groups of corallites. The ridges on *Psammocora nierstrazi* are more rounded, do not enclose polyp centers, and are usually not connected. Ridges on *Pavona varians* are more rounded and don't always enclose polyps. *Pavona venosa* forms lumpy colonies with cracks between the lumps, and is usually golden. Brown, or green, rare, reef slopes. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Muliava (Rose Atoll), Upolu, Apolima, and Savai'i.

A colony of *Psammocora profundacella* with high sharp ridges and polyp centers that are hard to see.

A colony of *Psammocora profundacella* with high ridges that mostly don’t enclose corallites.

Veron (2000) distinguished *Psammocora haimeana* from *Psammocora profundacella*. He indicatesd *P. haimeana* has high sharp ridges and indistinct corallite centers, and *P. profundacella* has lower, less sharp ridges, and corallites centers are distinct tiny pits. However, Sheppard and Sheppard, 1991, reported finding a gradation between colonies of these two species. A more recent study (Stefani et al. 2008) supported this view that these are not separate species. The name *Psammocora haimiana* applies to another species, not found so far in American Samoa, which used to be called *Psammocora digitata*. Photos of colonies of *P. profundacella* with lower ridges and more distinct colony centers are shown below.



A colony of *Psammocora profundacella* with lower ridges and more distinct centers.

A close-up of another colony of *Psammocora profundacella* with lower ridges and more distinct centers.

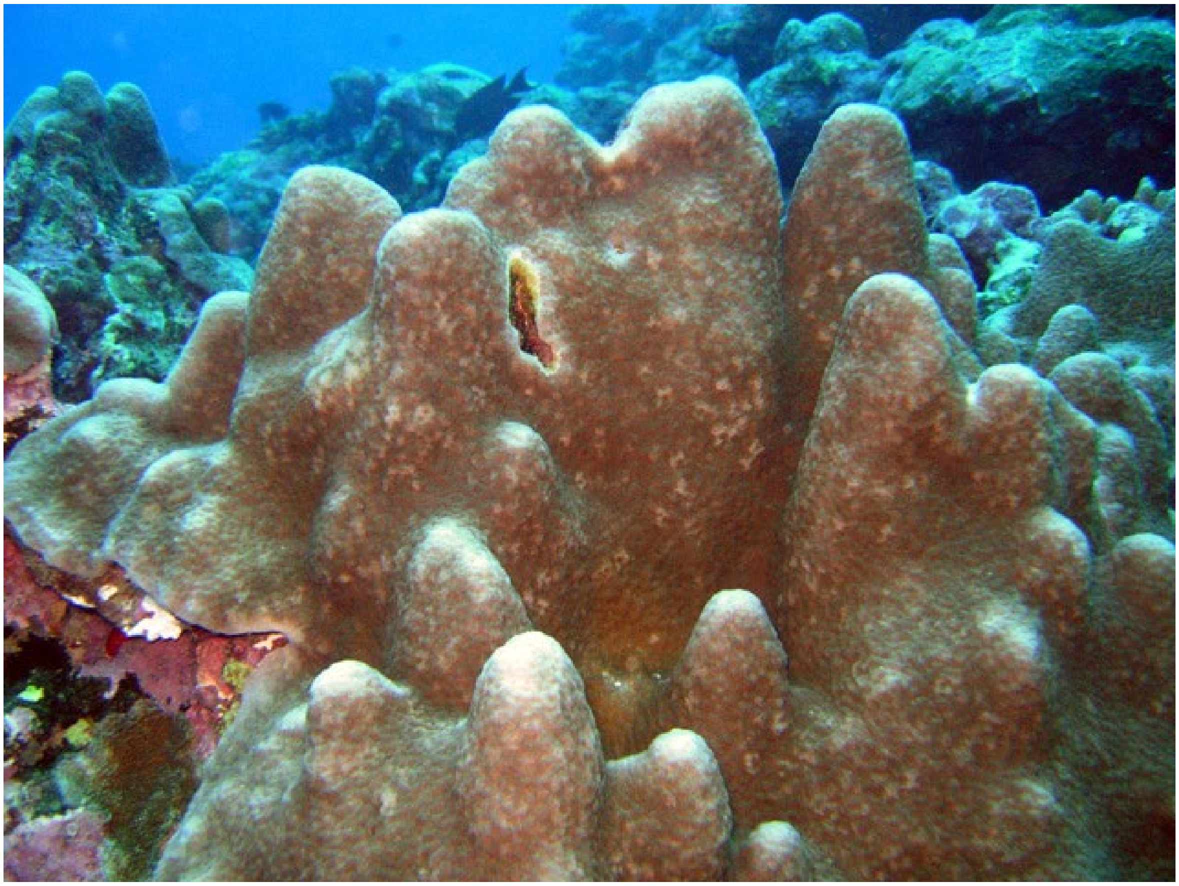
Psammocora digitata Milne Edwards and Haime, 1851

This species forms massive colonies that can be huge, up to 2 meters (6 feet) tall and 1 meter (3 feet) wide. Colonies can range from encrusting to massive with a cylindrical shape to a pyramid shape, and often have pairs of parallel ridges which may define part of a cylinder between them. The surface is finely granular and tentacles are not extended. Brown, gray, rarely purple. Uncommon. Also found in Tonga, Wallis and Fatuna, New Caledonia, the Great Barrier Reef and "China Seas". This species has not been shown in any field guides before. This is by far the largest species of *Psammocora*, the only large massive species in the genus. Massive *Porites* do not have the same colony shape, and the corallites are not separated by raised rounded ridges. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Upolu and Apolima.

A colony of *Psammocora digitata* with the characteristic lumps.

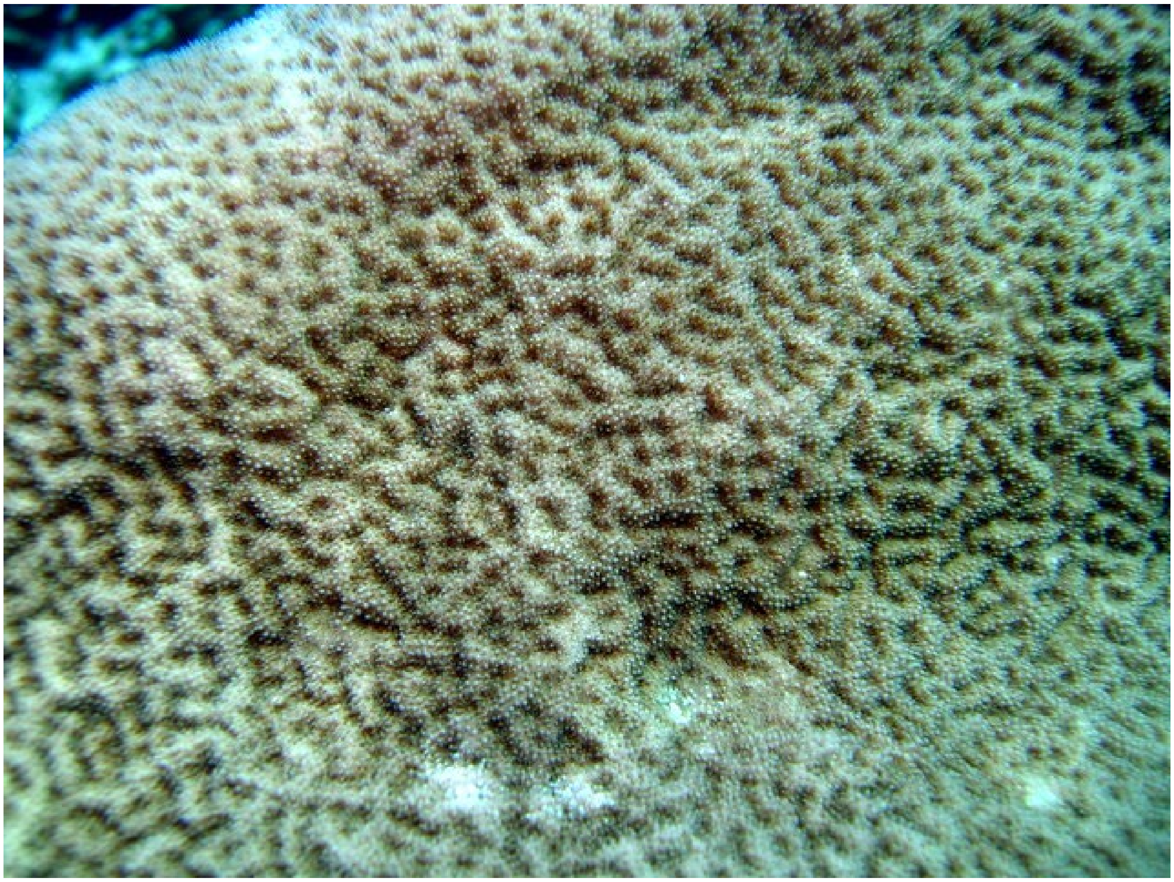
A re-examination of the type specimen of this species name found that this is the morphological species that corresponds to the name (Benzoni et al, 2010). In the past (Veron, 2000), this name has been applied to a species that has cylindrical columns and commonly has tentacles extended, but Benzoni et al (2010) found that species corresponds to the type specimen of a species named *Psammocora haimeana*, a name which has been applied to colonies of *Psammocora profundacella* in the past (Veron, 2000).

A colony of *Psammocora digitata* with rows of paddle-shaped growths.



A colony of *Psammocora digitata* with tapering cylindrical columns growing up from a massive base. This is an uncommon shape in this species.

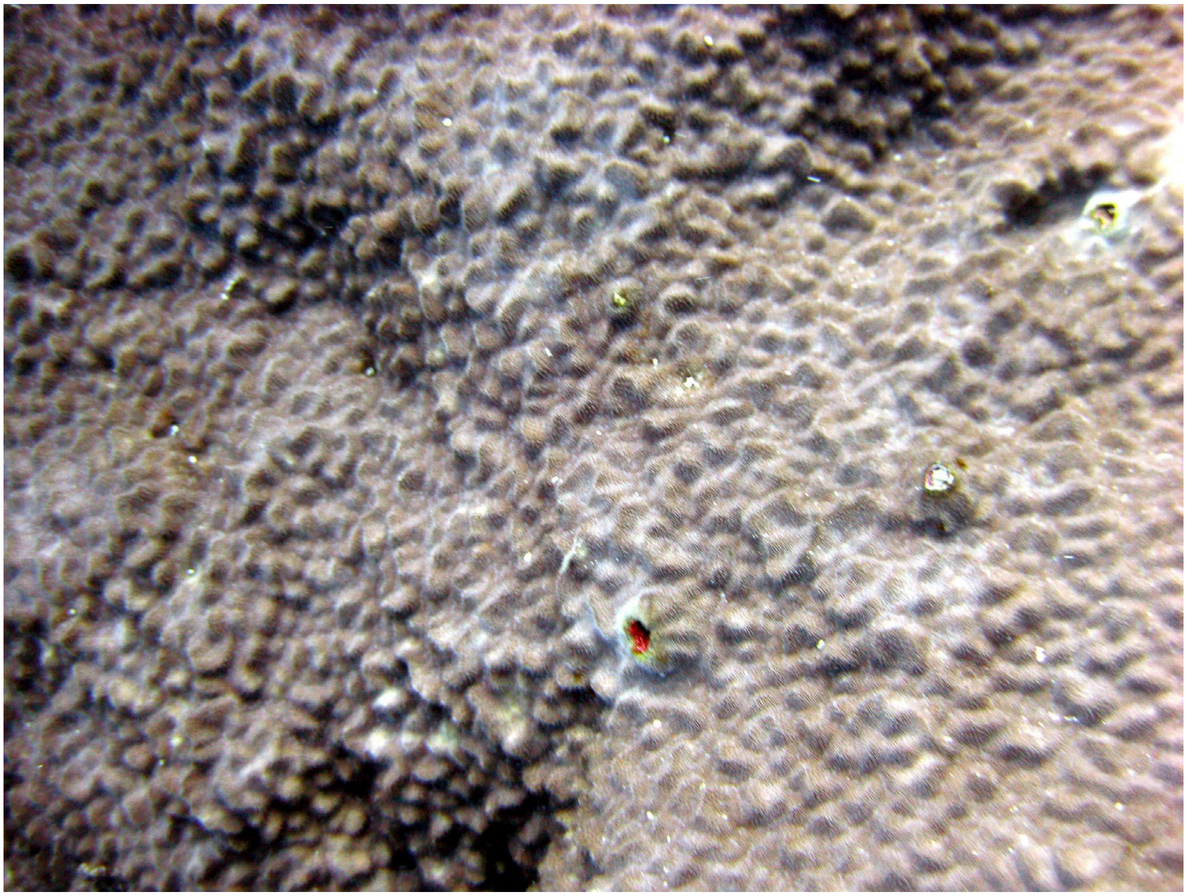
A close-up photo of the surface of *Psammocora digitata*.



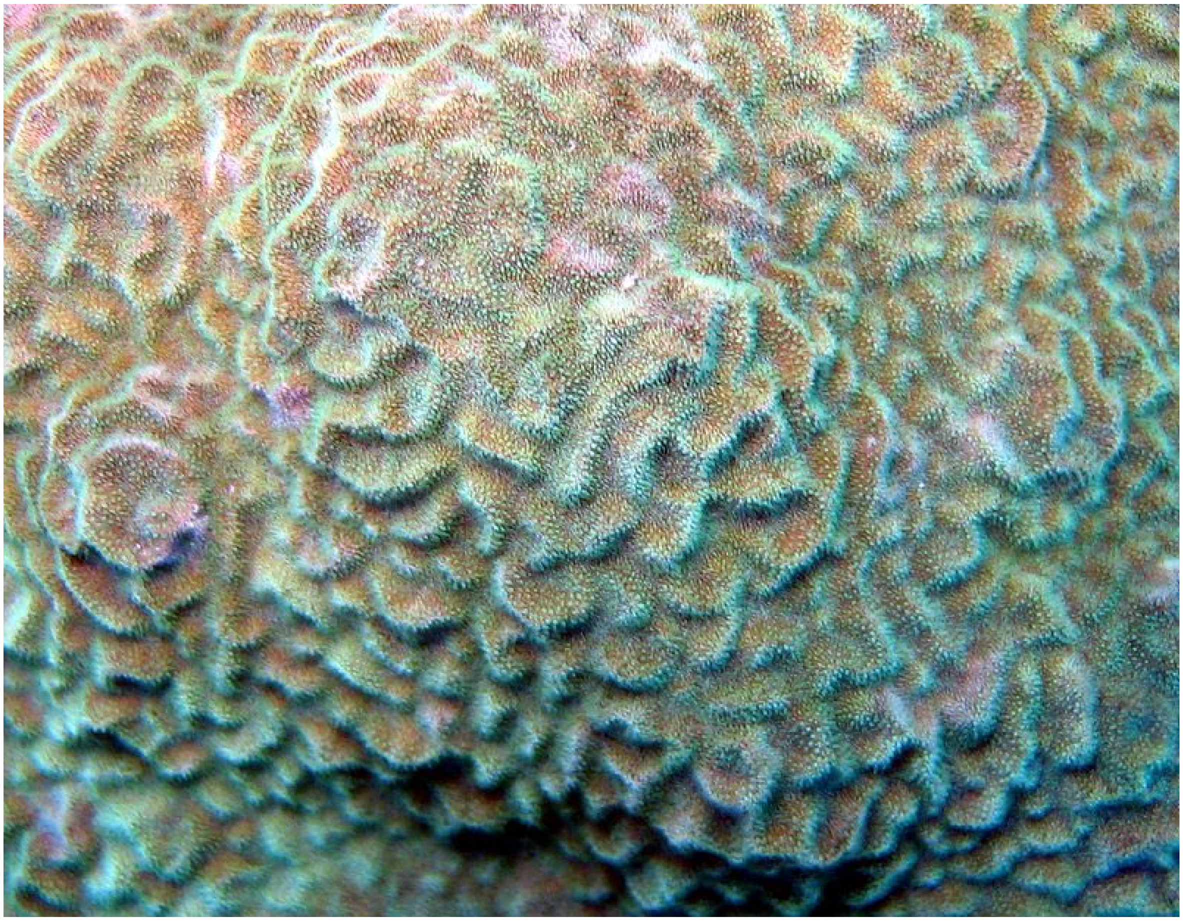
A close-up photo of the surface of *Psammocora digitata*.

Psammocora nierstraszi van der Horst, 1921

This coral forms encrusting colonies covered with small irregular winding ridges or bumps. Usually no finer features can be seen, unlike on *Pavona varians*. On *Psammocora nierstraszi* the ridges are rounded, don't enclose corallite centers, and are usually not connected, unlike on *Psammocora profundacella*. *Psammocora nierstraszi* has a nearly smooth surface texture, while on *Pavona varians* fine septa (ridges) radiate down the sides of the ridges and sometimes corallite centers can be seen between the ridges. Green, brown, grey, uncommon, reef slopes. Found so far on all islands but not on South Bank.



A colony of *Psammocora nierstraszi*.



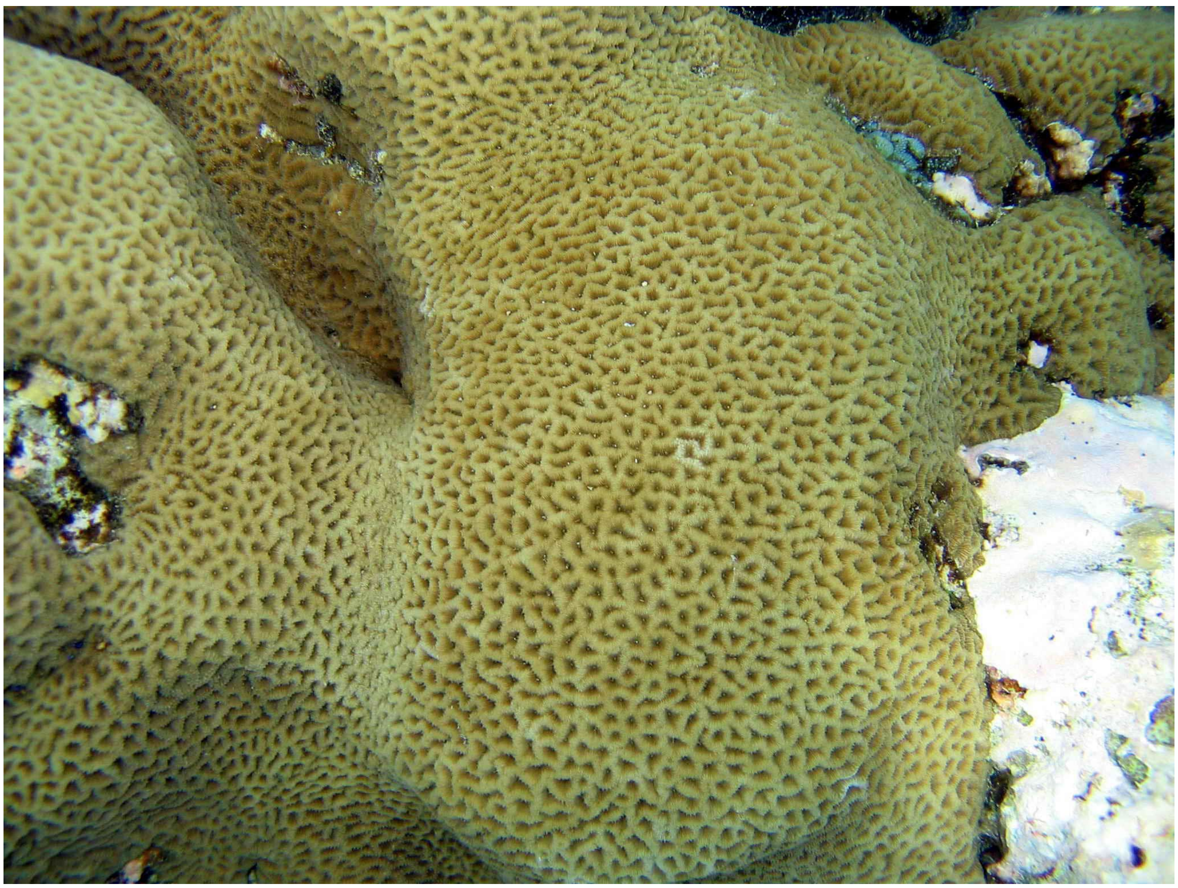
A close-up of *Psammocora nierstraszi*.

Coscinaraea

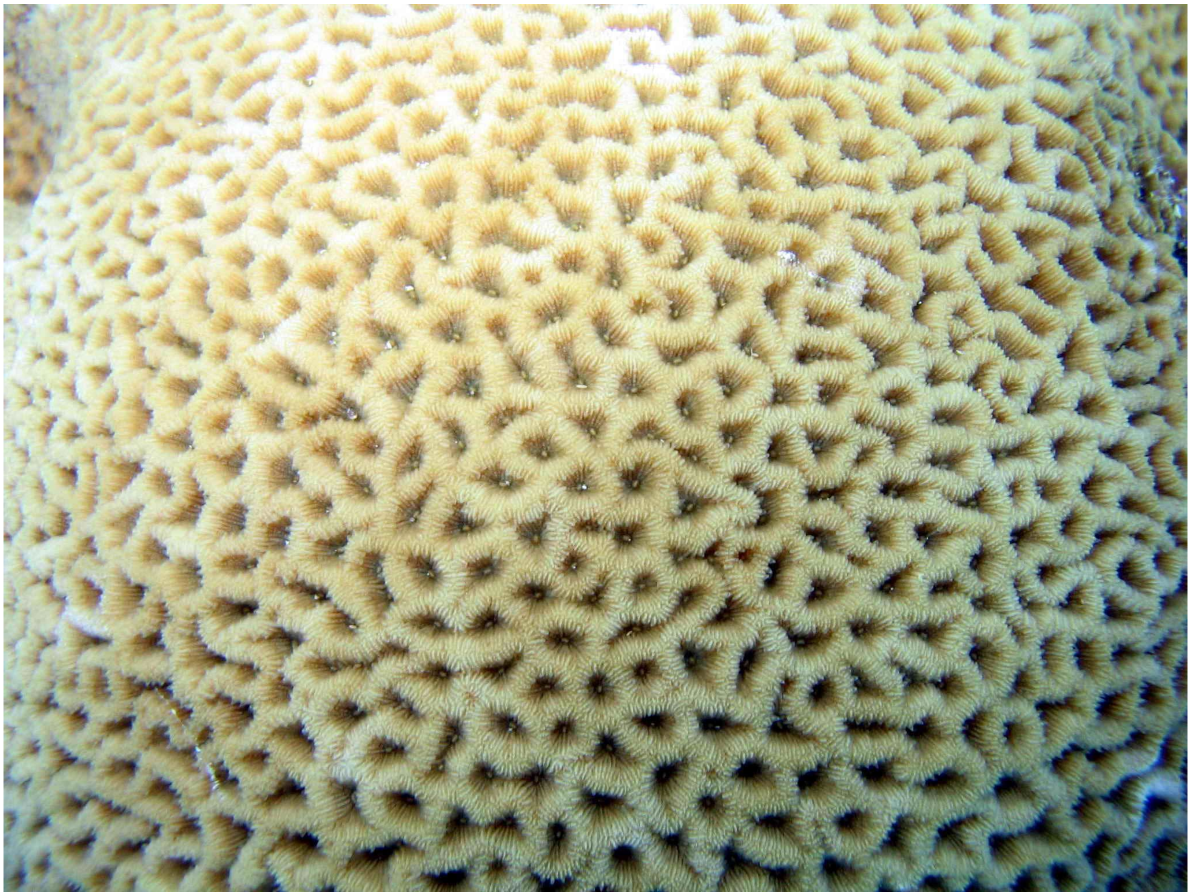
Coscinaraea forms encrusting or massive colonies with quite small winding ridges that enclose spaces. The ridges are somewhat square-topped. Colonies are always brown. Corallites are deep in the valleys and can't be seen. Uncommon. *Coscinaraea* might look a bit like *Favites*, but the ridges and valleys are smaller.

Coscinaraea columna (Dana, 1846)

This coral forms massive or encrusting colonies covered with small winding ridges. The ridges may enclose single corallites or several corallites. Small spines may be visible on the ridges. Brown, uncommon, reef slopes. *Coscinaraea exesa* forms columns, and the ridges are slightly spinier. The ridges are thicker than on other species with ridges. Found so far on all islands but not on South Bank.



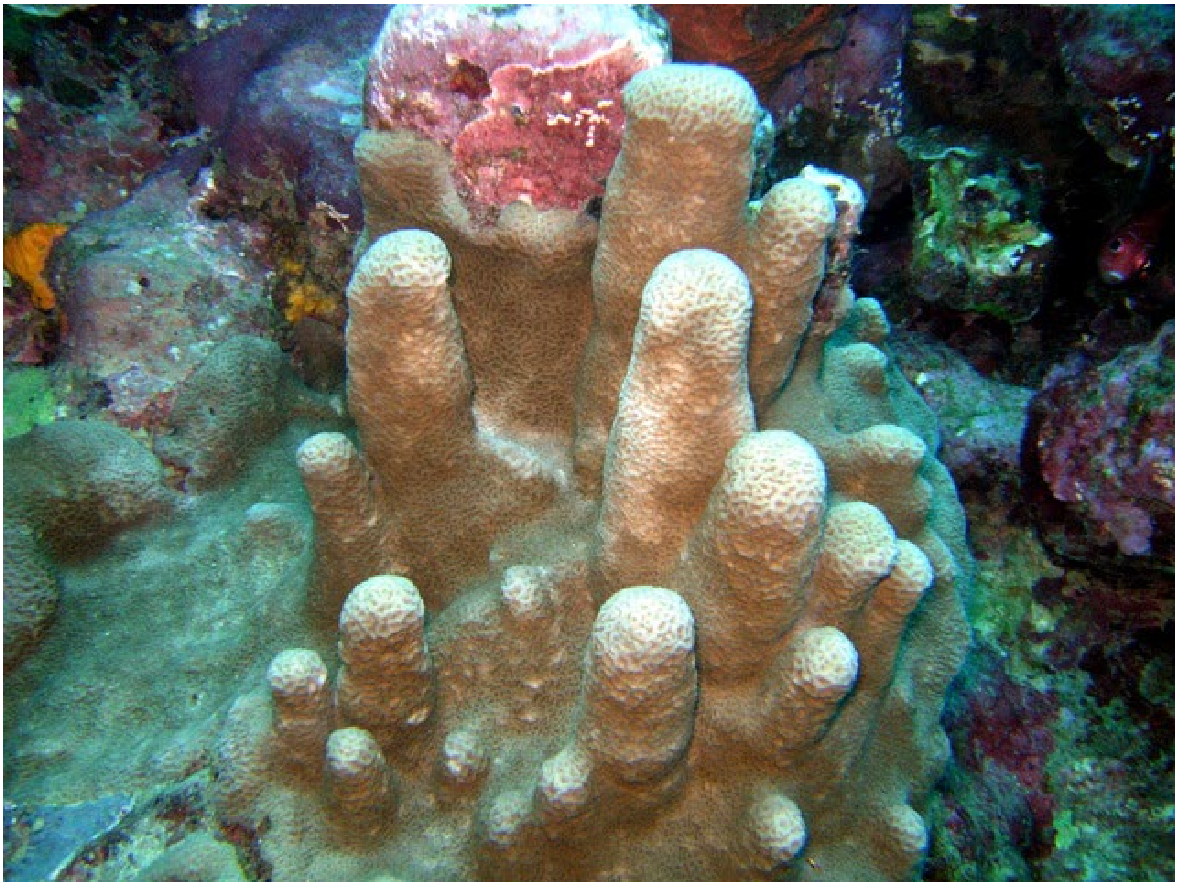
A colony of *Coscinaraea columna*.



A close-up of the surface of *Coscinaraea columna*.

Coscinaraea exesa (Dana, 1846)

This species forms cylindrical columns with small ridge surrounding corallites. There are small spines along the edge of the ridges, and often tentacles are extended. Light brown or bright green, rare, reef slopes and pools. *Coscinaraea columna* is massive and the ridges are slightly less spiny and spaces between them smaller and it is far more abundant. Other species have thinner ridges. Found so far on Tutuila, Ta'u, and Muliava (Rose Atoll).



A colony of *Coscinaraea exesa*.

A close-up of *Coscinaraea exesa*.

Gardineroseris

Gardineroseris is a genus with only one species. It forms massive colonies that have small corallites about 1/8 inch (3 mm) diameter that are separated by a very sharp ridge and no groove. Septa inside the corallite are so small and close together and all the same size so that they appear to be a very smooth surface. Redish-brown to brown, rare. Smaller corallites and sharper, smoother ridges than *Favites* or *Goniastrea*.

Gardineroseris planulata Dana, 1846 "honeycomb coral"

This coral forms encrusting or massive colonies, the surface of which is covered with tall sharp ridges that enclose corallites in a honey-comb like fashion. Septa are too small to be seen underwater, any ridges visible inside corallites are where the corallites are dividing. Colonies can get much larger than *Psammocora profundacella* and *Pavona venosa*, and the shape of the corallites is much more uniform and honeycomb-like. Brown, uncommon to rare, reef slopes. Found so far on Tutuila, Aunu'u, and Ofu-Olosega.

A colony of *Gardineroseris planulata*.

A close-up of *Gardineroseris planulata*.

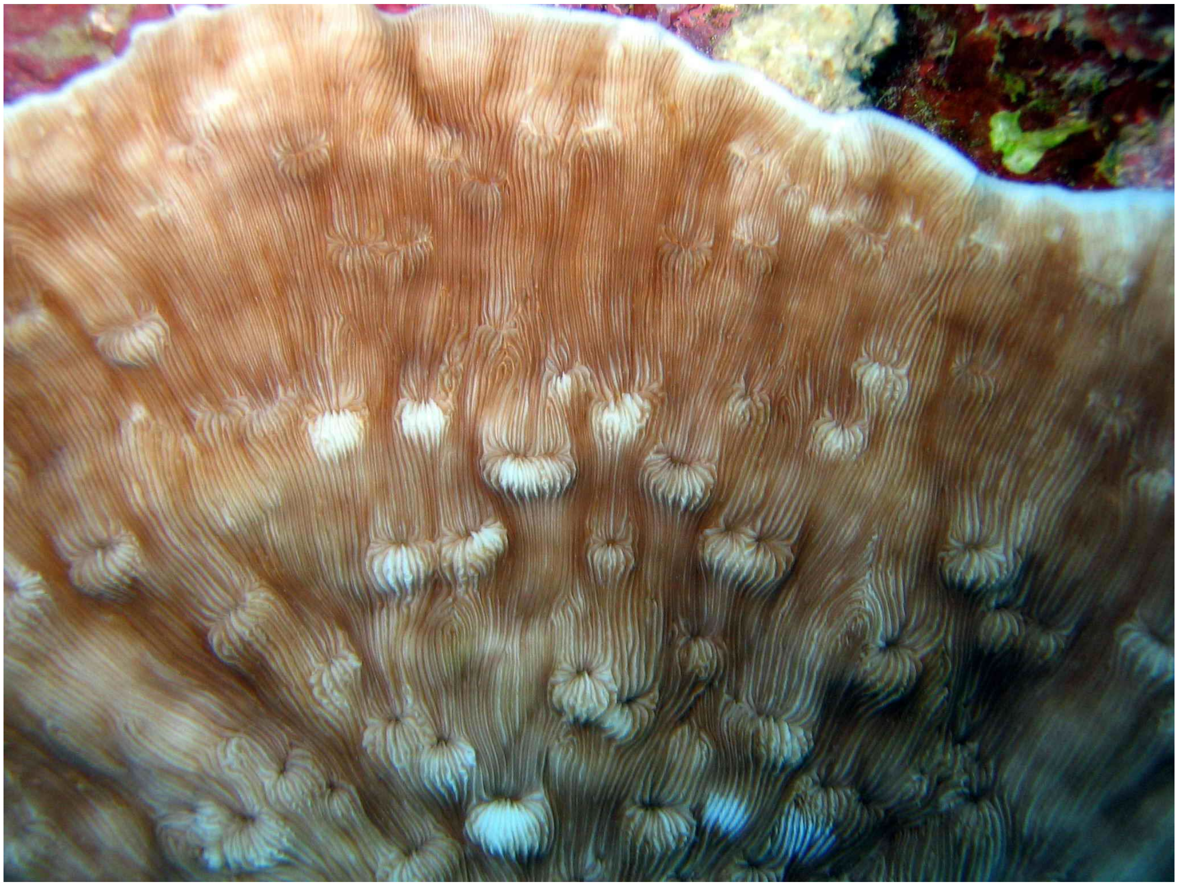
Leptoseris

Leptoseris usually forms thin plates, but some species are encrusting. They tend to be yellow-brown, and to be in lower-light conditions such as deeper water. Corallites in some cases are raised as round cushions, and may point outwards. In one of the most common species corallites are recessed and can't be seen, with winding ridges between the corallites giving a very wrinkled appearance. The septae continue outside the corallites as costae that reach other corallites and continue inside as septa, and so are called septo-costae, like in *Pavona*. Browns, light yellows to cream. Usually uncommon. Most *Pavona* are massive, columnar or branching, while most *Leptoseris* are thin plates or encrusting. *Pavona* are also not in low light conditions. The wrinkled colonies have smooth surfaces on the wrinkles and the wrinkles are thinner than ridges on *Favites*. On colonies with outward leaning cushion-shapped corallites, the plates are smoother and corallites smaller than on *Mycedium*.

Leptoseris scabra Vaughan, 1907

This coral forms small thin plates deeper on reef slopes in shaded locations. The plates are usually circular in shape and close to the substrate. Corallites are small raised rounded lumps that are tilted and point toward the edge of the plate. The plate has many tiny radiating ridges that are hard to see. *Leptoseris explanulata* has larger ridges. Yellow to brown, fairly common on lower reef slopes. Found so far on Tutuila, Aunu'u, Muliava (Rose), Upolu, and Savai'i.

A colony of *Leptoseris scabra*.



A close-up of *Leptoseris scabra*.

Leptoseris explanata Yabe & Sugiyama, 1941

This coral forms small encrusting colonies with plate edges. Larger colonies form plates or fronds which can be well up off the substrate. The surface is covered with small obvious ridges (septo-costae) that radiate from corallite centers and alternate in size. The ridges are more obvious than on other similar *Leptoseris*. Reddish-brown, rare, reef slopes. Found so far on Tutuila and Ta'u.

A colony of *Leptoseris explanata*.

Leptoseris explanata.

Leptoseris foliosa Dineson, 1980

This coral forms small encrusting colonies that may have plate edges. The surface is covered with smooth rounded ridges that are a variety of sizes and usually concentric on the plate. Ridges are separated by rows of little black holes which are the corallites. Ridges are much higher on *Leptoseris mycetoseroides* and go in many directions. Yellow to brown, rare, reef slopes. Found so far on Tutuila and Muliava (Rose Atoll).

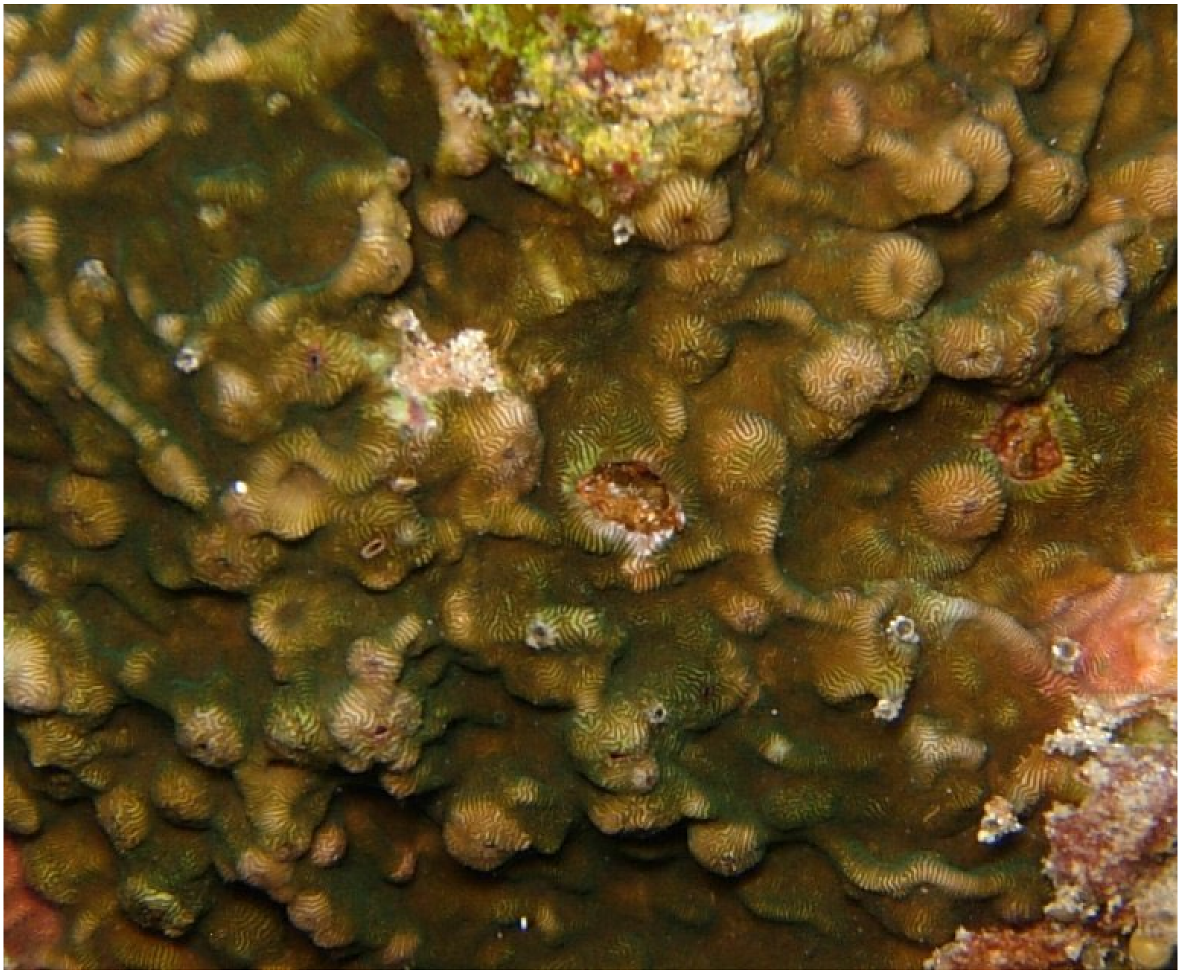
A colony of *Leptoseris foliosa*.

A close-up of *Leptoseris foliosa*.

Leptoseris incrustans (Quelch, 1886) Vulnerable

This coral forms small encrusting colonies covered with small irregular bumps. Some bumps may form partial circles, surrounding corallites, but many don't. Lumps on other species are cushion-shaped and have a hole in the center since they are corallites. Brown to green, rare, reef slope, least rare on overhangs. Found so far on Tutuila, Ofu-Olosega, and Muliava (Rose Atoll).

A colony of *Leptoseris incrustans*.



A close-up of *Leptoseris incrustans*. Some of the lumps have barnacles in them, indicated by the small black hole.

Leptoseris mycetoseroides Wells, 1954

This coral forms encrusting colonies covered with winding intersecting ridges. Ridges wind and intersect in a chaotic fashion. The corallites are between the ridges. The ridges are larger on some colonies than on others. *Leptoseris foliosa* has lower, rounded, concentric ridges with corallite indentations between them. *Leptoseris yabei* forms plates and has ridges which are either concentric or radiating, forming rectangles. Brown or yellow, sometimes with green polyps, uncommon to common, reef slopes. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Muliava (Rose), Swains, Upolu, and Savai'i.

A colony of *Leptoseris mycetoseroides*.

A close-up of *Leptoseris mycetoseroides*.

Leptoseris yabei (Pillai & Scheer, 1976) Vulnerable

This coral forms plates that may be in tiers. The upper surfaces of the plates are covered with intersecting ridges. Near the edge of the plates the largest ridges radiate and other ridges run at right angles forming rectangles. Ridges are similar to those on *L. mycetoseroides* except they are either concentric or radiating and enclose rectangles. Yellow or brown, rare, reef slopes. Found so far on Tutuila, Ofu-Olosega, and Muliava (Rose Atoll).

A colony of *Leptoseris yabei*.

A close-up of *Leptoseris yabei*.

Pavona

Pavona has a variety of colony forms. Some are encrusting, some form ridges the shape of pork chops, some have thick branches, some have lumps or columns, and some are plates. Among the plate colonies, a couple species have vertical plates which intersect, and the intersections between plates may be far apart so the plates are obvious, or very close together making it a crinkly mass. *Pavona* usually has corallites that are nearly flush with the surface, and the septa radiating from one tiny mouth run to the neighboring corallite and in to its mouth. So there is no wall on the corallite, and the septa continue as costae with no boundary between the two, so they are called septo-costae. Corallites and septo-costae are usually small, and can be tiny so they are hard to see. In one species they are covered with little white tentacles so you can't see them. Abundant to uncommon. *Pavona* is somewhat similar to *Leptoseris* but rarely forms thin plates.

Pavona duerdeni Vaughan, 1907

This coral forms thick vertical plates that look a little like pork chops on edge, though small colonies may be a lump. Surfaces are nearly smooth, with tiny star-like corallites. Corallites are smaller and harder to see than on other species of *Pavona* except *Pavona minuta*, which has the smallest corallites. *Pavona diffluens* can have vertical walls but often is lumpy, and has larger corallites with deep centers. Tan, uncommon, reef slopes. Found so far on all islands but Apolima.

A colony of *Pavona duerdeni*.

A close up of *Pavona duerdeni*.

Pavona diffluens (Lamarck, 1816) Threatened Vulnerable

This coral forms lumps or small porkchop-shaped colonies. Corallites are relatively large, much larger than *P. duerdeni*, but tentacles are not extended as on *P. gigantea*, and colonies are smaller than both. Uncommon on Rose Atoll, rare on Tutuila, reef slopes grey or rust color. It has large, deep corallite centers unlike other *Pavona* species. Thought to exist only in the Red Sea, this coral was discovered here and in Guam and then American Samoa by Richard Randall, a long way from the Red Sea. Veron thinks this is a similar but distinct species from *Pavona diffluens* with different size corallites, but corallites appear similar in size to published photographs of corallites of colonies in the Red Sea. Found so far on Tutuila, Ofu-Olosega, and Ta'u.

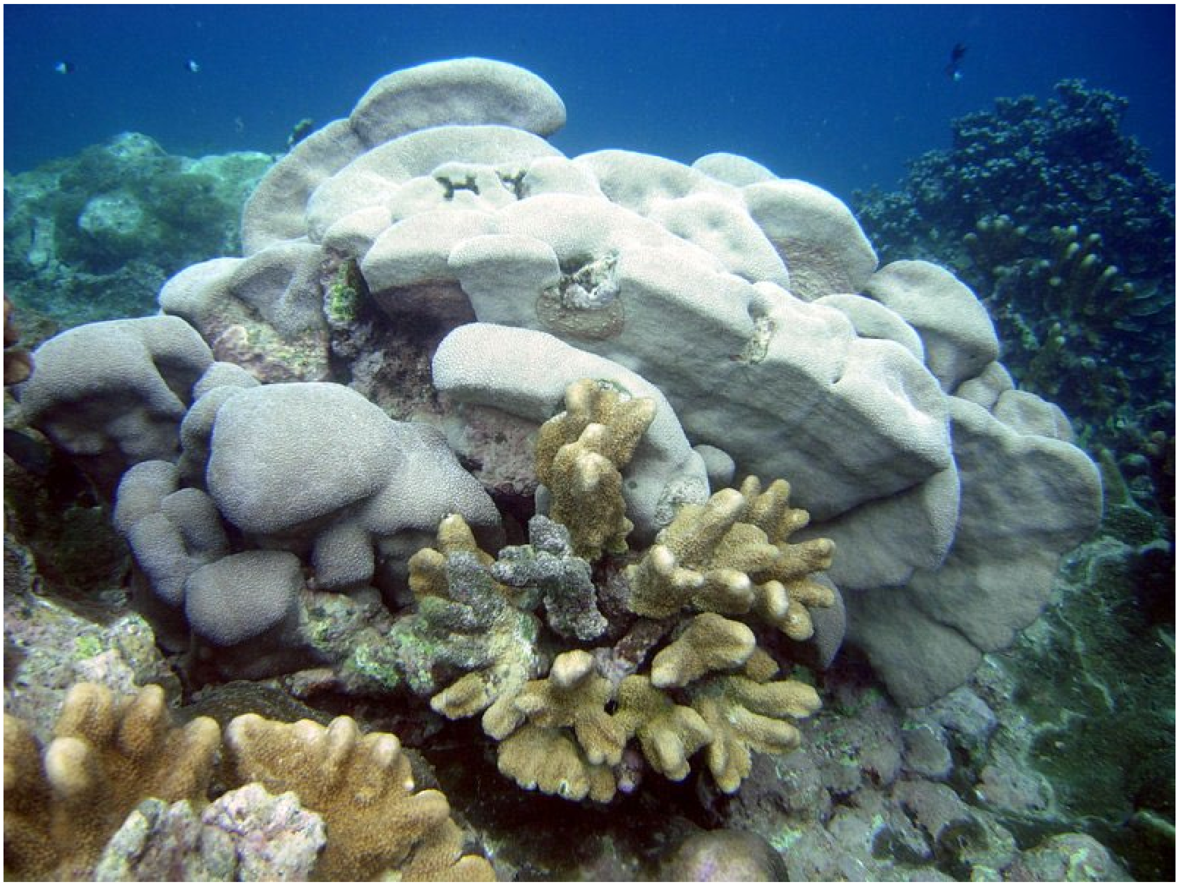
A colony of *Pavona diffluens*.

A close-up of *Pavona diffluens*. The large, deep corallite centers can easily be seen.

Pavona gigantea Verrill, 1896

This coral forms clusters of stout columns and thick plates. Clusters are usually just a half meter (1.5 feet) or less in diameter, but rarely can reach two meters (6 feet) or more in diameter and height. The surface is usually obscured by tentacles, which may be in little rings. Corallites are crowded together. *Pavona explanulata* has very similar corallites but is plating, usually does not have tentacles extended, and isn't always grey. Grey with white tentacles, uncommon, reef slopes. Found so far on Tutuila, Aunu'u, Upolu, and Savai'i.

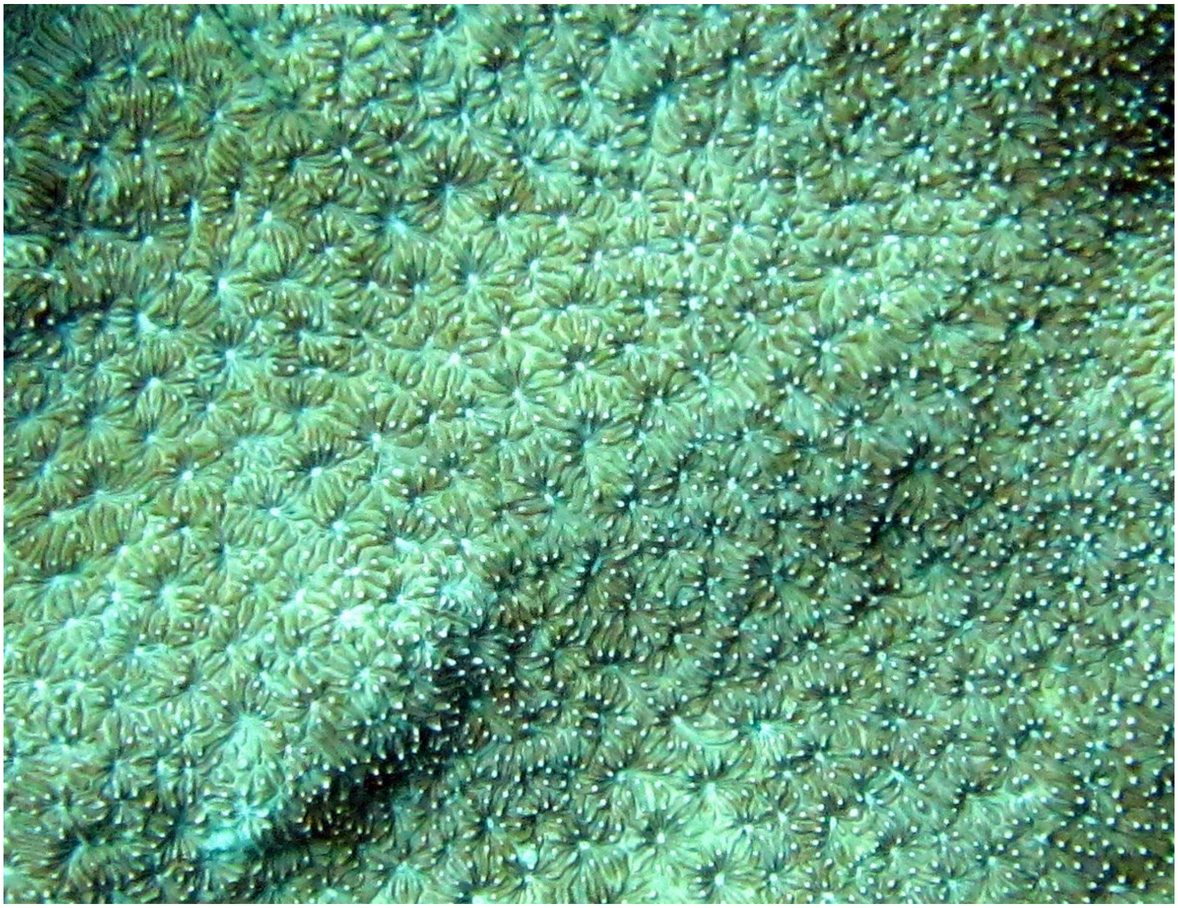
A huge colony of *Pavona gigantea*, the only one of this size found here so far.



A common size colony of *Pavona gigantea*. *Isopora palifera* is in the foreground.

A close-up of the top of *Pavona gigantea*.

The tentacles of *Pavona gigantea* can also look like this.



The sides of *Pavona gigantea* can look like this when tentacles are pulled in.

Pavona explanulata (Lamarck, 1816)

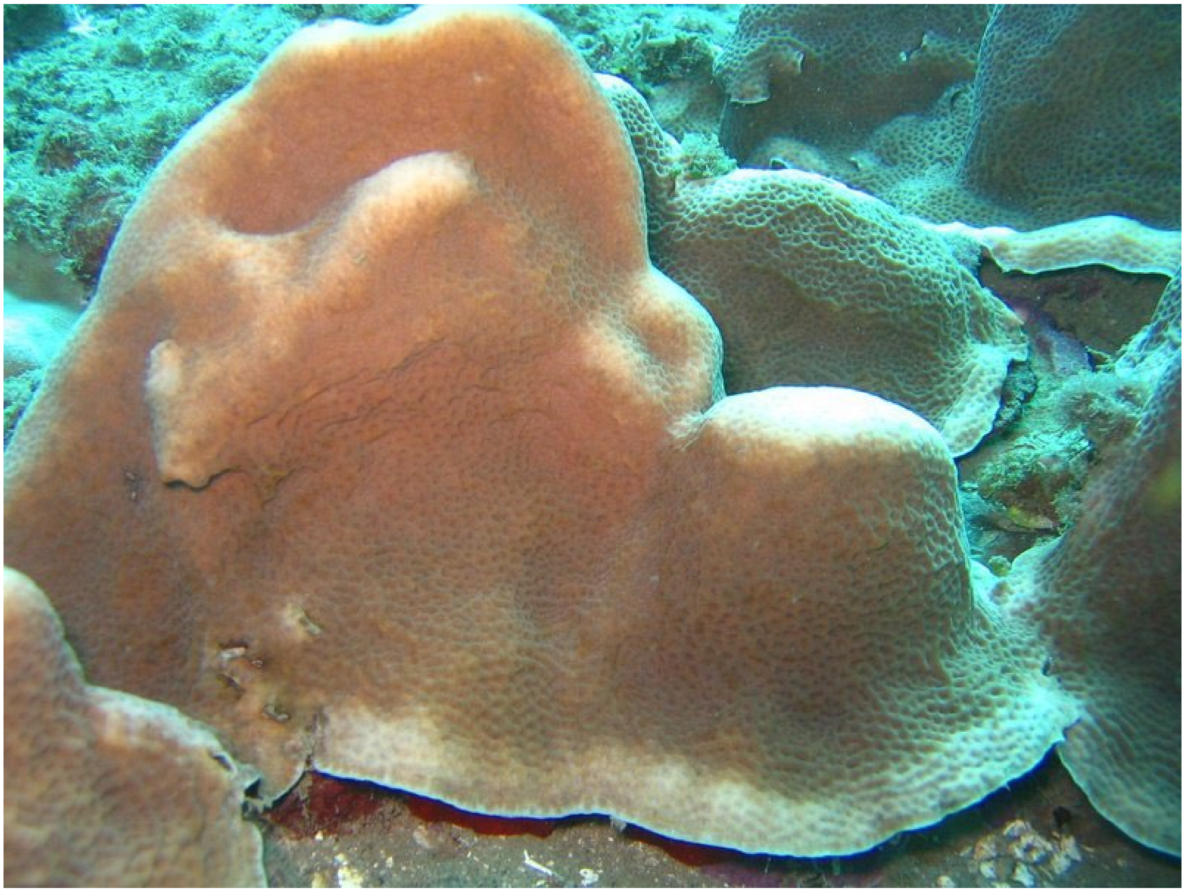
This coral forms thin encrusting sheets or plates. Corallites can be seen as a ring of tiny bumps. Corallites are very similar to those on lower plate edges of *Pavona gigantea* colonies. *Pavona gigantea* has similar coralltjes but forms colonies of columns and thick plates, and has tentacles extended. Brown to grey, rare, reef slopes. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, and Muliava (Rose Atoll).

A colony of *Pavona explanulata*.

A close-up of *Pavona explanulata*.

Pavona bipartita Nemenzo, 1980 Vulnerable

This coral forms irregular laterally flattened columnar lumps, and is encrusting between the lumps. The surface has corallites that are recessed somewhat, looking much like *Pavona clavus*, but separated by rounded ridges, with some ridges being higher than others. *Pavona clavus* forms uniform cylindrical columns while *Pavona bipartita* forms irregularly shaped lumps; and *Pavona clavus* is commonly cream, gray, or light green while *Pavona bipartita* is brown. Corallites are smaller than on *Pavona diffluens* and septa too small to see underwater. Brown, rare, reef slopes. Found so far on Tutuila and Savai'i.



Colonies of *Pavona bipartita*.

A close-up of *Pavona bipartita*.

Pavona maldivensis (Gardiner, 1905)

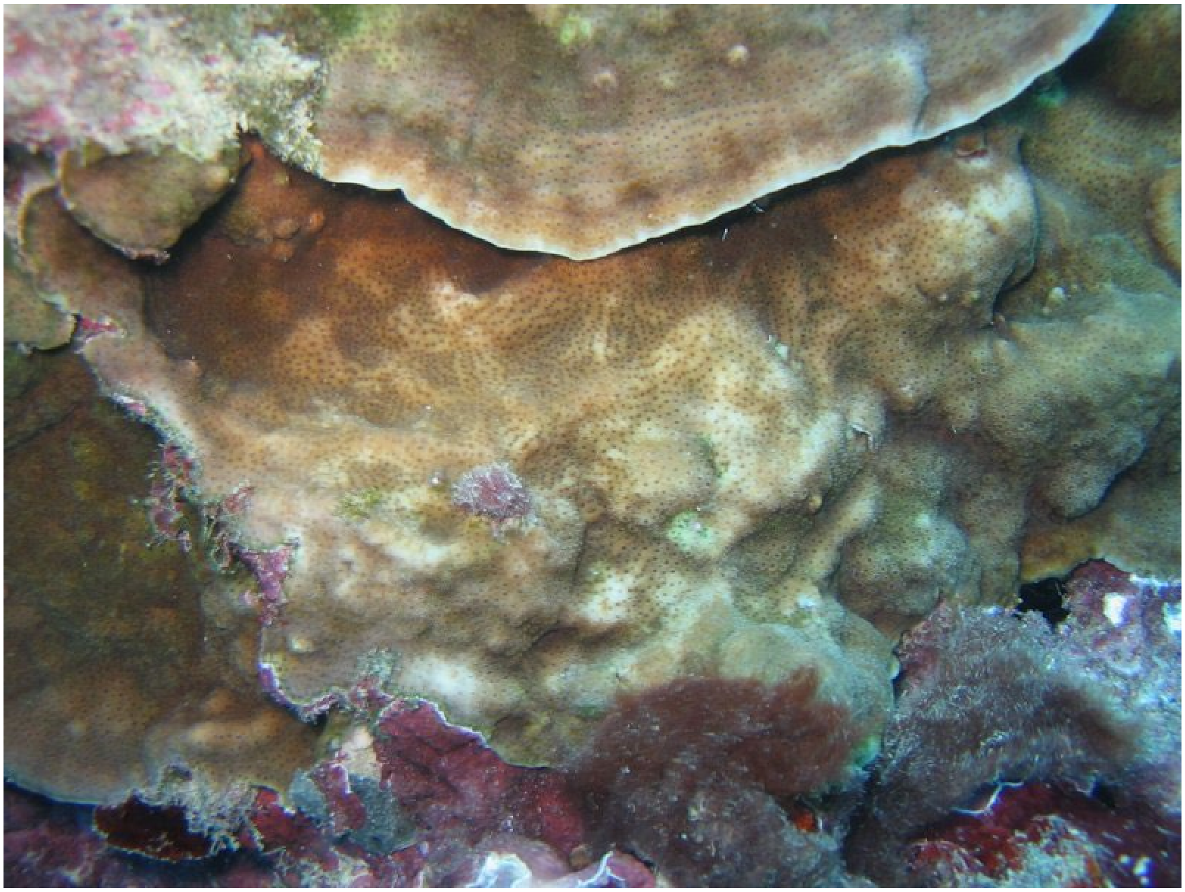
This species forms clusters of radiating short knob-like branches, very rarely branches are flattened into porkchop shapes. Corallites are small raised cones on branch sides, or smooth star-like patterns on branch ends. Brown or more rarely fluorescent green or orange, common to uncommon, reef slopes. Corallites do not project on other *Pavona* species and usually they do not have short knob-like branches. *Cyphastrea* is always encrusting here but otherwise looks similar. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Muliava (Rose), Swains, Upolu, and Savai'i.

A colony of *Pavona maldivensis*.

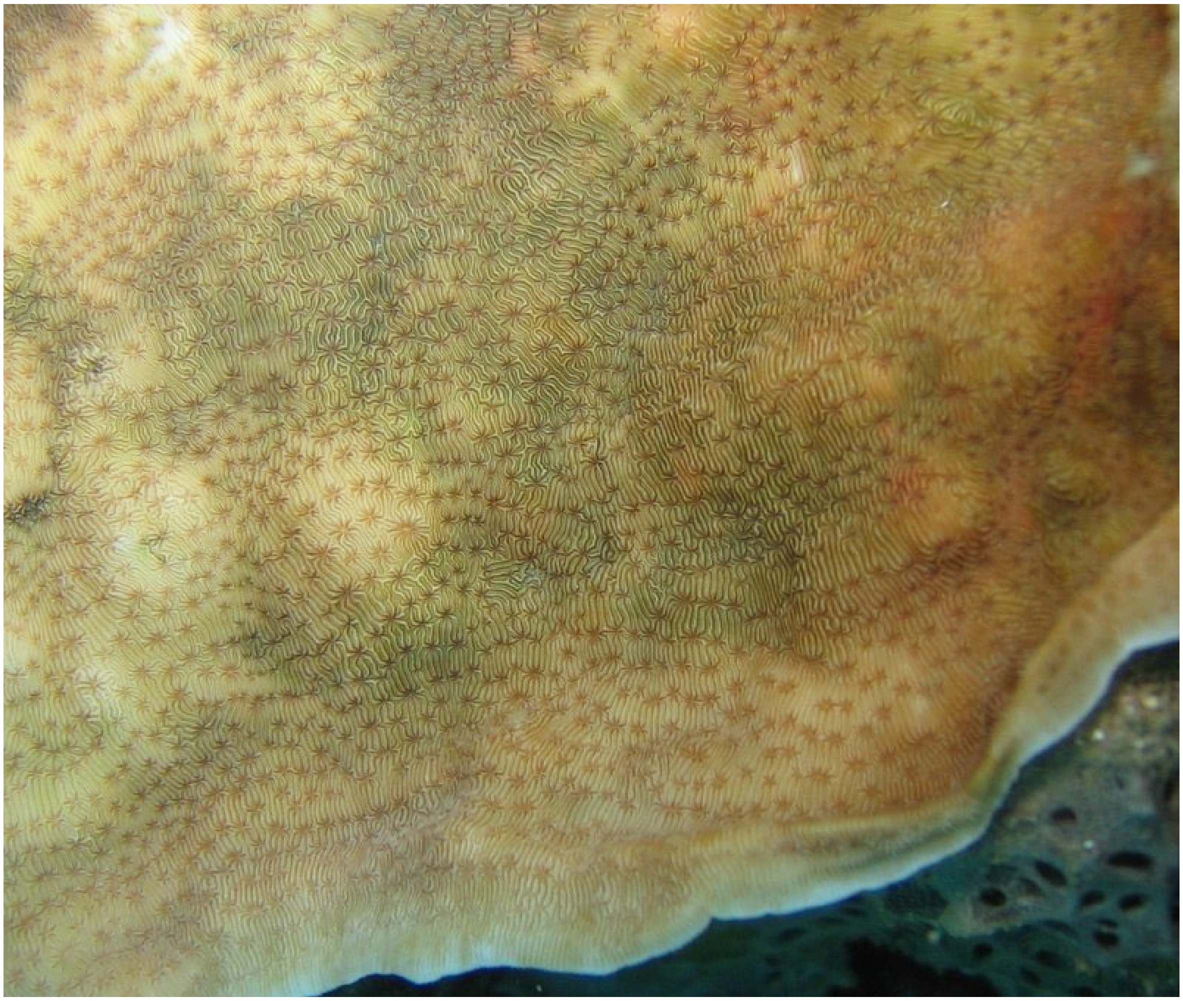
A close-up of branch ends of *Pavona maldivensis*.

A close-up of the sides of flattened *Pavona maldivensis* branches showing conical corallites.***Pavona minuta*** Wells, 1954

This species forms smooth encrusting colonies on steep slopes, often with raised thin plate lower edges. Corallites are tiny, hence the name. The corallites are the smallest of any *Pavona* species. Mottled brown, may have some green, uncommon to rare, reef slopes. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, and Muliava (Rose Atoll).



A colony of *Pavona minuta*.



A close-up of *Pavona minuta*.

Pavona varians Verrill, 1864

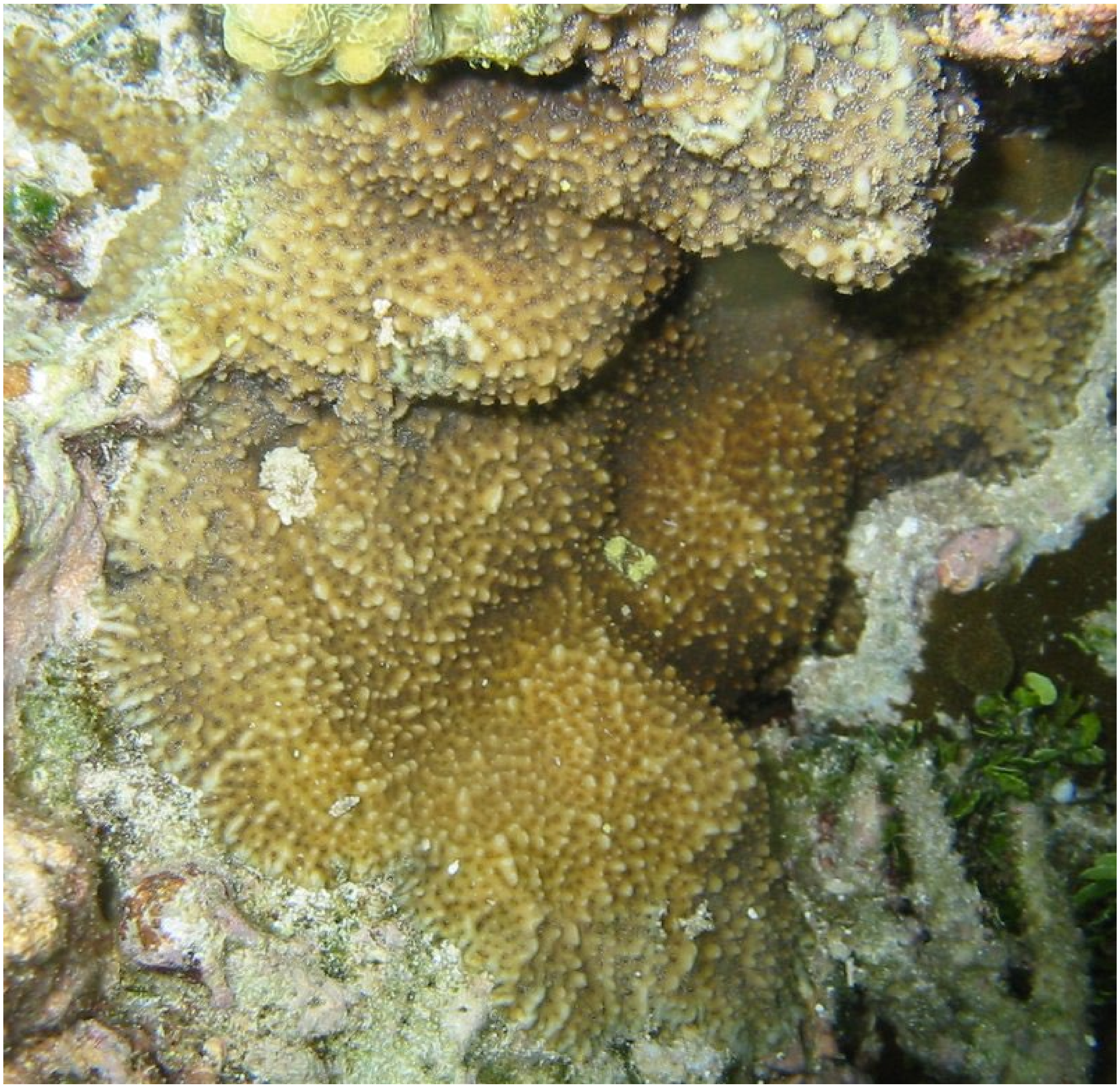
This species forms small encrusting or massive colonies, and can have plate edges. The surface is covered with small winding ridges. If examined closely, corallite centers or smaller ridges may be seen between ridges. Ridges are smaller and shorter than on *Leptoseris mycetoseroides*. Ridges have corallite centers between them and tiny septa ridges on the sides of ridges, unlike *Psammocora nierstraszi* which has short ridges that do not interconnect. Ridges are elongated unlike on *Pavona chiriquiensis*. Brown, very common on reef slopes of Tutuila. Found so far on all islands. This may be a species complex.

A colony of *Pavona varians*.

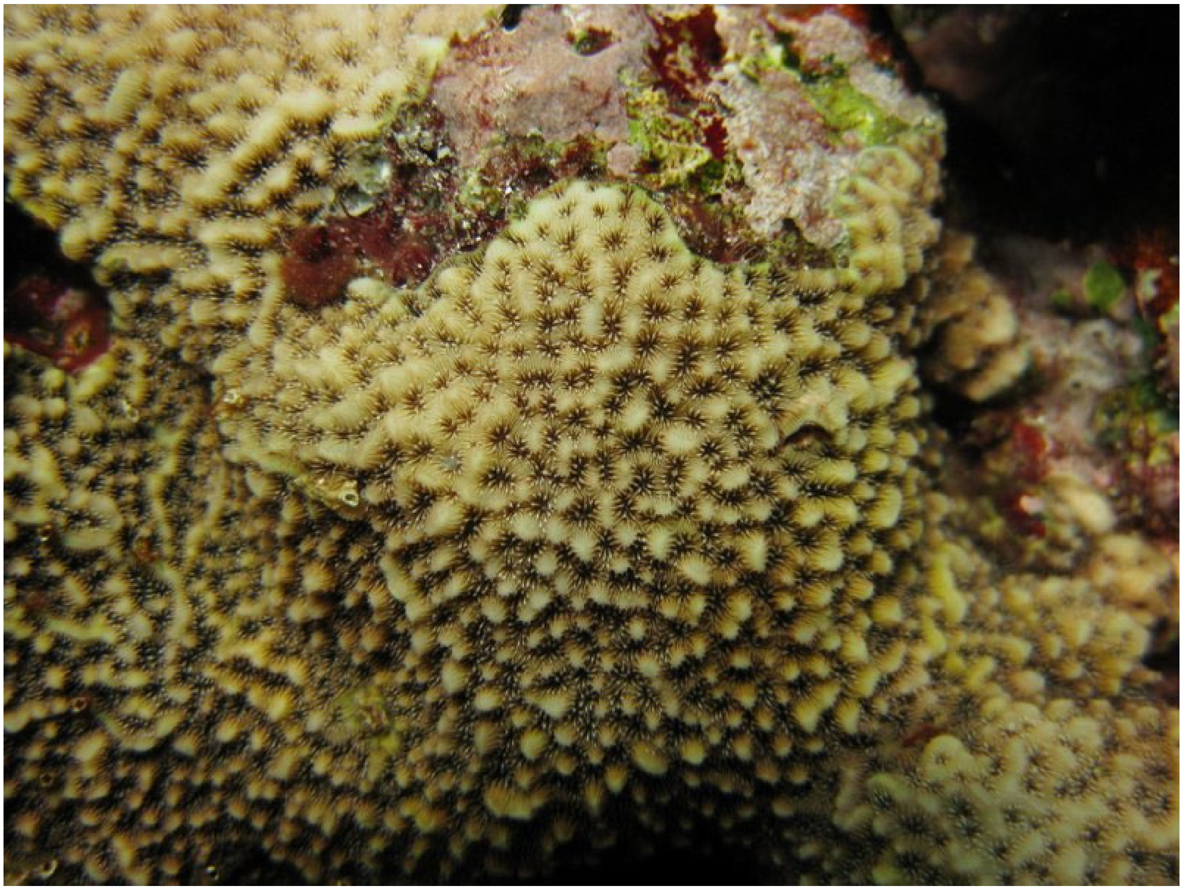
A close-up of *Pavona varians*.

Pavona chiriquensis Glynn, Mate & Stemann, 2001

This coral forms encrusting colonies with small widely spaced bumps. Between the bumps the corallites may be just visible. This species is almost identical to *Pavona varians* (and was long thought to be a variation of that species) but has ridges broken into short segments or bumps. Brown or grey, common, reef slopes and sometimes reef flats. This species has not been shown in field guides before. Found so far on all islands but not on South Bank.



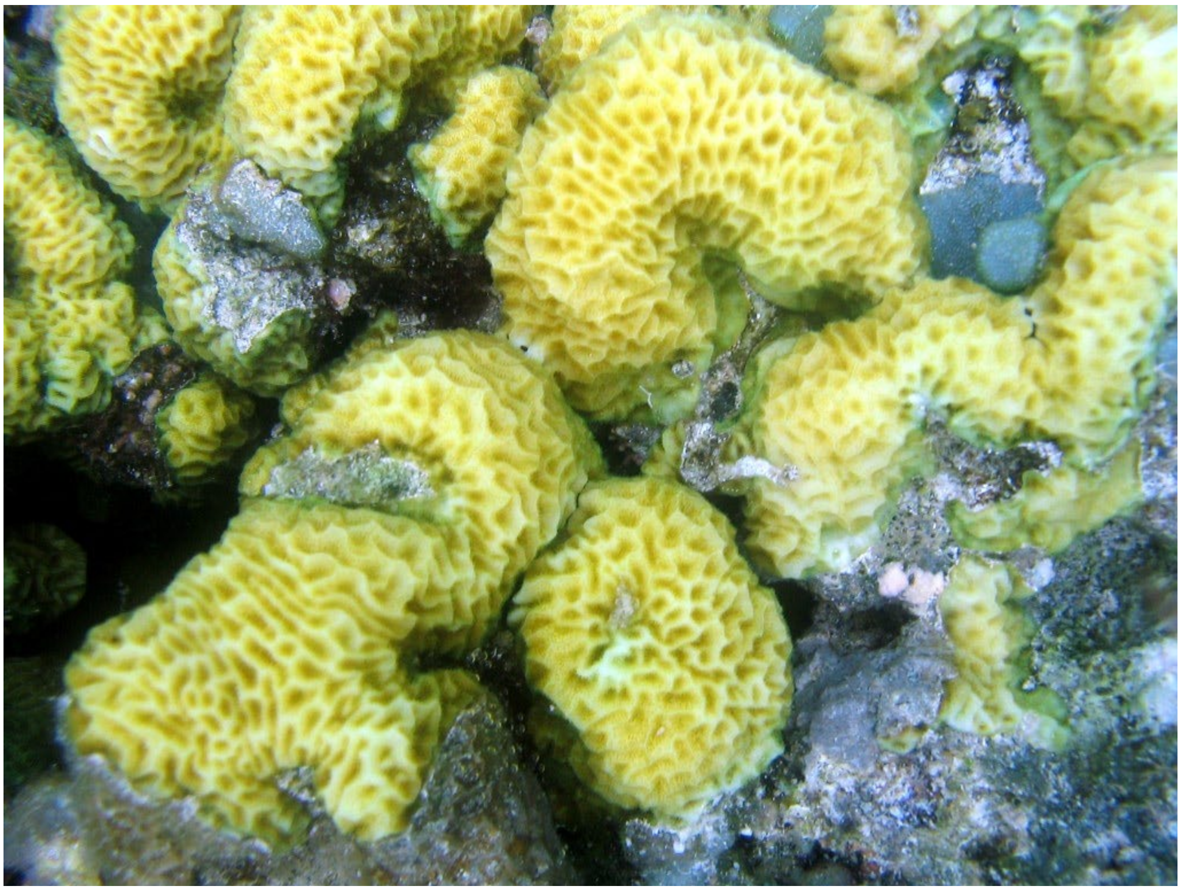
A colony of *Pavona chiriquensis*.



A close-up of *Pavona chiriquensis* with the polyp centers easily visible.

Pavona venosa (Ehrenberg, 1834) Vulnerable

This coral forms groups of small rounded masses, encrusting colonies with lumps, or groups of small columns, some of which may be flattened. Corallites are separated by sharp ridges. It is usually either a shade of yellow or orange. It can resemble *Psammocora profundacella*, though it forms clusters of lumps while *P. profundacella* forms single lumps. The ridges are sharper and enclose corallites unlike on *Pavona varians*. The corallites between ridges are not rounded and uniform as on *Gardineroseris planulata*, and it does not form large massive colonies. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Muliava (Rose), and Upolu.



Rounded lumps of *Pavona venosa*.

Columnar *Pavona venosa*.

Close-up of *Pavona venosa*. Note the sharp ridges completely enclose one or just a few corallites.

Pavona decussata (Dana, 1846) Vulnerable

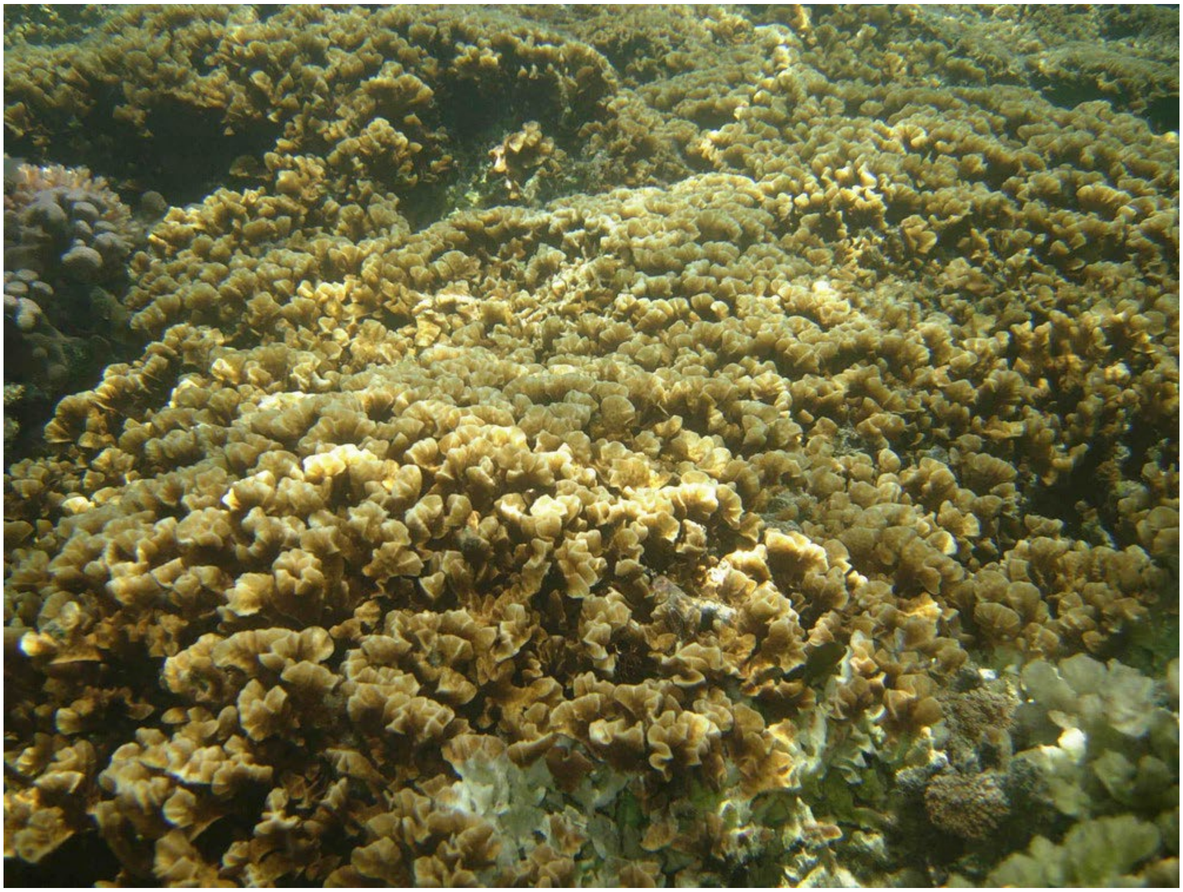
This coral forms thin vertical plates which usually either intersect with other plates or have small plates growing from their side. The plates range from large to small in different colonies. Small corallites can be seen on the sides. Brown to dark green, common to uncommon in backreef pools, less common on slopes. *Pavona diffluens* forms thicker, wall-like colonies and has deeper corallite centers. *Pavona frondifera* has smaller plates with many more side-ridges, making very crinckly colonies. Found so far on Tutuila, Ofu-Olosega, and Savai'i.

A colony of *Pavona decussata*.

Close-up picture of *Pavona decussata*.

Pavona frondifera (Lamarck, 1816)

This coral forms small thin plates that have many small vertical ridges on their sides. Plates turn and twist in many directions and are very crinkly. Much smaller plates than *Pavona decussata* with many more side-ridges or plates. Yellow-orange-brown, common on parts of reef flats, especially at Coconut Point. It is more abundant here than anywhere else the author has ever been. Found so far on Tutuila, Ofu-Olosega, Upolu, Apolima, and Savai'i.



Pavona frondifera

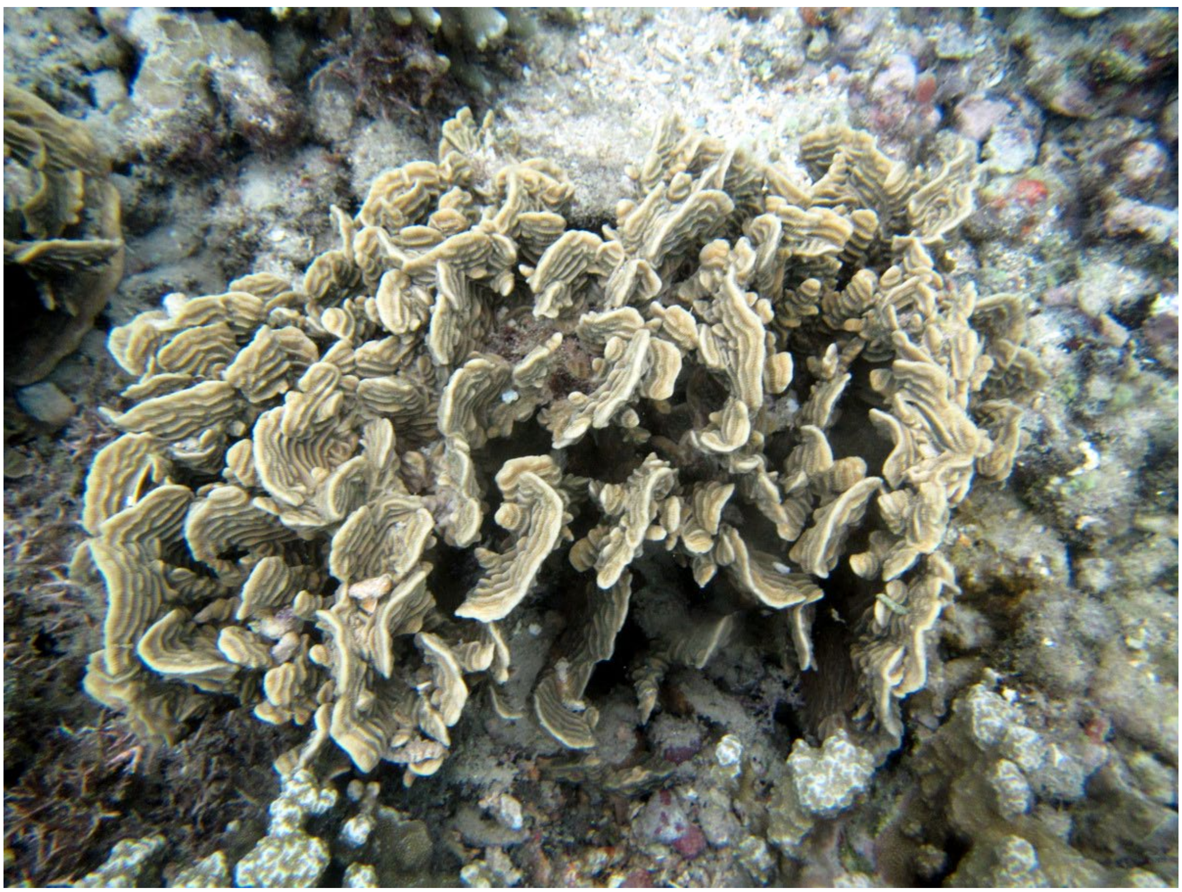
A close-up of *Pavona frondifera*.

Pachyseris

Pachyseris forms plates or an encrusting base with flattened columns. The plates have very regular, smooth ridges that run in parallel concentric circles. The ridges are around 3 mm wide and have a pyramid-shaped cross section. Colonies with columns on an encrusting base have similar ridges, but they wind around each other a lot. Fagatele Bay has a huge colony of the columnar species, by far the largest the author has ever seen. The plate colonies are grey, the columns may be grey or brown, plates seem to like it a bit deeper than the columns. Uncommon to rare. *Pachyseris* is the only genus with concentric ridges that are triangular in cross section.

Pachyseris rugosa (Lamarck, 1801) Vulnerable EDGE

This coral forms encrusting corals with vertical plates and/or paddles on them. The surface is covered with small ridges, many of which wind around each other. This is the only *Pachyseris* species that has ridges on both sides of vertical paddles and plates. Grey or brown, reef slopes, rare except in Fagatele Bay where there is a huge colony that may be one of the largest known anywhere, and many smaller colonies. Found so far on Tutuila, Aunu'u, Upolu, and Savai'i.



A colony of *Pachyseris rugosa*.

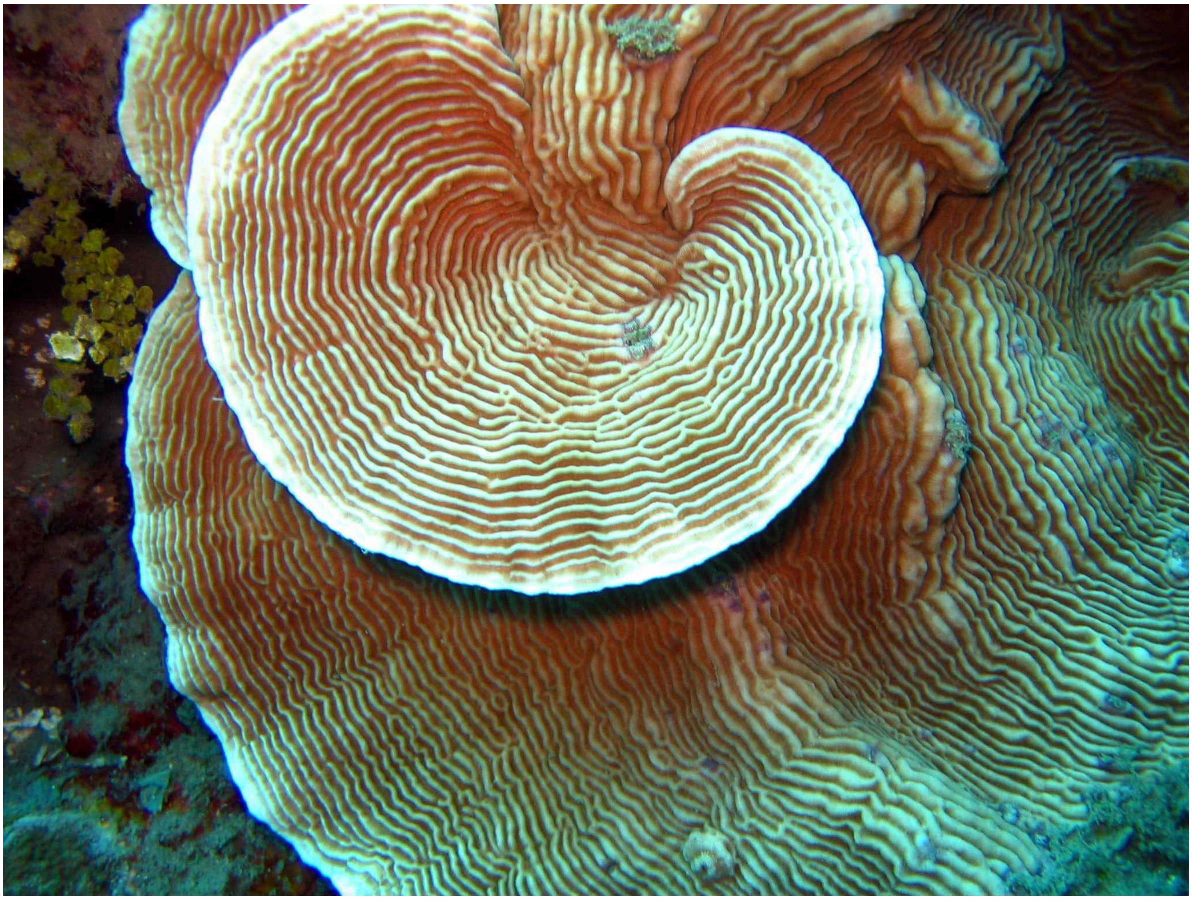
Another colony of *Pachyseris rugosa*

The ridges on *Pachyseris rugosa* often curve and wind around each other in a random fashion.

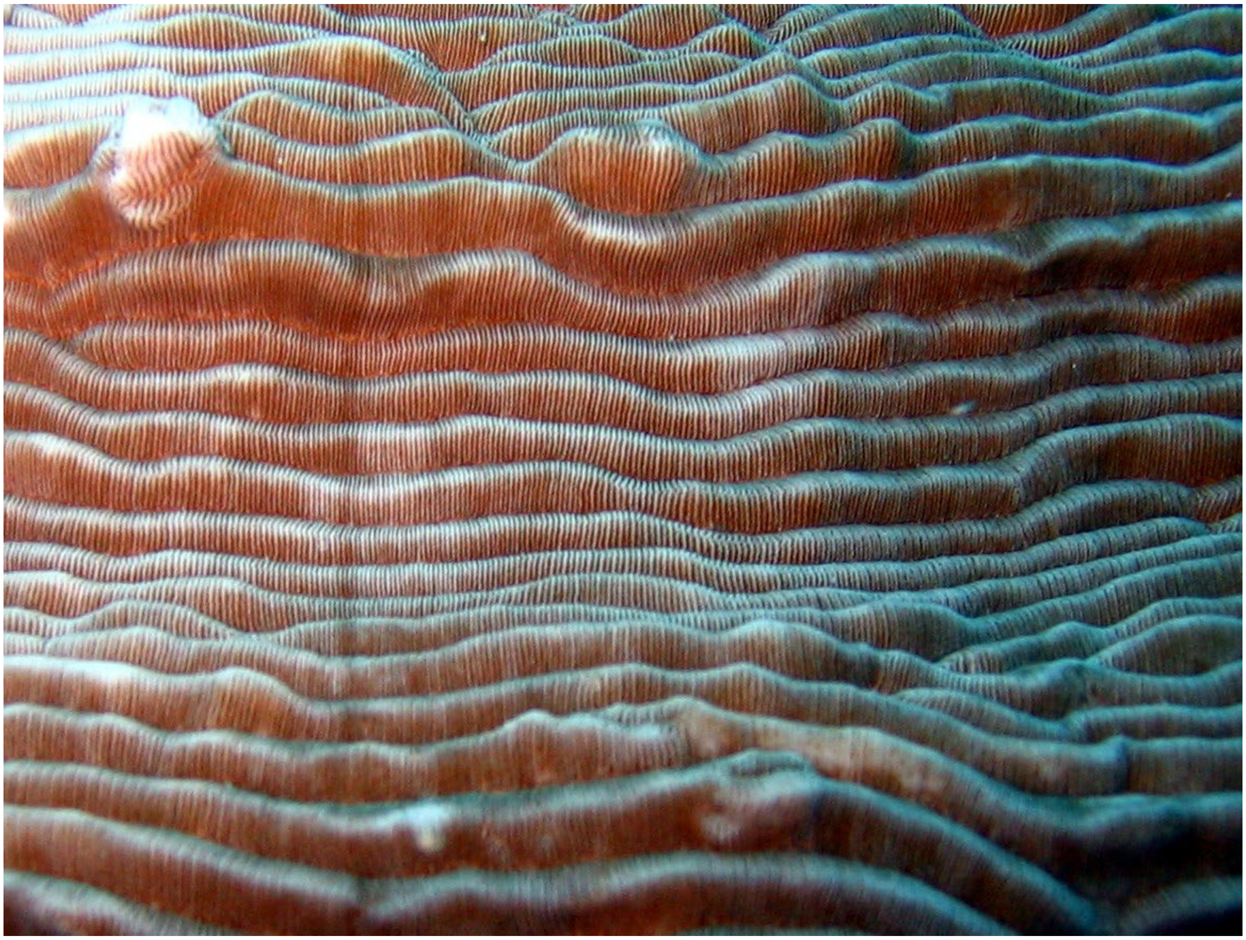
A close-up photo, showing the tiny ridges (septa) crossing the larger ridges. The larger ridges can be parallel as in this photo. The septa are similar in the other species of *Pachyseris*, but are so small they are hard to see.

Pachyseris speciosa (Dana, 1846)

This coral forms thin nearly horizontal plates covered with small concentric ridges which are uniform in height. The undersides of plates are smooth. Grey or brown, uncommon, reef slopes. Found so far on Tutuila, Aunu'u, Upolu, and Savai'i.



A colony of *Pachyseris speciosa*.



A close-up photo of *Pachyseris speciosa*. The lines running across the ridges are septa.

Pachyseris gemmae Nemenzo, 1955

This coral forms thin plates covered with small concentric ridges which vary in height along their length like waves. There may be portions of the colony that don't have wavy ridges, like the outer edge of this colony. Grey or brown, rare, reef slopes. Found so far on Tutuila.

A colony of *Pachyseris gemmae*.

Cycloseris `"small mushroom corals"

Cycloseris forms small single (solitary) corallites that are not attached and look like an overturned mushroom cap on the top. They are nearly smooth on the bottom, with small uniform granules like on sandpaper. The nearly smooth underside distinguishes it from small (young) individuals of *Fungia*, which are very similar but usually have spines on the underside and adults are usually larger.

Cycloseris costulata Ortmann, 1889 "mushroom coral"

This coral forms small discs about 5 cm (2 in) diameter or less in diameter. The center may be raised some, and the ridges (septa) are thick near the center. The underside is covered with fine granules. Brown, very rare, reef slopes. *Cycloseris tenuis* has small radiating ridges near the edge of the underside, which this species does not have. Found so far on Tutuila.

Cycloseris costulata.

Cycloseris tenuis Dana, 1846 "mushroom coral"

This coral forms small discs, usually about 3 cm (1 in) or smaller. They often have a dome shaped upper surface, but can have a slightly humped center of the upper surface. The under surface is covered with fine granules like sandpaper. Near the edge of the underside, the granules form small radiating ridges. *Cycloseris costulata* does not have small radiating ridges near the edge of the under side. Found so far on Tutuila. Very rare.

Cycloseris tenuis.

Lithophyllon

Lithophyllon has two different shapes. Some species are small attached plates with multiple mouths. Others are unattached, single polyp discs. Corals that are not attached are called “free-living, and corals with a single polyp are called “solitary/. One surface has a slit in the center which is the mouth, and sharp, thin, radiating ridges from the mouth out to the edge of the coral. The ridges are septa. This is the oral surface since the mouth is on that side. Usually the oral surface is facing up, but not always, and it doesn’t much hurt for it to be facing down. The other surface has rows of radiating spines or granules on it and no mouth-slit. They are commonly called “mushroom corals” because the oral surface with the radiating ridges looks a bit like the underside of a mushroom cap. *Cycloseris* are almost always small and have a granular under side. *Fungia* and *Danafungia* have larger teeth. *Pleuractis* and *Lobactis* are oval and have granules on the underside instead of spines.

Lithophyllon concinna (Verrill, 1864) or Lithophyhllon repanda (Dana, 1846)
These used to be in Fungia. “mushroom coral”

This coral forms flat discs about 10 cm (4 in) in diameter. The radiating ridges (septa) have very fine teeth on their edge and look smooth. The underside has rows of spines. Brown, sometimes with a green or purple edge, uncommon to common, reef slopes. Found so far on Tutuila, Aunu’u, Ofu-Olosega, Ta’u, Muliava (Rose), Swains, Upolu, and Apolima. The skeleton of *L. repanda* has tiny holes visible on the underside, which *L. concinna* doesn’t have. But tissue fills the holes so you can’t see them on live corals. The DMWR coral collection has both. *Fungia fungites* has septa that look closer together.

Lithophyllon concinna or *Lithophylon repanda*.

Lithophyllon concinna or *Lithophyllon repanda.* The white areas are a non-lethal disease.

Fungia "mushroom coral"

Fungia forms corals that have just one corallite and polyp, and not attached. Corals with only one polyp are called "solitary" and those that are not attached are called "free-living." They are most commonly about 3-6 inches (8-15 cm) diameter. You can easily pick them up since they are not attached. One surface has a slit in the center which is the mouth, and sharp, thin, radiating ridges from the mouth out to the edge of the coral. The ridges are septa. This is the oral surface since the mouth is on that side. Usually the oral surface is facing up, but not always, and it doesn't much hurt for it to be facing down. The other surface has rows of radiating spines or granules on it and no mouth-slit. They are commonly called "mushroom corals" because the oral surface with the radiating ridges looks a bit like the underside of a mushroom cap. Uncommon to very abundant. Most abundant at the bottom of some slopes where they accumulate as waves move them down slopes. *Danafungia* have larger teeth, *Lithophyllon* discs have smaller teeth, *Pleuractis and Lobactis* are oval with granules instead of spines on the under side, and *Lobactis* has obvious tentacle lobes. *Cycloseris* are almost always small and have a granular under side.

Fungia fungites (Linneaus, 1758) "mushroom coral"

This coral forms discs up to at least 20 cm (8 in) in diameter. Radiating ridges (septa) are close together and have small teeth visible. The underside has rows of spines. Small green tentacles are usually extended. Some colonies have the radiating septa curve together in a unique pattern. Brown to yellow with green tentacles and may have purple injured areas, common to uncommon, reef slopes and backreef pools. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Muliava (Rose Atoll), Upolu, Apolima, and Savai'i.

Fungia fungites.

Fungia fungites.

Fungia fungites

Danafungia

Corals are circular discs which are unattached (free living) and single polyps (solitary). The underside has spines. Teeth on the septa are larger than on *Lithophyllon*, *Pleuractis*, and *Lobactis*. *Pleuractis* and *Lobactis* have granules on the underside instead of spines and all *Lobactis* and all but one *Pleuractis* are oval.

Danafungia horrida Dana, 1846 "mushroom coral" This used to be in *Fungia*.

This coral forms discs up to at least 15 cm (6 in) in diameter. It is usually flat with a small hump in the center. The underside has spines. Radiating ridges (septa) have very large teeth on their edge. The teeth are variable in size. Other disc fungiids have smaller teeth. Mottled brown and white, rare, reef slopes. Found so far on Tutuila, Ofu-Olosega, and Ta'u.

Danafungia horrida.

Danafungia scruposa (Klunzinger, 1816)   "Mushroom coral"
This used to be in *Fungia*.

This coral forms discs up to at least 20 cm (8 in) in diameter. There may be a small hump in the center, or the entire upper surface may be raised as a cone. The ridges (septa) have medium size teeth, may be wavy, and a few are taller than the others. *Danafungia horrida* has larger teeth. Brown, uncommon to rare, reef slopes. Found so far on Tutuila, Aunu'u, Upolu, and Savai'i.

Danafungia scruposa.

Danafungia scruposa.

Pleuractis

Corals discs that are not attached (free-living) and have only one polyp (solitary). The underside has granules instead of spines. Corals reach about 6 inches (15 cm) diameter. Teeth on the septa are small. One forms circular disks, others form oval discs *Lobactis* has tentacles lobes. *Lithophyllon*, *Fungia*, and *Danafungia* form circular discs with spines on the underside.

Pleuractis granulosa (Klunzinger, 1879) "mushroom coral" This used to be in *Fungia*.

This coral forms circular discs up to about 10 cm (4 in) in diameter. Radiating ridges (septa) are wavy. The underside has an even, dense cover of tiny granules instead of tall spines. It is the only curcular disc with granules on the underside. Most other fungiids do not have wavy septa. Brown, uncommon, reef slopes. Found so far on Tutuila, Ofu-Olosega, Muliava (Rose Atoll), and Savai'i.

Pleuractis granulosa.

Pleuractis granulosa.

Pleuractis moluccensis (Horst, 1919) "mushroom coral" This used to be in *Fungia*.

This coral forms irregularly oval discs up to at least 15 cm (6 in) in length. The center has a very pronounced hump. The coral is sometimes distorted and asymetrical with an irregular outline and the hump tilted. The underside has a large "attachment scar" in the center. They can be attached as adults, though I have not seen this. This is the only fungiid with distorted corallites. *Pleuractis gravis* is humped but not distorted. Most other oval *Fungia* do not have a prominent central hump. Grey, rare, reef slopes, seen on Tutuila so far only at Fagasa, on sand below the reef slope. Found so far on Tutuila, Upolu, and Savai'i.

Pleuractis moluccensis.

An irregular-shaped *Pleuractis moluccensis* that is not oval.

Pleuractis paumotensis (Stutchbury, 1833) "mushroom coral" This used to be in *Fungia*.

This coral forms oval discs up to at least 15 cm (6 in) in length. There is usually little or no central hump, and the coral is not distorted. Most of the ridges (septa) are nearly straight and have smooth looking edges. The underside is covered with uniform tiny granules. *Fungia gravis* is very similar but humped in the center. *Pleuractis moluccensis* and *Pleuractis gravis* are humped and *Pleuractis moluccensis* may be asymmetrical. *Lobactis scutaria* has bumps on the septa called "tentacle lobes." Brown, uncommon, reef slopes. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, and Muiava (Rose Atoll).

Pleuractis paumotensis.

Pleuractis paumotensis

Pleuractis gravis (Nemenzo, 1955) "mushroom coral" This used to be in *Fungia*.

This coral forms oval discs up to at least 15 cm (6 in) in length. There is usually as strong central hump, and the coral is not distorted. The ridges (septa) are straight, some may be raised, and have smooth looking edges. The underside is covered with uniform tiny granules and doesn't have an attachment scar. *Fungia paumotensis* is very similar but does not have a central hump. *Fungia scutaria* has bumps on the septa that are tentacle lobes. Brown, rare, reef slopes. Found so far on Tutuila.

Pleuractis gravis.

Lobactis

Corals are unattached (free living), single-polyp (solitary) oval discs. The underside has granules. Septa have an upward extention called a “tentacle lobe” where tentacles are attached. *Pleuractis* does not have tentacle lobes. *Lithophyllon*, *Fungia* and *Danafungia* all have circular discs.

Lobactis scutaria Lamarck, 1816 “mushroom coral” This used to be in *Fungia*.

This coral forms oval discs up to at least 15 cm (6 in) in length. There is no central hump. The ridges (septa) have smooth edges, except for small rounded blades extending called “tentacle lobes” where the tentacles are attached. The underside is covered with fine granules. Brown, sometimes green, uncommon, reef slopes. Other oval *Fungia* do not have tentacle lobes. Found so far on Tutuila, Aunu’u, Ofu-Olosega, Ta’u, Muliava (Rose), Swains, Upolu, and Apolima.

Lobactis scutaria.

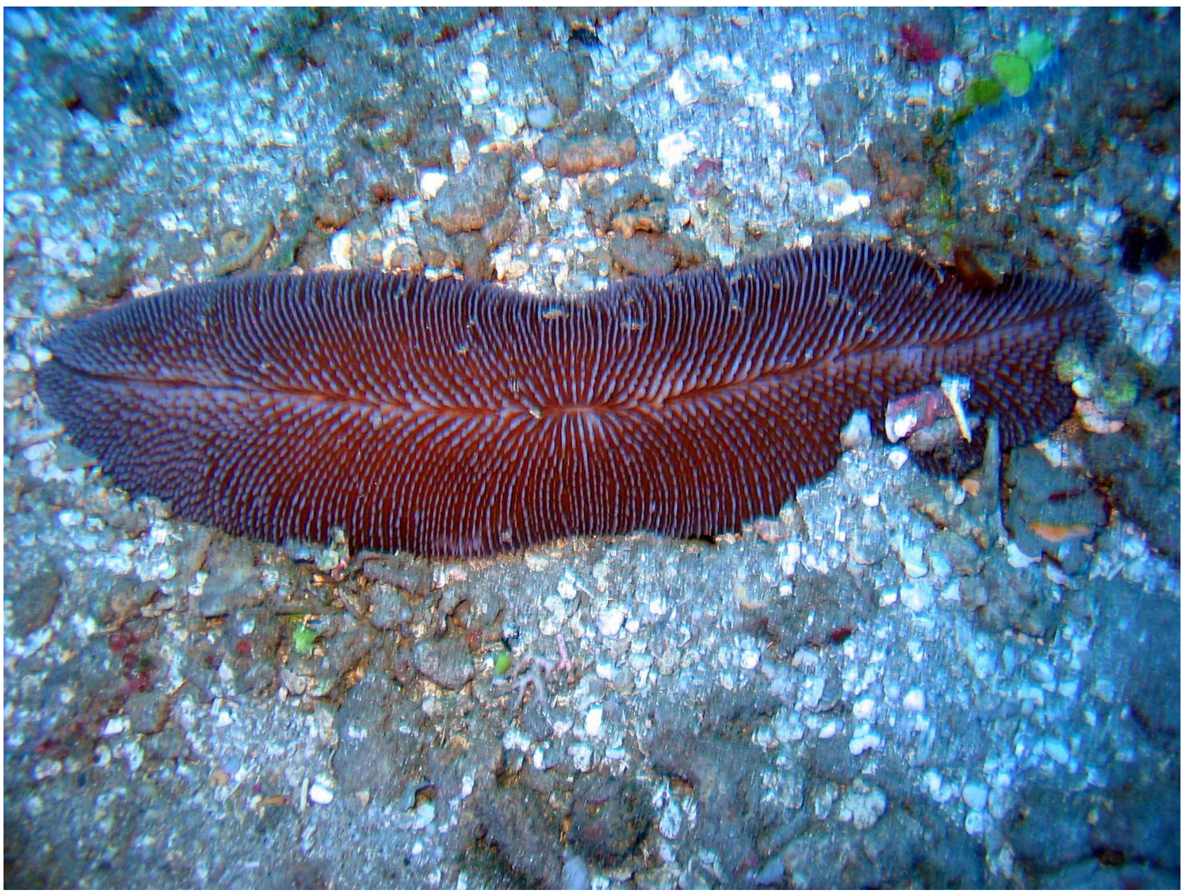
Lobactis scutaria.

Ctenactis

Ctenactis forms oval or elongated, unattached colonies or single polyps. The upper surface is usually nearly flat. There is a central crack running the length of the oral surface. In some the central crack is all one crack, so it has just one mouth, and the whole coral is just one polyp. In others, the central crack is divided into sections each of which is a mouth, and the coral is a colony. From the central crack, rows of thick spines run toward the edge of the colony, these are the septa. The other side is covered with thick granular spines. Most are brown. Rare. The upper surface has rows of spines instead of smooth ridges like *Herpolitha*.

Ctenactis crassa (Dana, 1846)

This coral forms elongated mushroom-like corals with very spiny ridges (septa). There is a very long central furrow which is divided into sections by places where the septa cross the slit. *Ctenactis echinata* has a single, unbroken crack the length of the coral. Brown, uncommon to rare, reef slopes. Found so far on Tutuila, Aunu'u, Apolima, and Savai'i.



A colony of *Ctenactis crassa.*

A close-up of *Ctenactis crassa*.

Ctenactis echinata (Pallas, 1766)

This coral forms elongated mushroom-like corals with very spiny ridges (septa). There is a very long central furrow which is continuous and undivided. *Ctenactis crassa* has the central crack divided into sections. Brown, uncommon to rare, reef slopes. Found so far on Tutuila and Ofu-Olosega.

A close-up of *Ctenactis echinata.*

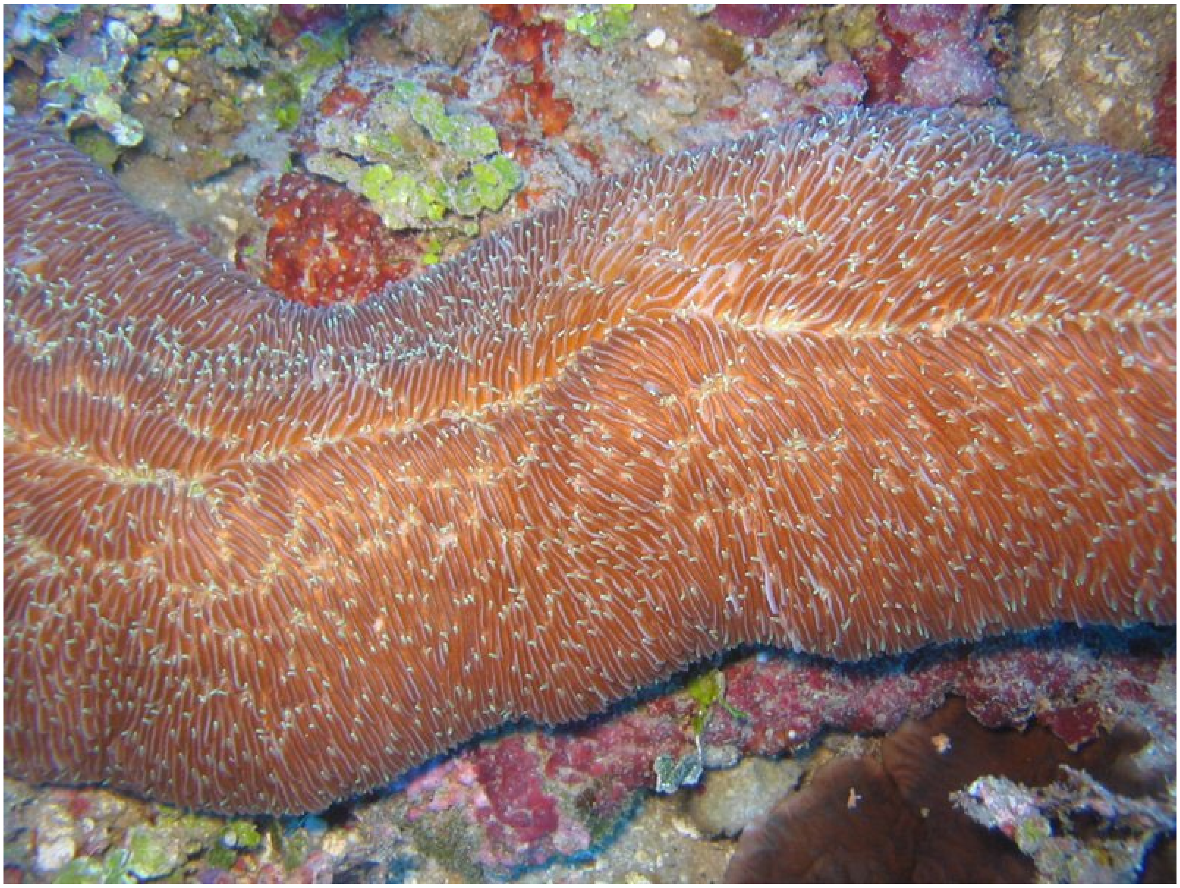
Herpolitha

Herpolitha forms elongated, unattached colonies with a central crack running lengthwise on the oral surface. The upper surface is usually smoothly rounded, so convex. The central crack is divided into multiple sections, each of which is a separate mouth. So it is a colony with several polyps. There are many ridges that go from the central crack towards the edge of the colony, these are septa. The other side is usually concave and is always covered with granules. The two ends of the elongated colony usually taper to a point. They are light brown to brown. Uncommon. Rounded upper surface with radiating ridges instead of flat upper surface and rows of spines like *Ctenactis*.

Herpolitha limax (Houttuyn, 1772)

This coral forms elongated mushroom-like corals with smooth ridges (septa). The coral may be bent or curved. The upper surface is often rounded. The ridges (septa) do not go all the way from the center to the edge, giving it a rough look. Brown, uncommon to rare, reef slopes. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Muliava, Upolu, Apolima, and Savai'i.

A colony of *Herpolitha limax*.



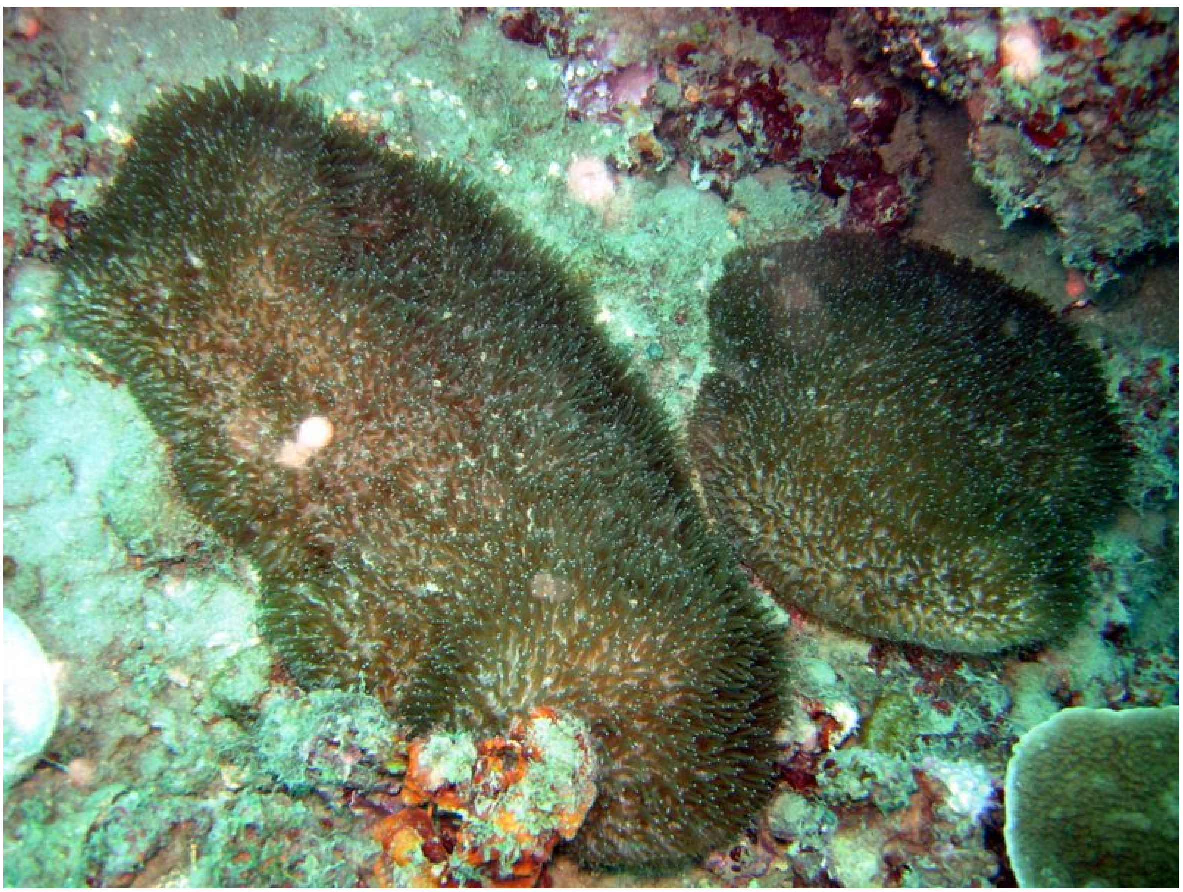
A close-up of *Herpolitha limax*.

Polyphyllia

Polyphyllia forms unattached, dome-shaped or elongated mushroom corals with small extended tentacles. Colonies can be circular in outline, oval, elongated, or irregular. There are two species, only one of which has been found in American Samoa. The species not found here is always elongated and has a thick heavy skeleton.

Polyphyllia novaehiberniae (Lesson, 1834)

This coral forms small to medium dome-shaped colonies that can be circular, oval, or irregular. Small tentacles are extended and cover the upper surface. This species has relatively thin skeletons and breaks fairly easily. It then regrows, forming irregularly shaped colonies in groups. Dark green. Found so far only on the slope at Faga'alu on Tutuila near the school. The only known colonies of this species in American Samoa probably were locally destroyed in the 2009 tsunami, so it may be locally extinct now, though huge areas have not been searched.



Two medium size colonies of *Polyphyllia novaehiberniae*.

Close-up of a small colony of *Polyphyllia novaehiberniae*.

Halomitra

Halomitra forms circular bowls, which can be up to nearly 2 feet (60 cm) wide, though commonly less than that. The convex surface has white, star-like appearing spots, which are the mouths, of which there are many. In between the white mouths are small spiny ridges, which are the septa. The edge of the colony is always purple. The concave surface has fine spines and is usually facing down, so the colony looks like a massive colony that is attached, but it is not. It is not attached and can be picked up. Most often the oral (convex) side is up. Individual colonies may differ in how arched they are, most here seem to be fairly low arches. Rare most places but there are clusters of them on the slope in some spots on the SE of Tutuila. Circular like *Fungia*, but with many mouths and large arched colonies. Circular and with white mouths, unlike *Sandalolitha*.

Halomitra pileus (Linnaeus, 1758)

This coral forms large, thin, circular inverted-bowl shaped colonies that are not attached. There are many mouths which are usually white, and the ridges (septa) have large saw-tooth teeth. Yellow-brown with a purple edge on the colony, uncommon, reef slopes. Found so far on Tutuila, Ofu-Olosega, Ta'u, Upolu, Apolima, and Savai'i.

A colony of *Halomitra pileus*.

A close up of *Halomitra pileus* showing the sawthooth spines on the edge of the septa radiating from the white mouths.

Sandalolitha

Sandalolitha forms oval bowls that may be less arched than *Halomitra*, and thicker. It has many short radiating ridges on the convex surface, which have smaller spines than on *Halomitra.* The color is usually a uniform brown or grey, and does not have white mouths or a purple edge to the colony. The concave side is covered with small spines. Rare most places. Oval not circular like *Halomitra*, and mouths are not white.

Sandalolitha dentata Quelch, 1884

This coral forms flat ovals with an irregular outline that is often dumbbell-shaped. There is a large mouth in the center, and smaller mouths clustered around it, but no mouths near the outer edge of the colony. *Sandalolitha robusta* has mouths spread evenly over the colony. Brown, uncommon, reef slopes. Found so far on Tutuila, Aunu'u, and Upolu.

A colony of *Sandalolitha dentata*.

A close-up of *Sandalolitha dentata*.

Sandalolitha robusta Quelch, 1886

This coral forms domed ovals with an irregular outline. Small mouths are distributed equally all over the surface. Sandalolitha dentata has mouths clustered in the center of the colony. Brown, rarely grey or green, rare, reef slopes. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Muliava (Rose), and South Bank.

A colony of *Sandalolitha robusta*.

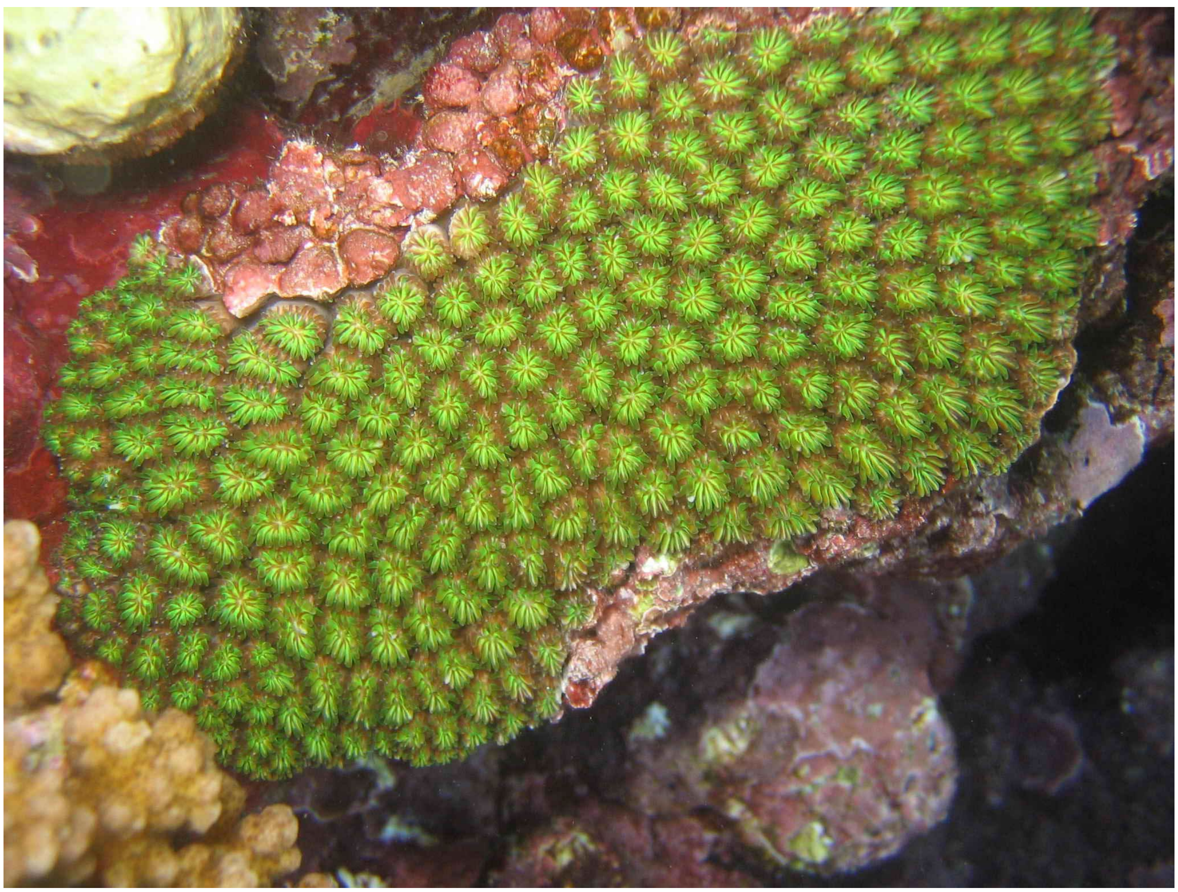
A close-up of *Sandalolitha robusta*.

Galaxea

Galaxea forms small encrusting colonies about 2-6 inches (5-15 cm) in diameter. The surface is covered with corallites which have septa that end in fairly long spines. So the surface looks like rings of spines. The spines also have tentacles on them. Colonies are usually dark green. Uncommon most places, but used to be abundant on the upper reef slope in Fagatele Bay. The rings of spines are more pronounced than on *Favia*.

Galaxea fascicularis (Linnaeus, 1767)

This coral forms small flat cushions with spiny corallites. Corallites are projecting and circular or oval, with septa projecting as spines and tentacles about the same size. Corallites are about 5-10 mm (1/4-38 in) diameter. Green or green and brown, reef slopes, uncommon except abundant in Fagatele Bay on the upper reef slope. *Galaxea astreata* has smaller corallites. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Muliava (Rose Atoll), Upolu, Apolima, and Savai'i.



A colony of *Galaxea fascicularis*.

A close-up of *Galaxea fascicularis*.

Galaxea astreata (Lamarck, 1816) Vulnerable

This coral forms small patches just like *Galaxea fascicularis*, often with similar colors. The corallites are smaller and have fewer septa. This species is rare. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Upolu, and Savai'i.

Galaxea astreata.

A close-up photo of *Galaxea astreata*.

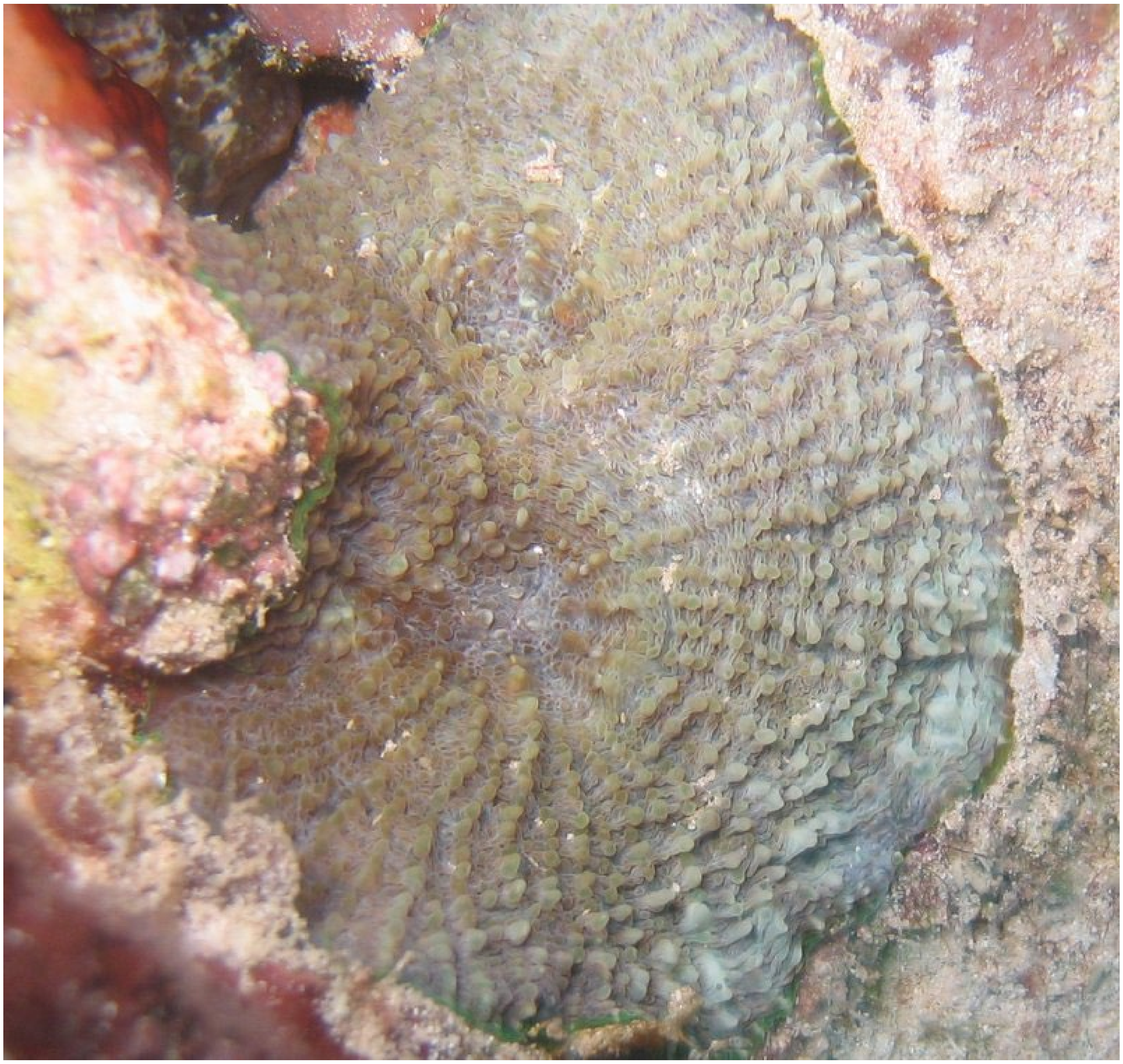
Echinomorpha

Echinomorpha forms small encrusting corals which usually just have one large polyp. The center of the polyp is slightly lower than the rest of the coral, and may be a different color from the rest. The outer part of the coral gently slopes down to the edge of the coral. The outer surface is covered with uniform small spines. Spinier than *Parascolymia*. There is only one species, which was previously placed in *Echinophyllia*.

Echinomorpha nishihirai (Veron, 1990)

This coral forms small encrusting corals with a central depression in the center of the corallite, and many sharp spines on its surface. Many are solitary, but there may be about 1-4 corallites. Grey-green, very rare, reef slopes, seen in Fagatele Bay and on Ofu so far.

A colony of *Echinomorpha nishihirai* with three corallites.



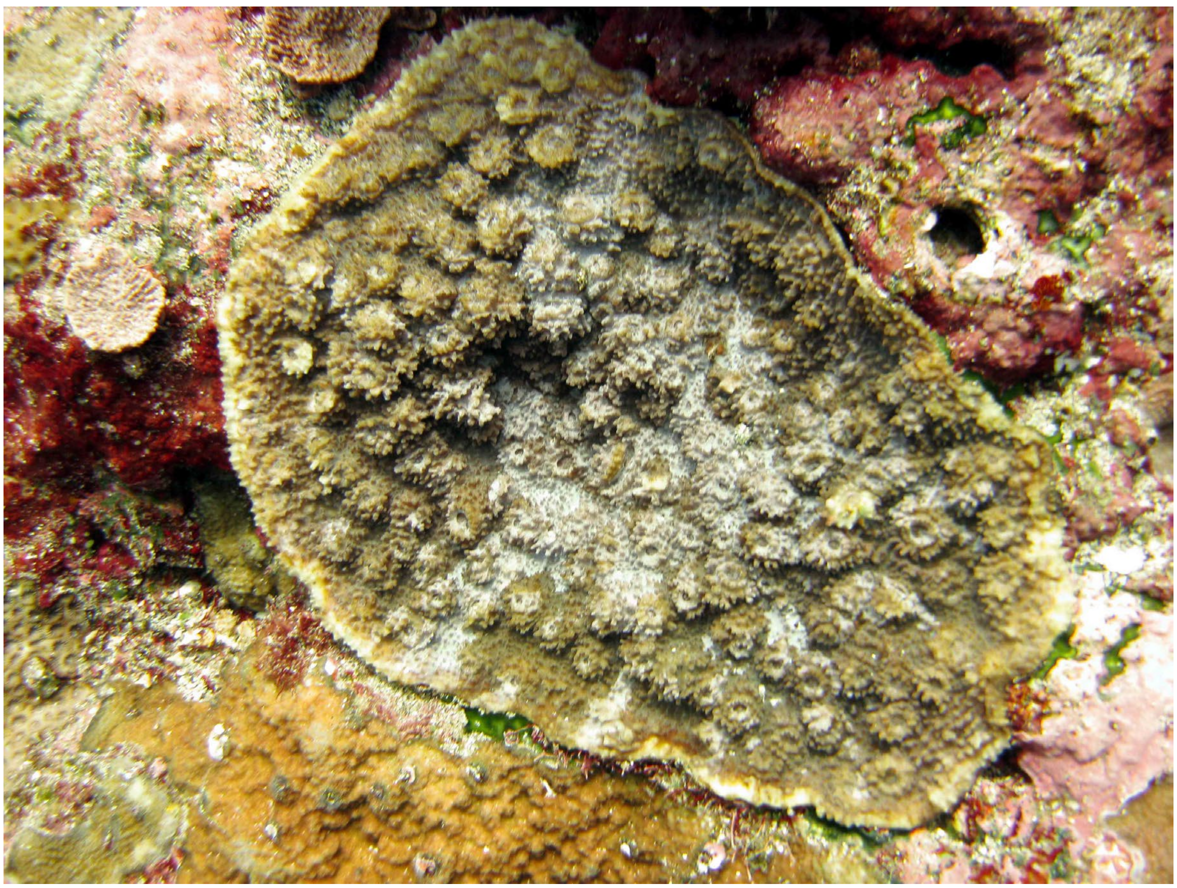
Echinomorpha nishihirai with small concentric folds of tissue.

Echinophyllia

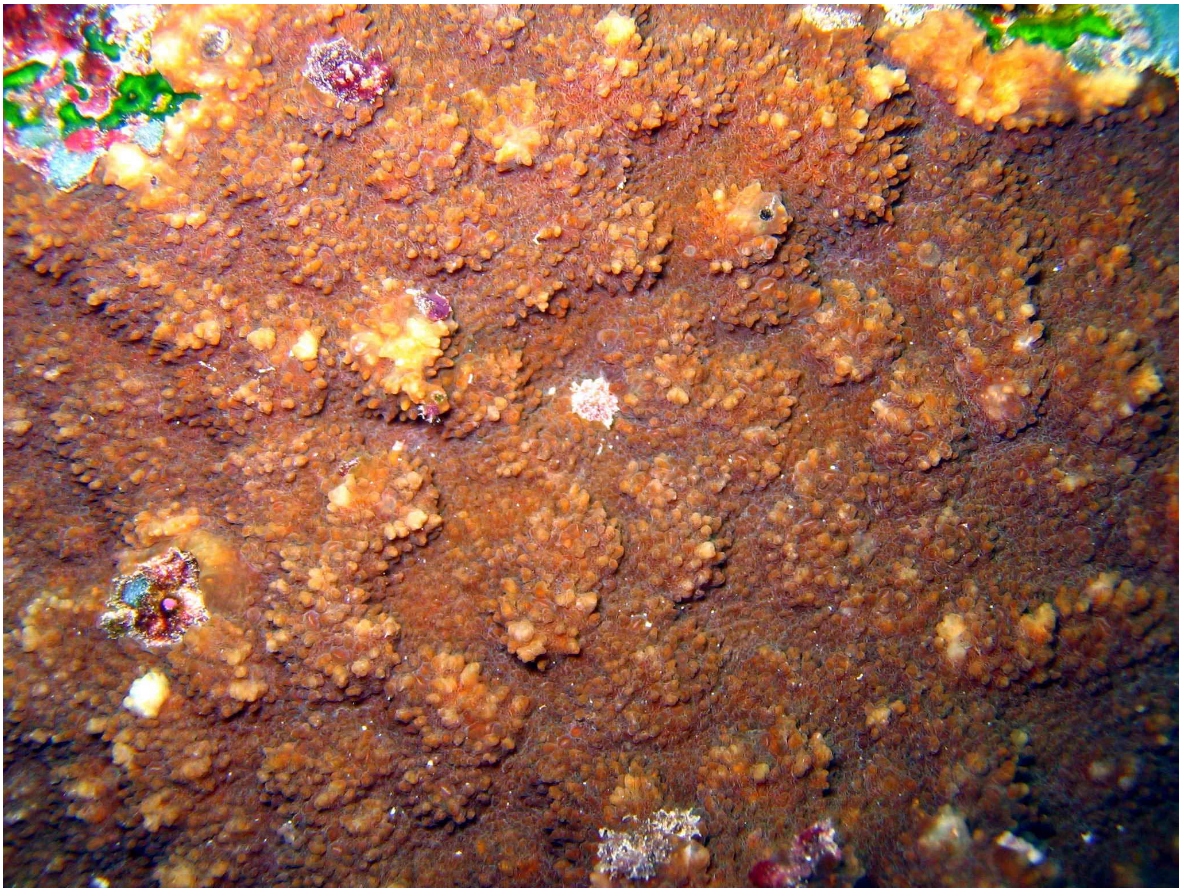
Echinophyllia forms thin plates close to the substrate on deeper slope areas. The surface is covered with spines. The genus name means “spine loving.” Corallites are about a quarter inch (5 mm) diameter, and are round raised cushions. They are often hard to spot among the spines. Usually grey or brown, rare. Corallites are not inclined to face the outer edge of the plate, as they are in *Mycedium*, and form mounds more than on *Oxypora*.

Echinophyllia aspera (Ellis & Solander, 1788)

This coral forms large thin sheets that are encrusting in the center and a raised thin plate at the edge. The surface is very spiny and lumpy. Lumps are irregular and about 1 cm (3/8 in) in diameter and are where the polyps are, but the polyps are often hard to recognize. The lumps are not inclined. The lumps are larger than on *Echinophyllia echinoporoides* and *Oxypora lacera*. Brown, reddish-brown or grey, uncommon, reef slopes. Found so far on Tutuila, Aunu’u, Ofu-Olosega, Ta’u, Muliava (Rose Atoll), Upolu, and Savai’i.



A colony of *Echinophyllia aspera*.



A close-up of *Echinophyllia aspera*.

Echinophyllia echinoporoides Veron & Pichon, 1980

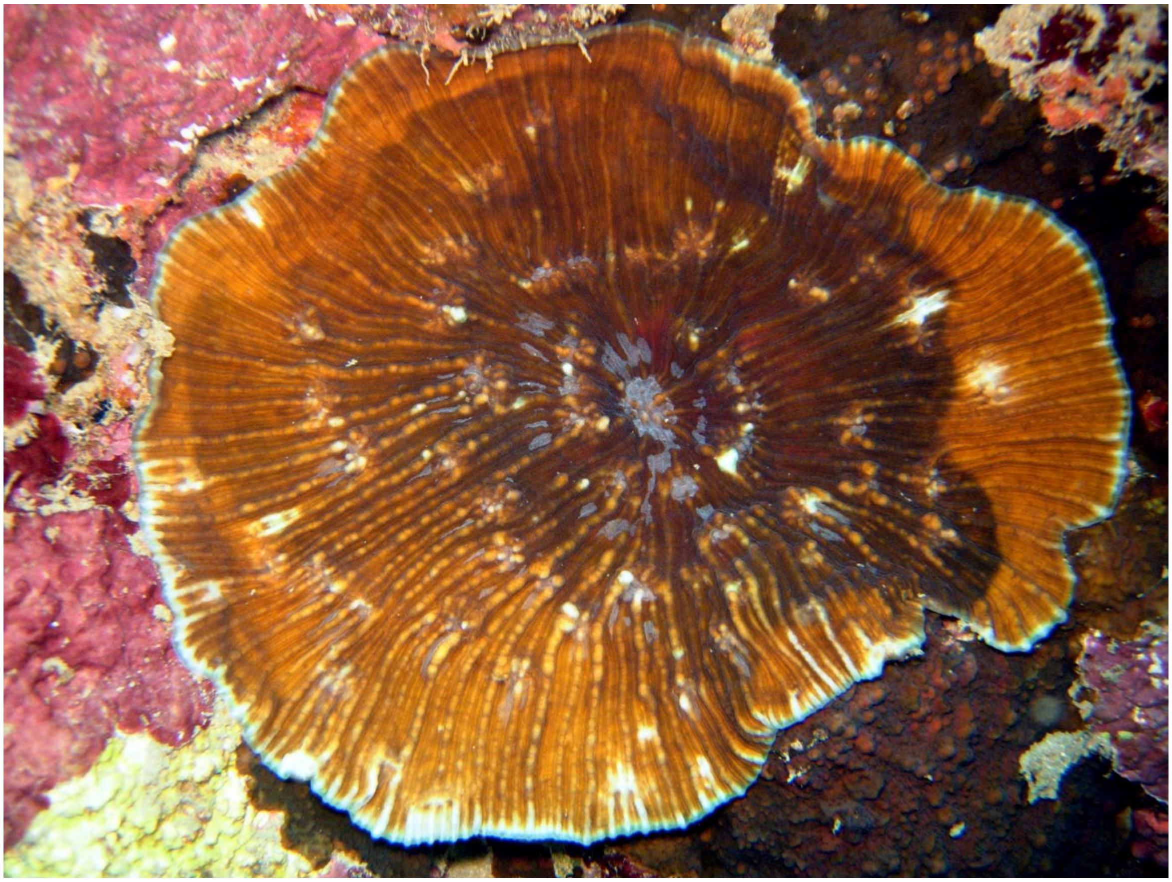
This species forms encrusting colonies with rounded, spiny lump-shaped corallites close together. The lumps are smaller than on *Echinophyllia aspera*. Reef slopes, rare.

A colony of *Echinophyllia echinoporoides*.

A close-up photo of *Echinophyllia echinoporoides*.

Echinophyllia echinata (Saville-Kent, 1871)

This species forms thin plate colonies with a large central corallite with ridges (costae) radiating from the central corallite. The ridges vary in height. There are widely spaced small corallites on the rest of the plate that may be nearly flush with the surface, or slightly inclined towards the outer edge of the plate. Colonies have a large central corallite, septa radiating all the way to the edge of the colony, and widely spaced smaller corallites unlike any other *Echinophyllia.* Rare, reef slopes.



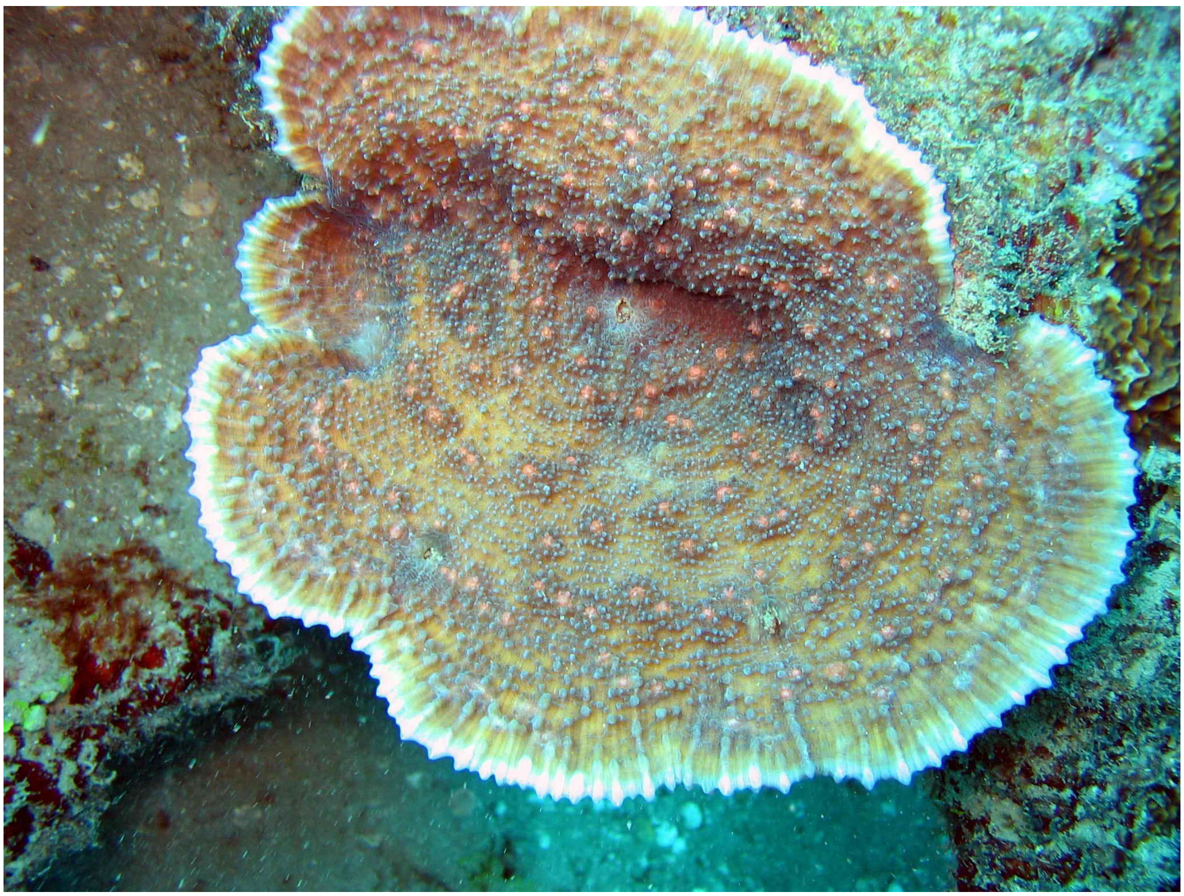
A colony of *Echinophyllia echinata*.

Oxypora

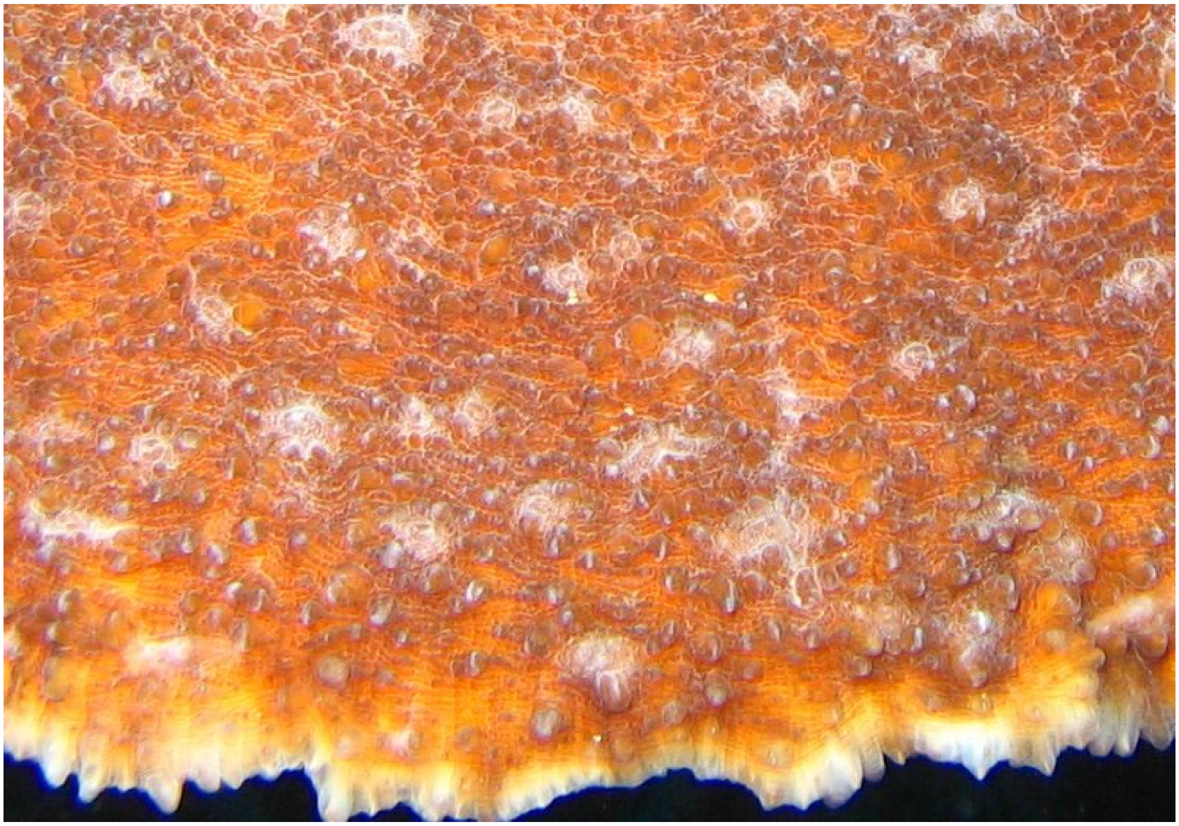
Oxypora forms thin plates close to the substrate on deeper slope areas. The surface is covered with spines. Corallites are about an eighth inch (3 mm) diameter, round but usually not raised. They are hard to spot among the spines unless they are colored differently from the rest of the colony. Usually grey or brown, uncommon to rare. Corallites are smaller than on *Echinophyllia*, and not inclined as on *Mycedium*

Oxypora lacera Verrill, 1864

This coral forms thin plates which are covered with fine spines. If polyp mouths are a contrasting color to the rest of the plate, they are obvious. Polyp mouths are surrounded by a ring of raised spines. Brown, grey or green, sometimes with pink or white polyp mouths, uncommon, reef slopes. Corallites project less than on *Echinophyllia*. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Upolu, and Savai'i.



A colony of *Oxypora lacera*.

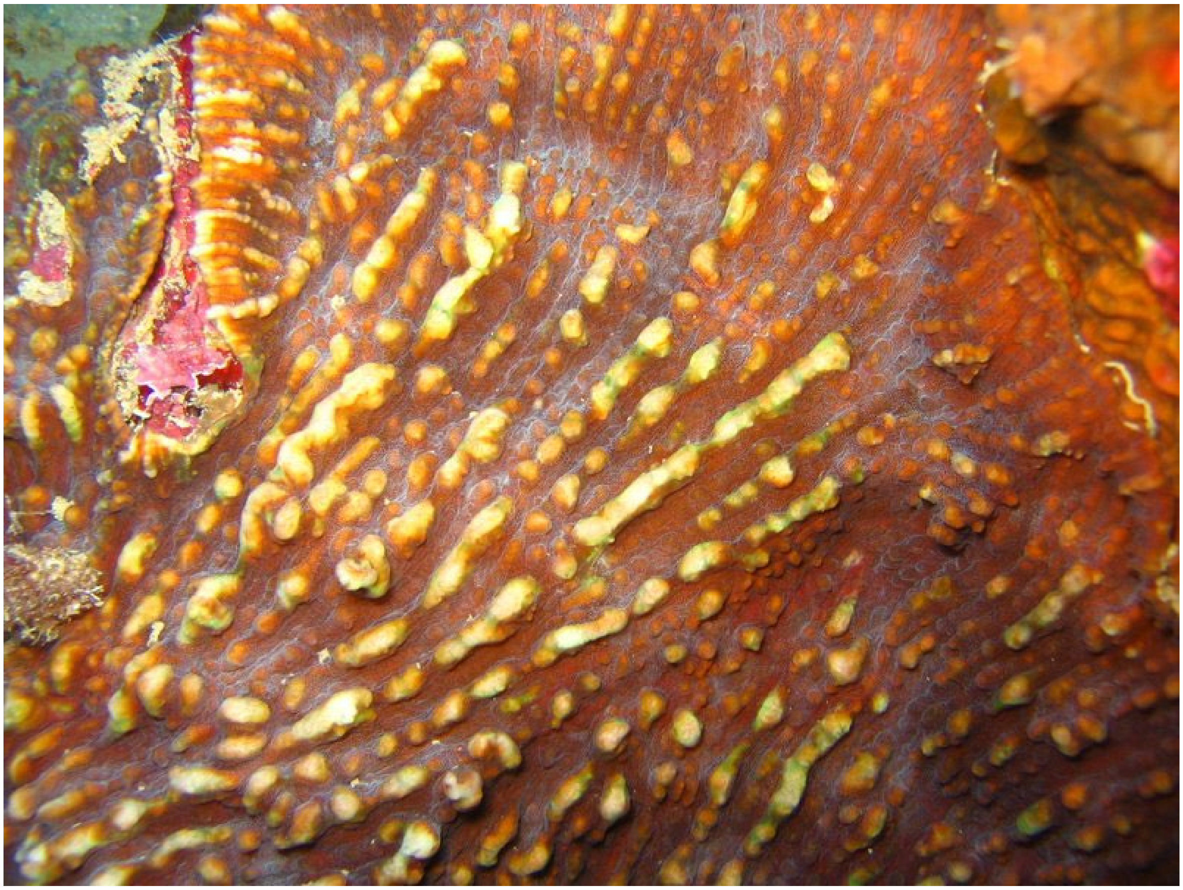


A close-up of *Oxypora lacera* with an unusual color.

Oxypora cf. *crassispinosa* Nemenzo, 1979

This coral forms thin plates with many thick rounded spines which may be in rows or even fuse into ridges. Corallites are not obvious. Corallites are much easier to locate on *Oxypora lacera*, and the spines are much smaller. Brown with white spines, uncommon to rare, reef slopes. Found so far on Tutuila and Upolu.

A colony of *Oxypora* cf. *crassispinosa*.



A close-up of *Oxypora* cf. *crassispinosa*.

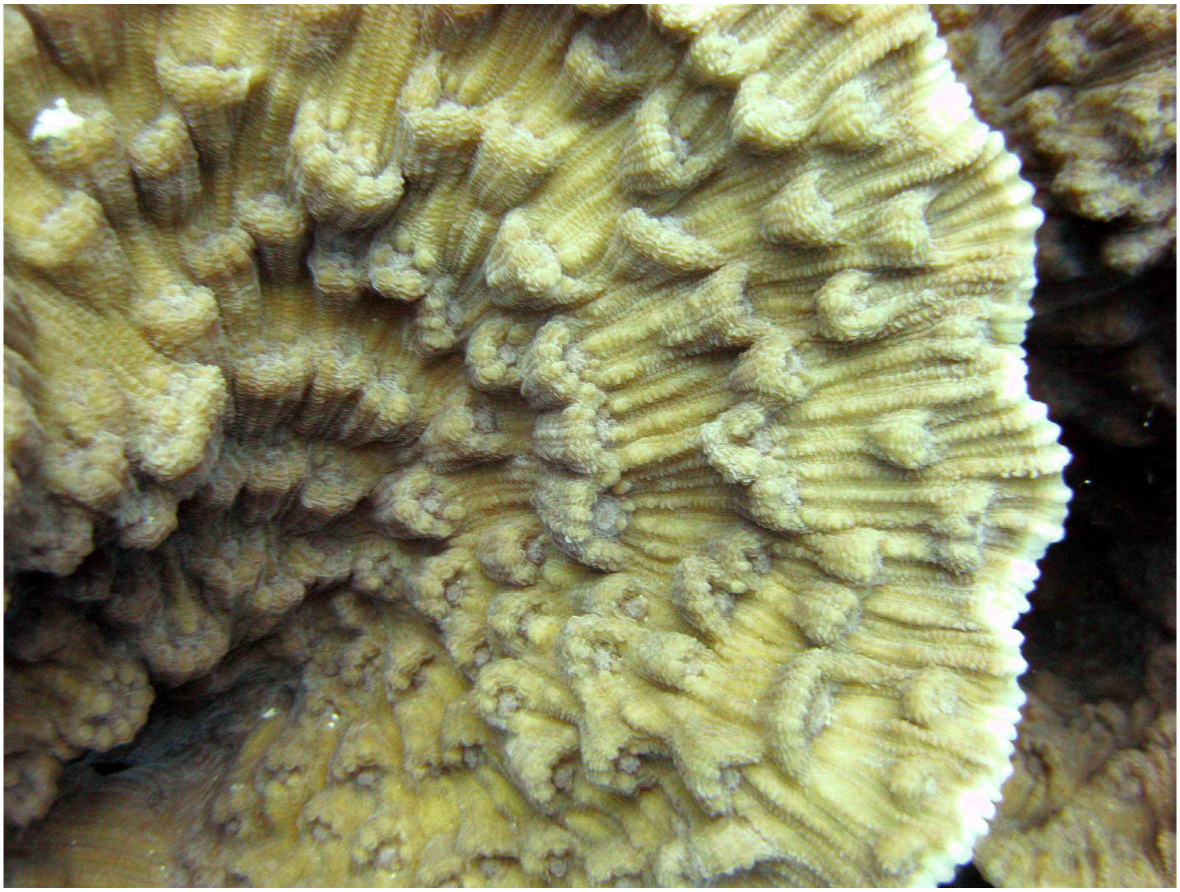
Mycedium

Mycedium forms thin plate corals that are usually close to the substrate, on deeper reef slopes. The surface of the colony is usually very rough with large spines. If corallites can be distinguished, they lean over, pointing toward the outer edge of the colony. The leaning corallites are the distinctive and defining feature of this genus. Some *Leptoseris* have outwardly inclined corallites, but have much finer features, without spines. Less commonly, the spines are much smaller and the corallites are easy to see. Dominates some deep slopes, common to uncommon elsewhere, rare in shallow.

Mycedium elephantotus (Pallas, 1766)

This coral forms thin plates which have many raised corallites which are strongly inclined so they point towards the edge of the plate. Small ridges run radially on the plate. Much less spiny and corallites much more obvious than some Mycedium. *Mycedium robokakai* has smaller corallites. Grey or tan, rare, reef slopes. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Muliava (Rose Atoll), Upolu, and Savai'i.

A colony of *Mycedium elephantotus*

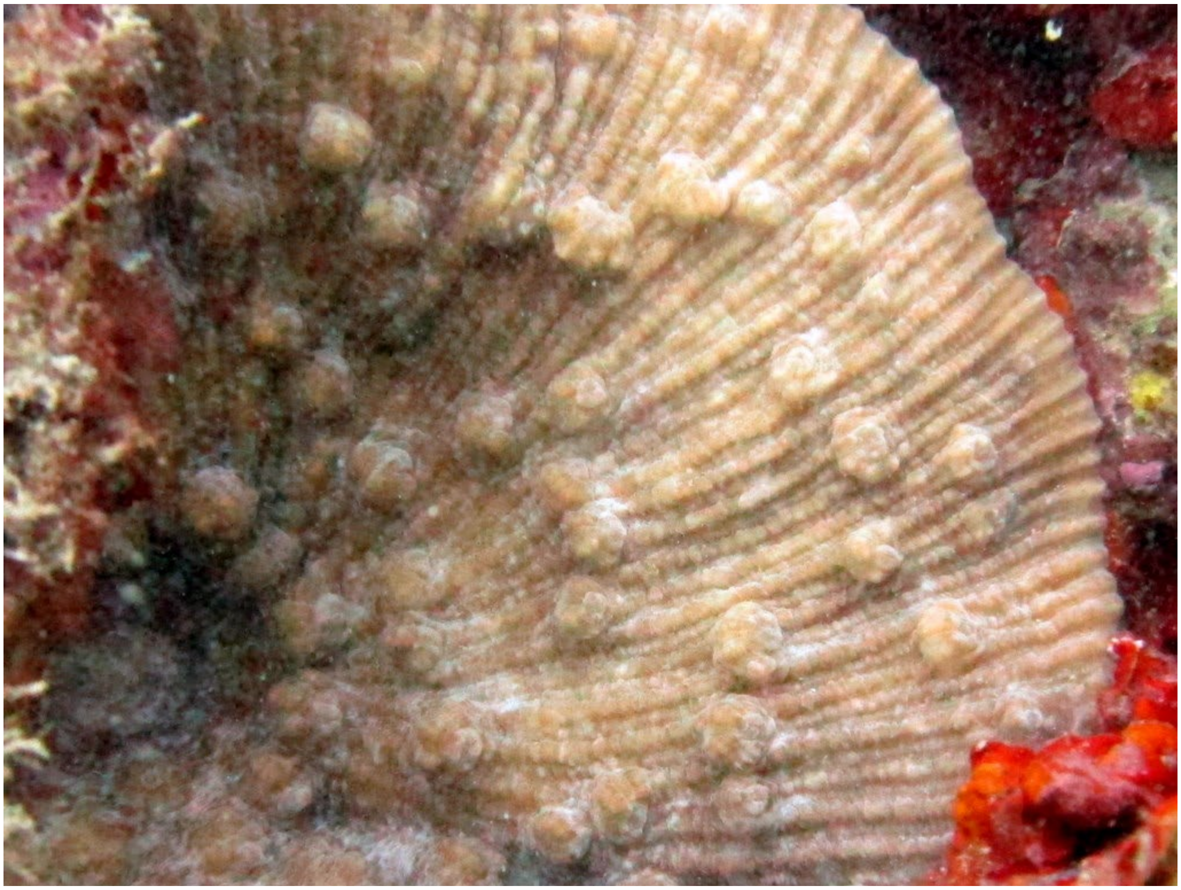


A close-up of *Mycedium elephantotus*.

Mycedium robokaki Moll & Borel Best, 1984

This coral has outwardly inclined corallites and radiating ridges. It resembles *Mycedium elephantotus* but has smaller corallites than *M. elephantotus*. It is not as spiny and corallites are easier to see than on some *Mycedium*. Rare. Found so far on Tutuila.

A small colony of *Mycedium robokaki*.



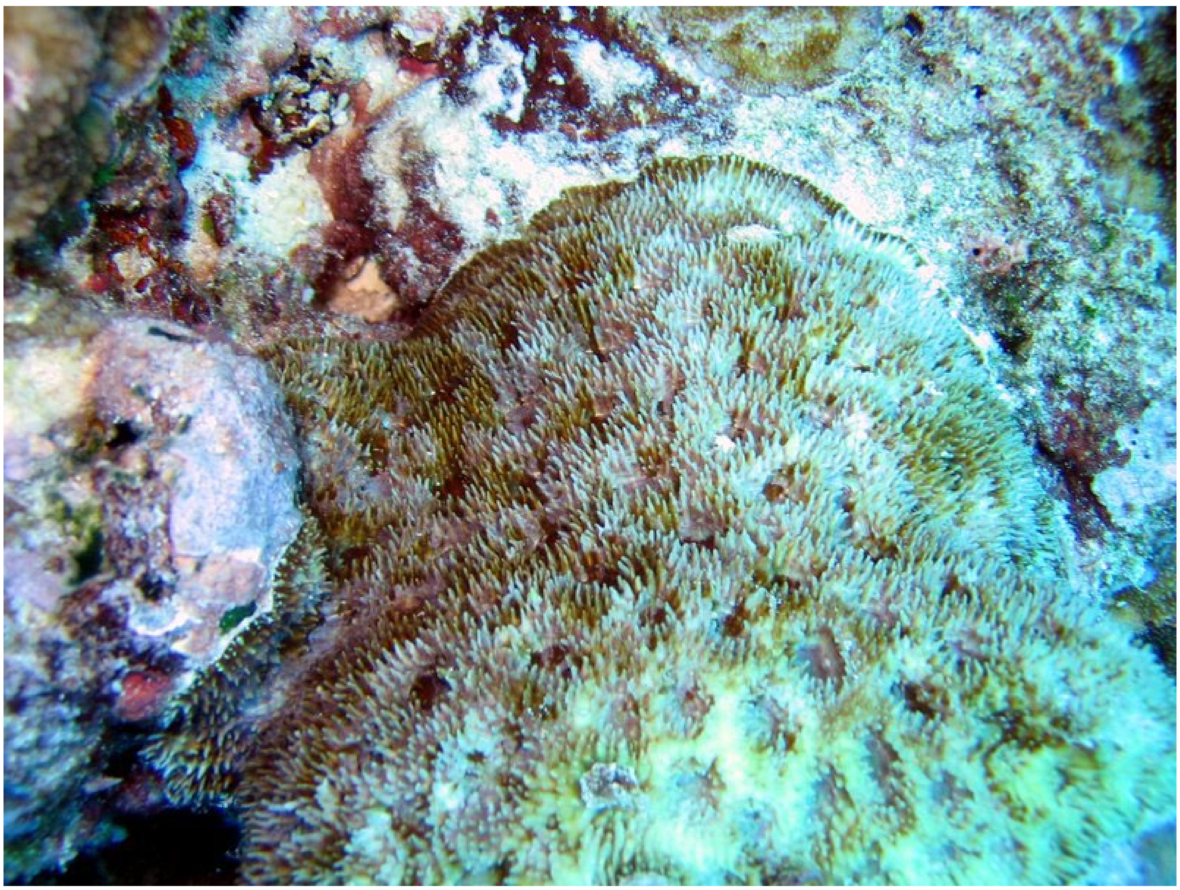
A close-up of *Mycedium robokokai*.

Acanthastrea

Acanthastrea is usually encrusting but rarely massive, has medium size polyps, is spiny, and may have some flesh that can be seen. Corallites can be separated or joined by a single ridge. It has corallites about 1 cm (3/8 in) diameter. Colors can be greens and browns and mottled patterns. Uncommon. Spinier than *Favia* or *Favites*, which it can otherwise resemble closely. Not branching like *Lobophyllia* and not meandroid like *Symphyllia*.

Acanthastrea brevis Milne Edwards & Haime, 1849 Vulnerable

This coral forms small encrusting colonies covered with a dense forest of long thin spines. Corallites are medium size circular depressions with space between them. Mottled brown with cream spines, rare, reef slopes. Other *Acathanstrea* have shorter spines. Found so far on Tutuila, Ofu-Olosega, Ta'u, and Muliava (Rose Atoll).

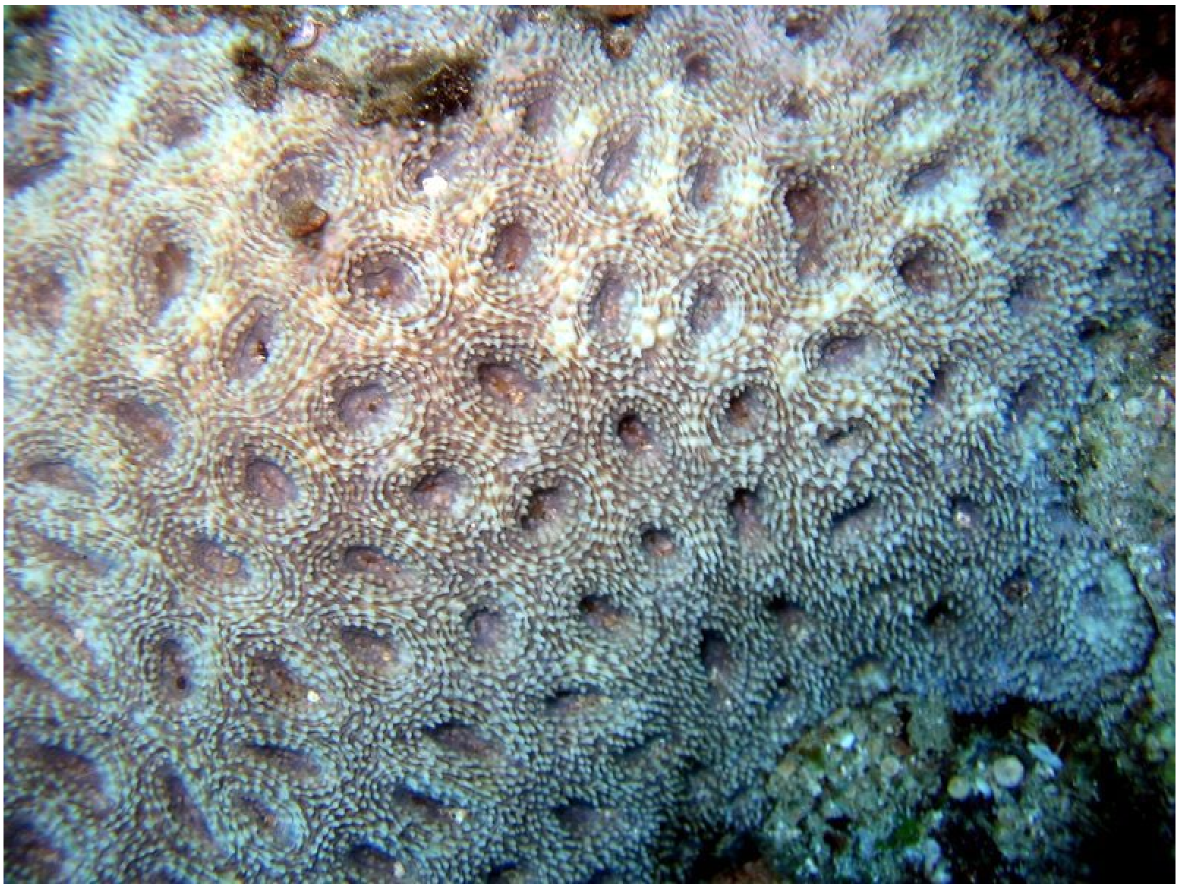


A colony of *Acanthastrea brevis*.

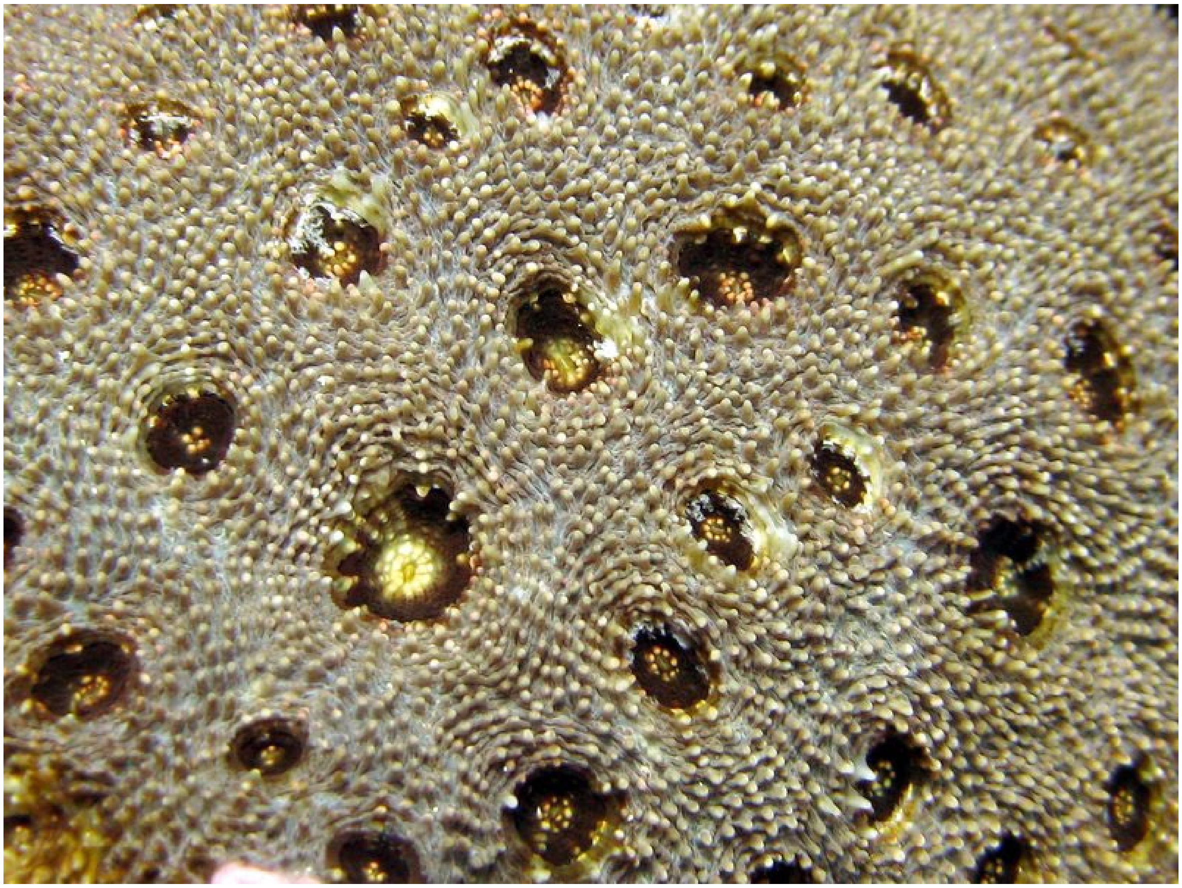
A close-up of *Acanthastrea brevis*.

Acanthastrea echinata (Dana, 1846)

This coral forms small encrusting colonies with an even covering of small short spines. Corallites are medium size circular depressions with space between them, and there is enough flesh for there to often be circular folds of flesh around the corallites. *Acanthastrea brevis* has taller spines and *Acanthastrea hemprichii* has corallites closer together and does not have circular tissue folds. *Acanthastrea ishigakiensis* has massive colonies with large pinched corallites. Grey, dark or light brown, rarely brilliant green, uncommon to rare, reef slopes. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Muliava (Rose Atoll), Upolu, and Savai'i.



A colony of *Acanthastrea echinata*.



A close-up of *Acanthastrea echinata*.

Acanthastrea hemprichii (Ehrenberg, 1834) Vulnerable

This coral forms small encrusting colonies with an even covering of small short spines. Corallites are medium size circular to polygonal depressions. There is no space between corallites, they share common walls like *Favites*. *Acanthastrea brevis* has longer spines. *Acanthastrea echinata* has more space between corallites and concentric tissue folds. *Acanthastrea ishigakiensis* has massive colonies and larger corallites that are pinched. Usually mottled, yellow, dark brown, and/or white, rare, reef slopes. Found so far on Tutuila.

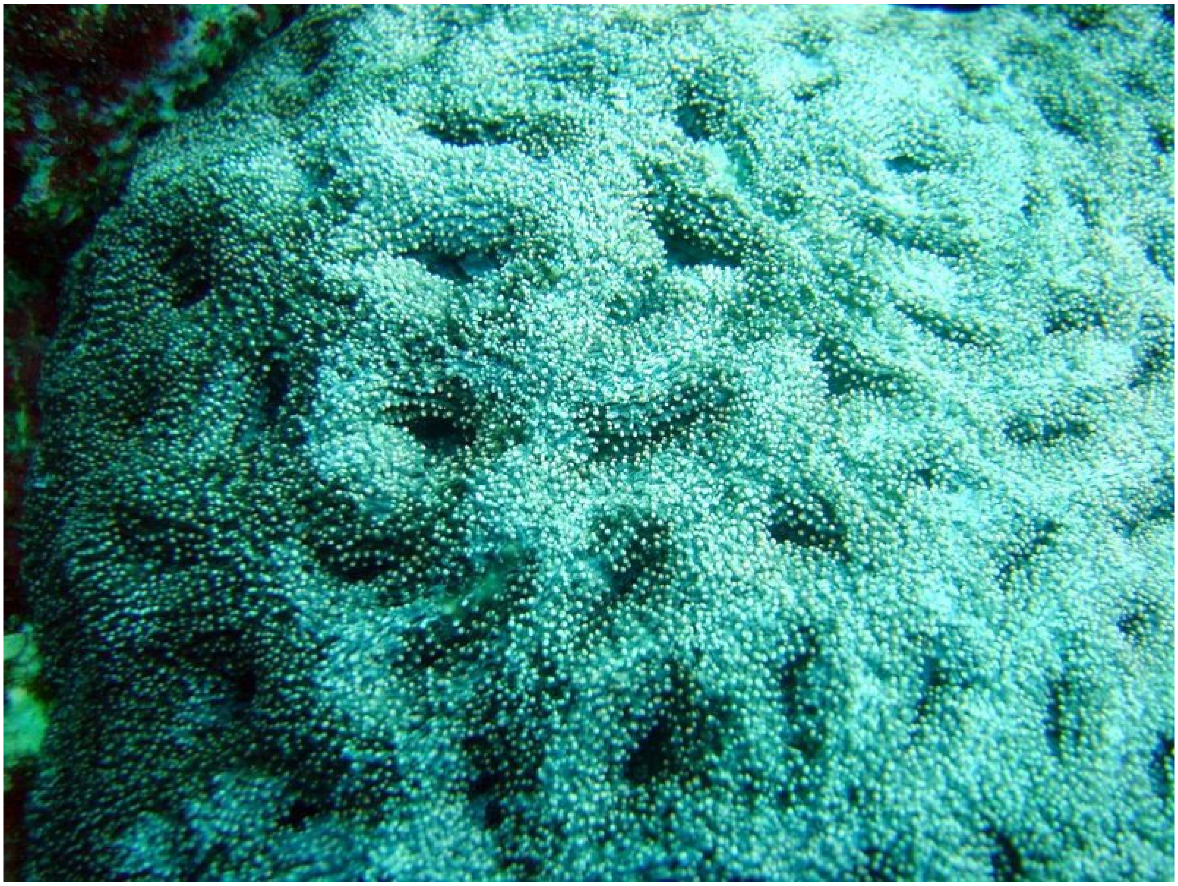
A colony of *Acanthastrea hemprichii*.

A close-up of *Acanthastrea hemprichii*.

Acanthastrea ishigakiensis Veron, 1990 Vulnerable

This coral forms hemispherical massive colonies with larger corallites than the other *Acanthastrea*. The surface is covered with small spines, and corallite centers are often very pinched sideways. Grey, very rare (only one colony found so far), reef slope. Found so far on Tutuila.

A colony of *Acanthastrea ishigakiensis*.



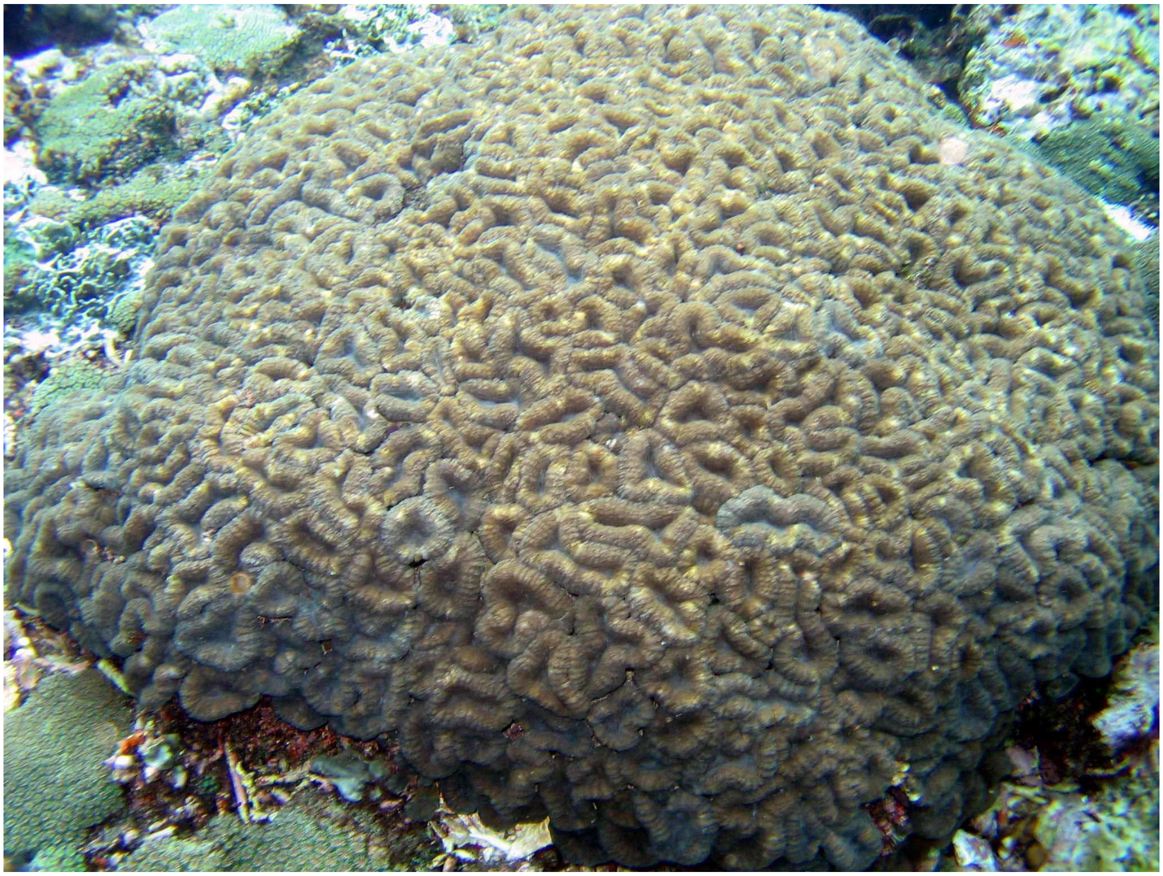
A close-up of *Acanthastrea ishigakiensis*.

Lobophyllia

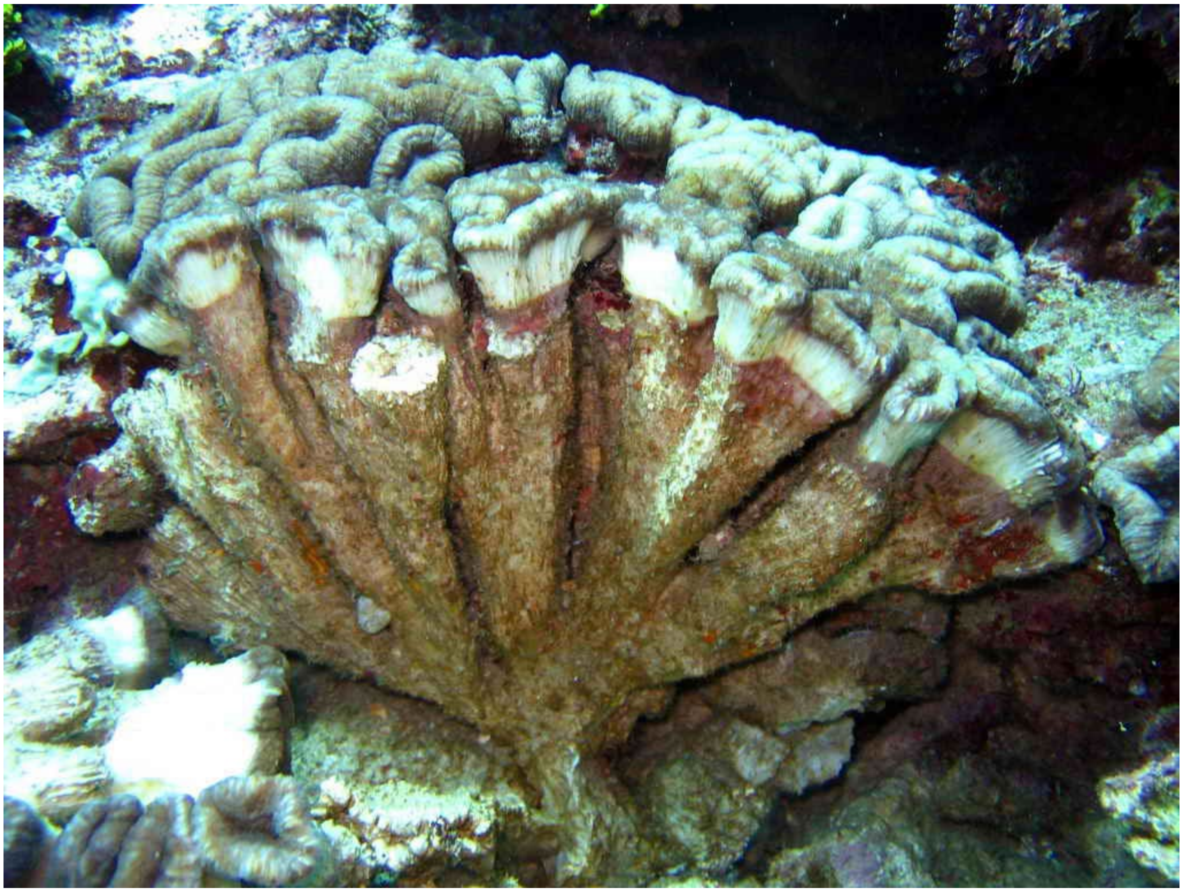
Lobophyllia forms colonies that have two different shapes. Some colonies are branching (though they appear massive), and others are actually massive with ridges on them that meander, making them “brain corals.” Colonies that have long been called “*Lobophyllia*” have what appears to be rounded ridges at first glace. A closer look will reveal that the rounded ridges are all circular or ovals, so they connect in a circle of some sort. Each circle or oval is about 1-4 inches (2.5-10 cm) across. There is a very thin crack between ovals. The crack is actually very deep, because the circles and ovals are individual polps and corallites on the ends of long thick branches. We call these colonies “semimassive” because they look like a solid massive coral, but actually are not, they are branching with the branches hidden. These colonies have large polyps, about 1-3 inches (2.5-8 cm) diameter. The colonies can get to be 5 or even 10 feet (1.5-3 m) in diameter. They are usually brown or grey. They are so common at medium depths in places in the SE coast of Tutuila that they dominate those areas, but they are uncommon other places. These colonies have larger polyps than most genera, including *Caulastrea,* which is also submassive. What appears to be a double ridge has a very deep crack in the center unlike the ridges of colonies long called “*Symphyllia”*, but whi8chare now in Lobophyllia also and which have no crack (but may have a narrow, shallow groove), so *Lobophyllia* colonies that used to be called *Symphyllia* are massive while colonies that used to be called *Lobophyllia* are branching. The ridges on massive colonies meander on the surface so it can be called “brain coral”. These colonies have the thickest ridges of any meandroid coral. Colonies reach a maximum of about 50 cm diameter, so much smaller than *Lobophyllia hemprichii*. In addition, there are 3 corals that are at least partway between these two lifeforms, which is consistant with uniting these in one genus.

Lobophyllia hemprichii (Ehrenberg, 1834) “submassive”

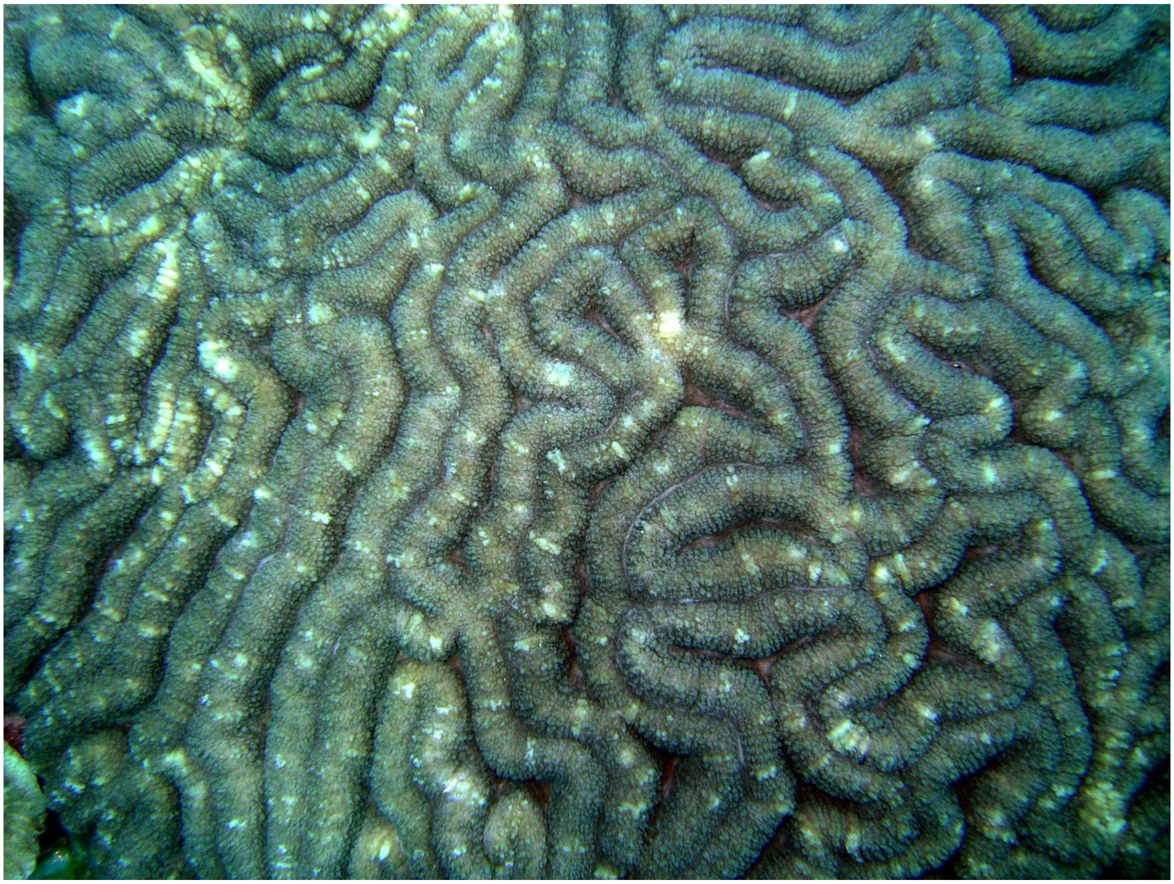
This coral forms large gently rolling fields of large corallites. Corallites are about 4-6 cm (1 ½ - 2 ½ in) in diameter, and have a large rounded edge with slight radiating ridges. Some corallites are circular but many are pinched or distorted to various degrees. Colonies appear massive but are actually branching. Colonies can reach at least 5 m diameter. Brown, dominates medium depth slopes of the SE of Tutuila, otherwise uncommon. *Lobophyllia corymbosa* has smaller corallites, *Lobophyllia robusta* has larger corallites that are fleshier and *Lobophyllia hataii* has a single large polyp with a flat bottomed valley between meandering edge ridges. Found so far on Tutuila, Aunu’u, Ofu-Olosega, Ta’u, Muliava, Upolu, Apolima, and Savai’i.



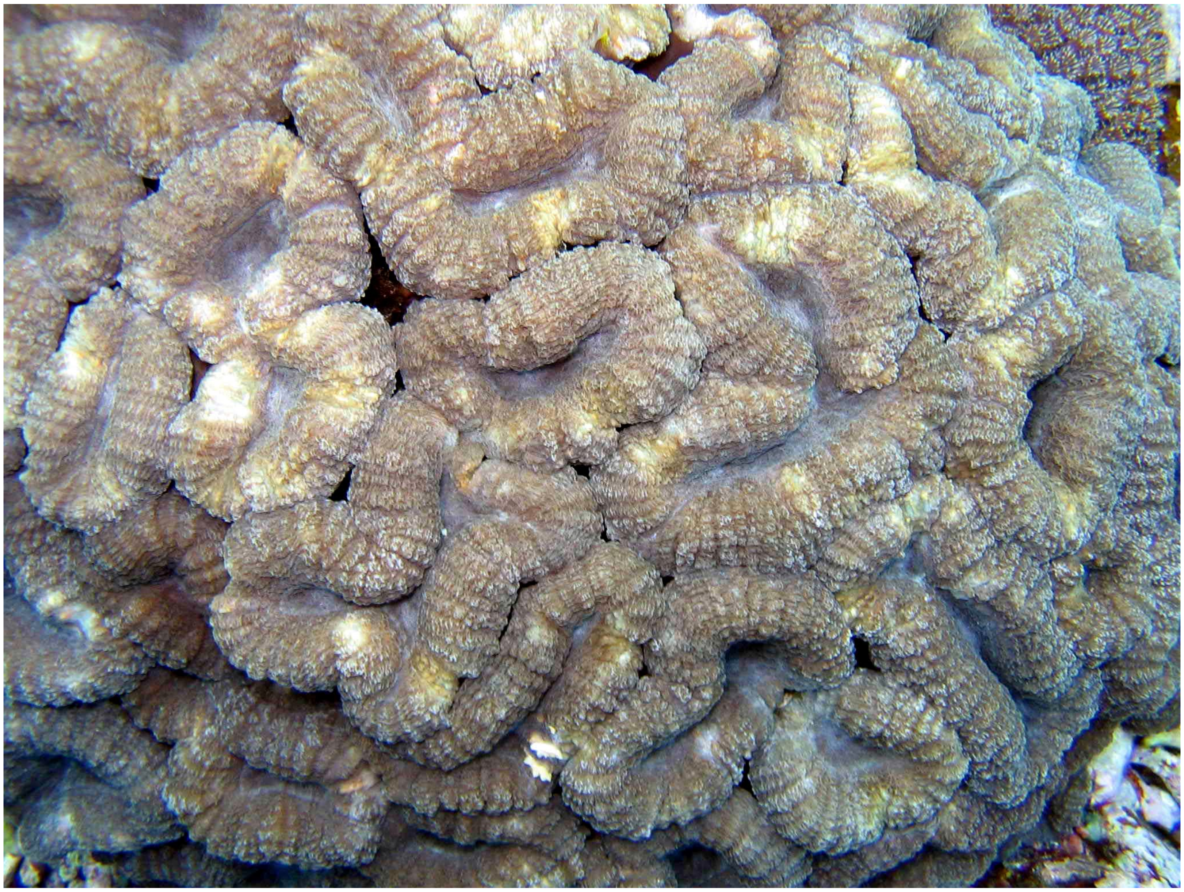
A whole colony of *Lobophyllia hemprichii*.



This colony of *Lobophyllia* was broken, revealing the branches with one polyp on the end of each branch.



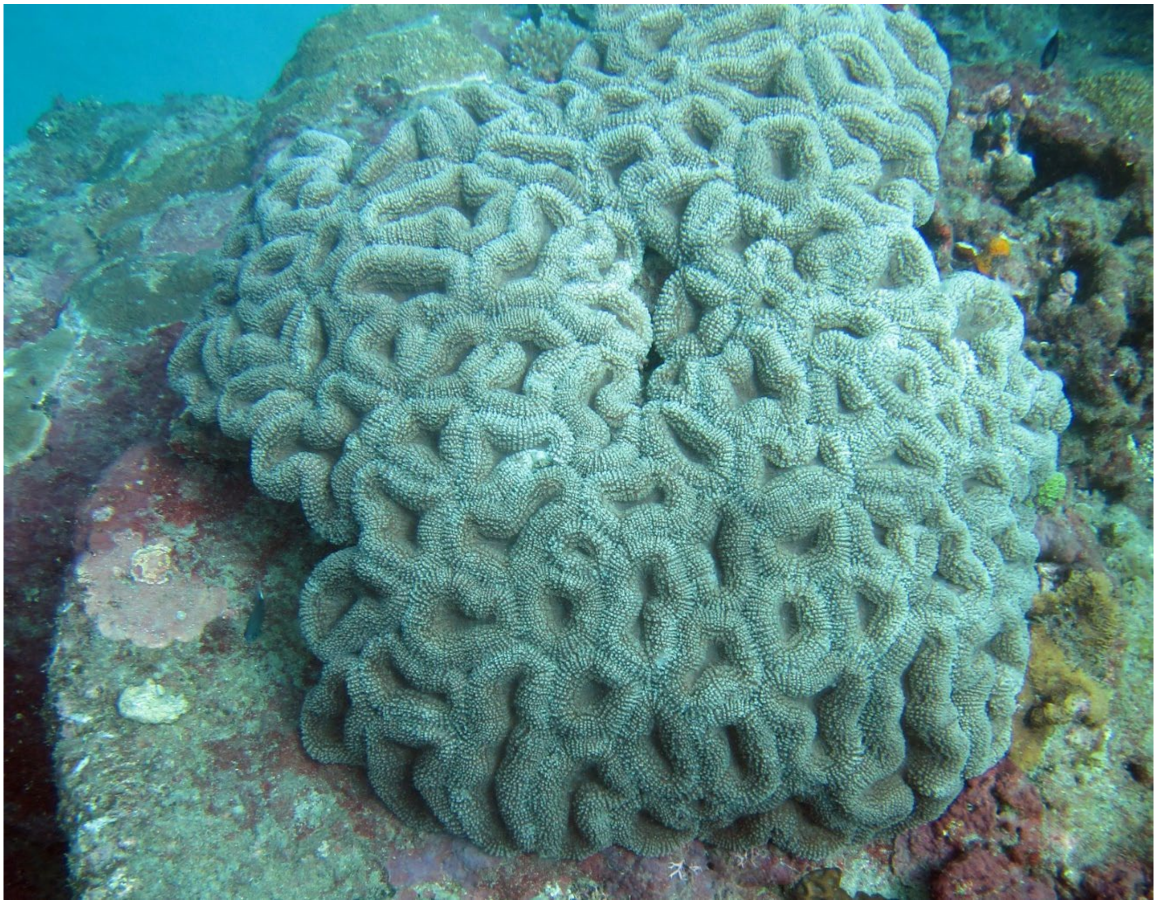
A colony of *Lobophyllia hemprichii* with very elongated polyps/corallites.



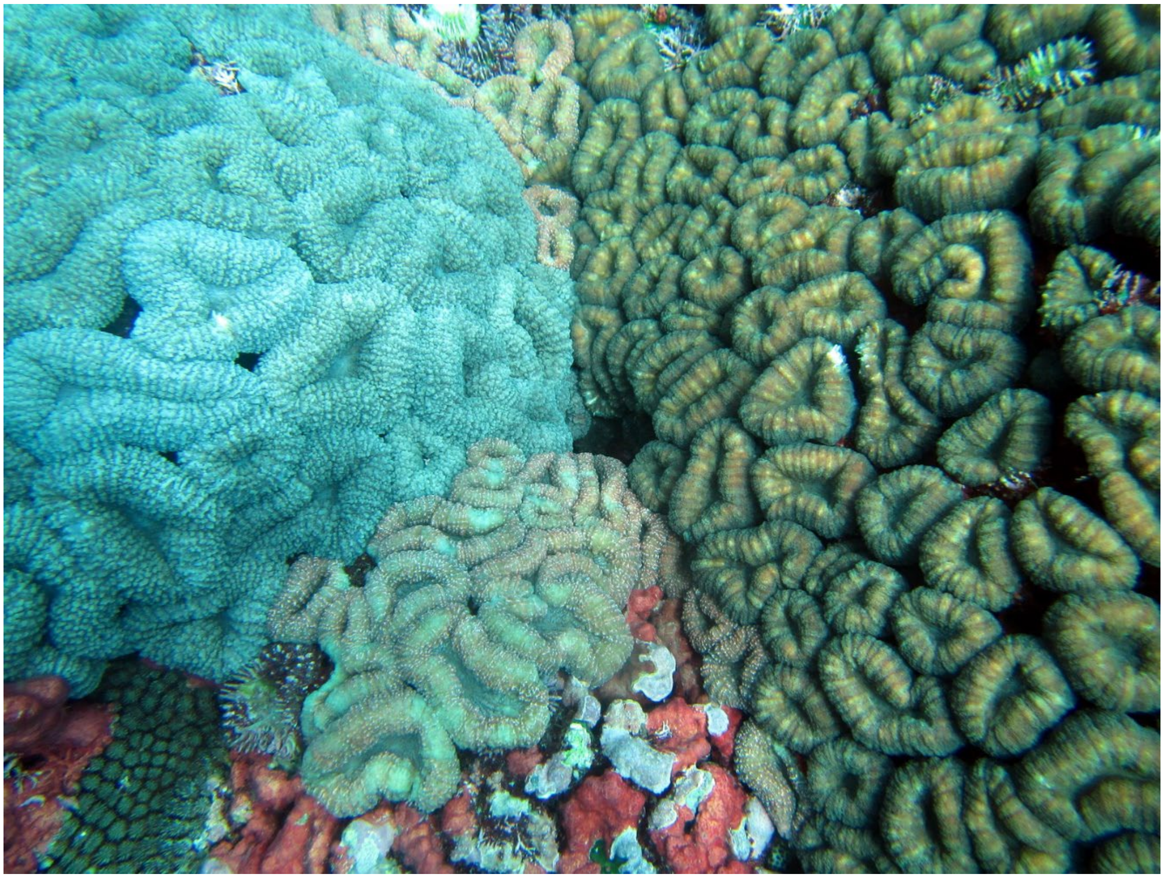
A close-up of the polyps of *Lobophyllia hemprichii*. The white and yellow areas are disease.

Lobophyllia robusta Yabe and Sugiyama, 1936 "submassive"

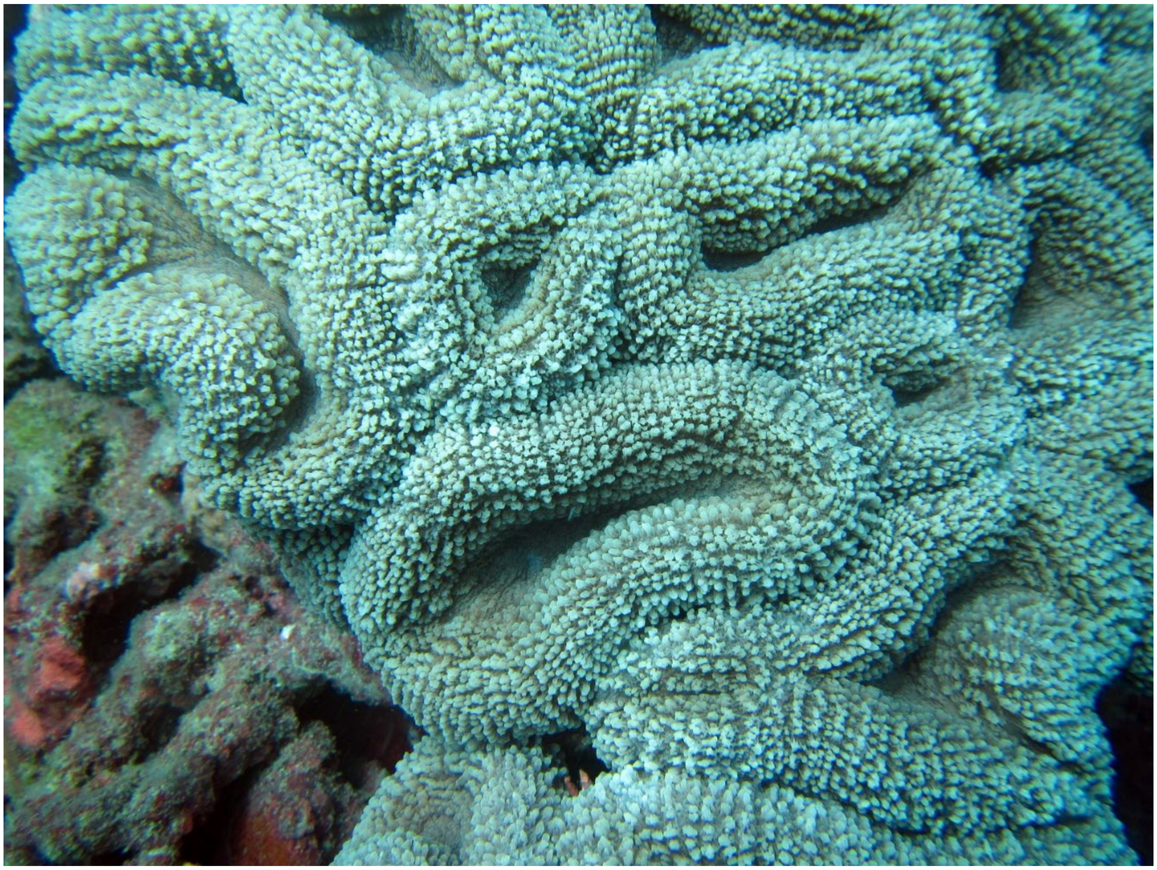
Colonies have large polyps, mostly 3-4 inches (8-10 cm) in diameter. Tissue surfaces are rough. Polyps are fleshy, so if you gently squeeze the rounded rim, it is soft and goes in aways before you feel the spines. *Lobophyllia hemprichii* can have smoother polyps and smaller polyps, and they are less fleshy, if you squeeze the rounded rim you feel the spines immediately. Colonies appear massive but are actually branching. Much less common than *Lobophyllia hemprichii*. Found on Tutuila so far.



Lobophyllia robusta colony.



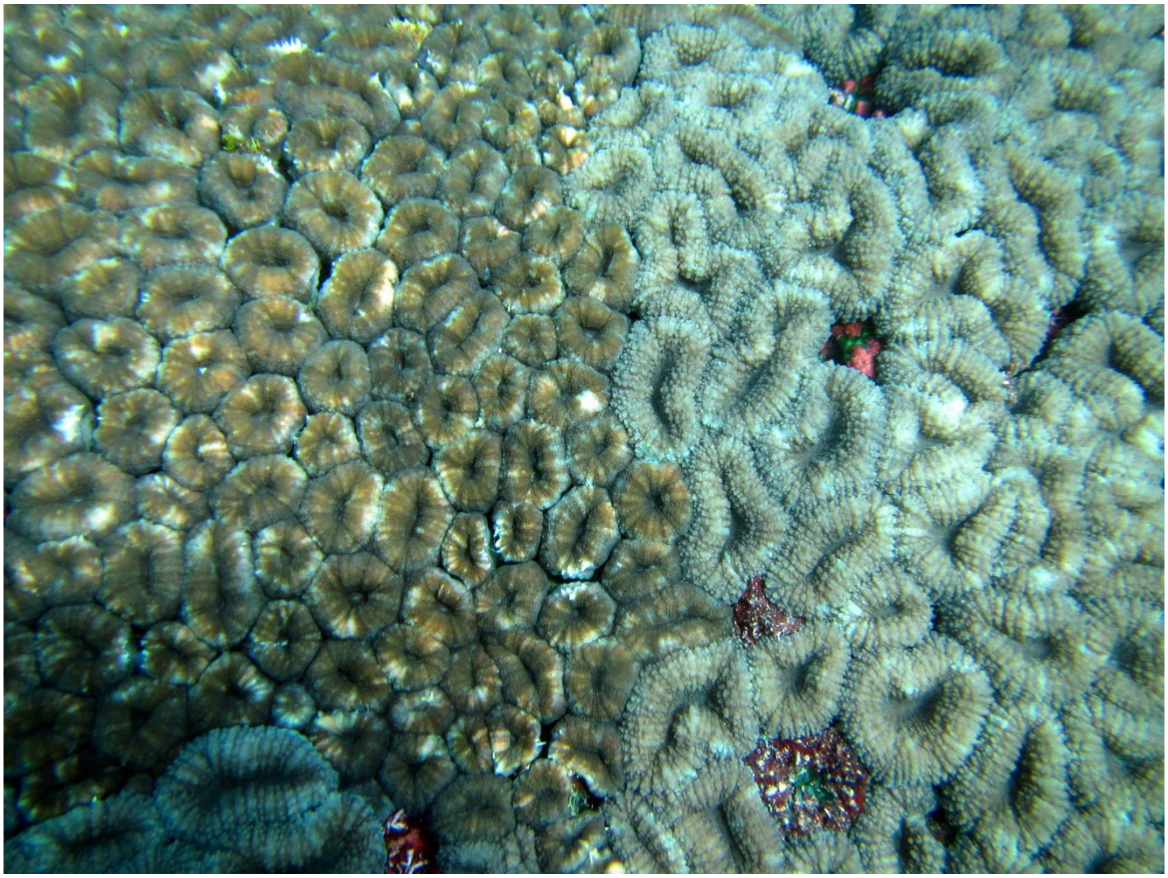
Lobophyllia robusta is on the upper left, and on the right and the bottom are colonies of *Lobophyllia hemprichii*.



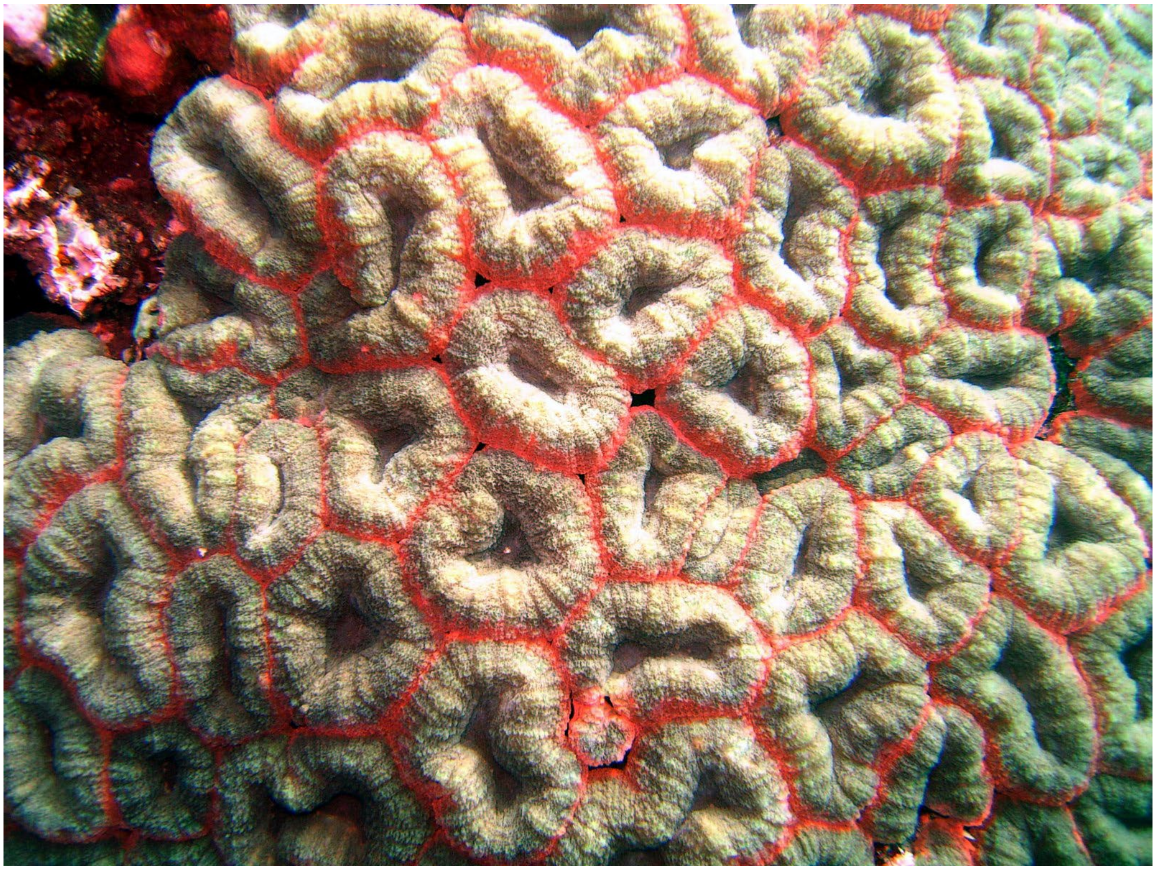
A close-up photo of *Lobophyllia robusta*.

Lobophyllia corymbosa (Forskal, 1775) “submassive”

Colonies appear to be massive but are actually branching. Corallites are smaller and rounder than on *Lobophyllia hembrichii* and have only 1-3 mouths. *Lobophyllia robusta* has even larger corallites. Rare



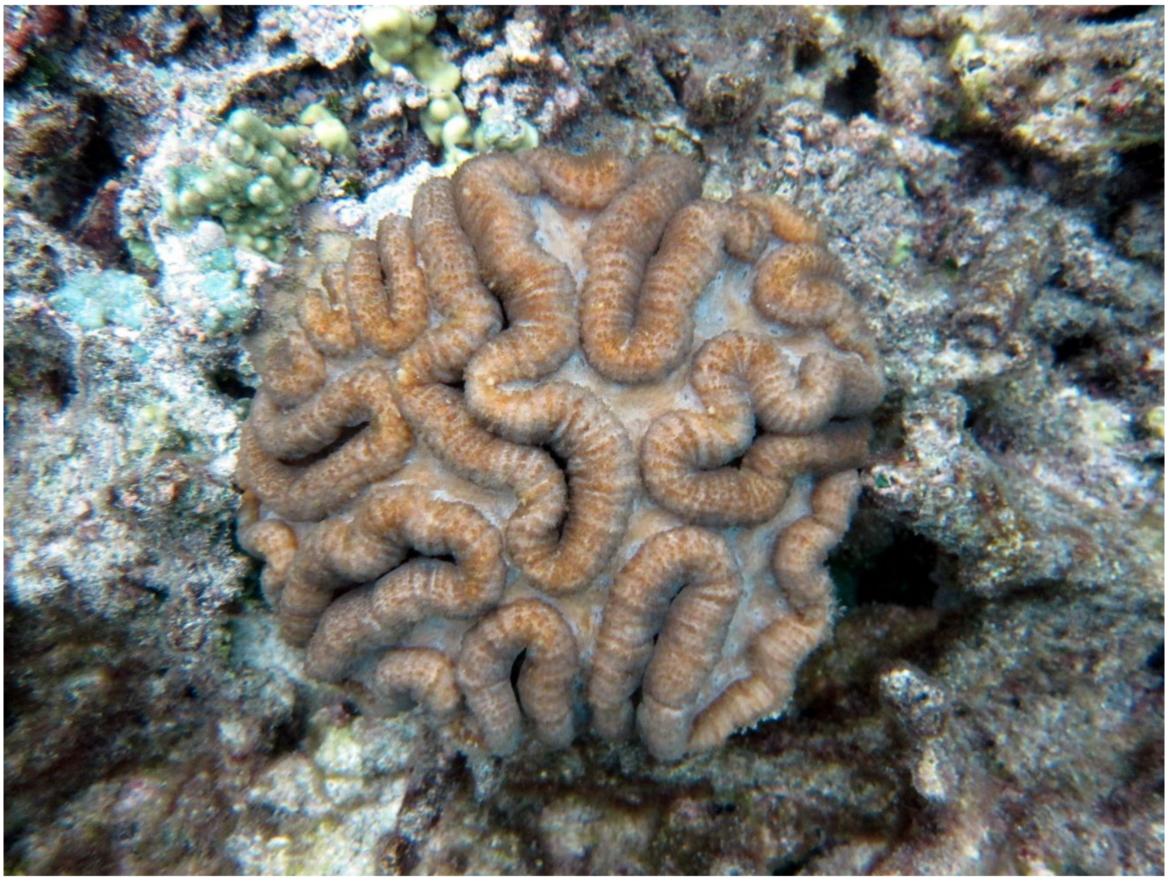
Lobophyllia corymobosa is on the left and *Lobophyllia hemprichii* is on the right.



A close photo of *Lobophyllia corymbosa*. Colonies can be spinier than this.

Lobophyllia hataii Yabe, Sugiyama and Eguchi, 1936

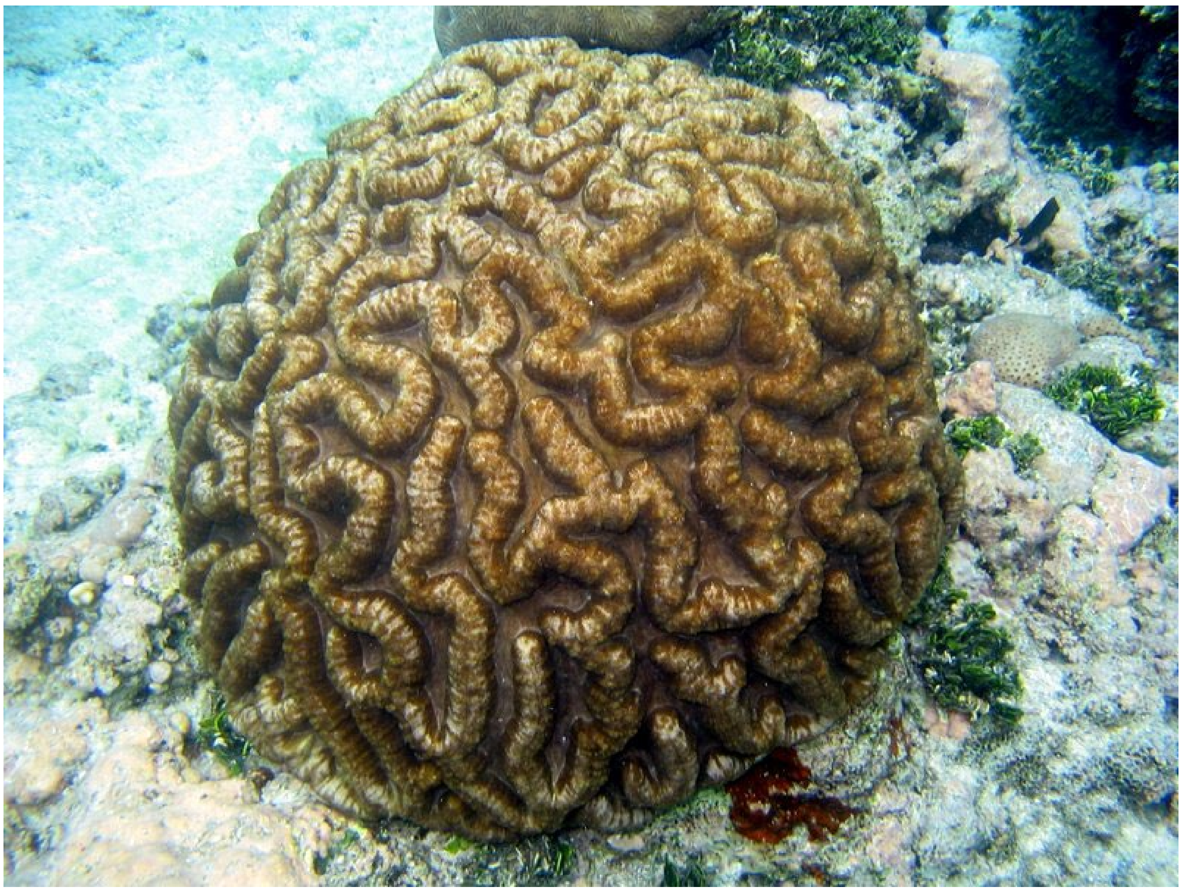
This species forms colonies that have large, meandering corallites. Colonies do not usually get much more than 40 cm (1 ½ feet) diameter. The edges of the corallites are raised as rounded ridges. There are deep cracks between corallites. The oral surface is a flat space between the rounded edges of the folded edges of the coralite. This species is very similar to some colonies of *Lobophyllia hemprichii* which have long corallites, but in this species the rounded edges have a wider low flat space between them while *L. hemprichii* has a much narrower space between the rounded edges. Most colonies of *Lobophyllia hemrichii* have many, much smaller polyps. Rare, reef slopes.



A colony of *Lobophyllia hataii*.

Lobophyllia agaricia Milne Edwards & Haime, 1849 meandroid or “brain coral”
This used to be in “*Symphyllia*.”

This coral forms massive colonies covered with large rounded ridges that meander over the surface, a “brain coral.” The ridges have a finely bumpy surface. The ridges are about 25-30 mm wide, the width of a thumb or slightly more. Colonies reach about 50 cm diameter or less, much less than *Lobophyllia hemprichii*. Ridges are thicker than on *Lobophyllia radians* and *Lobophyllia recta*. The ridges are wider than on *Oulophyllia*, and much wider than on *Platygyra.* Brown or red or orange, uncommon to rare, reef slopes. Found so far on Tutuila and Muliava (Rose Atoll).

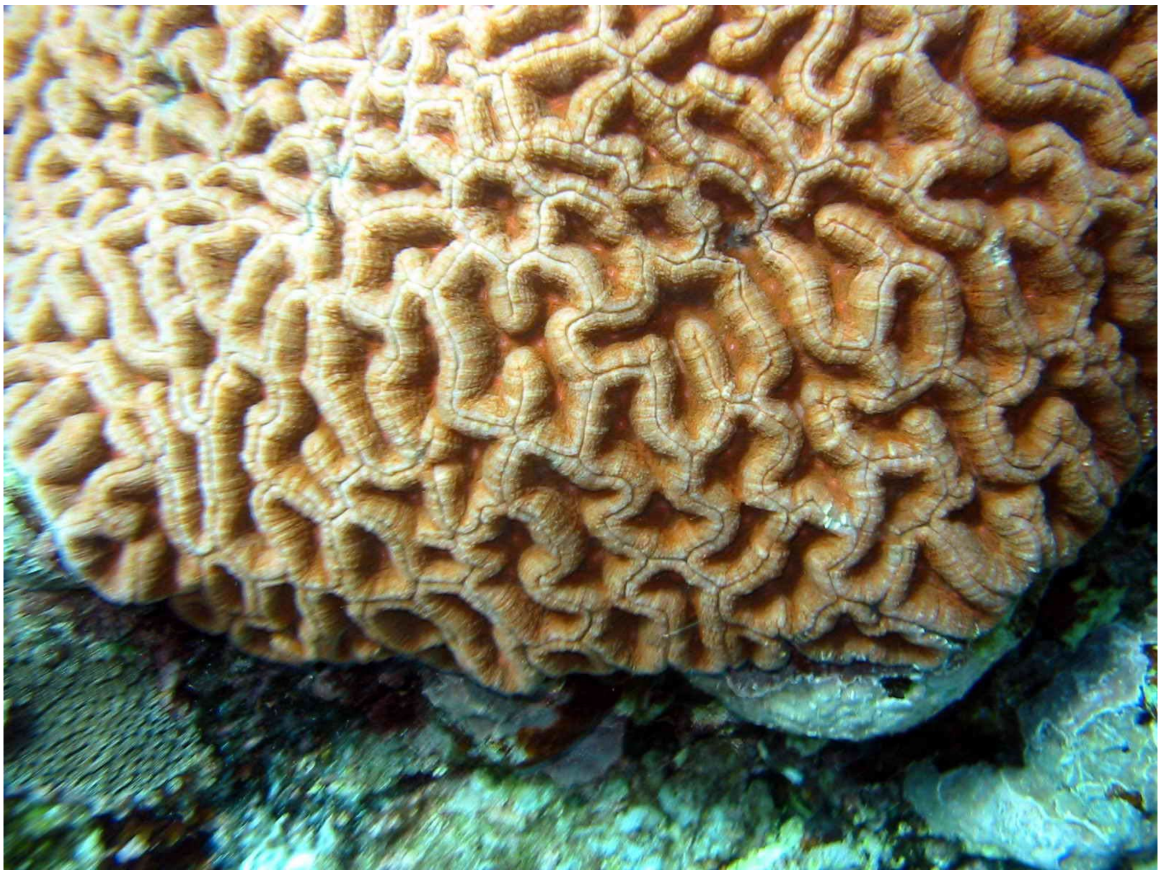


A colony of *Lobophyllia agaricia*.

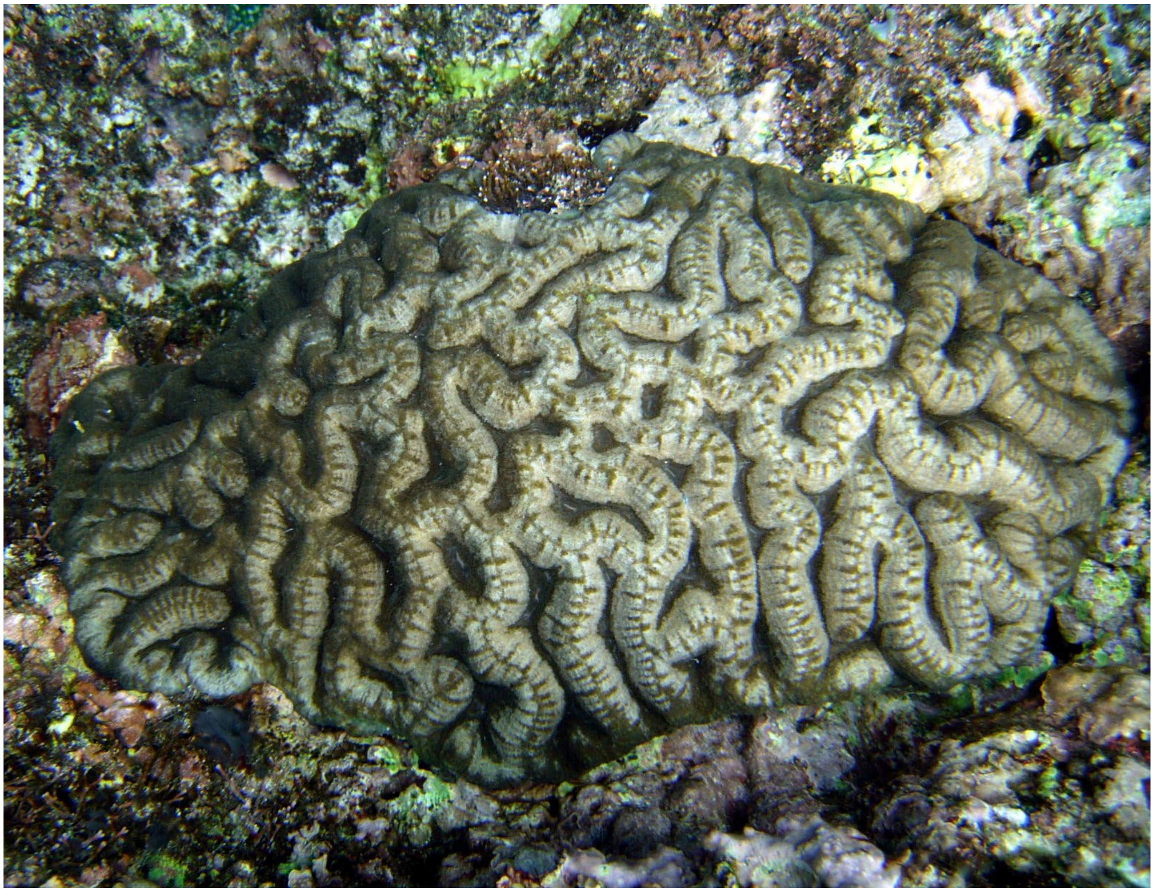
A close-up of *Lobophyllia agaricia*.

Lobophyllia radians Milne Edwards and Haime, 1849 and/or *Lobophyllia recta* (Dana, 1846)
meandroid or "brain coral"

Colonies are massive and meandroid. The three meandroid species of *Lobophyllia* here can be distinguished based on how wide the ridges are, but don't seem to be distinct based on the texture on the ridges. *Lobophyllia agaricia* has the thickest ridges, *Lobophyllia radians* medium width ridges, and *Lobophyllia recta* the thinnest. *Lobophyllia recta* still has thicker ridges than *Platygyra*. *Symphyllia* can have straighter ridges radiating towards the edges, especially on flat colonies. Without a scale in the photos, it is not possible to tell for sure which species is in a picture, but all three species appear to be in American Samoa.



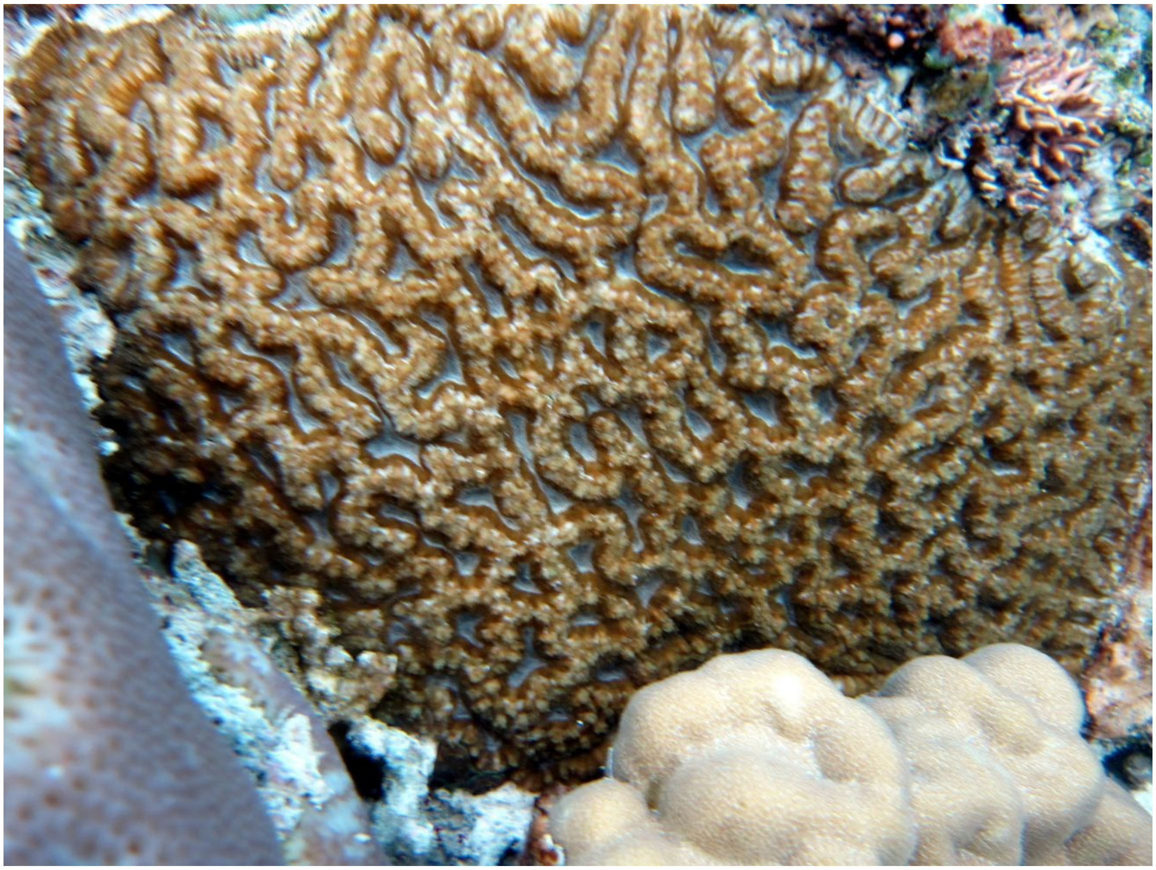
A colony that may be *Lobophyllia radians*.



A colony that may be *Lobophyllia radians*.

Lobophyllia recta (Dana, 1846) "brain coral"

Colonies are usually massive, with meandering ridges and valleys. The ridges are smaller than on *Lobophyllia radians* and *Lobophyllia agaricia*. Ridges are the width of a small finger or narrower.



A colony that may be *Lobophyllia recta*.

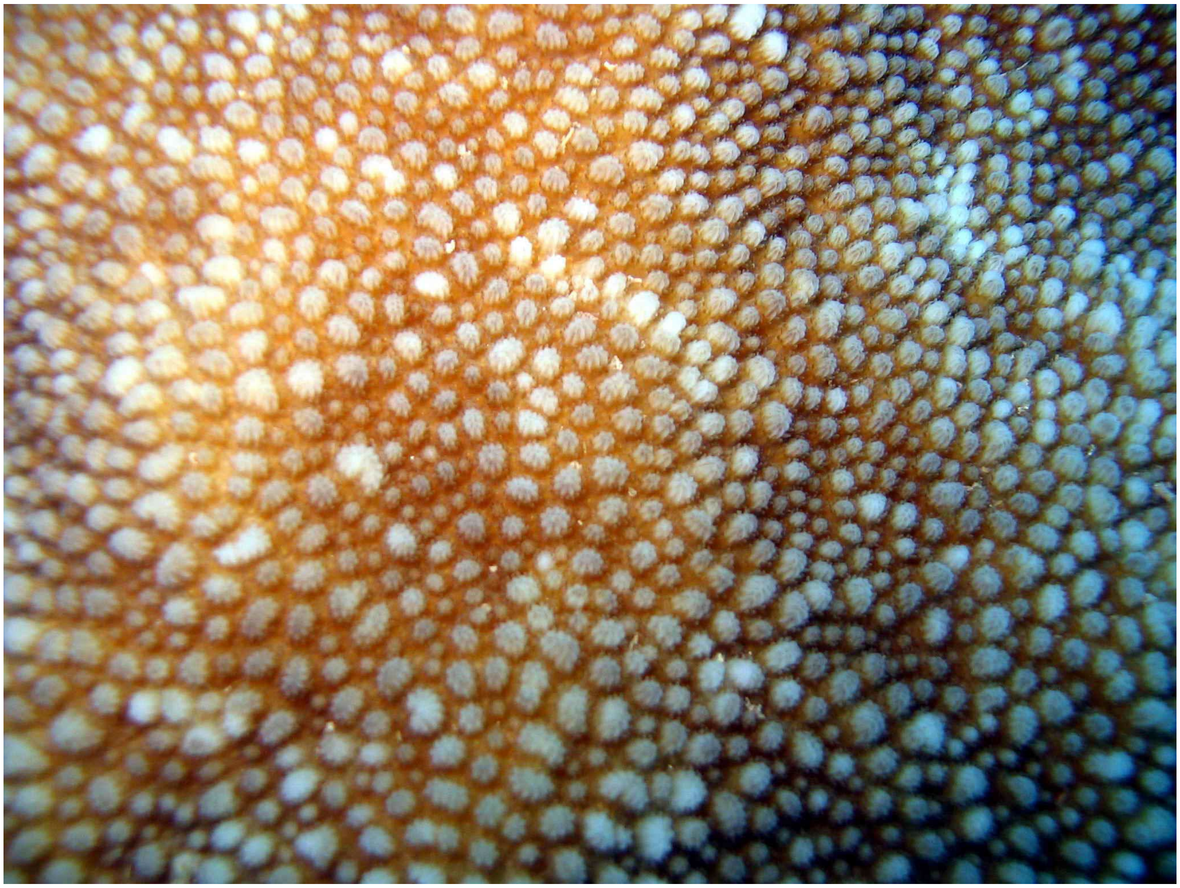
Hydnophora

Hydnophora can be massive, or have an encrusting base with branches, or be all branches. In all cases the surface is covered with fairly sharp bumps. If the bumps are tiny they are nearly round, larger bumps are usually oval or elongated into short ridges. The bumps are between corallites and have tiny ridges on their sides that are septa. The bumps are called “hydnophores” hence the name. In encrusting and branching colonies, tentacles are often extended, obscuring the bumps. The bumps are usually larger and are not rounded with corallites on them like on *Pocillopora*, and the bumps are not smooth like on *Montipora* and the tentacles if present are larger.

Hydnophora microconos (Lamarck, 1816)

This coral forms massive colonies (rarely encrusting) covered with small circular bumps that are smaller than on other *Hydnophora*. All other *Hydnophora* species have larger, oval bumps. Light tan to brown, uncommon, shallow slopes. Found so far on Tutuila, Aunu’u, Ofu-Olosega, Ta’u, and Savai’i.

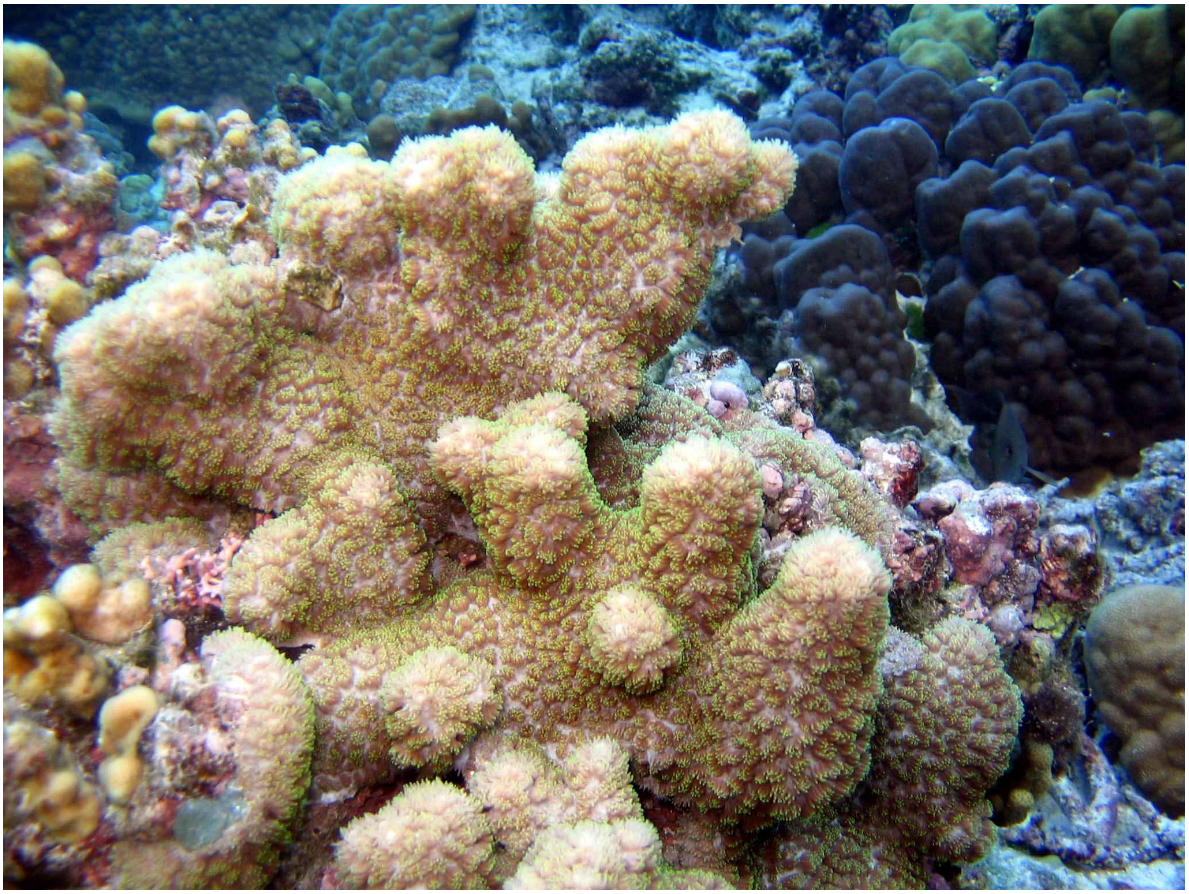
A small colony of *Hydnophora microconos*.



A close-up of the surface of a colony of *Hydnophora microconos*.

Hydnophora exesa (Pallas, 1766)

This coral forms encrusting sheets which usually have irregular upward growths on them. The surface is covered with small oval bumps which are surrounded by small tentacles. The tentacles may extend far enough to obscure the bumps. Grey or green, uncommon, reef slopes. *Hydnophora microconos* is massive and has smaller bumps. *Hydnophora laxa* is exclusively branching with thin branches. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Muliava (Rose Atoll), Upolu, Apolima, and Savai'i.

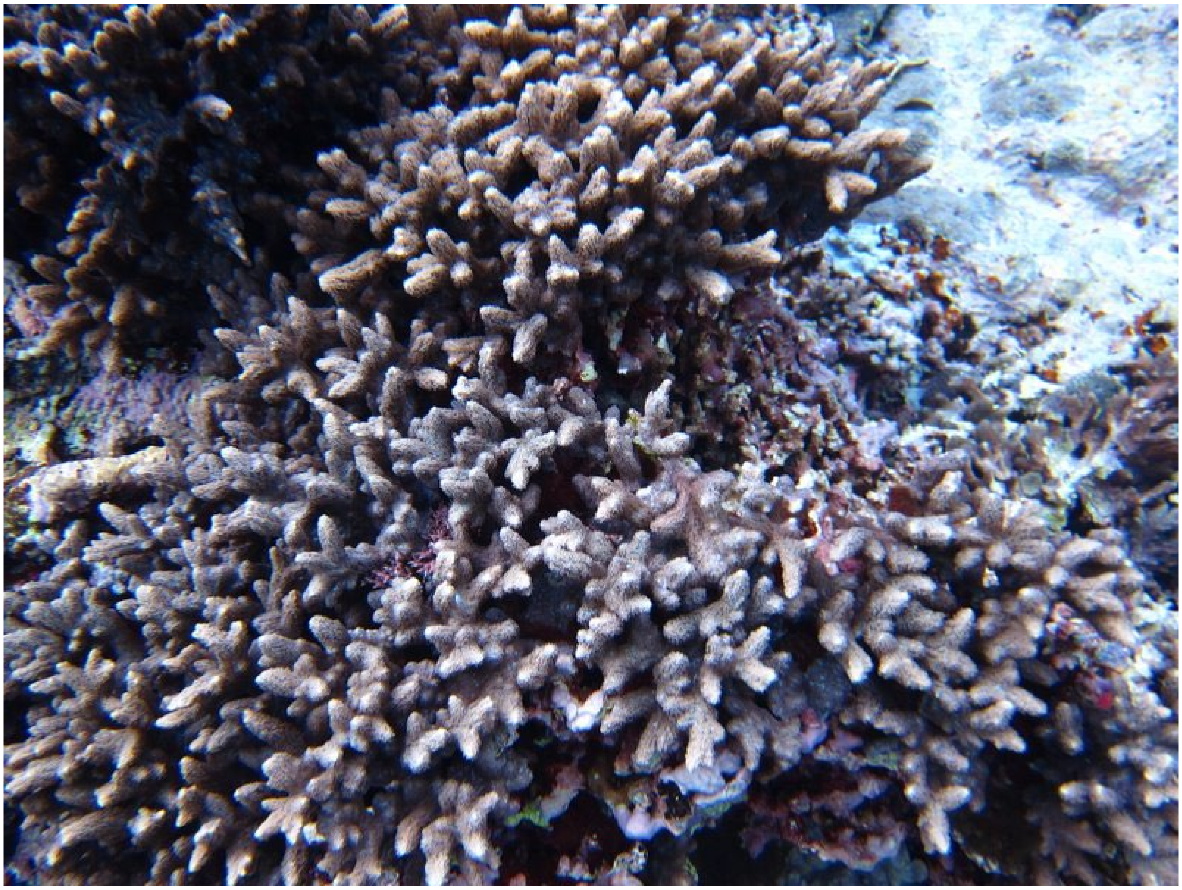


A colony of *Hydnophora exesa*.

A close-up of *Hydnophora exesa*.

Hydnophora rigida (Dana, 1846)

This coral forms masses of thin branches that sub-branch often. Branches are about the diameter of a pencil. The branches have elongated bumps or ridges on them, but the ridges are often obscured by fine tentacles. *Hydnophora exesa* is encrusting with irregular thick branches. *Hydnophora microconos* is massive with smaller, circular bumps. Grey, rare, reef slopes, present in Fagatele Bay and Larson's Bay. Found so far on Tutuila, Aunu'u, and Upolu. The type specimen of *Hydnophora rigida* has oval and circular bumps instead of elongated ridges like the *Hydnophora laxa* type specimen.



A colony of *Hydnophora rigida*.

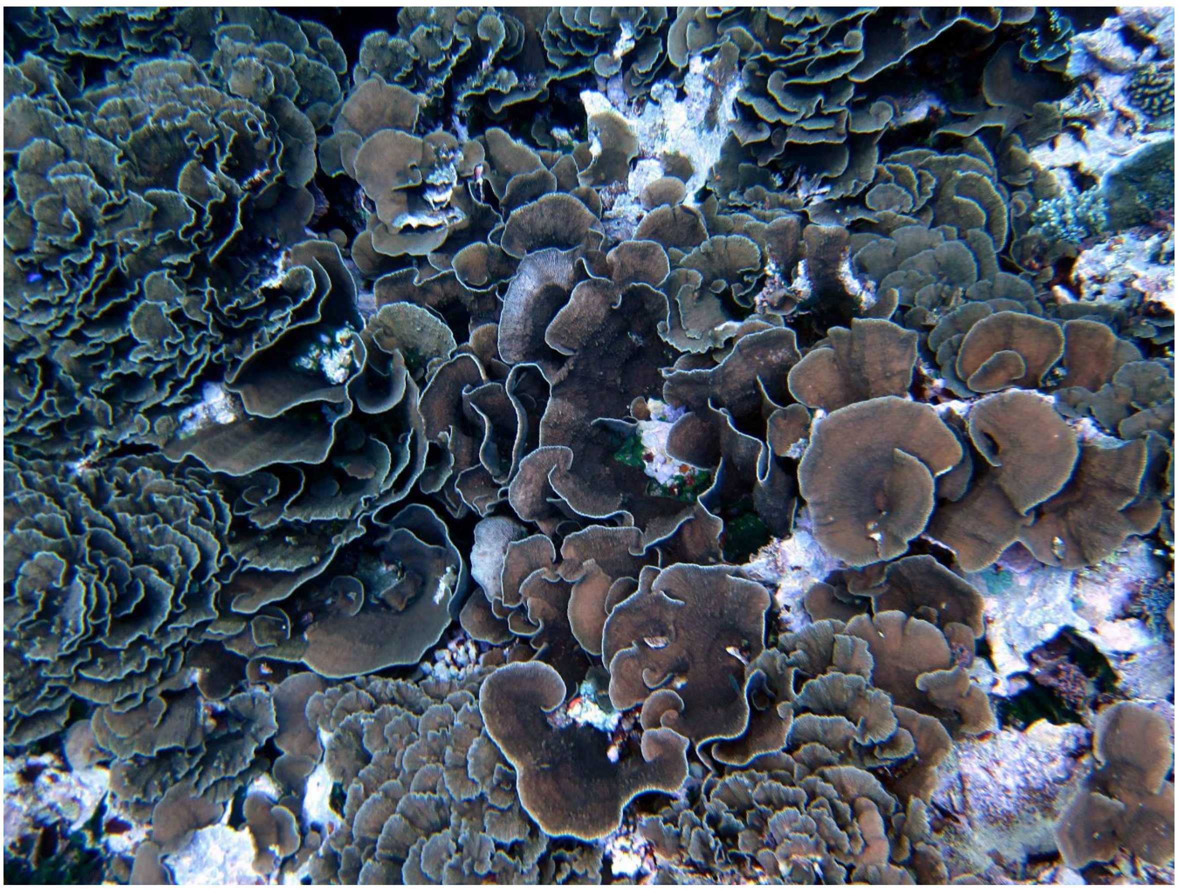
A close-up of *Hydnophora rigida*.

Merulina

Merulina forms thin plates. The plates have small, irregularly lumpy ridges on them. The ridges diverge and unite irregularly, but always run toward the edge of the plate. Often it forms thickets of plates. Sometimes colonies have bumps or columns growing on them. Usually brown but can be other colors. Uncommon. *Merulina* differs from *Scapophyllia* by usually being plates intead of having an encrusting base, and not having wide rounded bumps or columns. *Merulina* differs from *Pachyseris* in that the ridges run radially not concentrically, and the ridges are bumpy not smooth and don't have a sharp ridge. The plates have ridges instead of round corallites like *Echinopora*.

Merulina ampliata (Ellis & Solander, 1786)

This coral forms thin plates which have small rounded radiating ridges on them. The ridges are rough with small ridges (septa) running sideways on them. Brown, uncommon, reef slopes. *Merulina speciosa* has smaller ridges. *Scapophyllia cylindrica* forms thick bumps or cylindrical columns. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Muliava (Rose Atoll), Upolu, and Savai'i.



Merulina ampliata can form large fields of plates growing up at a 45-degree angle.

This colony of *Merulina ampliata* is mostly encrusting and has small columns or knobs on it.

Merulina ampliata plates showing the radiating ridges.

A close-up of the ridges on a *Merulina ampliata* plate.

Scapophyllia

Scapophyllia forms encrusting bases which may have thick oval bumps or columns on them, on reef slopes. Here they don't form columns and only sometimes form bumps. The surface has small irregularly lumpy ridges on them much like *Merulina* but instead of radiating on the plate they anastamose. Usually light yellow or brown or cream. There is only one species. Rare. Encrusting not plates like in *Merulina*, and light colors instead of dark brown.

Scapophyllia cylindrica Milne Edwards & Haime, 1848

This coral forms encrusting colonies which may have some knobby growths on it. The surface is covered with ragged ridges which anastamose and fuse so they surround small groups of corallites. Knobs are more common other places and can grow into columns. Grey or brown, uncommon to rare, reef slopes. *Merulina ampliata* has parallel radiating ridges on plates. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Muliava (Rose Atoll), and Upolu.

A colony of *Scapophyllia cylindrica*.

A close-up of *Scapophyllia cylindrica*.

Caulastrea

Caulastrea forms colonies of branches, with a corallite on the end of each branch. Corallites are about a quarter inch (6 mm) to a half inch (12 mm) diameter. If branch ends are very close together it is submassive and may look a little like a miniature *Lobophyllia*. But in other colonies the branches are well enough separated you can see the branches. Brown or green, rare most places except in Fagatele Bay where it is uncommon at medium depths.

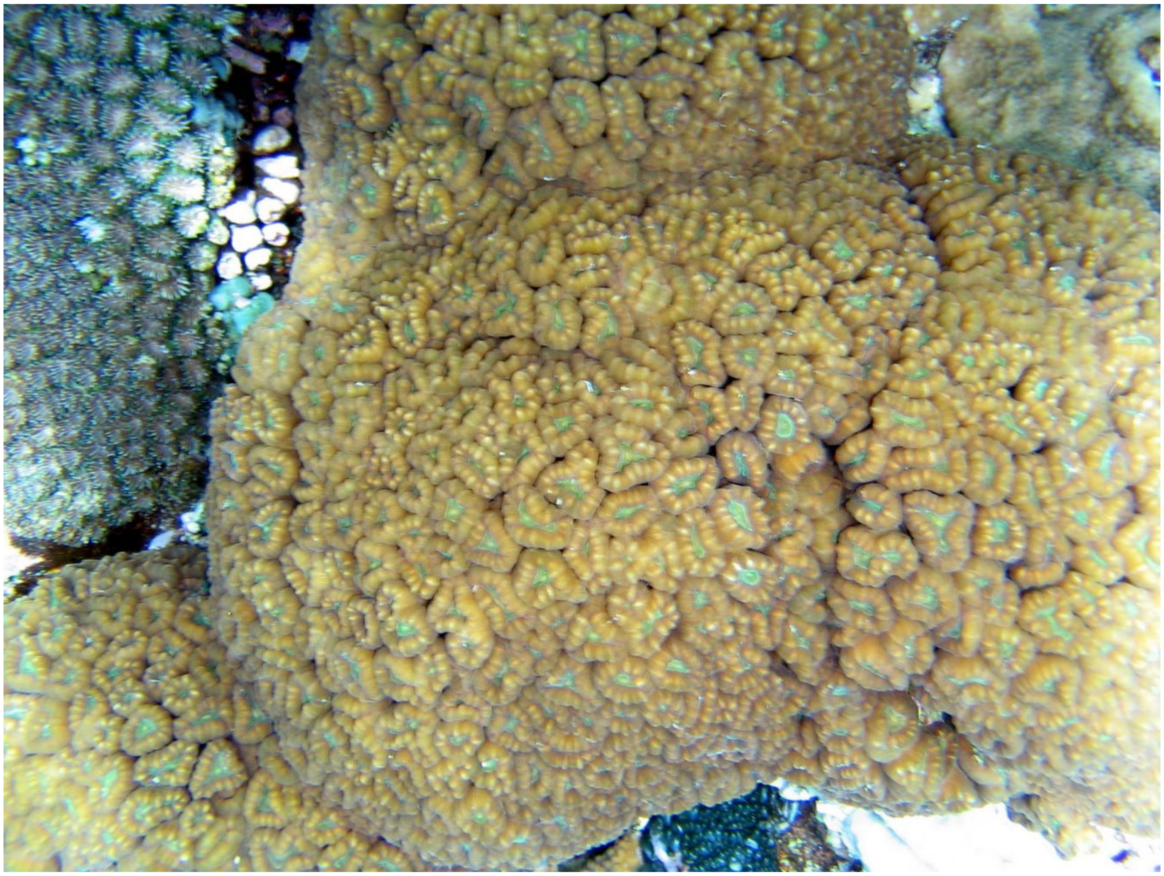
Caulastrea furcata

Colonies are branching, with polyps in corallites only on the ends of branches. Corallites are about 1-1.5 cm (1/2 in) wide. The branches diverge enough that the corallites are far enough apart the branches can be seen. Corallites are farther apart than on *Caulastrea echinulata*. Rare. Found only in Fagatele Bay on Tutuila so far.

A whole colony of *Caulastrea furcata.*

Caulastrea echinulata (Milne Edwards & Haime, 1849) "submassive" Vulnerable

This coral forms clumps of branches tightly squeezed together with a corallite at the end of each branch. Corallites are about 1-1.5 cm (3/8-1/2 in) diameter, round or pinched, with a rounded rim that has septal ridges radiating. Brown, may have green polyp centers, uncommon, reef slopes. Corallites are closer together than on *Caulastrea furcata*. This species qualifies as "submassive" like most *Lobophyllia* species, though the corallites are smaller. See taxonomic note. Found so far on Tutuila.



A colony of *Caulastrea echinulata*.

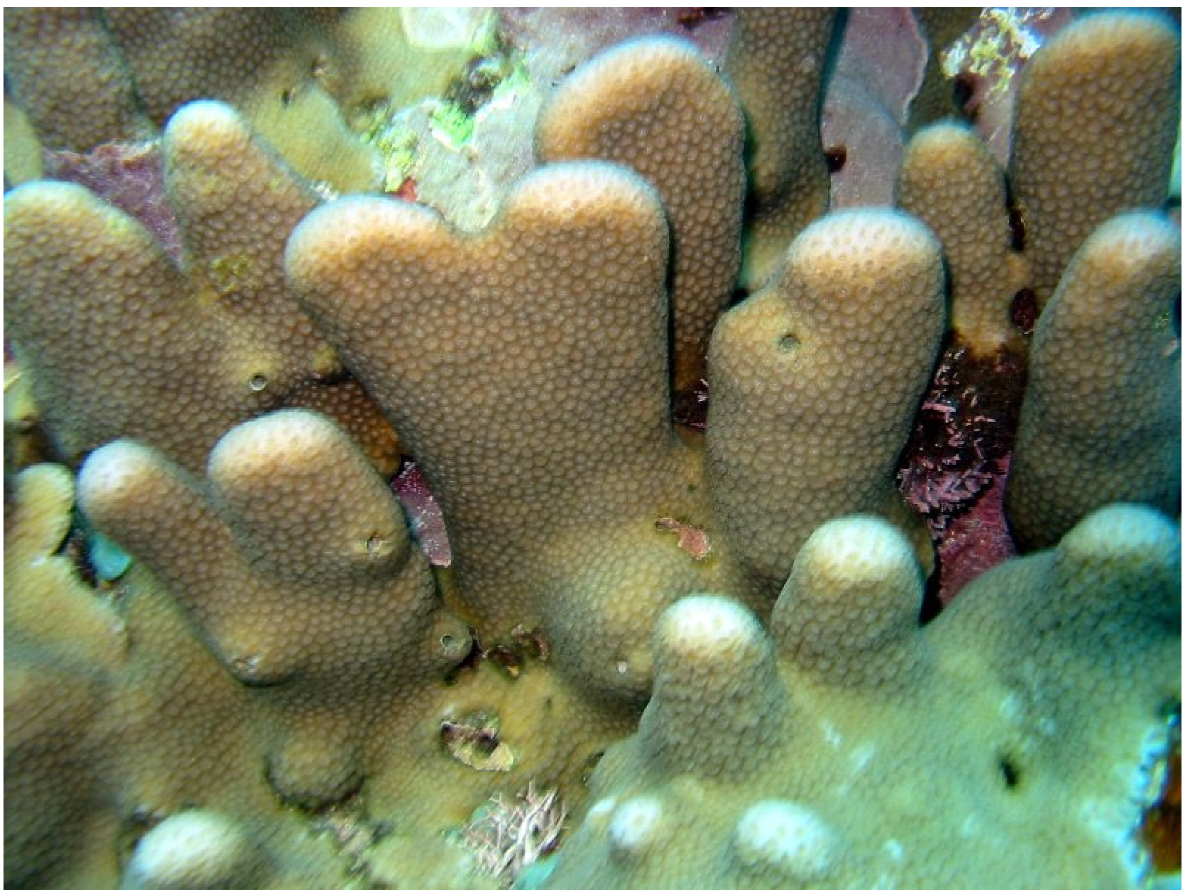
A close up of *Caulastrea echinulata*.

Dipsastrea This used to be in *Favia.*

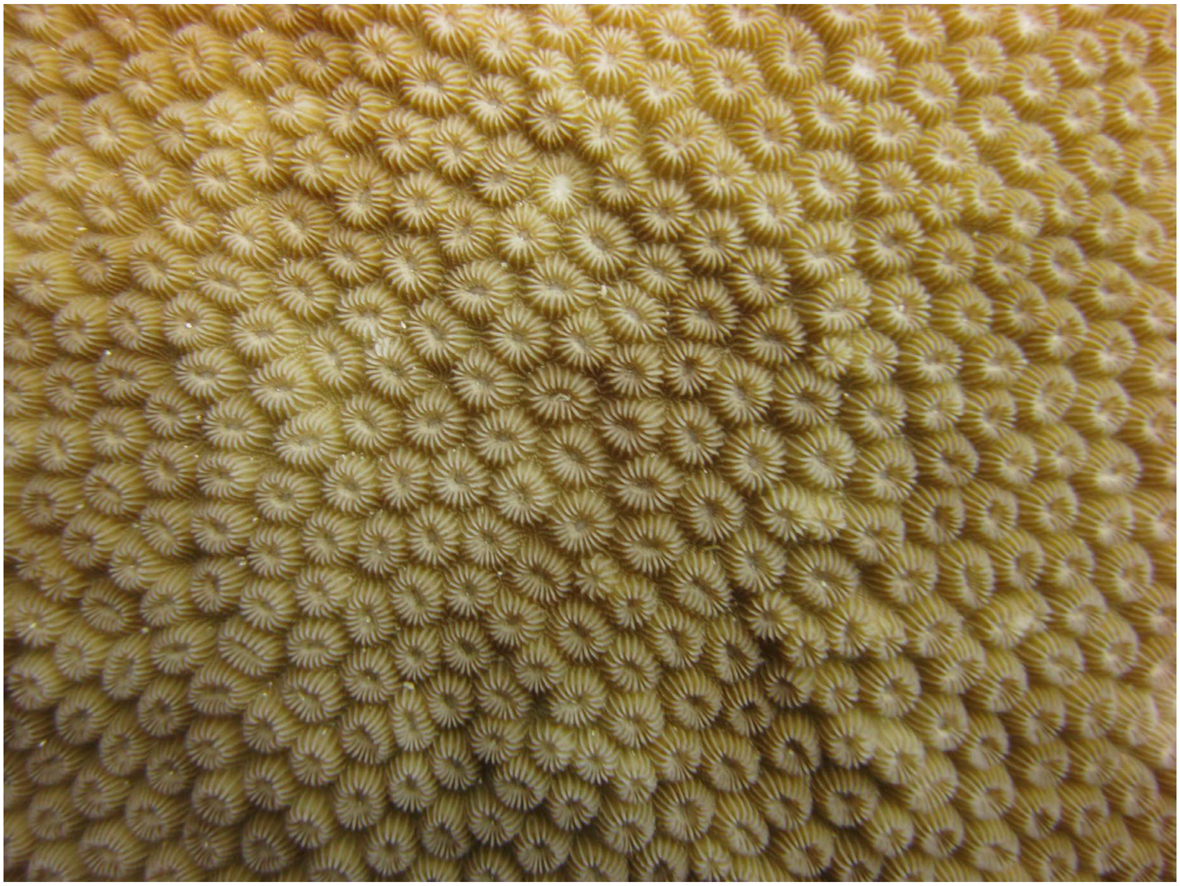
Dipsastrea usually forms massive colonies which have corallites about a quarter to half inch (12 mm) in diameter, though it can also be encrusting. There is a groove that separates corallites. Corallites often have a ring of short spines on their upper edge that are the ends of septa. Corallites are not always perfect circles. Yellows, browns, greens, may be mottled. Usually uncommon. Corallites are always separated by a groove or space, unlike on *Favites* where they are united by a common ridge. Common *Astrea* here have corallites that are projecting cylinders more than on *Dipsastrea.*

Goniastrea stelligera (Dana, 1846) This used to be in *Favia*.

This coral forms clusters of stout columns, some of which may be oval, about 5-10 cm (2-4 in) diameter. Corallites are small (about 3 mm diameter) and volcano-shaped or flat. Reddish-brown, common, reef slopes. Colonies are columnar unlike *Dipsastrea* or *Plesiastrea versipora*. Dipsastrea have larger corallites. *Plesiastrea* often has polyps and tentacles extended which *Goniastrea stelligera* does not do. This species is placed here because it looks much more like *Dipsastrea* than *Goniastrea.* Found so far on all islands, but not on South Bank.



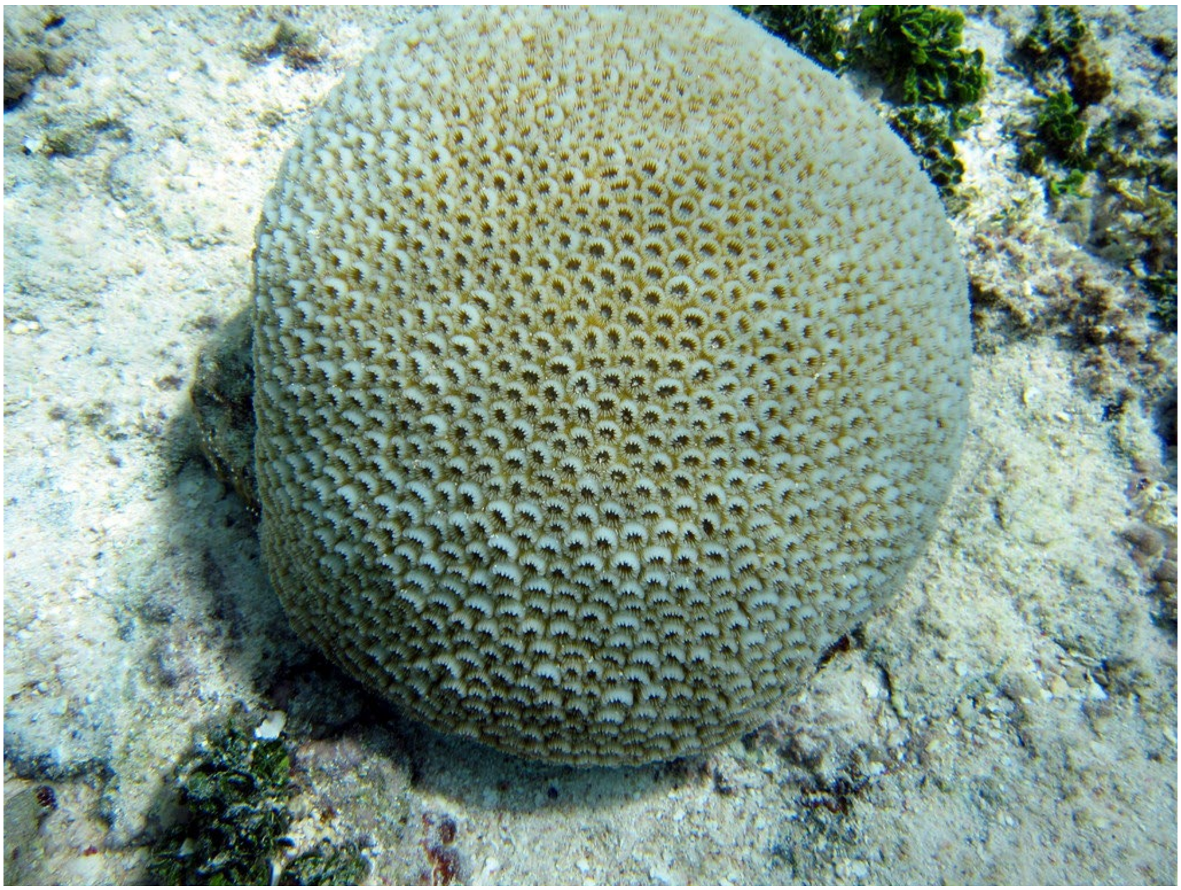
A colony of *Goniastrea stelligera*



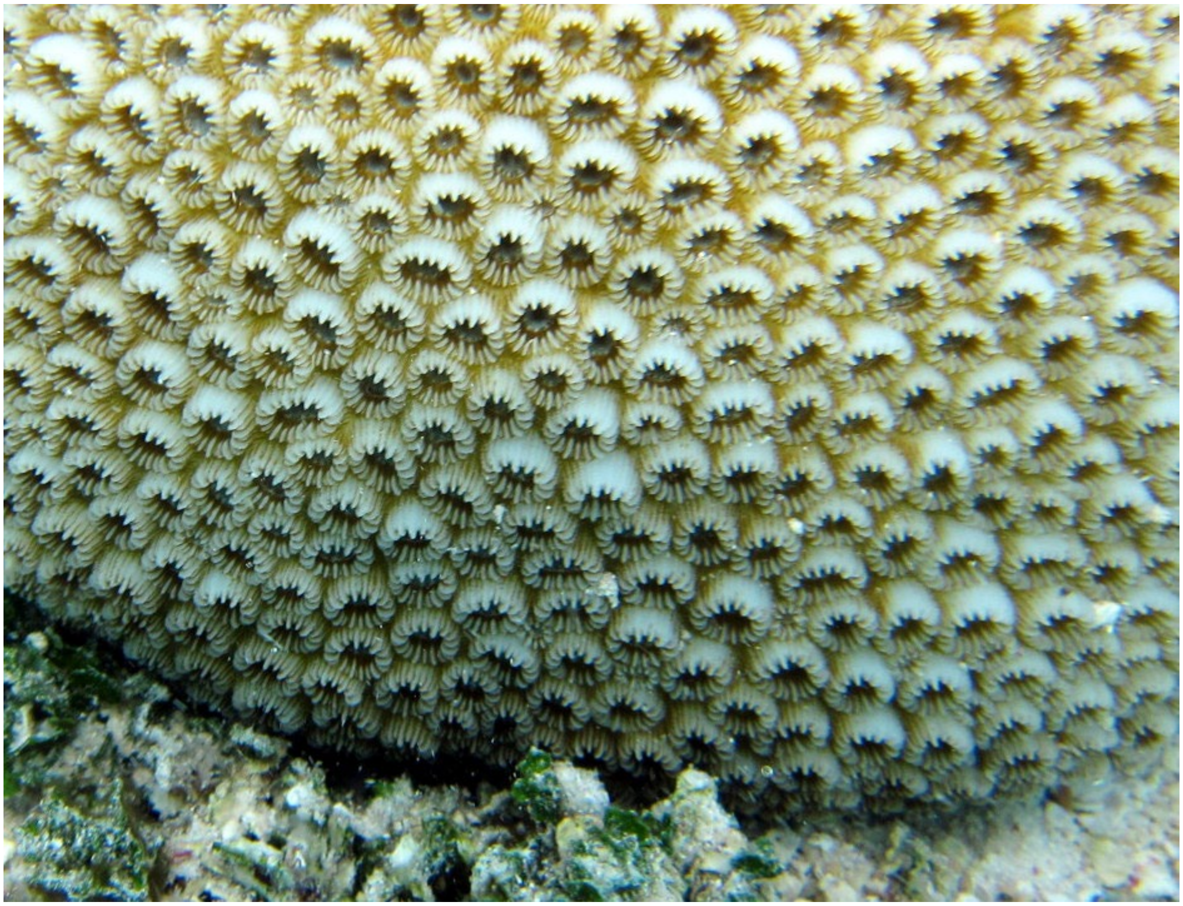
A close-up of the surface of a colony of *Goniastrea stelligera*.

Dipsastrea truncata Veron, 2000 This used to be in *Favia*.

This coral forms small massive colonies with circular, projecting corallites. On the sides of the colonies, most corallites are inclined downward. The corallites are larger than on *Favia stelligera*. The corallites look much like those on *Astrea curta*, but they are inclined on the side of the colony unlike on *A. curta*, and the centeral depression (fossa) may be larger than on *A. curta*. Rare. Found on Ofu-Olosega. Veron (2000) originally spelled this species *Favia truncatus*, but the rules in the International Code of Zoological Nomenclature require the gender of species and genus names must match, so it must be *Favia truncata* (International Commision on Zoological Nomenclature, 2011).



A colony of *Dipsastrea truncata*. Note the inclined corallites on the lower side.



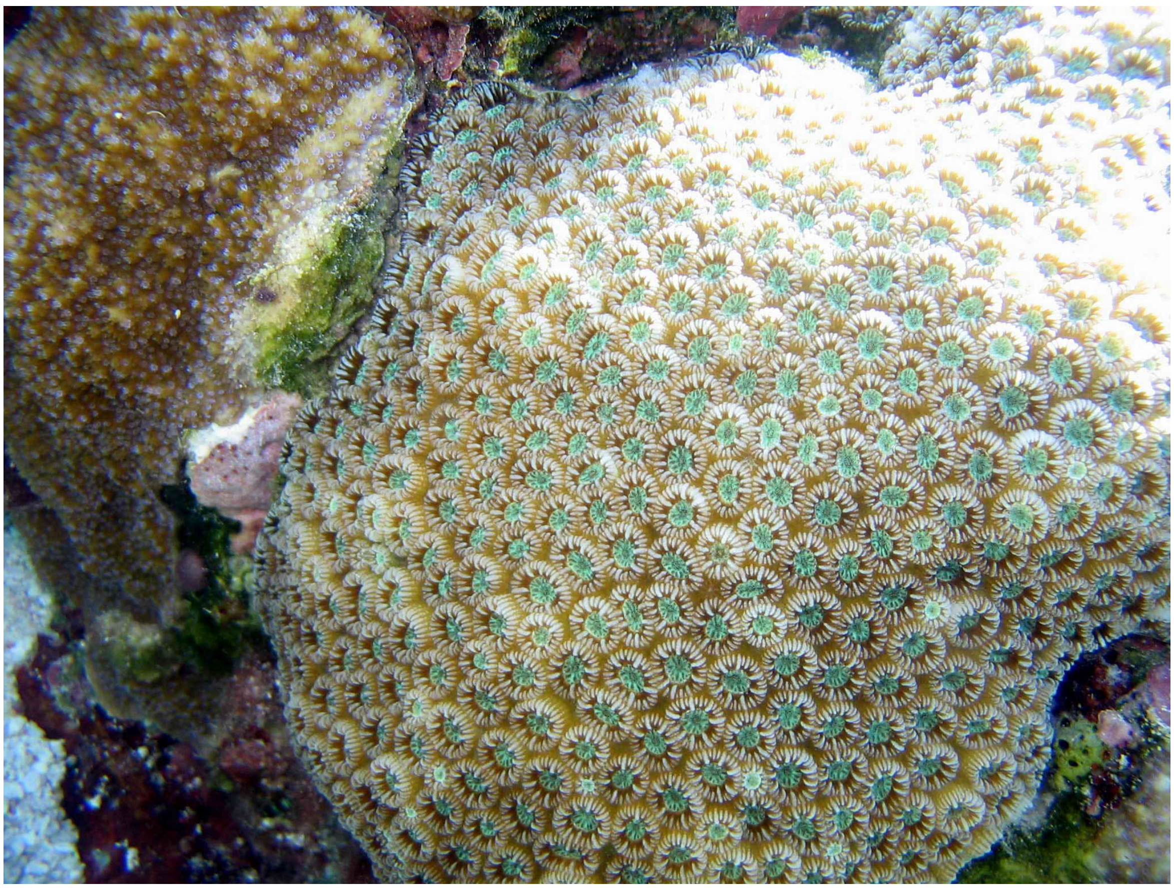
A close-up of the lower side of *Dipsastrea truncata*.

Astrea (previously referred to as *Montastraea*)

Astrea forms massive or encrusting colonies that have corallites about a quarter inch (6 mm) or a bit less in diameter. Corallites are circular, projecting cylinders, and quite uniform, and have a groove between corallites separating them. Massive colonies are usually cream, encrusting colonies usually brown. Uncommon to common. Corallites are more projecting than on most *Favia*.

Astrea annuligera Milne Edwards & Haime, 1849

This coral forms small encrusting sheets or rarely massive colonies. The corallites are circular about 5 mm in diameter, and have a narrow groove between them and adjacent corallites. A few septa are larger than the rest, and may be white. Brown, green or less often cream, uncommon, reef slopes, crest. *Astrea curta* is massive, cream colored and has more uniform septa. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, and Muliava (Rose Atoll).

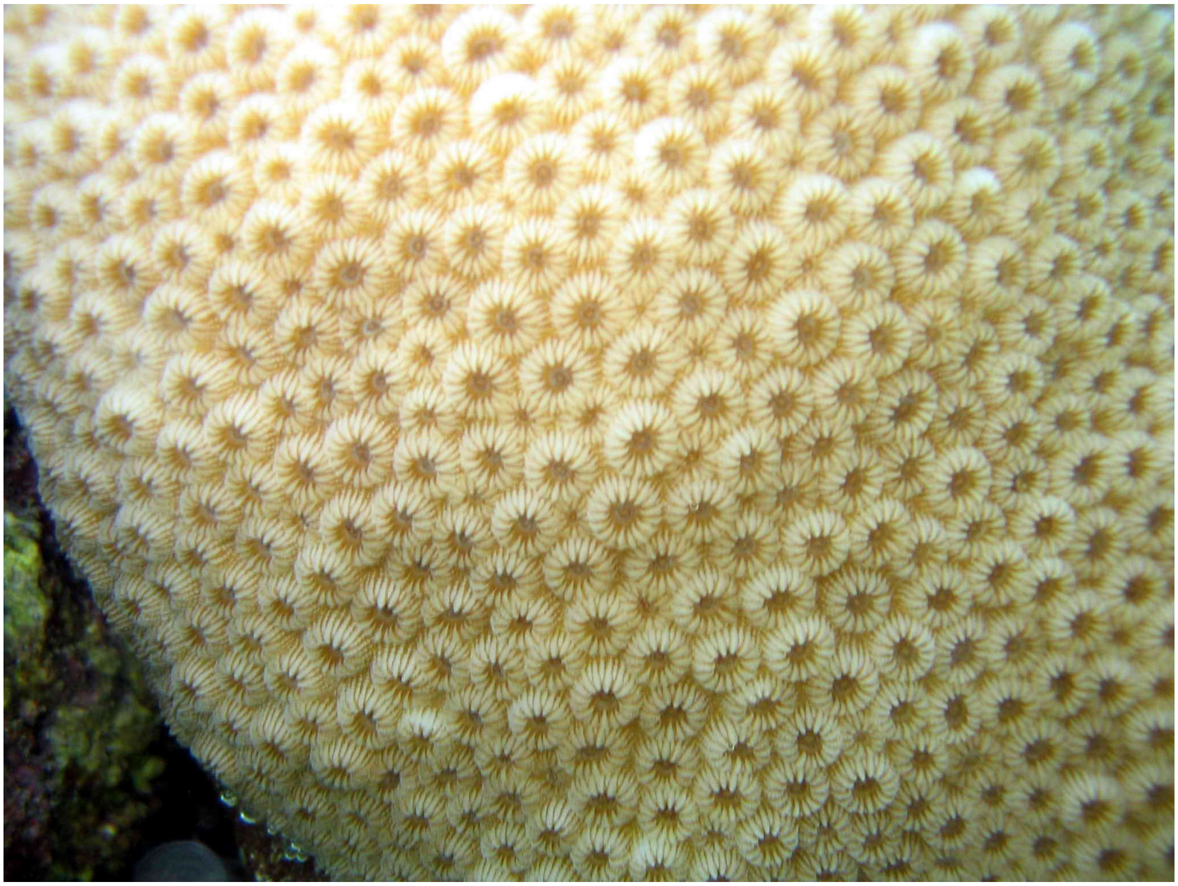


A close-up of a colony of *Astrea annuligera*.

Astrea curta Dana, 1846 (previously referred to as *Montastraea curta*)

This coral forms small massive colonies. The corallites are circular, about 5 mm in diameter, and have a narrow groove between them and the next corallites. All septa are the same size and none are a different color. Cream, common, reef slopes. *Astrea annuligera* is encrusting, colored and has a few septa that are larger than others. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Muliava, Upolu, Apolima, and Savai'i.

A colony of *Astrea curta*.



A close-up of an *Astrea curta* colony.

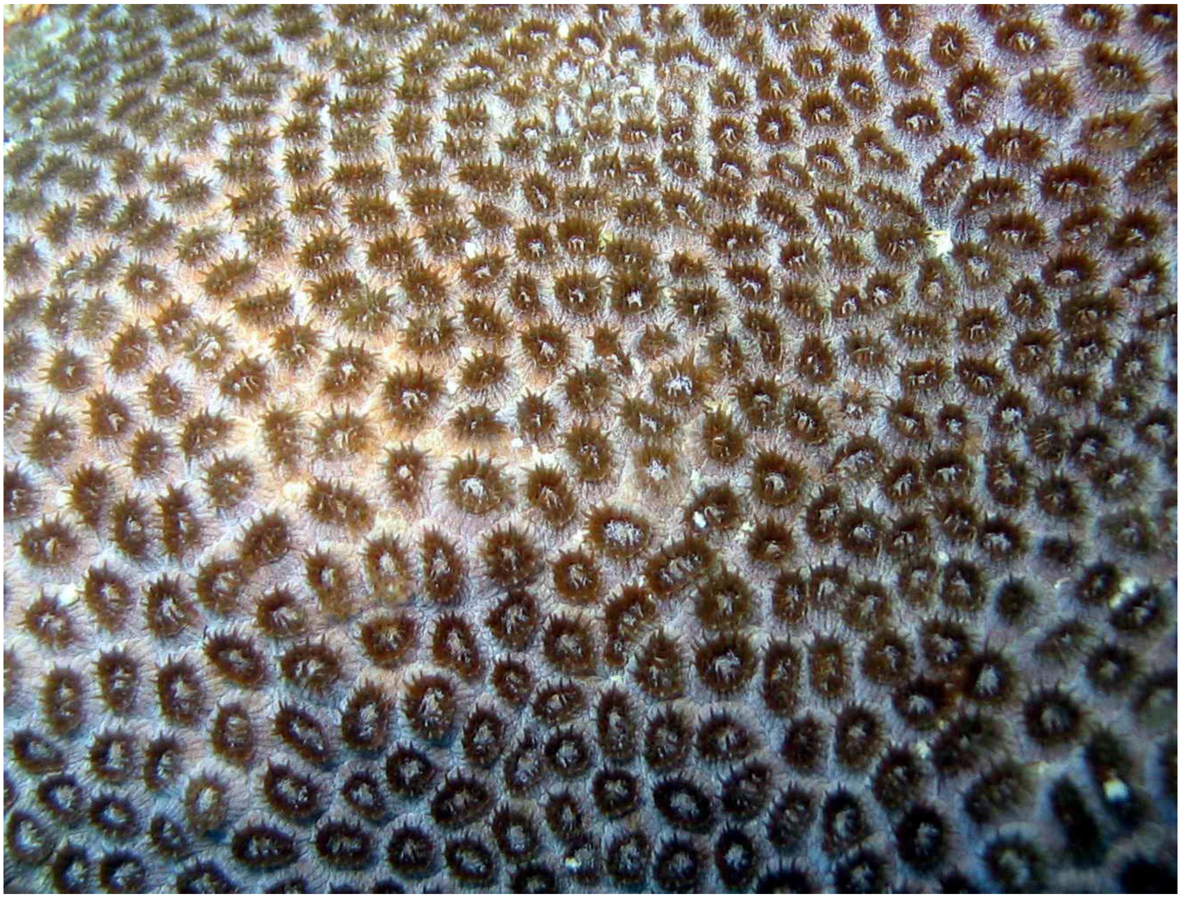
Plesiastrea

Plesiastrea forms encrusting colonies that have small circular corallites. Often tentacles are extended in a ring around each corallite. Corallites are about 3 mm diameter, similar to *Favia stelligera*. There is only one species in the Samoan archipelago. Greens or browns, rare. Smaller corallites than *Echinopora*, but larger than *Cyphastrea*, and tentacles are usually extended unlike other genera.

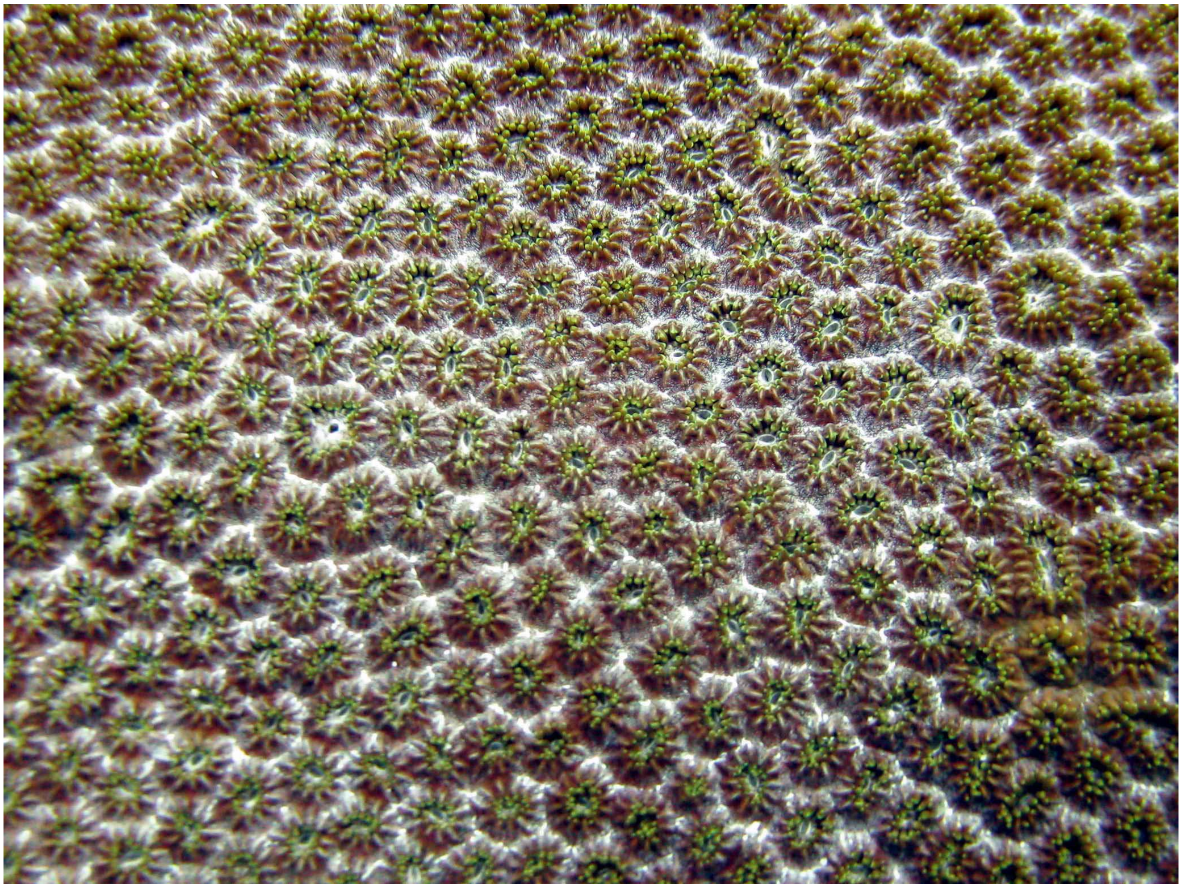
Plesiastrea versipora (Lamarck, 1816)

This coral forms encrusting sheets or mounds. The corallites are small and circular, about 3-4 mm in diameter. Usually, polyps are extended as a ring of tissue and tentacles, obscuring the corallites. When the polyp is contracted, the corallite is a low cone or flat. Grey with dark brown tentacles, or green, uncommon, reef slopes. *Favia stelligera* forms columnar colonies has does not extend fleshy polyps. Found so far on Tutuila, Ta'u, Muliava, South Bank, Upolu, Apolima, and Savai'i.

A colony of *Plesiastrea versipora*.



A close-up of *Plesiastrea versipora* with the polyps extended, they way they are most often.



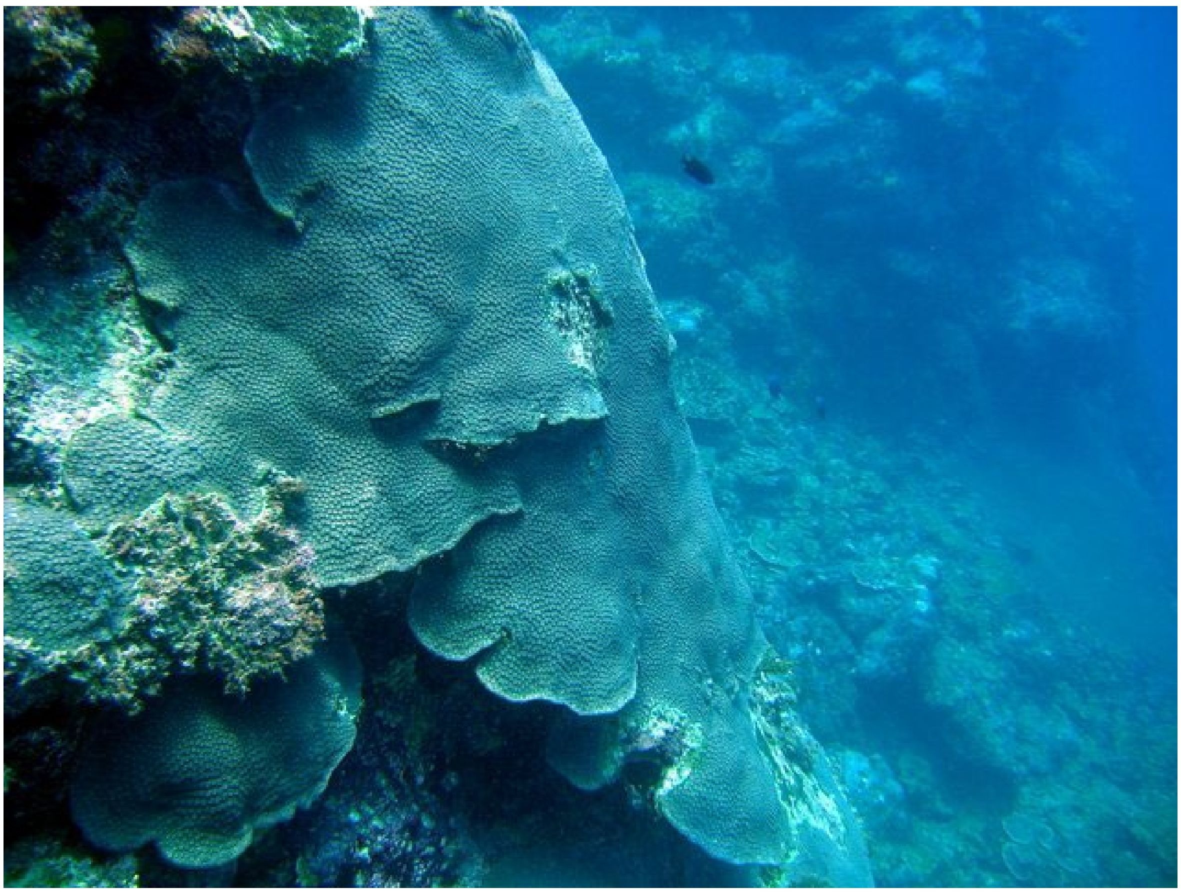
This is a close-up of how *Plesiastrea versipora* looks with the polyps retracted.

Diploastrea

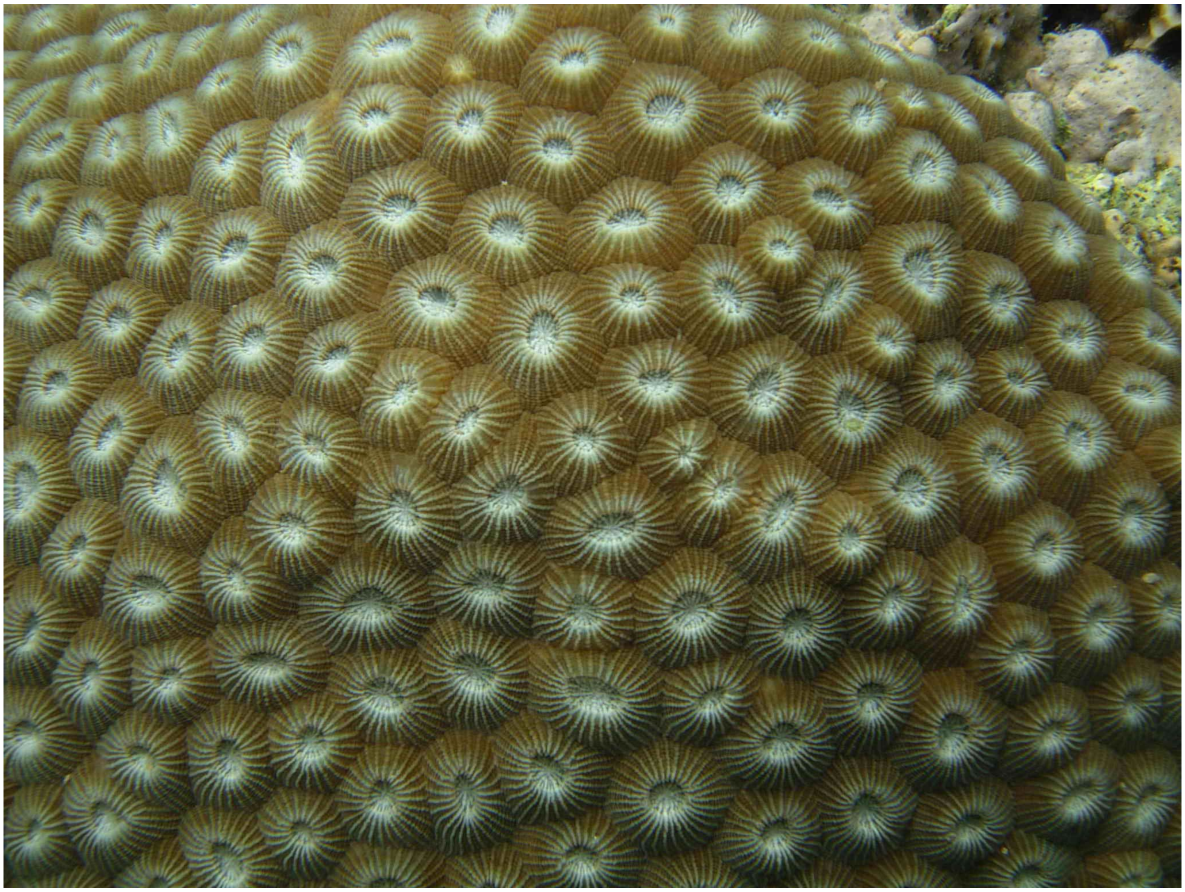
Diploastrea forms large encrusting colonies on steep slopes here. Rarely it can be massive here, and usually other places it is massive. Corallites are easily visible as small volcano-like mounds about a quarter inch (6 mm) diameter. The sides of the corallites have little radiating ridges, which are the costae. There is only one species. Usually a dull green-grey color. Uncommon most places but fairly common others. No other coral is quite like this one.

Diploastrea heliopora (Lamarck, 1816)

This coral forms huge encrusting sheets on steep slopes, with thick overhanging lower edges. The corallites are about 1 cm (1/2 in) in diameter, and resemble volcanoes, with costae (ridges) running down their side. Dull green, sometimes grey with light centers, uncommon to common, reef slopes. Corallites on *Favia* and *Astrea* do not make cones with sloping sides. Found so far on Tutuila, Ofu-Olosega, Ta'u, Upolu, Apolima, and Savai'i.



A large colony of *Diploastrea heliopora* on a steep slope.



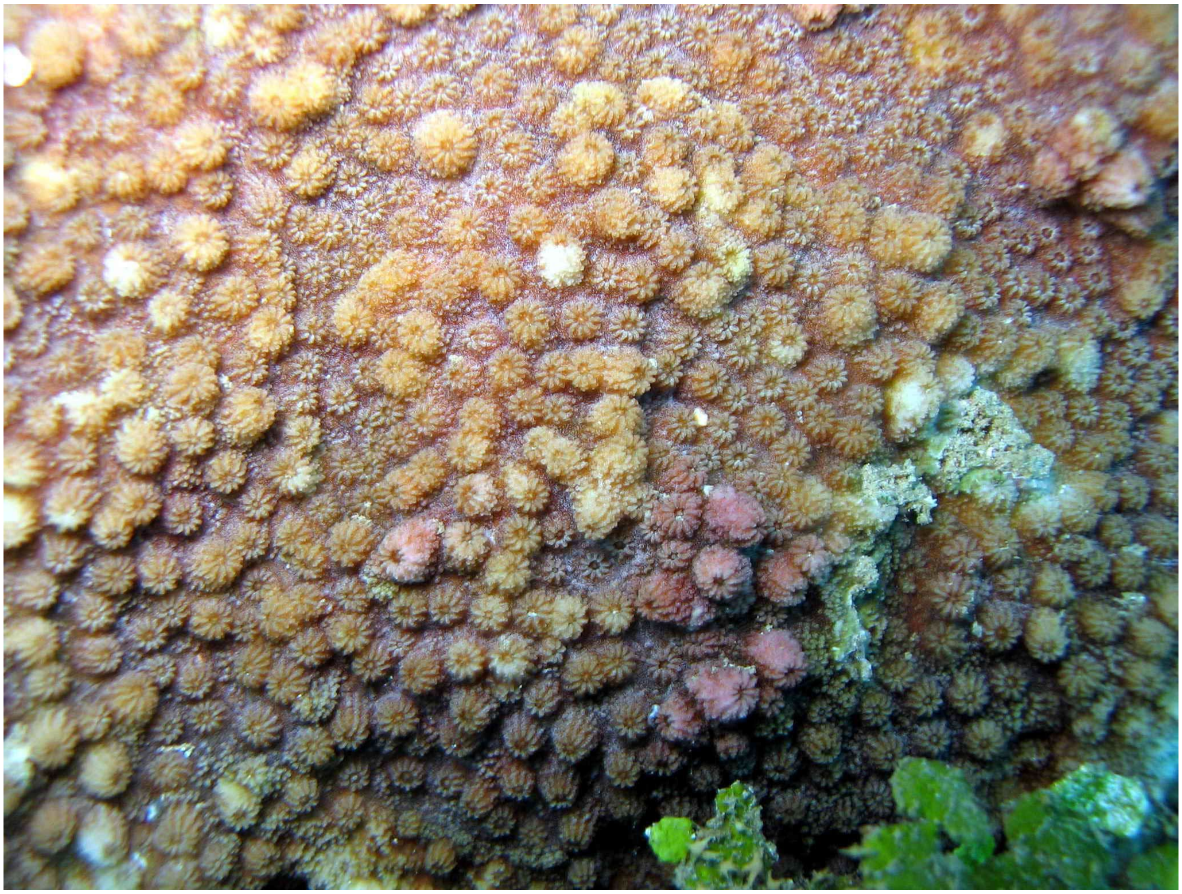
A close-up of *Diploastrea heliopora*.

Cyphastrea

Cyphastrea sp.

Colonies are usually encrusting here, and have small corallites that are only 2-3 mm diameter. The corallites project and are round, with a groove between them. Brown, uncommon. Corallites are smaller than on *Echinopora* and *Plesiastrea*, and tentacles are not extended. The features needed to distinguish features are microscopic and hard to distinguish even in close-up photos. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Muliava (Rose Atoll), Upolu, Apolima, and Savai'i.

A colony of *Cyphastrea* sp.



A close-up of *Cyphastrea* sp. The corallites have 12 costae, which are hard to count in a photo, let alone underwater. Several species have 12 costae.

Echinopora

Echinopora can be thin plates or encrusting. Corallites are small, around an eighth inch (3 mm) in diameter. Corallites are always circular, slightly raised as bumps, and have some flat space between them or at least a groove. Encrusting colonies are covered with small spines and may have some lumpy, irregular, small columns. Thin plates are usually grey and encrusting colonies brown. Thin plates can form large masses of horizontal plates up to at least 20 feet (6 m) across. Usually uncommon. Spinier and corallites may be more widely spaced and not project as far as on *Astrea*. Corallites larger than on *Plesiastrea* and *Cyphastrea*. and tentacles not extended like on *Plesiastrea.*

Echinopora lamellosa Esper, 1795

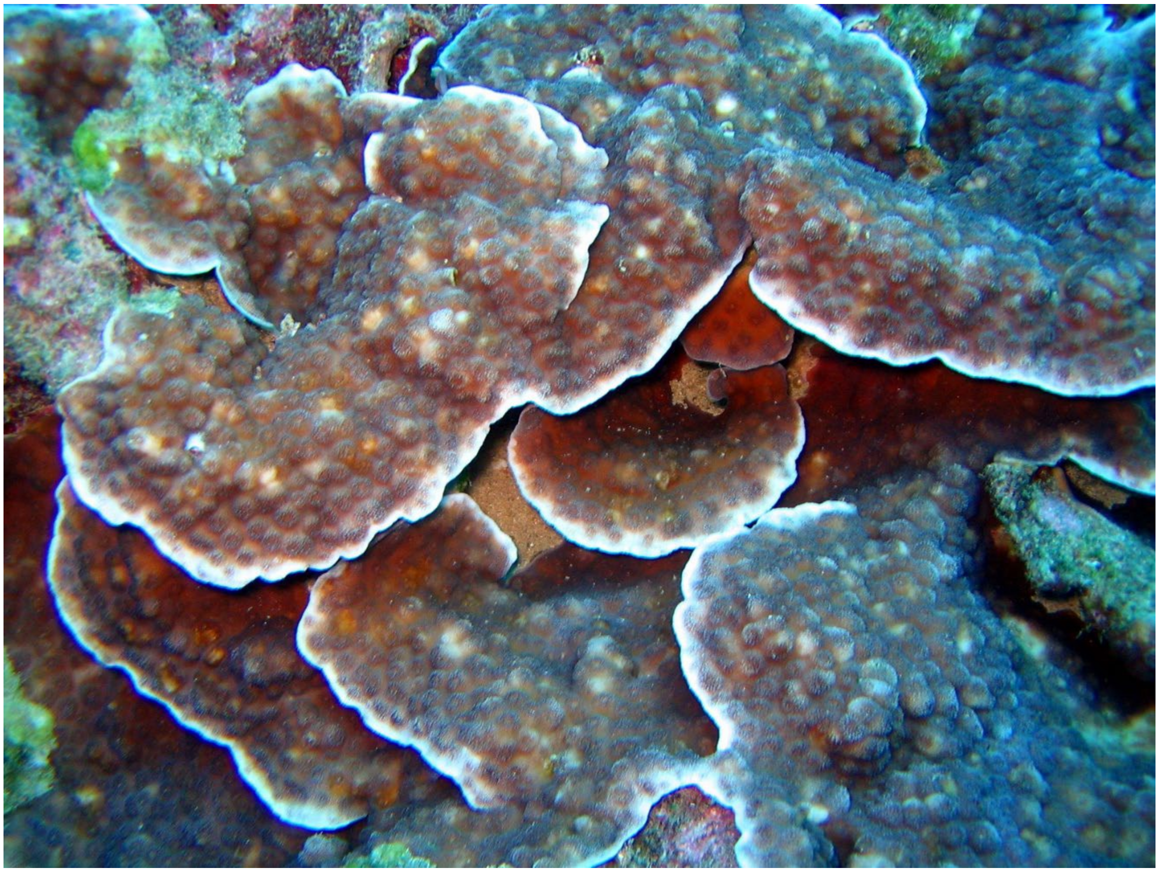
This coral forms thin, nearly flat plates which can make very large accumulations of plates. Corallites are small mounds of tiny spines. Uniform grey, uncommon, reef slopes. *Echinopora hirsuitisima* is encrusting and usually has knobby branches. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Muliava (Rose Atoll), and Upolu.

A cluster of *Echinopora lamellosa* plates.

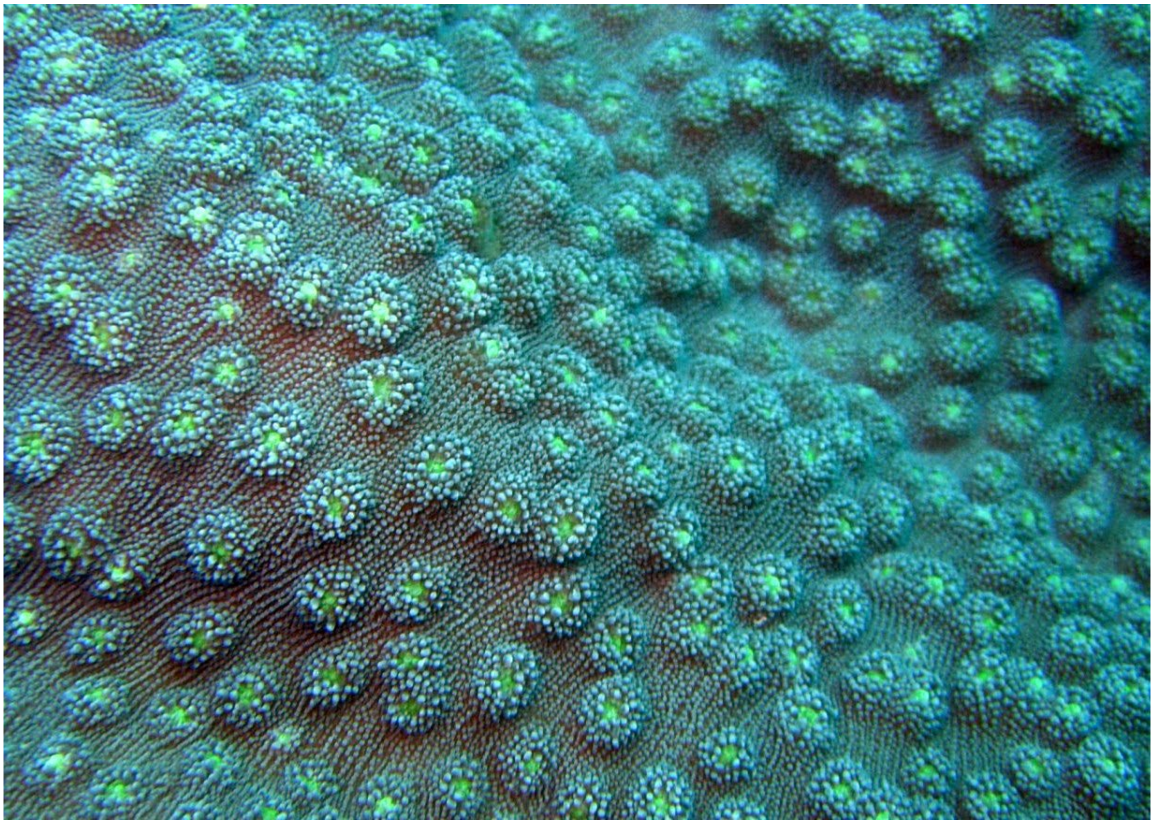
A close-up of *Echinopora lamellosa*.

Echinopora gemmacea (Lamarck, 1816)

Colonies form thin plates which are often near the substrate but do not have to be. Corallites may be the same size of corallites on *Echinopora lamellosa* or larger. Spines are visible and larger than on *Echinopora lamellosa*. Large colonies like *Echinopora lamellosa* have not been seen in American Samoa. Green or brown.



Echinopora gemmacea colonies.

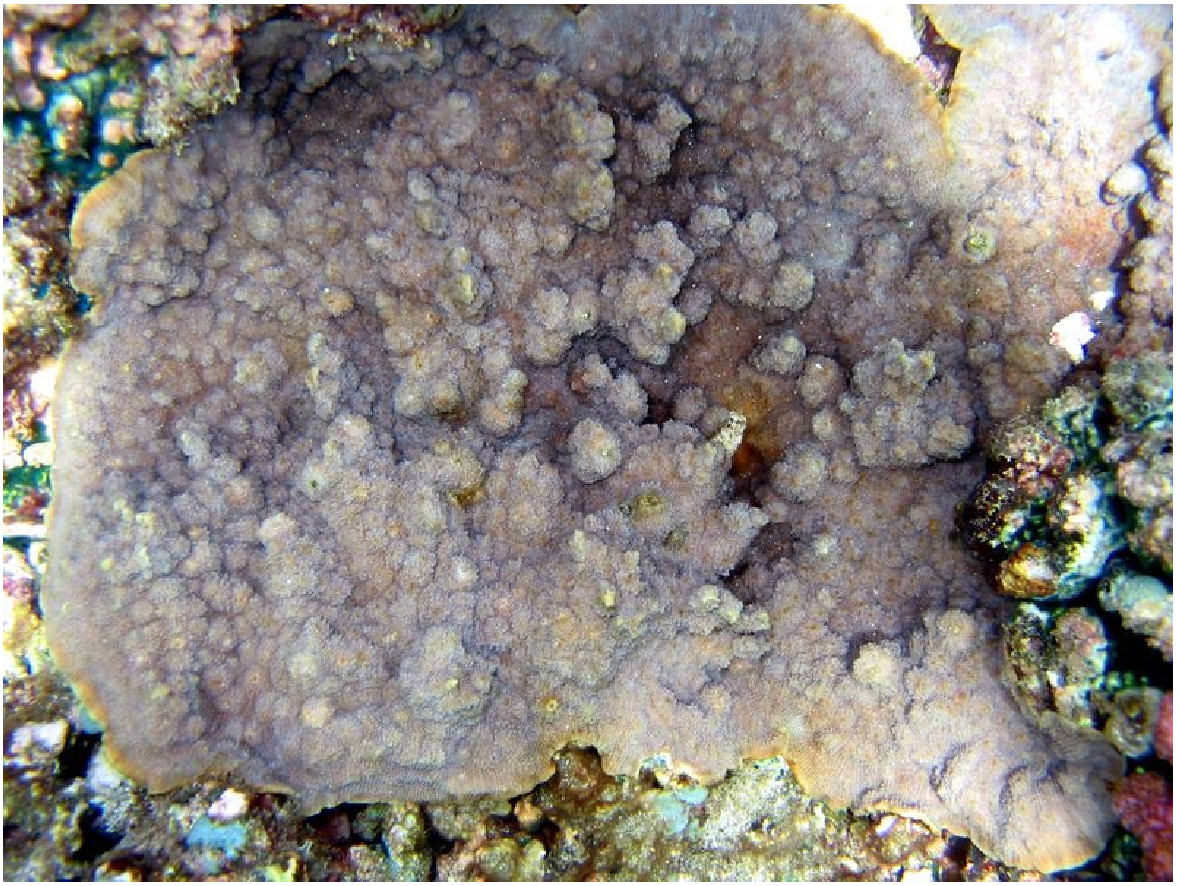


A close-up photo of a green colony of *Echinopora gemmacea*.

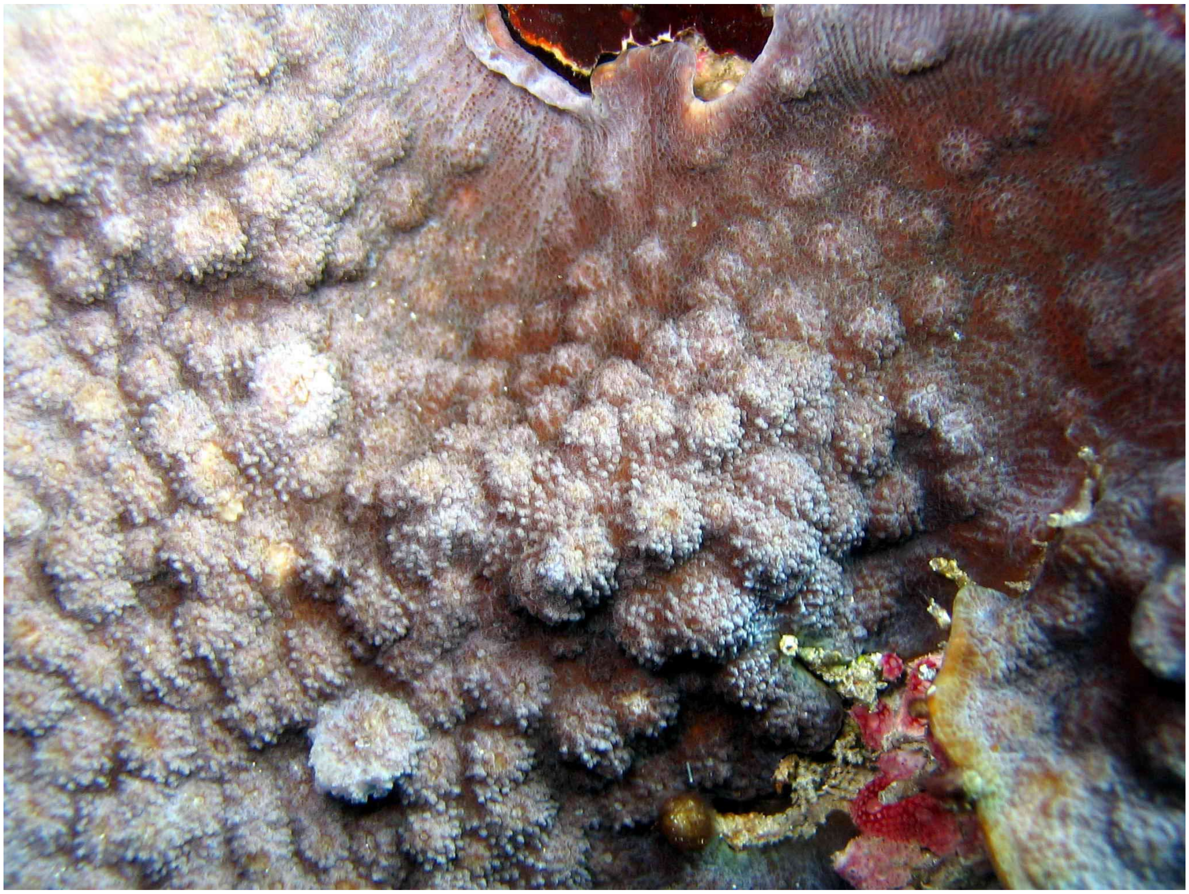
A close-up photo of a brown colony of *Echinopora gemmacea*.

Echinopora cf. hirsutissima

This coral forms encrusting colonies in American Samoa, usually with some irregular bumps or columns. Other places it can be branching with a plate base or entirely branching. The corallites and colony are spinier than other *Echinopora* and the corallites are completely round. Other *Echinopora* here do not have branches. Grey or brown, common, reef slopes. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Muliava (Rose Atoll), Upolu, Apolima, and Savai'i.



A colony of *Echinopora* cf. *hirsuitissima*.



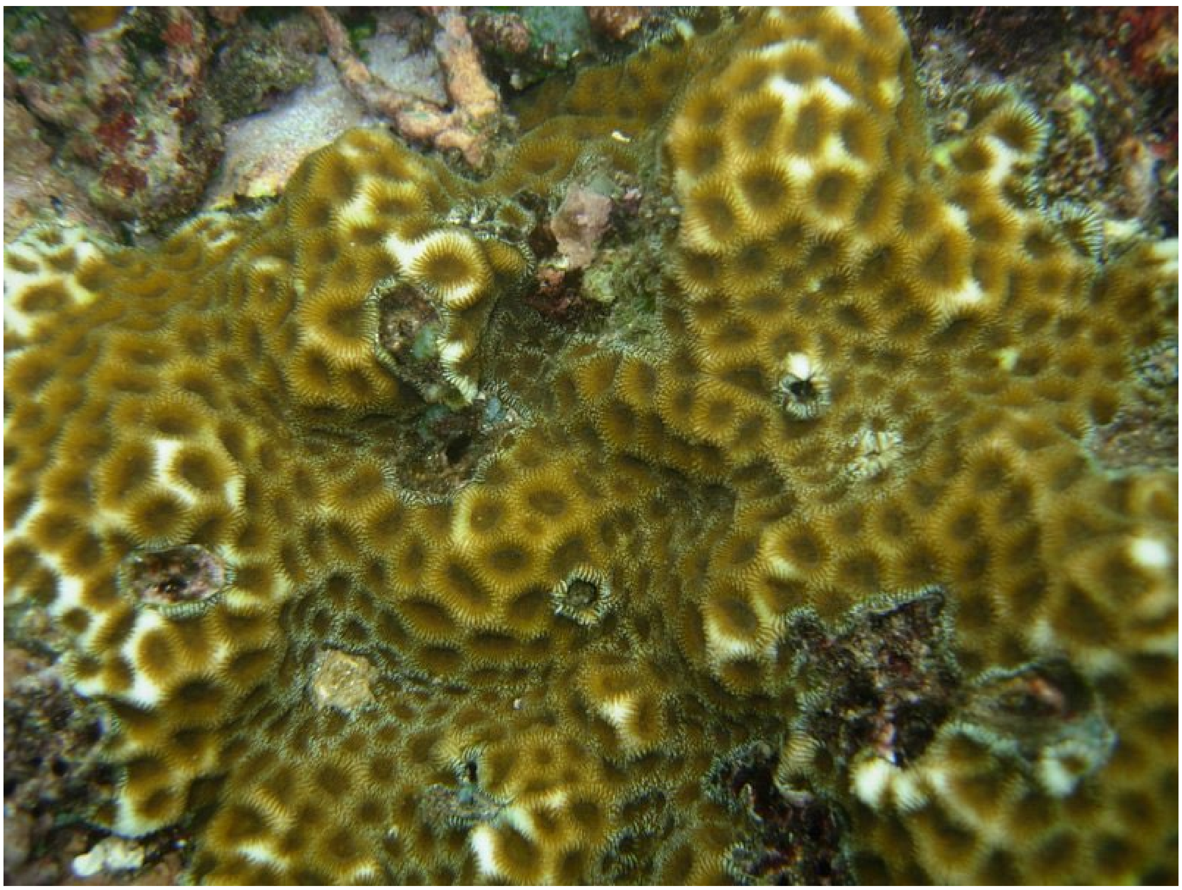
A closeup of *Echinopora* cf. *hirsuitissima*.

Favites

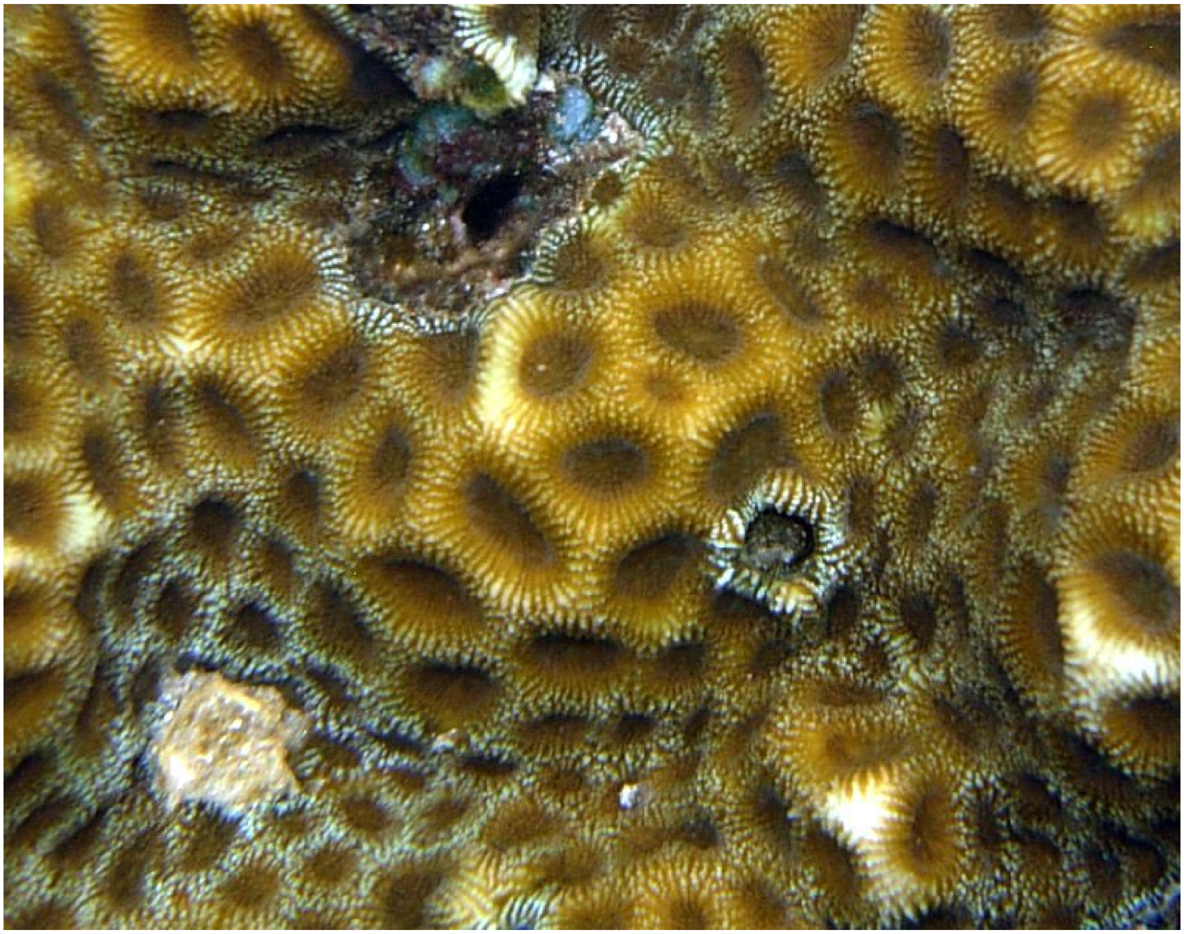
*Favite*s forms encrusting or massive colonies which have corallites about a quarter to half inch (12 mm) in diameter. There is no groove separating corallites, just a ridge. Browns, yellows, greys, uncommon. *Favia* has a groove separating corallites. Corallites are usually larger and more irregular than on *Goniastrea*, which usually has a rusty color.

Favites abdita (Ellis & Solander, 1786)

This coral forms encrusting or lumpy colonies. The walls between corallites are relatively sharp, septa small and regular, giving colonies a smooth appearance. Brown or yellow, may have green mouths, rare, reef flats and slopes. *Favites halicora* has more rounded, thick walls between corallites. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, and Upolu.



A colony of *Favites abdita*.



A close-up of *Favites abdita*.

Favites halicora (Ehrenberg, 1834)

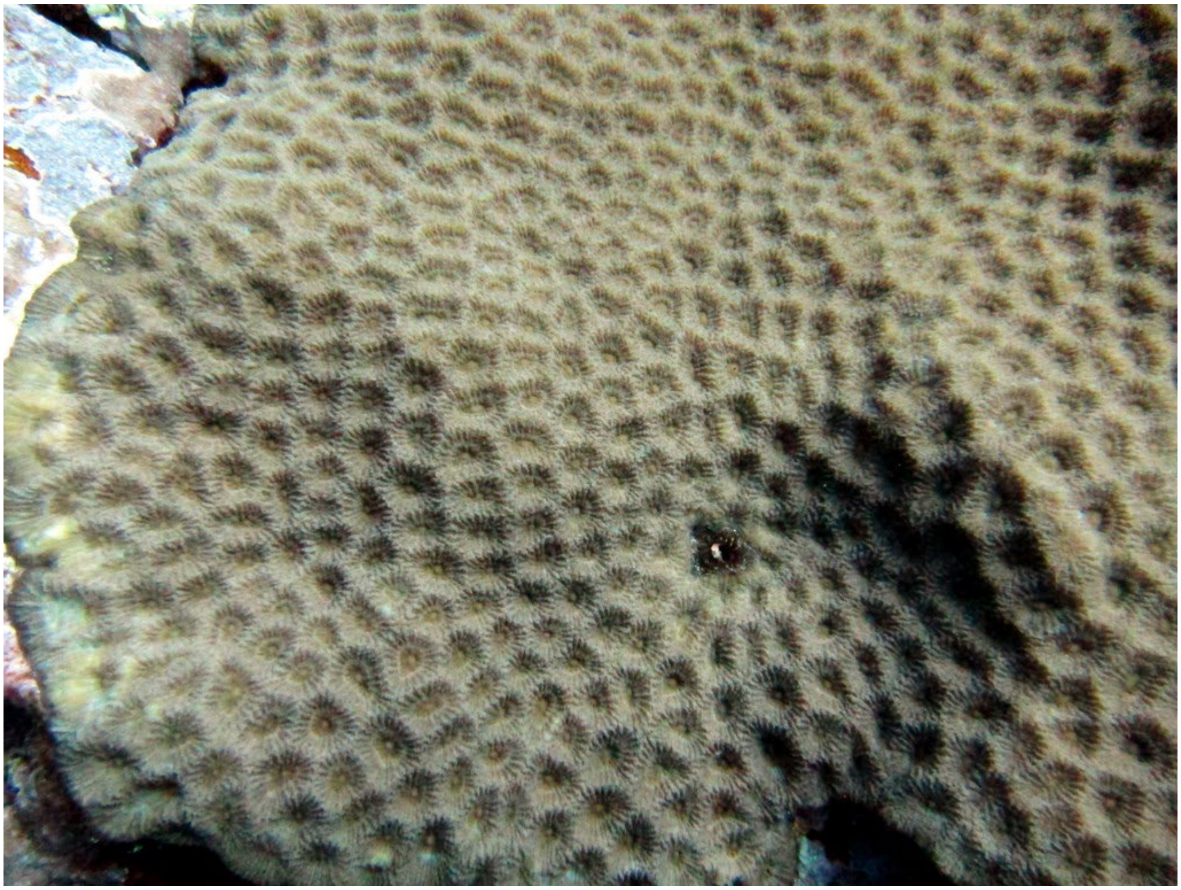
Colonies are usually encrusting but are often lumpy. Corallites are about the size of a finger to that of a little finger. Corallites share common walls that are rounded and thick. *Favites abdita* has thinner, sharper walls. Often yellow or brown, may have bright green mouths.

Favites halicora.

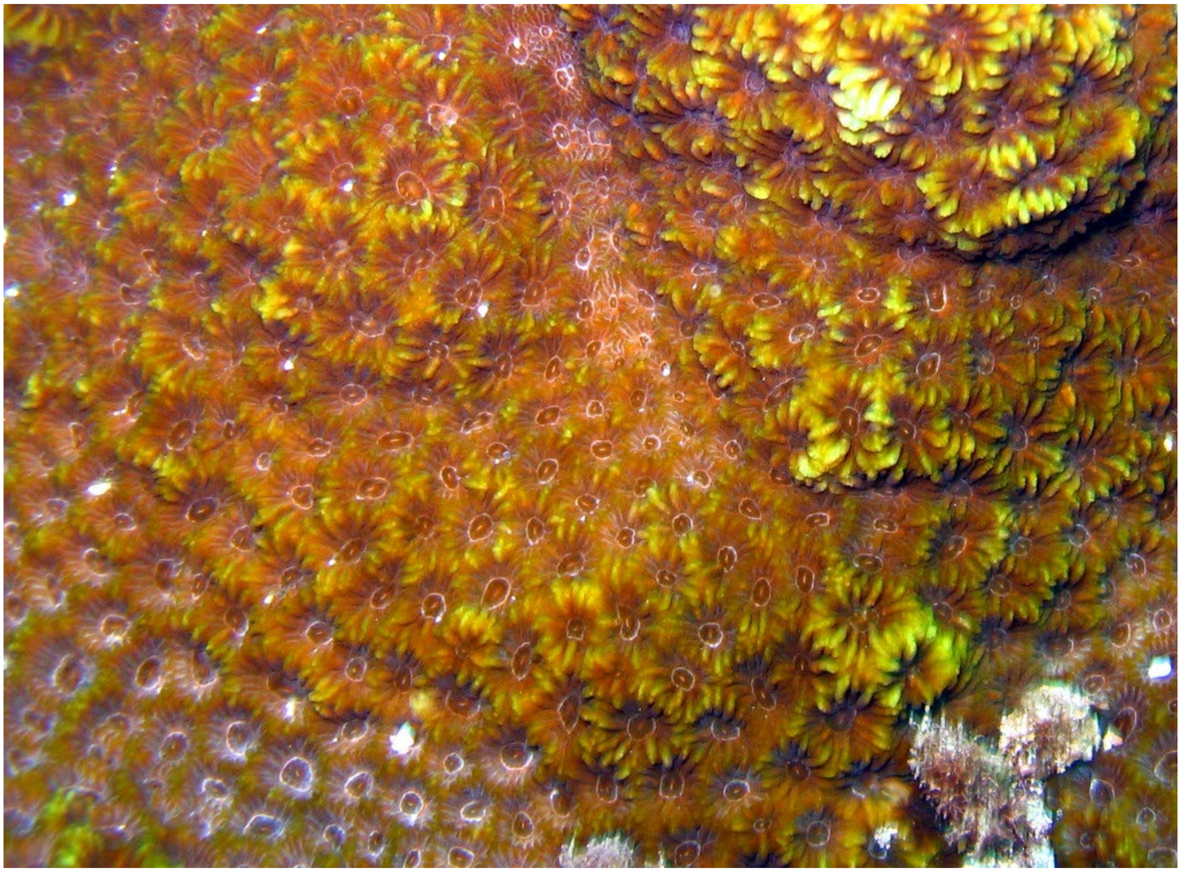
A closer photo of *Favites halicora*.

Favites pentagona Esper, 1794

This coral forms encrusting colonies, with moderately small corallites. Corallites share a single wall between them, which is usually short but sharp at the top. Corallites often have about five sides. Corallites are smaller than on *Favites abdita* and *Favites halicora*. Rare. Found so far on Tutuila and Ta'u.



A colony of *Favites pentagona*.



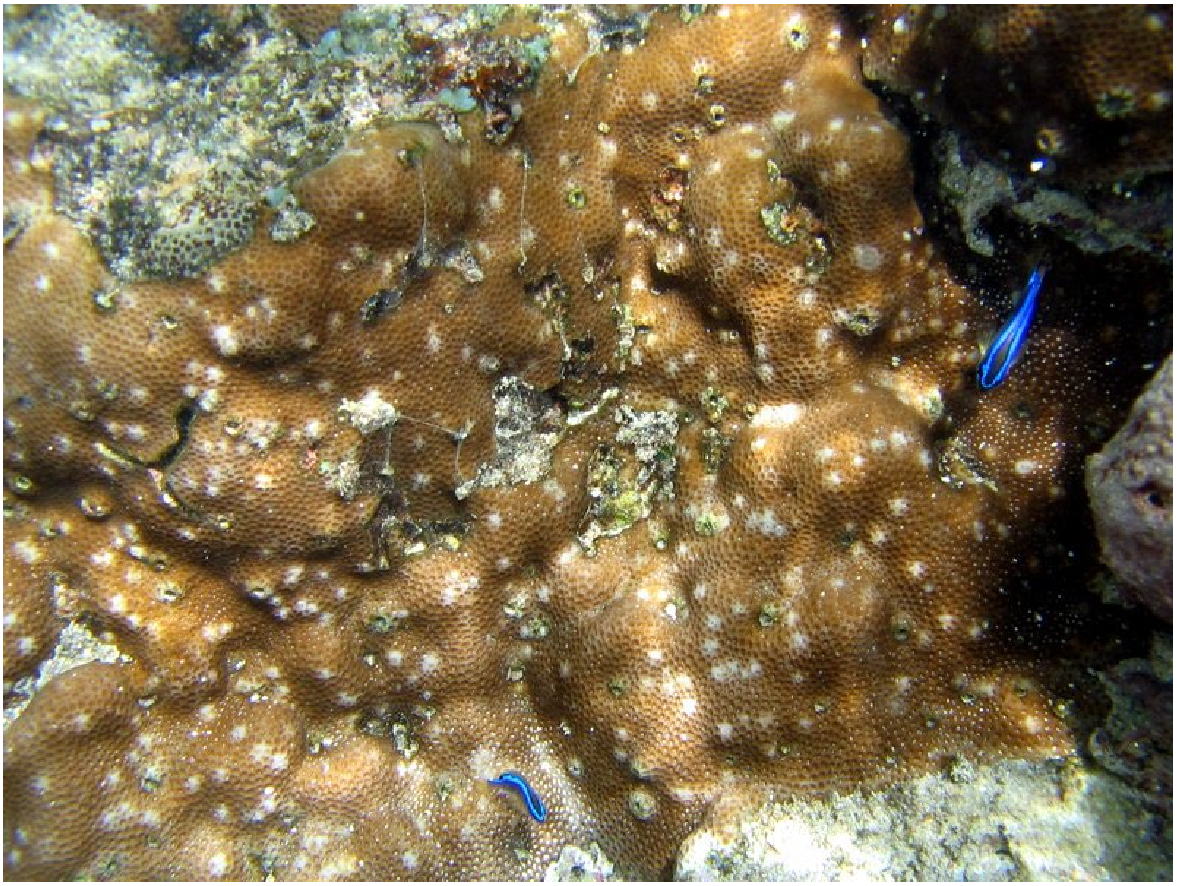
A close-up of *Favites pentagona*.

Goniastrea

Goniastrea forms massive or encrusting colonies which have corallites from 2 mm diameter up to a quarter inch (6 mm) or so. No groove separates corallites, only a ridge that is often thin. Usually a yellowish cream or pinkish cream or rust colored. Uncommon. Corallites are united by a single ridge like *Favites*, but usually smaller and may be more uniform than *Favites*, plus they are more often rust colored.

Goniastrea minuta Veron, 2000

This coral forms large encrusting colonies with small corallites, 2- 3 mm in diameter. Colonies may be lumpy, and parts of colonies may be separated by dead areas. Walls separating corallites are thin, and the corallites are shallow. Colonies commonly host many barnacles. Brown with white spots where barnacles are located, common to abundant, crest and upper reef slopes. *Goniastrea retiformis* has simiar sized corallites, but forms large, rounded, smooth massive colonie with cracks, and has deeper corallites that are less round. Other *Goniastrea* species have larger corallites, and do not have barnacles. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, and Upolu.

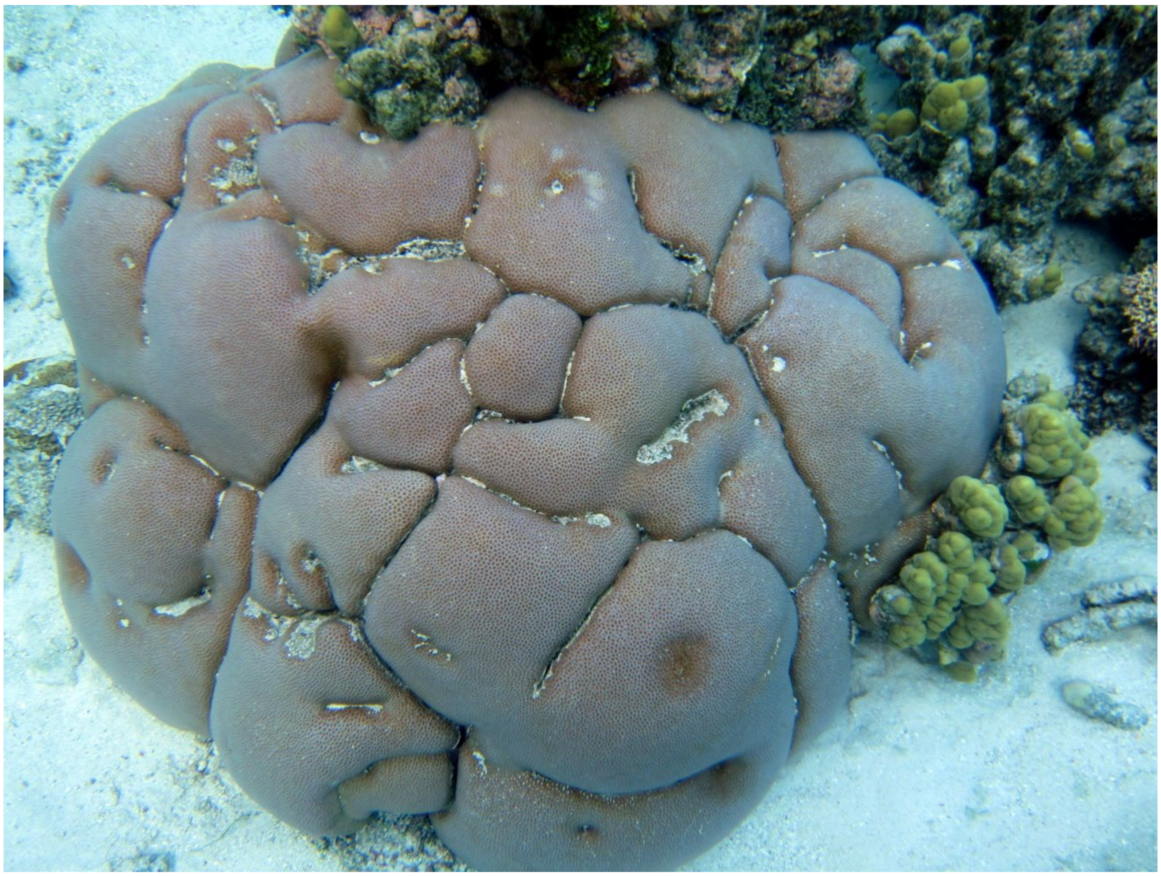


A colony of *Goniastrea minuta*.

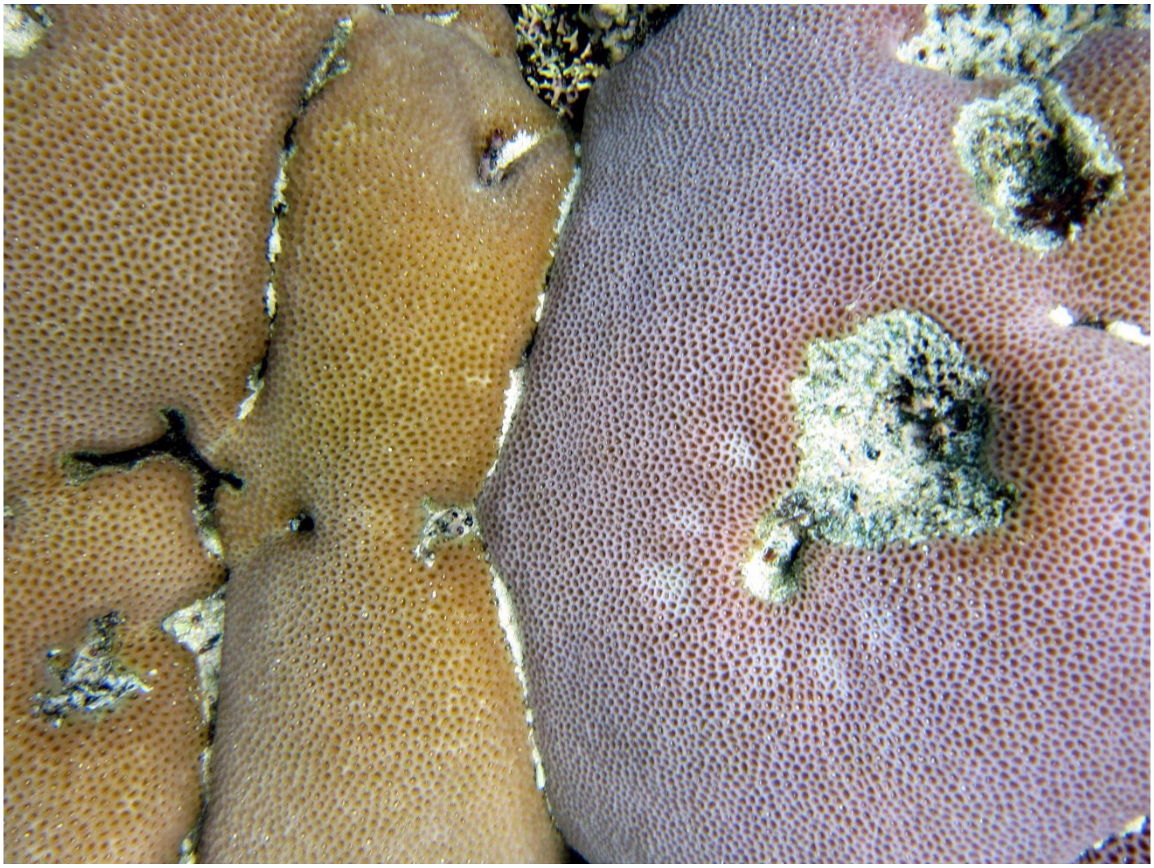
A close-up photo of *Goniastrea minuta*. The white spots are barnacles.

Goniastrea retiformis (Lamarck, 1816)

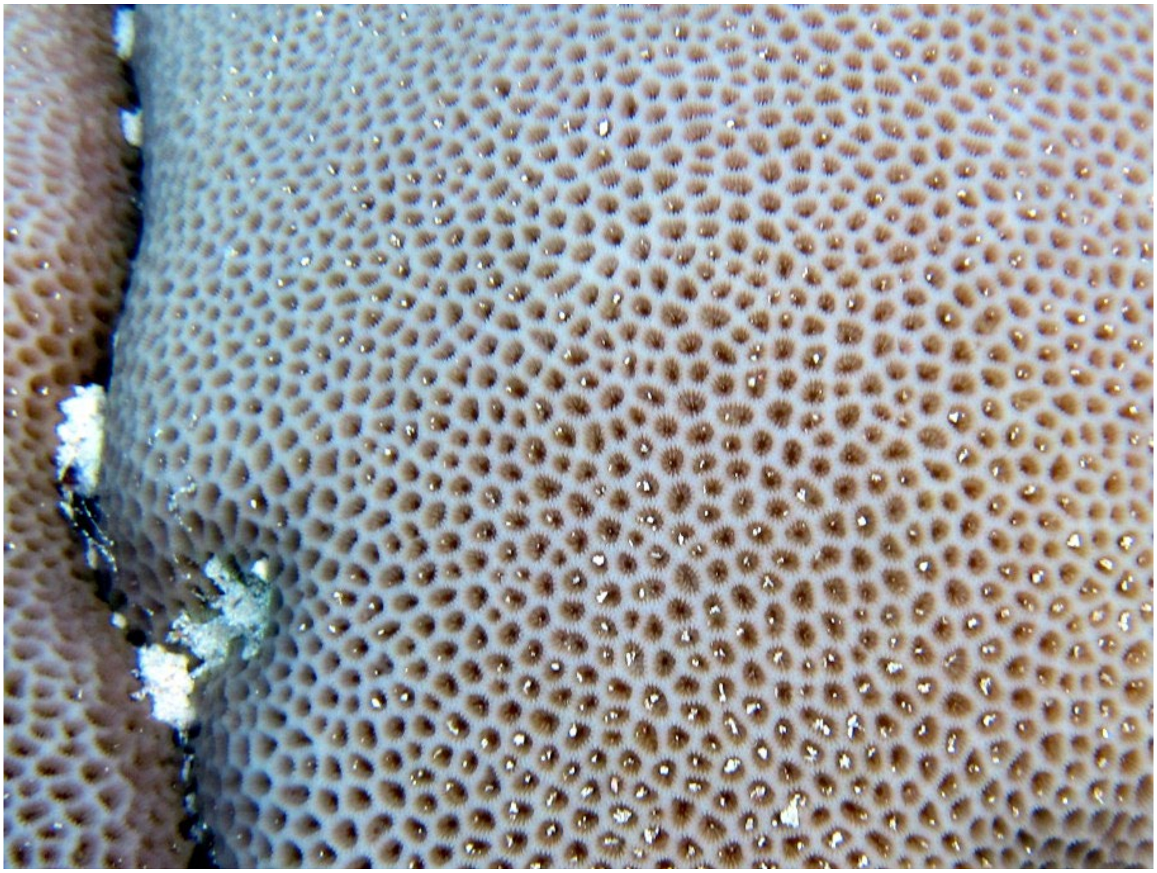
This species makes massive colonies which when large usually have lobes separated by cracks. The corallites are small and deep. Corallites are about 3-4 mm diameter. It does not have barnacles. *Goniastrea minuta* is encrusting and may have small lumps, and has corallites that are shallower and slightly smaller. Other *Goniastrea* species have larger corallites but smaller colonies. Colonies are most often a pinkish-purple color but sometimes are brown. Common in the Hurricane House pool on Ofu, uncommon elsewhere. Most colonies on Ofu now have dead tops. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Muliava (Rose Atoll), Upolu, and Savai'i.



A colony of *Goniastrea retiformis*.



A closer photo of *Goniastrea retiformis*, showing two different colors. The more common color is on the right.



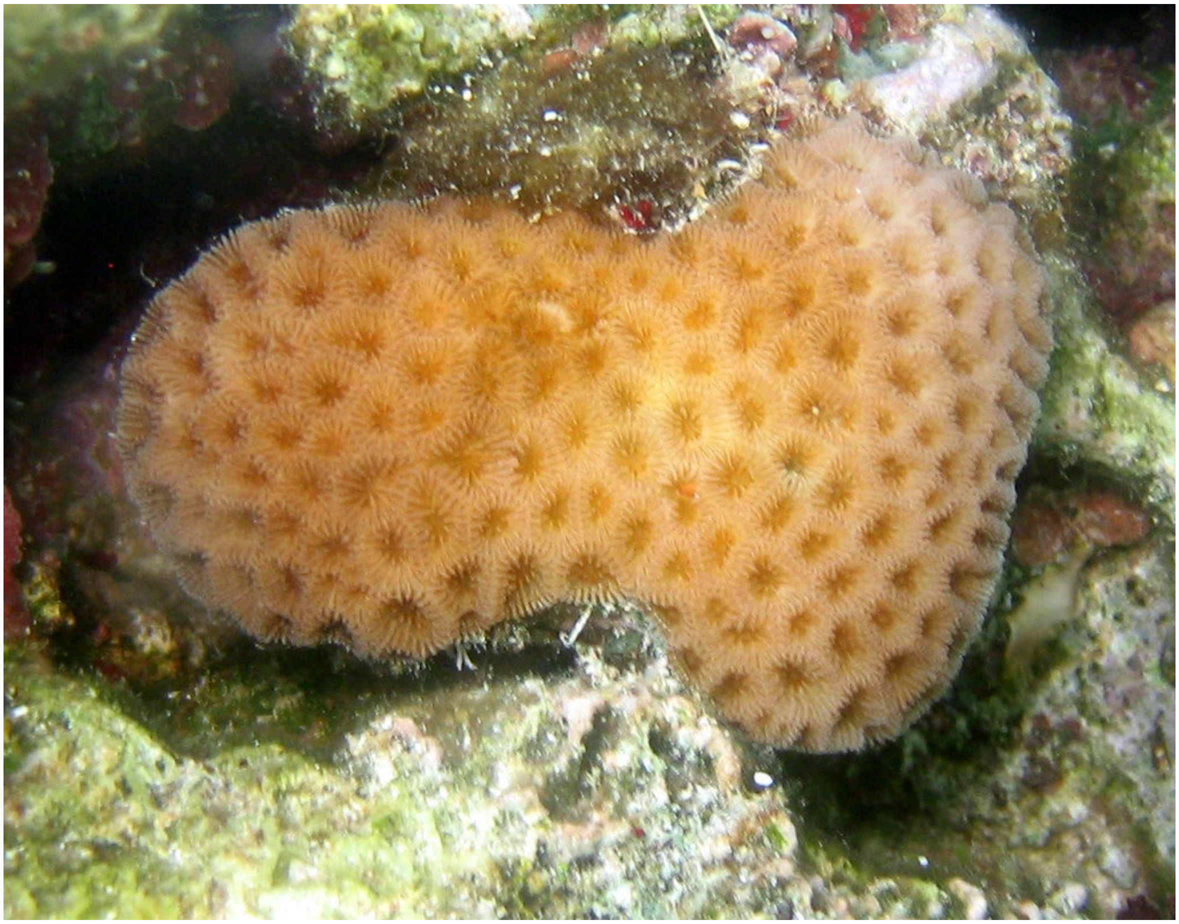
A close-up photo of a colony of *Goniastrea retiformis*. The white spots are sand.

A close-up photo of *Goniastrea retiformis*.

Goniastrea edwardsi Chevalier, 1971

This coral forms small massive colonies that have small corallites separated by thick walls. Corallites are about 4-5 mm in diameter. The corallites are larger than on *Goniastrea retiformis* and *Goniastrea minuta*, and have thicker walls. Other *Goniastrea* have larger corallites. Brown or light rusty color, rare except in the Ofu pools. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Upolu, and Savai'i.

A colony of *Goniastrea edwardsi*.

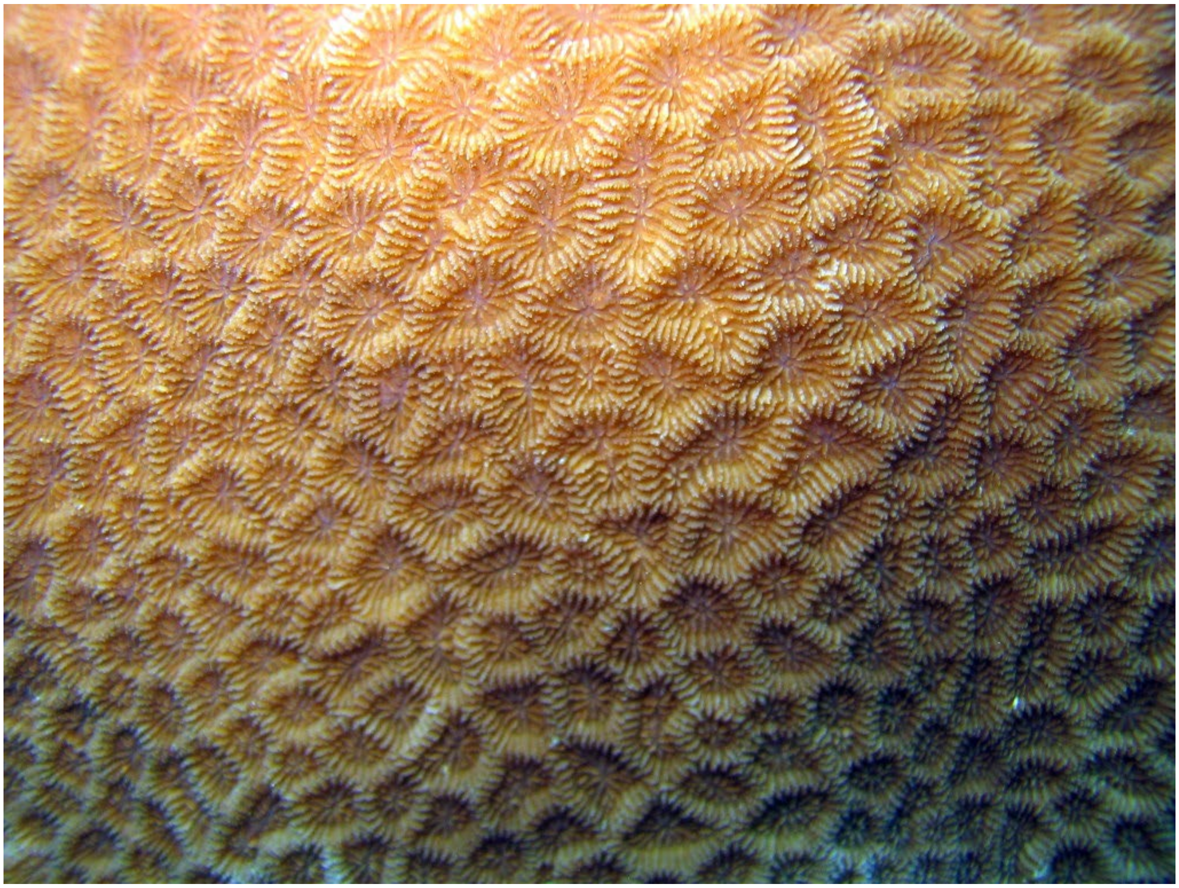


A close-up photo of *Goniastrea edwardsi*.

Goniastrea favulus (Dana, 1846)

This coral is encrusting or massive. It has shallow corallites, with short walls and wider floors than other *Goniastrea*. Corallites are larger than on *Goniastrea minuta*, *Gonastrea retiformis*, and *Goniastrea edwardsi*. Walls are thinner than on *Goniastrea edwardsi* and *Goniastrea pectinata*. Walls are shorter and floors of corallits are wider than on *Goniastrea pectinata* and colonies are not lumpy. Rare, usually rusty color. Found so far on Tutuila, Ofu-Olosega, and Ta'u.

A colony of *Goniastrea favulus*.



A close-up photo of *Goniastrea favulus*.

Goniastrea pectinata (Ehrenberg, 1834)

This coral forms encrusting lumpy colonies. Walls between corallites are high and thick, and commonly enclose more than one corallite center together. Walls that enclose more than one corallite center produce enclosed shapes that are elongated. Pinkish light rusty color to yellow, can have fluorescent green tentacles, rare, reef slopes. *Goniastrea minuta*, *Goniastrea retiformis* and *Goniastrea edwardsi* have smaller corallites. Other *Goniastrea* here do not have elongated corallites with 2 or more centers, and do not have irregular small sharp lumps. *Goniastrea favulus* has thinner, shorter walls with wider floors to the corallites. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Upolu, Apolima, and Savai'i.

A colony of *Goniastrea pectinata*.

A close-up of *Goniastrea pectinata*.

Leptastrea

Leptastrea forms encrusting colonies which may be anything from an inch (2.5 cm) in diameter to several feet (a meter or so). Corallites are small, about an eighth to quarter inch (3-6 mm) in diameter. There is no groove that separates corallites on most species, but one species has a ring of tiny spines around each corallite which are the ends of septa. Browns or sometimes dark green, usually uncommon but sometimes abundant. Corallites are smaller than most *Favites*, may be less uniform than *Goniastrea*, and are usually not rust colored.

Leptastrea purpurea (Dana, 1846)

This coral forms small encrusting or lumpy colonies. Corallites vary greatly in size from one part of the colony to another. There are more septa in large corallites than on other species. Cream with darker centers, rare, reef slopes. Corallites vary in size within a colony more than in any other species of *Leptastrea*. Found so far on all islands, but not on South Bank.

A colony of *Leptastrea purpurea*.

A close-up of *Leptastrea purpurea*.

Leptastrea pruinosa Crossland, 1952

This coral produces small encrusting or lump colonies. Corallites are small, but their centers are relatively large and contrasting color from the rest of the corallite. Tentacles and are usually extended but may be hard to see. Other *Leptastrea* species usually do not have contrasting center and ridge colors. Brown or grey with light centers, rare, reef slopes. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Muliava (Rose Atoll), and Savai'i.

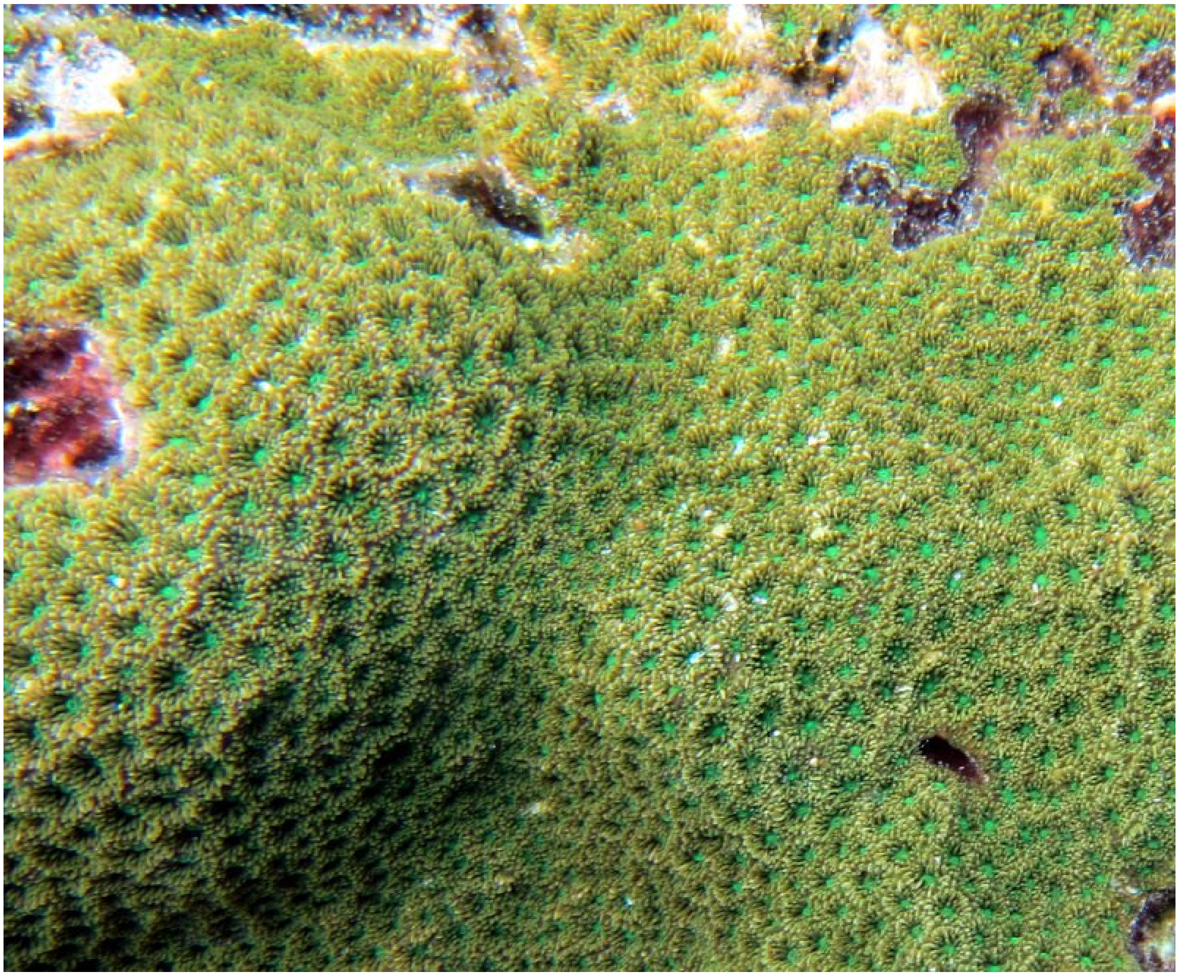
A colony of *Leptastrea pruinosa*.

A close-up of *Leptastrea pruinosa*.

Leptastrea transversa Klunzinger, 1879

This coral forms small and medium encrusting colonies. Corallites are all uniformly small, and the edge of a corallite is made up of the extended ends of septa, which make a ring around the corallite. There is a thin groove between corallites. Can be mottled cream and brown, all brown, all green, or brown with green centers, uncommon, reef slopes. Other *Leptastrea* speces do not have the tiny groove between corallites. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Muliava (Rose Atoll), Upolu, Apolima, and Savai'i.

A colony of *Leptastrea transversa*.

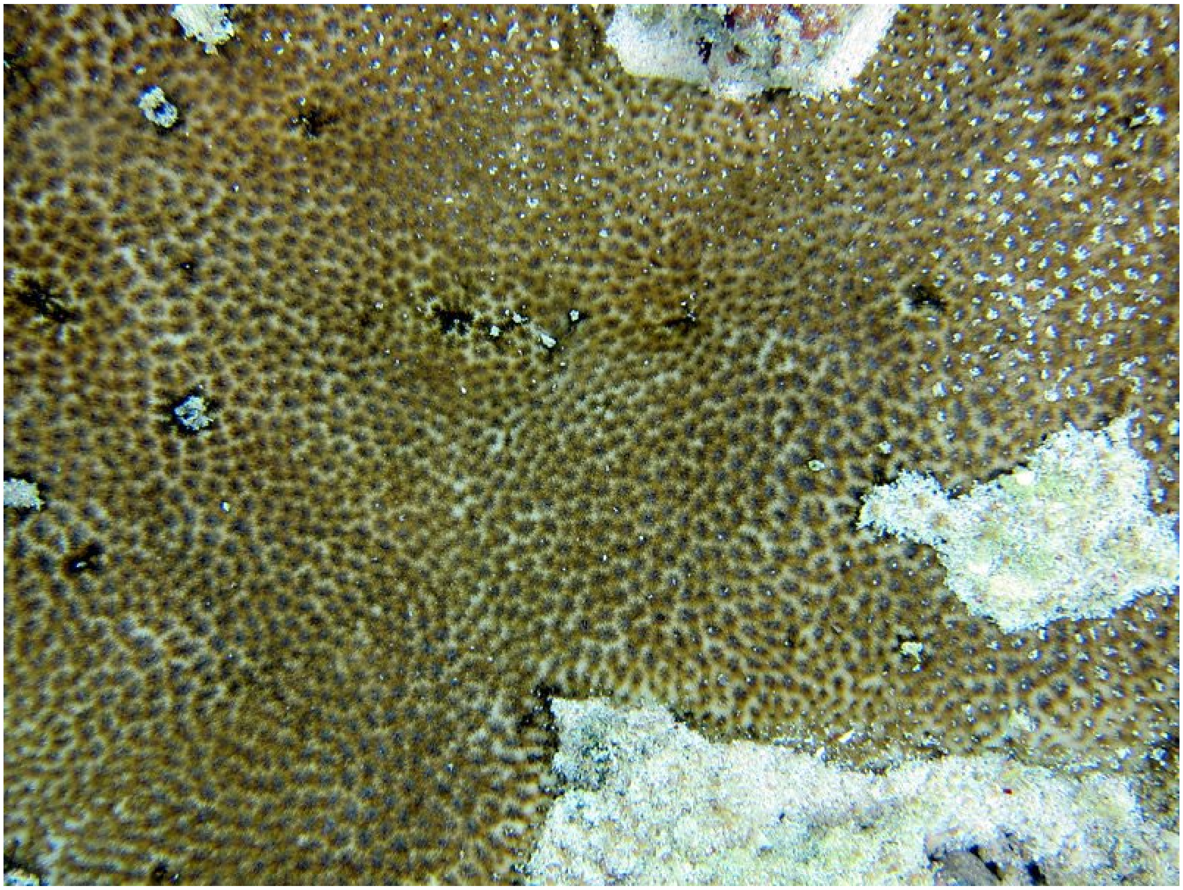


A close-up of *Leptastrea transversa*.

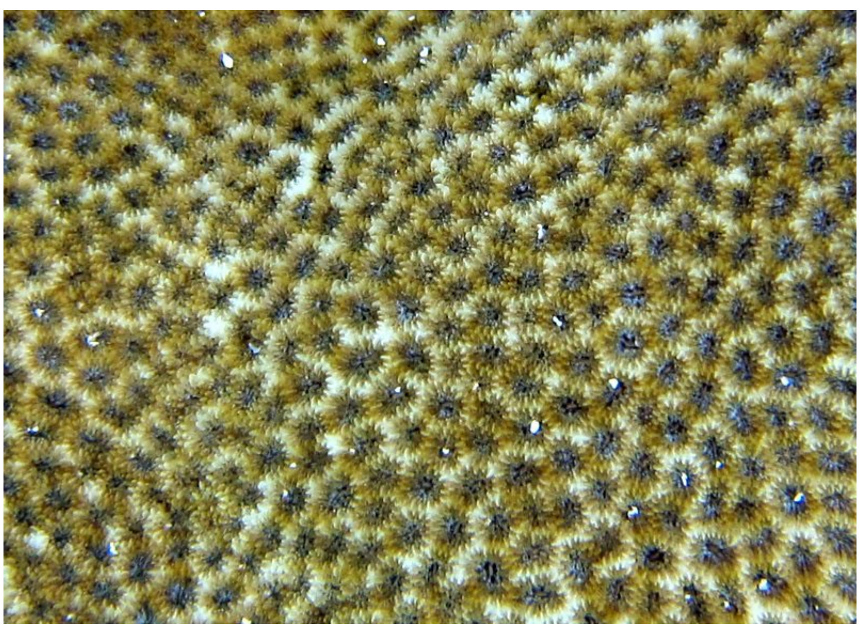
Leptastrea bewickensis Veron & Pichon, 1977

This coral forms encrusting colonies, most often on bare rock. Corallites are small and may be hard to see, and there are often sand grains on the colony. Dark brown with light polyp centers, or mottled with brown streaks connecting several corallites, rare, found in the Ofu pools. The mottling with brown streaks between corallits is not found in other *Leptastrea* species. Found so far on Tutuila, Ofu-Olosega, Ta'u, Muliava (Rose Atoll), and Upolu.

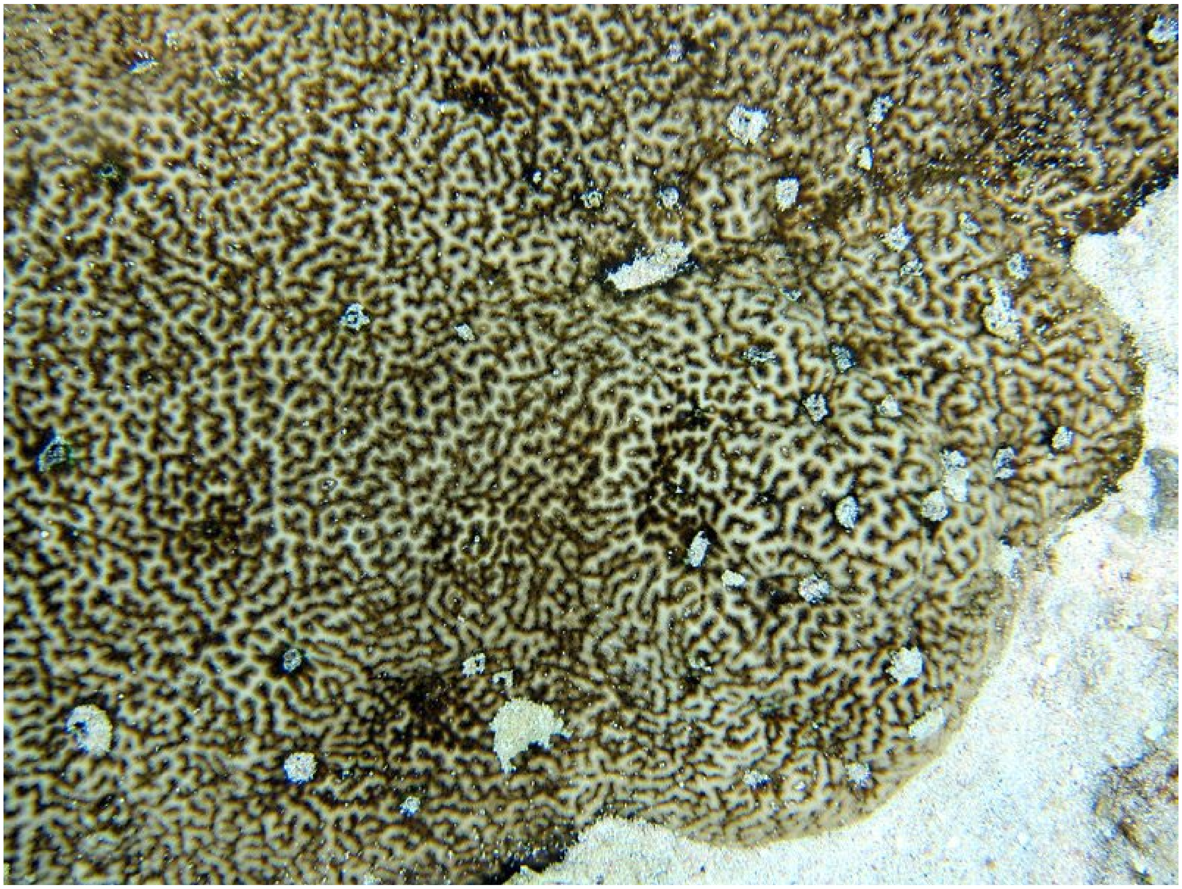
A colony of *Leptastrea bewickensis*.



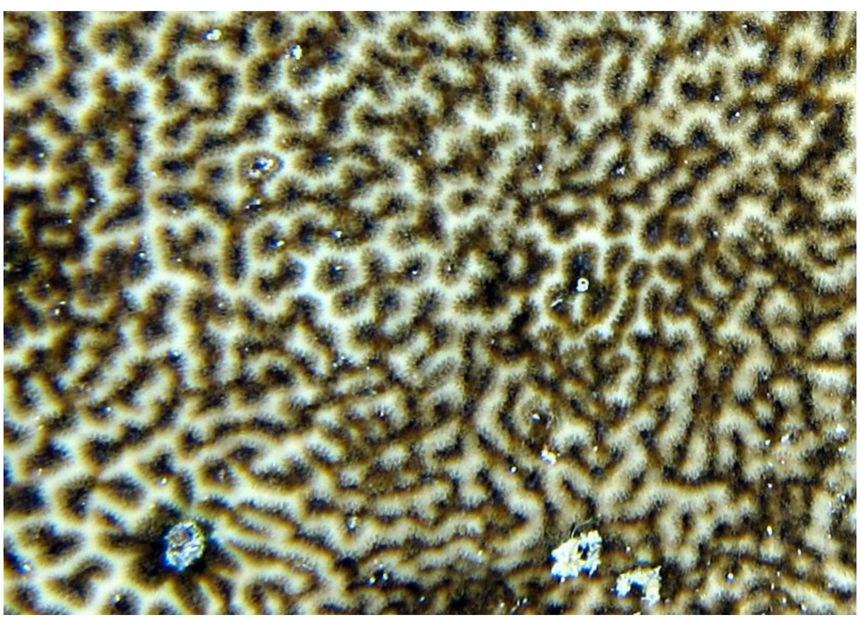
A closer photo of *Leptastrea bewickensis*.



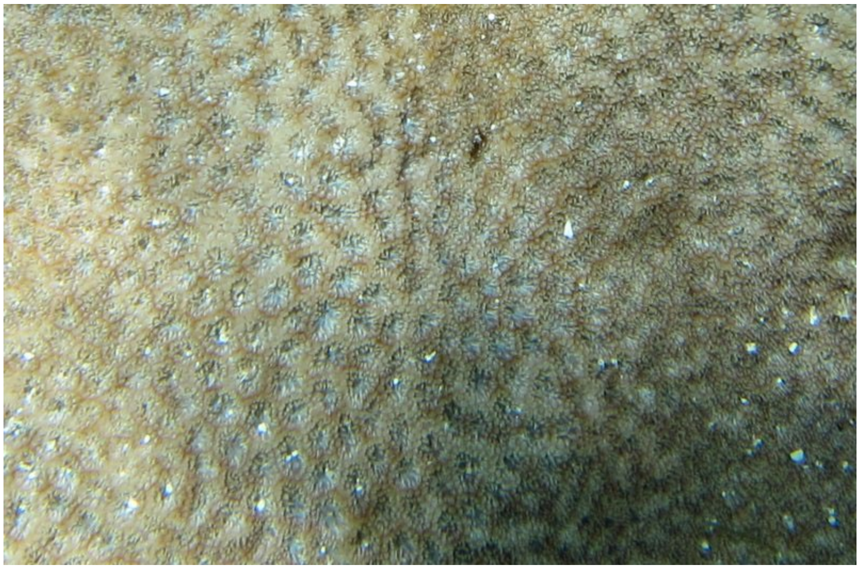
A close-up of the same colony of *Leptastrea bewickensis*.



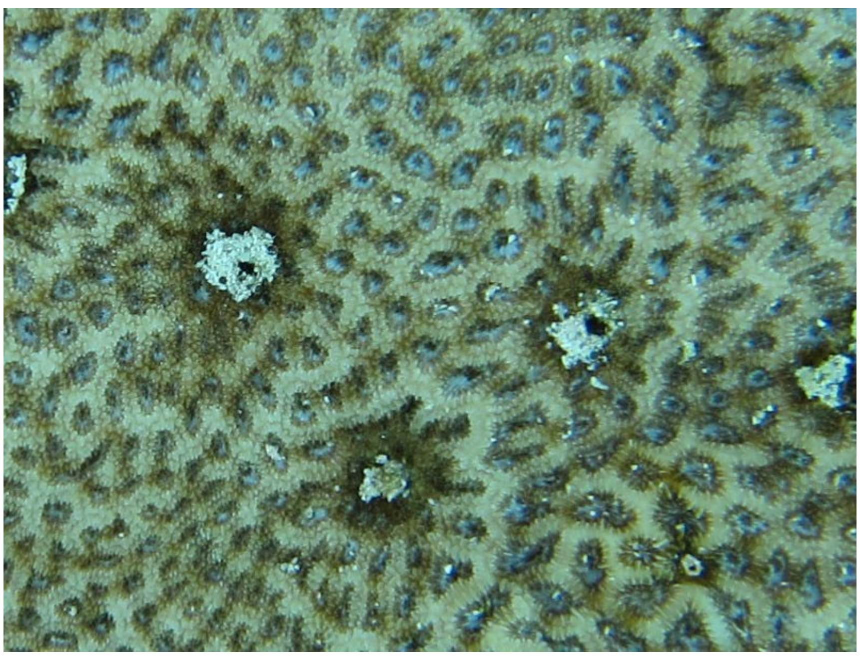
A closer photo of *Leptastrea bewickensis*.



A close-up of the same colony of *Leptastrea bewickensis*.



A close-up of *Leptastrea bewickensis*.



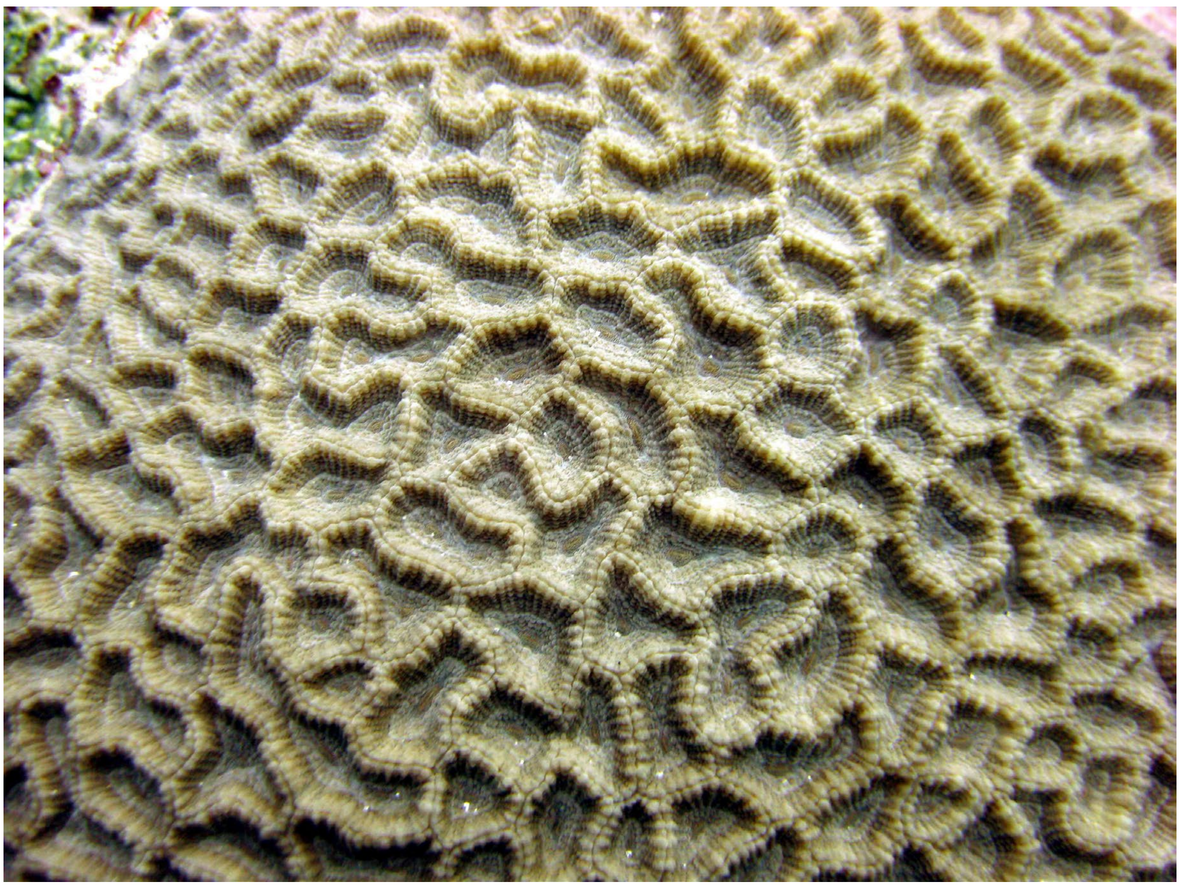
A close-up of *Leptastrea bewickensis*.

Oulophyllia

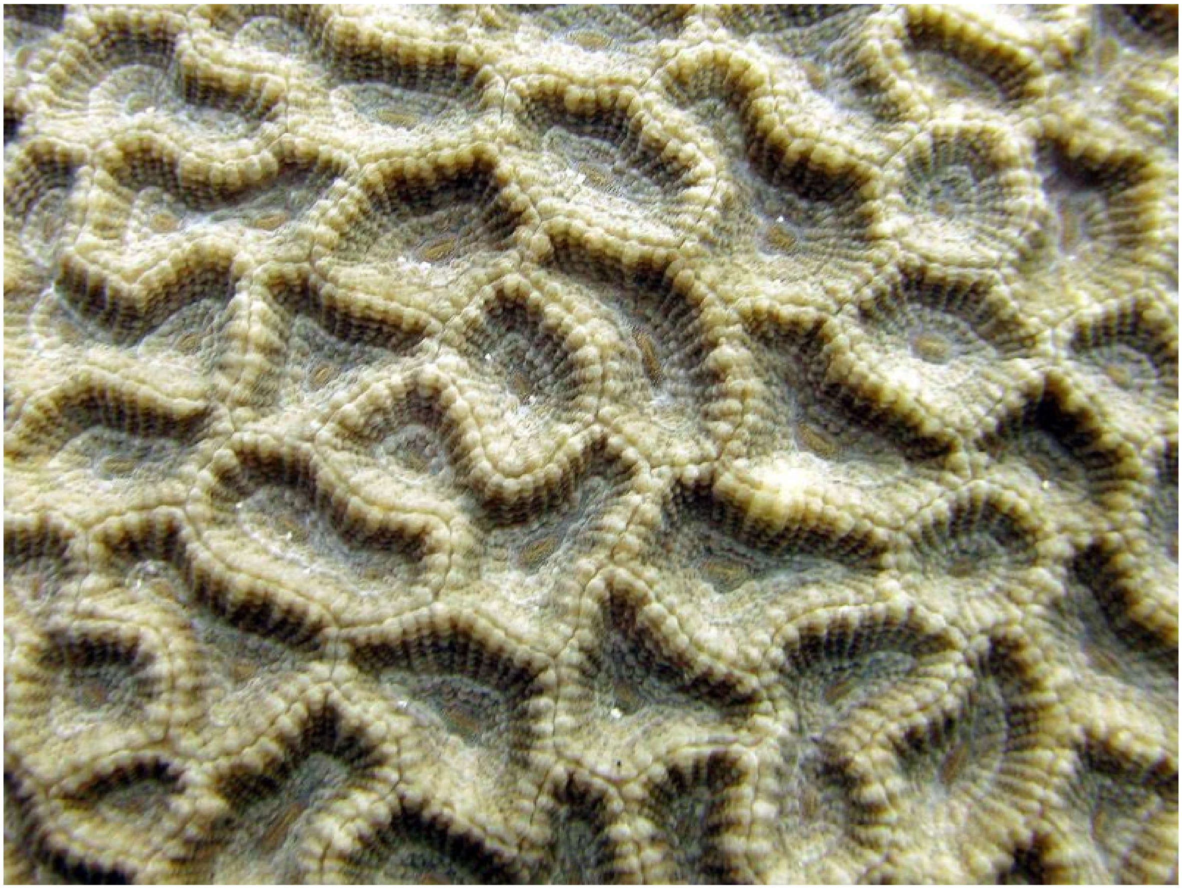
Oulophyllia forms massive colonies with medium size corallites. Corallites are separated by a ridge. The ridge usually has a square top to it and may have some small spines that are the ends of septa. Corallites are about a quarter inch (6 mm) in diameter. Often the centers of the corallites are a different color than the ridges. In one species corallites are all surrounded by ridges like in *Favites*, in another the ridges are winding with rows of corallites between them, so someone could call it brain coral. Uncommon to rare. Ridges are a little bumpier and have a square top more than on *Favites*, but no groove like *Favia*, ridges are smaller than *Symphyllia* which has rounded ridges, but larger than on *Platygyra*.

Oulophyllia bennettae Veron, Pichon, & Wijsman-Best, 1977

This coral forms massive colonies with widely spaced thin meandering ridges which enclose mostly just one or two corallites. Otherwise very similar to *Oulophyllia crispa*. The valleys are wider than on *Platygyra*. Grey or brown, rare, reef slopes. Found so far on Tutuila, Ofu-Olosega, Ta'u, Upolu, and Savai'i.



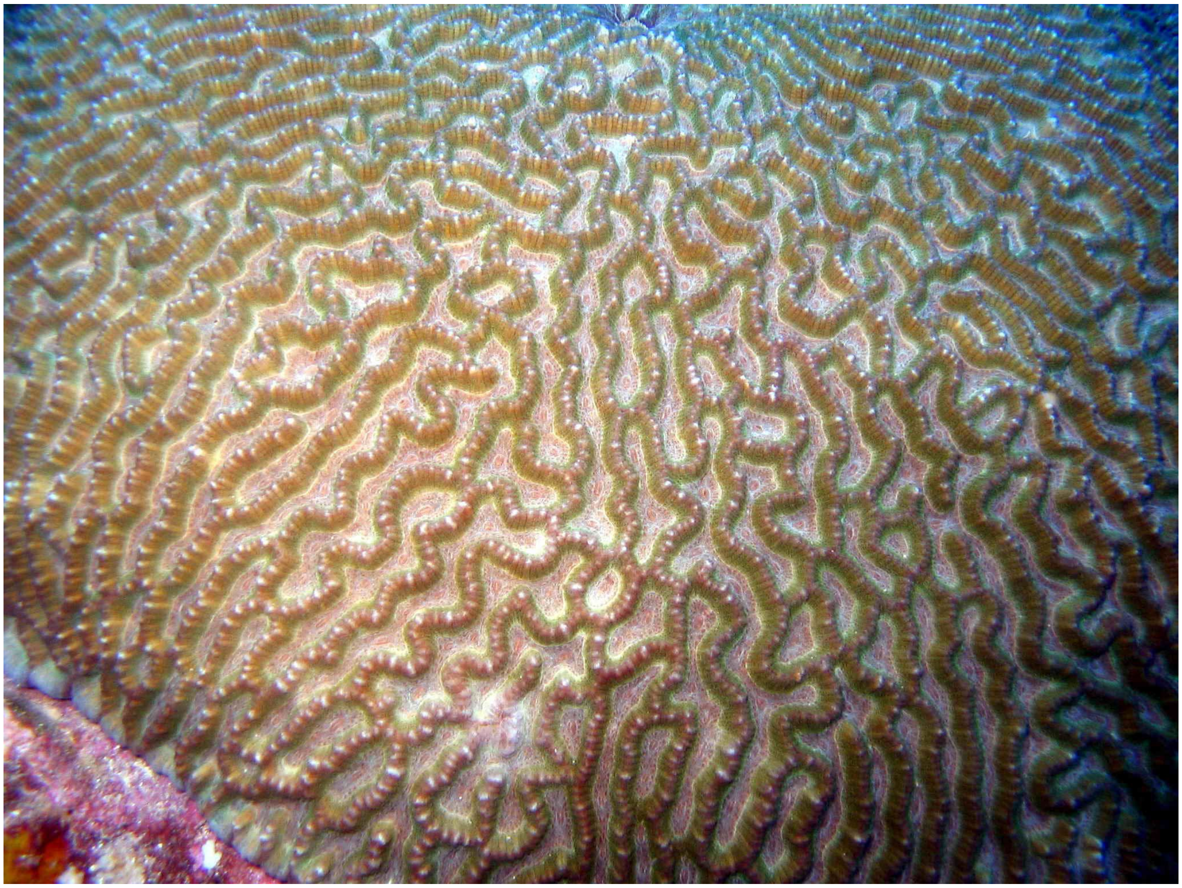
A colony of *Oulophyllia bennettae*.



A close-up of *Oulophyllia bennettae*.

Oulophyllia crispa (Lamarck, 1816) meandroid or "brain coral"

This coral forms massive colonies with widely spaced thin meandering ridges which enclose long valleys as well as short. The valleys are longer than on *Oulophyllia bennettae*. The valleys are much wider than on *Platygyra daedalea*, the ridges are a bit larger than *Platygyra daedalea*, and have short uniform septa. Grey or brown, can have green tints, rare, reef slopes. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Muliava (Rose Atoll), and Upolu.



A colony of *Oulophyllia crispa*.

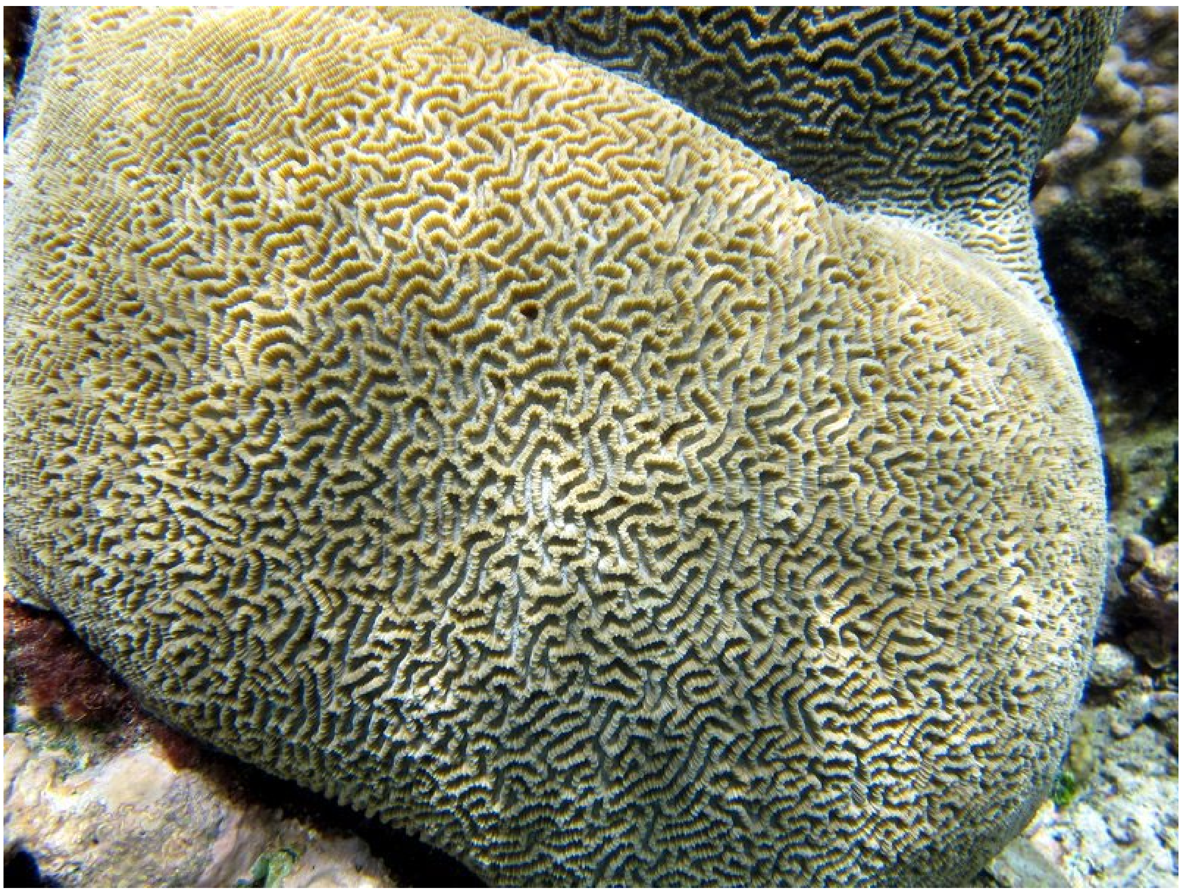
A close-up of *Oulophyllia crispa*.

Platygyra

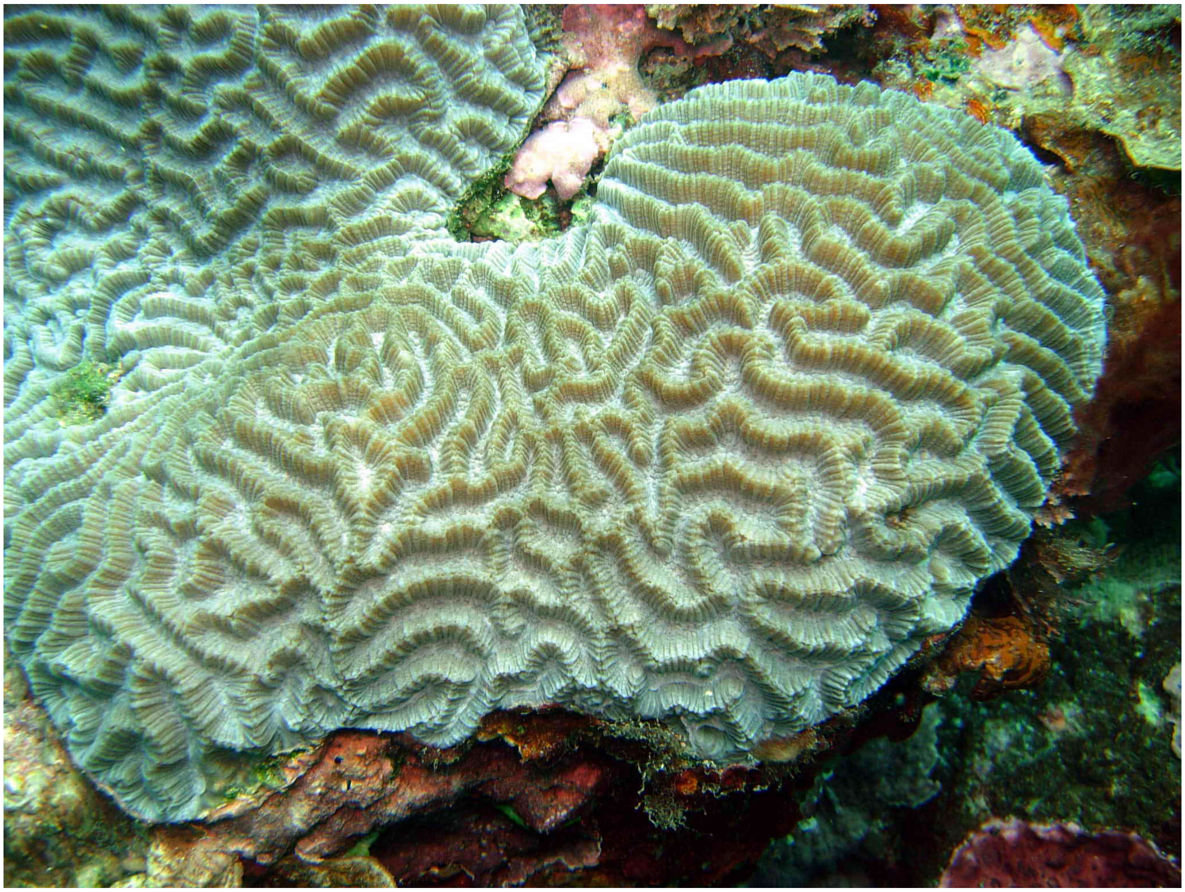
Platygyra form massive colonies, covered with thin ridges that are separated by valleys. In some species the ridges and valleys are long and meander, and they are called "brain corals." In others, valleys are short and surrounded by ridges. Uncommon to rare. Ridges are smaller than on *Symphyllia* or *Oulophyllia*, but larger than on *Leptoria*.

Platygyra daedalea (Ellis & Solander, 1786) meandroid or "brain coral"

This coral forms massive colonies with thin meandering ridges. Ridges do not have a sharp upper edge. Brown, yellow or grey, uncommon, reef slopes and flats. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Muliava (Rose Atoll), Upolu, and Savai'i. *Platygyra sinensis* has narrower ridges, *Platygyra lamellina* has thicker ridges. *Platygyra pini* is not meandroid.



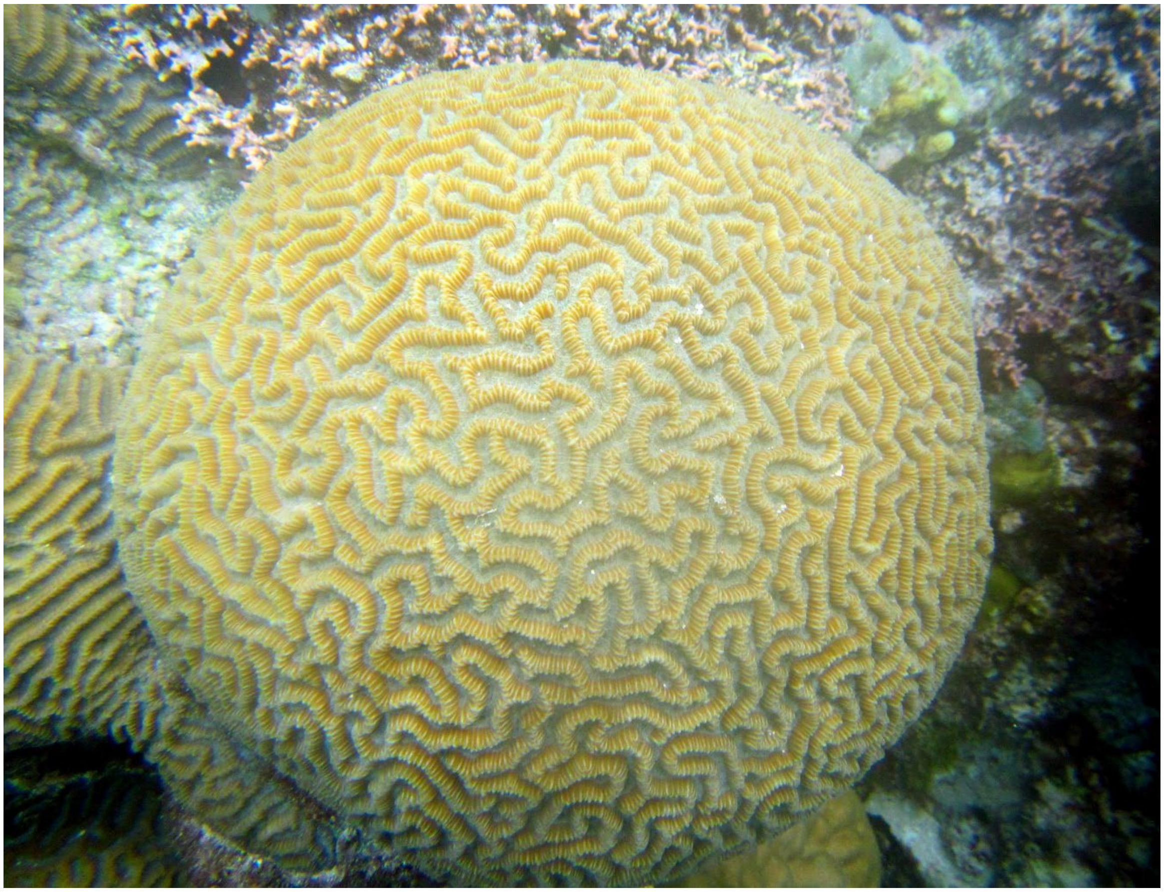
A colony of *Platygyra daedalea*.



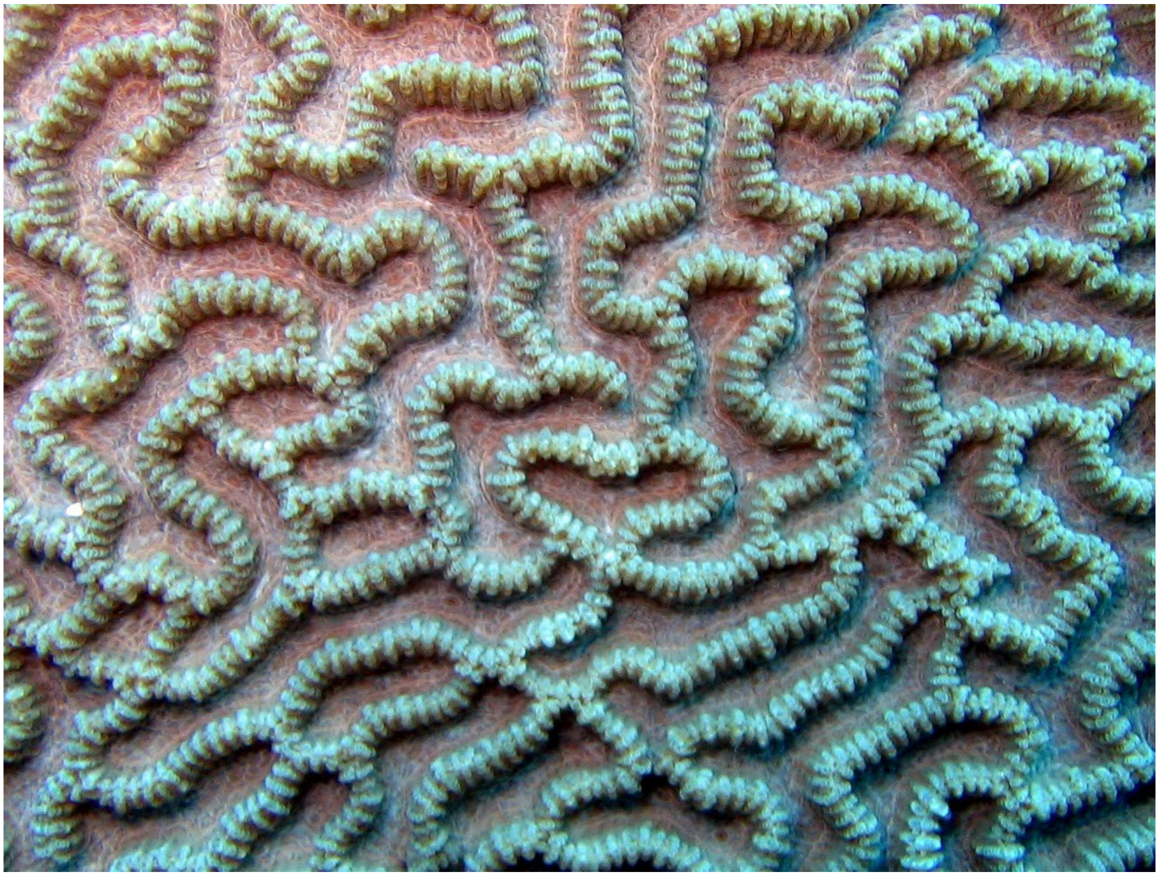
A close-up of *Platygyra daedalea*.

Platygyra sinensis (Milne Edwards and Haime, 1849) meandroid or "brain coral"

Colonies are massive and meandroid. Ridges are a bit narrow and rounded. In some colonies septa alternate with one being lighter than the other. *Platygyra daedalea* has thicker ridges and *Platygyra lamellina* has much thicker ridges. *Platygyra pini* is not meandroid.



A colony of *Platygyra sinensis*.



A closer photo of *Platygyra sinensis*.

A close-up photo of *Platygyra sinensis*.

Platygyra lamellina (Ehrenberg, 1834) meandroid or "brain coral"

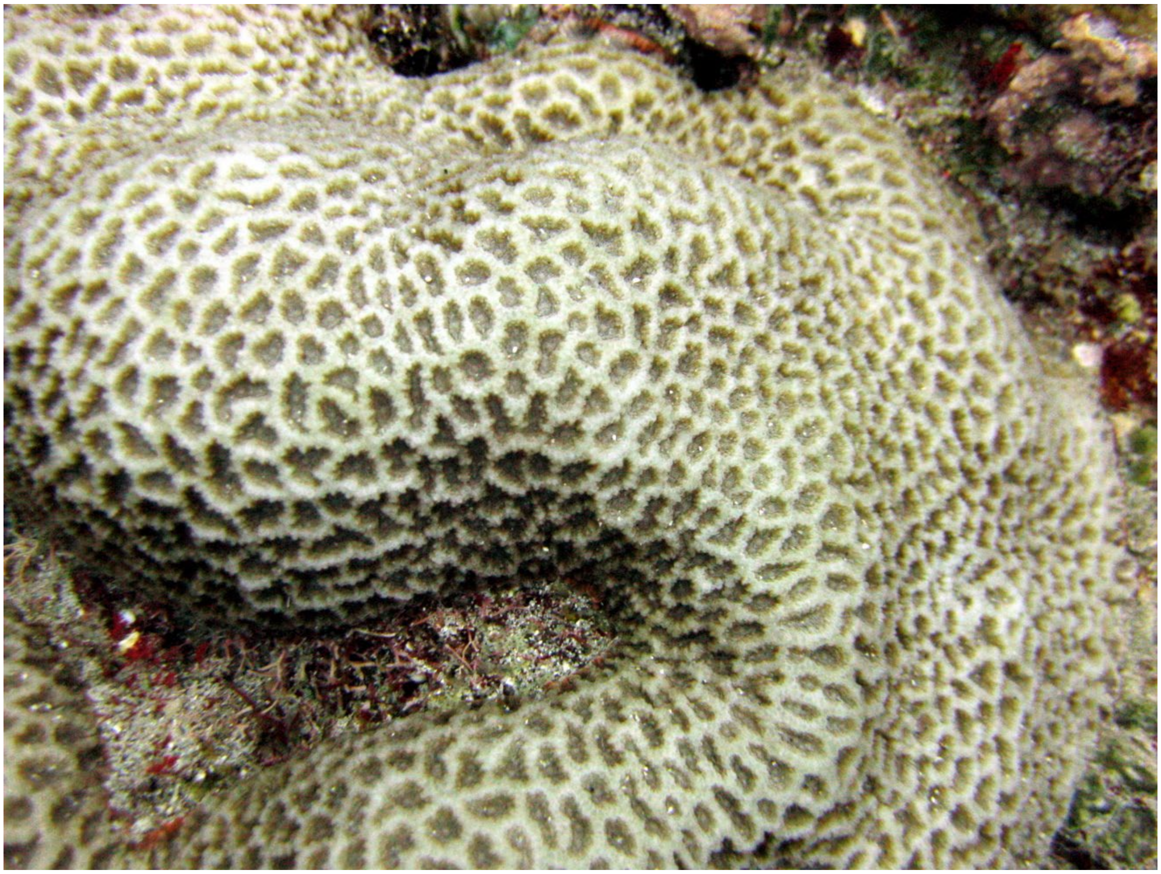
Colonies are massive and meandroid. Ridges are thicker than on *Platygyra daedalea* and *Platygyra sinensis*. *Platygyra pini* is not meandroid. *Symphylla recta* has a rougher surface and may have thicker ridges. Rare.

A photo of *Platygyra lamellina*.

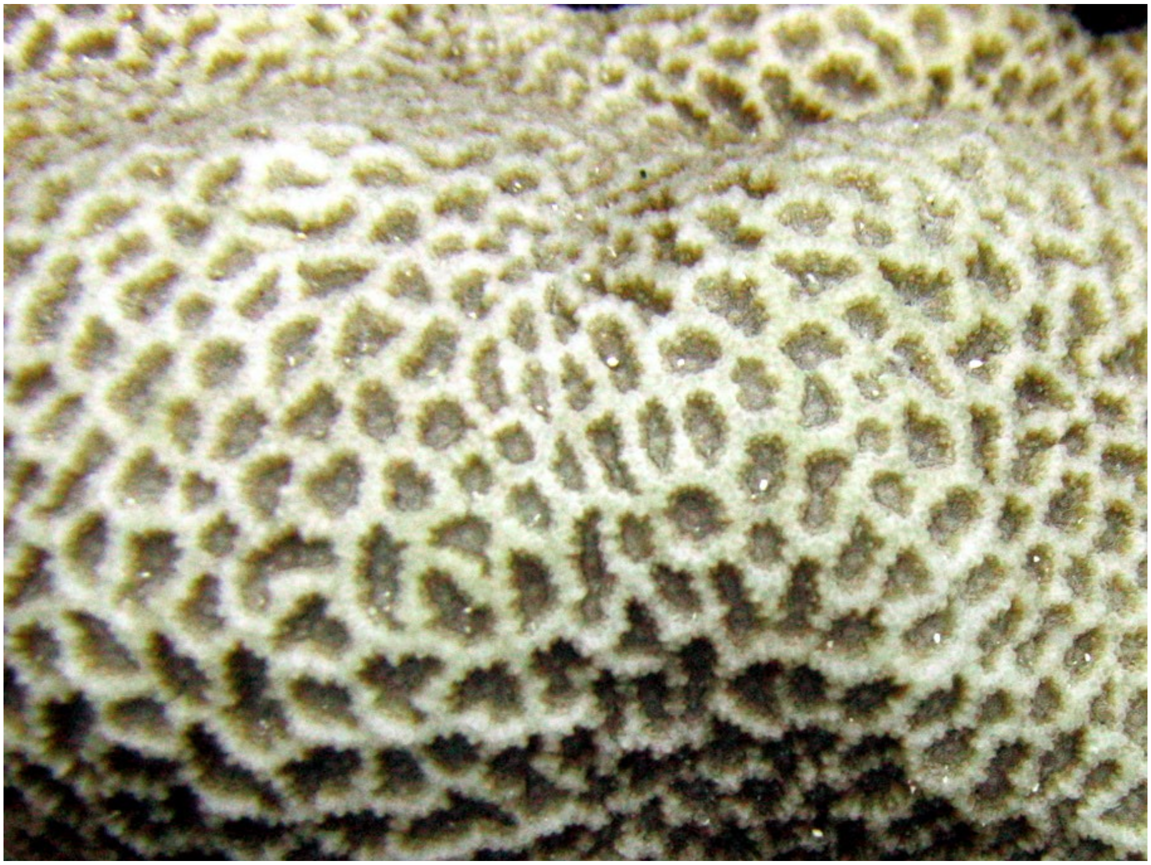
A close-up photo of *Platygyra lamellina*.

Platygyra pini Chevalier, 1975

Colonies are massive or encrusting, but not meandroid. Ridges intersect, surrounding spaces that vary from polygonal to oval. Ridges are relatively thick, thicker than on *Platygyra ryukyuensis*, which is otherwise similar. Veron says this is a species complex, which is probably why different colonies look different.



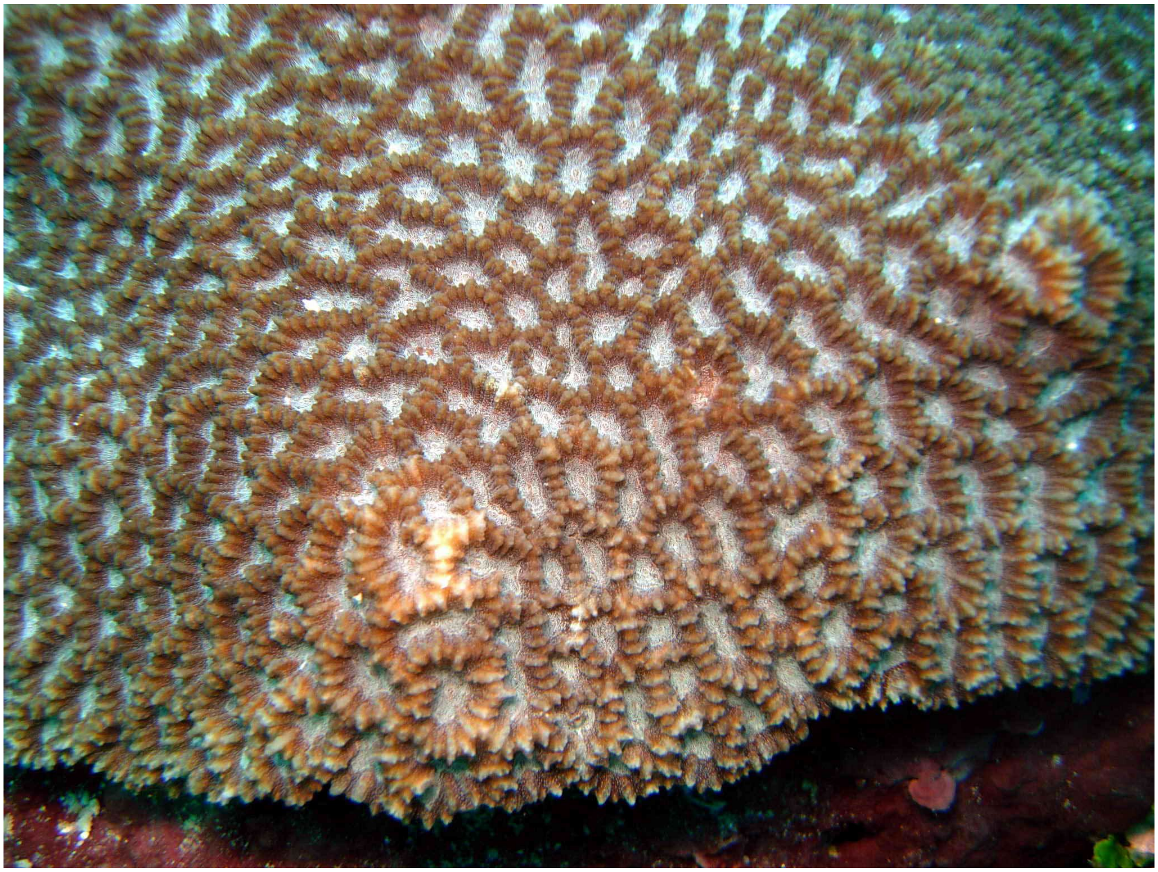
A colony of *Platygyra pini*.



A close-up photo of *Platygyra pini*.

Platygyra ryukyuensis Yabe and Sugiyama, 1936.

Colonies are massive or encrusting, but are not meandroid. Ridges are thin and intersect, enclosing spaces that are polygonal to oval. Similar to *Platygyra pini*, but the ridges are thinner.



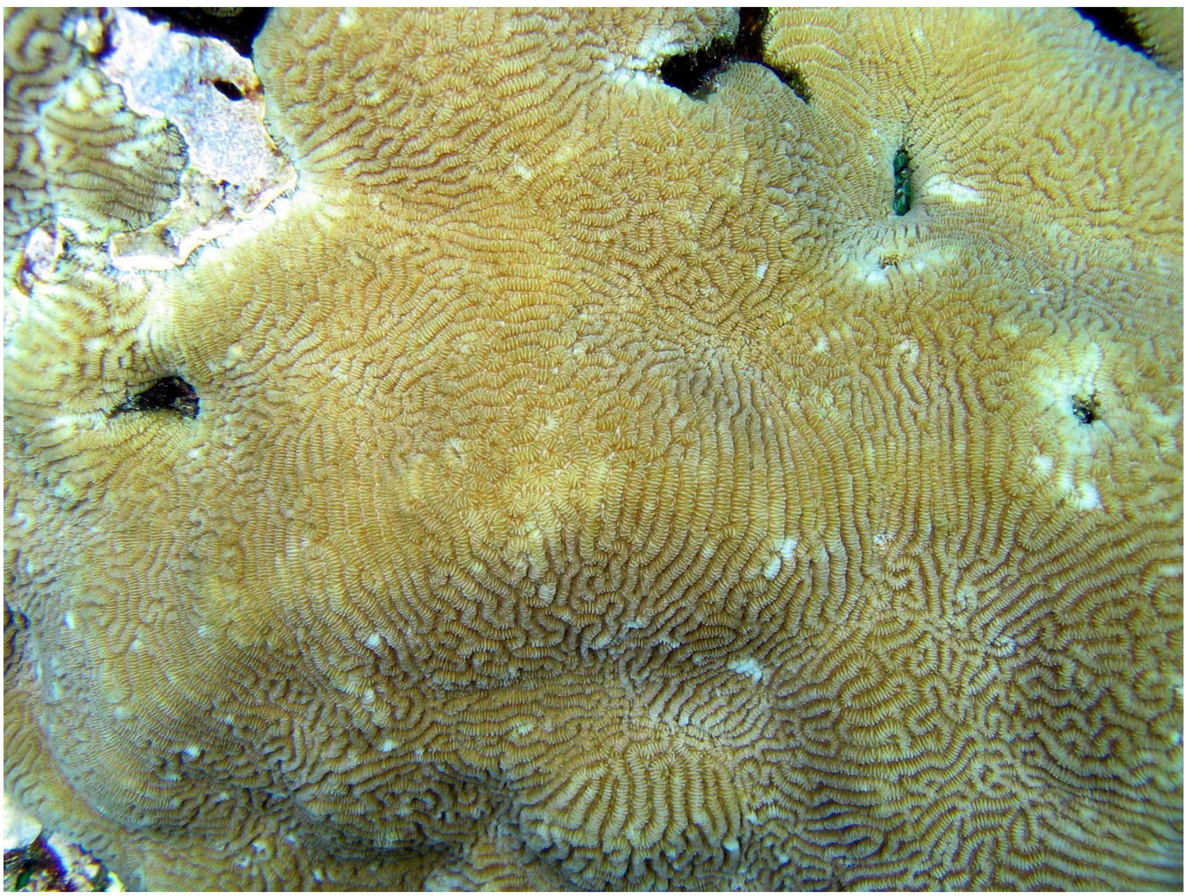
A close photo of *Platygyra ryukyuensis*

Leptoria

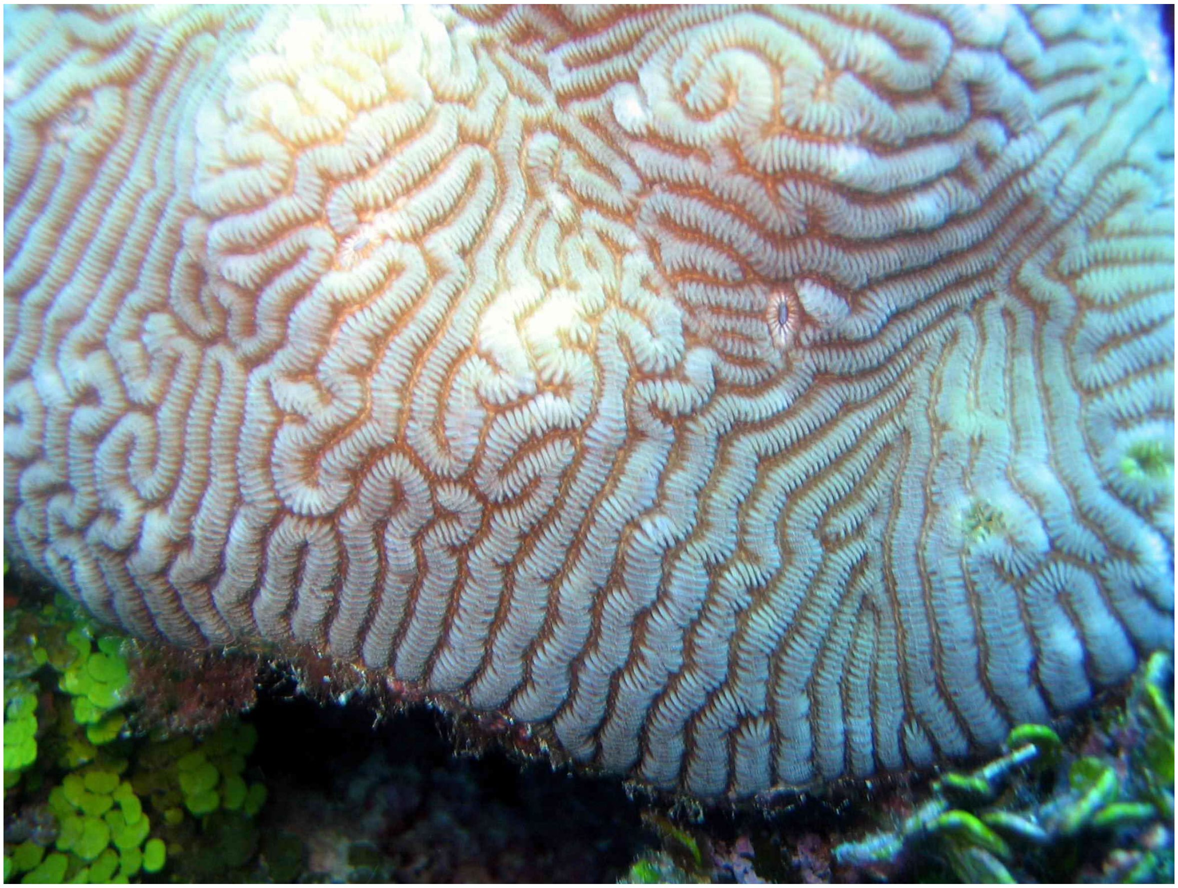
Leptoria forms massive colonies although small colonies may be encrusting. The surface is covered with tiny ridges that wind around, separated by a very thin valley where the corallites are. The ridges are uniform in shape and low, giving the colony as a whole a nearly smooth surface. It has the smallest ridges of any brain coral. Common to uncommon. There is only one species of *Leptoria* in the Samoan archipelago.

Leptoria phrygia (Ellis & Solander) "brain coral"

This coral forms massive encrusting or lumpy colonies with small meandering ridges. The ridges are very short, rounded, and can vary in size across the coral, but are very smooth and uniform. Ridges are smaller than on *Platygyra*. Brown, cream, sometimes fluorescent green between the ridges, common on reef slopes and uncommon on reef flats. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Upolu, Apolima, and Savai'i.



A colony of *Leptoria phyrgia*.



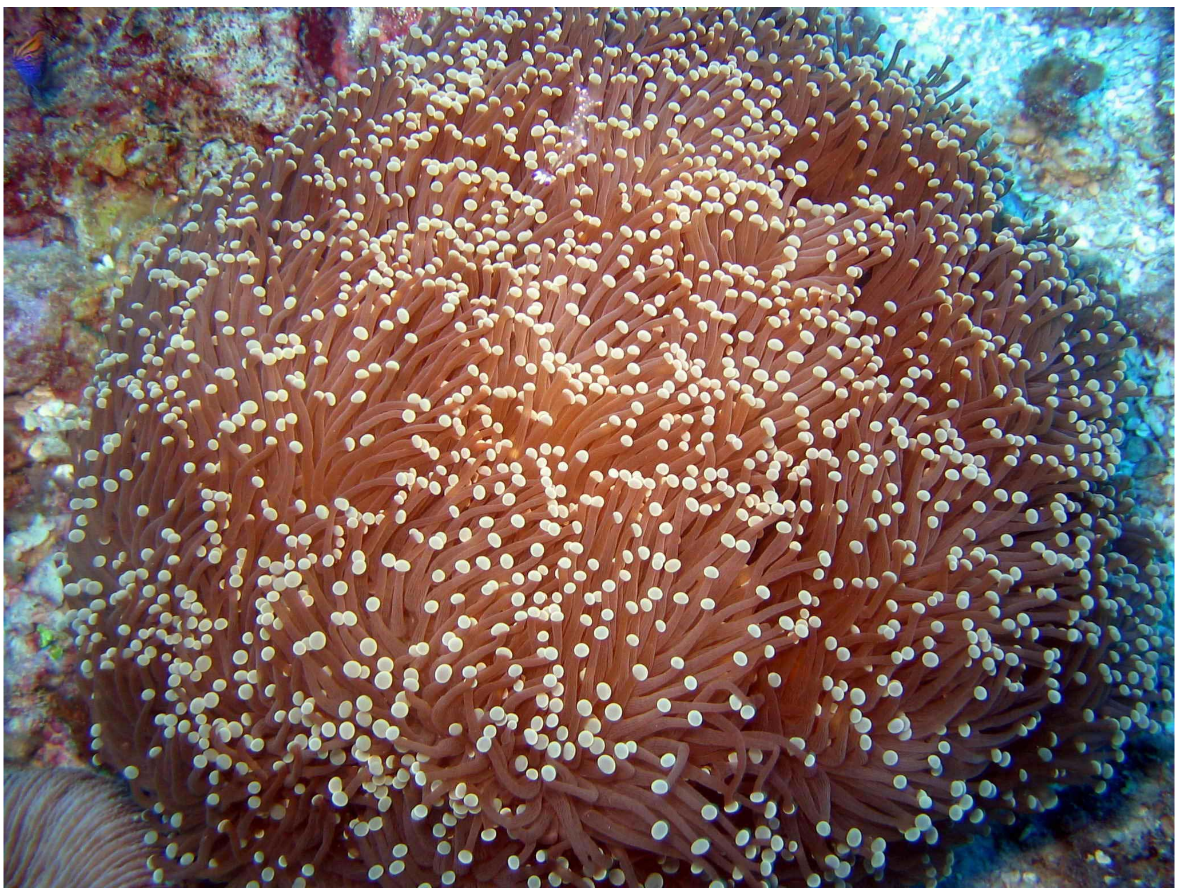
A close-up of *Leptoria phrygia*.

Fimbriaphyllia *These species used to be in Euphyllia.*

Fimbriaphyllia has relatively large tentacles that cover the skeleton. In most colonies here, the tentacles are long and thin and don't branch. Tentacles usually have a white tip. Most colonies have tan or brown tentacles. Some colonies could be mistaken for being massive, because the tentacles cover the skeleton and all you see is the rounded colony shape. But it is branching, so it could be called "submassive." In other colonies the branches are widely spaced and you can see that it is branching. This genus is rare here but easy to identify to genus, as no other coral genus here has tentacles this large. Can look a bit like an anemone, but it has a hard skeleton and never has clownfish which all large anemones here have.

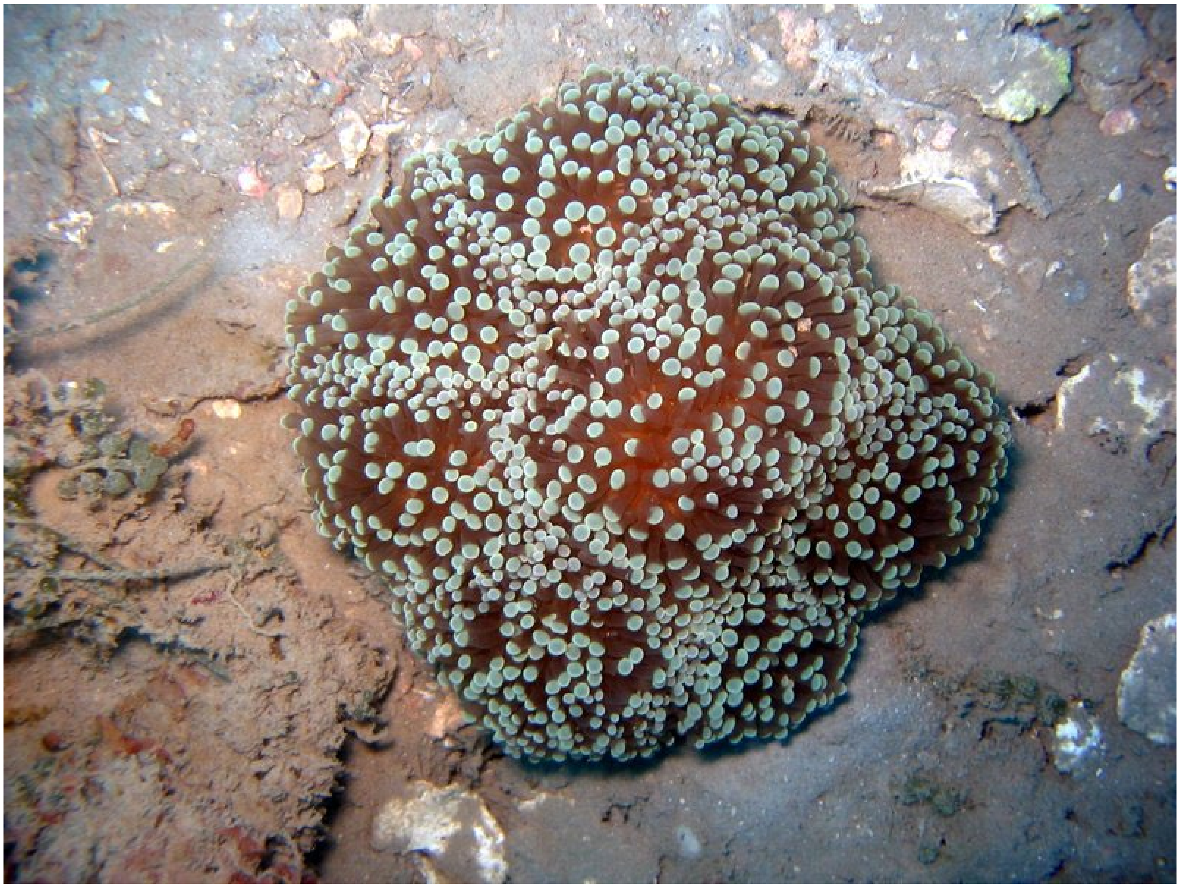
Fimbriaphyllia glabrescens (Chamisso & Eysenhardt, 1821) "submassive"

This coral forms round colonies covered with large anemone-like tentacles which completely obscure the skeleton. The skeleton is branching with polyps only on the ends of branches. The skeleton felt with a finger has at least finger space between branches. The tentacles do not branch. Thin brown or grey or thicker dark brown tentacles, uncommon to rare. *Euphylla paradivisa* has branching tentacles. Found so far on Tutuila, Aunu'u, and Upolu.



A colony of *Fimbriaphyllia glabrescens* with thin brown tentacles.

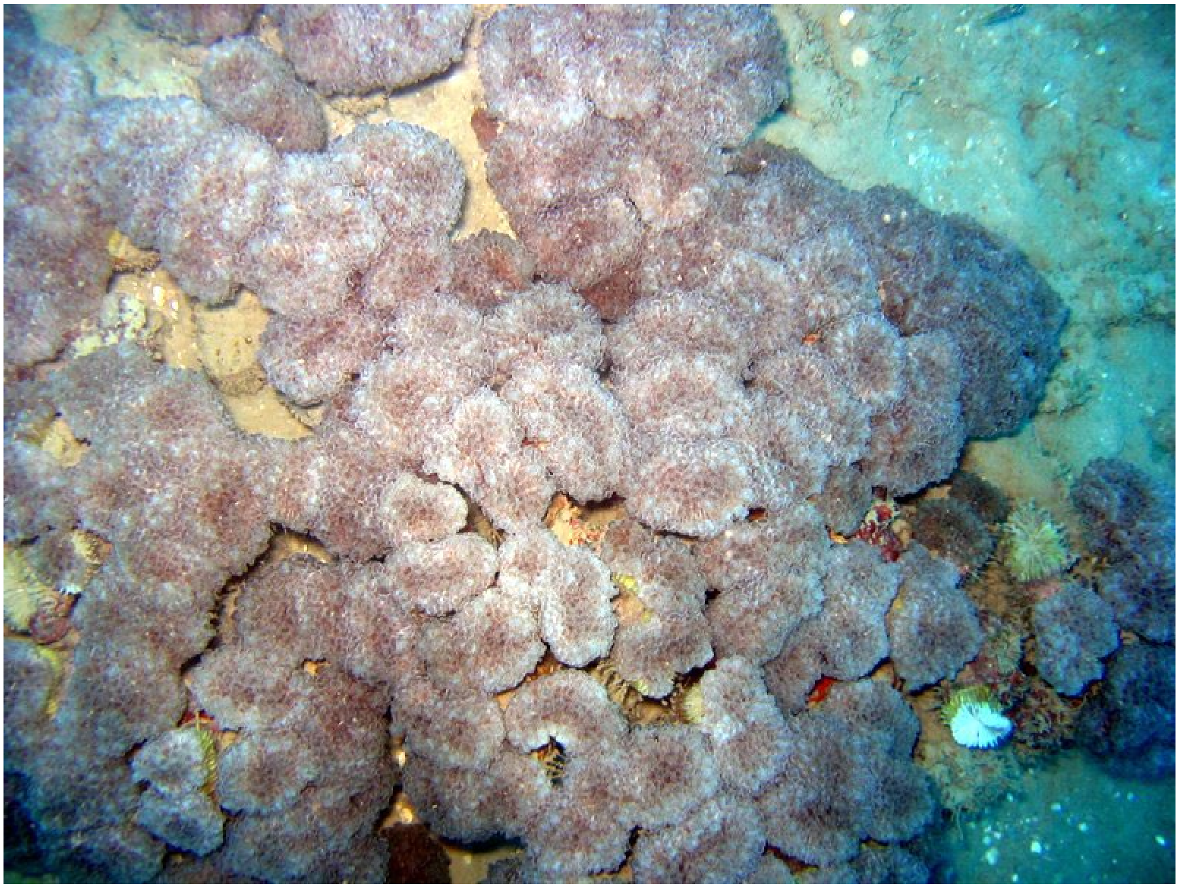
The live polyps and tentacles are at the ends of branches, which are hidden. Here a piece of the colony reveals the branches.



A colony of *Fimbriaphyllia glabrescens* with thicker dark brown tentacles.

Fimbriaphyllia paradivisa (Veron, 1990) Threatened Vulnerable

This coral forms branching colonies with small tentacles covering the ends of branches. Tentacles branch, so that even when partly contracted, different size knobs can be seen on tentacles and branches, side branches of the tentacles have smaller knobs. Some colonies have retracted tentacles and others have them expanded. Light brown or reddish-brown, rare, below reef slope. Found so far on Tutuila.



A colony of *Fimbriaphyllia paradivisa*.

A close-up of *Fimbriaphyllia paradivisa*.

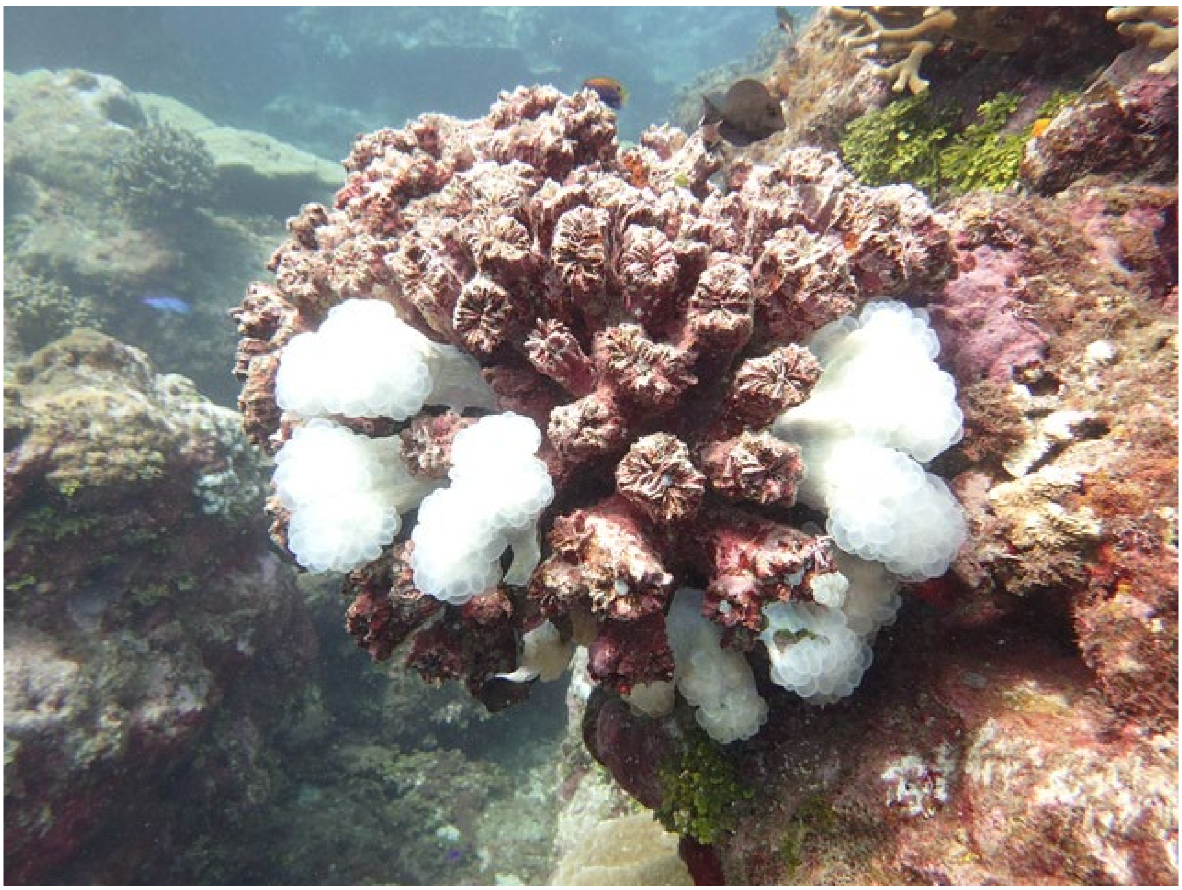
Fimbriaphyllia paradivisa. The dividing tentacles are more easily seen on this colony with expanded tentacles. Photo copyright by Anthony Montgomery.

Plerogyra

Plerogyra has its surface covered with bubbles of thin grey tissue, unlike any other coral. The skeleton is either meandering on a massive base, or short branches. It is very rare here, but easy to identify to genus.

Plerogyra simplex Rehberg, 1892

This coral forms rounded colonies of radiating branches, each branch with a clump of bubbles on the end. The bubbles are round or oval, about 0.5-1 cm diameter, and nearly clear. The branches which the bubbles are on the ends of may be very short or as long as about 5 cm (2 inches). Cream-clear, very rare, reef slopes. *Plerogyra sinuosa* does not have branches. Found so far on Tutuila and Savai'i.



This is a colony of *Plerogyra simplex* with relatively long branches. The white areas are the clusters of bubbles on the ends of branches. The branches are most easily seen where they are dead and covered with pink coralline algae. The living tissue appears to be bleached. Photo courtesy of Alice Lawrence, copyright Alice Lawrence.

A colony of *Plerogyra simplex* with very short branches.

A close-up of *Plerogyra simplex*.

Plerogyra sinuosa (Dana, 1946)

Plerogyra sinuosa is a rounded mass, with continuous bubbles all over it. It does not have branches. The skeleton can only be seen if it is dead, since the bubbles cover it completely during the daytime. Large colonies have the bubbles in sinuous rows, but a large colony has not been found here yet. *Plerogyra simplex* has branches. Very rare here, only one colony seen so far. Found so far on Tutuila.

A photo of *Plerogyra sinuosa*.

A close-up photo of the bubbles on *Plerogyra sinuosa*. The bubbles may be a bit larger than on *Plerogyra simplex*. The bubbles are extended in the daytime, and have the single celled algae we call "zooxanthellae" in them, so extending them during the day exposes the algae to light so they can photosynthesize. At night the bubbles are retracted and small tentacles extended to catch zooplankton.

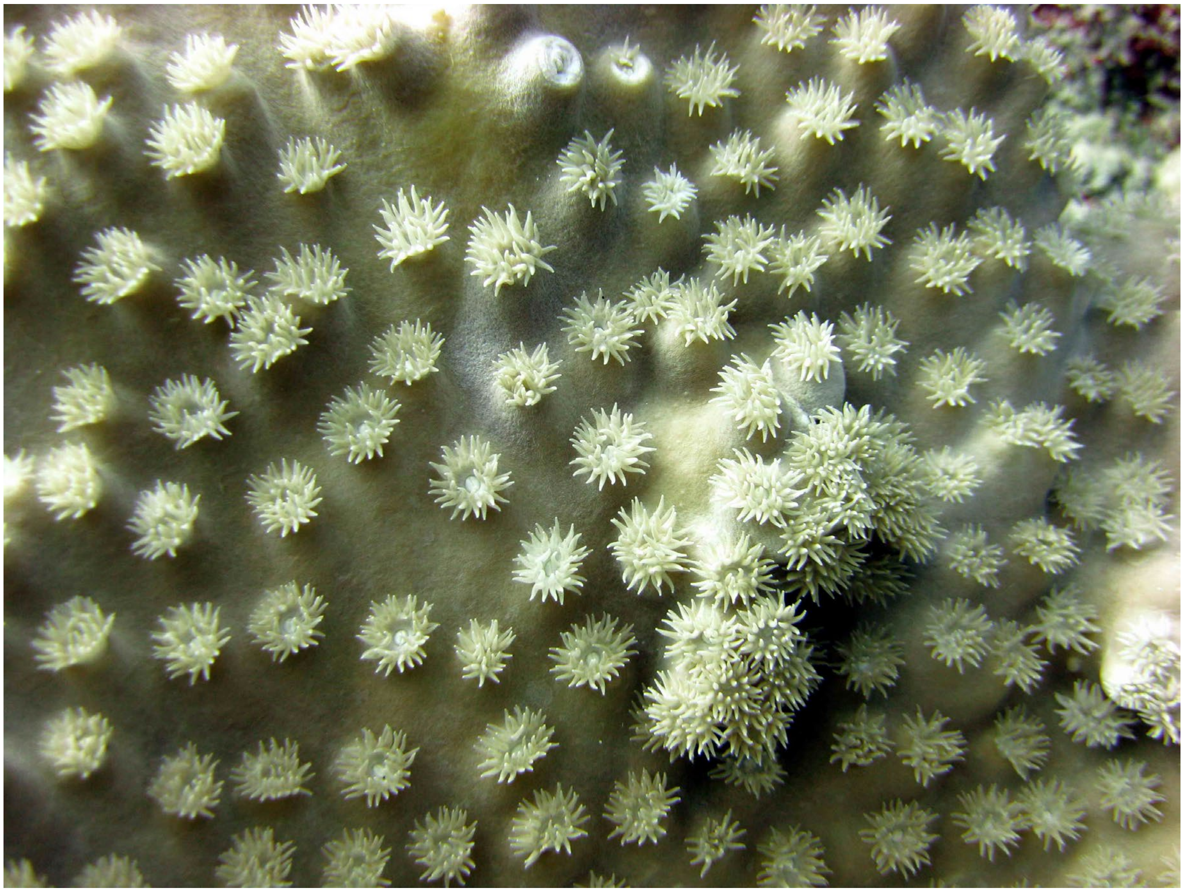
Turbinaria

Turbinaria forms plates or encrusting colonies. Corallites are round projections and may be relatively widely spaced. The space (coenosteum) between the corallites is smooth. Corallites vary from about one eighth inch (3 mm) diameter to a quarter inch (6 mm) diameter. Plates can be thin or thick. Yellow-green, brown, or grey. Uncommon. Corallites and the surface between them are smoother than on *Astrea*, *Echinopora*, or *Cyphastrea*, and colonies are often plates or may be encrusting, while *Astraea* is massive and *Cyphastrea* does not form plates

Turbinaria peltata (Esper, 1794) Vulnerable EDGE

This coral forms large thick plates up to at least 3 feet (1 m) across. Corallites are large and usually widely spaced with smooth surface between them, and the tentacles are almost always extended. Rare, gray, below the reef slope at Amaua. Other species of *Turbinaria* have smaller corallites and thinner plates. Found so far on Tutuila, Aunu'u, and South Bank.

A colony of *Turbinaria peltata* with tentacles retracted.



A close-up of *Turbinaria peltata* with tentacles extended.

Turbinaria mesenterina (Lamarck, 1816) Vulnerable EDGE

This coral forms thin plates with small low corallites on the upper surfaces; colonies may be large. Plates are usually curved and may be twisted or coiled such that undersurfaces can be seen. Polyp tentacles may be extended. Grey or tan, rare except in the Ofu pools. *Turbnaria peltata* has larger corallites, *Turbinaria reniformis* is yellow, and *Turbinaria stellulata* is encrusting. Found so far on Tutuila, Ofu-Olosega, Ta'u, Muliava (Rose Atoll), and Upolu.

A large field of colonies of *Turbinaria mesenterina*.

A colony of *Turbinaria mesenterina* with ruffled or twisted plates.

A close-up of *Turbinaria mesenterina* with its tentacles extended.

Turbinaria reniformis Bernard, 1896 Vulnerable EDGE

This coral forms thin plates which may form whorls but do not curve or coil such that the underside can be seen. Corallites are small and low, and the tentacles are usually extended. Brown-green with yellow polyps, or entirely yellow, fairly common some places like Fagatele Bay, the Ofu pools, and Rose Atoll, but otherwise uncommon. *Turbinaria peltata* has larger corallites, *Turbinaria mesenterina* is not yellow, and *Turbinaria stelluata* is encrusting. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Ta'u, Muliava (Rose Atoll), and Upolu.

A colony of *Turbinaria reniformis*.

Part of a colony of *Turbinaria reniformis* in which only the polyps and plate edges are yellow.

A close-up of *Turbinaria reniformis*.

Turbinaria stellulata (Lamarck, 1816) Vulnerable EDGE

This coral forms encrusting colonies that may have a little bit of their edge raised as a plate. The corallites are small but project as short tubes, the tentacles are usually not extended. Brown or purple with white corallite tips, rare, reef slopes. Other *Turbinaria* here form plates. Found so far at Tutuila, Ofu-Olosega, Ta'u, Muliava (Rose Atoll), and Savai'i.

A colony of *Turbinaria stellulata*.

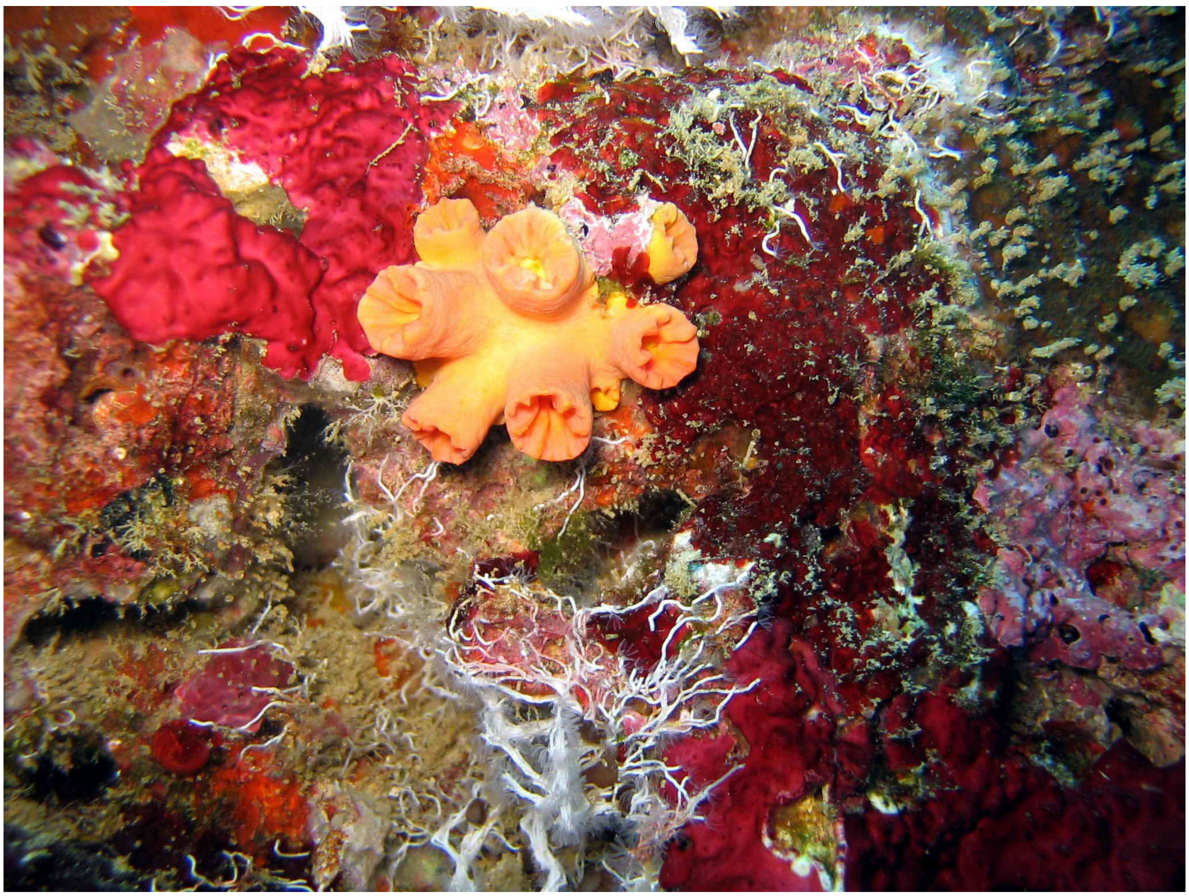
A close-up of *Turbinaria stellulata.*

Tubastraea

Tubastraea forms small cushions with radiating cylindrical corallites. Corallites are about an eight to quarter inch (6 mm) diameter. Colonies are only found in shaded locations like overhangs, and are azooxanthellate. Bright orange. Rare, but uncommon on the vertical wall areas of the northern side of the harbor. No other coral forms cushions of radiating cylindrical orange corallites.

Tubastraea coccinea Lesson, 1829 "Orange Tube Coral"

This coral forms small clumps of radiating tube-shaped corallites. Corallites about the diameter of a pencil. They live on vertical walls or overhangs. Orange, seen only at Aua, Tutuila, on the reef slope. *Rhizopsammia* has orange tissues and looks very similar but forms single polyps and small branching colonies. Found so far on Tutuila and Savai'i.



A colony of *Tubastraea coccinea*.

A colony of *Tubastraea coccinea*.

Rhizopsammia forms "runners" or stolons at the base of colonies, from which other colonies bud. The runners function like "runners" on strawberries, as a method of starting a new colony, asexual reproduction. This is an azooxanthellate genus.

Rhizopsammia verrilli Host, 1926

This coral forms single small corallites which can branch. The base can have a rounded "runner." Colonies are orange and the runners are the same color unless covered. They live on vertical walls or overhangs. *Tubastraea coccinea* is similar but forms lumps. Rare. Found so far on Tutuila.

This is a group of *Rhizopsammia verrilli*. One individual near the center has the basal part of the coral covered with red coralline algae, and a rounded ridge going to the left from the base is a runner covered with red coralline algae.

Several *Rhizopsammia verrilli*. A few have small side branches.

Endopsammia is a tiny, solitary (single-polyp) coral that also does not have zooxanthellae.

Endopsammia regularis (Gardiner, 1899)

This coral forms tiny single polyps on the undersides of rubble on the reef flat behind the reef crest. About 5 mm tall and wide, known only from Fagaitua, Tutuila so far. Previously known only from one location in New Caledonia. Light yellow, reef flat under rubble. Rare, Found so far only on Tutuila. Smallest single corallite coral yet found in American Samaoa. Identified from skeleton by Dr. Stephen Cairns.

A close-up of *Endopsammia regularis* from the side.

A picture of *Endopsammia regularis* from above. Notice the size of the sand grains for reference.

Class Octocorallia or Alcyonaria ‘octocorals’

Octocorals have exactly eight tentacles, and each tentacle has small regular side branches called “pini”. Some, called “soft corals,” are very fleshy and can form at least some external skeleton below them that is solid, without corallites. Some (gorgonian) do not form calcium skeletons, but one here is not fleshy and does form a hard skeleton. The Octocorals include all of the soft corals, gorgonians, and sea pens, plus a couple of hard corals, *Heliopora* and *Tubipora*. Both of these have the zooxanthellae single-cell algae in their cells just like the Scleractinia. Many soft corals and gorgonia also have zooxanthellae, but many others do not. *Heliopora* and *Tubipora* do form skeletons of calcium carbonate (aragonite) with a thin tissue layer over them, much like Scleractinia. Soft corals are much fleshier than Scleractinia, but some do produce hard calcium underneath their tissues. They produce tiny knobs of calcium carbonate (aragonite) called “sclerites” in their tissues and move them down slowly and then extrude them beneath them and glue them to what is already there. Many species thus build an undulating smooth platform beneath them, which is as hard as the skeleton of Scleractinia. One species of *Sinularia* builds it in the shape of thick branches that can be up to at least 2 meters (6 feet) tall, and there are a few places in reefs where the reef is made more of this material (called “spiculite”) than skeletons of Scleractinia. Most gorgonians are branching and have a flexible rod in the center of the branch under the thin layer of tissue.

Order Helioporacea or Coenothecalia

This order has only one family: Helioporidae.

Family Helioporidae

This family has only one genus: *Heliopora.*

Genus Heliopora

Heliopora is one of only two genera of Octocorals that are not fleshy and form large solid skeletons. There are only two species, and Manu’a is the most eastern-most place the genus is known from. The only common species of *Heliopora* forms branching colonies, with branches usually extending vertically. Branches may be round but usually are flattened, and can be curved or even winding. Branches are very smooth with no corallites visible, except for tiny pores or holes for the tiny polyps. If the polyps are out they appear as a white fuzz, and if examined very closely you might be able to see individual polyps with tentacles. It is a light blue to brown color. If the skeleton of the species here is broken, it is a vivid dark blue (the other species has a white skeeton). It is uncommon on reef slopes and in pools on Ofu-Olosega, Swains, also present on the seamount called South Bank 40 miles (64 km) south of Tutuila, at 80+ feet (24 m) deep, not seen elsewhere, and rare on Tutuila (one colony seen). Olosega is the eastern most place it is known from on the planet. It is actually an Octocoral like the soft corals and gorgonians. The polyps are smaller and the surface smoother than on any Scleractinian corals, and the blue color of the skeleton is unique.

Heliopora coerulea (Pallas, 1776) “Blue Coral” Vulnerable

This coral forms thin smooth blue-grey vertical paddles and/or columns which may have a thin white fuzz coating of polyps extended. Blue-grey, not uncommon in the Ofu pools, but very rare or absent elsewhere. Their skeleton is dark blue.

A large colony of *Heliopora coerulea*.

Colonies of *Heliopora coerulea*. The colonies in the center have their polyps out, the others do not.

Subphylum Medusozoa

These organisms alternate generations between polyps and medusae (jellyfish). Some have prominent polyps and tiny medusae, others have prominent medusae and tiny polyps.

Class Hydrozoa

Class Hydrozoa contains hydroids, some small jellyfish, and several genera that produce hard skeletons, including the last three genera. All hydrozoans alternate generations between small polyps which asexually produce medusa (jellyfish), which in turn produce eggs and sperm which when fertilized grow into polyps. In some hydrozoa the polyp stage is obvious and the medusa stage less so and in others it is the other way around. The stage that produces the skeletons we see in the next three genera are all colonial polyp stages and produce tiny medusa (about 1 mm diameter or less) that then release eggs and sperm.

Order Hydrocorallina *"hydrocorals"*

This order contains the genera that have colonial polyp colonies that produce calcium carbonate (aragonite) skeletons, suborders Milleporina and Stylasterina. One genus (*Millepora*) is zooxanthellate and a common contributor to coral reefs, and several genera are azooxanthellate, only two of which are on coral reefs (*Distichopora* and *Stylaster*).

Suborder Milleporina

This suborder has only one family and genus:

Family Milleporidae

Genus Millepora "Fire Corals"

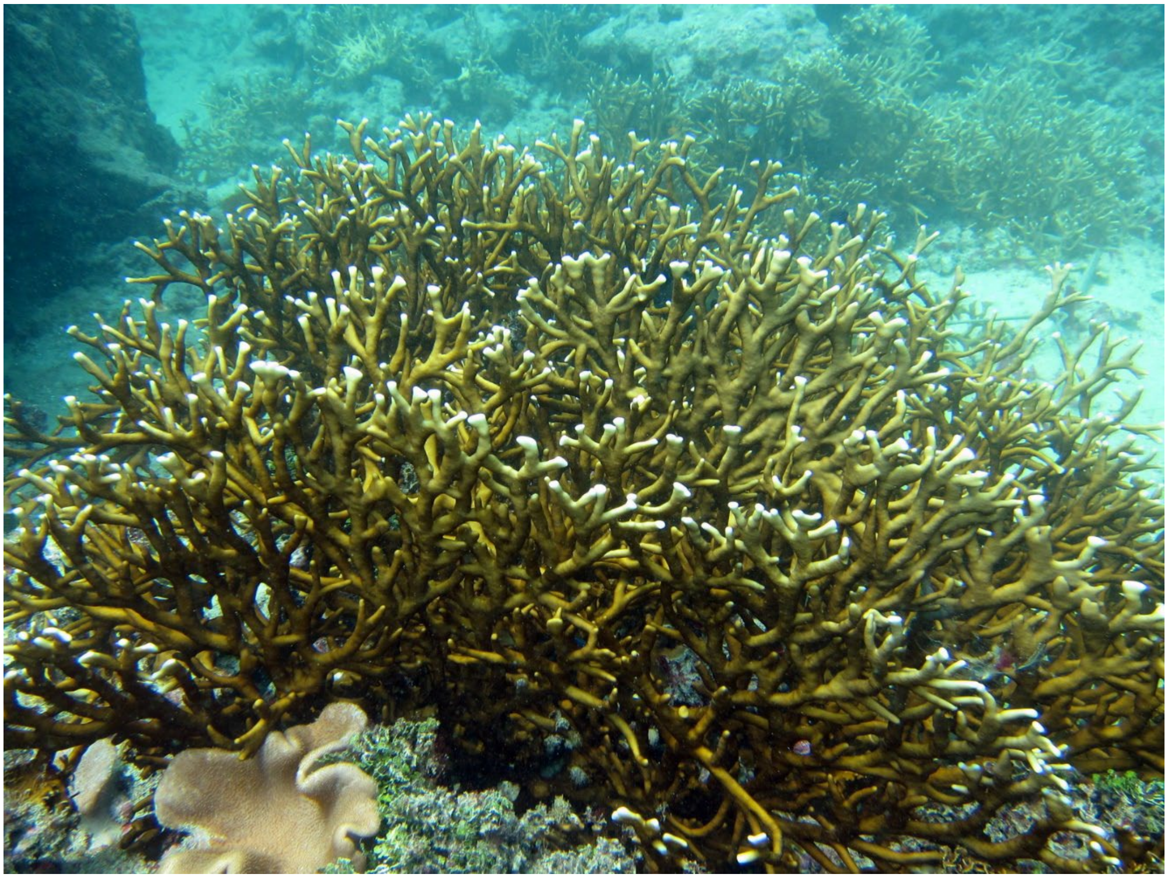
Millepora means "thousands" (= Mill) of pores. This is because it has many very tiny polyps and tiny holes or pores in the skeleton where the polyps are. Unless you look very closely with back lighting or use a magnifying glass, you won't see any corallites or pores. It is actually a hydrozoan, and reproduces by producing tiny medusae (jellyfish) which are brooded in tiny pockets in the skeleton and then released. The medusae quickly produce eggs or sperm, which when united become a larva which settles and becomes a polyp that founds a new colony.

Millepora is fairly fast growing. Branching species are also some of the most sensitive to mass coral bleaching.

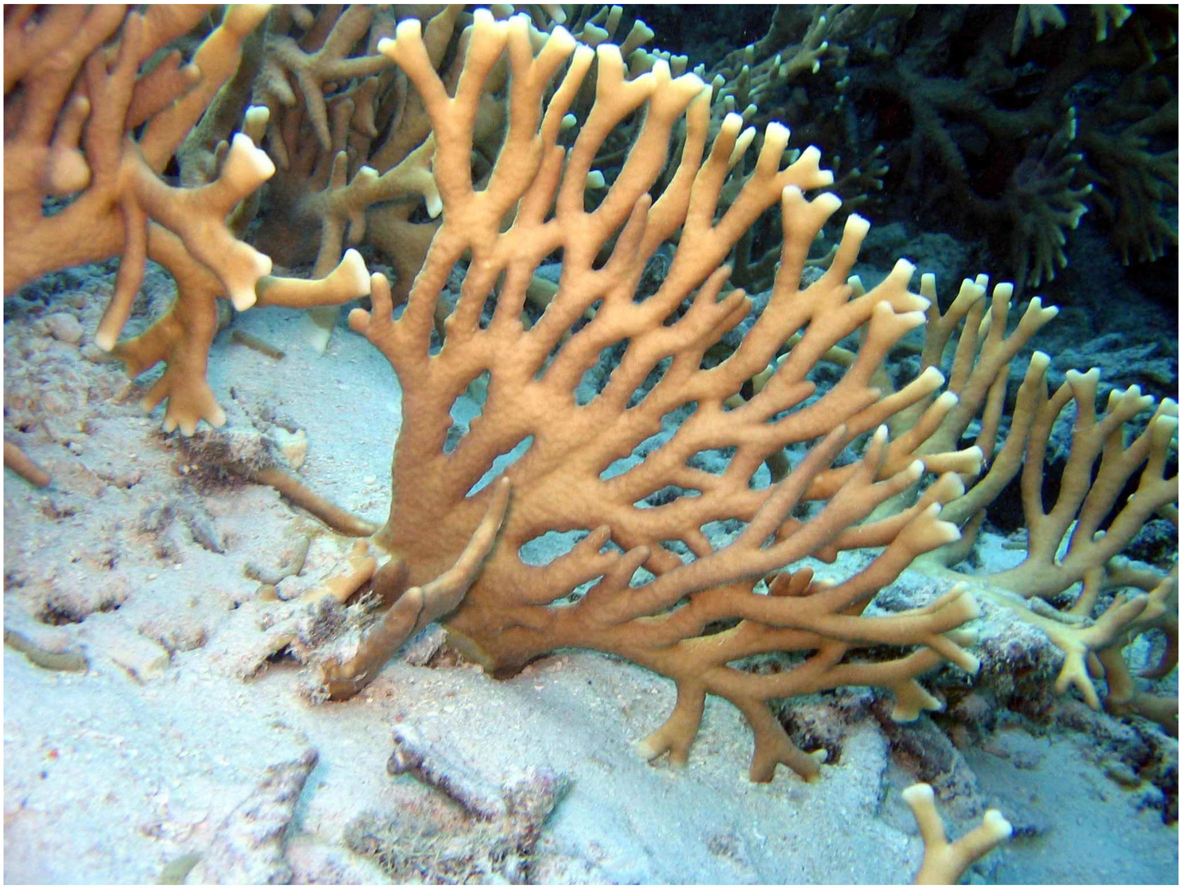
Millepora can be encrusting, encrusting base with vertical paddles, or branching. Surfaces may be smooth or bumpy. Colony shapes are highly variable. It is most often yellow or brown, but can be light green, pink, or dark reddish-purple. They have zooxanthellae and are found in light. Touching it with anything but your finger tips will likely give a sting, and it is the only coral that can sting humans. They are called "fire corals" because of their sting. Other hydrozoans like the feathery hydroids can sting as well, but they do not have skeleton. The smooth yellow-brown colonies are distinct, and no other hard coral can sting humans.

Millepora dichotoma Forskål, 1775

This coral forms smooth branching colonies that usually form fans and which often have the branches anastomosing, though not always. Branches are nearly round and usually about 1 cm (3/8 in) thick, and are a yellow-tan color. Branches are well-spaced. Branches on *Millepora murrayi* are vertical, close together, and a few curve downward with branches on their upper edge. Found in backreef pools, the cluster of colonies in the airport pool has probably been killed by bleaching. Rare on upper reef slopes. Stings. *Millepora murrayii* has branches that grow vertically with little if any anastomosing, and a few branches curve downward and have branches growing upward from their upper surface. No other species is branching here. Found so far on Tutuila, Aunu'u, Ofu-Olosega, and Upolu.



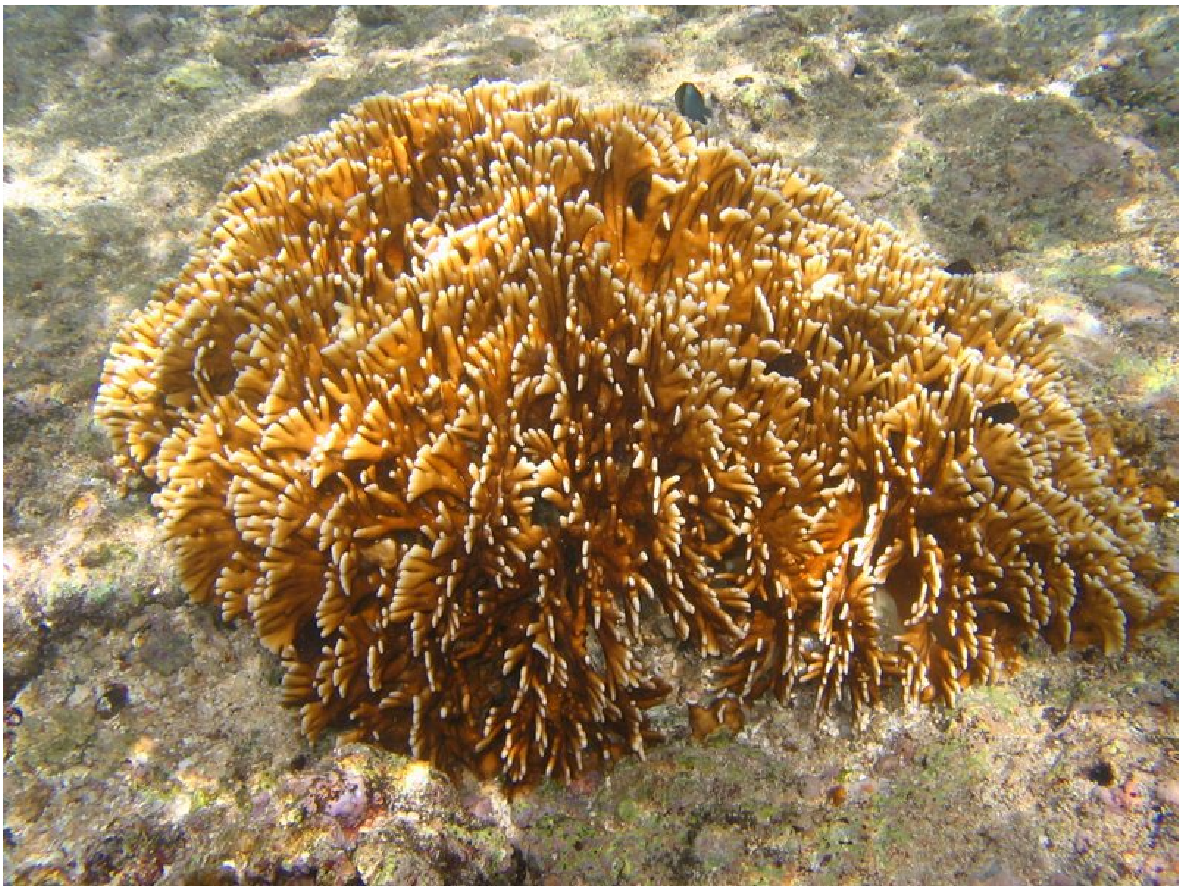
A bushy colony of *Millepora dichotoma*.



A single fan of *Millepora dichotoma* from the Tutuila airport pool.

Millepora murrayi Quelch, 1884

This coral forms smooth branching colonies that form mounds of fans of branches projecting in all directions. Most branches grow upward, forming rows of vertical branches that are close together, but some branches curve downward as they grow outward and have branches extending upward from their upper surface. Branches are about 0.5 cm diameter, are round and smooth, and an orange-yellow or cream color. Found so far in two backreef pools in the harbor and the Ofu pools. Stings. All colonies in one of the two harbor pools were killed by the 2016 bleaching. All colonies in the Ofu pool were dead when first observed in 2004, likely from the bleaching in 2003, but recovered in subsequent years and then were killed again in 2015-17. This species has not been shown in any field guides previously. *Millepora dichotoma* does not form ogives, and it is the only other branching species found here so far. Found so far on Tutuila and Ofu.



A colony of *Millepora murrayi* on Tutuila.

A bushy colony of light colored *Millepora murrayi* in the Ofu pools. Photographed in 2011.

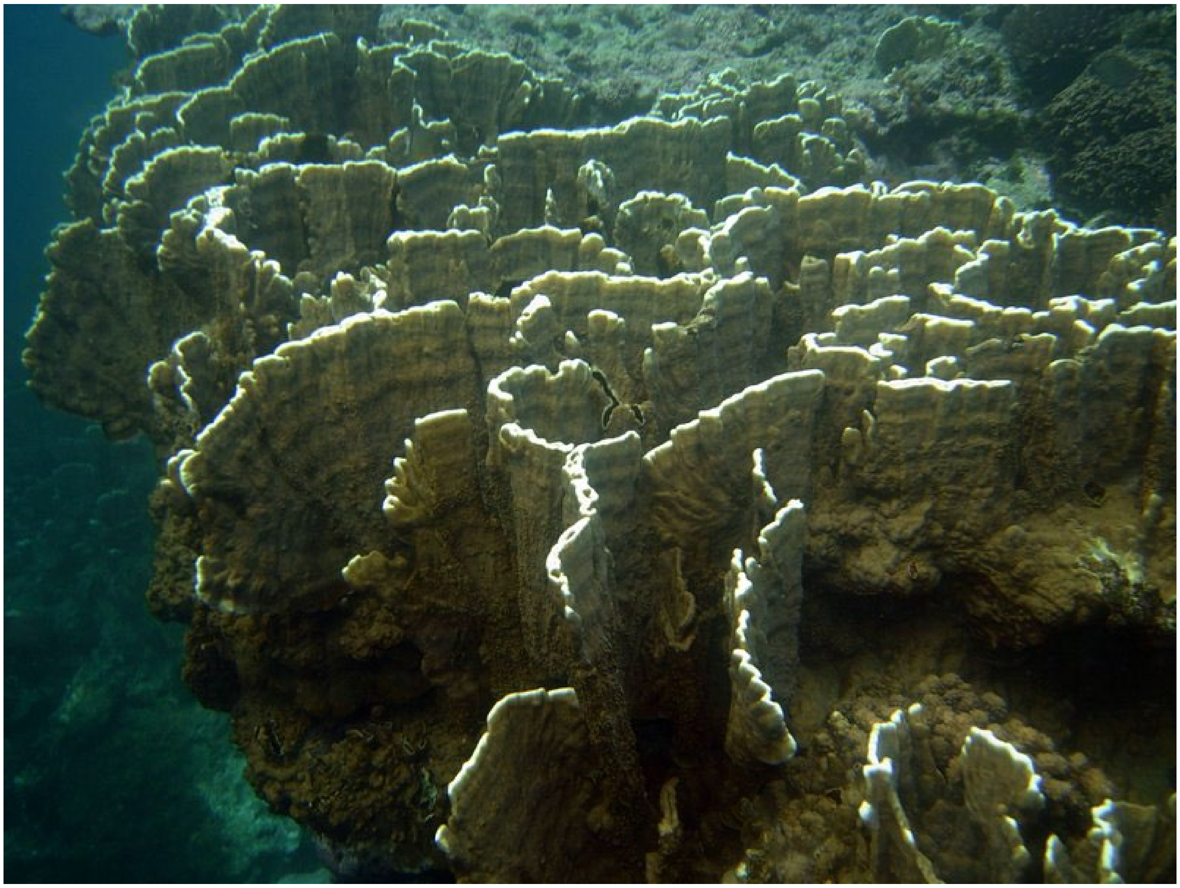
A close-up showing the branches on *Millepora murrayi*.

A close-up of *Millepora murrayi* that shows the downward curved “ogives” that have branches growing upward from their upper surface.

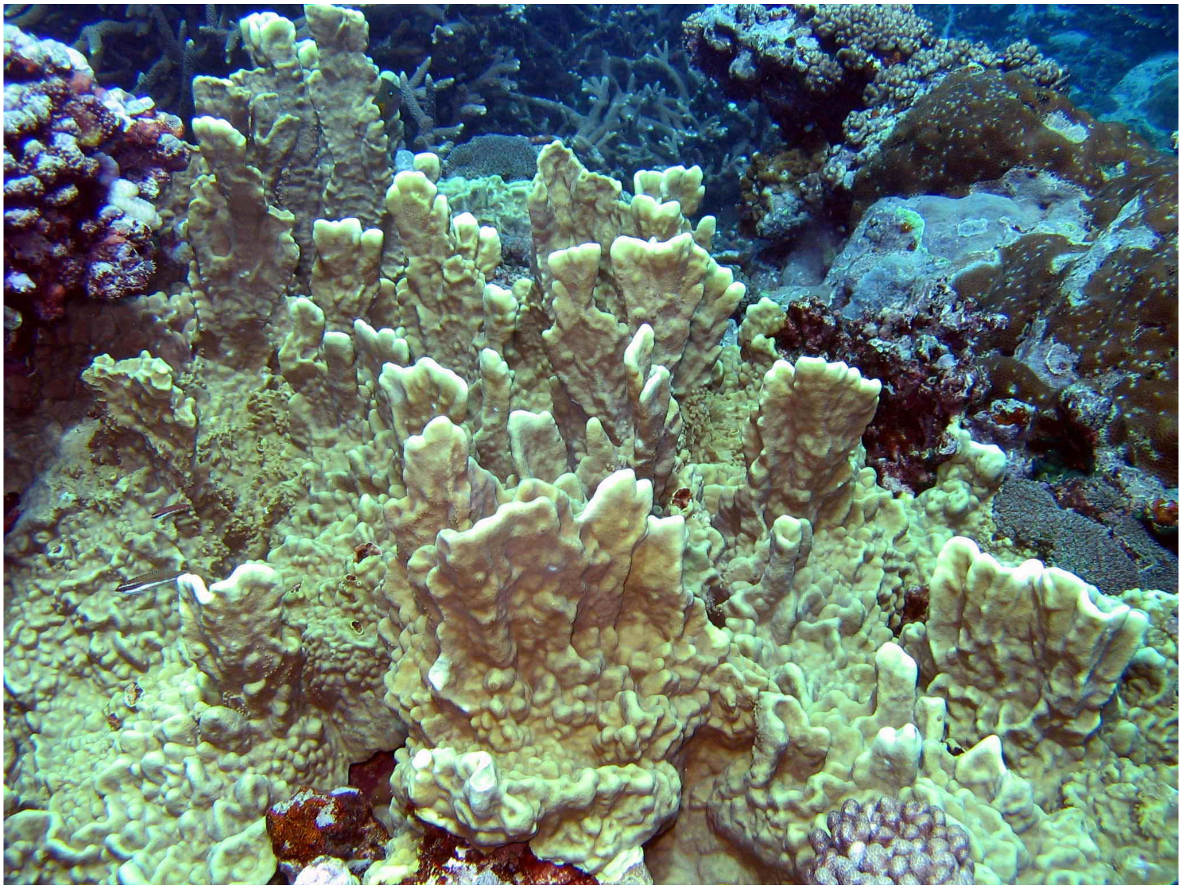
An extreme close-up of *Millepora murrayi* showing the tiny polyps.

Millepora platyphylla Hemprich & Ehrenberg, 1834

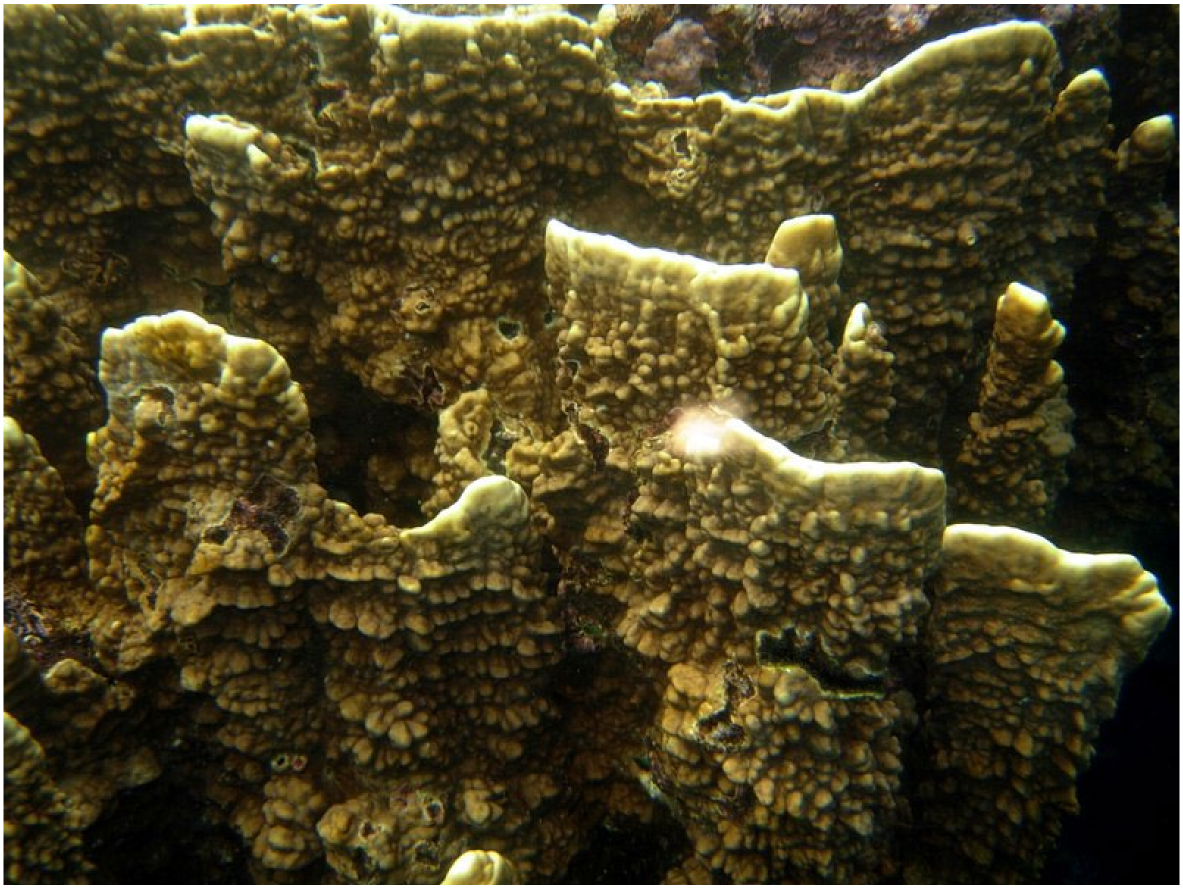
This coral forms encrusting colonies with thick paddle-shaped columns and plates growing up from them. The upper edges of paddles and plates are flat or rounded, and they are commonly about 1 cm (3/8 in) thick. Colonies are dark brown with light yellow tops on columns and plates. Fairly common, on upper slopes and reef crest. Stings. Other species of *Millepora* are branching or encrusting. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Muliava (Rose Atoll), Upolu, Apolima, and Savai'i.



A plating colony of *Millepora platyphylla*.



A colony of *Millepora platyphylla* with an encrusting base.



A very rough colony of *Millepora platyphylla*.

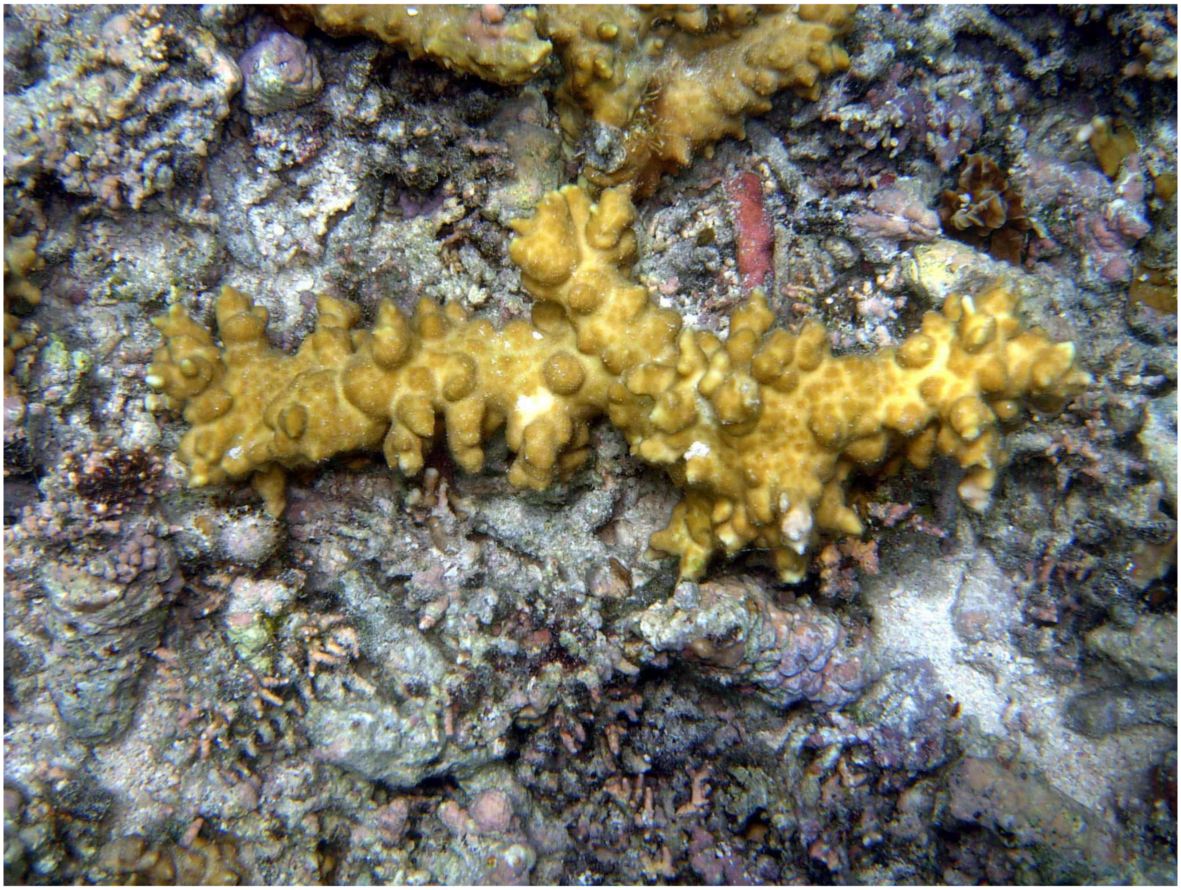
A colony of *Millepora platyphylla* with thick plates.

A colony of *Millepora platyphylla* with low fused ridges.

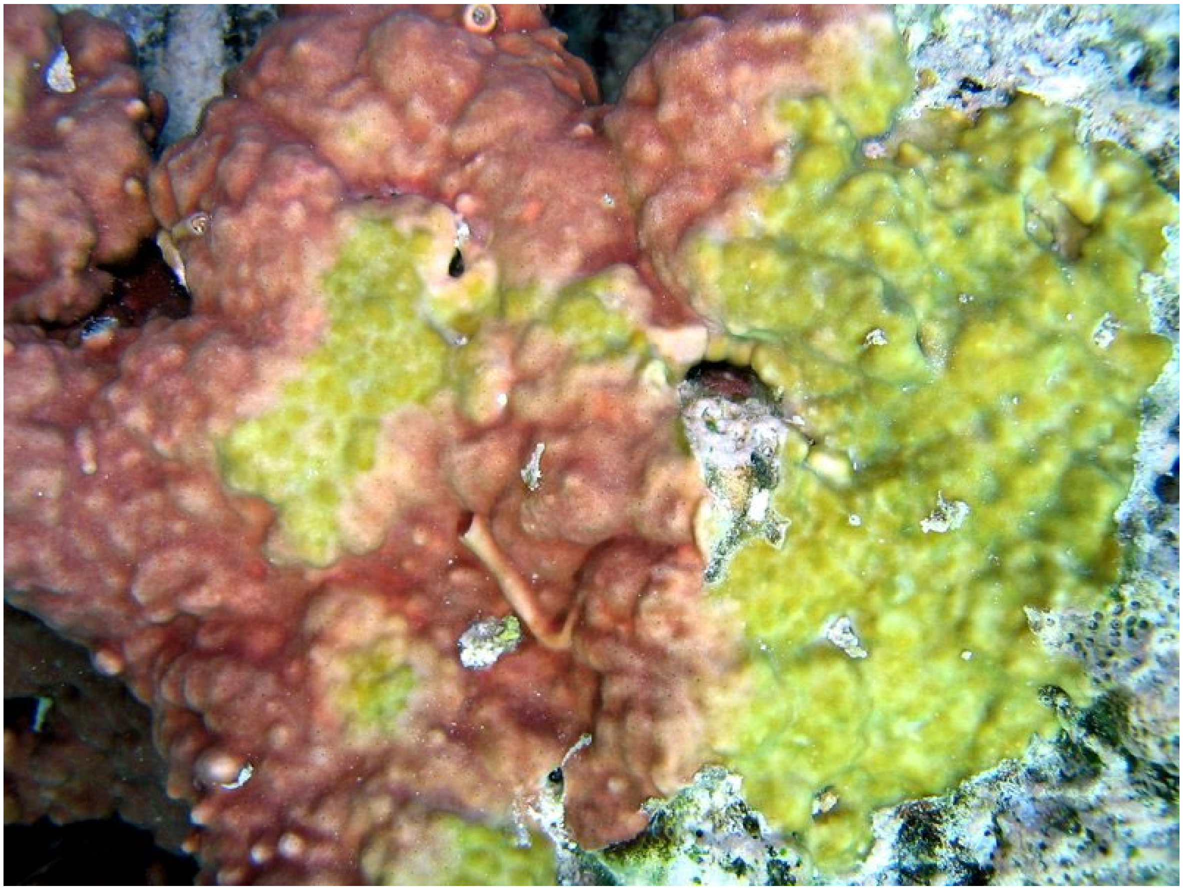
A rare colony of *Millepora platyphylla* with columns.

Millepora exaesa Forskål, 1775

This coral forms bumpy colonies that encrust rubble. Most colonies are a greenish yellow color with some small spotting, but some colonies are pink-purple, and some colonies have some of both. Does not bleach easily. Found in backreef pools. Stings mildly. *Millepora tuberosa* forms large purple encrusting colonies on reef slopes with smaller bumps. Other *Millepora* are not encrusting except bases of *Millepora platyphylla*. Found so far on Tutuila, Aunu'u, Ofu-Olosega, and Ta'u.



A colony of *Millepora exaesa* encrusting rubble.

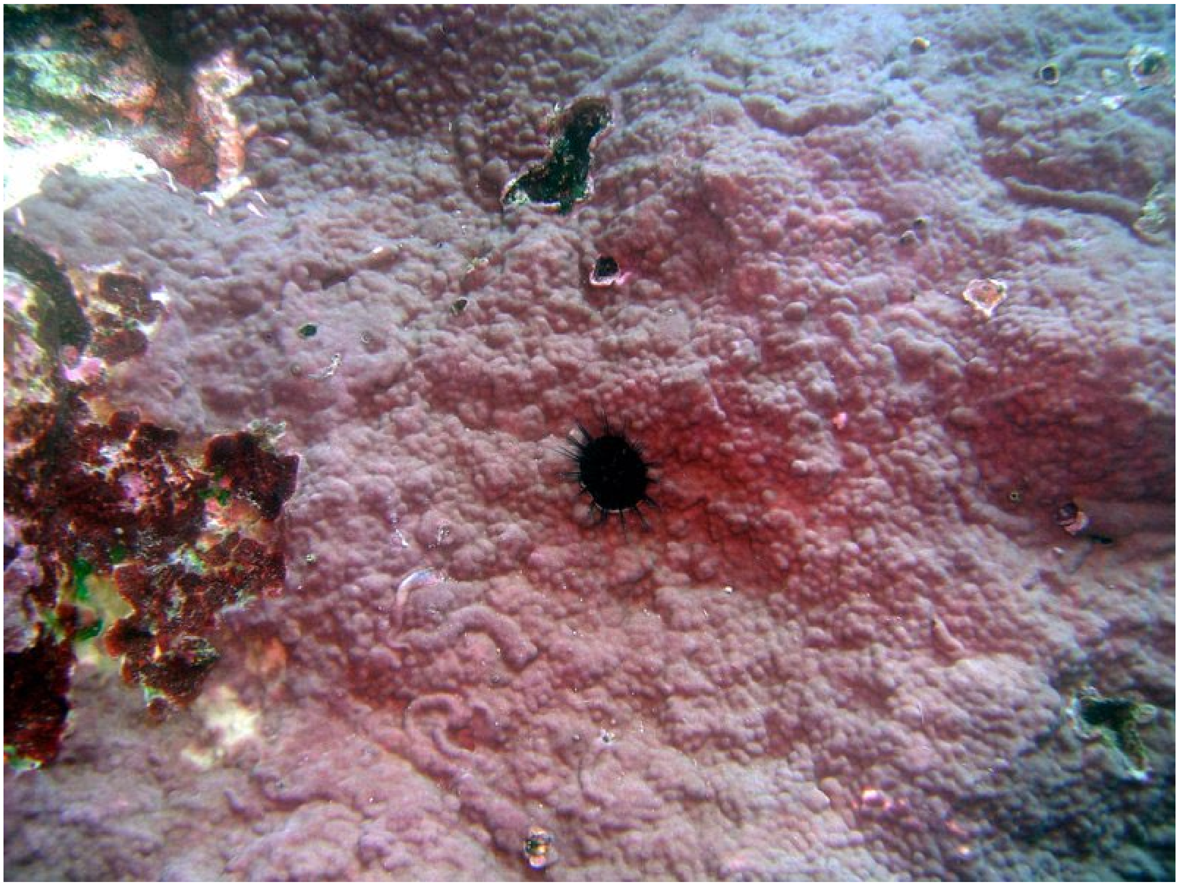


A colony of *Millepora exaesa* that is partly green and partly red.

A colony of *Millepora exaesa* that shows a common spotting pattern.

Millepora tuberosa Boschma, 1966 Endangered (Red List)

This coral forms encrusting, very dark red to purple sheets with small bumps. Very close examination reveals a slight texture from tiny pits where the polyps are located. Rare, on reef slopes. Stings mildly. *Millepora exaesa* forms smaller encrusting colonies that are not dark purple and is found in backreef pools where it encrusts rubble. Other *Millepora* species are not encrusting other than the bases fo *Millepora platyphylla*. Found so far on Tutuila, Aunu'u, and Ofu-Olosega.



A colony of *Millepora tuberosa*.

A close-up of *Millepora tuberosa*. The pores where the polyps live are just visible.

Family Stylasteridae has several genera in it, all of which are azooxanthellate, only two of which have species on coral reefs.

Stylaster

Stylaster is a genus with what appears to be only one species in shallow water in the Samoan archipelago, but there are apparently many Pacific species and they are in need of taxonomic revision. *Stylaster* forms little fans of bright pink, red, or purple that are in shaded holes. The fans have thin, intricate branches. They do not have zooxanthellae. *Millepora* is yellow-brown, is found in the light, and is zooxanthellate. *Distichopora* has thicker branches that are smooth and often is purple.

Stylaster sp. "Lace Coral"

This coral form small fans of thin pink to purple to white branches. Branches are rough with corallites, and often have a zig-zag look. Colonies are about 1-4 cm (½ -1 ½ in) tall. They are exclusively found under overhangs. Not uncommon in cavities. The species name is not known. Found so far on Tutuila, Aunu'u, Ofu-Olosega, Muliava (Rose Atoll), Swains, Upolu, and Savai'i.

A colony of *Stylaster* attached to the ceiling of an overhang.

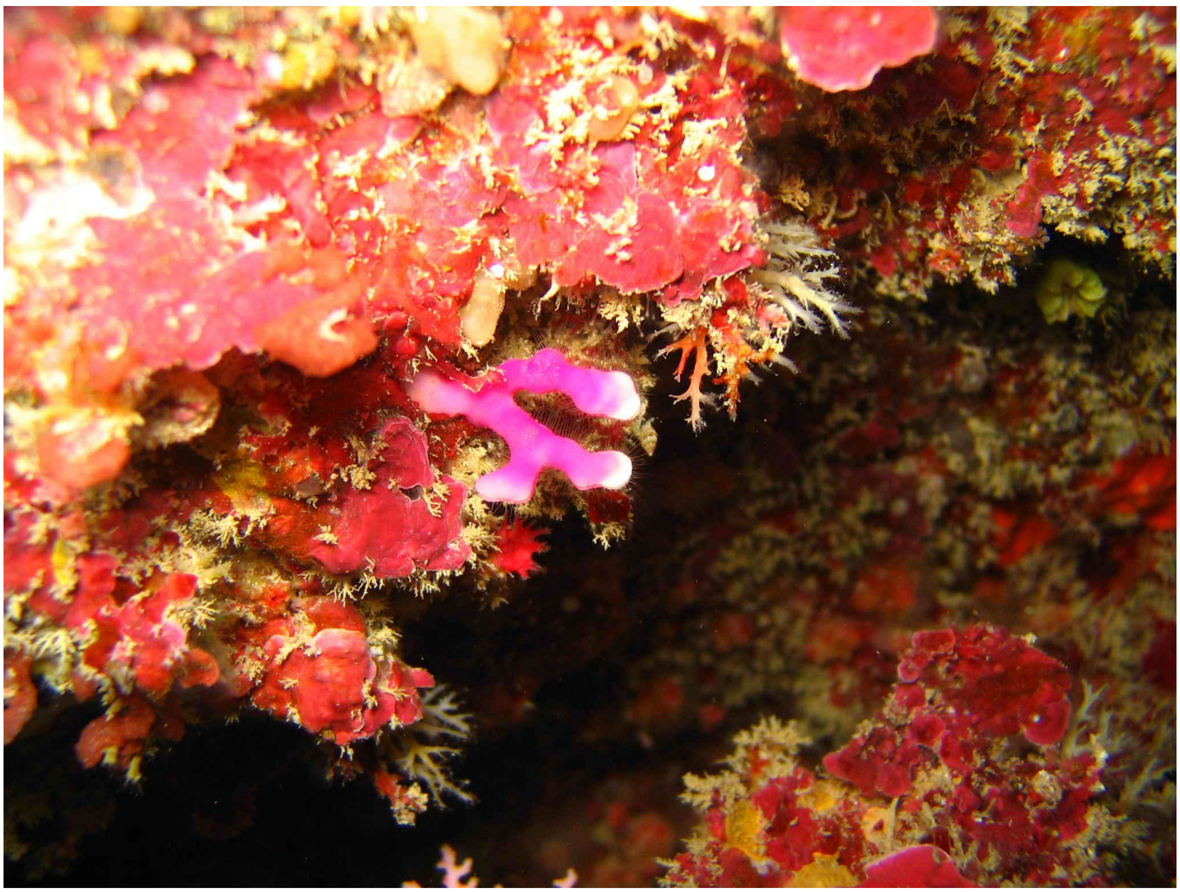
Three colonies of *Stylaster*.

Distichopora

Distichopora is a genus with only one species found in shallow water in the Samoan archipelago. They form very small purple colonies with thick oval smooth branches, in shaded holes. They do not have zooxanthellae. Millepora is yellow-brown, found in the light, and is zooxanthellate. *Stylaster* has thinner, more zig-zag branches.

Distichopora violacea (Pallas, 1766)

This coral forms small smooth fans of purple branches, often with white tips (the name refers to the purple color). They are almost exclusively found under overhangs. The branches are much larger and smoother than *Stylaster*, and have rounded tips. Colonies here are about 1-3 cm (½ - 1 in) tall (but larger elsewhere). Uncommon in places on the slopes if you search cavities. Found so far on Tutuila.



A close-up of *Distichopora violacea*.

Taxonomic Notes

For more taxonomic information on each hard coral species including a description of a skeletons from American Samoa and photographs of skeletons, see the companion taxonomic monograph, Fenner (in press).

Pocillopora is a particularly difficult genus. The main morphological differences distinguishing the species are branch shapes. A few species are relatively distinct in American Samoa, particularly *Pocillopora eydouxi* and *Pocillopora setchelli*. However, there are many colonies that appear to be intermediate between *Pocillopora damicornis* and *Pocillopora verrucosa*, although there are probably more *P. damicornis* colonies that are quite clear and distinct than those that are intermediate. There are so many colonies intermediate between *P. verrucosa* and *Pocillopora meandrina*, and so few colonies that are clearly one or other of those two species, that there is doubt whether they are separate species, but at least one DNA sequencing study found they were valid separate species.. *Pocillopora ligulata* appears to have intermediates between it and *P. meandrina*. The author began work in American Samoa by distinguishing colonies that have branching morphology like *P. meandrina*, but with smaller verrucae, and called them *Pocillopora elegans*. However, there appear to be intermediates between those two, and an examination of the type specimen of *P. elegans* in the Smithsonian Institution revealed it had large verrucae like *P. meandrina* and otherwise appeared to be the same as *P. meandrina*. For these reasons *P. elegans* is not distinguished in this guide. A recent macromolecular (DNA sequencing) genetics study has found that the morphologically distinguished species of *Pocillopora* are not distinct genetically, but there are microscopic features of the skeleton that correspond to genetically distinct species. Another genetics study found *P. meandrina* and *P. verucosa* were distinct. If *Pocillopor*a species could only be distinguished by microscopic features, that would leave ecologists and monitoring teams unable to identify *Pocillopora* species on the reefs. In addition, the observed differences in the morphology of branching remain unexplained by the genetics at this point. For these reasons, and also because the genetics results are new, some of the genetics results are contradictory, genetics are not always right, only a few genes have been sequenced so far, and changes in the genetics are possible in the future, this guide continues to present the morphospecies. However, caution should be used in the interpretation of these morphological differences, particularly for the distinction between *P. verrucosa* and *P. meandrina*.

Pocillopora setchelli Hoffmeister, 1929 was not recognized by Veron (2000), but these colonies in American Samoa are similar to a description (Randall and Myers, 1983), and they are relatively easy to distinguish from other *Pocillopora* species, and can be seen growing side by side with other *Pocillopora* species. There are a few colonies that are difficult to place in one species or the other, but they are a small minority. Veron (2000) shows a photo of several under the name *P. meandrina*. Among *P. setchelli* colonies, most have flattened curving branches, a few have round branches, and rarely they may resemble *P. damicornis*, so most colonies resemble *P. meandrina*, some resemble *P. verrucosa* and a very few resemble *P. damicornis*. This raises interesting possibilities that have not been explored.

Montipora turgescens Bernard, 1897 and *M. nodosa* (Dana, 1846). Veron (2000) shows pictures of a purple colony he has under the name *M. nodosa* that corresponds to the colonies shown here under the name *M. turgescens*. *M. nodosa* has papillae, while *M. turgescens* does not (Veron and Wallace, 1984). These colonies never have papillae, and correspond best to *M. turgescens.*

Montipora vaughani Hoffmeister, 1925 was described from American Samoa. Colonies matching that description are uncommon here. It is, however, very close to *M. foveolata* or *M. venosa*, but appears to be distinct enough to be a valid species.

Acropora abrotanoides (Lamarck, 1816). This coral was referred to as *A. danai* in the older literature, as the type specimen of *A. abrotanoides* could not be found. It has since been found, so the oldest name, *A. abrotanoides*, is once again used.

Acropora globiceps (Dana, 1964) and *Acropora humilis* (Dana, 1846). *Acropora humilis* has long (and often) been reported here, including in Wolstenholm et al. (2003). However, the axial corallites of colonies in American Samoa are always small and tubular, and never large and dome-shaped, and colonies always have short, uniform, vertical, non-diverging branches. *Acropora humilis* has thinner, widely diverging branches that vary in length and have many side branches. The author has examined the type specimens of *A. globiceps* and *A. humilis* in the Smithsonian and they have these features.

Acropora intermedia (Brook, 1891). Wallace (1978; 1999), Wallace and Dai (1997) and Wallace and Wolstenholme (1998) use the name *A. intermedia* (Brook, 1891) for this species, while Veron and Wallace (1984) and Veron (1986; 2000) use the name *A. nobilis* for it. Wallace (1999) states that the type of *A. nobilis* is a member of the robusta group, but not this species. The author has examined the holotypes of *A. nobilis* and *A. robusta,* and agrees, though has not yet been able to examine the type of *A. intermedia*.

Acropora leptocyathus has long been considered a synonym of *Acropora digitifera*. However, it is noticeably different from the latter. The branches on *A. digitifera* are longer and do not taper and have a blue tip. The branches of *A. leptocyathus* are shorter and taper to a point and do not have a blue tip. The type location of *A. leptocyathus* is Tutuila. I have not seen *A. digitifera* here.

Acropora cophodactyla (Brook, 1842). Veron et al. (2016) report that the colonies of this species which they are using this name for are not the same as the type. Further, it appears that these colonies are similar to *Acropora retusa*, differing mainly in the size of the axial corallite.

Acropora pagoensis Hoffmeister, 1925. Veron (2000) and Wallace (1999) do not recognize this species. Wallace (1999) indicates it is in the *A. selago* group, and that it is probably a synonym of *A. tenuis*, though the type specimen is too small and it could be *A. yongei*. Colonies that match Hoffmeister's photo, description, and holotype are fairly common in American Samoa, and they do not appear similar to *A. tenuis* or *A. yongei*. The type specimen is sufficiently large and clear to make a clear identification. Their identification as *A. pagoensis* was confirmed by R. Randall who has worked on coral in American Samoa and collected many. *A. pagoensis* is probably closest to *A. akajimensis* (Veron, 1990) and was probably identified as such by Fisk and Birkeland (2002), Green et al. (2005) and Birkeland (unpublished). However, *A. pagoensis* has radial corallites closer together, and with more variation in their shape, more that are rasp or nariform shaped, and probably thicker corallite walls. The name *A. pagoensis* is senior to *A. akajimensis*, but *A. akajimensis* appears to be a valid species, which the author has seen in New Caledonia and American Samoa. Wallace (1999) synonymizes *A. akajimensis* with *A. donei*. The name *A. pagoensis* was reported from American Samoa by Birkeland et al. (1979, 1982, 1985), Lamberts (1983), Green, Birkeland and Randall (1999), Coles et al. (2003), and Green et al. (2005). Richard Randall reports that he has also seen *A. pagoensis* in Taiwan. It is a very distinct and easily identified valid species.

Acropora palmerae Wells, 1954 has an uncertain status since it is indistinguishable from *A. robusta* except for the fact that it is almost entirely encrusting while *A. robusa* only has a small encrusting base and lots of branches. Colonies of *A. palmerae* can have some branches, usually short. Although it has been suggested to prefer heavy wave exposure, it appears in the same habitat as *A. robusta* in American Samoa. Wallace (1999) and Veron (2000) recognize it. However, the only difference between *A. palmerae* and *A. robusta* is the presence, number, and length of branches, and there appears to be a continuum between the two species. Most *A. plamerae* here are bright green, while most *A. robusta* are brown, but there are green *A. robusta* and vice versa.

Acropora surculosa has long been considered a junior synonym of *Acropora hyacinthus*, but they are quite different. *A. surculosa* is a small corymbose colony while *A. hyacinthus* is a large table. A. surculosa has longer branches than *A. hyacinthus*. *A. surculosa* usually has some branches fused together except at the tip, *A. hyacinthus* doesn't. *A. hyacinthus* has very long tentacles that are extended near the base of the branch, *A. hyacinthus* doesn't. *A. sirculosa* looks more like *A. millepora* than *A. hyacinthus.*

Acropora paniculata Verrill, 1902 *sensu* Wallace (1999) has the problem that it appears that the holotype is not this species. The holotype is a proliferating branch which grew vertically, not a branch of a table coral. It is far too tall to be a branchlet in a table coral, and it doesn't have the flat underside of a piece of table and major branches in only two dimensions. Whatever that species is, this table coral is not that, but does appear to be what Wallace (1999) documents. The "*sensu*" means what Wallace was referring to, her species concept for this name.

Isopora crateriformis (Gardiner, 1898) and *Isopora palifera* (Lamarck, 1816) are two of several species that have until recently been considered to be in the genus *Acropora*, under the sub-genus *Isopora*. A recent article reviewed the evidence and reported that not only do they not have an axial corallite, but also they are all brooders while *Acropora* are all broadcast spawners. The evidence is convincing that they are a separate genus (Wallace et al. 2007)

Astreopora elliptica Yabe & Sugiyama 1941 is not recognized by Veron (2000), but the colonies match the description (Lamberts, 1982), and they are very easy to distinguish from other *Astreopora*, with few intermediates, so it is included here as a valid species.

Porites arnaudi Reyes-Bonilla and Carricart-Ganivet, 2000 is known from the eastern Pacific, and Veron (2000) indicates that it is in our area but with some morphological differences. Samples from here are a close match to the original description, and colonies are quite similar to those in the eastern Pacific (Veron, 2000).

Porites lutea Milne Edwards & Haime, 1851 is the name applied to this coral in Hawaii by Fenner (2005). It had long been called *Porites evermanni* Vaughan 1907 there (Maragos, 1977). Hawaii is the type location of *P. evermanni*. The two species have essentially the same arrangement of elements in their corallites, and *P. lutea* is the older name so it gets precedence, so it was called that in Fenner (2005). However there is genetic evidence that there are three genetically different species that all have the same corallite plan as *P. lutea* (Z. Foresman, personal comm.) The specimen of *P. lutea* in the Paris Museam of Natural History that is labeled as the type is not certain to actually be the type, since sometimes labels get changed, and the original description may not figure it or designate the type. Also, museum specimens of corals rarely have any tissue which could be used for genetics. This has not yet been resolved.

Pavona chiriquensis Glynn, Mate & Stemann, 2001 is very similar to *P. varians* and has been included in it until recently. It has separated small bumps instead of long ridges, and usually has white tentacles. It is always encrusting. The two are very easy to distinguish in American Samoa, with few if any intermediates.

Pavona diffluens (Lamarck, 1816) was known from only the Red Sea. It has actually been reported from American Samoa previously in species lists. The living colonies and skeleton match those from the Red Sea (Sheppard and Sheppard, 1991; Veron, 2000). Richard Randall was the first to recognize it here.

Pavona gigantea Verrill, 1896 is well known from the eastern Pacific, but not the rest of the Pacific, though Veron (2000) indicates it is in the south-central Pacific. The living colonies and skeleton match that from the eastern Pacific.

Pavona duerdeni and *Pavona minuta* were mis-idenfied in the past, *P. duerdeni* was identified as *P. minuta* in Veron (1986) and *P. minuta* was identified as *P. diminuta* in Veron (1990). The author learned in Hawaii what *P. duerdeni* was and then when the author examined the type specimen of *P. minuta* it became clear what that species was. Veron (2000) adopted the author's views once he saw the type specimen of *P. minuta*.

Herpolitha weberi is a species which Veron (2000) recognizes, but Hoeksema (1989) does not. Colonies that have long septa which reach the edge of the colony here are small. Large colonies which are clearly *Herpolitha limax* usually have longer septa near the central groove than farther to the side. Thus, it appears that small colonies with long septa are just a growth stage of *H. limax*.

Echinomorpha nishihirai (Veron, 1990) has until recently been known from Japan to Australia, but not eastward in the Pacific. It was rare most places it was known from. Fenner (2006, 2007) reported it was uncommon but not rare in Fiji, and now this report extends the known range farther eastward.

Millepora platyphylla is highly variable in American Samoa. In the Philippines, all colonies I saw were thin flat vertical plates, a morphology that is present in American Samoa but rare. Randall and Cheng (1984) also report the thin plate morphology from Taiwan. Generally, the area where a species has the highest genetic diversity is the oldest population since it has more time to accumulate mutations, so this might suggest the Pacific or South Pacific may be where they originally evolved.

References

Birkeland, C., Craig, P., Fenner, D., Smith, L. W., Kiene, W. E. and Riegl, B. 2008. Ch. 20: Geologic setting and ecological functioning of coral reefs in American Samoa. Pages 741-765 in B. Riegl and R. Dodge, Coral Reefs of the USA, Springer.

Craig, P., DiDonato, G., Fenner, D. and Hawkins, C. 2005. The state of coral reef ecosystems in American Samoa. Pages 312-337 in: J. Waddell (ed.), The State of Coral Reef Ecosystems of the United States and Pacific Freely Associated States: 2005. Silver Spring, MD. NOAA Technical Memorandum NOS NCCOS 11.

Fenner, D. et al. 2008. The state of coral reef ecosystems of American Samoa. P. 307-351 in J.E. Waddell and A.M. Clarke (eds.), The State of Coral Reef Ecosystems of the United States and Pacific Freely Associated States: 2008. NOAA Technical Memorandum NOS NCCOS 73. Silver Spring, MD.

Fenner, D. 2019. Chapter 28: The Samoan archipelago. Pages 619-644 in: Sheppard, C. 2019, World Seas: an environmental evaluation, 2nd Edition, Vol II: The Indian Ocean to the Pacific. Academic Press.

Fenner, D. 2022. Corals of Hawaii, 2nd edition. Mutual Publishing, Honolulu.

Goldberg, W. M. 2013. The Biology of Reefs and Reef Organisms. Univ. Chicago Press. 401pp.

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

Kitahara, M. V., Fukami, H., Benzoni, F., Huang, D. 2016. The new systematics of Scleractinia: Integrating molecular and morphological evidence. Pp. 41-59 In Goffredo, G., Dubinsky, Z. (eds.), The Cnidaria, Past, Present, and Future. Springer.

Lamberts, A. E. 1982. The reef coral *Astreopora* (Anthozoa, Scleractinia, Astrocoeniidae): A revision of the taxonomy and description of a new species. Pacific Science 36: 83-105.

Losos, J. B., Hillis, D. M., Greene, H. W. 2012. Who speaks with a forked tongue? Science 338: 1428-1429.

Montgomery, A.D., Fenner, D., Toonan, R.J. 2019. Annotated checklist for stony corals of American Samoa with reference to mesophotic depth records. Zookeys 849:1-170.

Nemenzo, F. Sr. 1986. Guide to Philippine Flora and Fauna: Corals. Natural Resources Management Center and the University of the Philippines. 273 pp.

Randall, R. H. and Y-M. Cheng. 1984. Recent corals of Taiwan. Part III. Shallow water Hydrozoan Corals. Acta Geologica Taiwanica 22: 35-99.

Randall, R. H. and R. F. Myers. 1983. The Corals. Volume II. Guide to the coastal resources of Guam. University of Guam Press. 128 pp. (out of print)

Razak, T.B. and B.W. Hoeksema. 2003. The hydrocoral genus *Millepora* (Hydrozoa: Capitata: Milleporidae) in Indonesia. Zoologishe Verhandelingen Leiden 345: 313-336.

Sheppard, C. 2021. Coral Reefs: A Natural History. Princeton University Press. 240 pp.

Sheppard, C., S. Davey, G. Pilling, and N. Graham. 2018. The Biology of Coral Reefs. 2nd Edition. Oxford University Press. 384 Pp.

Veron, J. E. N. 1995. Corals in Space and Time; the biogeography and evolution of the Scleractinia. UNSW Press, Sydney. 321pp.

Veron, J. E. N. (2000). Corals of the World. Vol. 1-3. Townsville: Australian Institute of Marine Science.

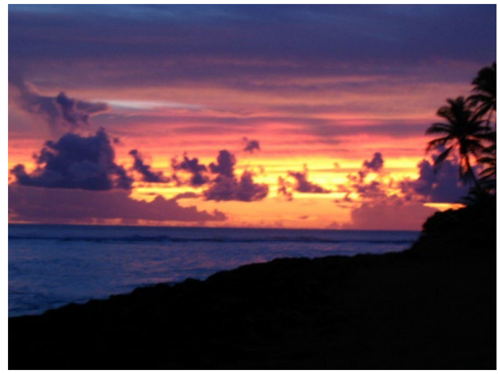
Veron, J.E.N., Stafford-Smith, M.G, Turak, E., and DeVantier, L.M. 2020. Corals of the World. Version 0.01 (Beta). www.coralsoftheworld.org/v0.01

Wallace, C.C. 1999. Staghorn Corals of the World: a revision of the genus *Acropora*. CISRO Publishing, Collingwood, Australia. 422 pages.

Wallace, C.C., Done, B.J., Muir, P.R. 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.

The south side of Ofu, beach and backreef pools in the National Park.



An Ofu sunrise

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Douglas Fenner

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Born in Michigan, USA, the author has lived in a variety of places in the states, including Florida during his high school years, which stimulated an interest in tropical marine life. During his years at Reed College in Portland, Oregon, he was introduced to biology, including invertebrate biology, studied sea urchin tube feet and respiration for his thesis and spent two summers in Hawaii studying fish behavior with his professors. Snorkeling trips to the Caribbean (including to Jamaica just before Hurricane Allen) during graduate school at the University of Pennsylvania were followed by scuba trips to the Caribbean. His coral reef research and publications began with surveys and description of reefs in the Caribbean, including Cozumel, Roatan, Cayman Brac, Little Cayman, and St. Lucia. It became clear that to do transects you need to know your corals, and existing guides were inadequate, so Caribbean coral identification and taxonomy were next to be studied. By this time the author lived in Seattle, Washington. Then the author began to study corals in Hawaii, which led to his identification book for Hawaiian corals. Following that, he worked in the Philippines for two years, learning many coral species in that area of high diversity. This was followed by six years of working with Dr. “Charlie” J.E.N. Veron at the Australian Institute of Marine Science on the “Coral ID” electronic key to corals of the world. At that time, the author began to be invited to study and record corals during Rapid Assessment Programs to a variety of places around the Indo-Pacific. In November, 2003, the author began work at the Dept. Marine & Wildlife Resources, in American Samoa. He began working on coral reef monitoring there a year later and continued with that, and continued to make trips to study corals around the Indo-Pacific. Currently, the author has studied coral at 14 islands in the Caribbean and 14 areas of the Indo-Pacific, plus the Mediterranean. He is an author of 17 book chapters and 46 peer-reviewed articles in scientific journals. He has worked as a contractor for NOAA NMFS Protected Species on the threatened coral species since 2013. That work has taken him around the Pacific each year to study corals and teach people how to identify corals. That effort includes photographing corals, writing field guides and building “practice modules” for teaching coral ID and people to practice with. He also works on describing new corals species and diseases and a variety of other coral reef topics. He continues to be based in American Samoa.