Field Guide to the Corals of Palau

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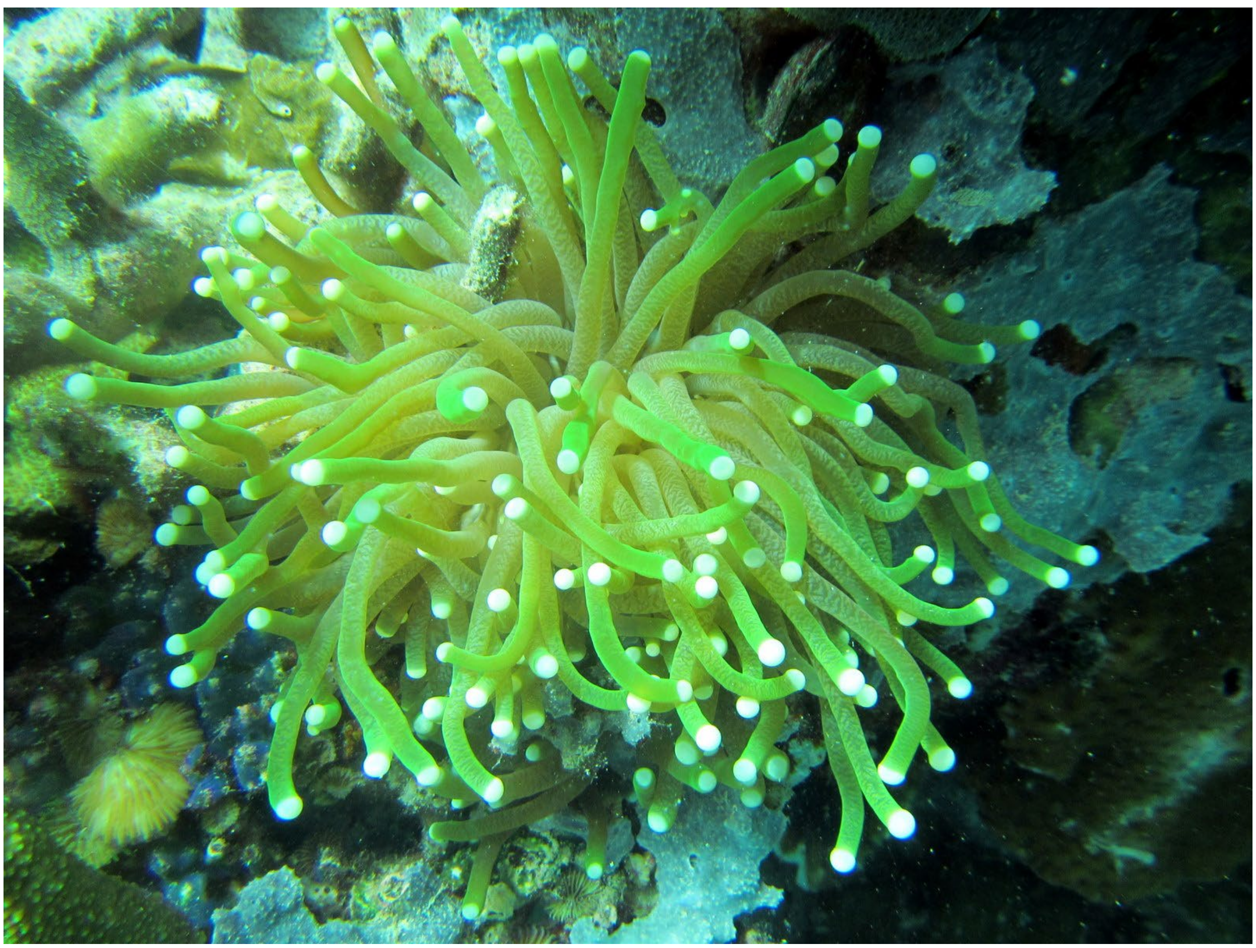
A guide to the underwater identification of 164 living coral species in 54 genera that secrete hard skeletons in Palau.



An individual *Heliofungia actiniformis*, Palau.

All photographs in this guide were taken in Palau. All photos were taken by the author, unless indicated otherwise. All species in this guide are in Palau and look the way the corals look here. This is a first draft ID guide for Palau. In future years I hope to photograph many more corals and add many more species to this guide. Parts of the introductory text are the same as in the other guides by the author.

To Carden Wallace, for all you have done to advance the study of corals.

Other field guides by the same author:

Fenner, D. 2022. Corals of Hawai'I, 2nd Edition: Field Guide, Coral Diseases, Coral Biology, Coral Reef Ecology, Hawaiian Reefs. Mutual Publishing, Honolulu. 400 pages.

Fenner, D. 2022. Field Guide to the Corals of the Marshall Islands. MIMRA.

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

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Fenner, D. 2019. Field Guide to the Corals of Wake Atoll.

Fenner, D. 2020. Field Guide to the Corals of the Northern Mariana Islands.

Fenner, D. 2020. Field Guide to the Corals of the Marianas.

Fenner, D. 2022. Field Guide to the Corals of New Caledonia.

We 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 thank Lance Smith at NOAA Fisheries' Pacific Islands Regional Office for supporting the development of this guide.

Contents

Corals Listed by the New Systematics: DNA-sequencing (PCR) Phylogeny

Here, families are listed alphabetically, genera within each family are listed alphabetically, and species within 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, but so far there is no independent evidence for that for most cases with coral taxonomy.

Introduction

This field identification guide was written to help identify corals in Palau. All the photos were taken in Palau, so the photos look like the corals in Palau. 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 Palau, so you don't have to pick your way through many species that aren't in Palau. This is a first version of this and so many corals that are in Palau. are not yet in this guide, but with additional visits 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.

Fringing reefs typically have two major types of habitats for coral reefs and barrier reefs and atolls typically have four. All three have fore reef slopes, which are on the outside of the fringing reef or barrier reef and slopes steeply at about a 45-degree angle down into the abyss. Another that all three types of reef have is the reef flat: a flat, shallow reef area between the reef crest where the waves break and either the lagoon or the island. A habitat that only barrier reefs and atolls have is the inside slope from the island or reef flat down into the lagoon. And the fourth that barrier reefs and atolls have consists of patch reefs some of which are in the shape of pinnacles, in the lagoon. Lagoons are typically sandy bottomed and are usually between about 30 m and 100 m deep. There are often patch reefs or pinnacles in lagoons. The fore reef slope typically has wave surge that decreases with depth and may have currents at times. The reef flat has waves coming across it after they break at the crest, and anything extending above the flat may be exposed to air at extreme low tides. The reef flat on the lagoon side of islands is much more protected than the outer reef flat and thus may have different communities. The slope and patch reefs in the lagoon are protected from open ocean waves and typically have no current. The ring of reefs may have passes where the ring of coral is deeper than elsewhere. Such passes usually have strong currents as water levels outside the lagoon rise or fall with the tides. On rising tides, water rushes through passes into the lagoon, and on falling tides water rushes out. Water on the outer fore reef slope is usually very clear, while that in the lagoon may not be as clear. Each of these zones typically hosts different species of coral, and species that live on one often don't live on the others or are less common on the others. In addition, coral communities are affected by how much wave action they are exposed to. If one side of an atoll has continual heavy wave action and the other side is always calm, there may be quite different coral communities on those two sides. Depth also affects corals, probably from both decreasing light with depth, and decreasing 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.

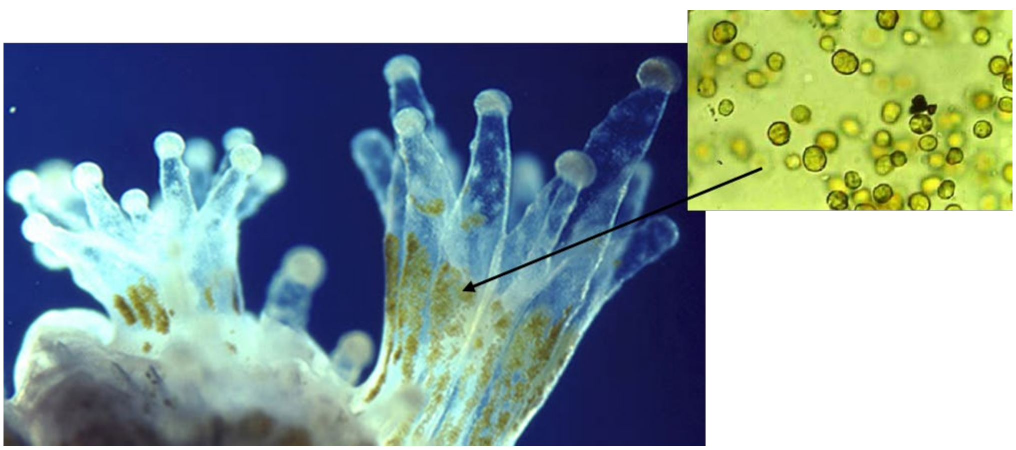
For more background information on marine environments in Palau and on coral reef ecosystems and habitats in Palau, see Wells, S., 1978; Marino et al, 2008; and Colin, 2009. For more information on coral reefs and corals in general, see Veron (1995; 2000), Wallace (1999), Goldberg (2013), Sheppard et 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 have 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 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 Palau. 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 Palau 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 world'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 Palau, and so many of them may look quite different than corals in Palau. This guide helps you by only showing you coral species that are in Palau, and only showing you photos of corals in Palau, 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 (2020).

Yet we still very much need to be able to identify corals to species in the field, 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.

Useful Terms

The descriptions often refer to “corallites.” These are the skeleton cups that the polyps sit in. The word “corallite” refers to both the inside of the cup and the outside.

The descriptions also commonly refer to several different colony shapes. Here are some of the shapes:

Massive = dome shaped, round, or hemispherical colonies without deep cracks, but which can be any size.

Submassive = appear massive, but there are very deep cracks in it because it is actually branching. The polyps are only on the ends of the branches, and the cracks may not be visible. *Lobophyllia, Caulastrea, Fimbriaphyllia*.

Branching = having branches that have side branches and can go in any direction.

Columnar = having near vertical columns that don’t branch or don’t branch much.

Encrusting = forming a thin crust over the substrate and attached to it, with no space under the coral. Much like paint though not usually as thin as paint.

Foliose = Plate = a relatively thin, nearly flat structure that is thin and has two sides like a plate. Plates are commonly near horizontal but sometimes can be vertical.

Mushroom coral = resembles the overturned cap of a mushroom.

Staghorn = branching, with branches that look like staghorn (always in genus *Acropora*)

Table = a flat top surface held up by a pedestal which is usually under the center of the table (always in genus *Acropora*)

Digitate = branches look like fingers, without any side branches, not very long, and usually parallel, extending upward from an encrusting base (always in genus *Acropora*).

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 (2020), Wallace (1999), Wallace et al (2012), Hoeksema (1989), Randall and Cheng (1984), and references therein, and type specimens and original descriptions (mostly for *Acropora*).

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 Corals

Phylum Cnidaria

This phylum contains animals that have a very simple sack-like body with three layers of cells and no organs. The body has a mouth that leads to a water-filled gastrovascular cavity, but the mouth is the only opening into 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.

Class Anthozoa

This class 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).

Subclass Zoantharia or Hexacorallia 'hexacorals'

This subclass contains animals that have six tentacles or multiples thereof: sea anemones, Scleractinia (hard corals), black corals, ceranthid anemones, zoanthids, and corallimorphs.

Order Scleractinia

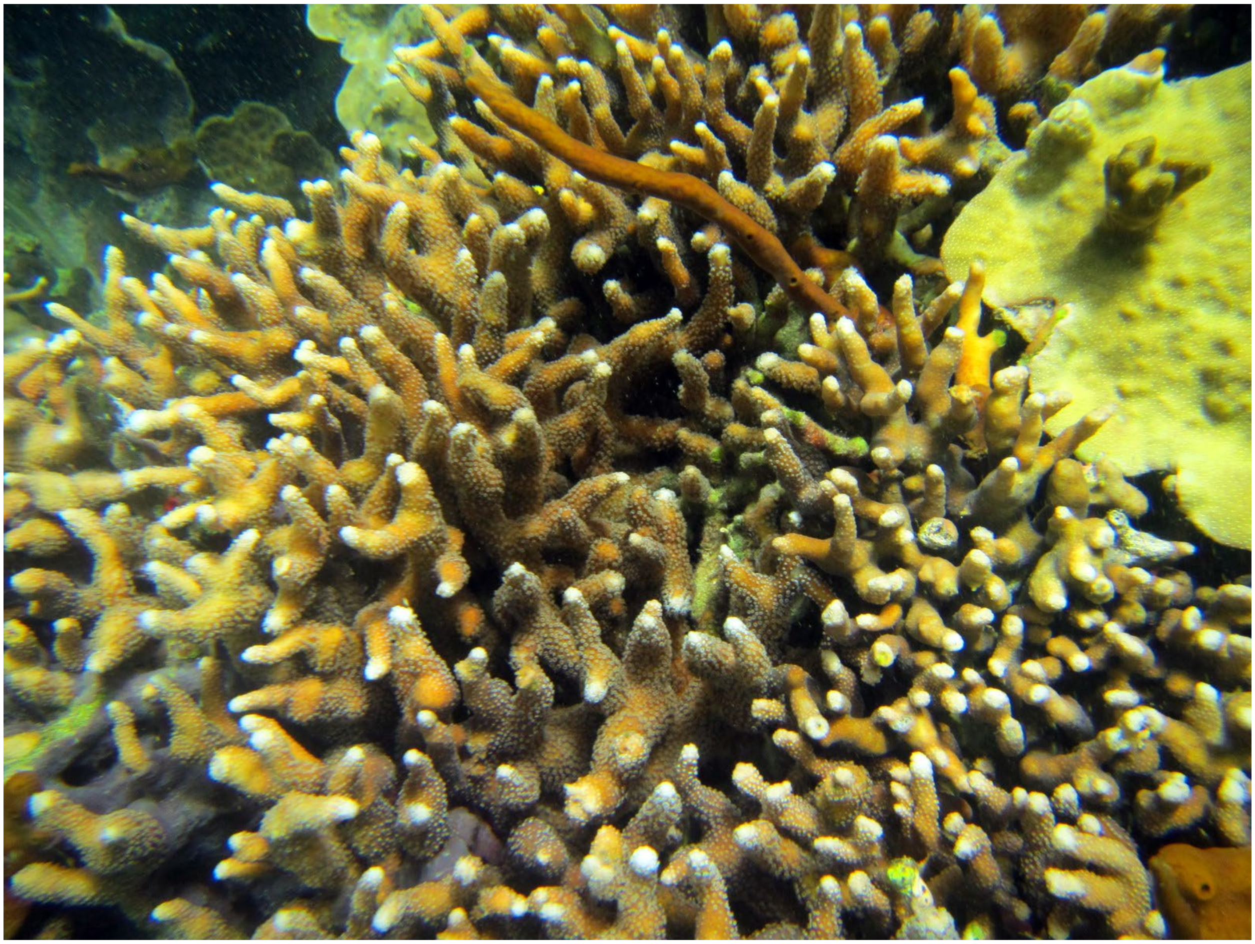
This order contains animals that build calcium carbonate skeletons underneath themselves. In the corallites ("polyp cups") that polyps sit in, there are "sclerosepta" that are thin walls made of skeleton that project into the calice (the inside of the corallite). This includes almost all of the reef-building 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 azooxantellate 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 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 diameter, and they vary greatly in shape and other details. Colonies also vary greatly in shape and size, which is helpful in identification.

Palauastrea

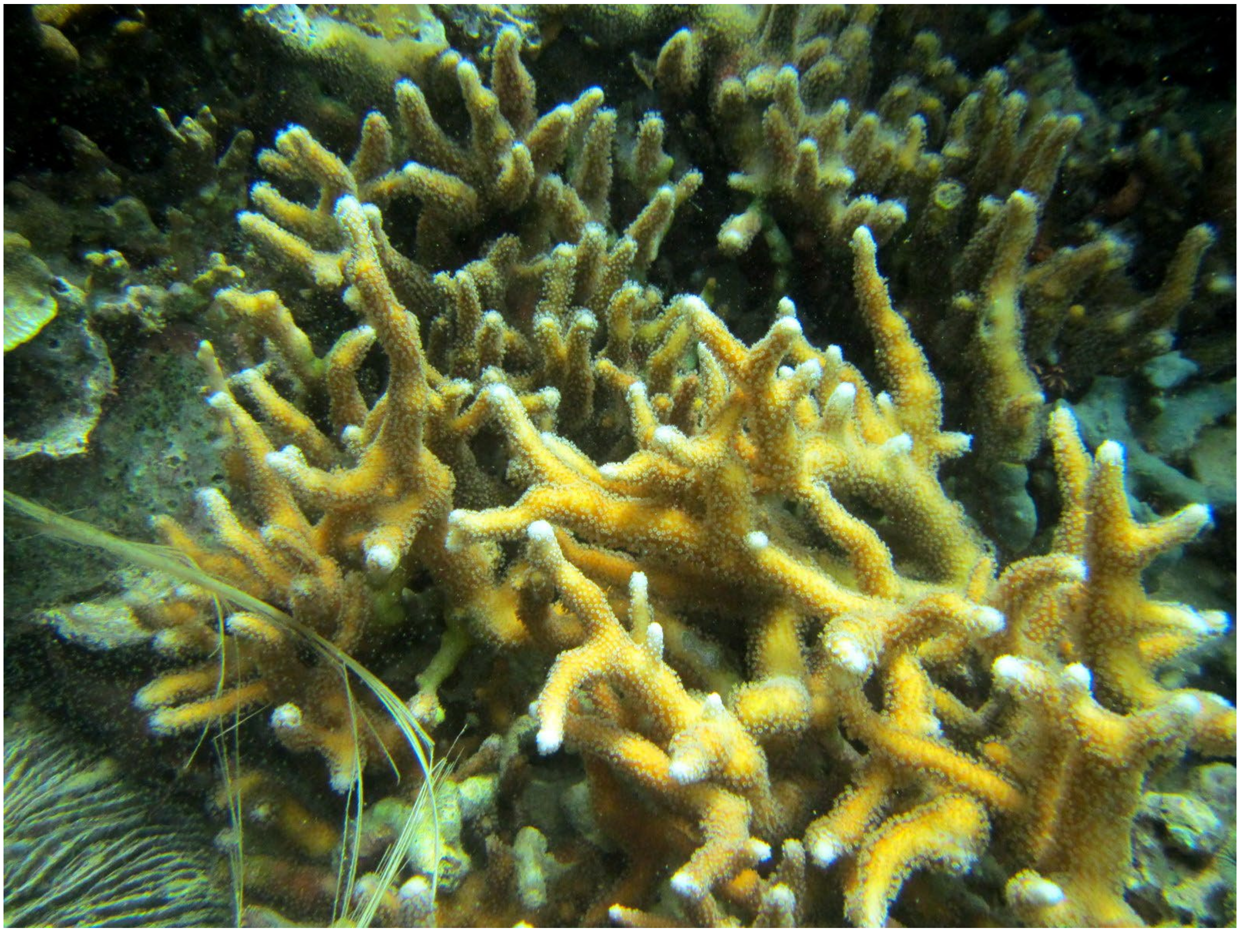
This genus forms branching colonies with tiny corallites, 1 mm or less in diameter. There is only one species. It looks a bit lik *Porites cylindrica*, but branches are thinner.

Palauastrea ramosa

This species forms thin branching colonies with smooth, rounded branches with rounded tips. Tentacles may be extended. The branches are much thinner than on *Porites cylindrica.* Rock Islands.



A photo of *Palauastrea ramosa*.



A colony of *Palauastrea ramosa* with more widely spaced branches.

A close-up photo of *Palauastrea ramosa*, showing the extended polyps.

Pocillopora

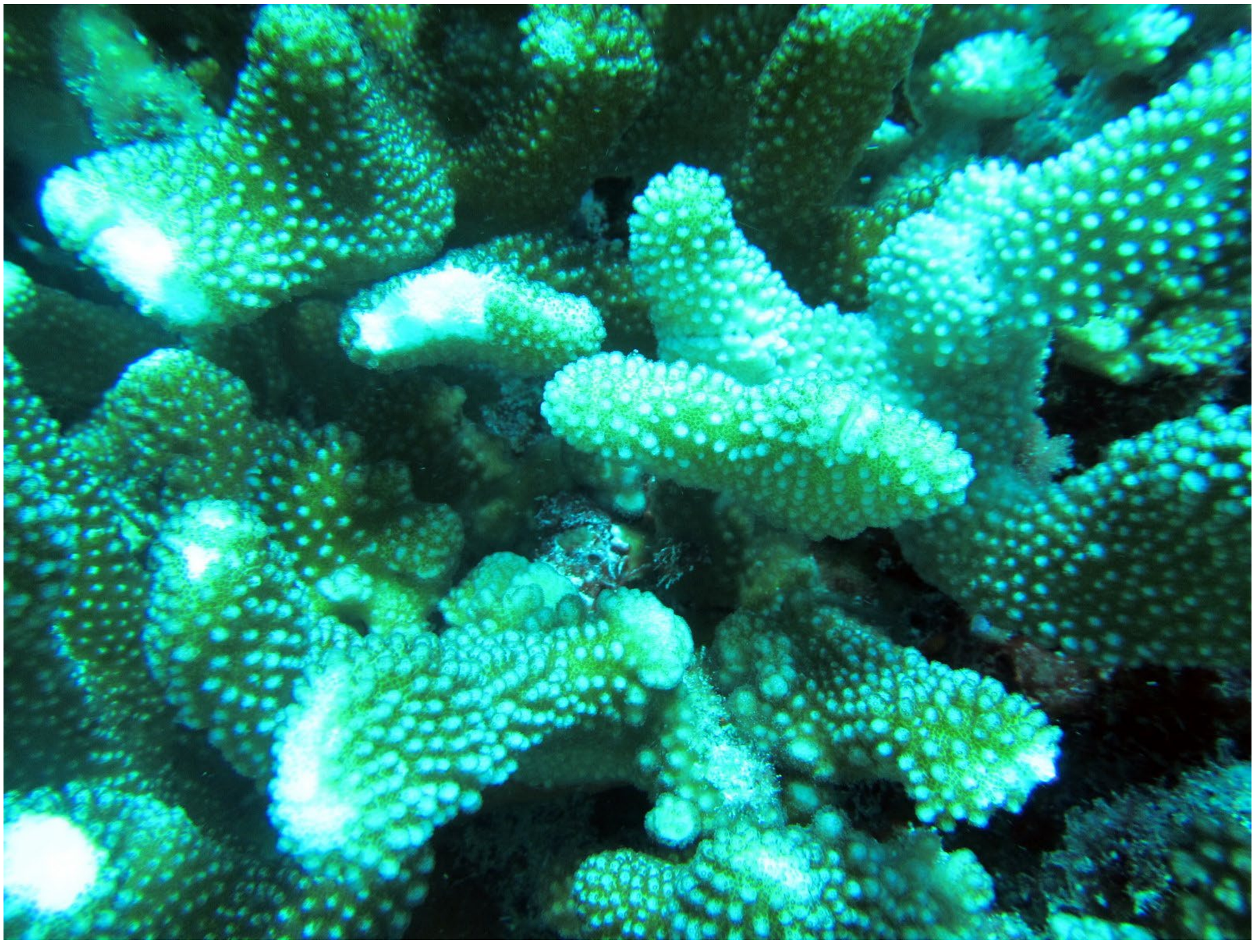
This genus forms branching colonies with branches covered with small bumps called "verrucae" (Latin for "blister"). The corallites and polyps in them are tiny, about 1 mm diameter, and are randomly all over the bumps and on the branches between bumps. *Montpora* can have bumps that are also called "verrucae" but corallites are only between them, not on them as in *Pocillopora*, and they are smooth. All *Pocillopora* are branching, but only some *Montipora* are branching, and many do not have bumps. *Stylophora* is branching but has tiny spines instead of bumps.

Pocillopora grandis *(previously known as Pocillopora eydouxi)*

This species forms branching colonies that that grow several meters in diameter, but are often smaller than that. Branches can by flattened or cylindrical, but most often have flattened ends. The flattened ends are often curved. This species often has branch shapes similar to *Pocillopora meandrina*, but the branches are larger and the spaces between branches are greater, and colonies are often (but not always) larger.

A very large colony of *Pocillopora grandis* (= *P. edouxi*) with cylindrical branches.

A smaller colony of *Pocillopora grandis* (= *P. eydouxi*. Branches vary from cylindrical to flattened in this colony. Notice that the branches are relatively far apart.



A close-up photo of *Pocillopora grandis*. Note the verrucae (bumps) all over the branches.

Pocillopora meandrina

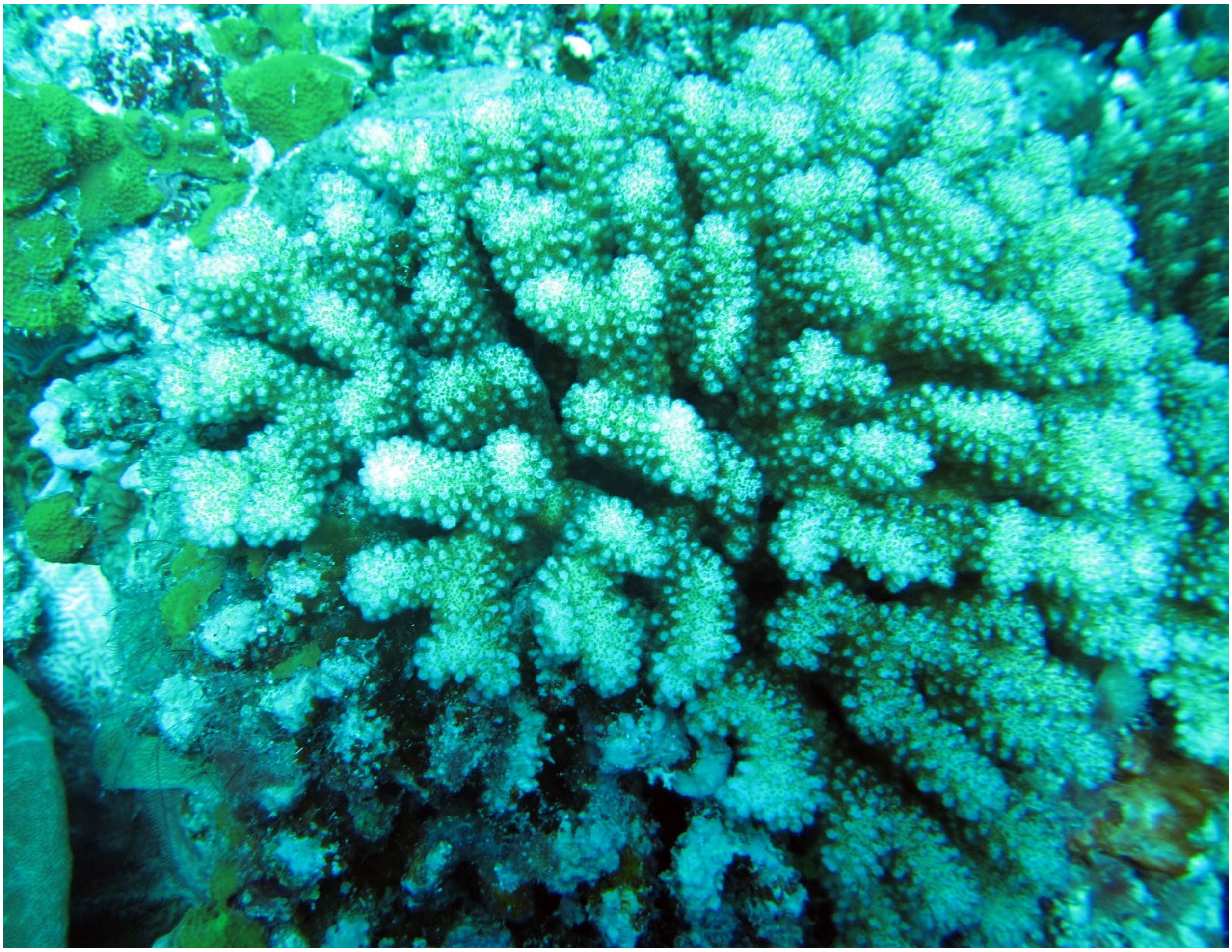
This species forms branching colonies usually less than 40 cm diameter, with some to many of the branches flattened near their ends. Flattened branches often curve in a meandering fashion which the name comes from. The branches are smaller and closer together than on *Pocillopora grandis*. Most of the branches are flattened unlike on *Pocillopora verrucosa*. The branches are much thicker than on *Pocillopora damicornis*.

A colony of *Pocillopora meandrina* showing the flattened, curved branches.

A close-up photo of branches of *Pocillopora meandrina*. Notice the uniform verrucae (bumps) and the tiny dark spots all over the verrucae and between them. The dark spots are the contracted polyps in the corallites (polyp cups).

Pocillopora verrucosa

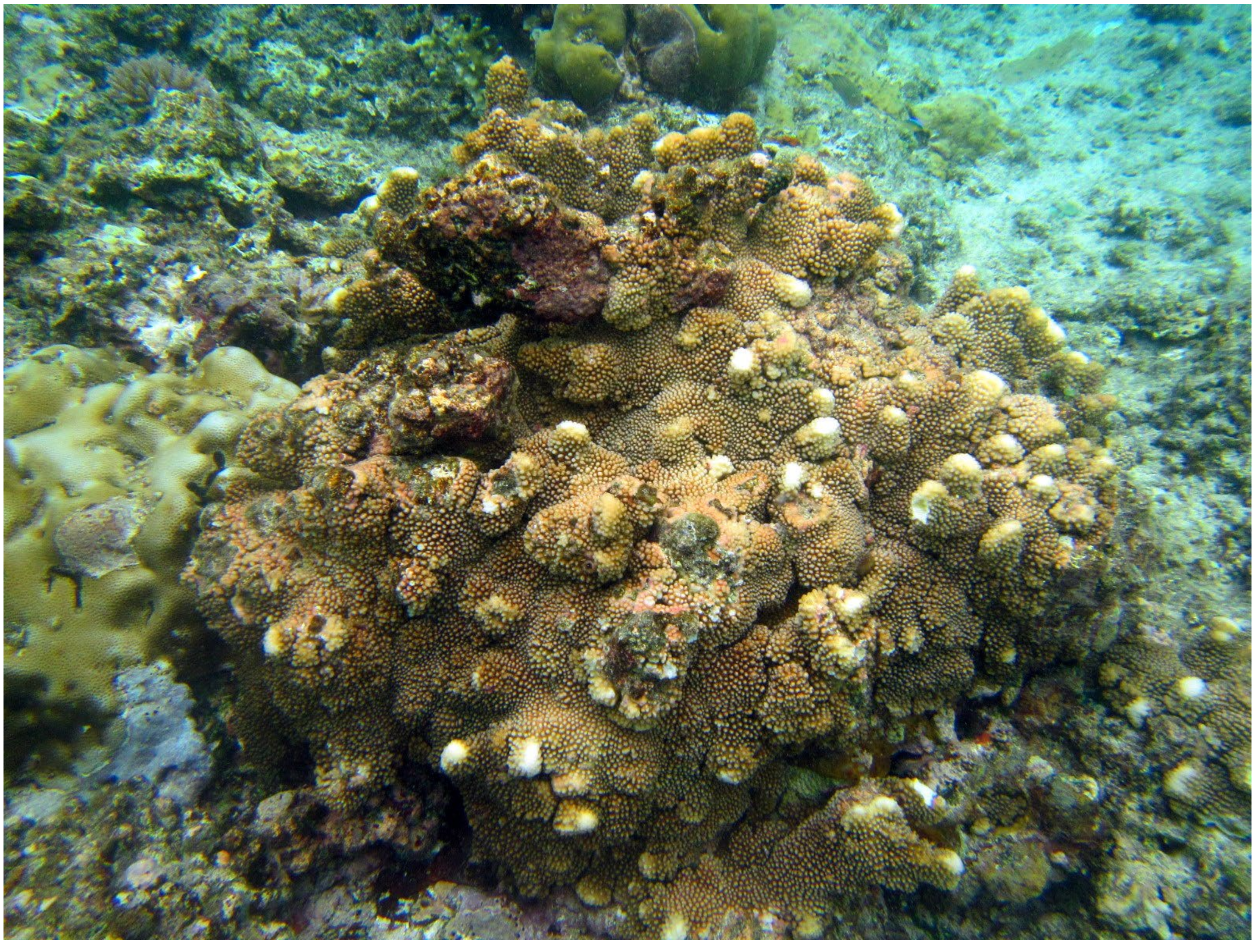
This species forms branching colonies that are usually less than 40 cm diameter. The branches are cylindrical. Colonies have few if any of the obvious flattened branches of *Pocillopora meandrina*. Branches are much larger than on *Pocillopora damicornis a*nd smaller than on *Pocillopora grandis*.



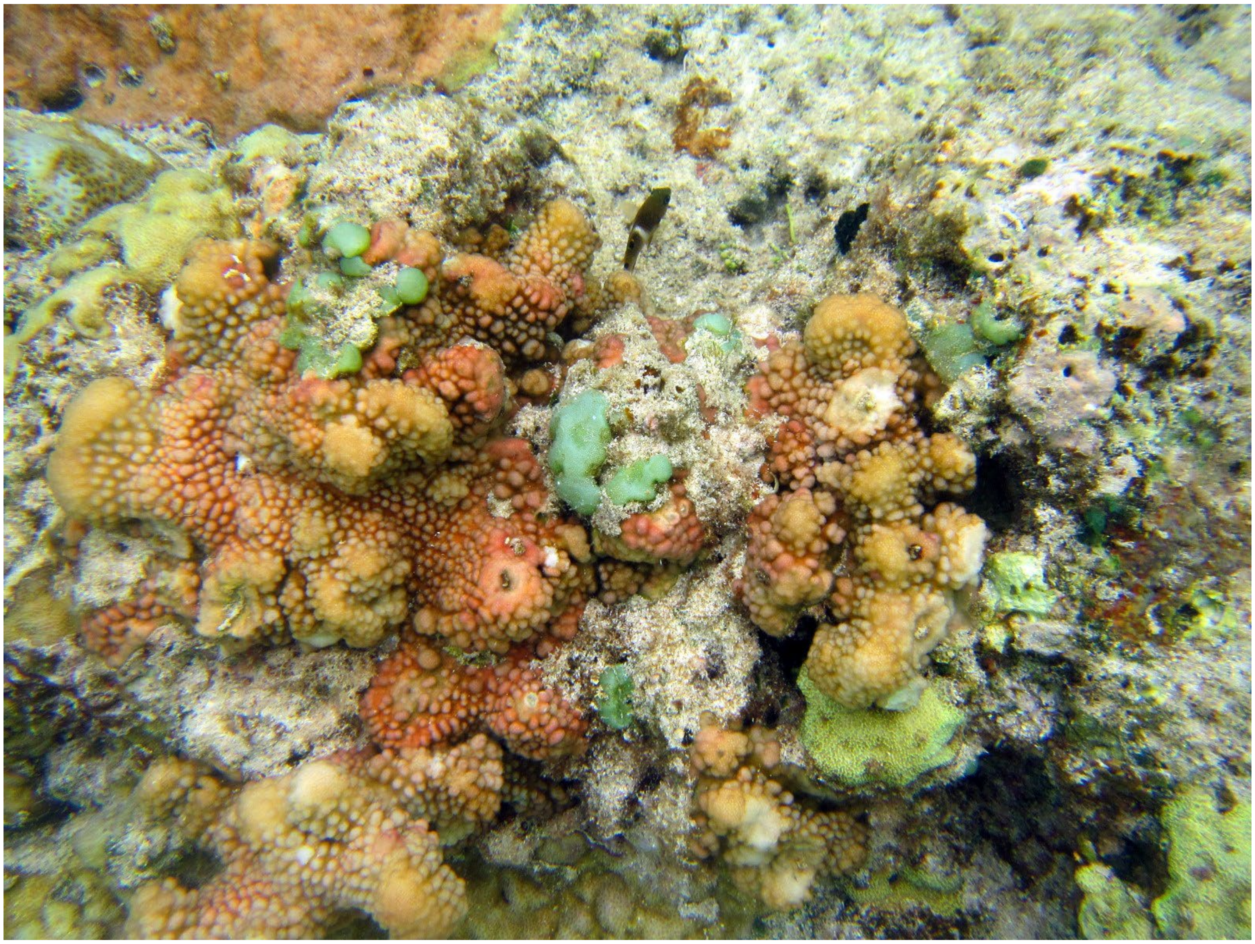
A colony of *Pocillopora verrucosa*. The branches are cylindrical with very few if any exceptions.

Pocillopora fungiformis

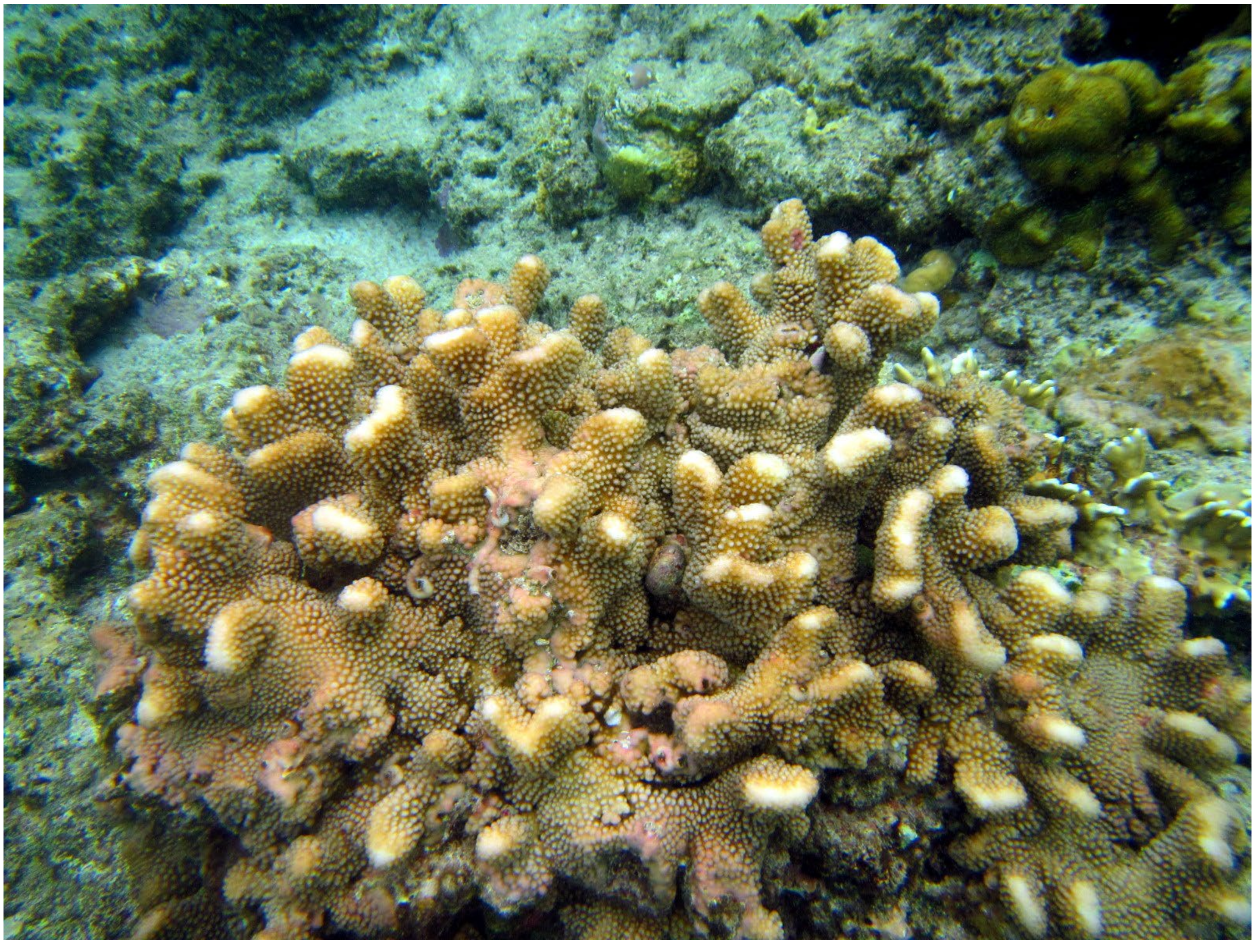
Colonies usually have encrusting bases, with short, knobby, irregular, thick branches. The encrusting base often has cracks in it. Branches are shorter and more irregular than in other species of *Pocillopora*.



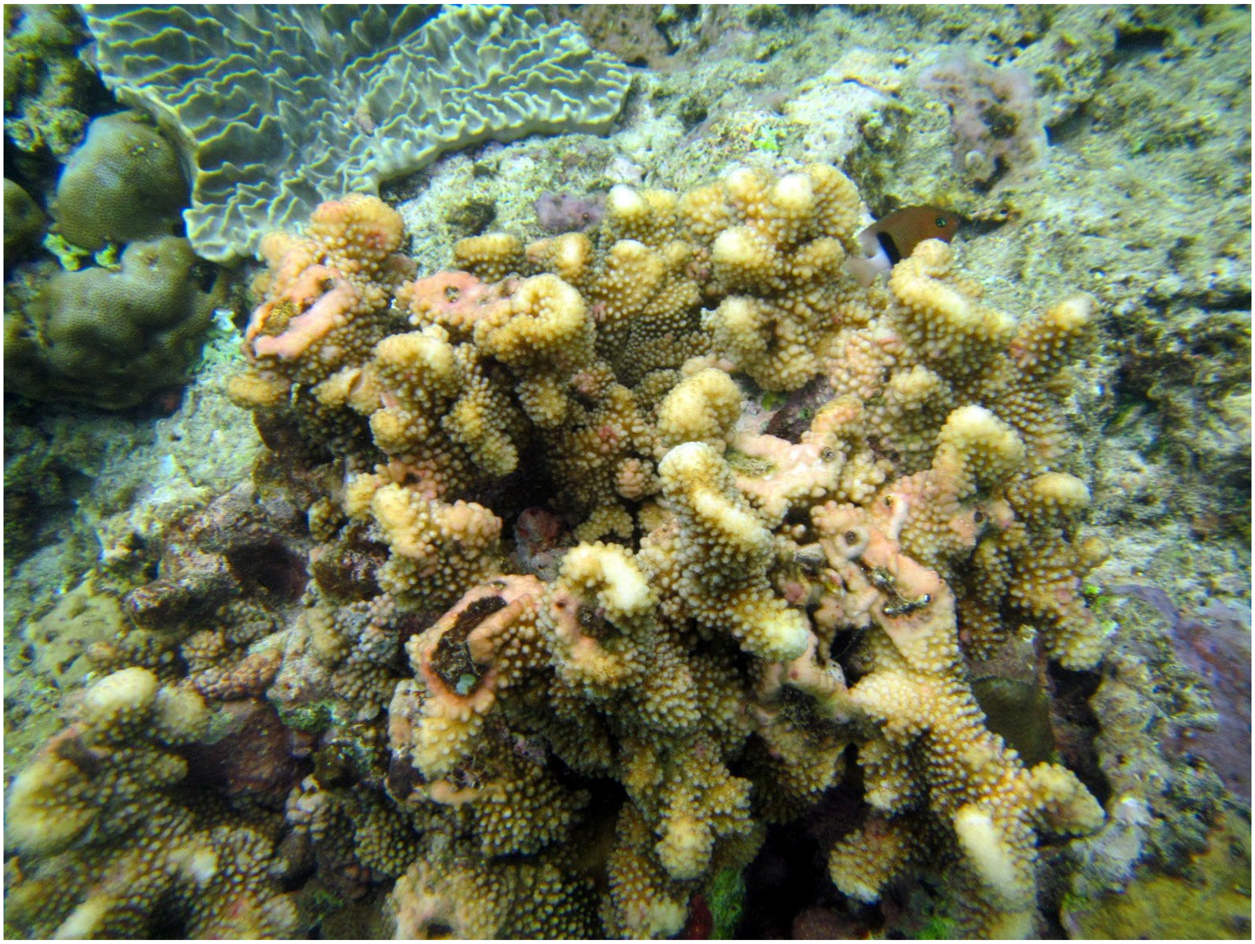
A photo of a colony of *Pocillopora fungiformis* that is mostly encrusting, with only a few stubby branches.



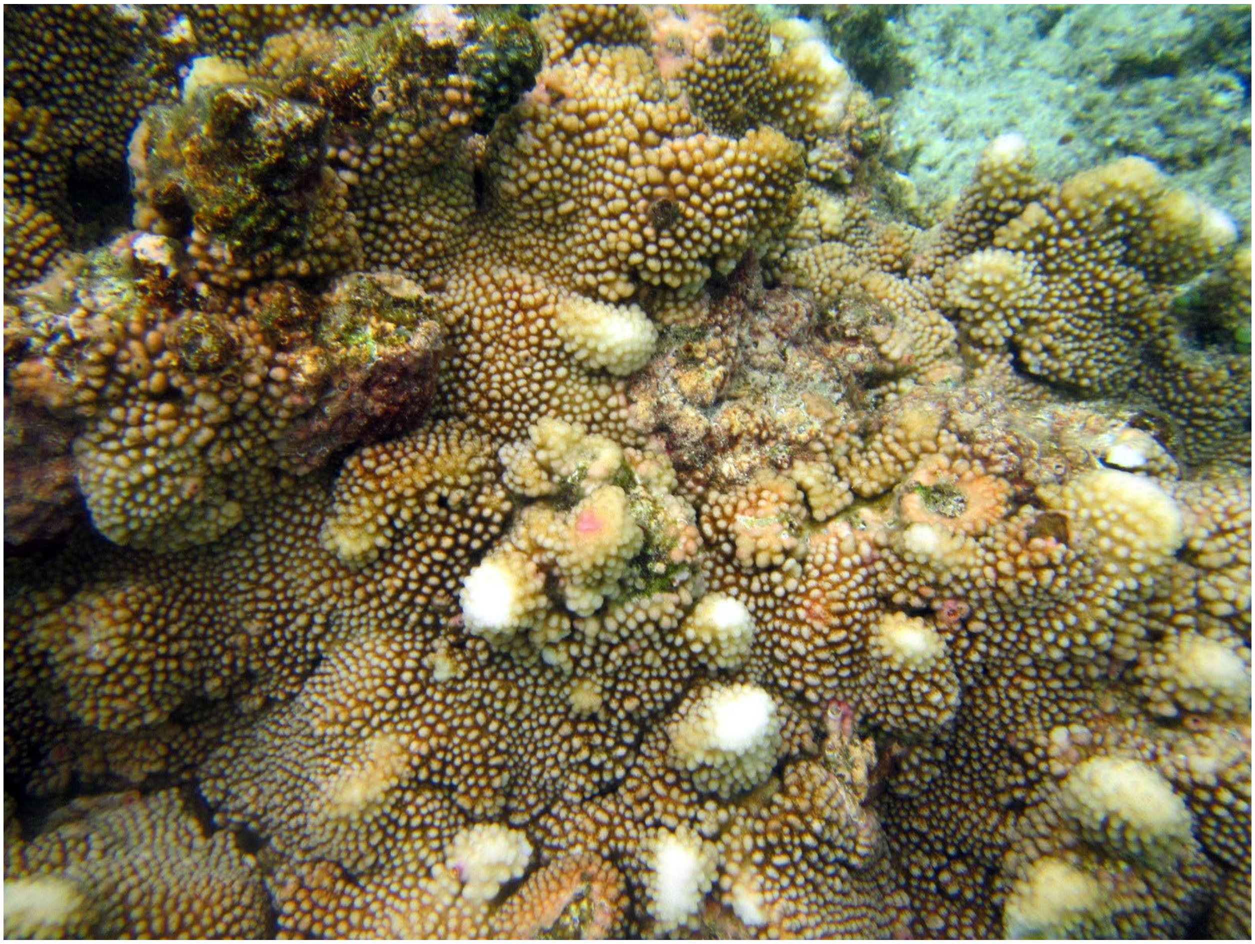
A colony of *Pocillopora fungiformis* with very stubby, bump-like branches.



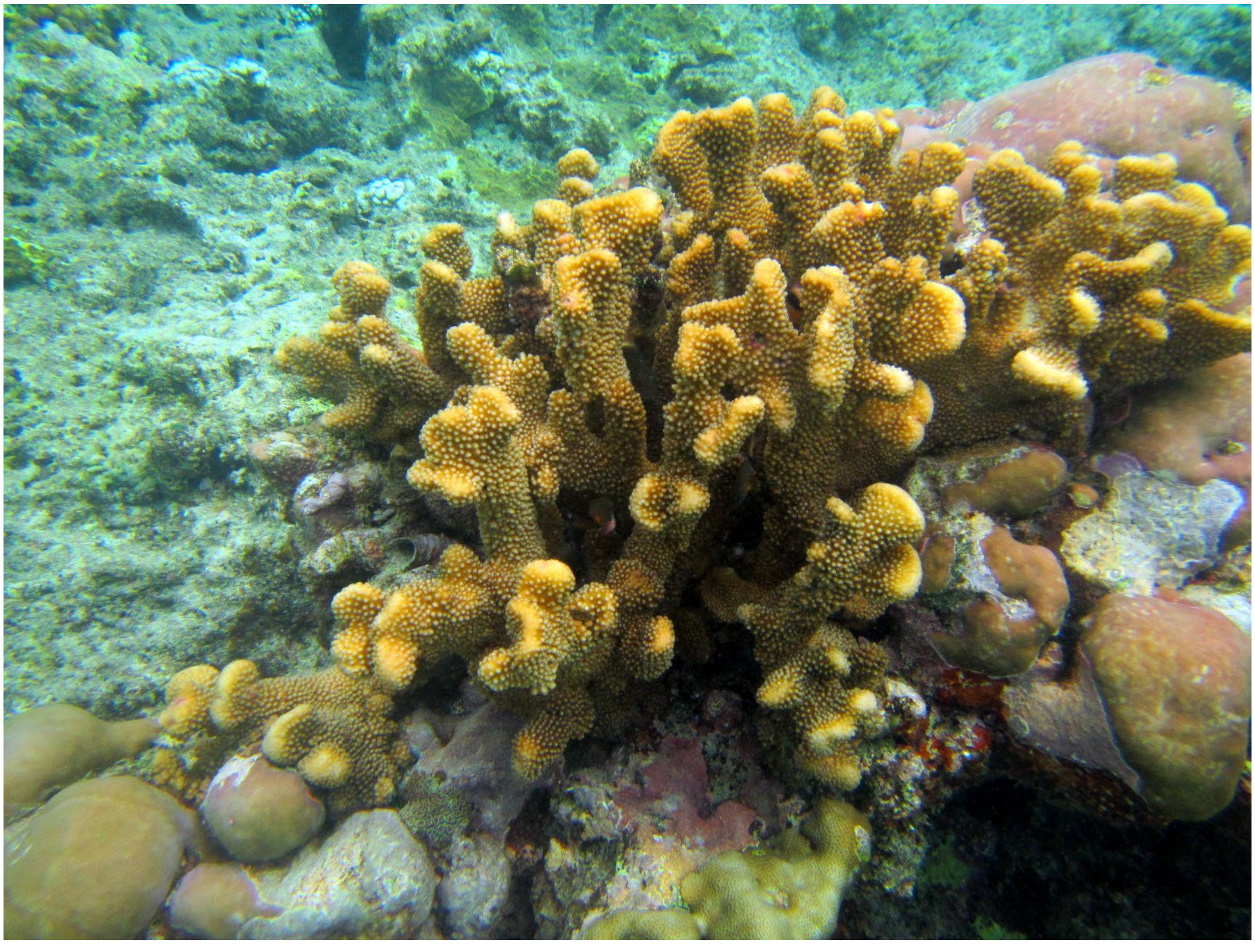
A colony of *Pocillopora fungiformis* with many short, stubby branches.



A colony of *Pocillopora fungiformis* with many stubby, irregular branches.



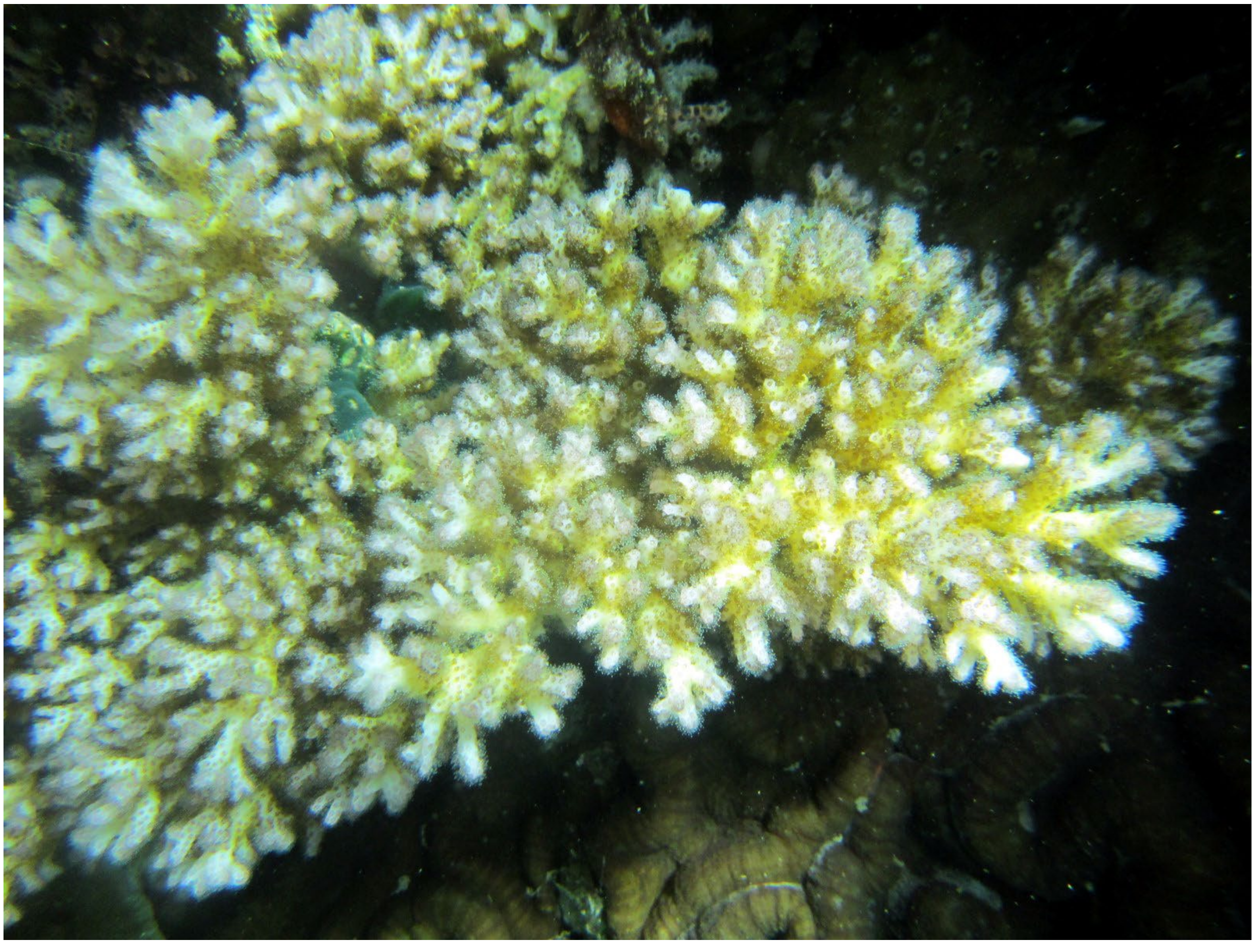
A closer photo of a colony of *Pocillopora fungiformis* with encrusting base, showing the cracks in the base.



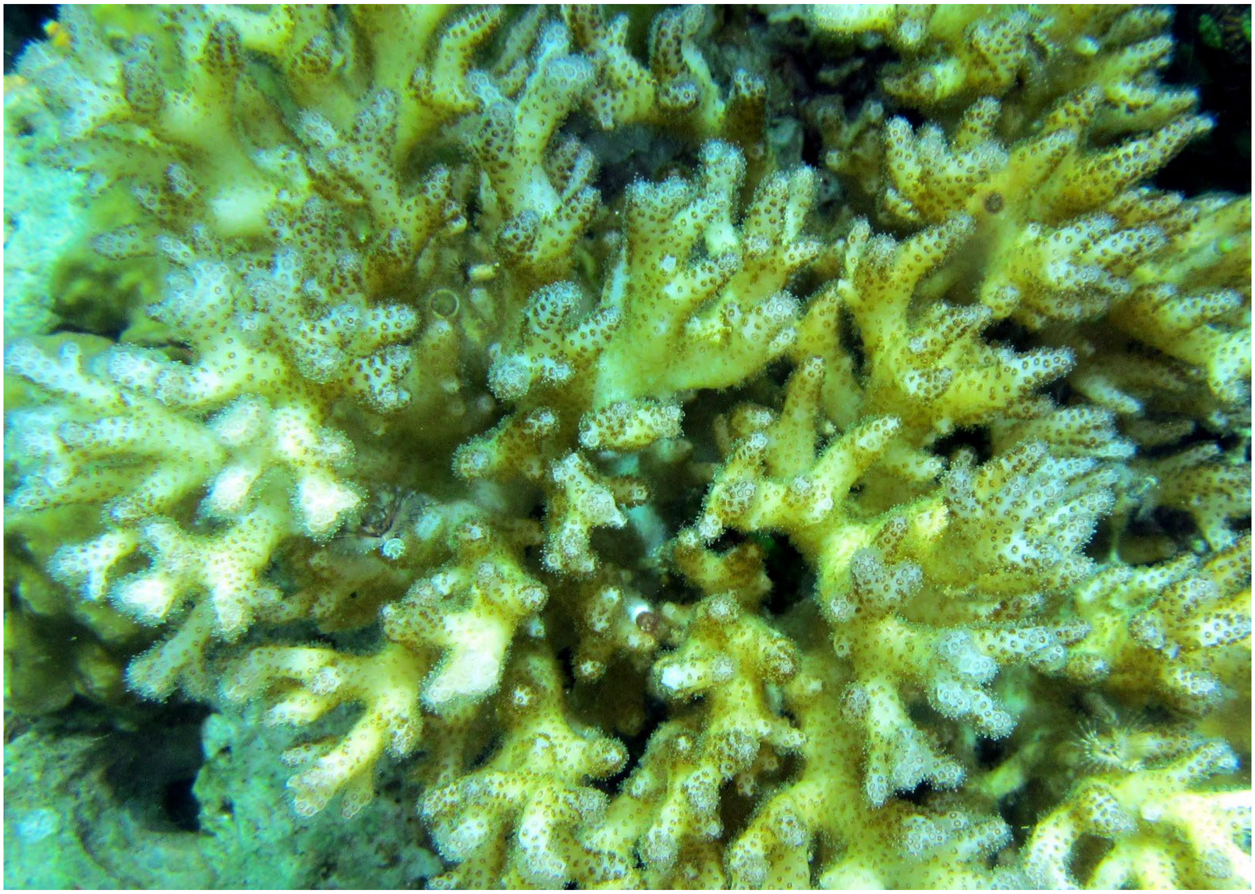
A possible colony of *Pocillopora fungiformis* with longer branches and an unusual branching pattern.

Pocillopora damicornis

This species usually forms colonies less than about 30 cm diameter. The branches divide irregularly and repeatedly until the branch tips are as small as the verrucae (bumps). It is not possible to distinguish verrucae from branch tips. The distance between branches can vary greatly between colonies in different habitats, but in most colonies they are close together. In most other species in this genus, branches are much larger than verrucae, but not in this species. Most colonies are a yellowish color, but they can also be dark red or other colors. Some colonies have so many tiny tentacles out they look fuzzy.



A fairly typical colony of *Pocillopora damicornis*.



A close-up photo of *Pocillopora damicornis*. The dark spots are polyps in corallites.

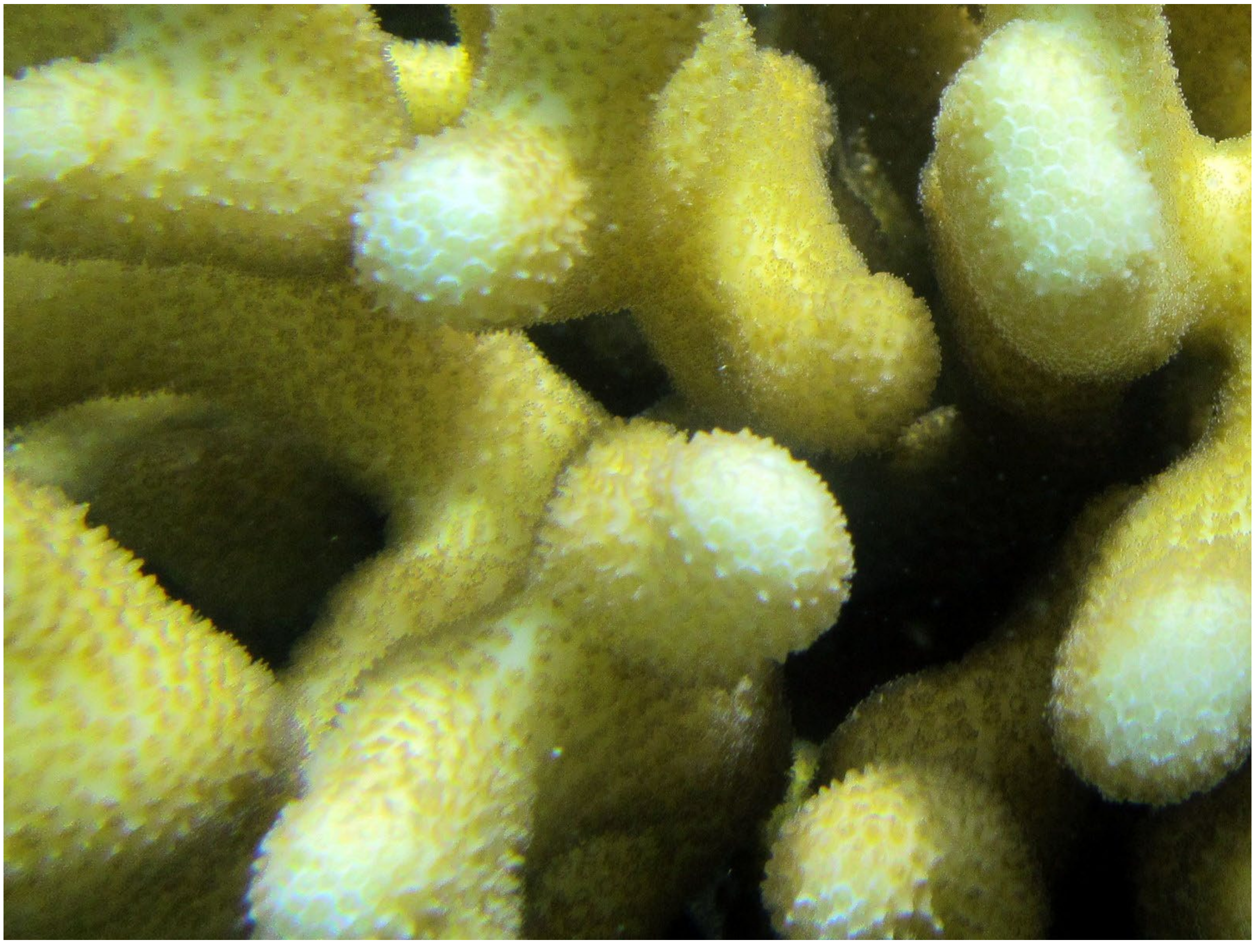
Stylophora

This genus is branching, with different size branches. The largest species has branches that are somewhat similar looking to those on *Pocillopora*. The corallites and polyps are tiny, about 1 mm diameter. Typically, there is a tiny hood or spine projecting above each corallite. The hood is pointed and is small enough to be a bit hard to see, but can be felt easily like a tiny spine. The hoods are much smaller than the verrucae on *Pocillopora*.

Stylophora pistillata

This species forms branching colonies that are usually less than about 30 cm diameter. The branches are smooth with rounded tips, and can be either cylindrical or flattened. Colonies can look like *Pocillopora*, especially like *Pocillopora meandrina*, but there are no verrucae and branches are usually thinner. *Stylophora subseriata* has thinner branches about the diameter of a pencil.

A good size colony of *Stylophora pistillata*. Many of the branches on this colony are cylindrical but they can be flattened. A fair number of colonies are smaller and can have just a few branches.



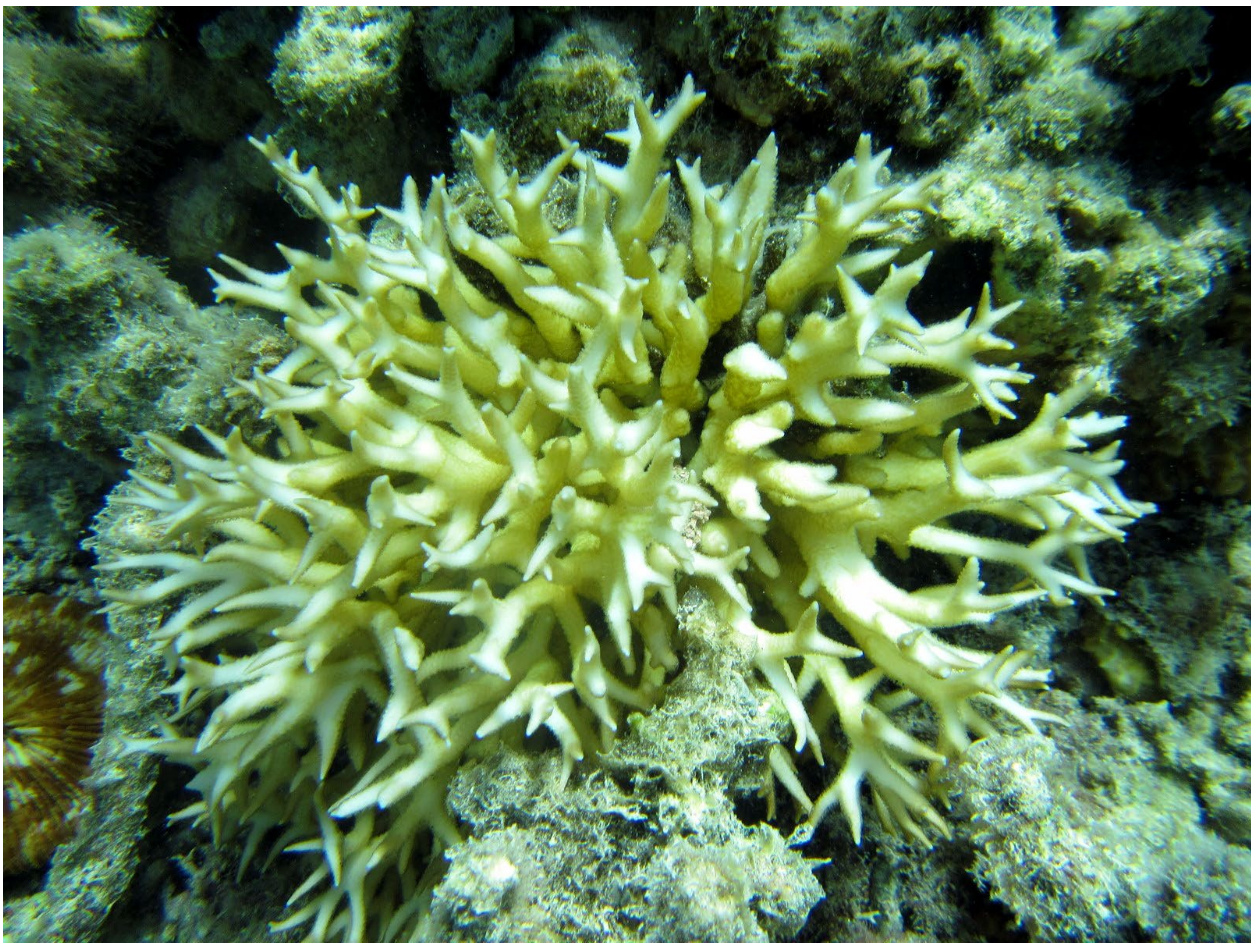
A close-up of *Stylophora pistillata*. The hoods (spines) are visible here, but are generally a bit hard to see under water.

Seriatopora

This genus forms branching colonies with branches about the diameter of a pencil or thinner. The corallites and polyps are tiny, only about 1 mm diameter. There are no verrucae or hoods, and in most species the corallites are flush with the branch and can be quite hard to see. In different species, branches can be long or short, taper to a point over a long distance or over a short distance, or branch tips are rounded. Corallites are usually flush with the surface but can be raised in rows in different species. Branches are thinner than on most *Pocillopora* and *Stylophora*, and there are no verrucae or hoods. There is not corallite at the end of the branch, unlike *Acropora*. Branch ends are usually sharp and polyps are not out unlike *Palauastrea*.

Seriatopora hystrix

This species forms branching colonies that are often less than 30 cm diameter, with branches about the diameter of a pencil or a bit thinner, and which gradually taper over a distance to a sharp point. The corallites are flush with the branch surface and usually very hard to see. Colonies are usually light yellow to cream, but can have some pink. The branches are longer thann on *Seriatopora aculeata*.



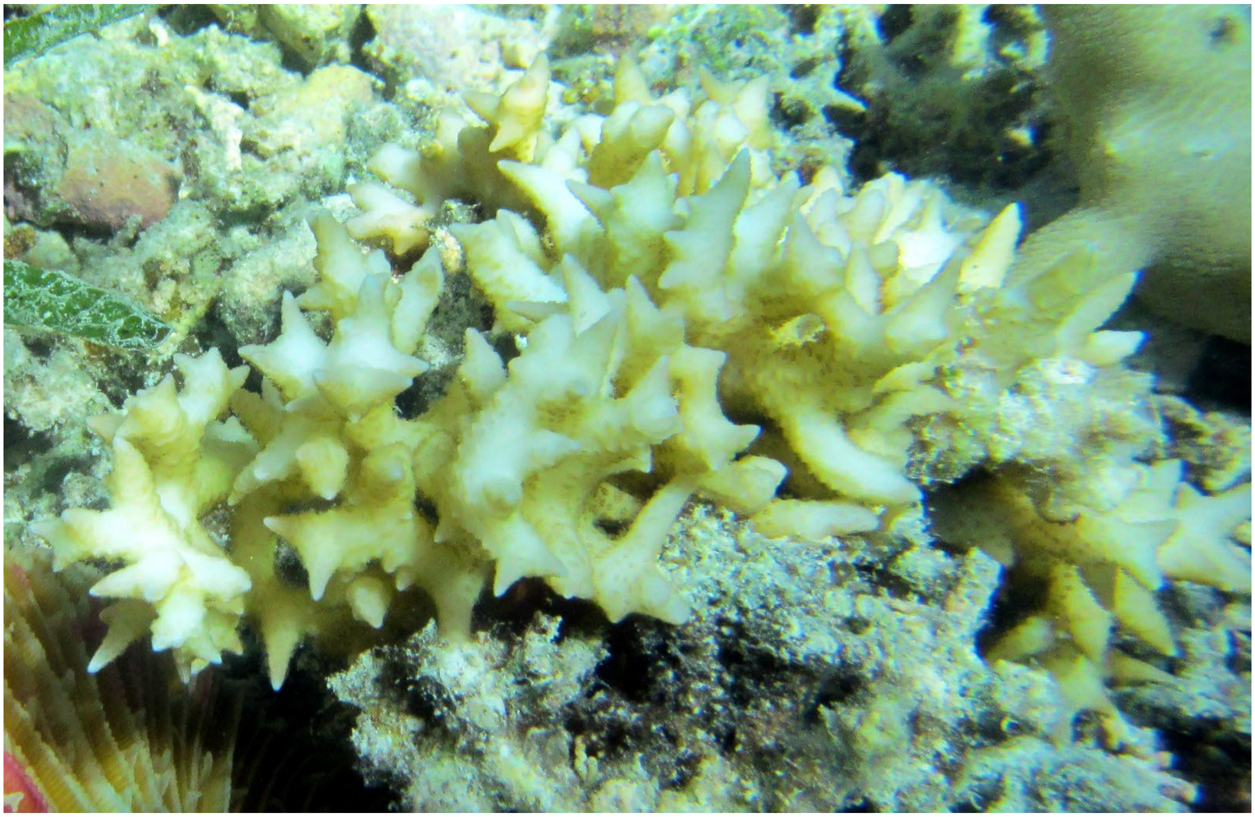
A colony of *Seriatopora hystrix*.

A close-up photo of *Seriatopora hystrix*. The tiny bumps on the branches are tiny tentacles extended partway from the polyps.

Seriatopora aculeata *threatened*

This species forms colonies that are usually less than 20 cm diameter, with branches about the diameter of a pencil or slightly thinner. The branches are very short and taper to a sharp point over a short distance. The corallites are usually very hard to see. The branches are shorter and taper to a point over a shorter distance than on *Seriatopora hystrix*.

A colony of *Seriatopora aculeata*, showing the short branches and tapering to a sharp point over a short distance.



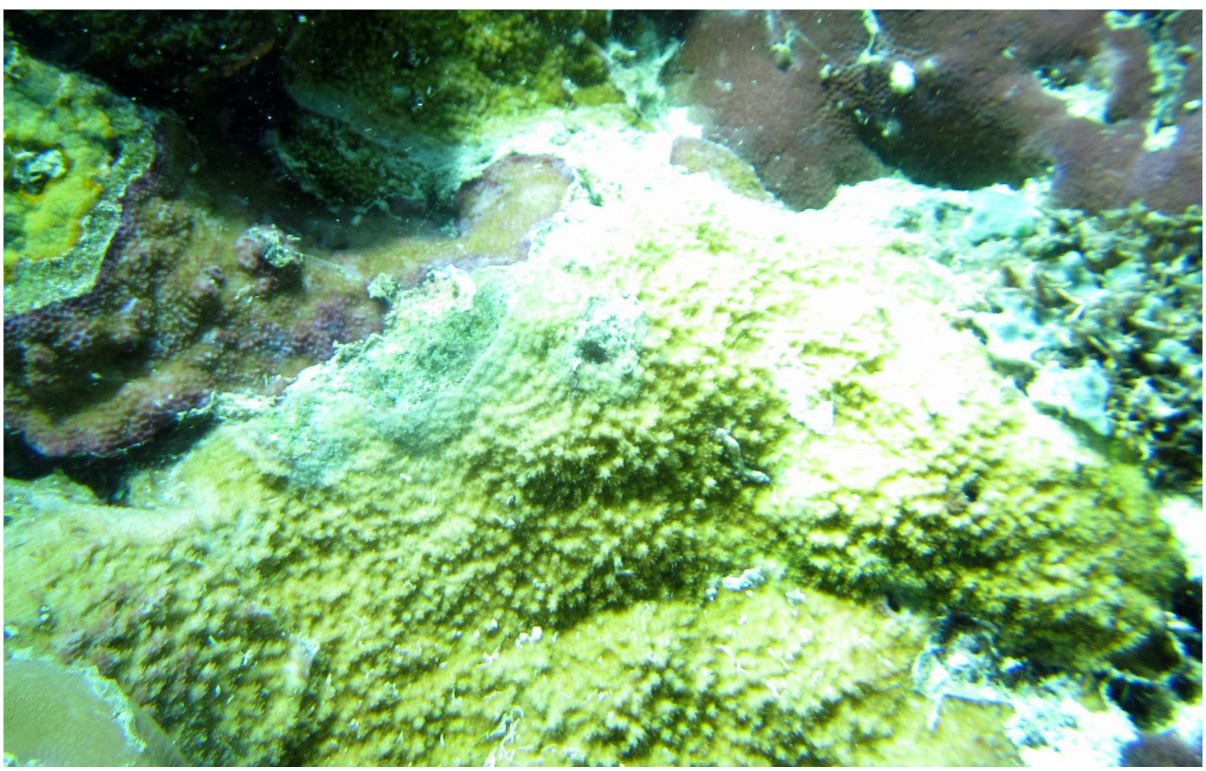
Another colony of *Seriatopora aculeata*, showing the short branches and strong tapering to sharp points.

Montipora

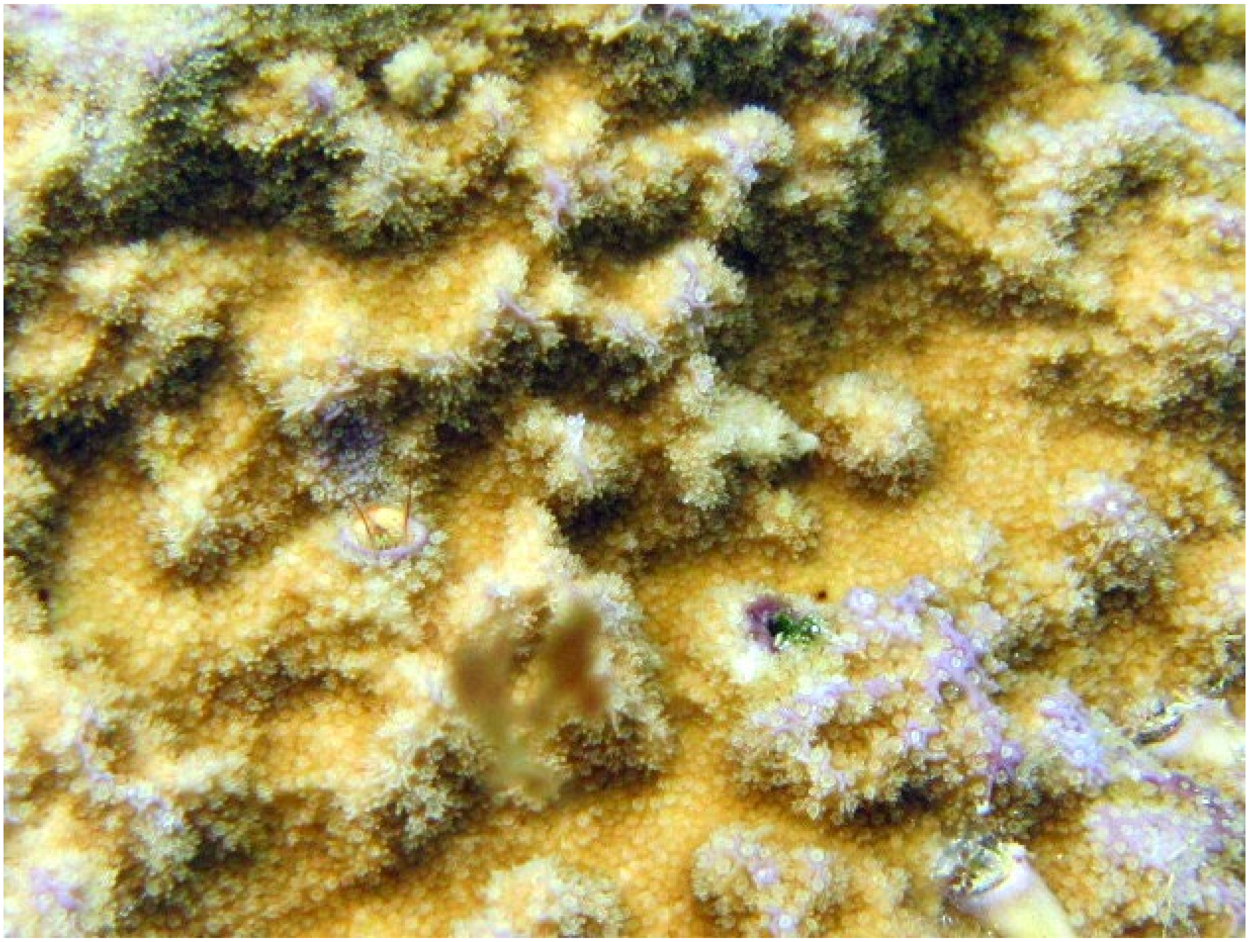
This is the second largest genus of reef corals. Colonies can be a wide variety of shapes from massive to encrusting to thin or thick plates to branches or columns, and can have a combination of shapes. The corallites are about 1 mm diameter and are often hard to see under water. Many species have spines or bumps on their surfaces, which are called "tuberculae." Some species have tiny spines smaller than corallites that are called "papillae." Other species have rounded, uniform pegs or bumps as larger or larger than corallites, called "verrucae" (which means "blister" in Latin). Verrucae can be up to about 4-5 mm diameter. In some species, the papillae or verrucae are fused into ridges of various lengths and shapes. In some species, larger lumps about the size of marbles may be present, with papillae on them. A few species have completely smooth surfaces, which is called "glabrous." Others have their corallites recessed into the coral at the base of funnels, this condition is called "foveolate." *Montipora* is the second largest genus of corals, with about 75 species known. *Porites* also has tiny corallites, but rarely has much space between them or bump between them, and never has spines. *Pocillopora* has bumps called "verrucae" but has polyps all over them and they are not smooth.

Montipora grisea

This species forms encrusting colonies with tiny spines called papillae. The papillae can appear and/or feel like the grit on sandpaper. In this species, the corallites are commonly surrounded by papillae, and may be raised by the papillae. Also, there are papillae between the corallites. The papillae are smaller and harder to see than on *Montipora informis*, and more irregular in height. *Montipora aequituberculata* is a plate and has tiny ridges at the edge.



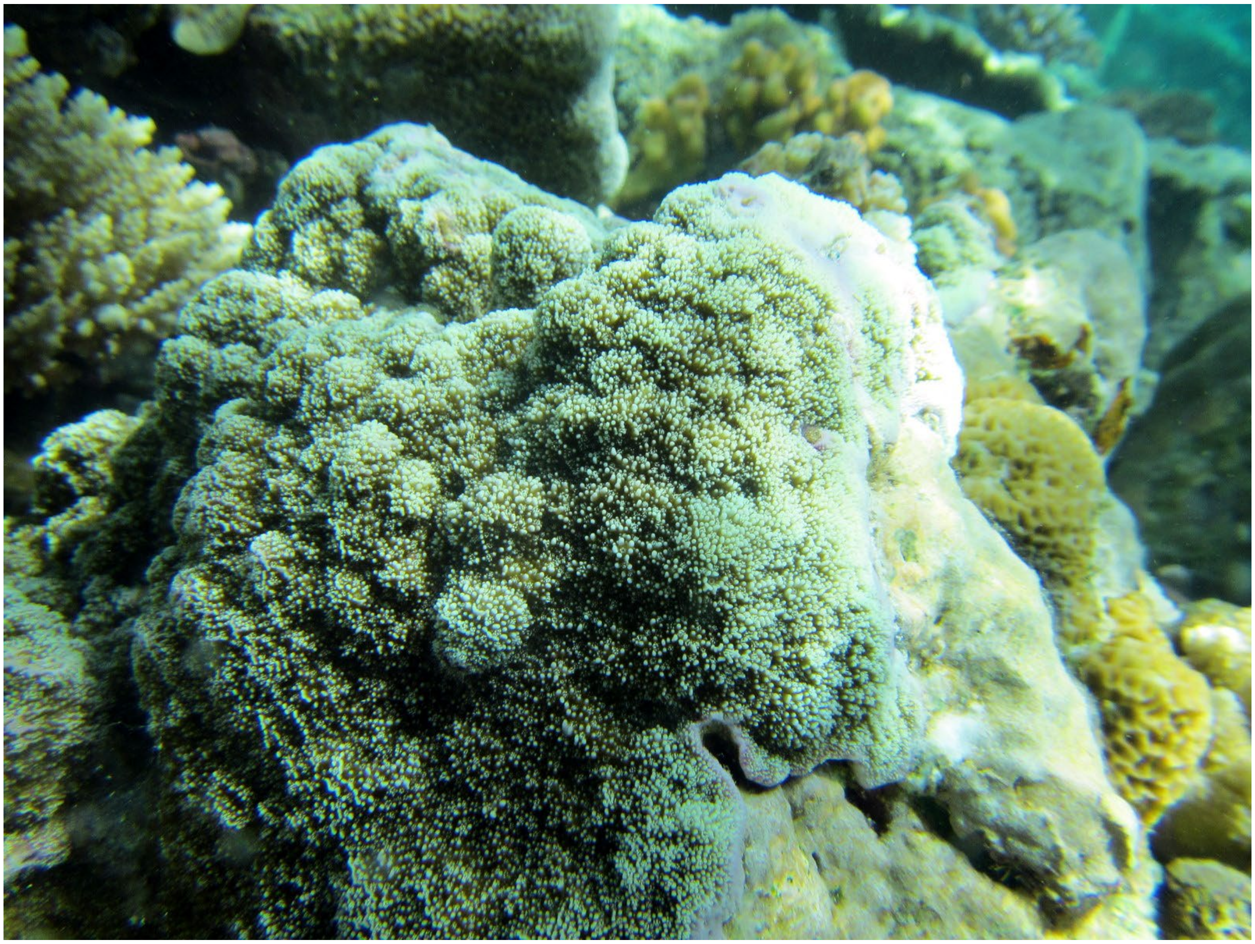
The lower, yellowish coral in this picture is *Montipora grisea*. It has many corallites raised by a ring of papillae around them.



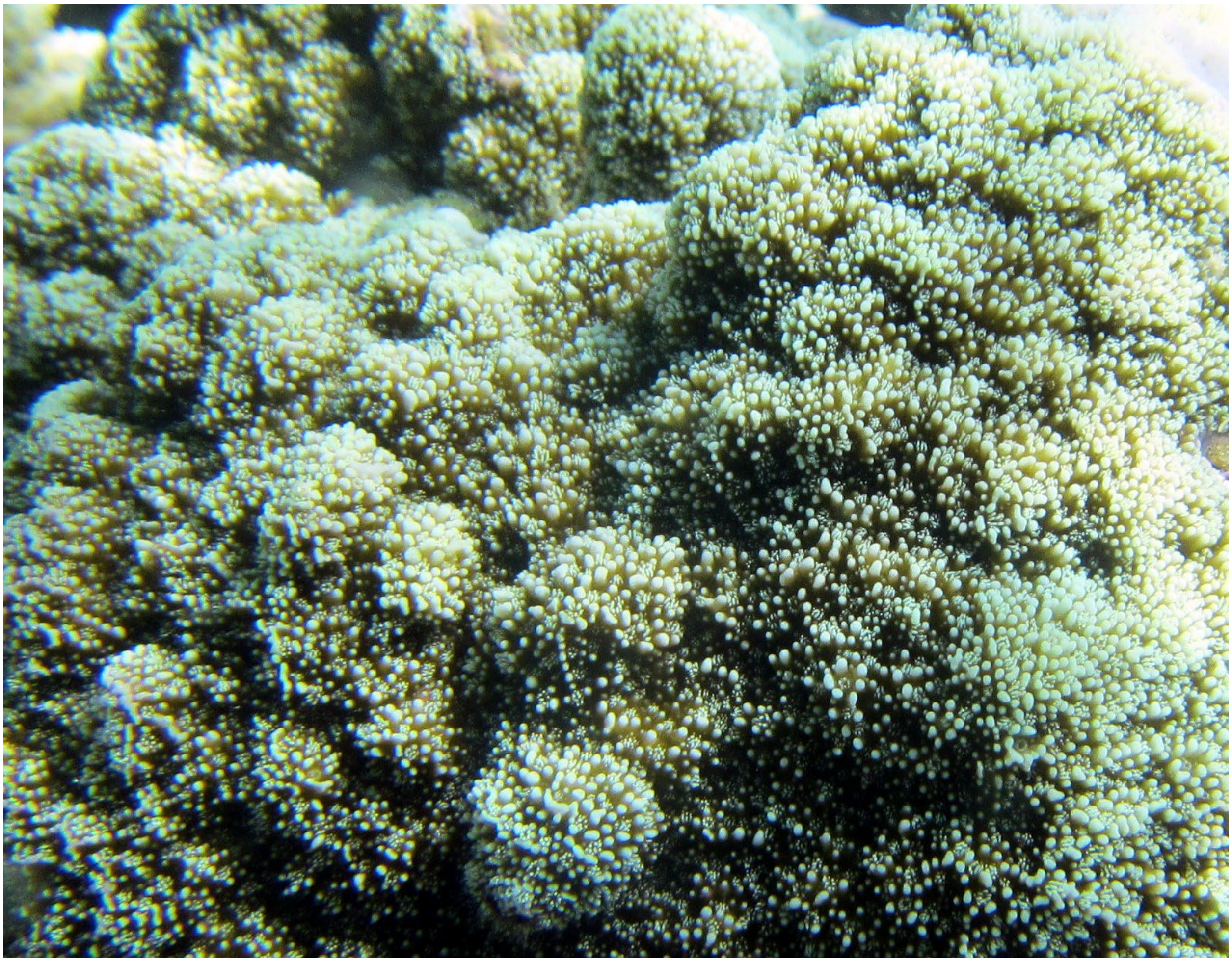
A close-up photo of *Montipora grisea*. The tiny circular bumps are corallites, each surrounded by a ring of tiny papillae.

Montipora informis

This species is encrusting, and has uniform papillae that are tiny cylinders with rounded ends. In some colonies they can be light colored against the dark backround of the colony. They are more uniform and visible than on *Montipora grisea*. *Montipora aequituberculata* forms plates with tiny ridges at the edge.



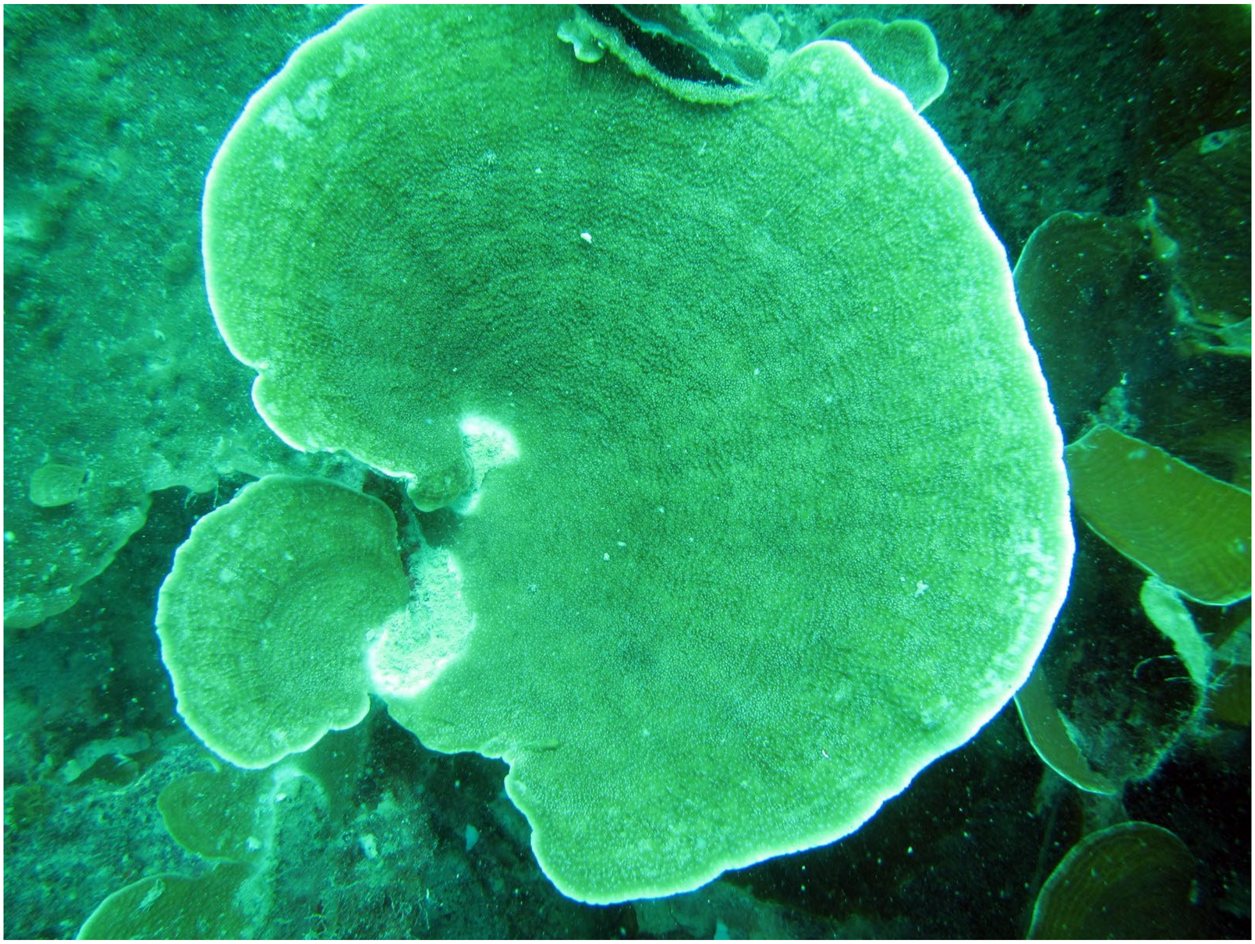
A colony of *Montipora informis*. The dots are the papillae.



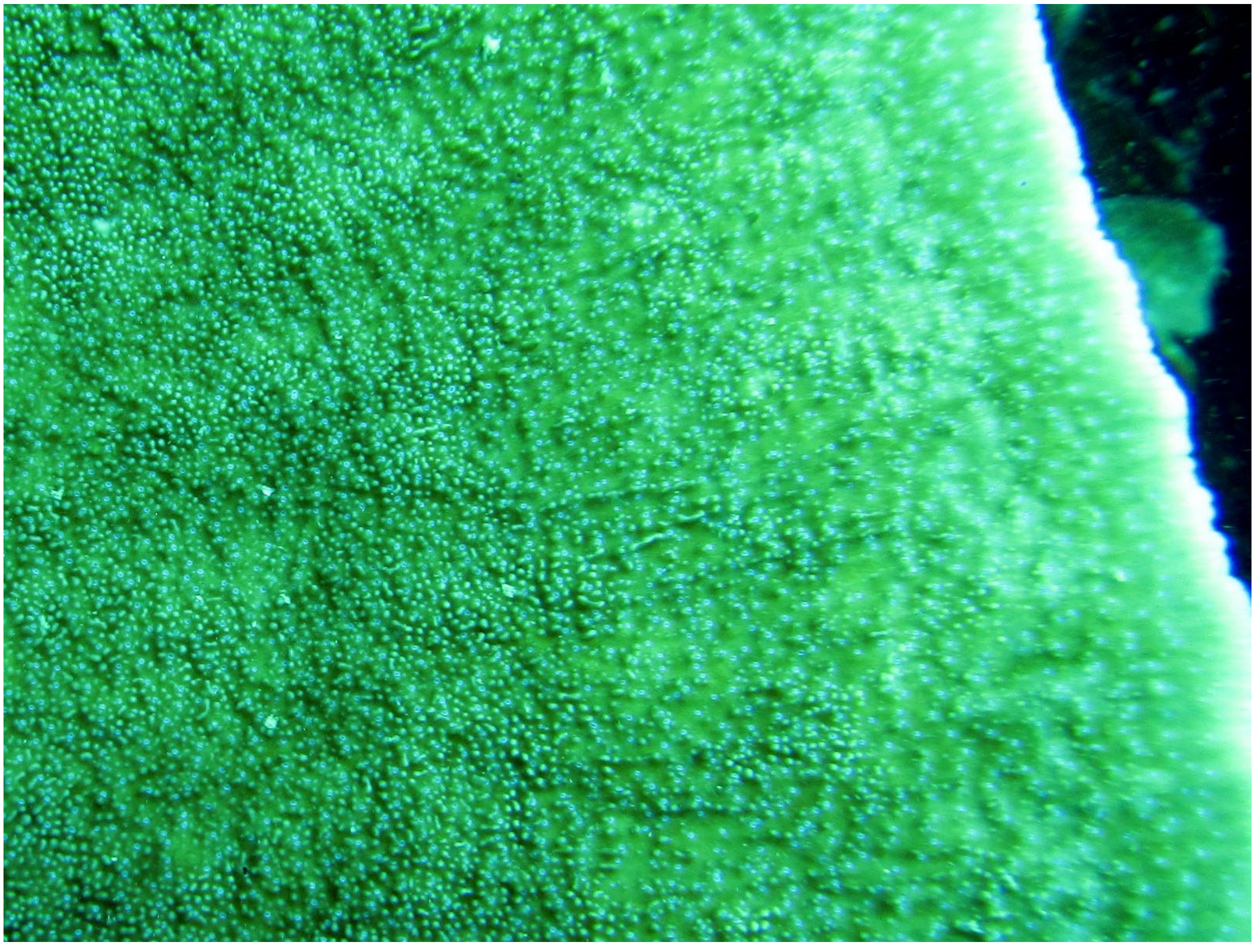
A close-up photo of the same colony showing the papillae. The corallites are slightly indented and tiny tentacles can be seen in some places.

Montipora cf. aequituberculata

The “cf.” in the names means “compare to.” It indicates there is some uncertainty about this identification. This species forms thin plates with small papillae on them, which usually fuse into short radiating ridges near the edges of the plate. The plate figured has a few thin ridges near the edge of the plate. *Montipora grisea* and *Montipora informis* are encrusting and do not have thin ridges near the edge of the plate.



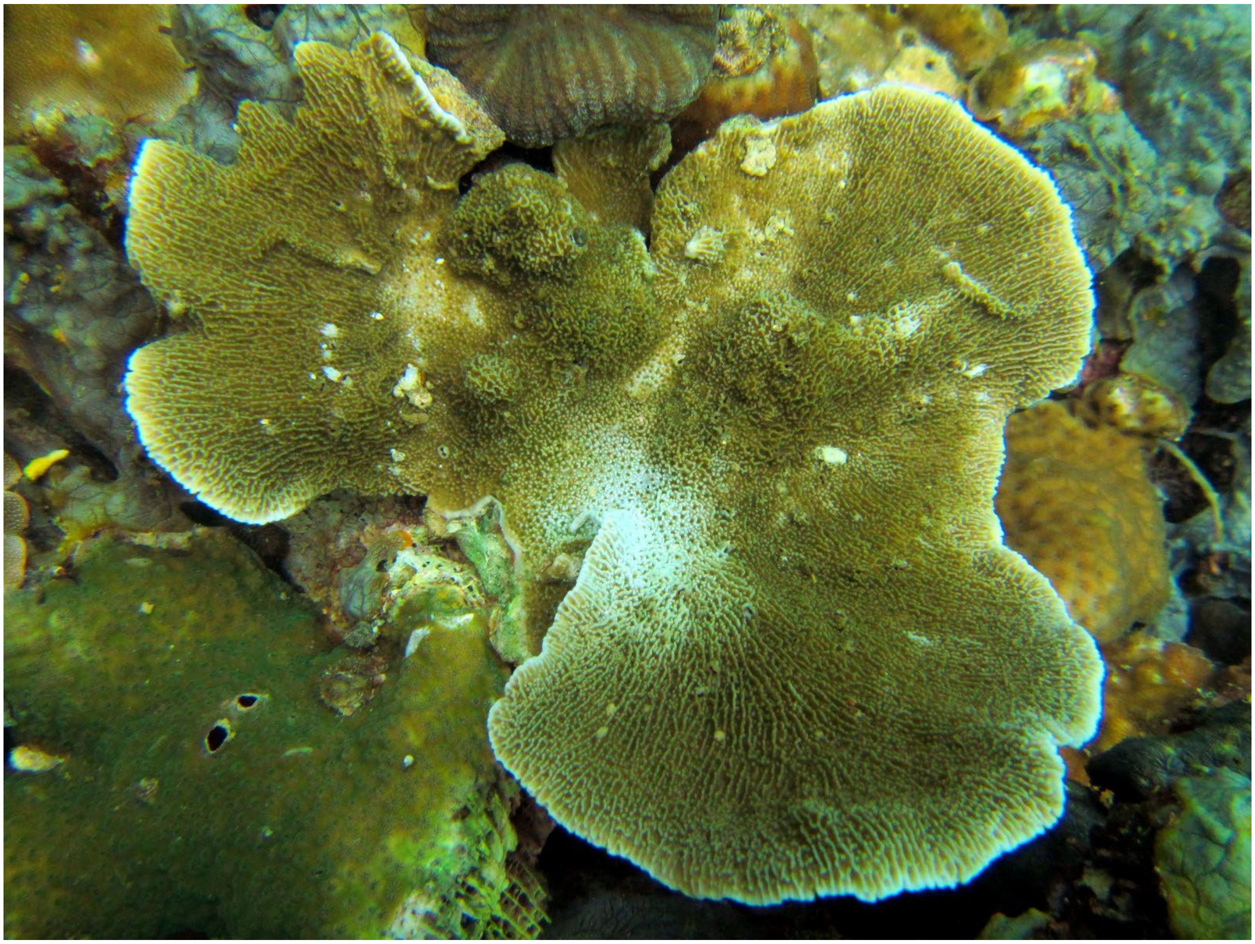
A thin plate *Montipora* that may be *Montipora aequituberculata*.



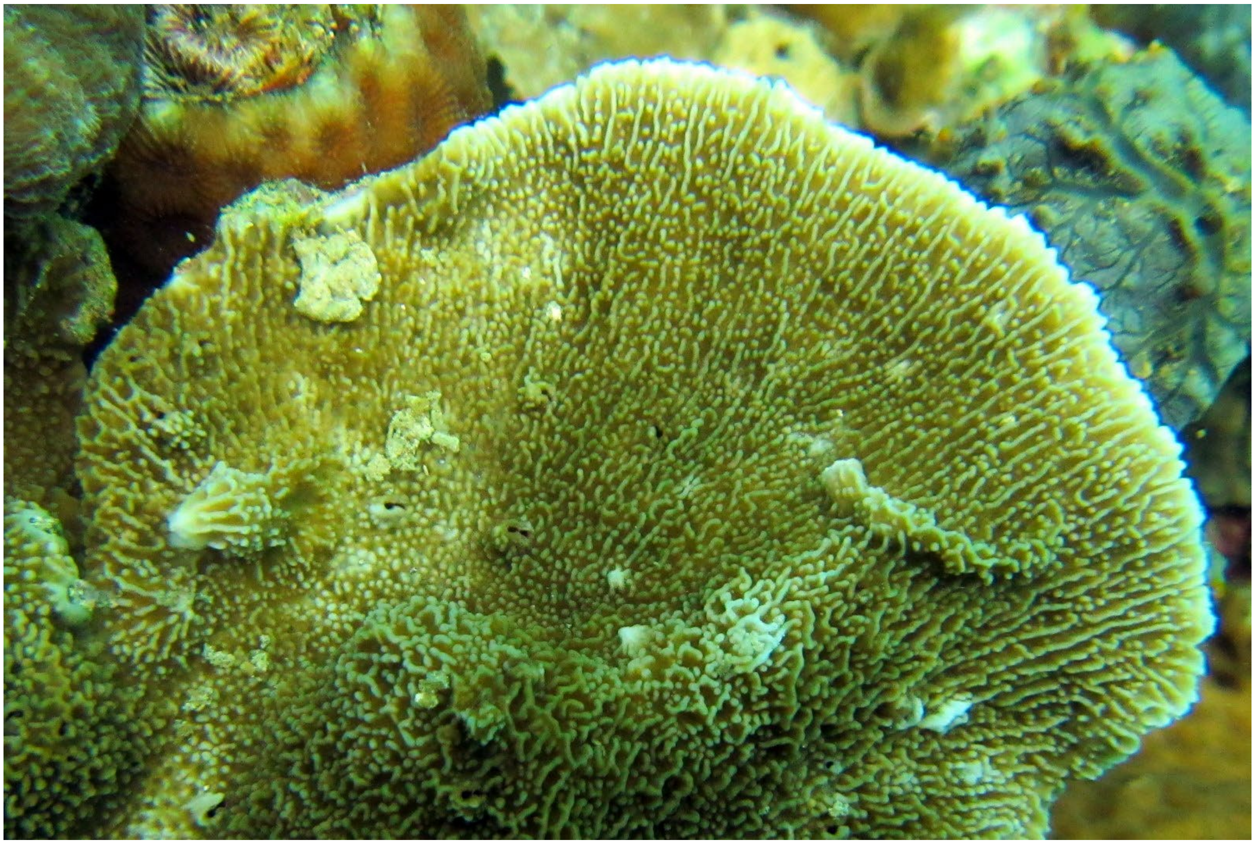
A close-up of the same colony of *Montipora* cf. *aequituberculata*. There are a few radiating thin ridges near the center of the photo.

Montipora foliosa

This species forms thin plates with thin radiating ridges on it. The ridges are much longer than on *Montipora aequituberculata*.



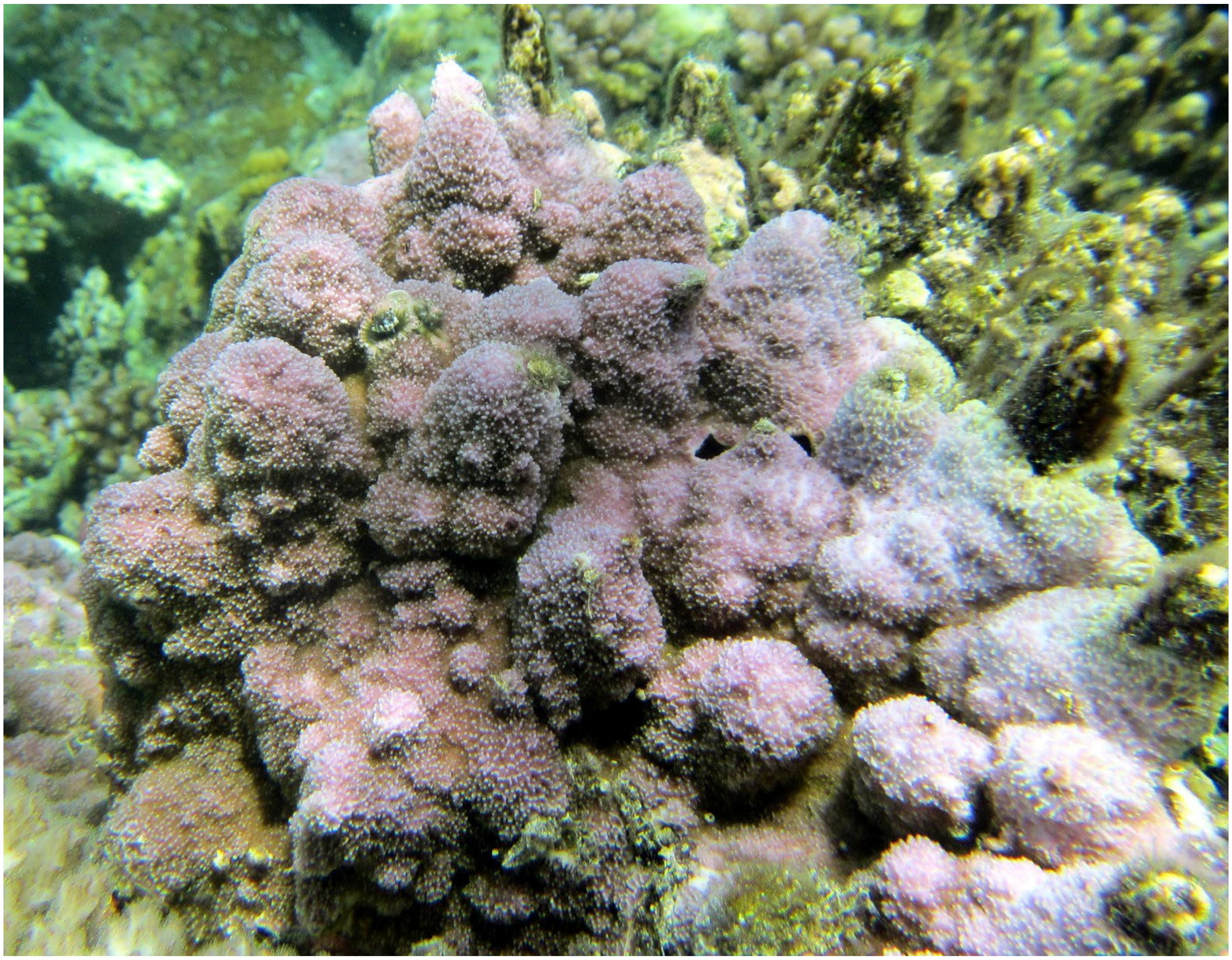
Montipora foliosa, showing the thin radiating ridges.



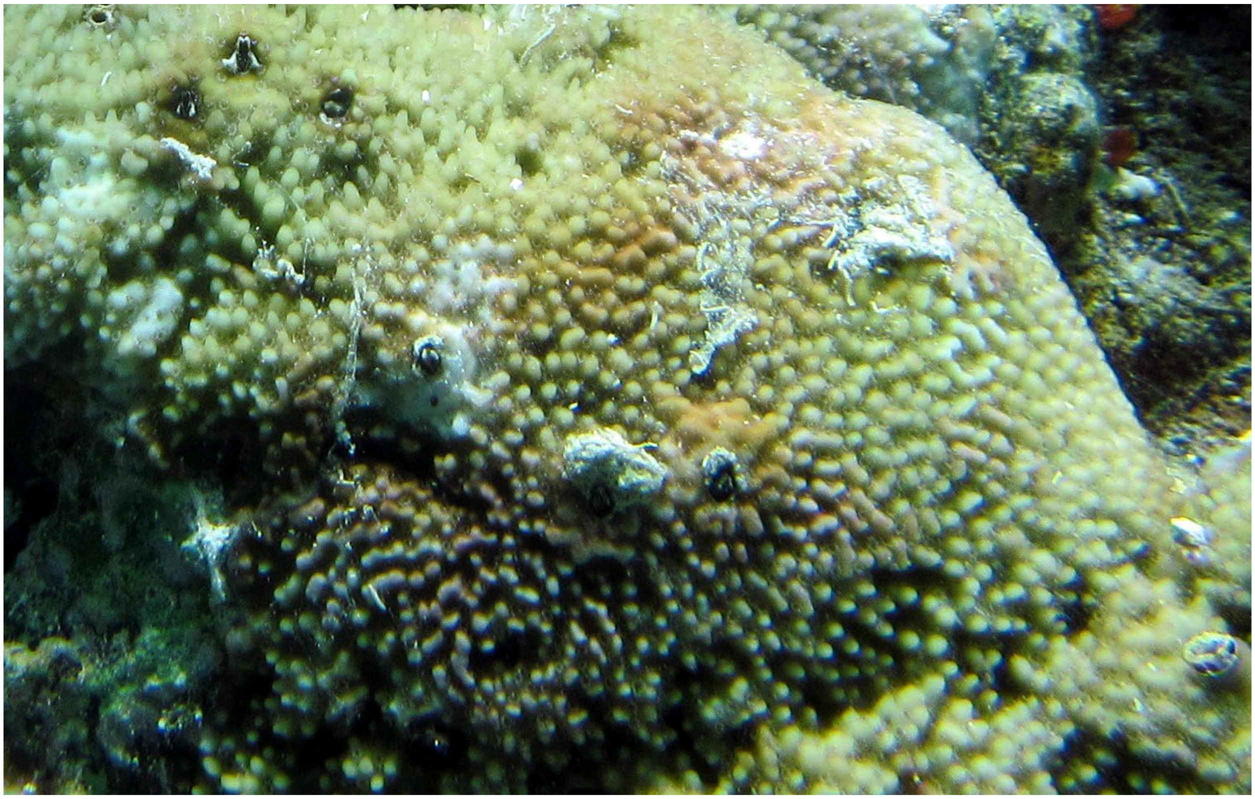
A close-up of *Montipora foliosa*, showing the thin radiating ridges.

Montipora tuberculosa

This species is encrusting, with tuberculae that are about the diameter of the corallites. So they are larger than papillae (which are smaller than corallites) but smaller than most verrucae, which are larger than corallites. This species has tuberculae that are larger than the papillae (spines) on *Montipora grisea*, *M. informis*, and *M. aequituberculosa.*



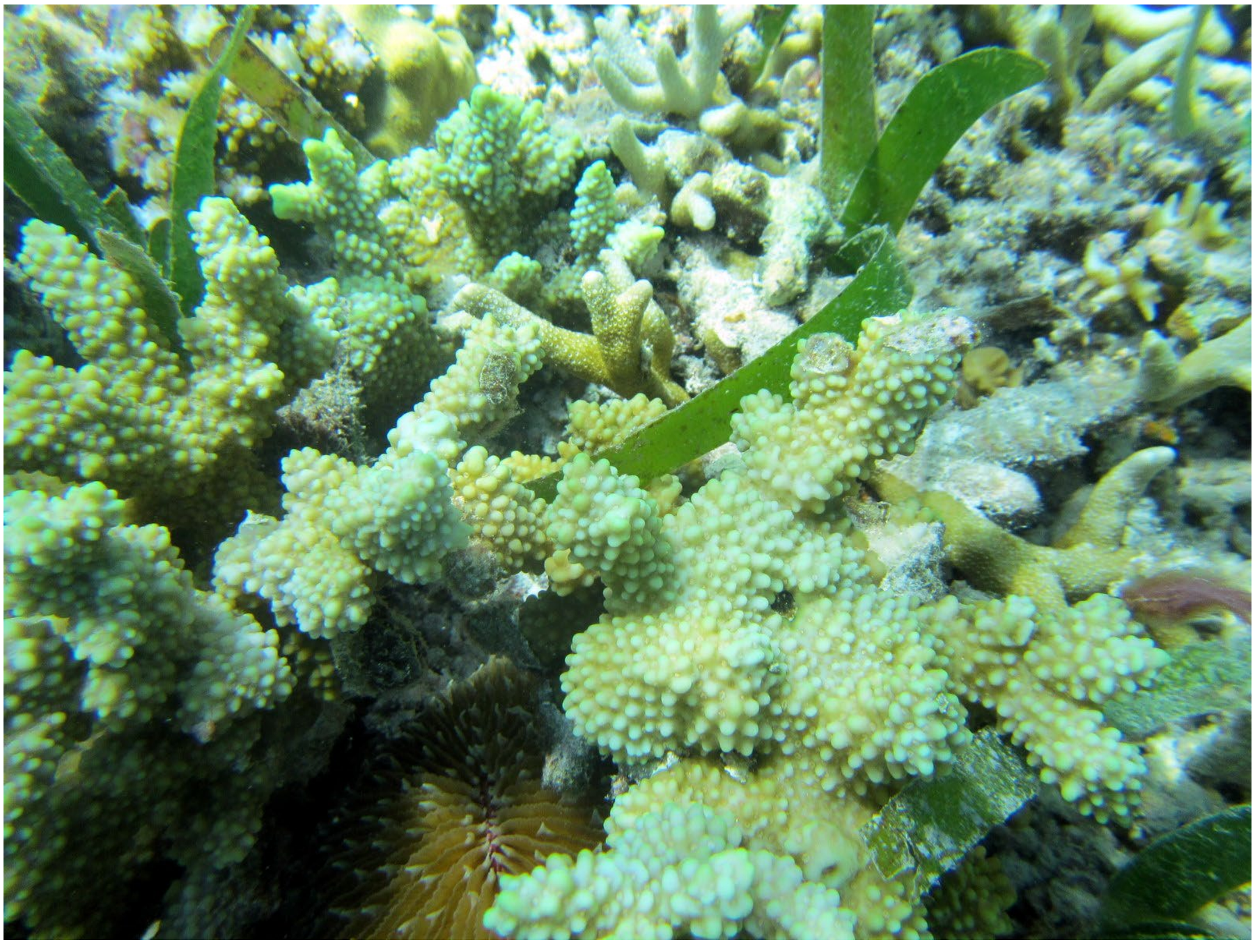
A colony of *Montipora tuberculosa*.

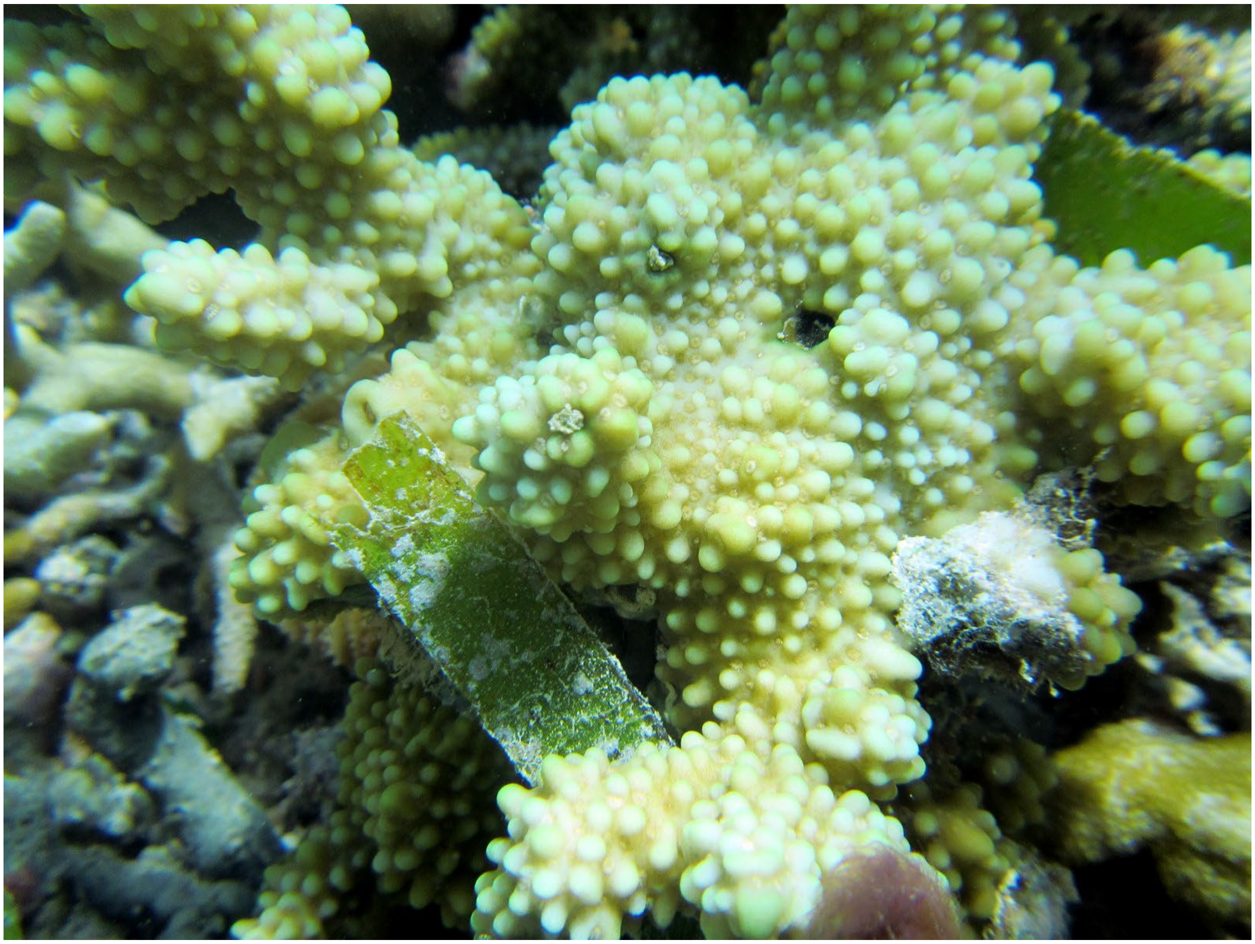


A close-up of a colony of *Montipora tuberculosa*.   The tuberculae are about the diameter of the polyps (and thus corallites).

Montipora capitata

This species can be encrusting or branching, or a combination of both. It has small verrucae, which are larger than the tuberculae on *Montipora tuberculosa*, but smaller than the verrucae on *Montipora verrucosa* and *Montipora danae*. The verrucae on this species are usually about the same width as their height, and are rounded and smooth. The colonies seen here are branching and were found in a shallow rubble field along with other species. The branch tips are rounded and smooth, without an axial corallite (which *Acropora* has).

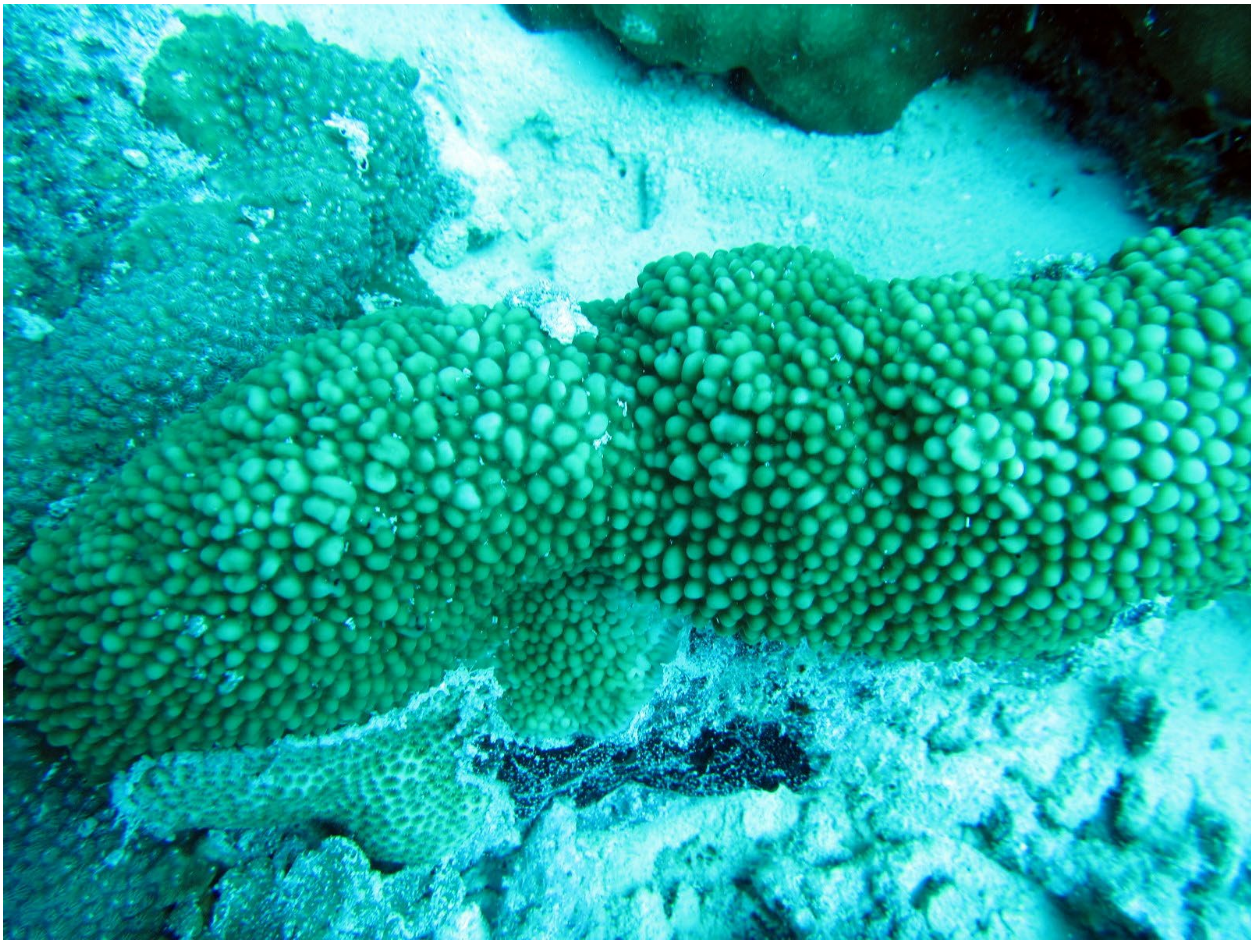




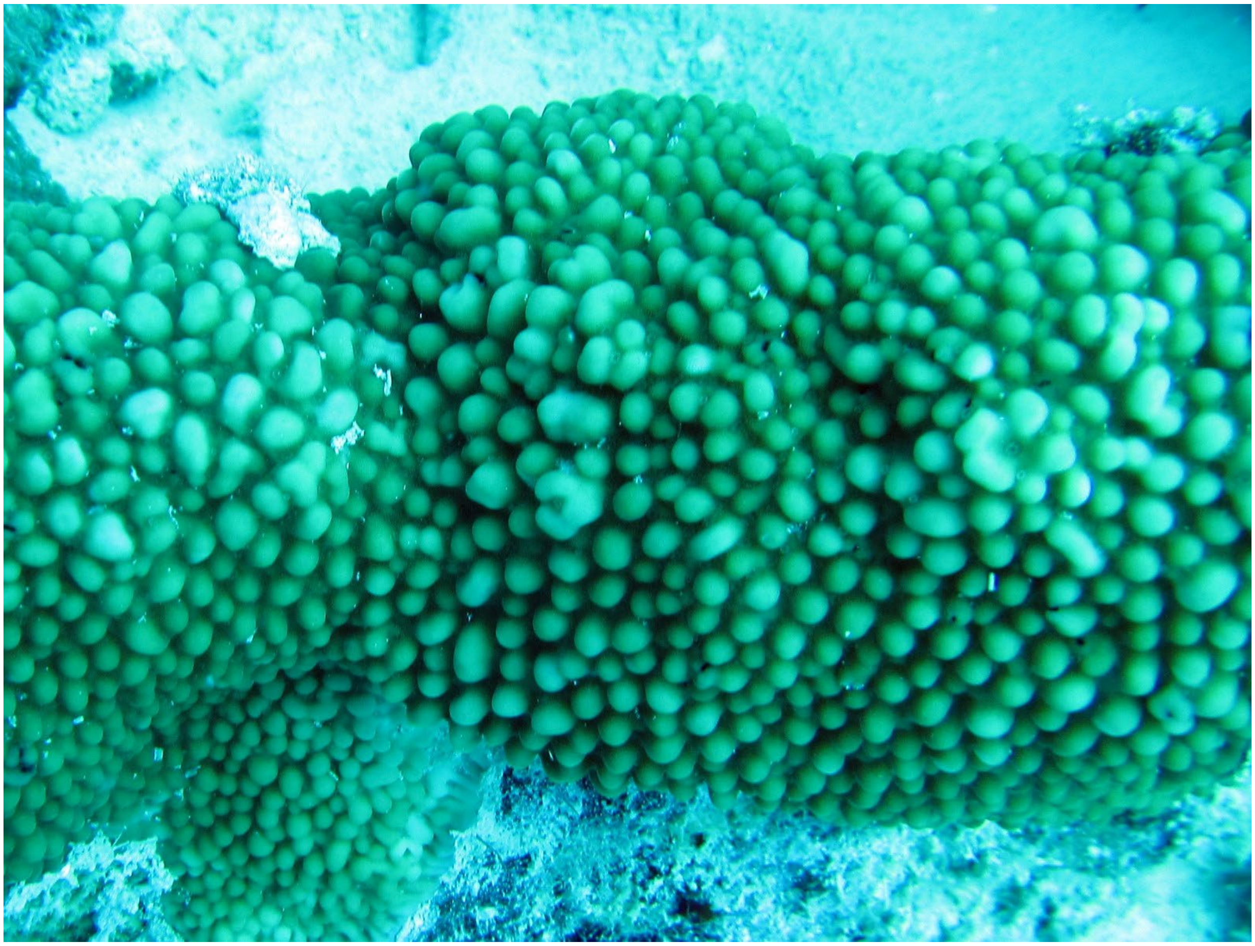
A close-up of a colony of *Montipora capitata*. The verrucae are larger than the corallites. There is variation in the size of verrucae on this colony, other colonies may have less size variation.

Montipora danae

This species has larger verrucae than *Montipora capitata*, and the verrucae are often irregular in outline, not uniformly near-circular as on *Montipora verrucosa*.



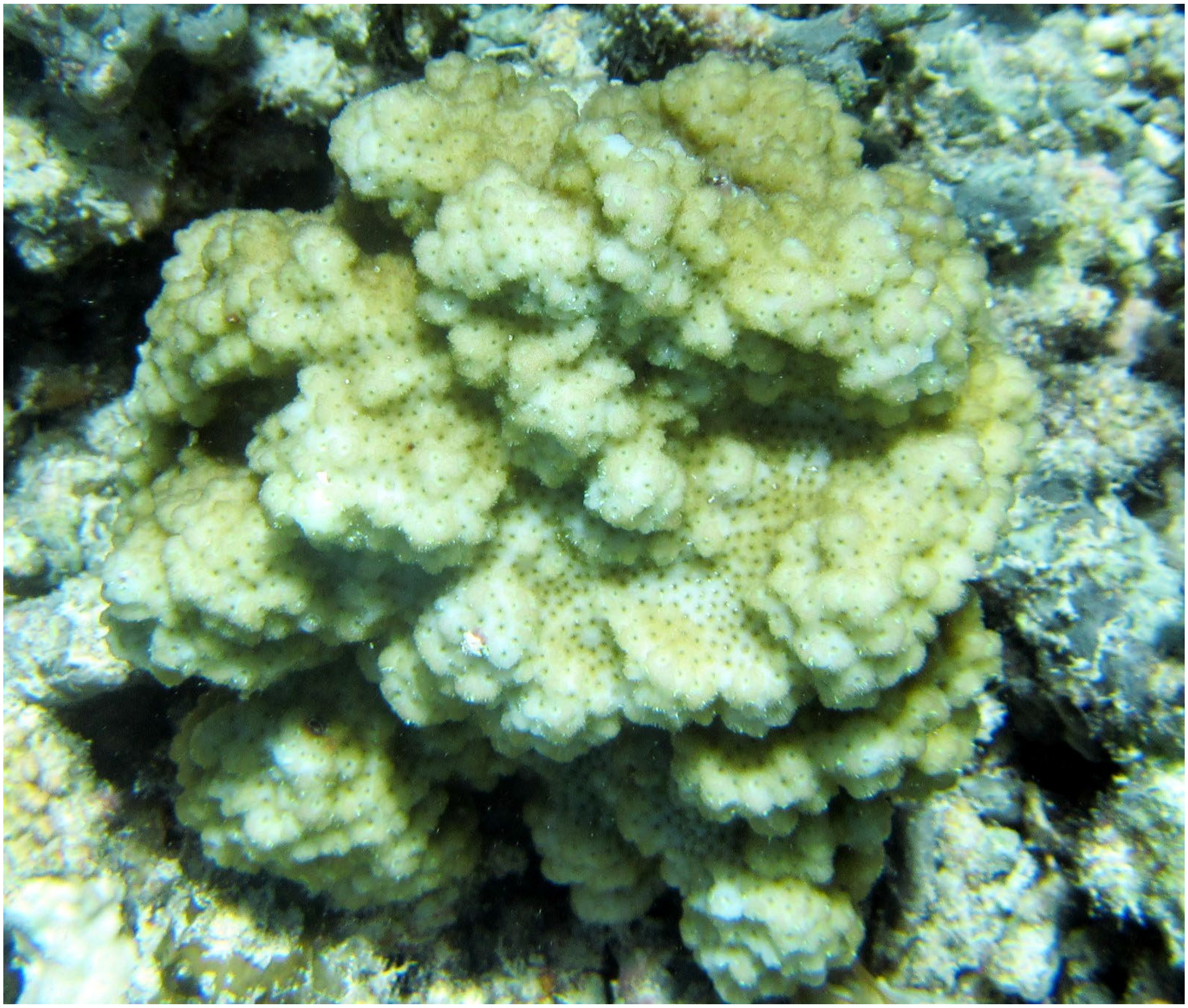
A colony of *Montipora danae* with larger verrucae that can be in irregular shapes.



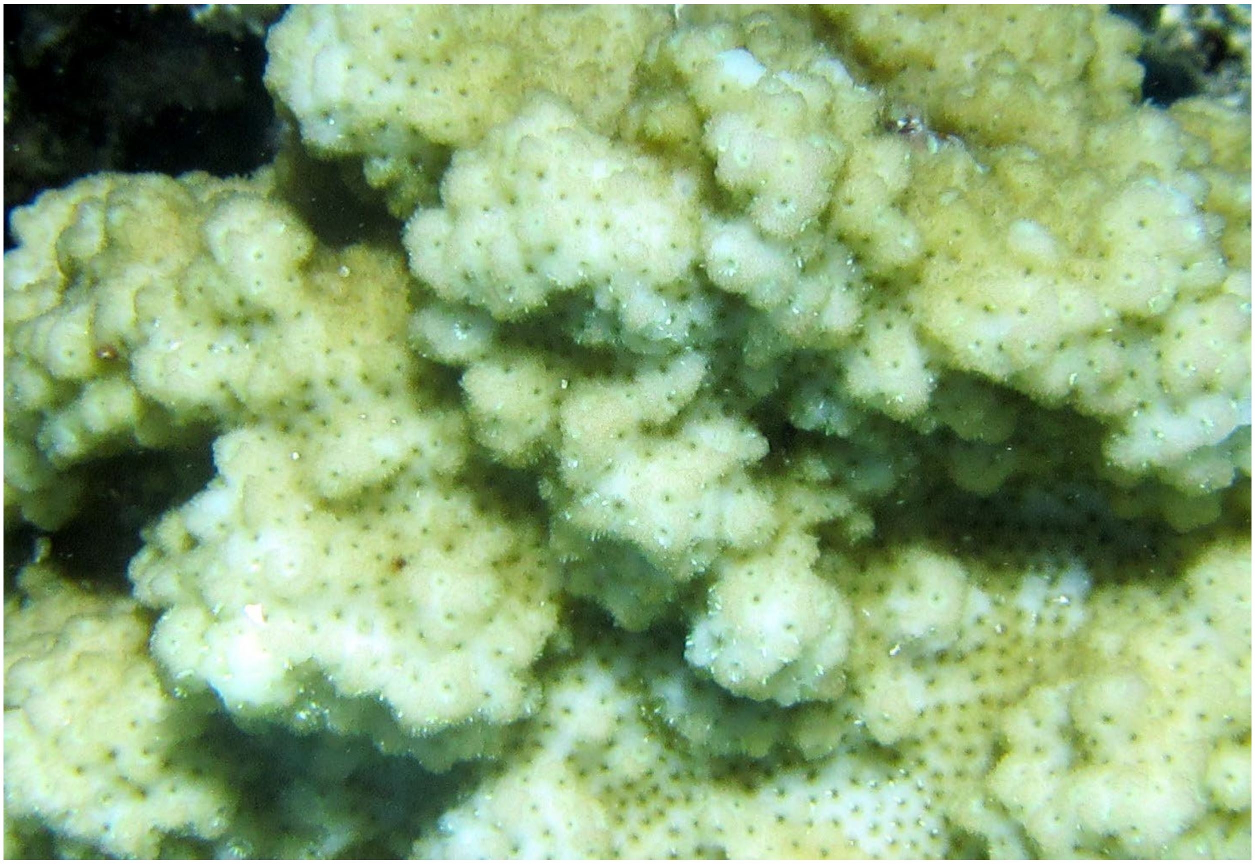
A close-up photo of *Montipora danae*, showing the larger verrucae which can be irregular shapes.

Montipora hoffmeisteri

This species forms encrusting colonies with irregular lumps on it, which have corallites both between the lumps and on the lumps. There are no papillae or tuberulae. Other species that have bumps have papillae.



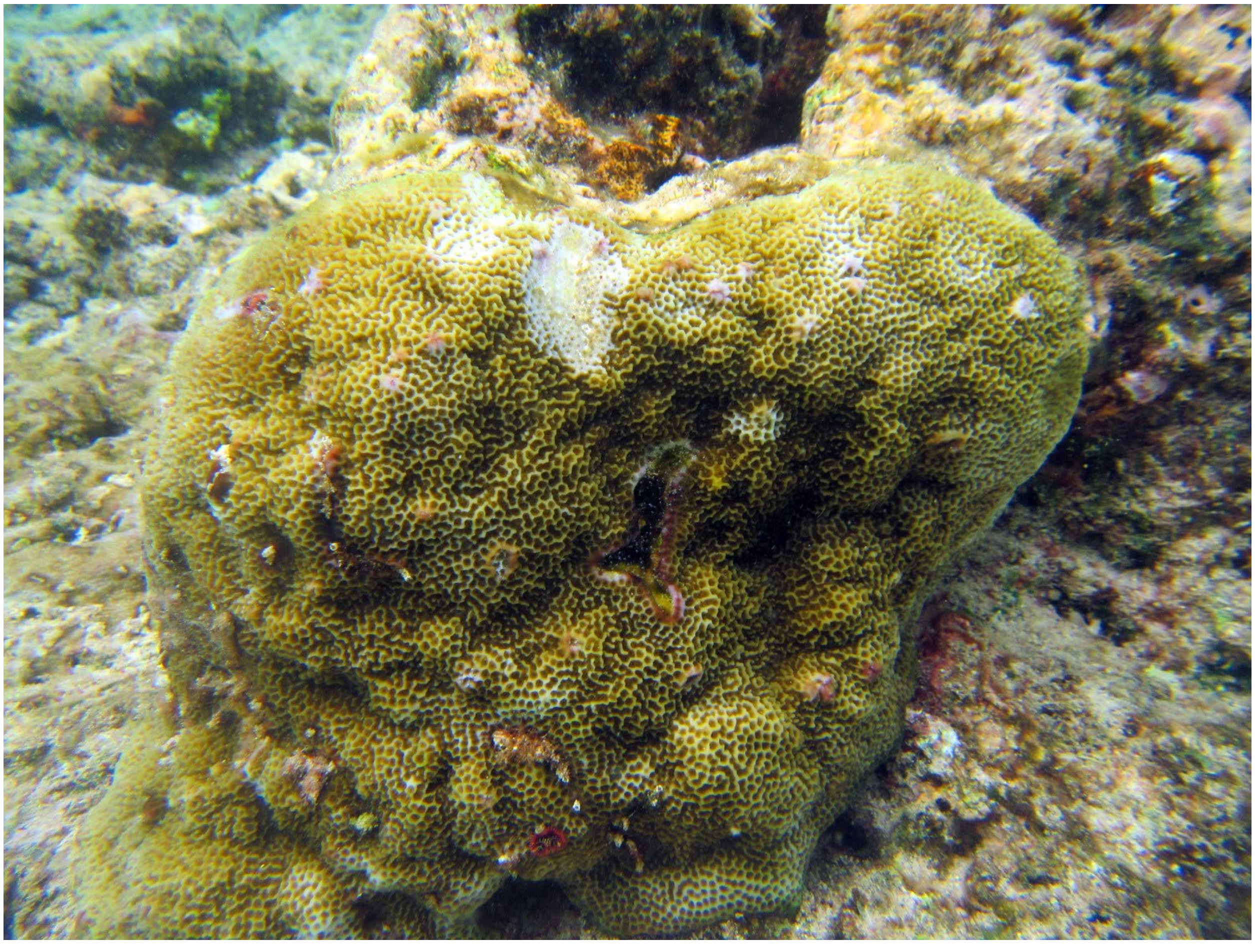
A small colony of *Montipora hoffmeisteri*. The dark spots are the corallites, which are both on and between the lumps.



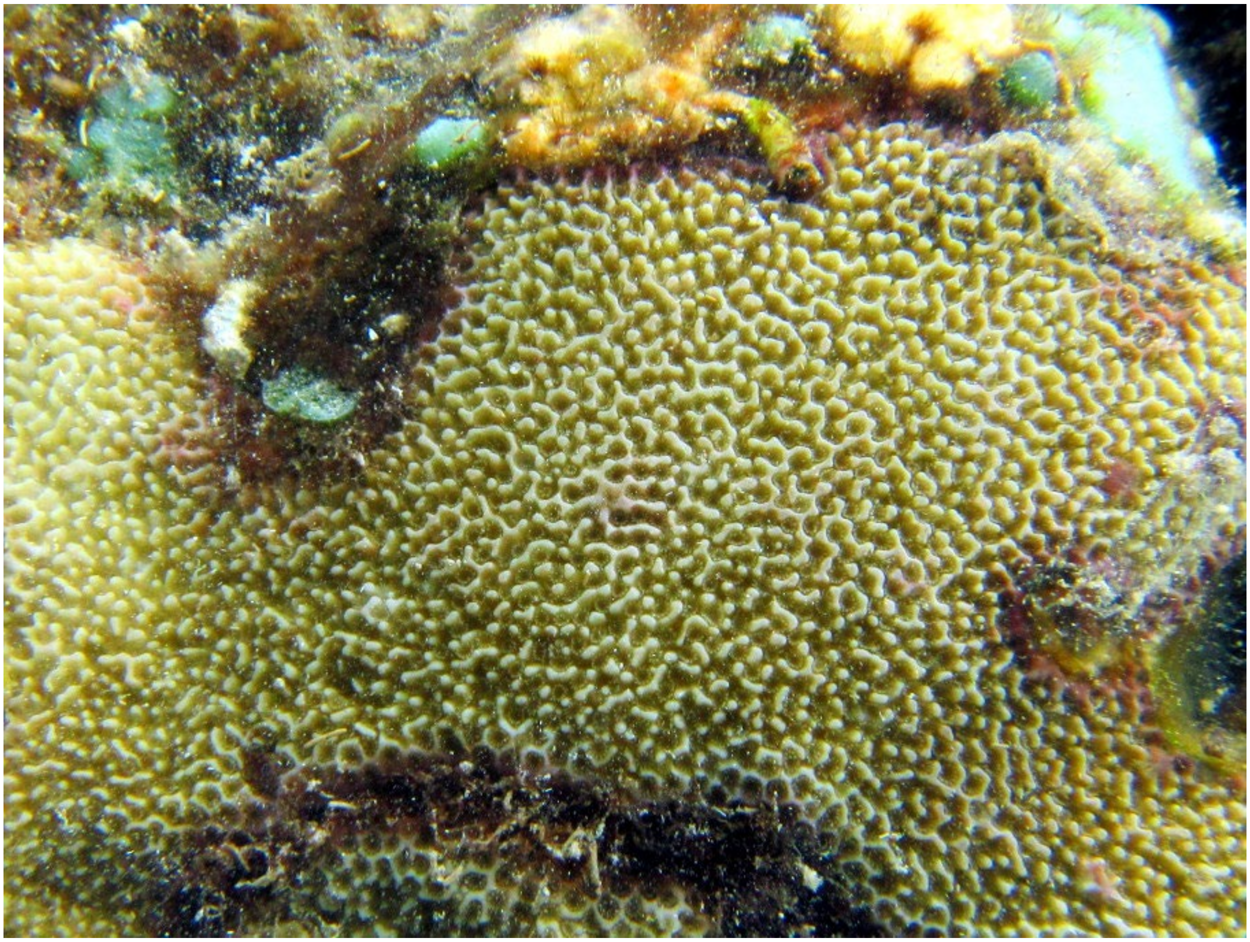
A close-up photo of the same coral showing corallites both between and on lumps.

Montipora caliculata *Vulnerable*

This species forms encrusting or massive colonies with papillae that fuse into ridges that partly surround corallites. In some places there are individual papillae, in others there are thin ridges that completely surround corallites. The thin ridges do not radiate towards the edge of the colony as in *Montipora aequituberculata* and *Montipora foliosa*, and the colony is encrusting not a thin plate. The thin ridges do not completely enclose corallites as on *Montipora foveolata*.



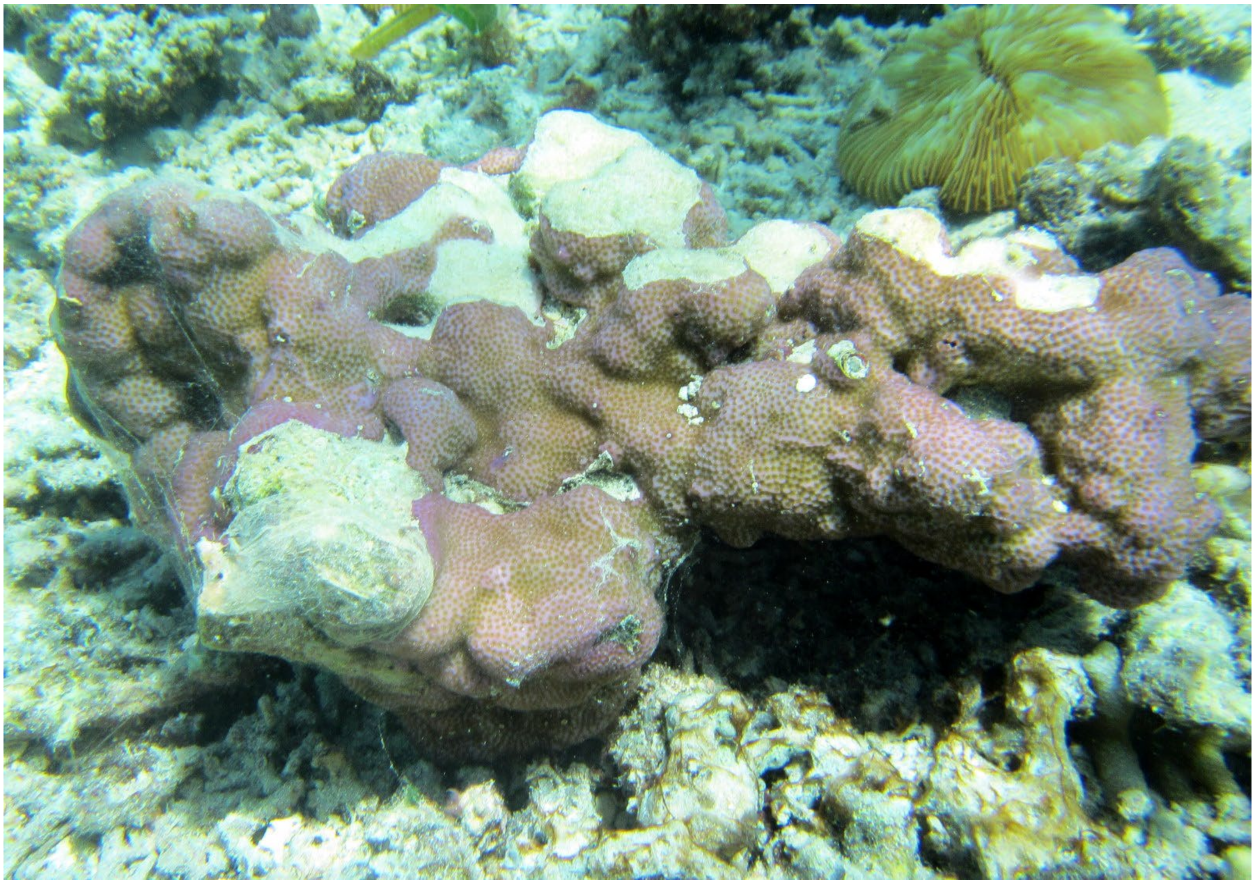
A colony of *Montipora caliculata.*



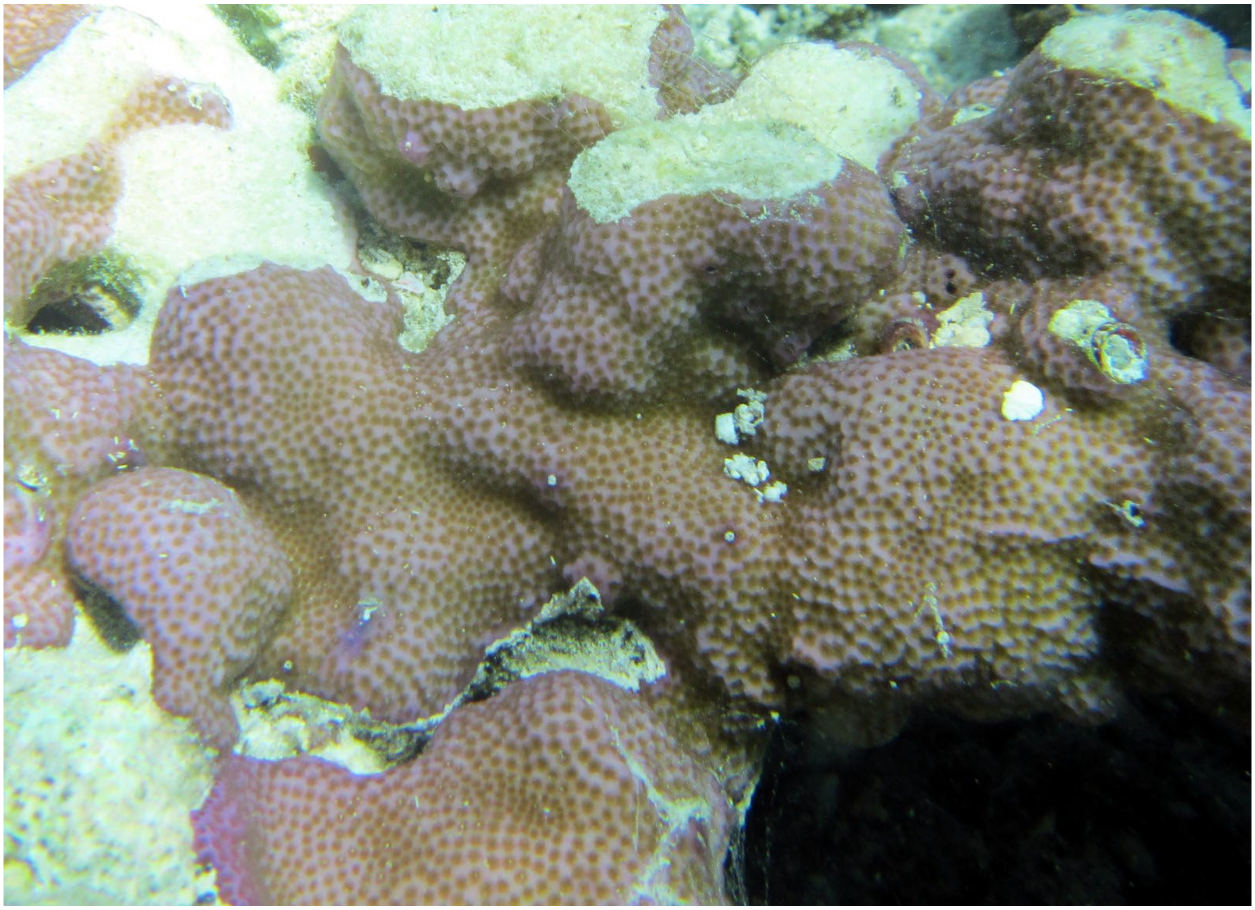
A photo of a colony of *Montipora caliculata* in which there are isolated papillae and ridges of fused papillae that do not completely enclose single corallites.

Montipora venosa

This species forms encrusting colonies that have the corallites slightly recessed (foveolate). There are no raised ridges between corallites. *Montipora caliculata* has rased tuberculae and ridges.



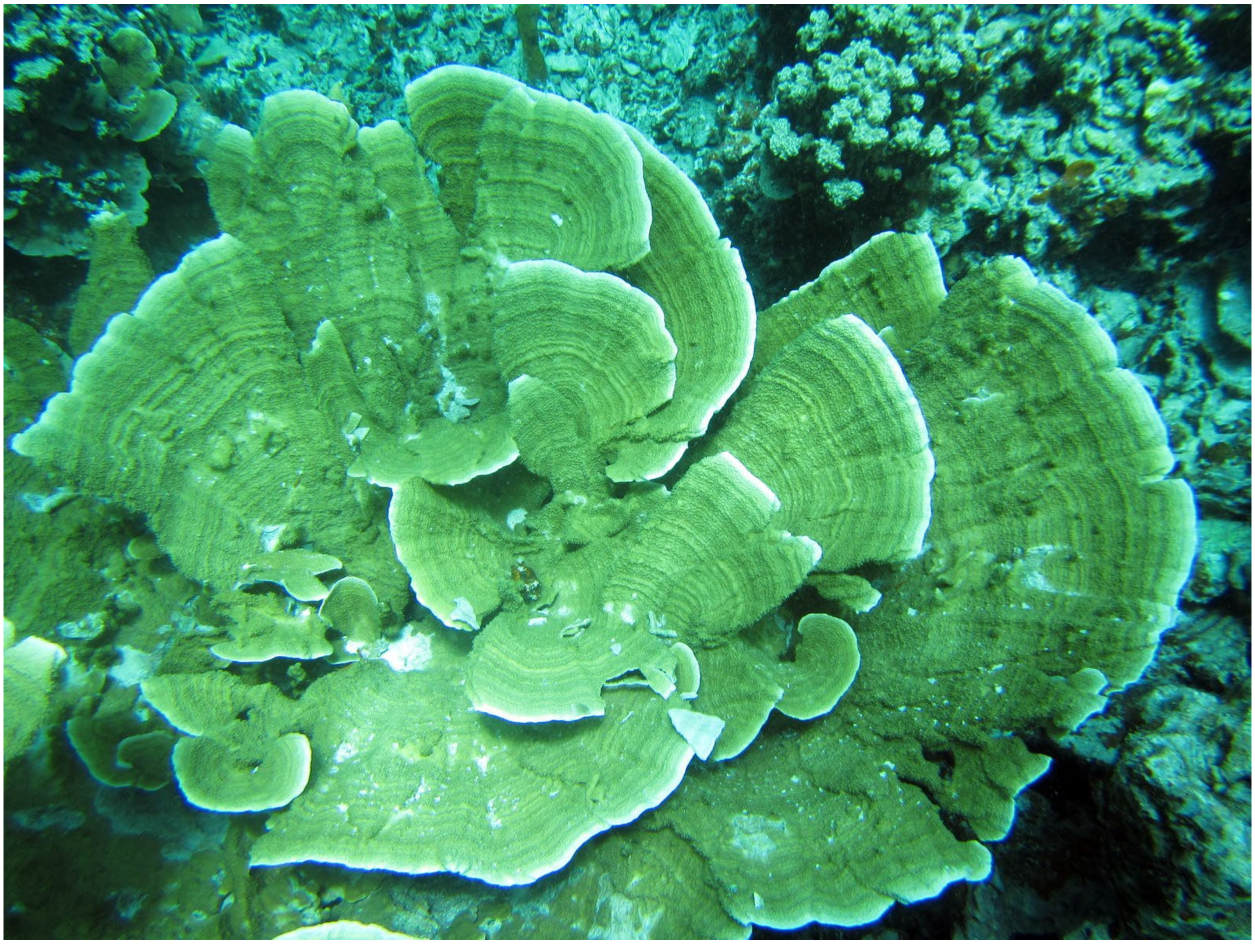
A colony of *Montipora venosa*.



A close-up photo of *Montipora venosa*. The corallites are slightly recessed into the coral.

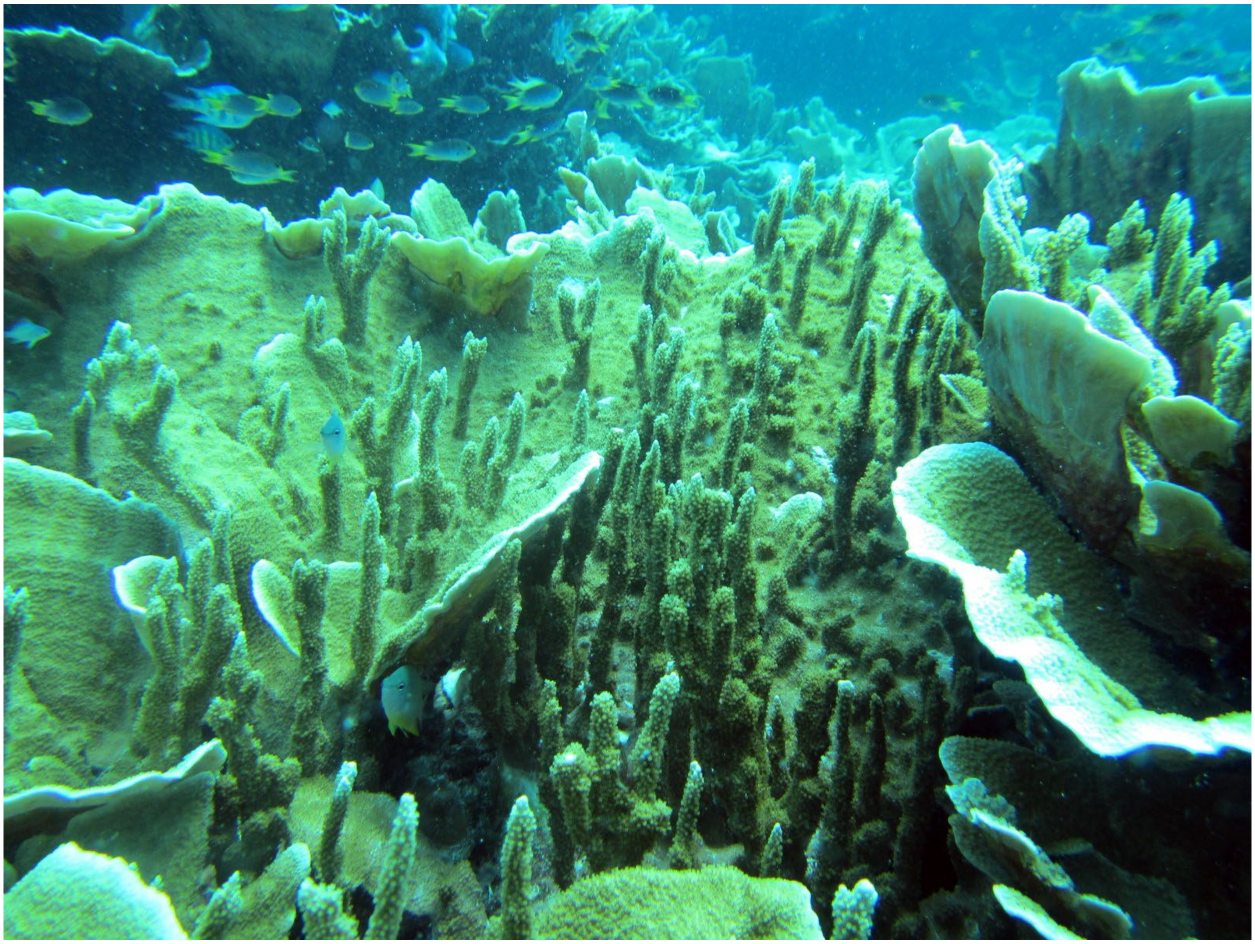
Montipora hispida

This species can be any combination of thin plates and thin irregular columns. Surfaces are covered with fine papillae. This species dominates shallow water at the popular dive site called the "cemetery." Colonies do not have radiating ridges at the edge of plates like *Montipora aequiituberculata*. It is plating instead of encrusting like *Montipora grisea* and *Montipora informis*. It has columns unlike most other *Montipora*.

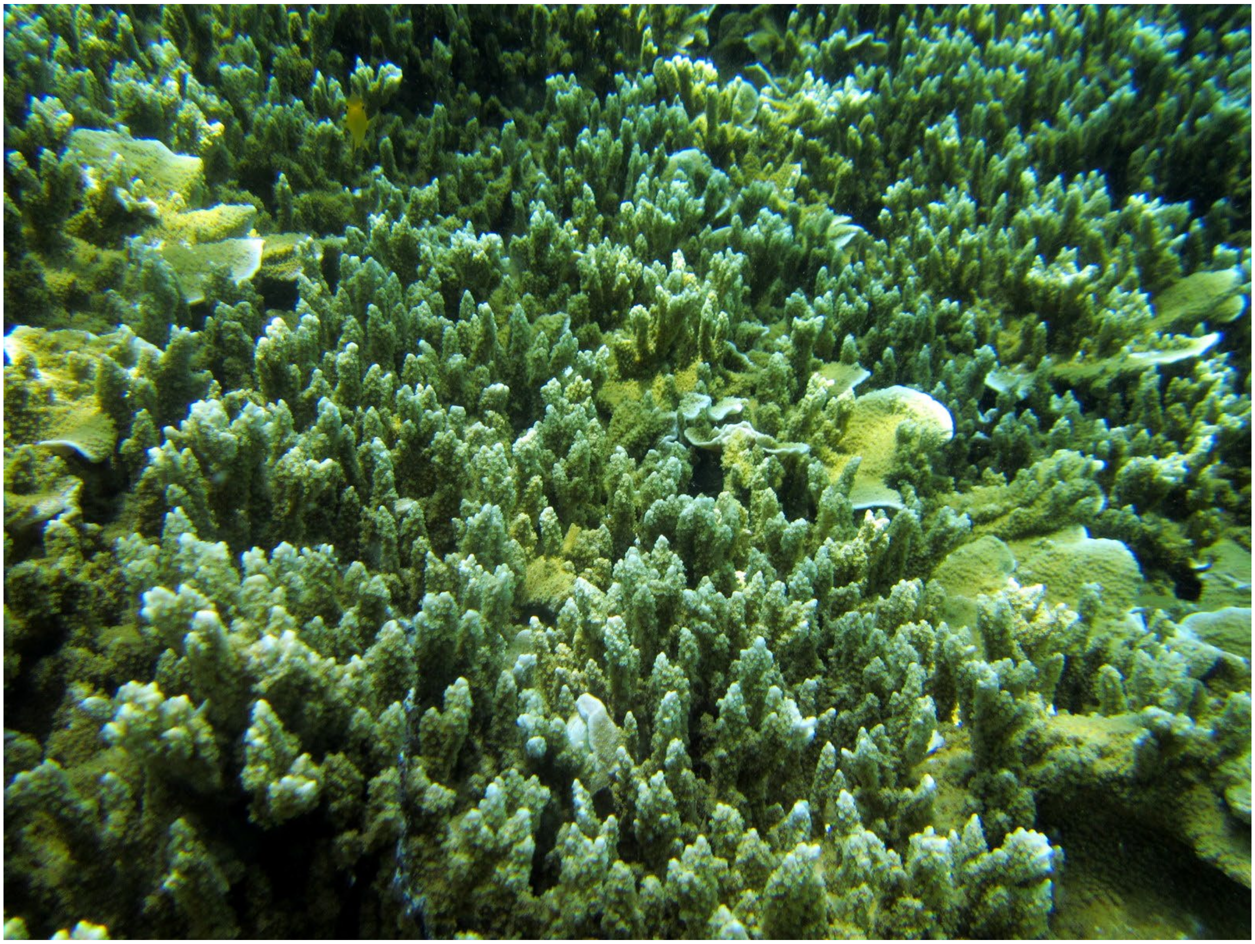


A large group of plates of *Montipora hispida*, without any columns.

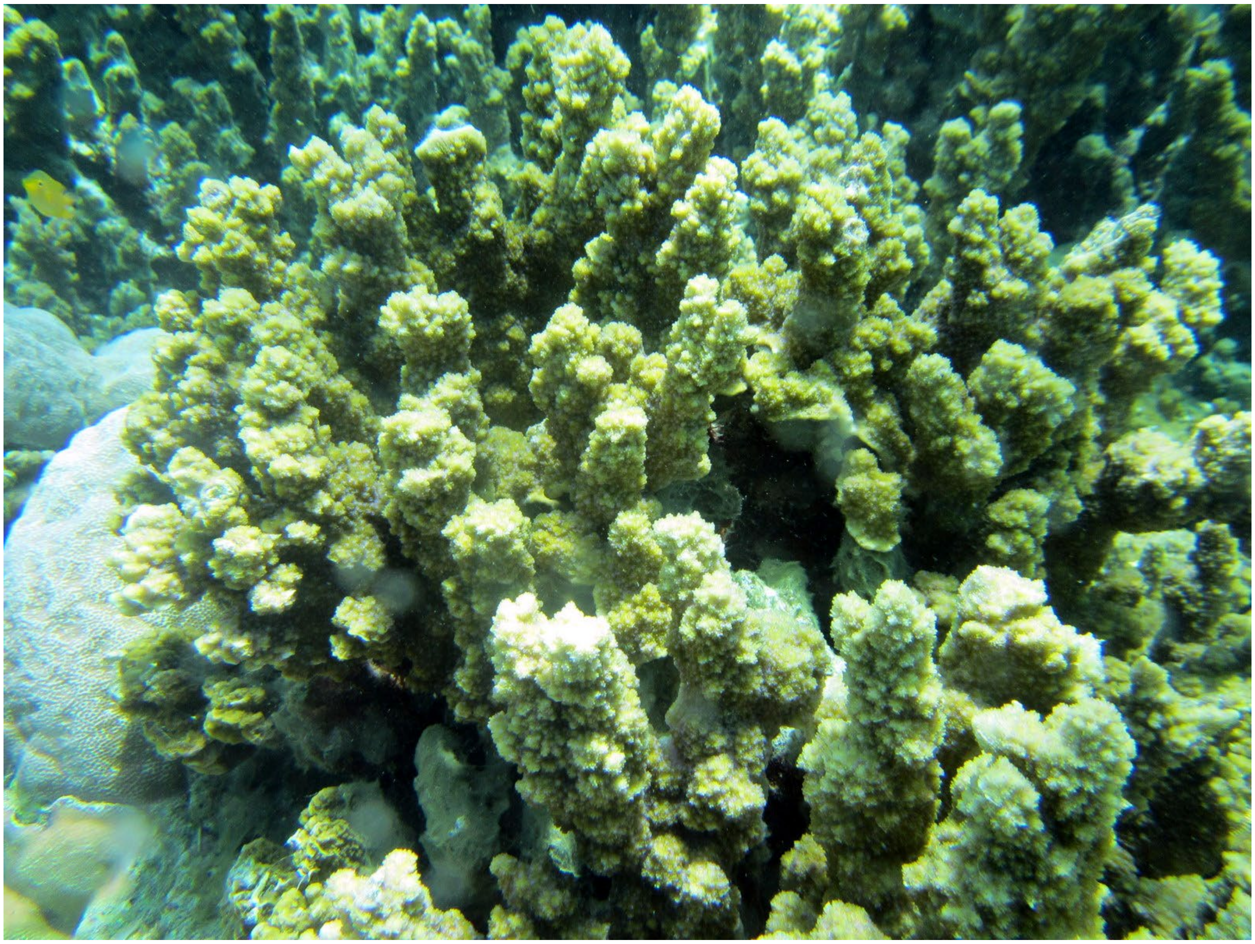
A close-up of a plate showing the rough surface which is produced by a ring of tiny papillae around each corallite.



Thin columns growing upwards from plates.



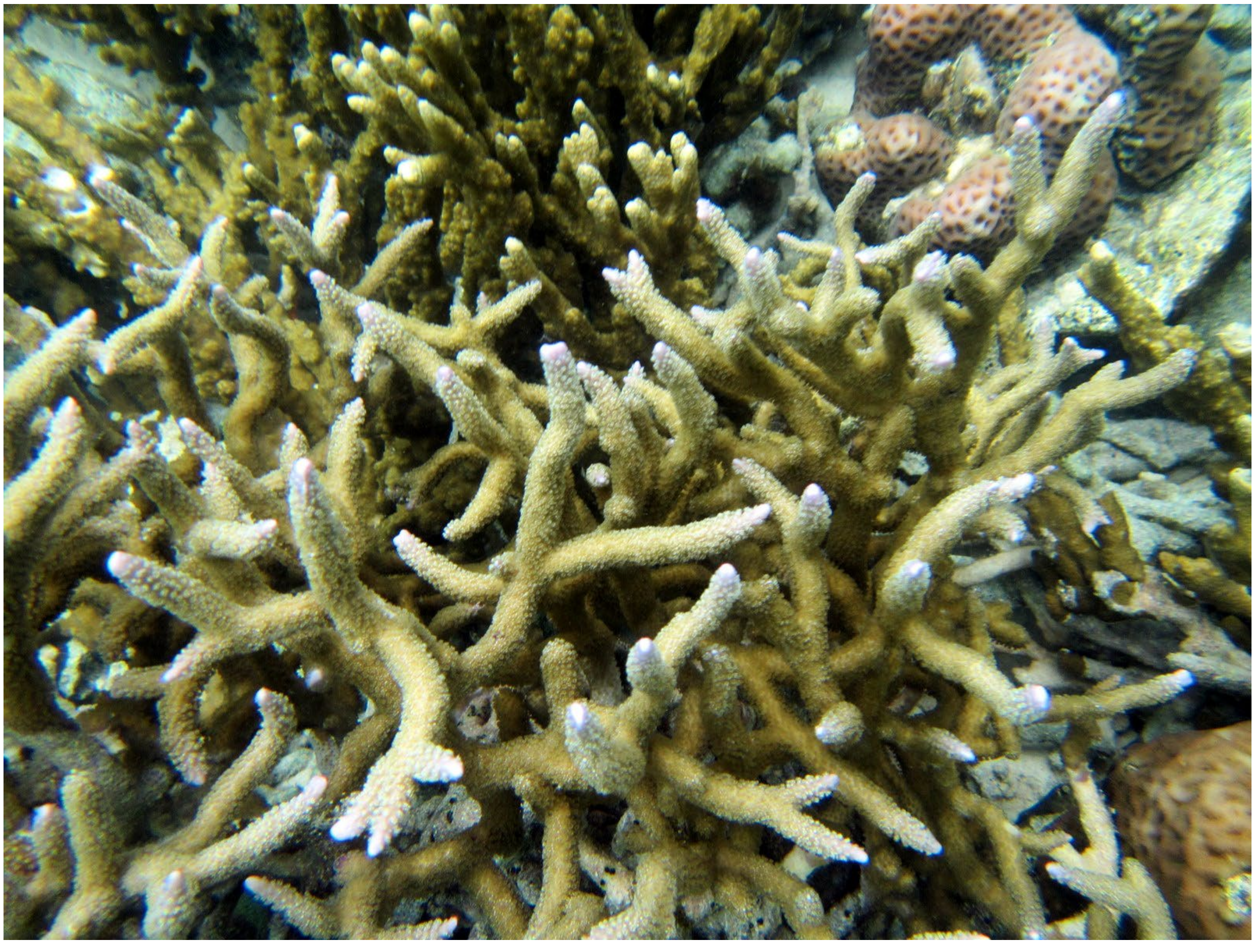
Large numbers of columns growing up from plates.



On a reef flat, the columns can be much thicker and nodular, but usually at least a few small plates can be found.

Montipora digitata

This species forms entirely branching colonies that don't have any papillae or tuberculae on them. If they look rough, it is due to having polyp tentacles extended. There is no polyp cup at the end of the branch, that would be *Acropora*. Colonies can be one or a few branches, or extensive thickets. Branches are larger than on *Palauastrea ramosa* and polyps do not extend as far.

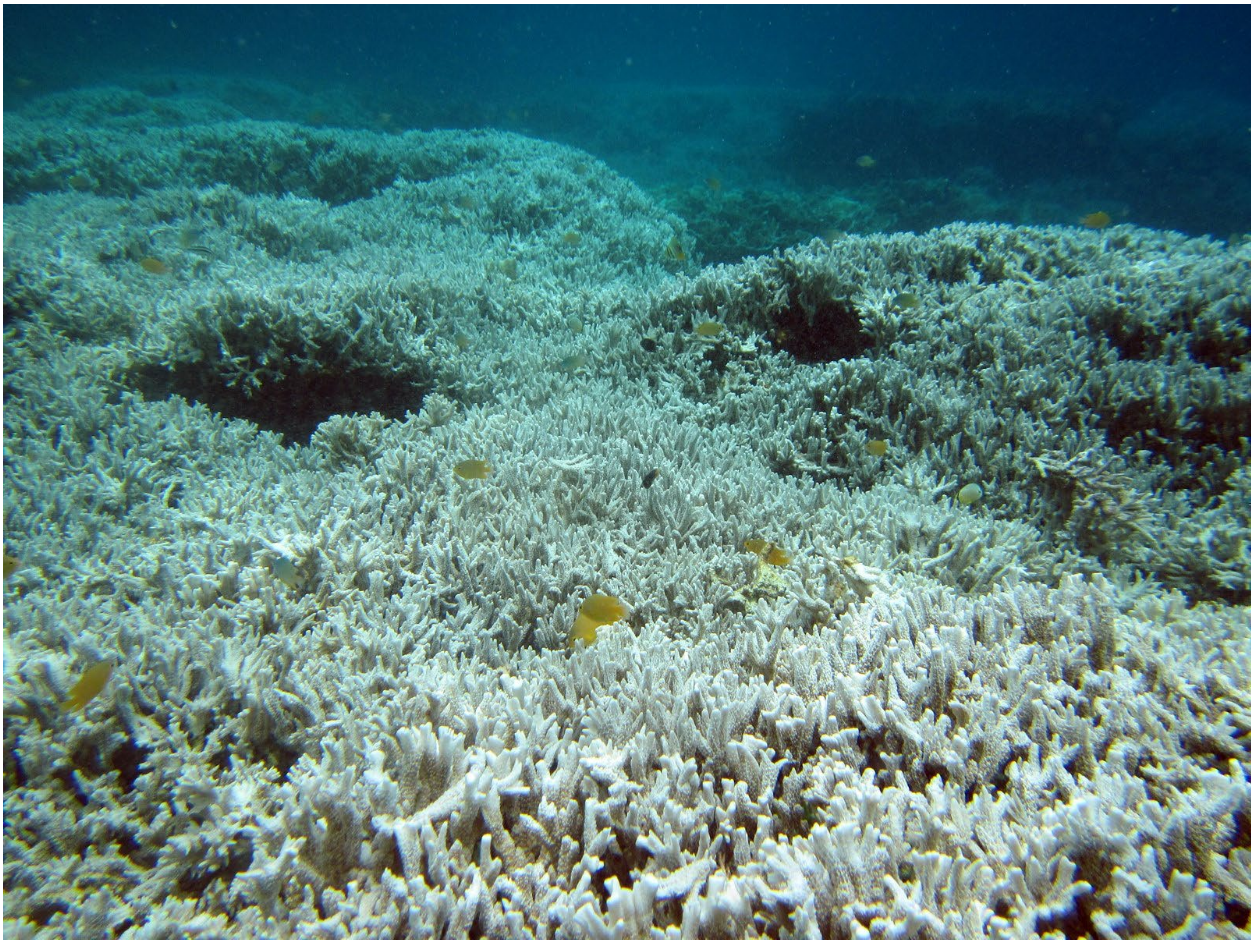


Colonies of *Montipora digitata*.

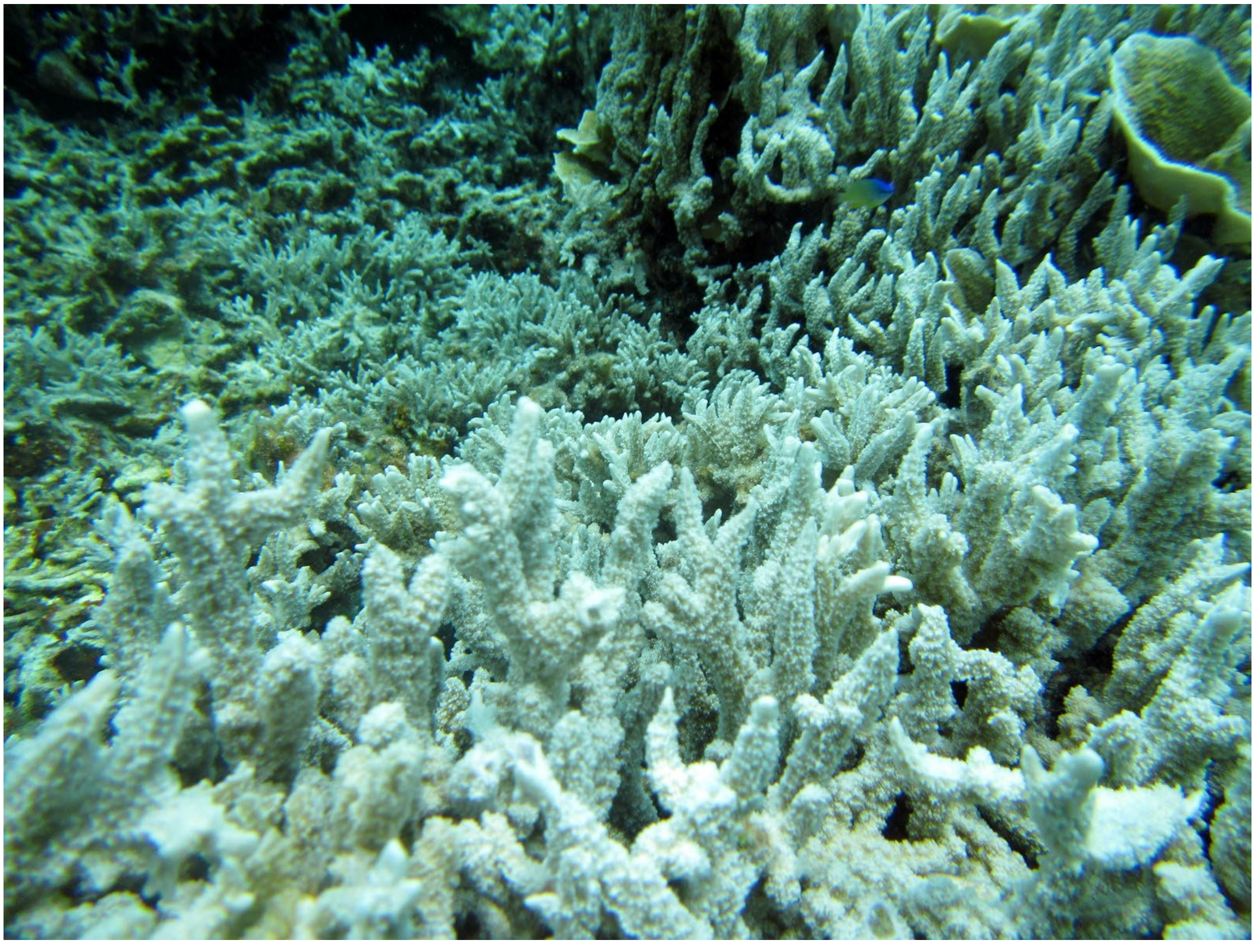
A close-up photo of *Montipora digitata*. Rings of tentacles are visible, and each ring is a polyp.

Montipora stellata

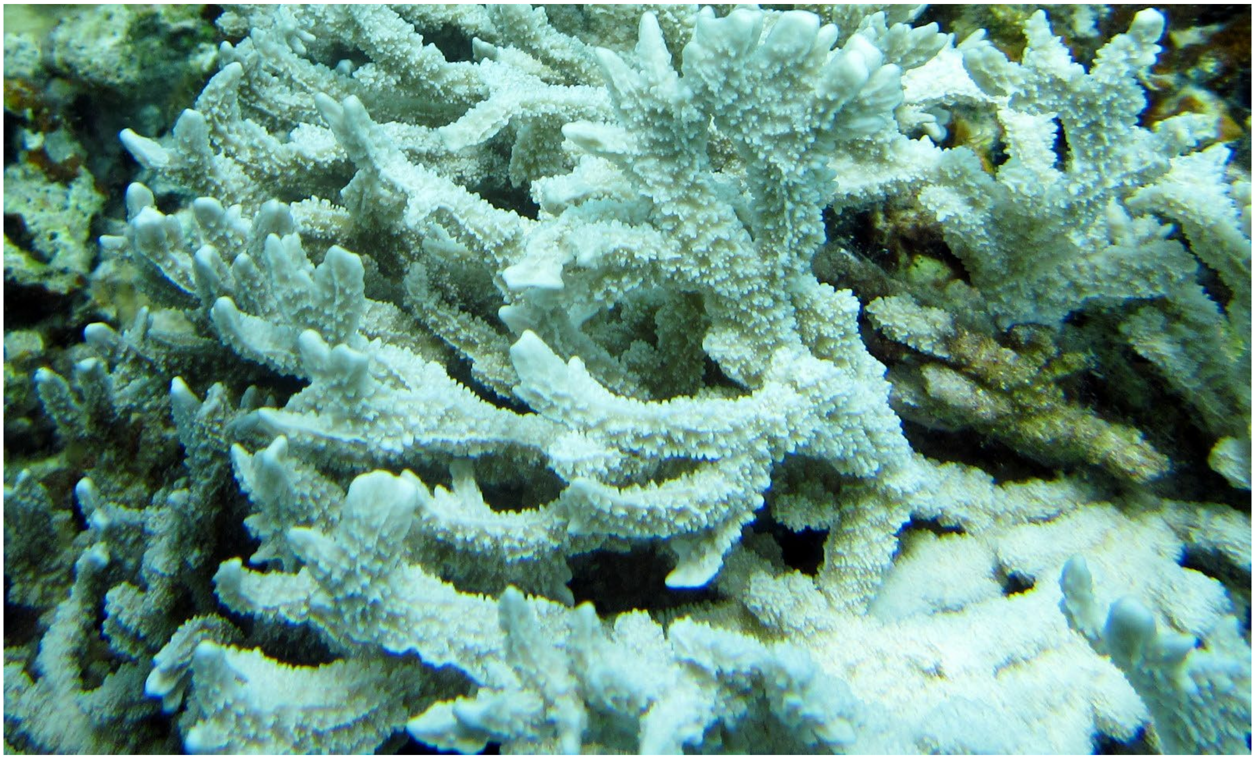
This species forms branching colonies with rough surfaces, which taper to a smooth rounded end. The sides have clusters of tiny papillae on them, and in some places may have thin ridges running longitudinally on the branch. Branches can form large thickets, or be individual branches. *Montiipora digitata* does not have papillae or ridges, and can have larger branches.



A very large thicket of *Montipora stellata*.



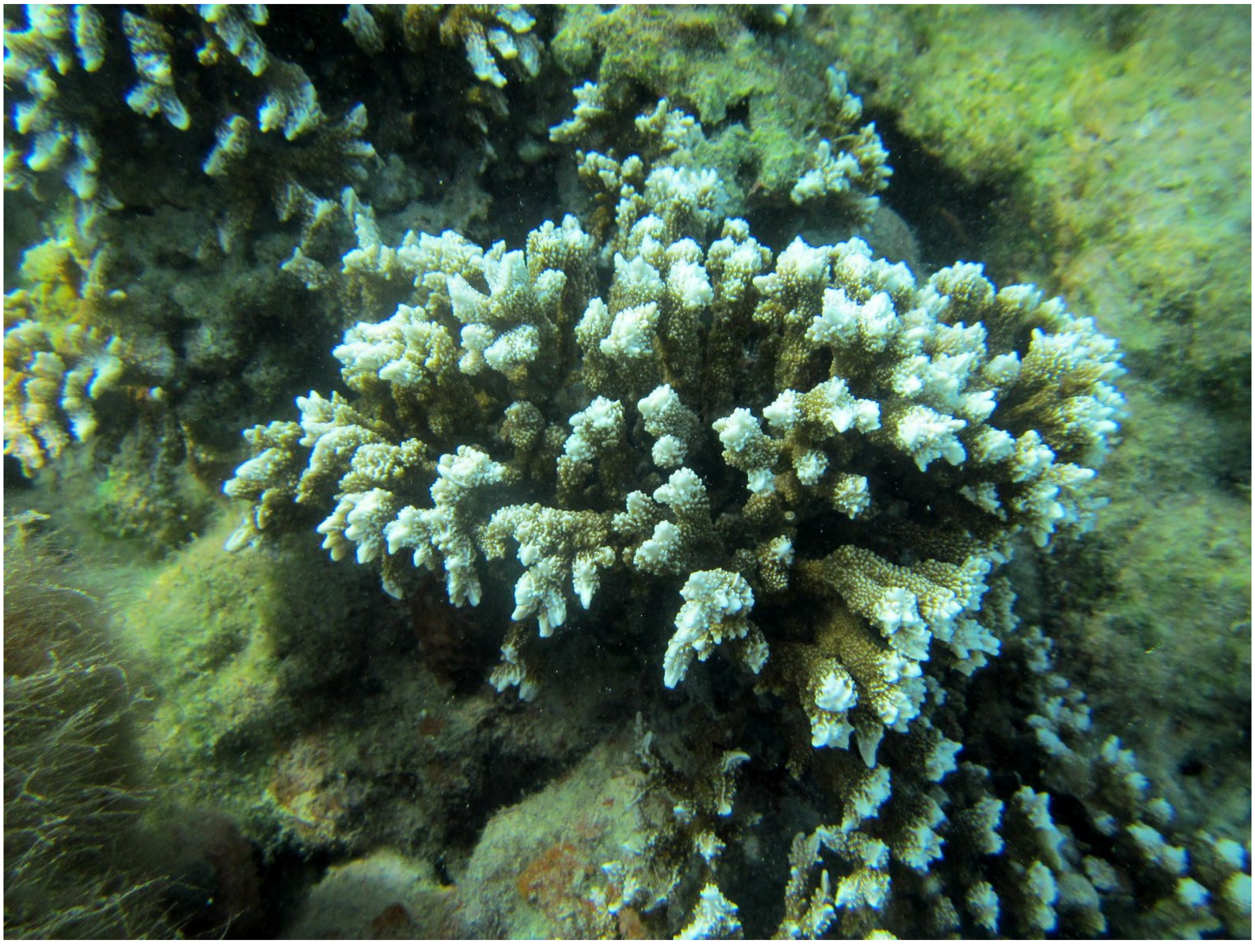
Branches of *Montipora stellata*. The branch sides are rough with papillae.



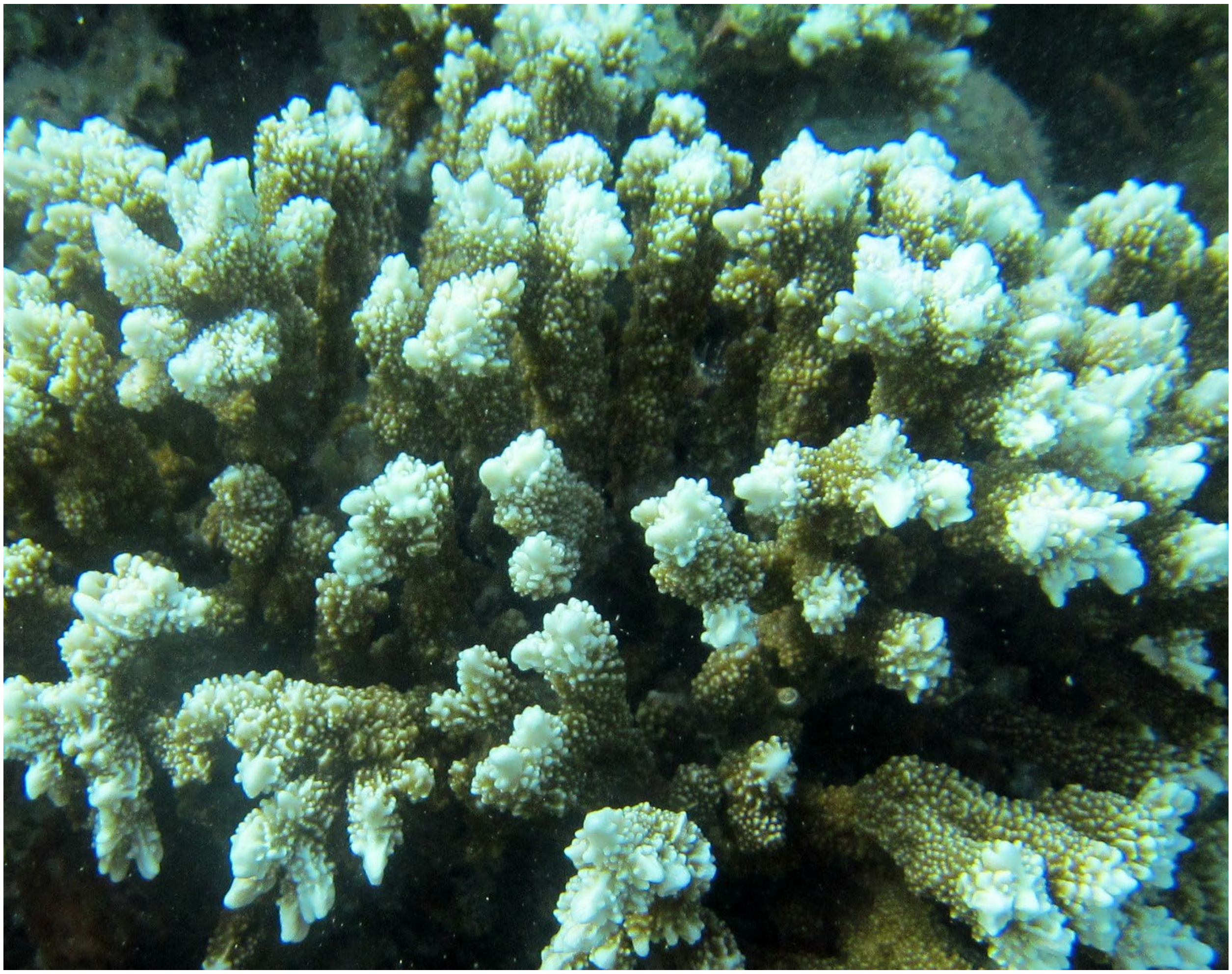
A close-up picture of *Montipora stellata*, with clusters of papillae, thin longitudinal ridges, and smooth branch tips visible.

Montipora malampaya

This species forms branching colonies with tuberculae that are about the size of corallites, perhaps a little smaller. The tuberculae are uniform in size and fairly evenly spread on the branches. The tuberculae are closer together and more uniform than on *Montipora stellata*. They probably have fewer ridges.



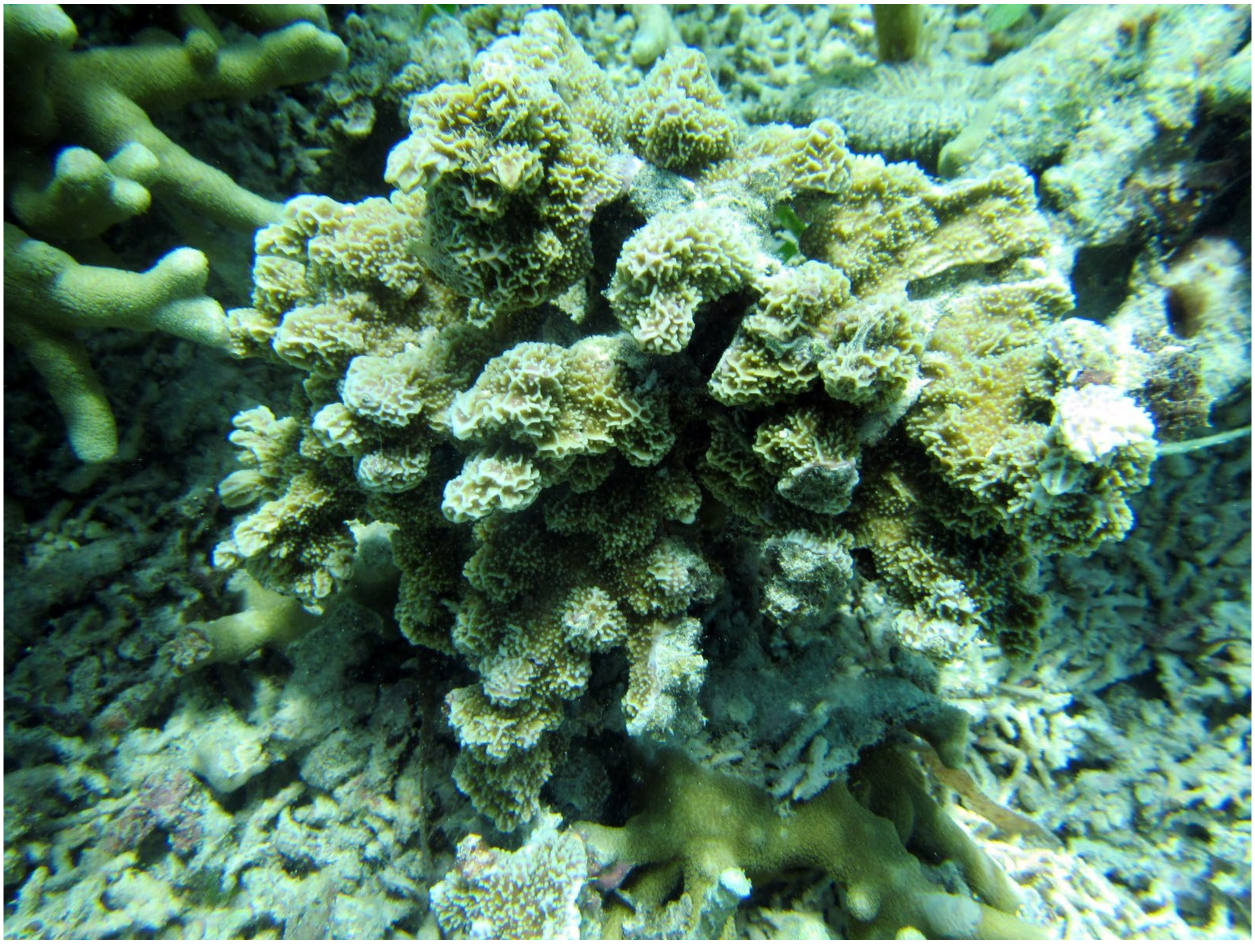
A colony of *Montipora malampaya*.



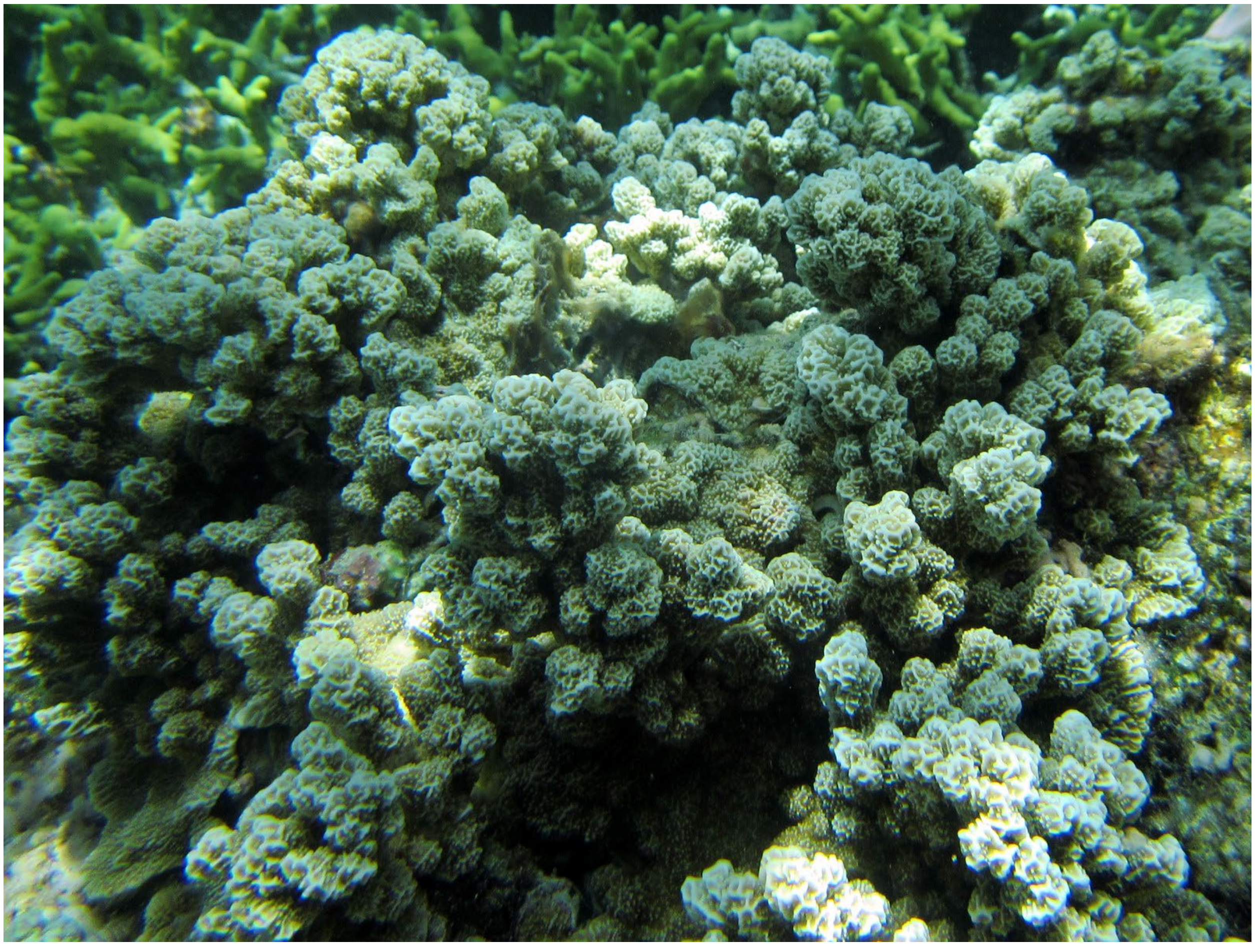
A close-up photo of the same colony of *Montipora malampaya*.

Montipora vietnamensis

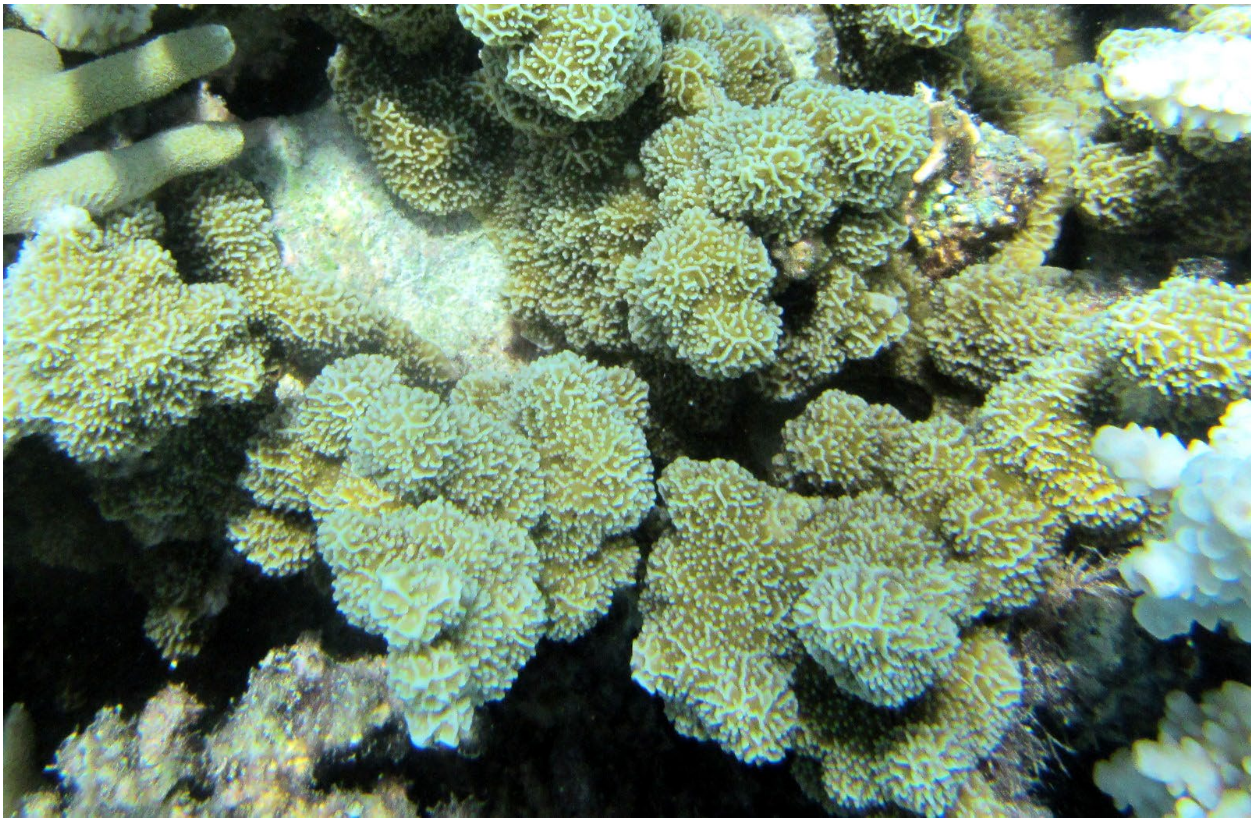
Colonies are often branching but can have an encrusting or plate base. The surface is covered with a mixture of thin intersecting ridges and individual small tuberculae. Colonies can have all intersecting ridges. Branches are thicker and more irregular than on *Montipora malampaya* and tuberculae and ridges are larger.



A colony of *Montipora vietnamensis*.



A colony of *Montipora vietnamensis* with all intersecting thin ridges.



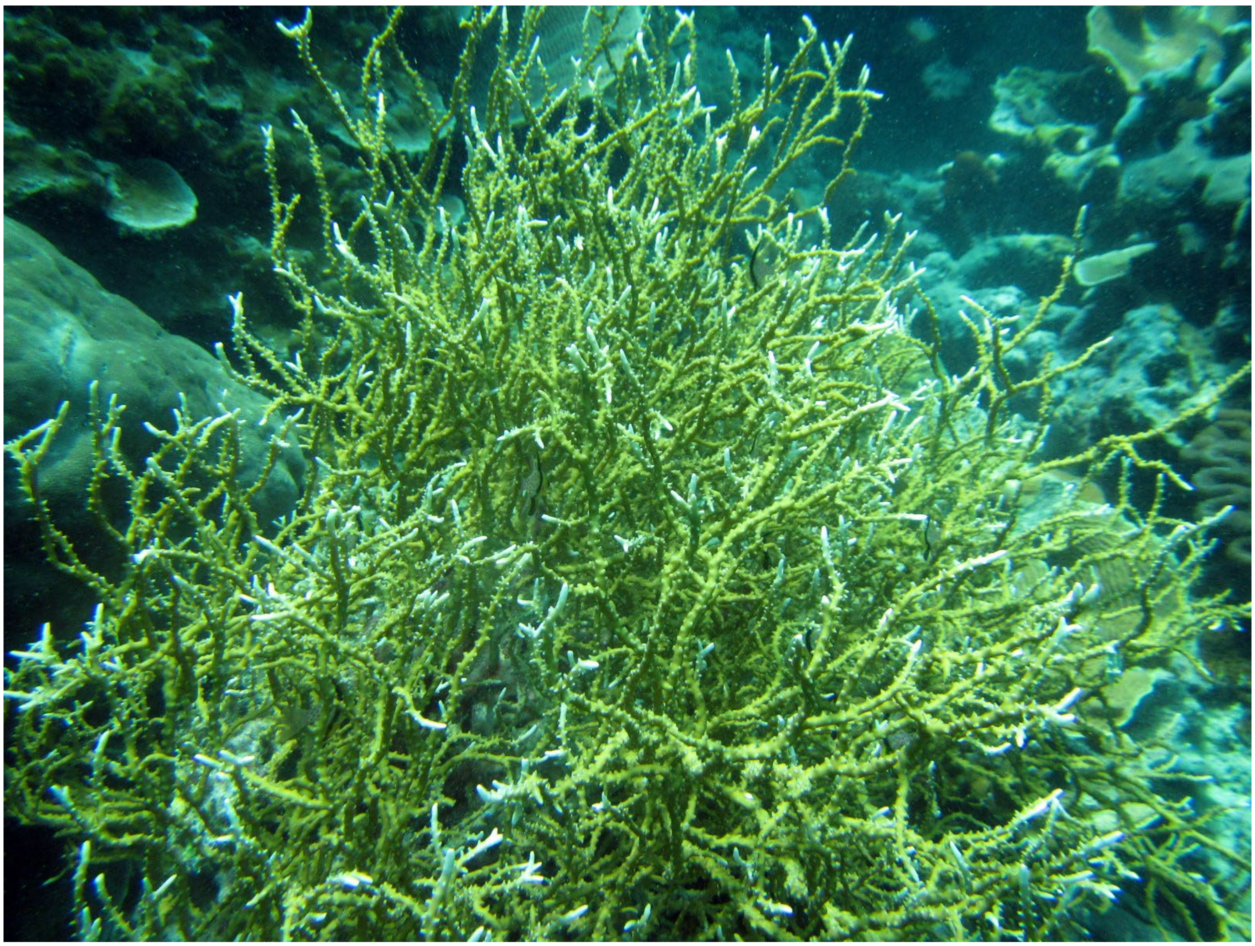
A colony with a mix of intersecting thin ridges and individual tuberculae/papillae.

Anacropora

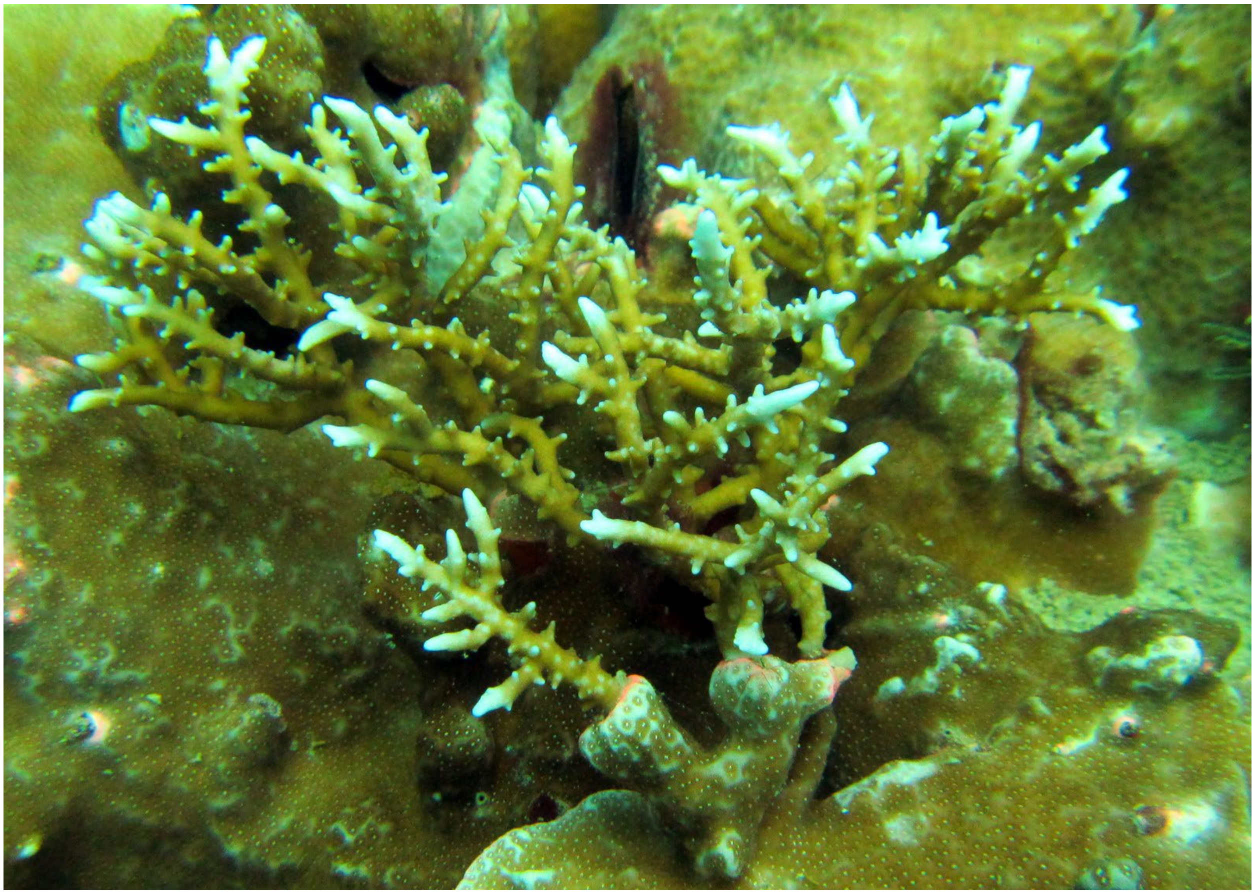
Anacropora are always branching, without a base. Branches in most species are thin and delicate. Branches usually have spines on them, varying from very small to fairly large. In most species, each spine is below a corallite. Species vary in how big branches are, how many spines there are, and how big the spines are. *Anacropora* skeleton is quite similar to *Montipora* under the microscope, but features are usually smaller. *Anacropora* usually has one spine under each corallite but *Montipora* has many spines.   The branch tips are rounded and do not have an axial corallite like *Acropora*.

Anacropora puertogalerae

Colonies are thin branches, which can form large thickets. Spines are small and widely spread and fairly uniform. Branch tips are rounded and white. *Anacorpora spinosa* has many more spines, closer together.



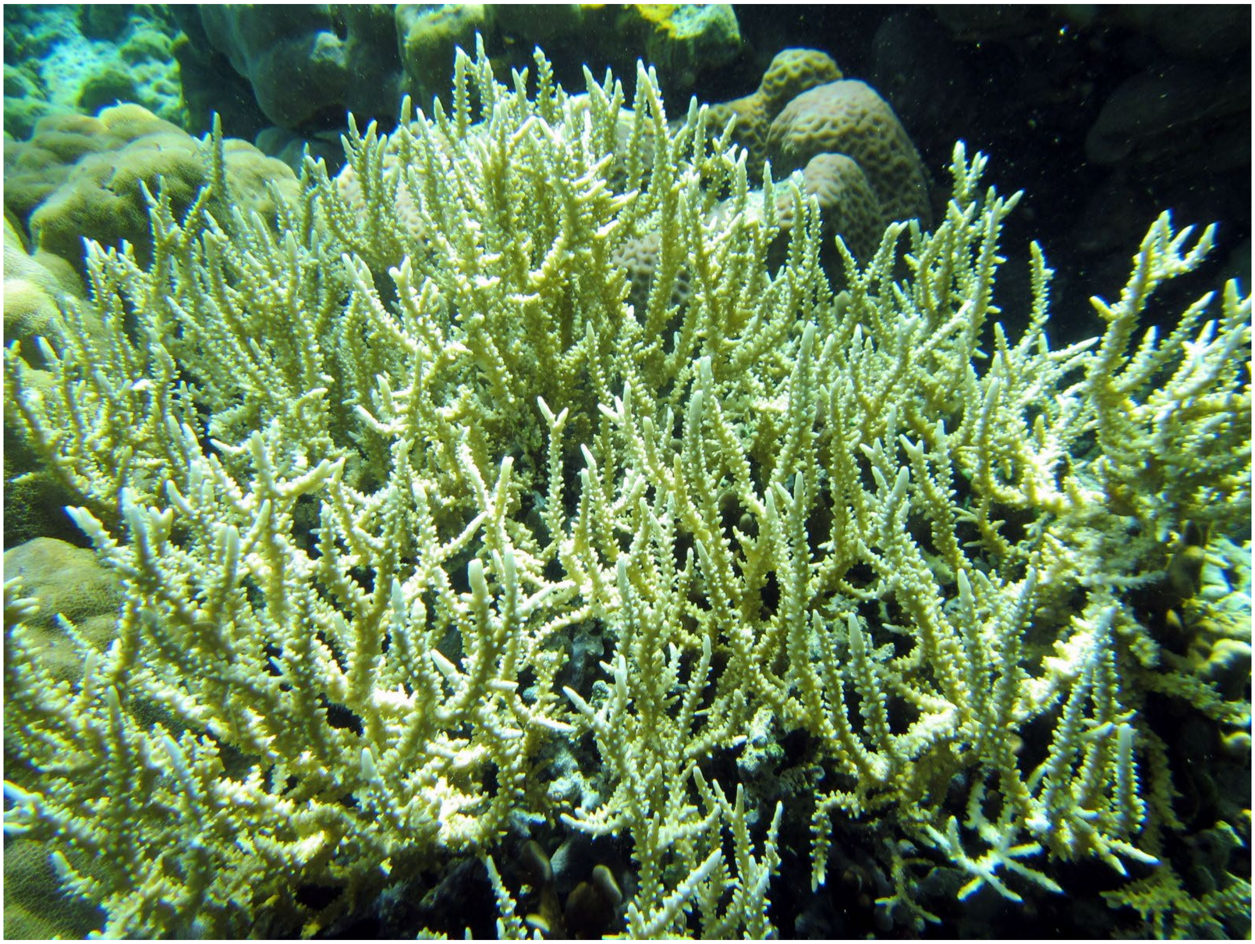
A thicket of *Anacropora puertogalerae*.



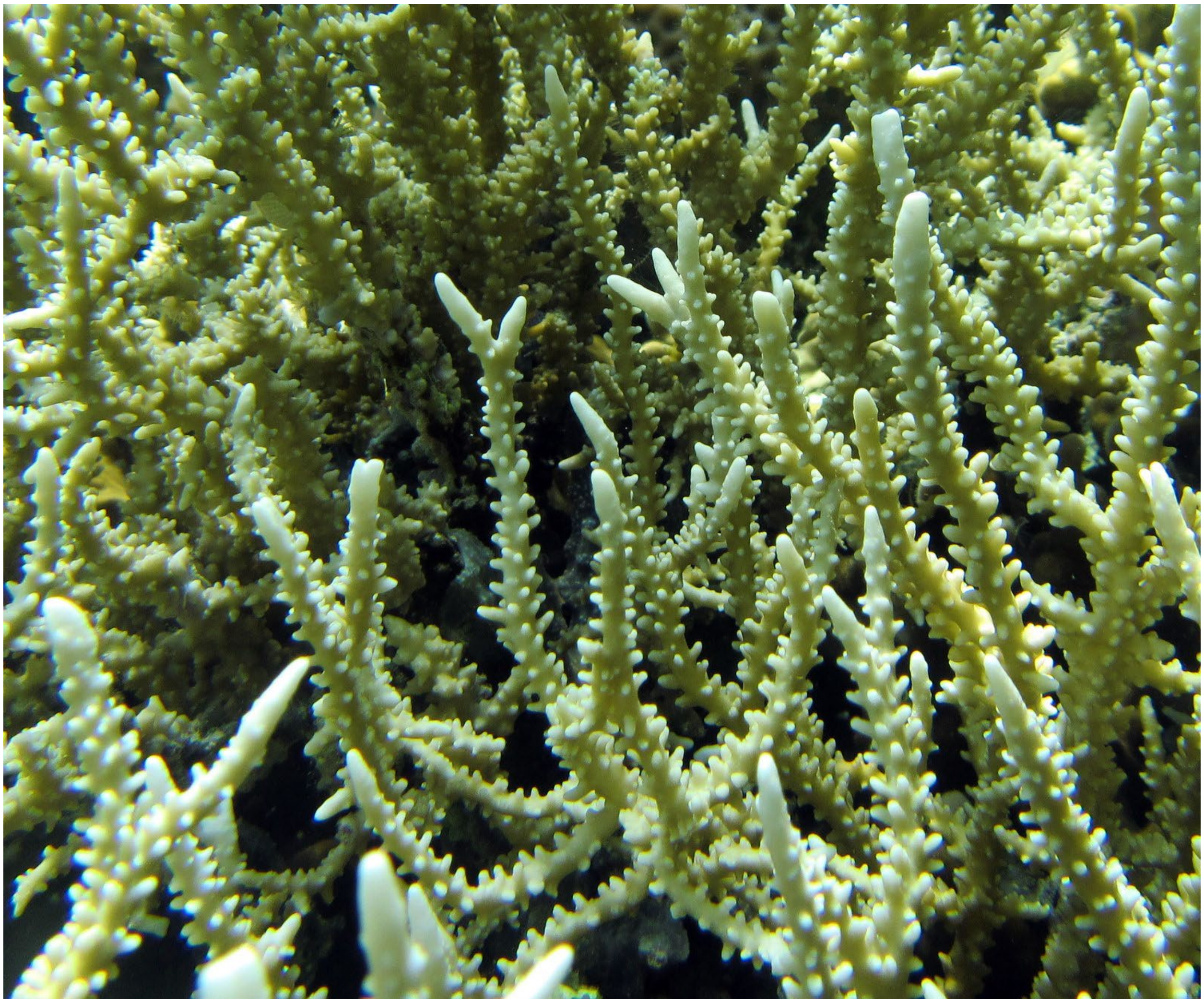
A close-up photo of *Anacropora puertogalerae*.

Anacropora spinosa

Colonies have thin branches with a dense cover of spines which are close together, many more spines than *Anacropora puertogalerae*. This species can make large thickets. Branch tips are round and smooth.



A small thicket of *Anacropora spinosa*.



A close-up photo of *Anacropora spinosa*, showing the many spines close together on thin branches.

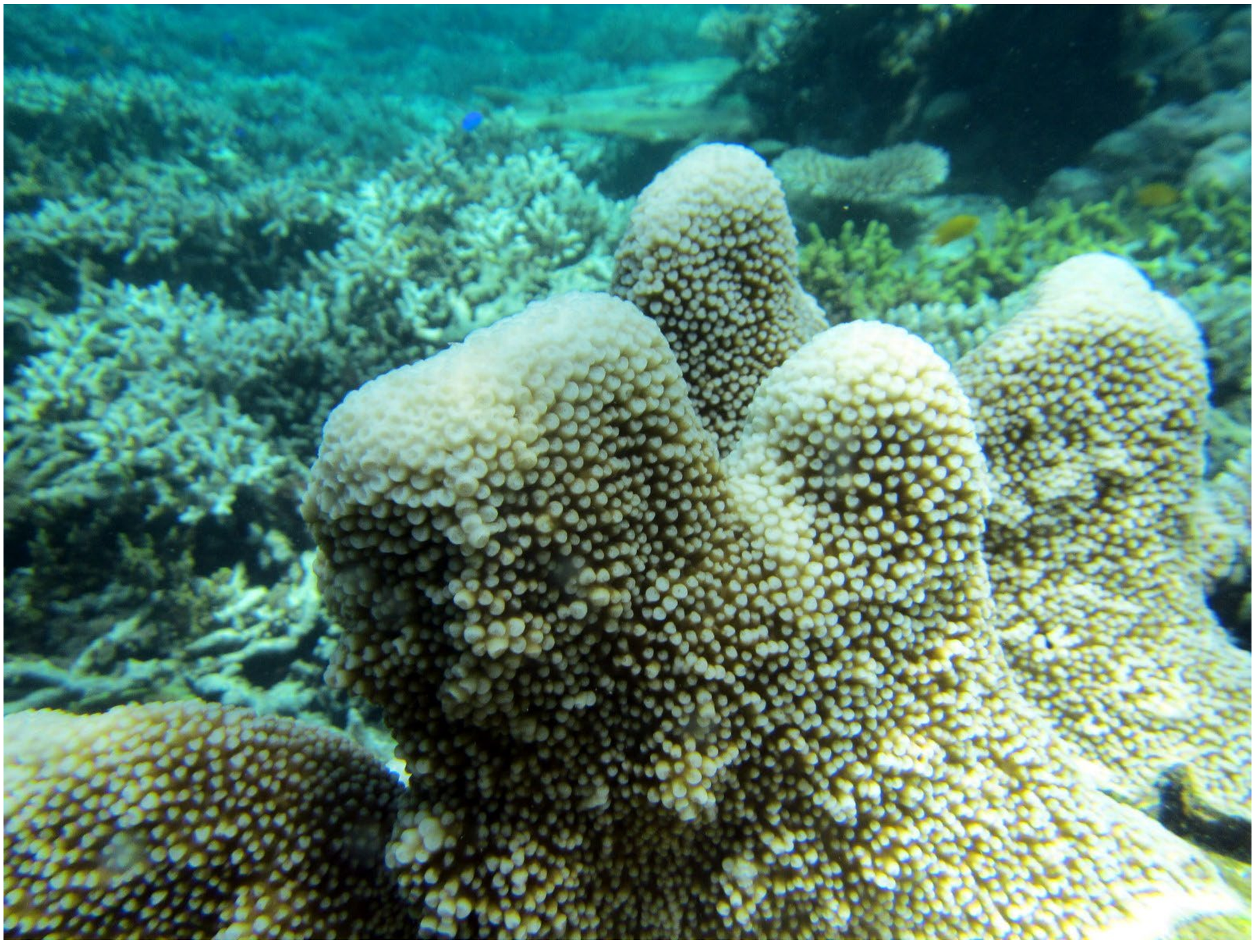
Isopora

This genus ranges from encrusting to wall-shaped colonies to branching colonies. The corallites are small. Colonies have multiple, usually many, corallites on the ends of branches, which are all similar in size and shape. In the past, *Isopora* was considered a subgenus of *Acropora*, but several lines of evidence, such as the fact that all *Isopora* are brooders while all non-*Isopora Acropora* are broadcast spawners, plus genetics, clearly show that these two are separate genera. Colonies can look similar to *Pocillopora*, but the branches are as thick or thicker than any *Pocillopora*. Also, the bumps are not rounded verrucae with tiny corallites all over them, but are themselves single corallites.

Isopora palifera

Colonies are usually branching, either upright or near horizontal. Branches are about as thick as a wrist and have rounded ends with many corallites on both the ends of branches and sides of branches. *Isopora bruggemanni* has much thinner branches with just 1-3 axial corallites.

A colony of *Isopora* with stubby branches.

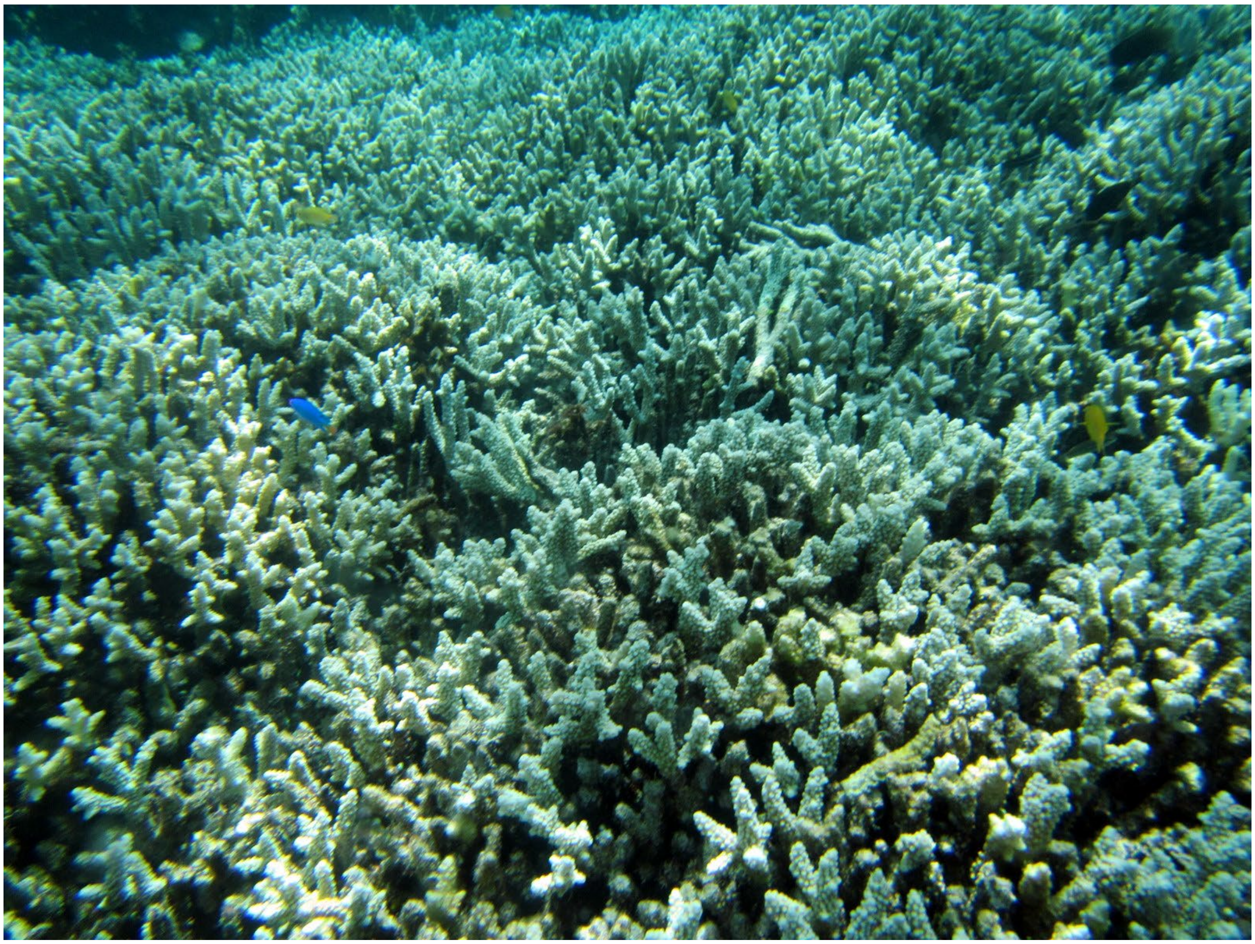


A closer of *Isopora palifera*, showing the corallites.

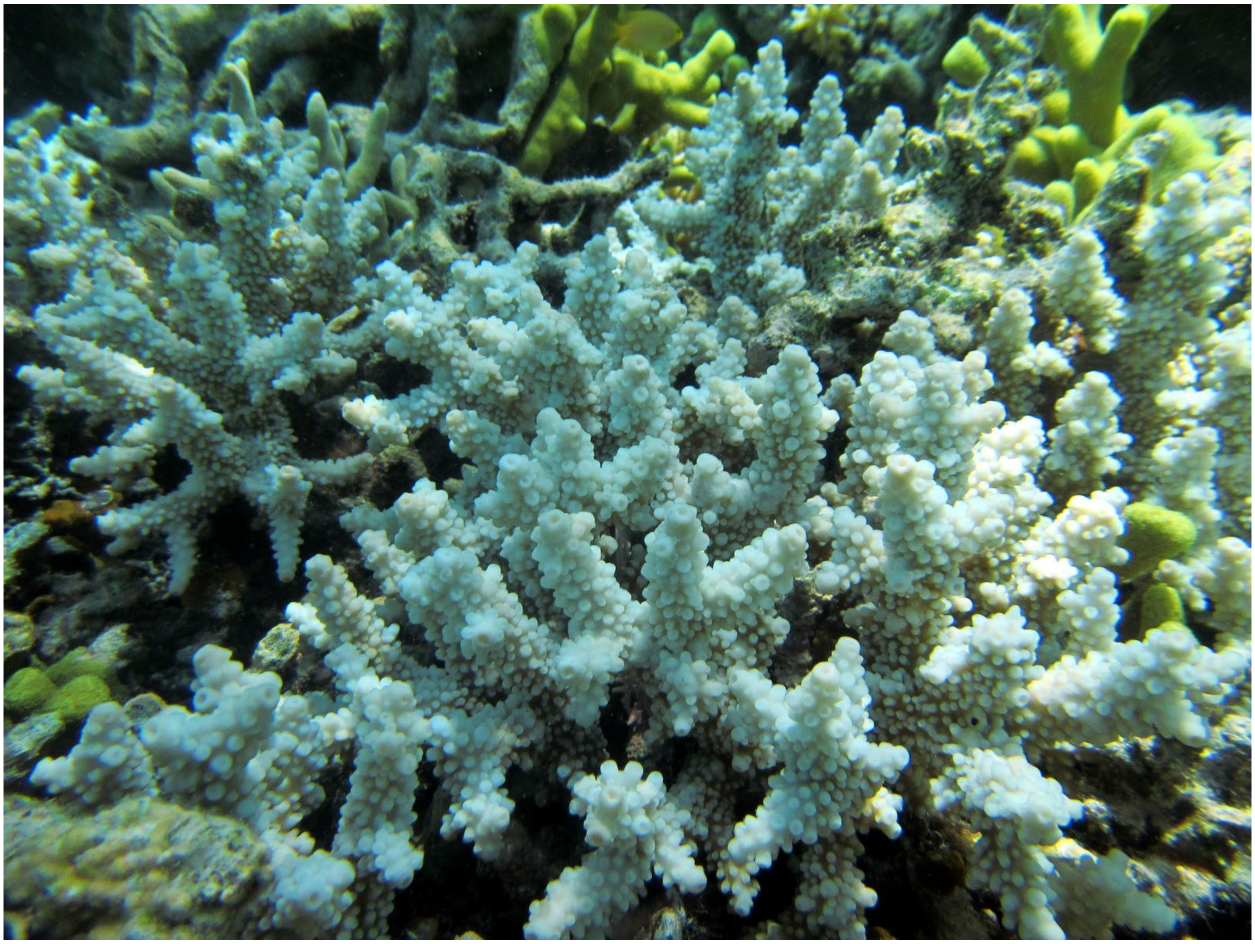
A close-up photo of *Isopora palifera* showing that the bumps are corallites and not rounded verrucae like on *Pocillopora*, which have many corallites on them.

Isopora bruggemanni

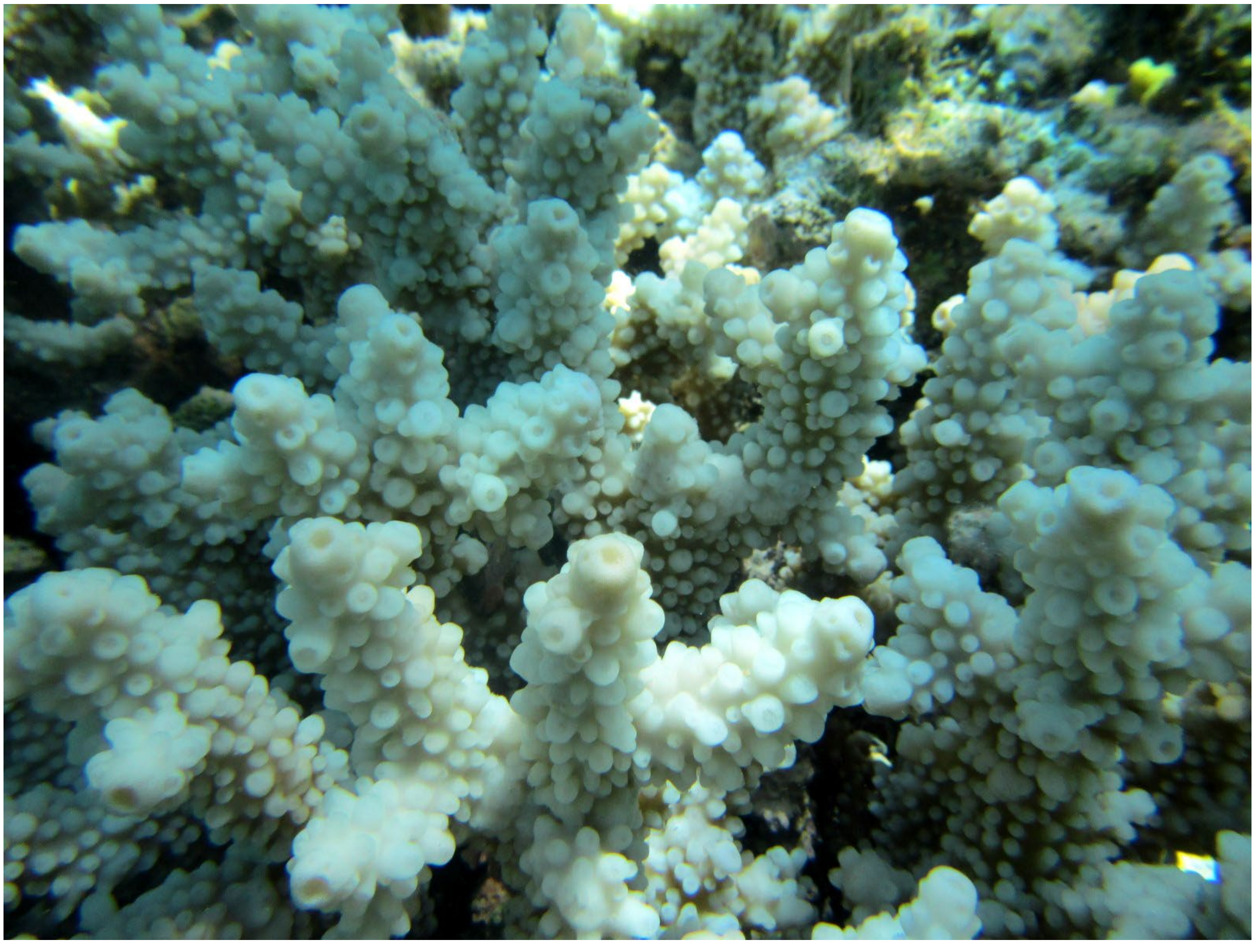
This species forms thin, cylindrical branches like staghorn and can form large thickets like staghorn. Many branches have just one, enlarged corallite on the end of the branch, but some have two, three, or more enlarged corallites on the ends of branches (which are beginning new branches). It is similar to *Acropora* except it has more than one corallite on some branch tips, and is a brooder, and several other things that indicate it is in *Isopora*, not *Acropora*. The branches are much thinner than *Isopora palifera*, and it has only one or a few axial corallites on the ends of branches.



A thicket of *Isopora bruggemanni*.



A closer photo of *Isopora bruggemanni*. The ends of most branches have a single enlarged corallite, but many have one or more other large corallites near the branch tip.



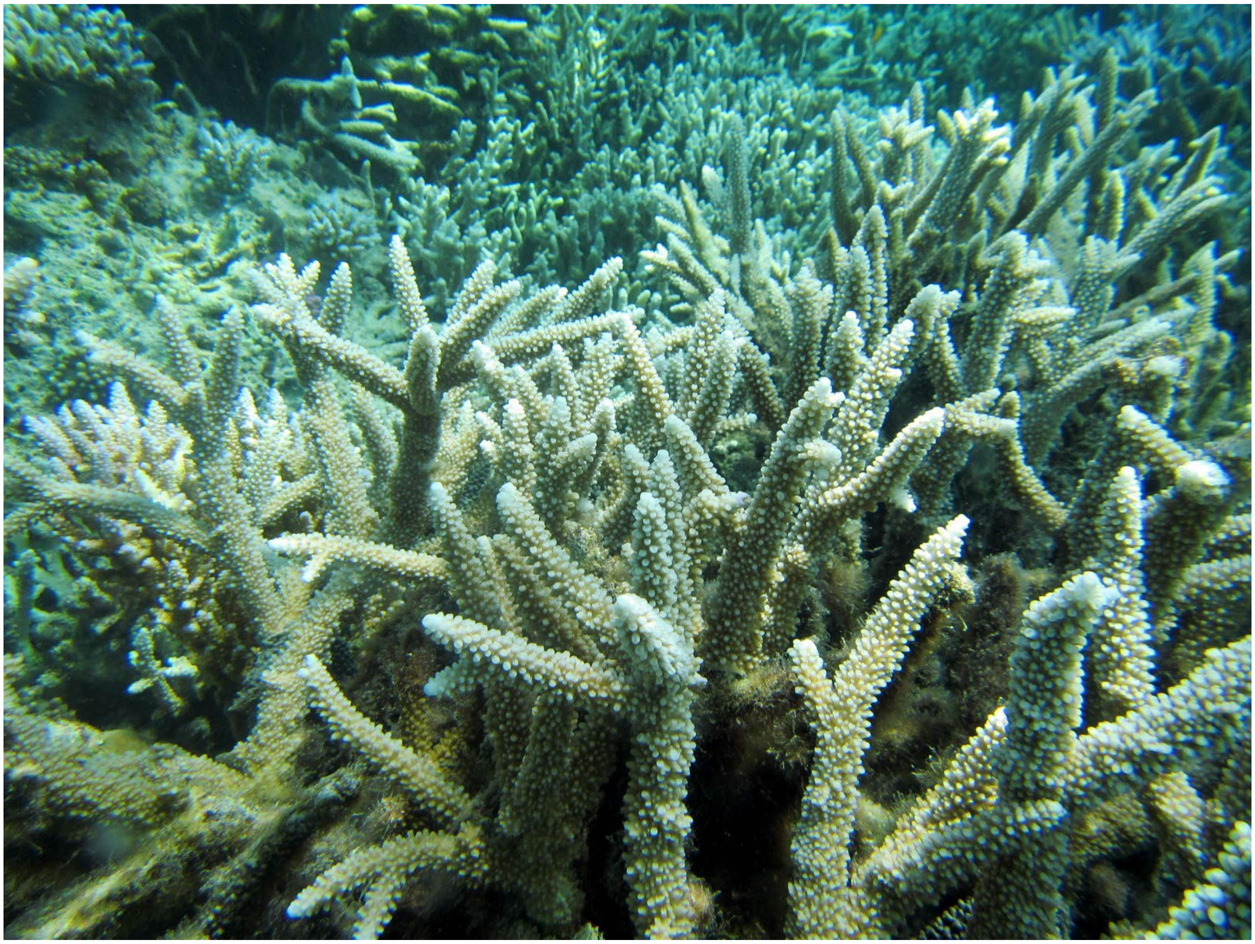
A colony of *Isopora bruggemanni*, showing the enlarged corallite on branch tips and other large corallites near the branch tip.

Acropora

Acropora has the most species of any coral genus, over 165 species. Some of the *Acropora* species are often common or abundant, and the genus often dominates coral reefs (but not always). Thus they are particularly important. *Acropora* species are virtually always branching, and have exactly one corallite on the tip of each branch. It is the only genus that has exactly one corallite on each branch tip, *Montipora* and *Anacropora* have none, and *Isopora* usually has many on each branch end and always has at least a few branches with multiple corallites on the end of the branch. The corallites are tiny, about 1 mm diameter on the inside. Often, the corallite on the end of the branch is different from those on the sides of branches. The corallite on the end of the branch is called an "axial" corallite like the axle on a car, and the corallites on the sides of branches are called "radial" corallites like radial tires. Different species usually have different radial corallite shapes, and in some species there are two or more different shape radial corallites. The two most helpful things in identifying species of *Acropora* are the shape of colonies, and the shape of the radial corallites. Some *Acropora* colonies are branching and are shaped a bit like deer antlers, and so are called "arborescent" or "staghorns." Other species have short parallel branches that don't have sub-branches, so their branches look like fingers and so they are called "digitate." Other species have smaller branches that are vertical and ace called "corymbose." Quite a few species are bushy, with branches going in many directions, and are called "caespitose." Some have a trunk that holds up a thin wide plate, and these are called "tabulate" or "table corals." Others have many small short side branches on main branches, and look like bottlebrushes and are called "hispidose." *Acropora* has one and only one corallite on the end of each branch, unlike Isopora and other genera.

Acropora muricata *"staghorn"* *(used to be called Acropora formosa)*

Colonies are staghorns, with branches about 1-2 cm thick with fairly sharp branch tips. The radial corallites on branch sides are thin tubes. Colonies can make large thickets. The branches are thinner than on *Acropora intermedia*, and the radial corallites are thinner. Branches are longer and thinner on *Acropora teres*.

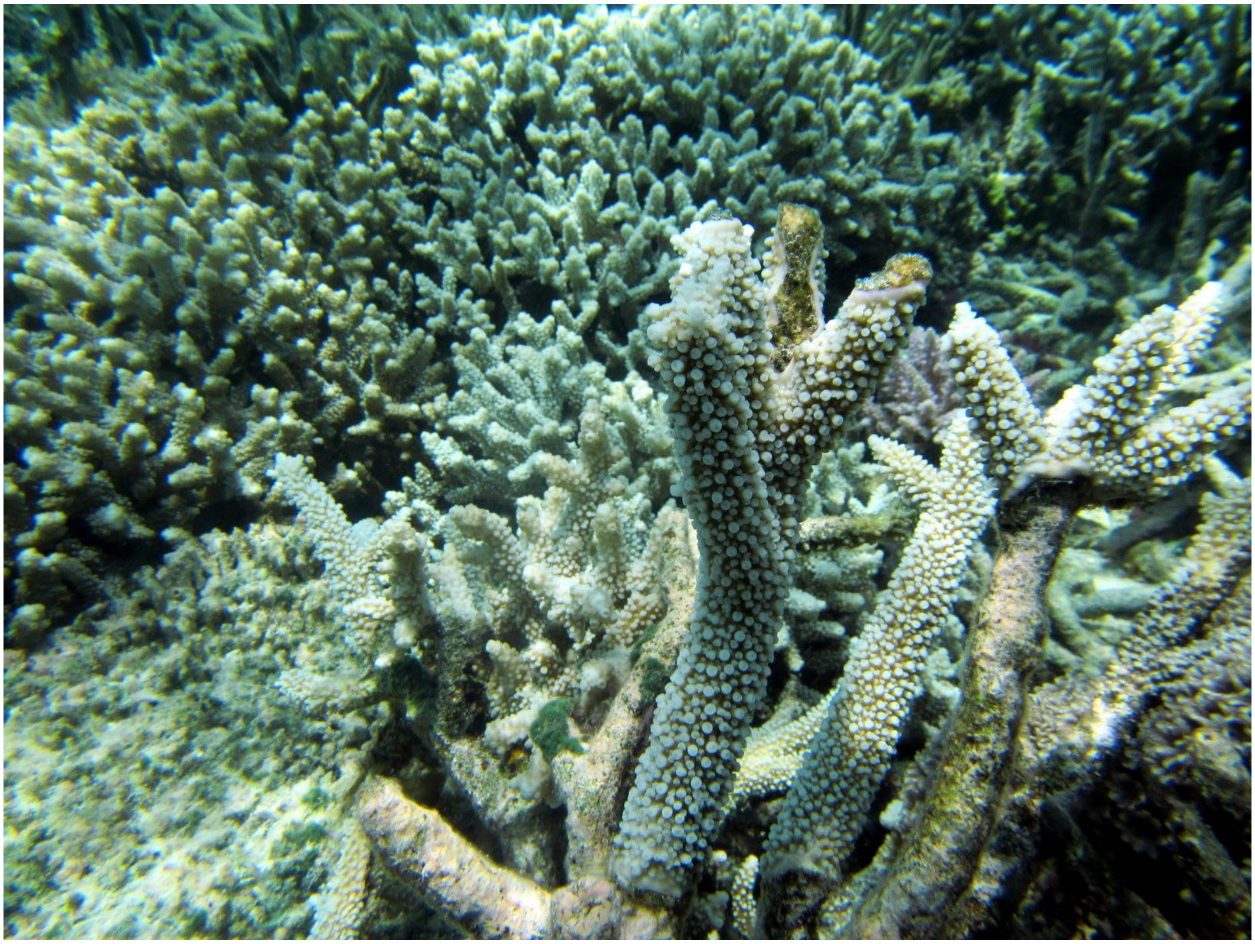


Acropora muricata staghorn coral.

A close-up photo of *Acropora muricata*.

Acropora intermedia *"staghorn"* *(used to be called "Acropora nobilis")*

Colonies are staghorns, and can form large thickets. Branches are about 2-3 cm diameter. The radial corallites are in two sizes, and the larger radial corallites have openings facing towards the branch tip. Branches are thicker than on *Acropora muricata* and *Acropora teres*.



Acropora intermedia.

Another picture of *Acropora intermedia*, showing the radial corallites.

Acropora teres *"staghorn"*

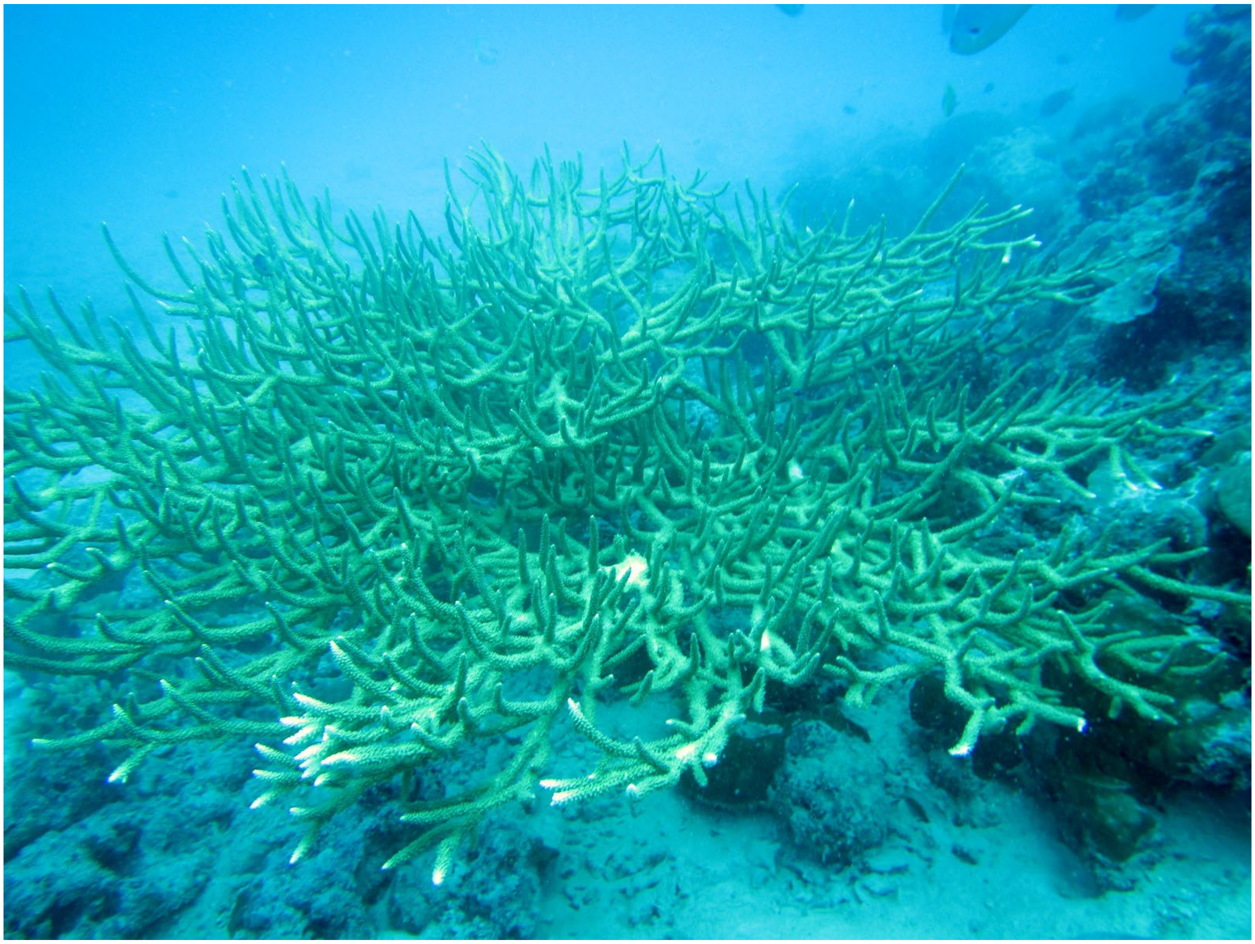
Colonies are long thin staghorn corals. Radial corallites are small and short, and down the branch they get shorter until they don't project at all from the branch surface. Branch tips are usually blue. Tiny tentacles are usually extended during the day.

A photo of *Acropora teres.*

A close-up photo of *Acropora teres*.

Acropora valenciennesi or possibly Acropora hoeksemai

Colonies have staghorn-shaped branches that grow outward from the center and then curve upward until they are near vertical. The radial corallites are uniform. The diameter of branches is less than on *Acropora robusta*, radial corallites are tubular instead of rasp-like, and colonies are not restricted to shallow water as with *Acropora robusta*.



A large colony of *Acropora valenciennesi* or Acropora *hoeksemai*.

A close-up photo of *Acropora valenciennesi*.

Acropora robusta

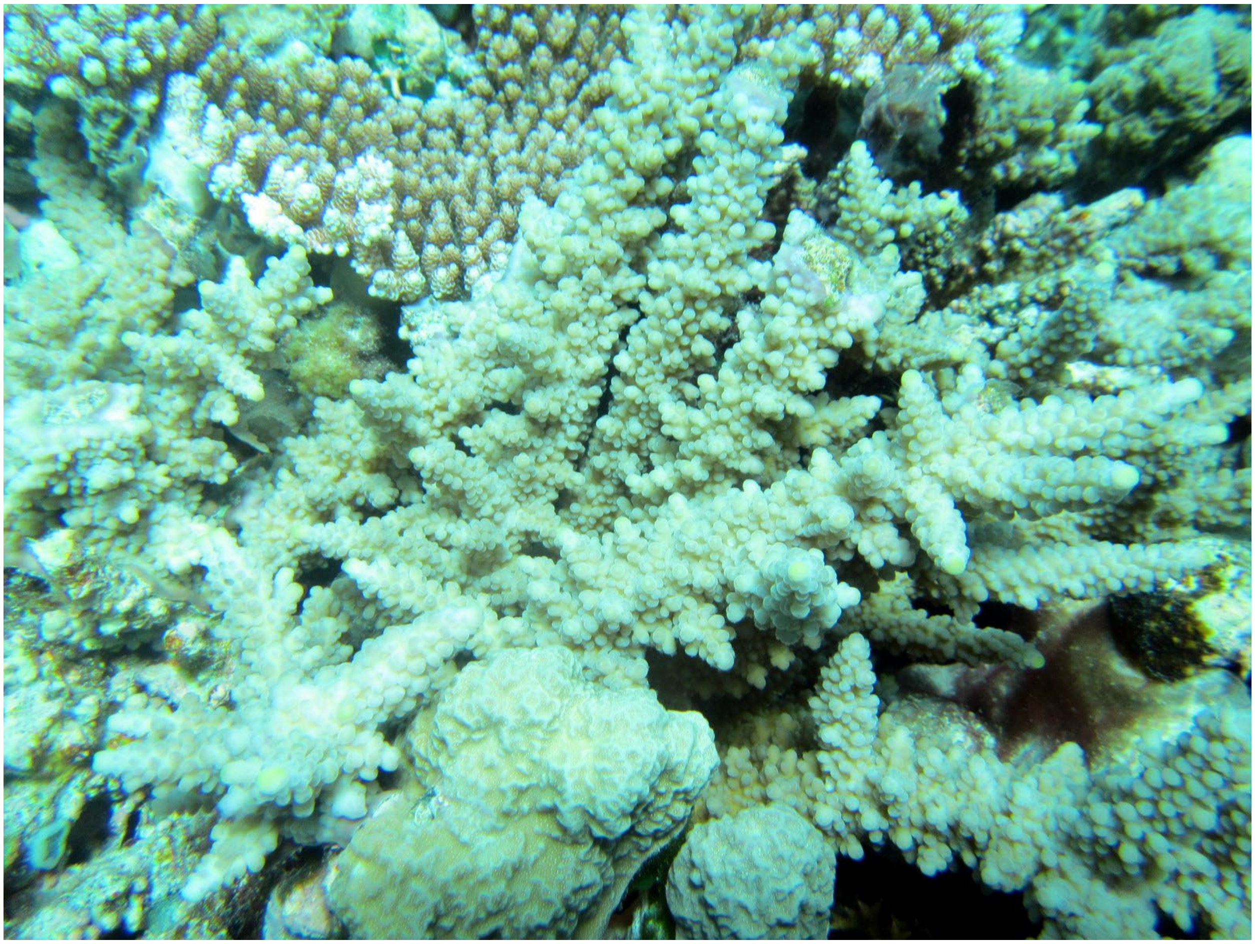
Colonies have thick, staghorn-shaped branches that taper to sharp points. Branches grow horizontally outward from the colony center, then curve upward. Radial corallites are uniform, short and rasp-shaped. Colonies are found in shallow water, usually on outer reef flats. Colonies are discrete and do not form thickets of indefinite size. *Acropora valenciennessi* has thinner branches.

A colony of *Acropora robusta*.

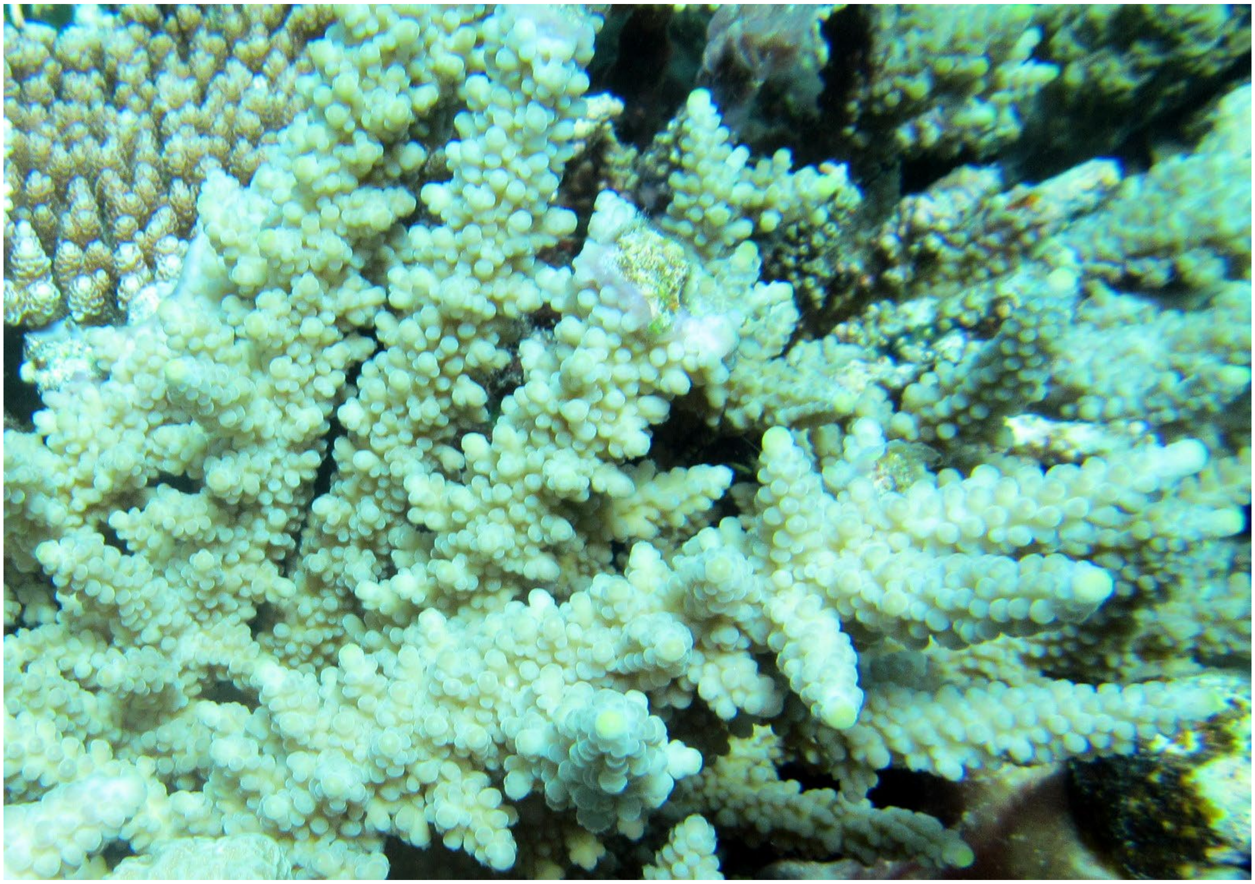
A close-up photo of branches of *Acropora robusta*.

Acropora austera

Colonies are formed of stout branches that are irregular in shape and often fuse. The radial corallites have thicker walls than most other species of *Acropora* and they are close together. Axial corallites are large and often yellow. Branches are more irregular than on staghorns and the corallites are larger. Branches are larger and more irregular than on *Acropora verweyi*.



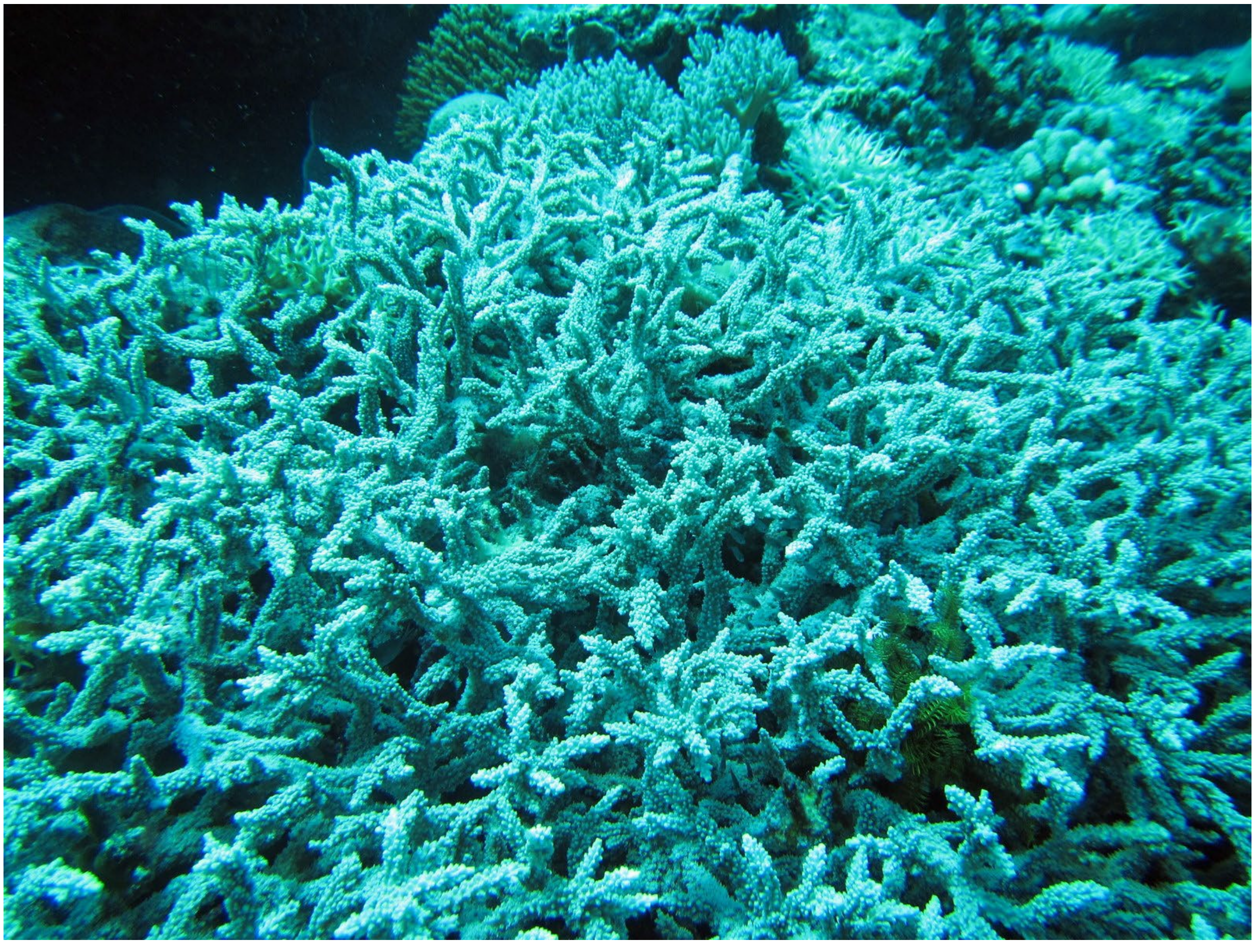
Acropora austera branches.



A closer photo of *Acropora austera* showing the large yellow axial corallites and thick-walled radial corallites close together.

Acropora horrida

Colonies are bushy with many branches that are about pencil width. Branches are often rough with many small tubular radial corallites that are tilted towards the branch tip. Often some or all tentacles are extended during the day. This species can form large thickets. Branches are thinner and more irregular than staghorns.

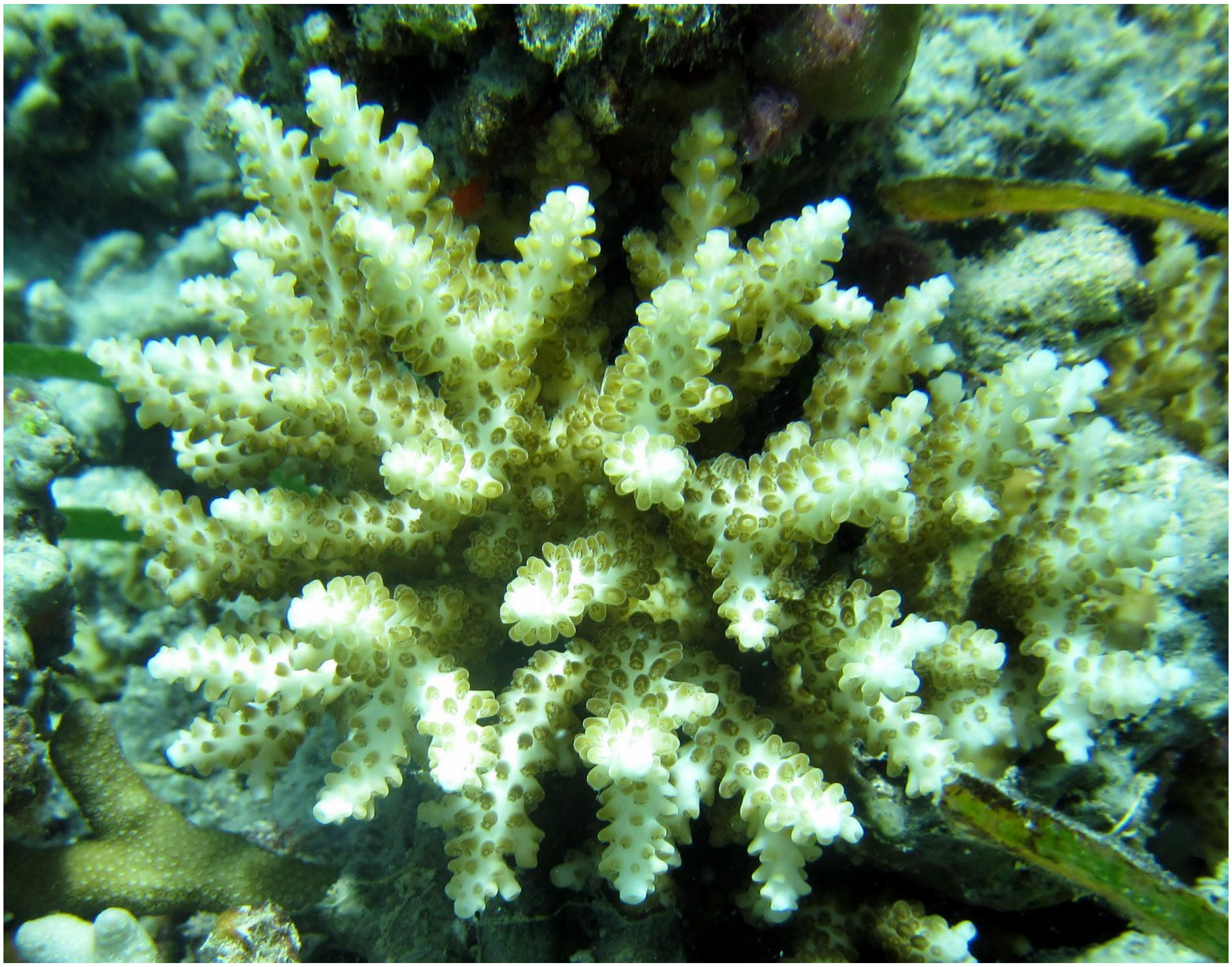


A thicket of *Acropora horrida*.

A closer photo of *Acropora horrida*, showing the thin tubular radial corallites.

Acropora cf. insignis

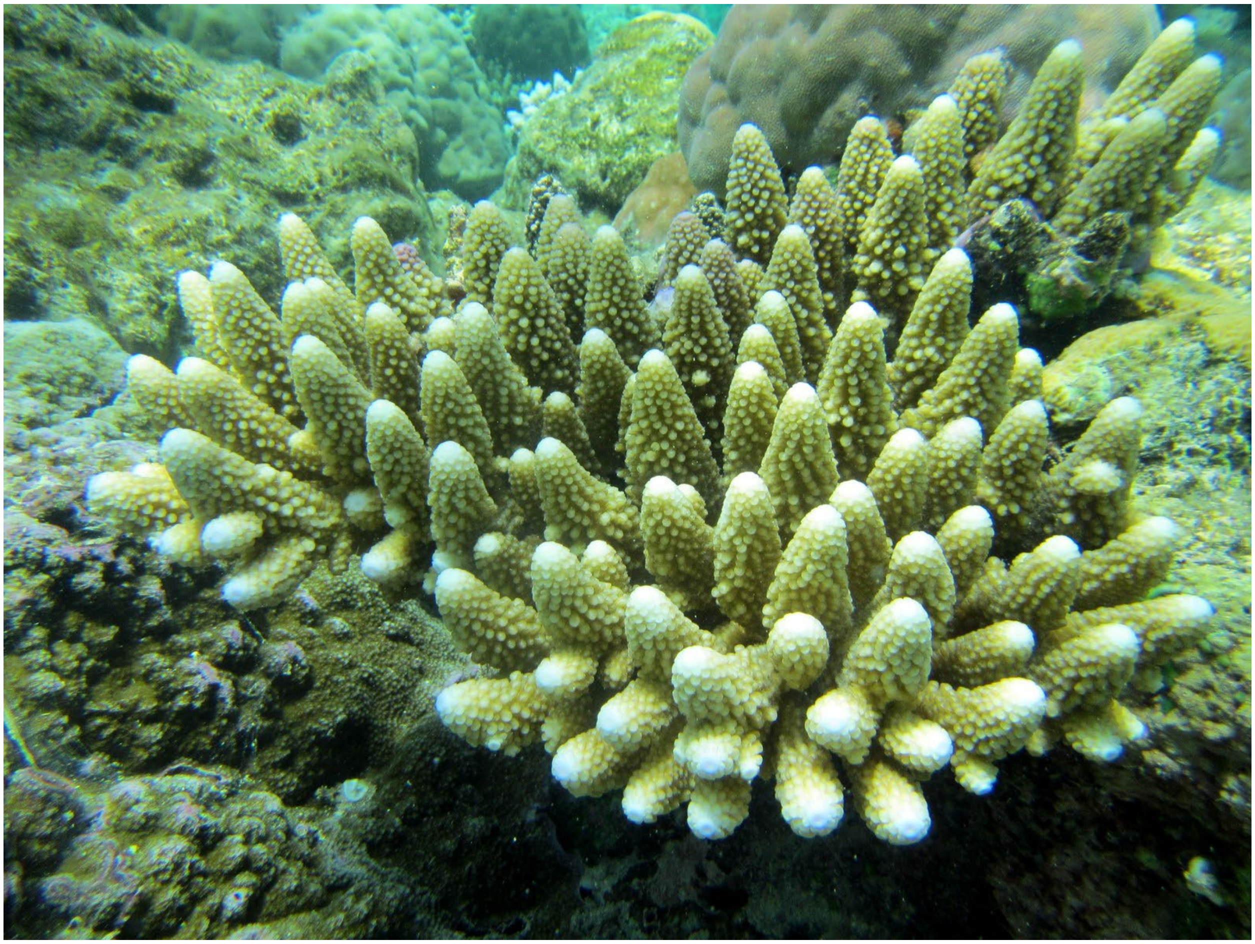
Colonies are small bushes, with small cylindrical branches. The radial corallites are short, small, and inclined towards the branch tip. The radial corallites are brown and stand out against the white branches unlike on other species.



A close-up photo of a colony of *Acropora* cf. *insignis*.

Acropora gemmifera *"digitate"*

Colonies are digitate, with finger-shaped branches that don't branch. The branches often taper and may (or may not) be variable in length and direction the branch grows. Radial corallites increase in size down the branch, have thick walls, and the openings point towards the branch tip. The branches are thicker than on *Acropora humilis* and diverge less, they are smoother than on *Acropora retusa*, and they are larger than on *Acopora digitata*.



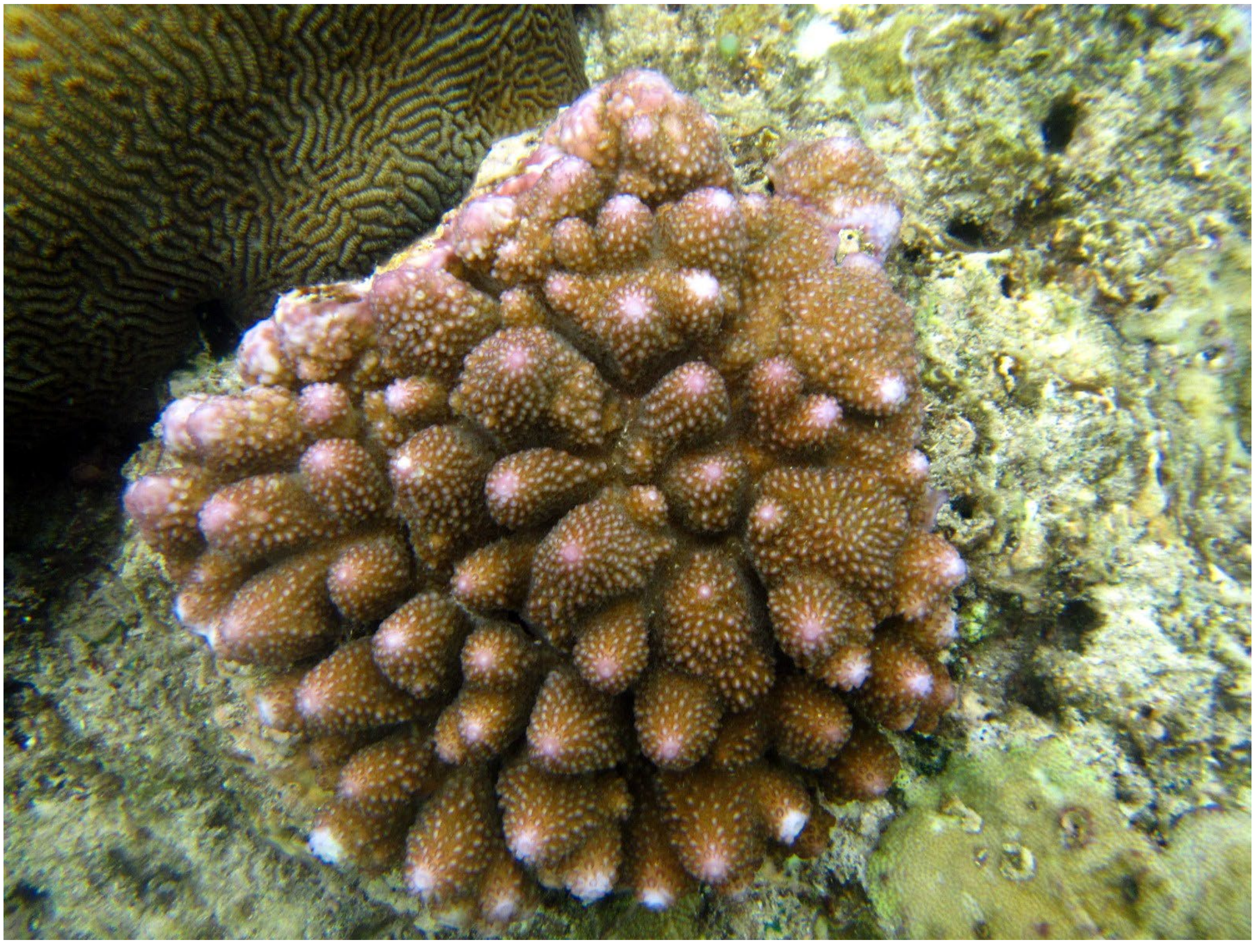
A colony of *Acropora gemmifera* with tapering branches.

A close-up photo of *Acropora gemmifera*, showing the short radial corallites with thick walls.

Acropora monticulosa digitate tapering morph

Colonies are digitate with parallel, vertical branches except near colony edges where they often are inclined outwardly. Branches are uniform in size and shape, except that branches near the center may be larger and taper more. Branches taper strongly along their entire length to a rounded tip or sharp point. Axials and radials are small and short. On the *Acropora monticulosa* branching morph, branches can go any direction, are cylindrical until near the tip where they taper, and can have side branches that are as big as the main branch. Radial corallites are much smaller than on *Acropora gemmifera* and branches taper more than on *Acropora globiceps*.

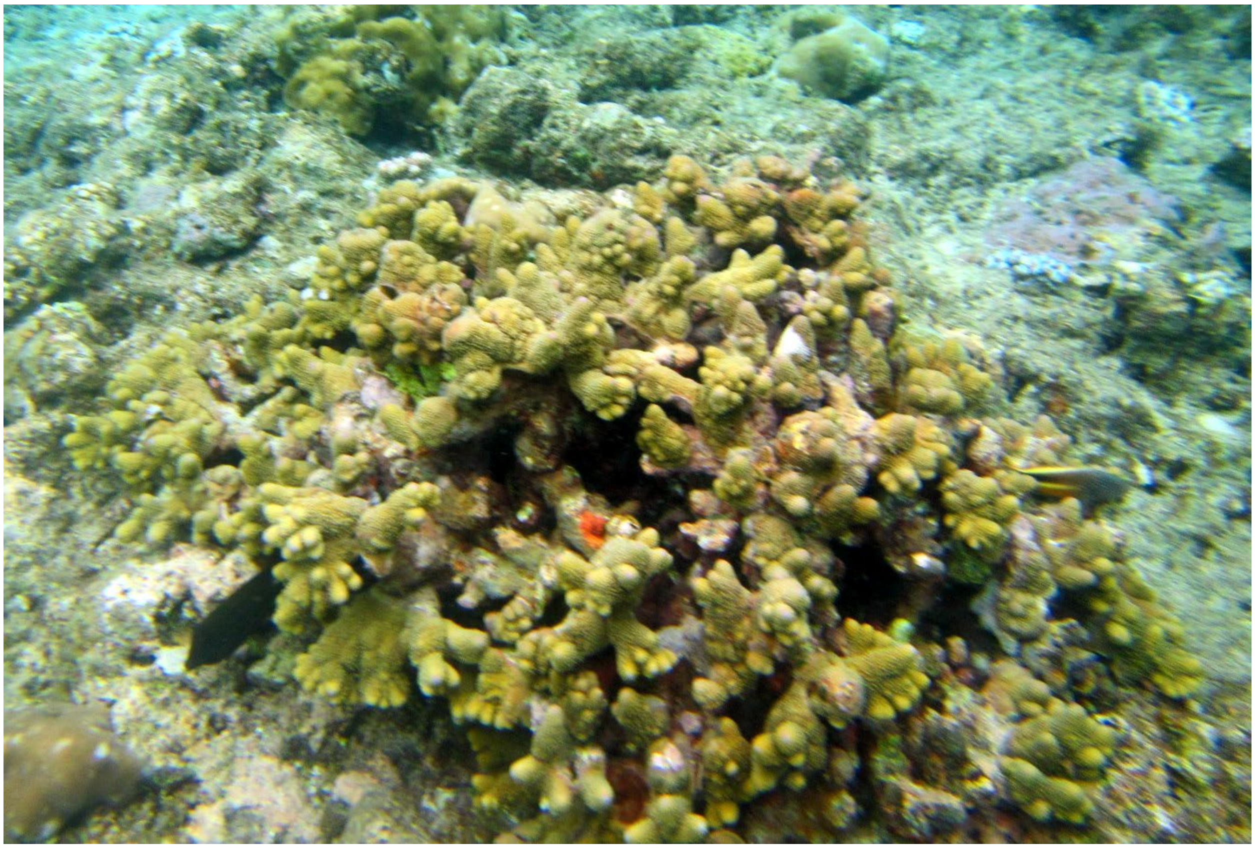
A colony of *Acropora monticulosa* tapering digitate morph.



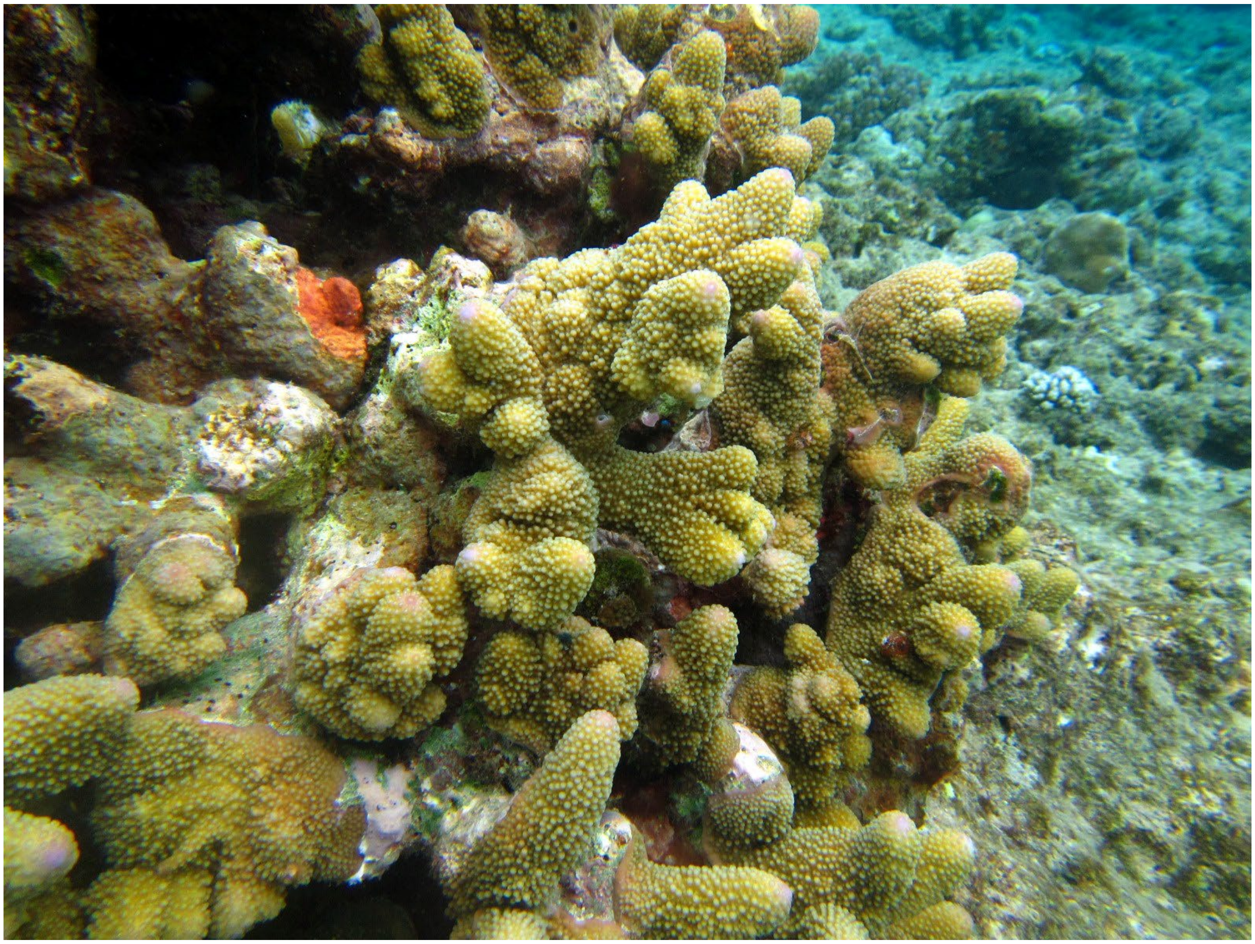
A colony of *Acropora monticulosa* tapering digitate morph.

Acropora monticulosa branching morph

Colonies can be large and mounding, and commonly have dead areas between clumps of branches. Branches are cylindrical and usually short. Branches can be in a variety of sizes, usually do not taper except near the branch tip, can go any of a variety of directions, so not parallel or close together. Branches often have side branches of a variety of sizes from small to the same size as the main branch. Axial and radial corallites are small. This species was recognized as *Acropora monticulosa* by Randall and Myers (1983). Branches do not have sub-branches on the tapering digitate morph of this species, have parallel branches that grow vertically, and taper the full length of the short branches.

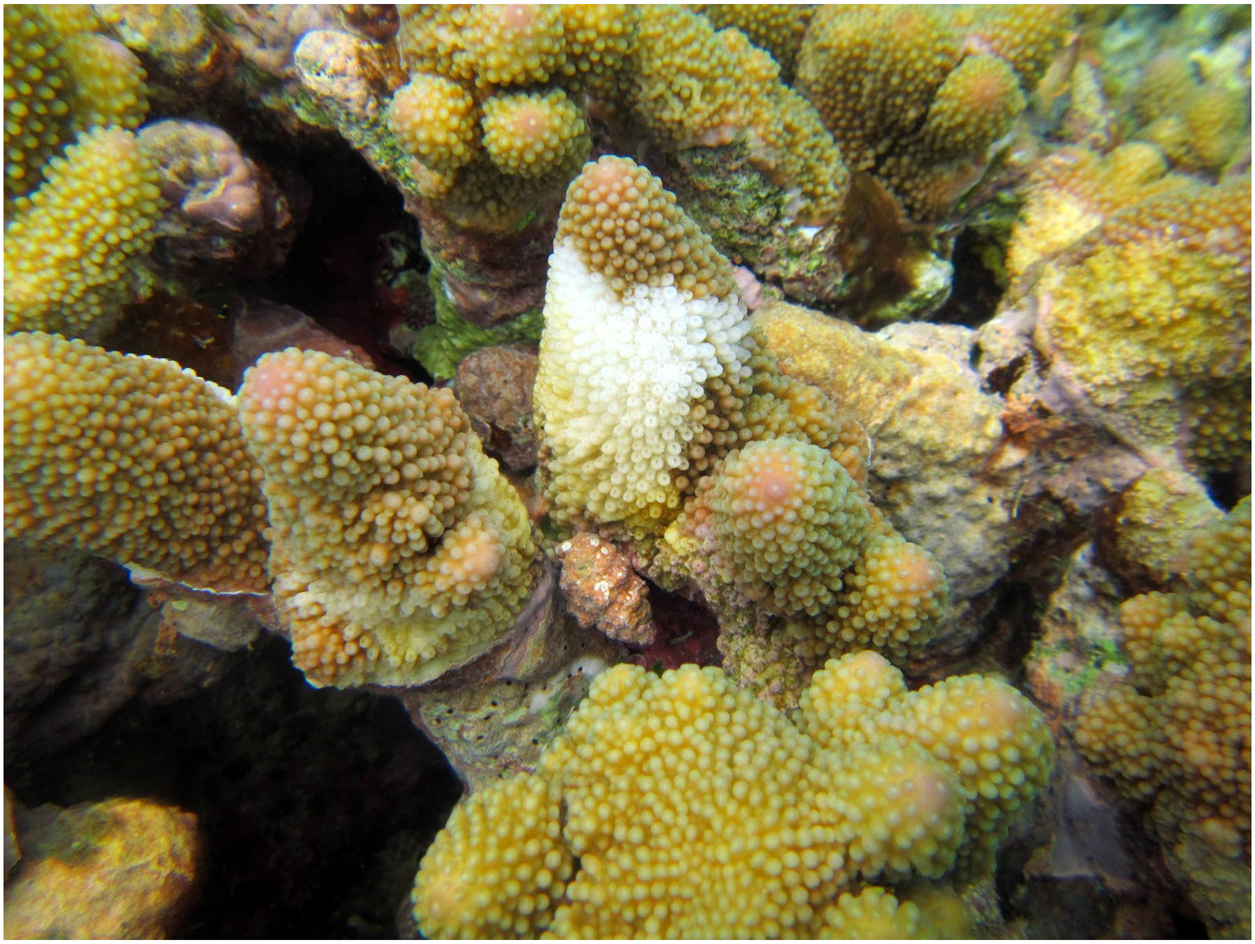


A large colony of *Acropora monticulosa* branching morph.



A photo of *Acropora monticulosa* branching morph.

A photo of *Acropora monticulosa* branching morph.



A closer photo of *Acropora monticulosa* branching morph. The white area was eaten by the *Drupella* snail that is below the white area.

Acropora globiceps Vulnerable Threatened

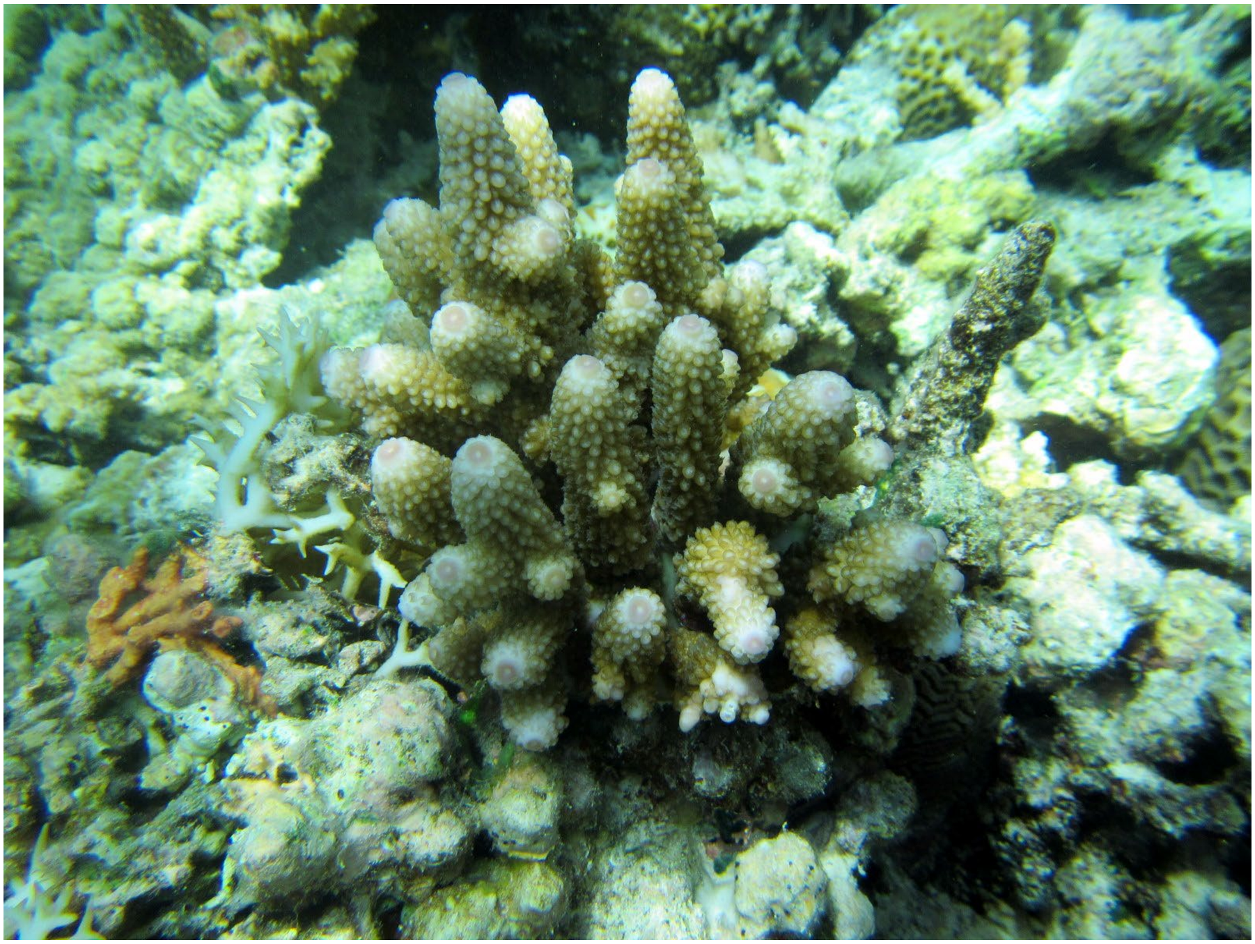
Colonies are digitate, with an encrusting base and branches that are not long, usually taper little, are uniform in size and shape, have few if any side branches, are close together (often with a uniform width crack between branch bases), and have a small axial corallite. *Acropora humilis* has more variable length branches that diverge, often with small side branches, and a slightly larger axial corallite. *Acropora gemmifera* branches taper more, corallites increase in size down the branch, and radial corallites are short, point towards the branch tip, and have thick walls.

A colony of *Acropora globiceps*.

A close-up photo of *Acropora globiceps*.

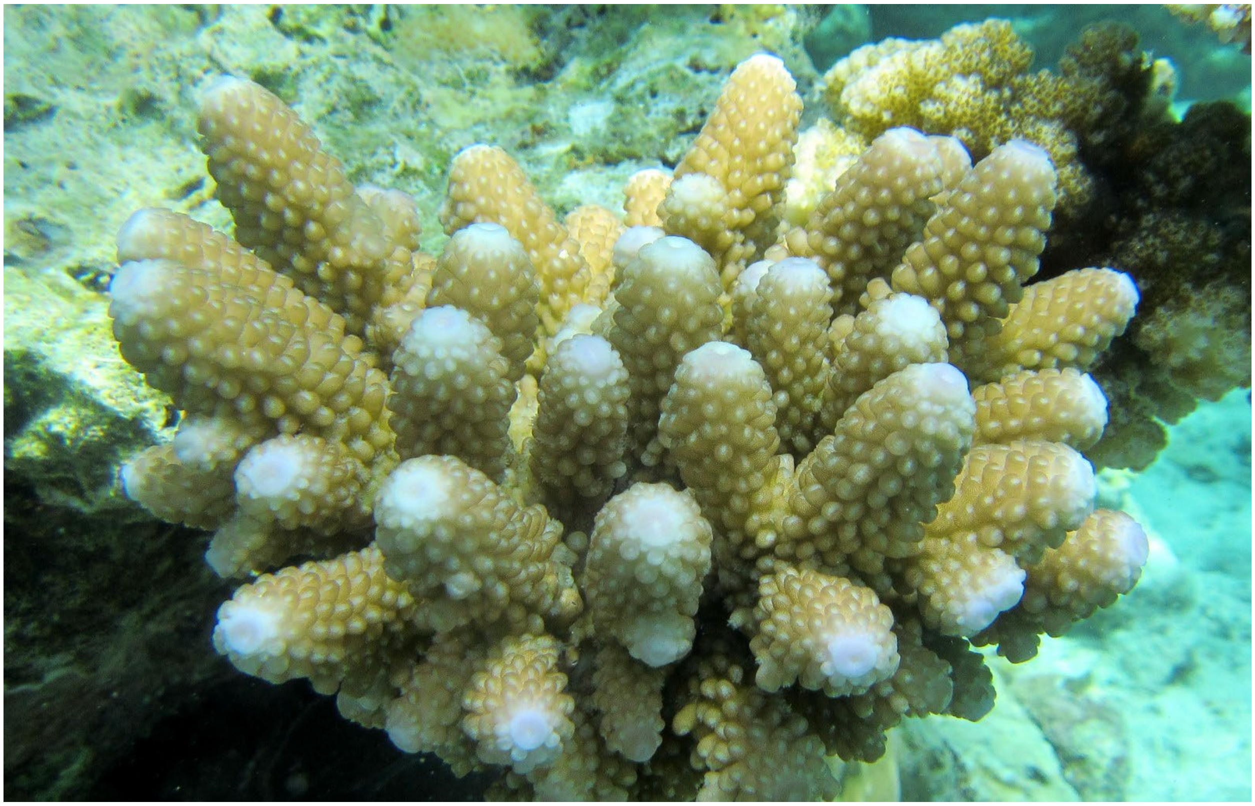
Acropora humilis *"digitate"*

Colonies are digitate, with branches that taper little if any, which can vary in length and diverge widely. In some colonies, the axial corallite is a very wide, low dome, but not it all colonies. Radial corallites increase little in size down the branches. Branches are thinner, taper much less, diverge more and are more variable in length than on *Acropora gemmifera* and *Acropora globiceps,* and are longer, larger, and less uniform in length than on *Acropora digitata*.



A colony of *Acropora humilis* with branches of variable lengths, little tapering on the branches, and fairly large axial corallites.

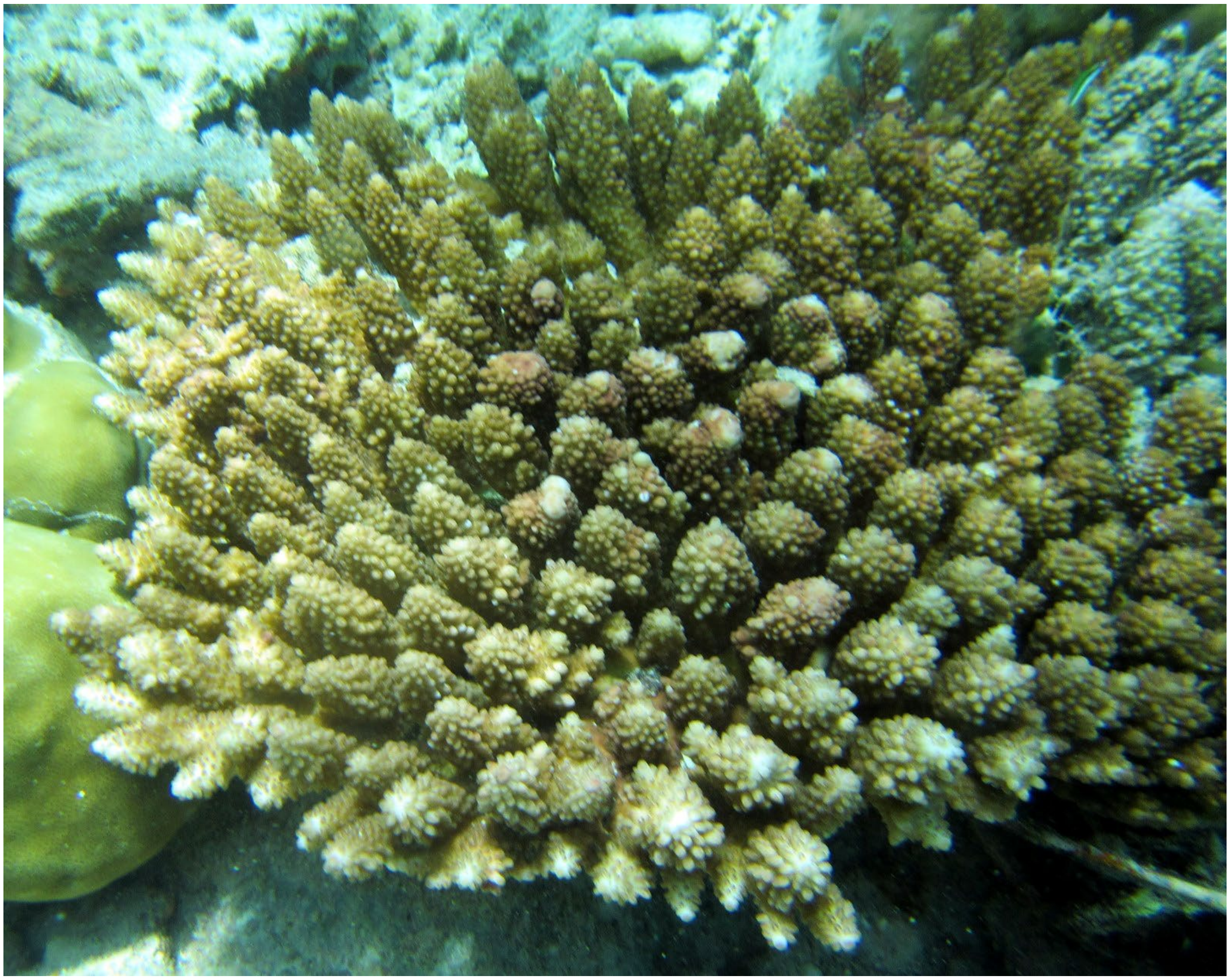
A colony of *Acropora humilis*.



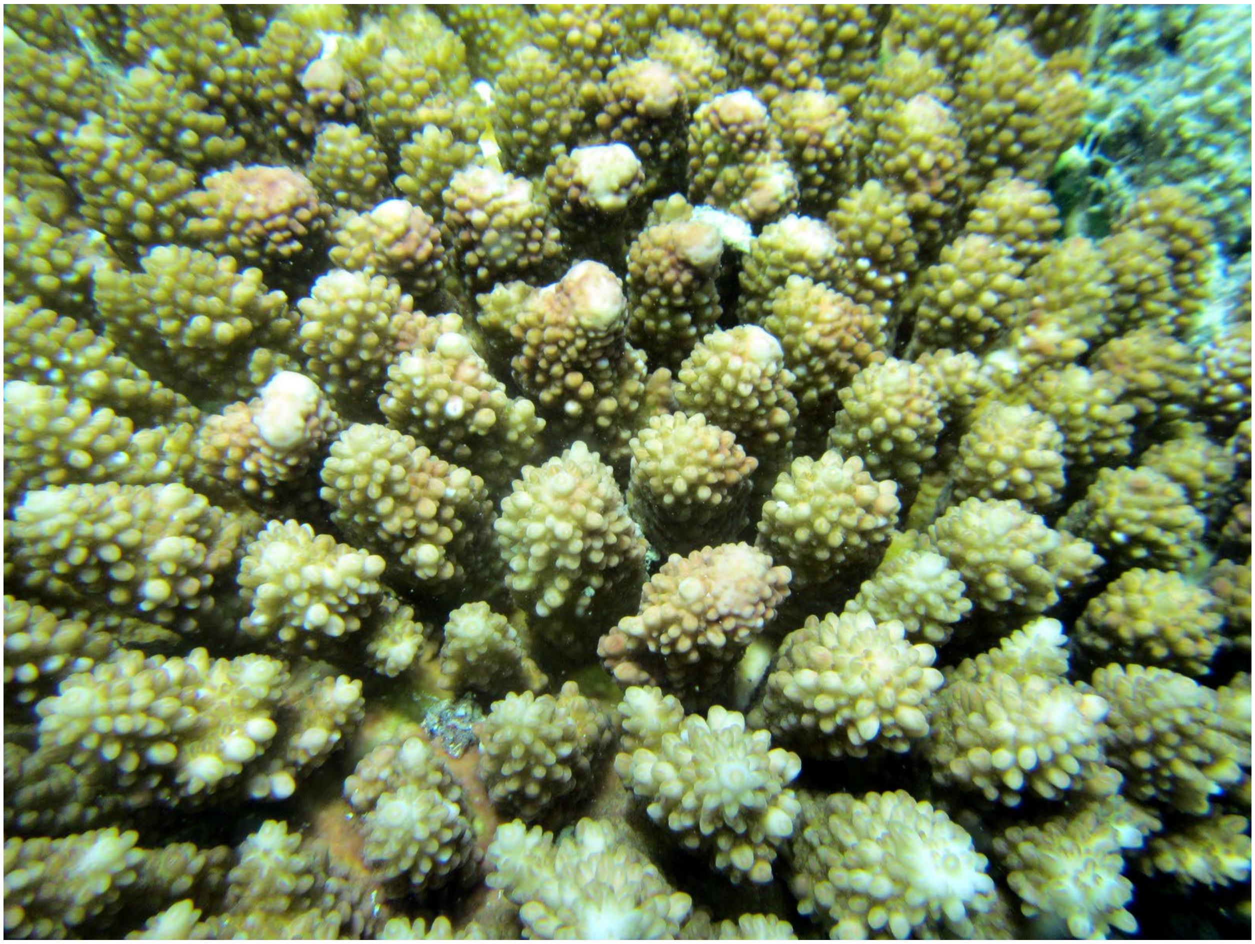
A closer photo of *Acropora humilis*, with diverging, variable length branches with larger axial corallites.

Acropora retusa *"digitate"* *Threatened Vulnerable*

Colonies are digitate, with relatively short, thick branches. The axial corallites and radial corallites are similar in size and shape. The radial corallites are tubular and thick walled, and variable in length, which makes branches look bumpy or prickly. Branches are bumpier than on *Acropora globiceps*, corallites have thicker walls, and axial corallites are similar to radial corallites.



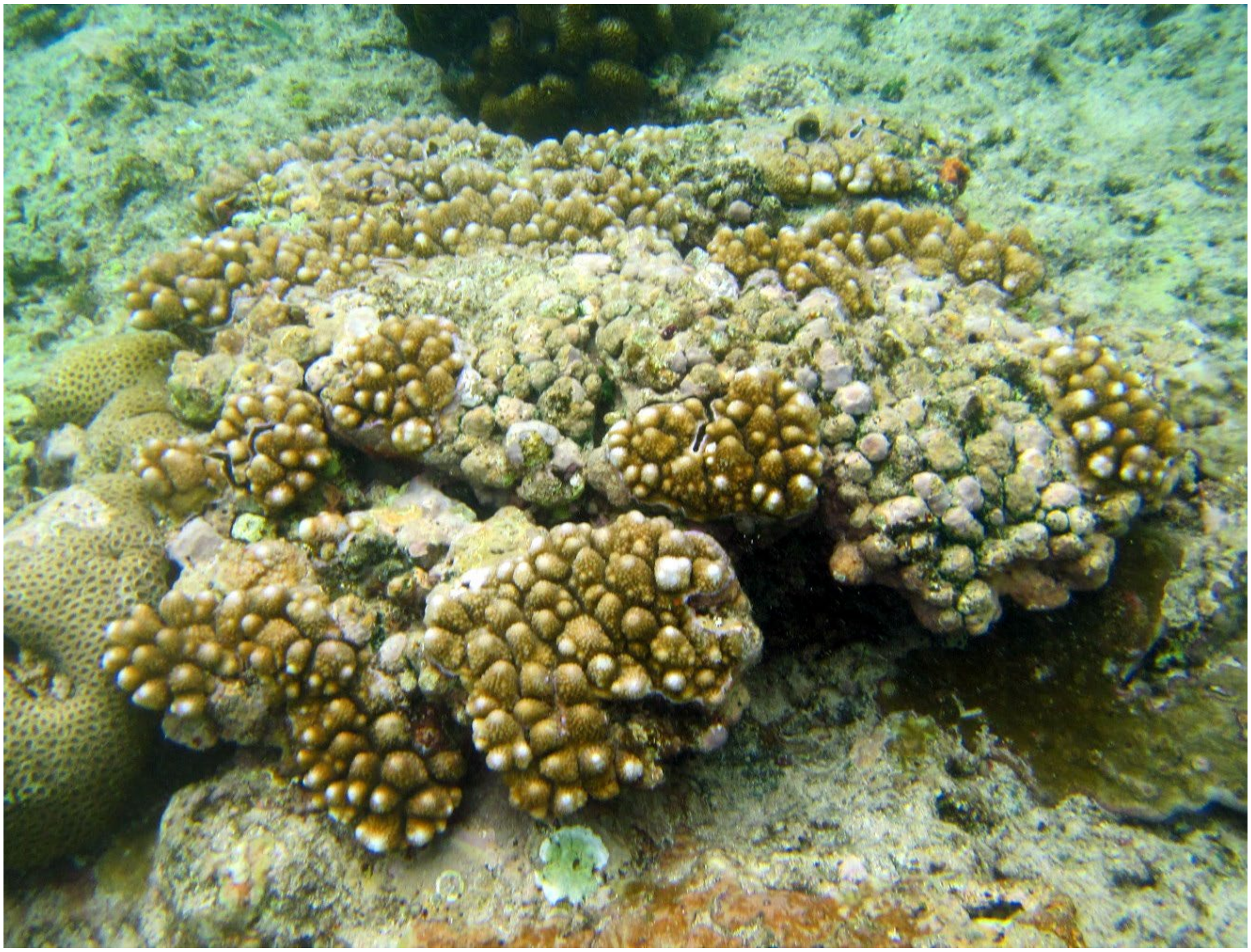
A colony of *Acropora retusa*.



A close-up photo of *Acropora retusa*.

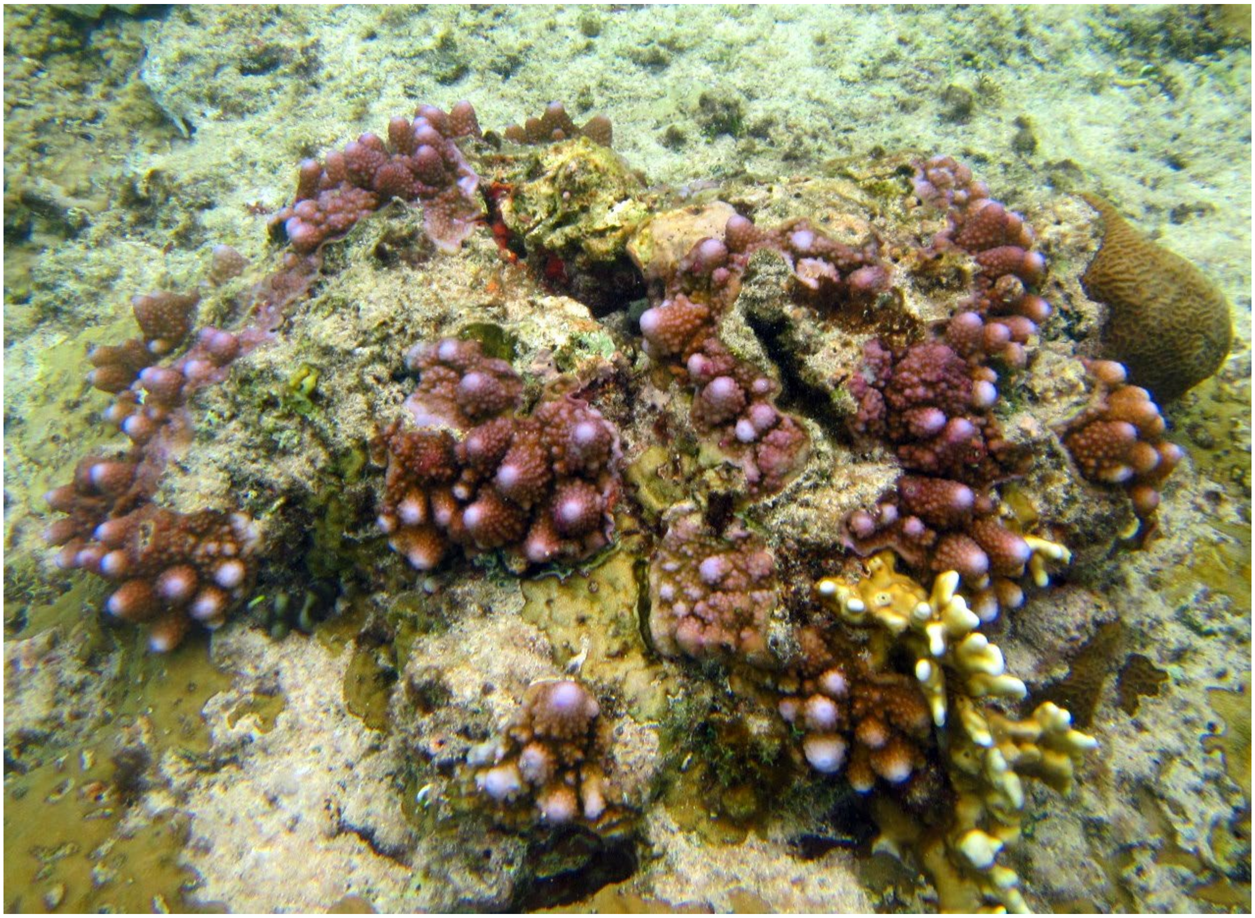
Acropora cf. ocellata

Colonies usually consist of a cluster of small colonies which appear to be remnants of a previous larger colony. Colonies are digitate with short tapering branches that are close together. Randall and Myers (1983) show clusters of digitate colonies under this name, however Veron (2000) and Veron et al (2020) have a different concept of what this species name refers to. Other *Acropora* do not have the short branches and dead areas between islands of living coral.

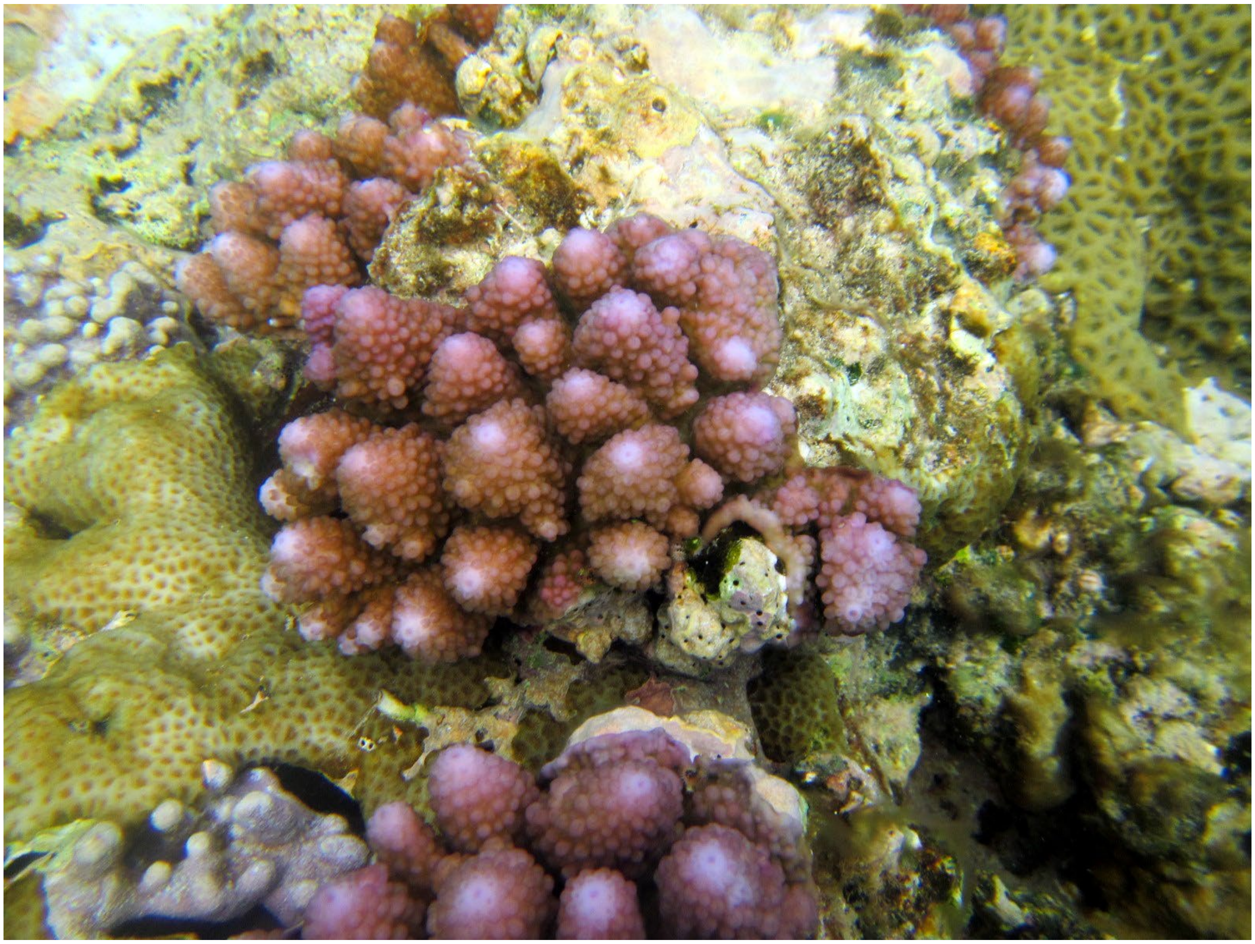


A cluster of colonies of *Acropora* cf. *ocellata*.

A close photo of *Acropora* cf. *ocellata*.



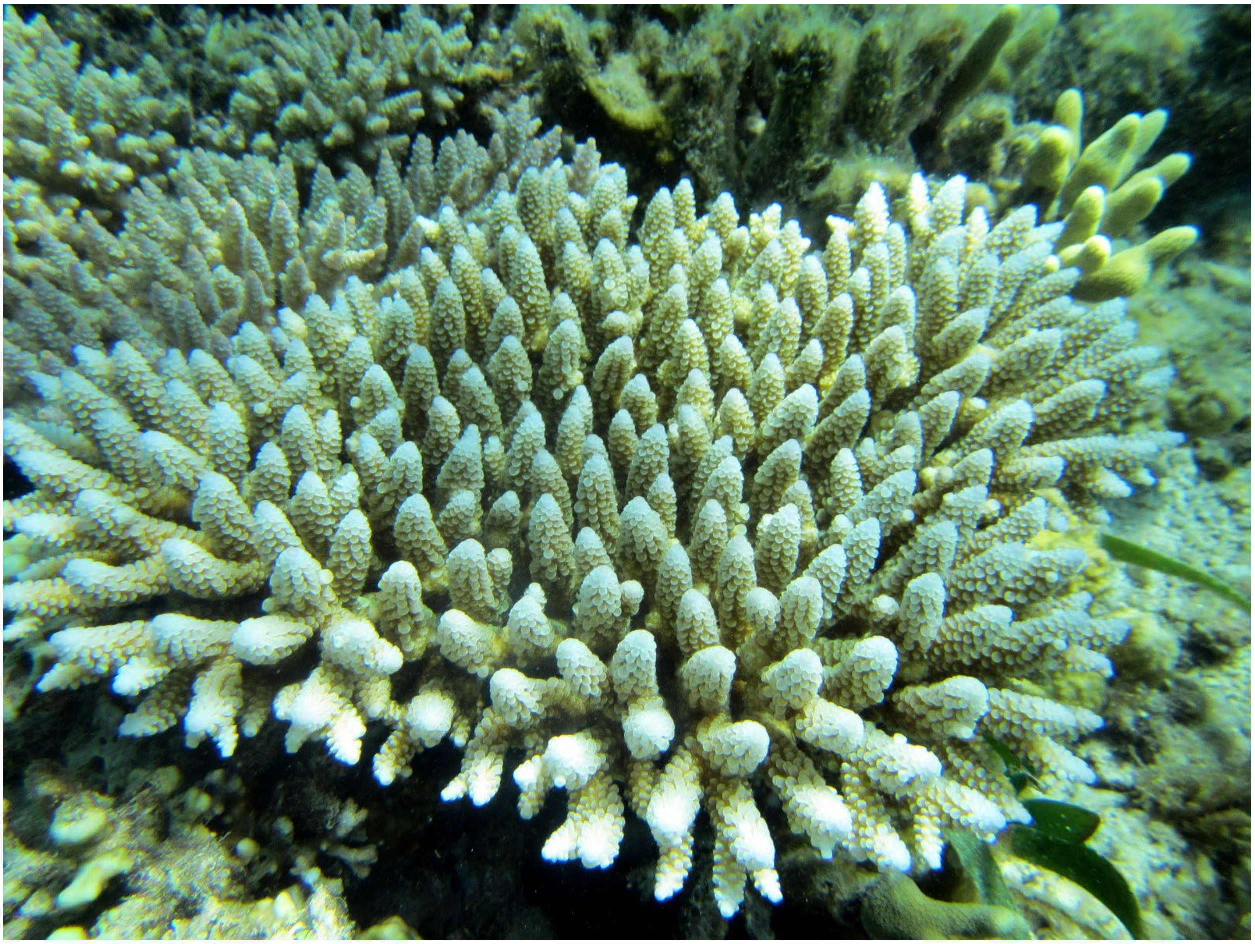
A cluster of colonies of *Acropora* cf. *ocellata*.



A close photo of *Acropora* cf. *ocellata*.

Acropora digitifera *"digitate" or "corymbose"*

Colonies are digitate with slim, uniform branchlets that taper to a point. Axial corallites are small and radial corallites are uniform and short, with openings pointing towards the branch tip. In some colonies, branch tips are blue. This species is in shallow water, usually with wave surge. The branchlets are thinner than on most other digitate species. The radial corallites are not as leafy as on *Acropora tenuis*, which is not restricted to shallow water and does not have blue banch tips.

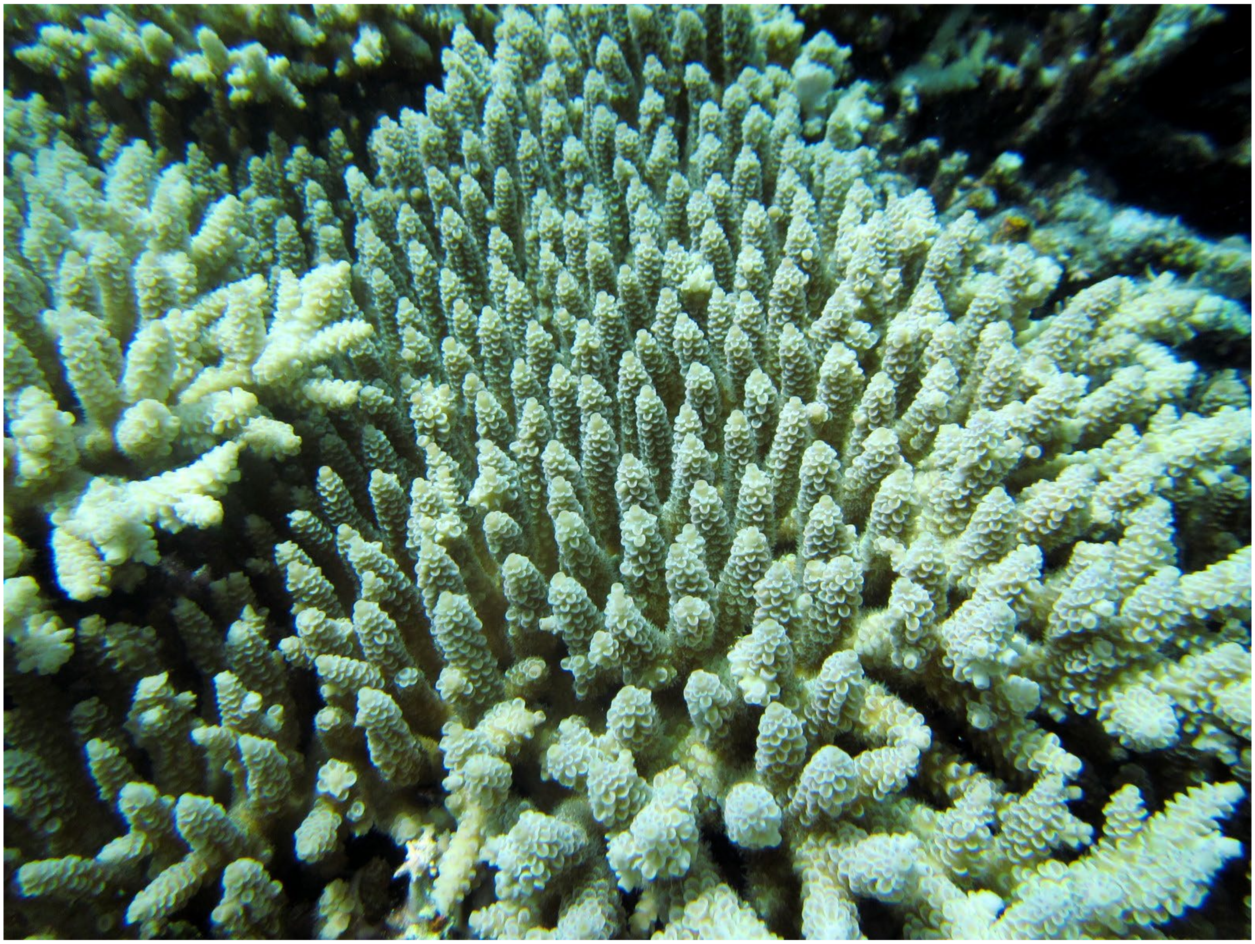


A colony of *Acropora digitifera*.

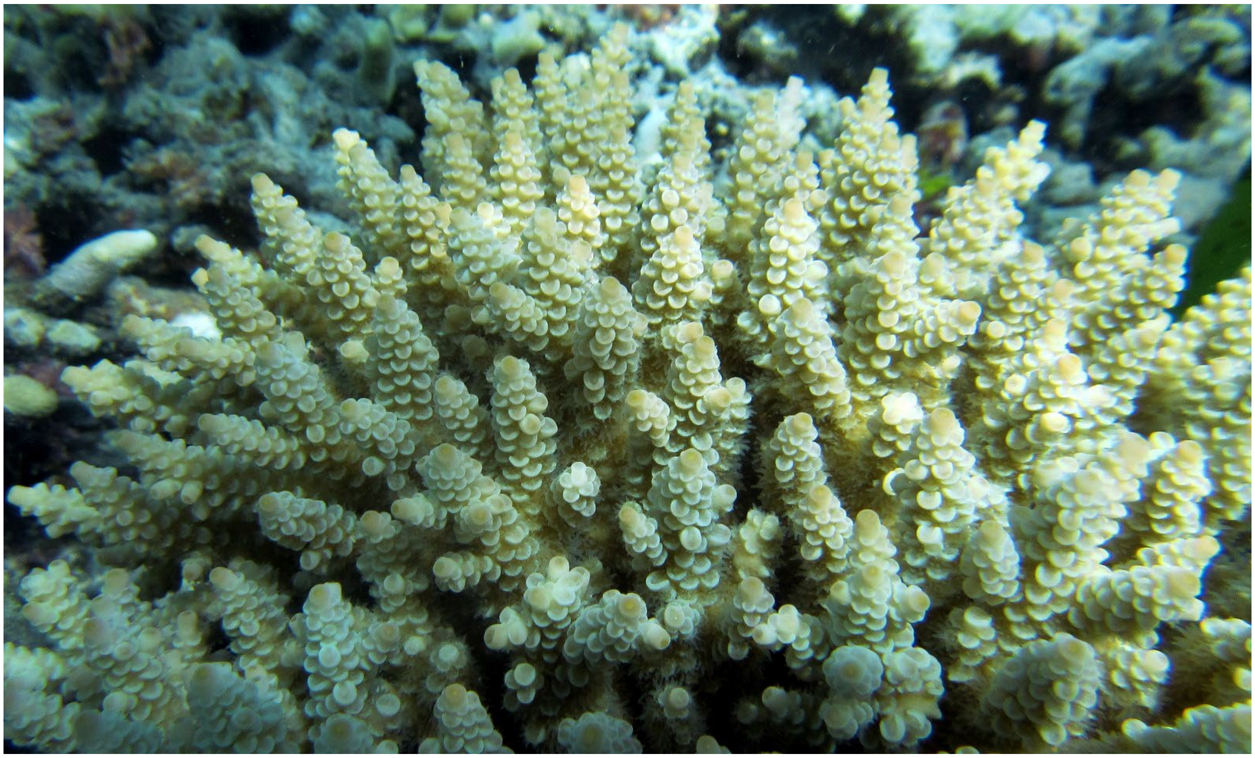
A close-up picture of *Acropora digitifera*.

Acropora tenuis *"corymbose"*

Colonies are corymbose, with small axial corallites and uniform radial corallites with projecting lower lips. The lower lips on *Acropora millepora* are closer together, flatter and thinner. Radiial corallites are not as leafy on *Acropora digitifera* which usually has blue branch tips and is restricted to shallow water.



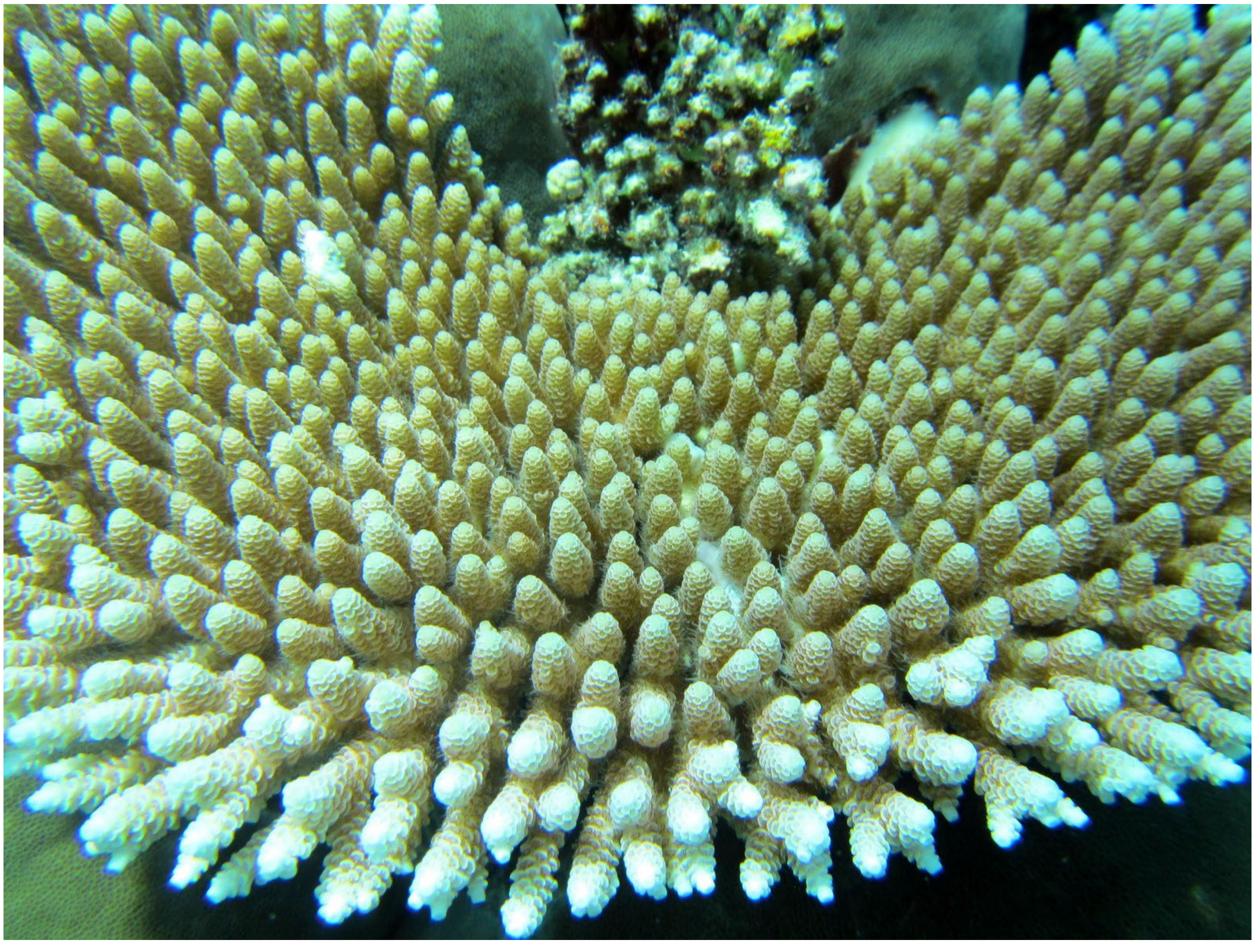
A colony of *Acropora tenuis*.



A close-up photo of *Acropora tenuis*.

Acropora millepora

Colonies are corymbose with uniform branches growing upward. Branches have rounded ends. Radial corallites have long thin lips projecting uniformly from the sides of branches. Long tentacles may be extended near branch bases. *Acropora tenuis* has lower lips that are farther apart, more curved, and thicker.



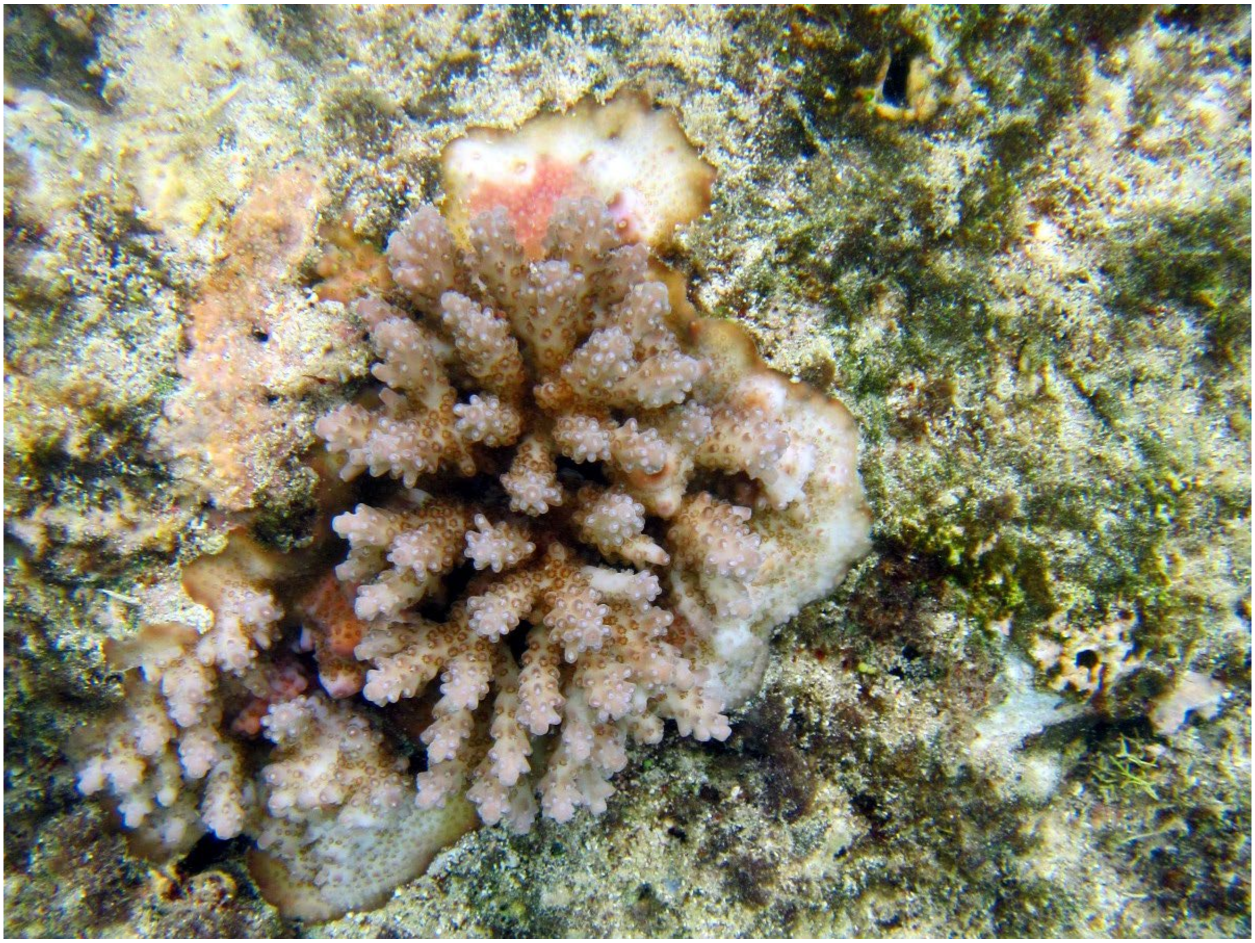
A colony of *Acropora millepora*.

A closer photo of *Acroproa millepora*.

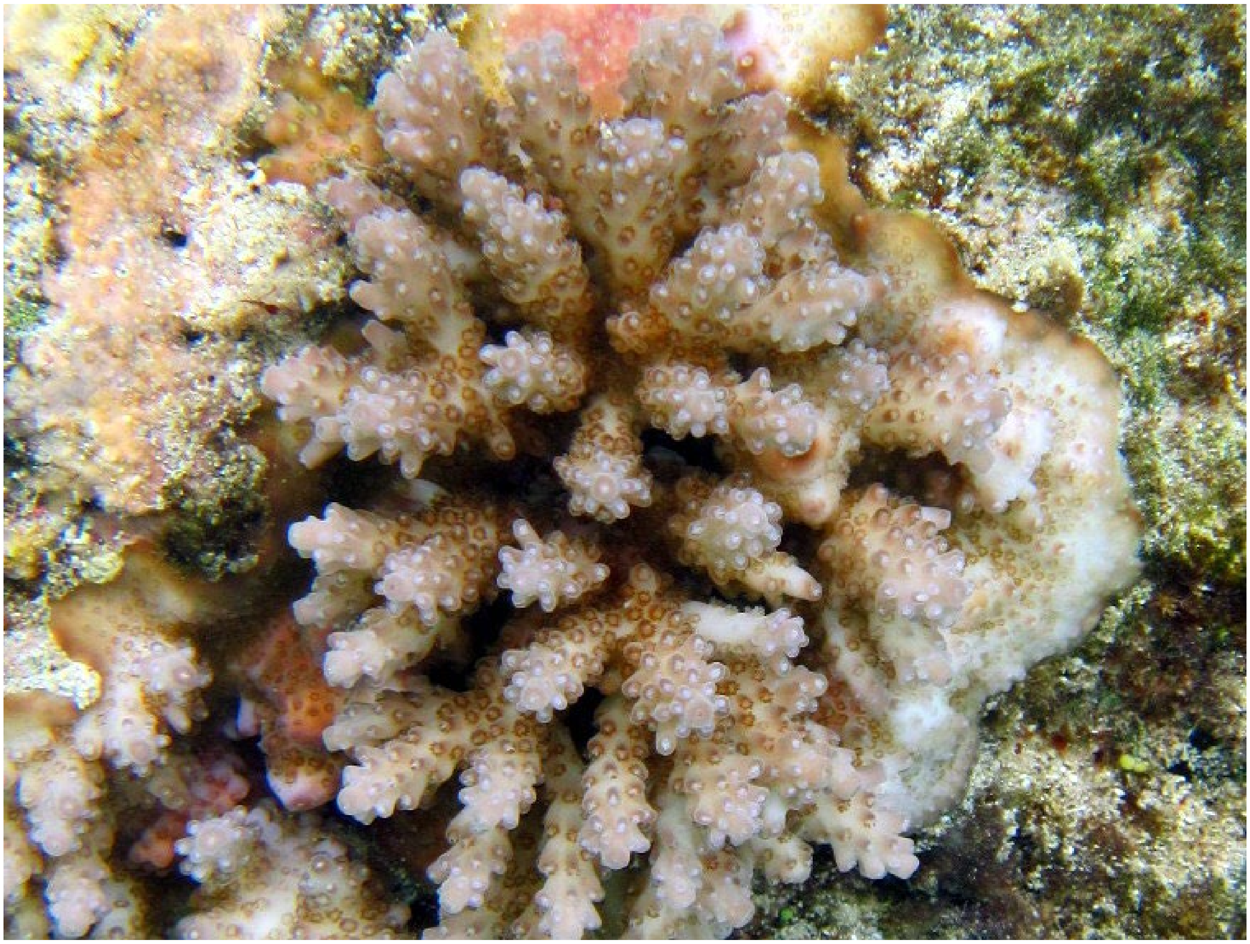
A close-up photo of *Acropora millepora* showing tentacles between some branches.

Acropora nana

Colonies are usually small clumps, corymbose with radiating branchlets. Branchlets may have side branches. Radial corallites are thin tubular, and there may be a few incipient axials near branch tips. It usually prefers to be near reef crests. The radial corallites on *Acropora valida* are appressed against the branches and it is usually blue or purple.



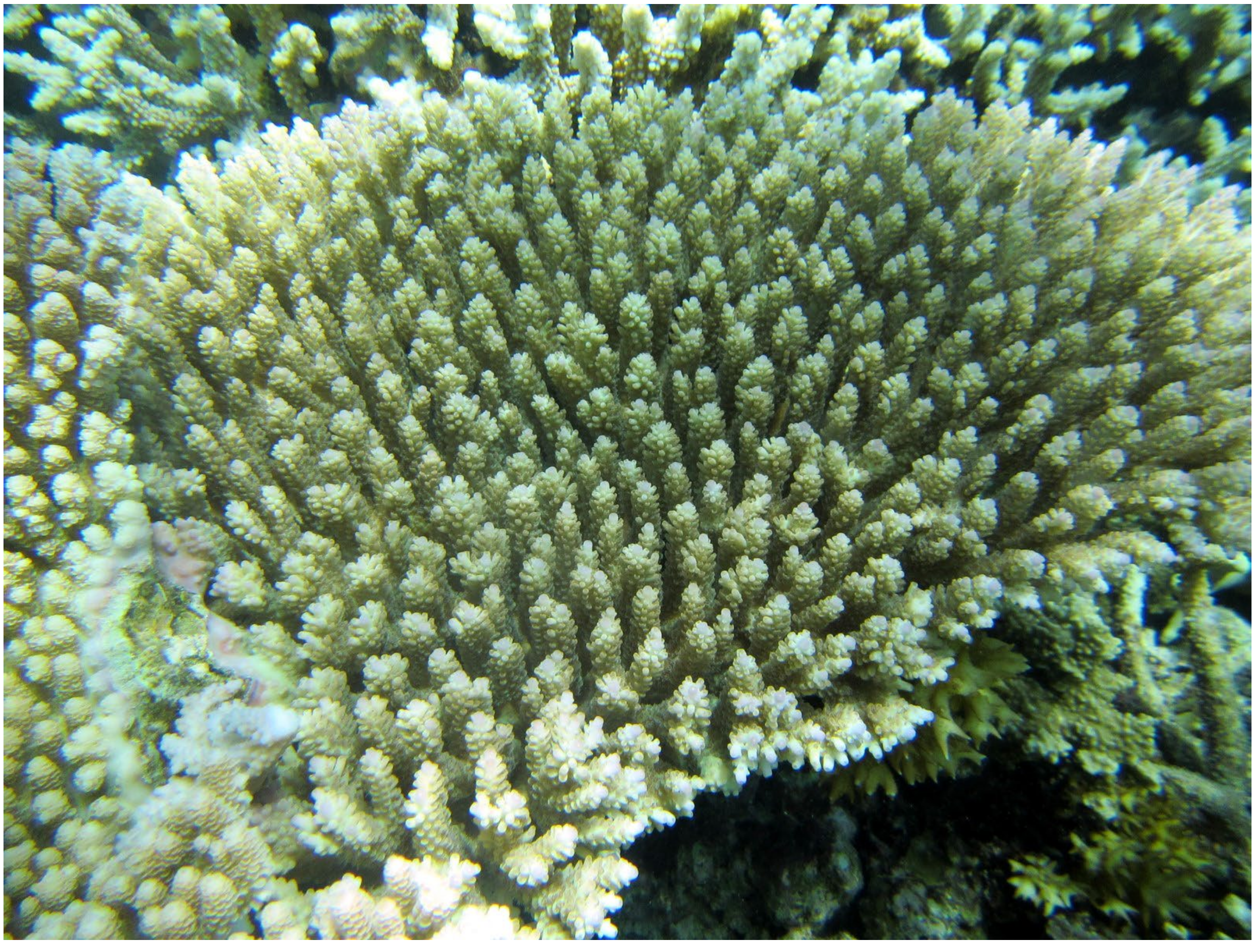
A colony of *Acropora nana*.



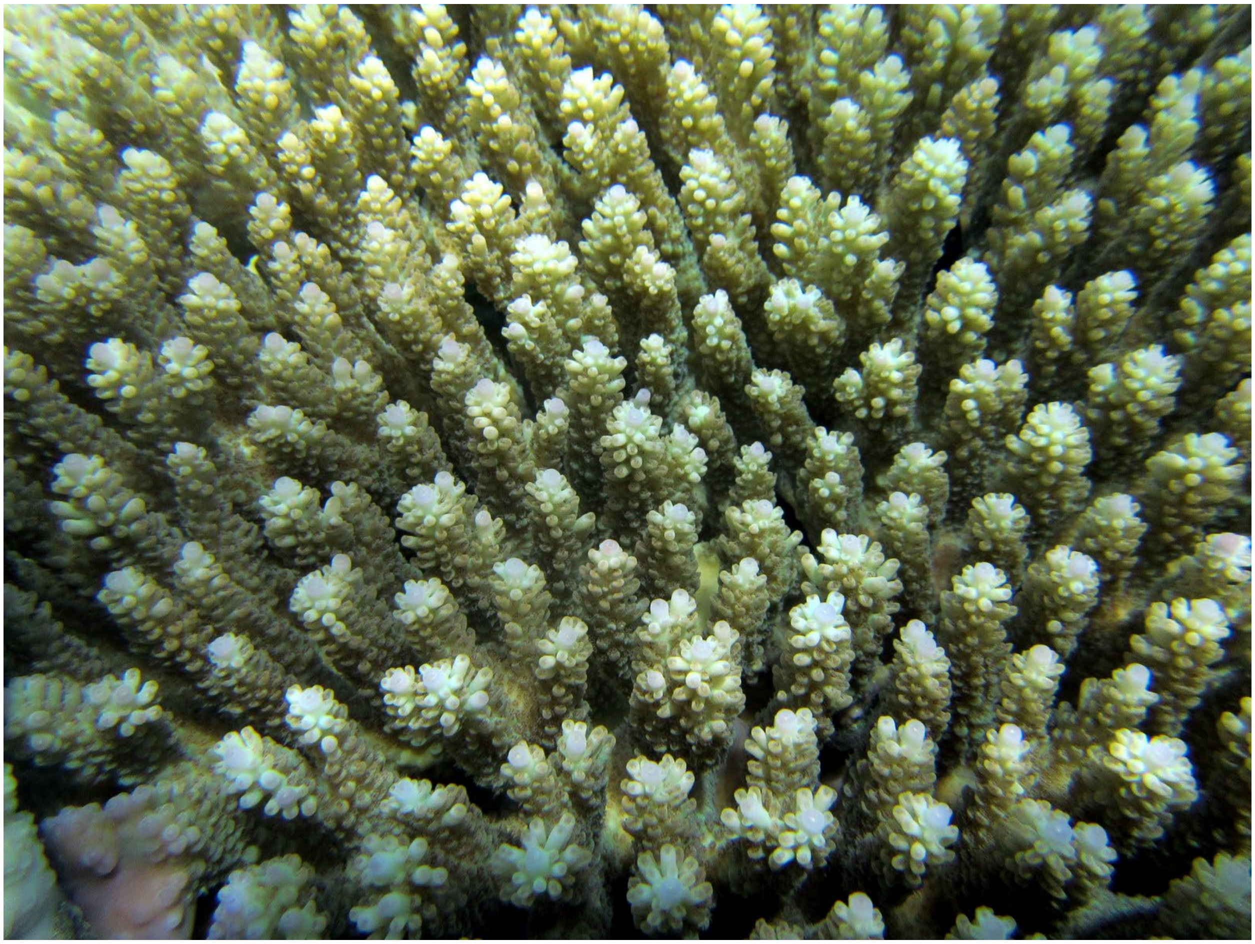
A close-up photo of *Acropora nana*.

Acropora nasuta *"corymbose"*

Colonies are corymbose, with vertical, parallel branchlets. Axial corallites are small, and radial corallites are projecting thin tubes with openings pointing upwards. The branch is thick enough that the projecting radial corallites are only a small part of the total diameter of the branch, unlike in *A. cerealis* which has thinner branches and the radial corallites are a large part of the branch.



A colony of *Acropora nasuta*.

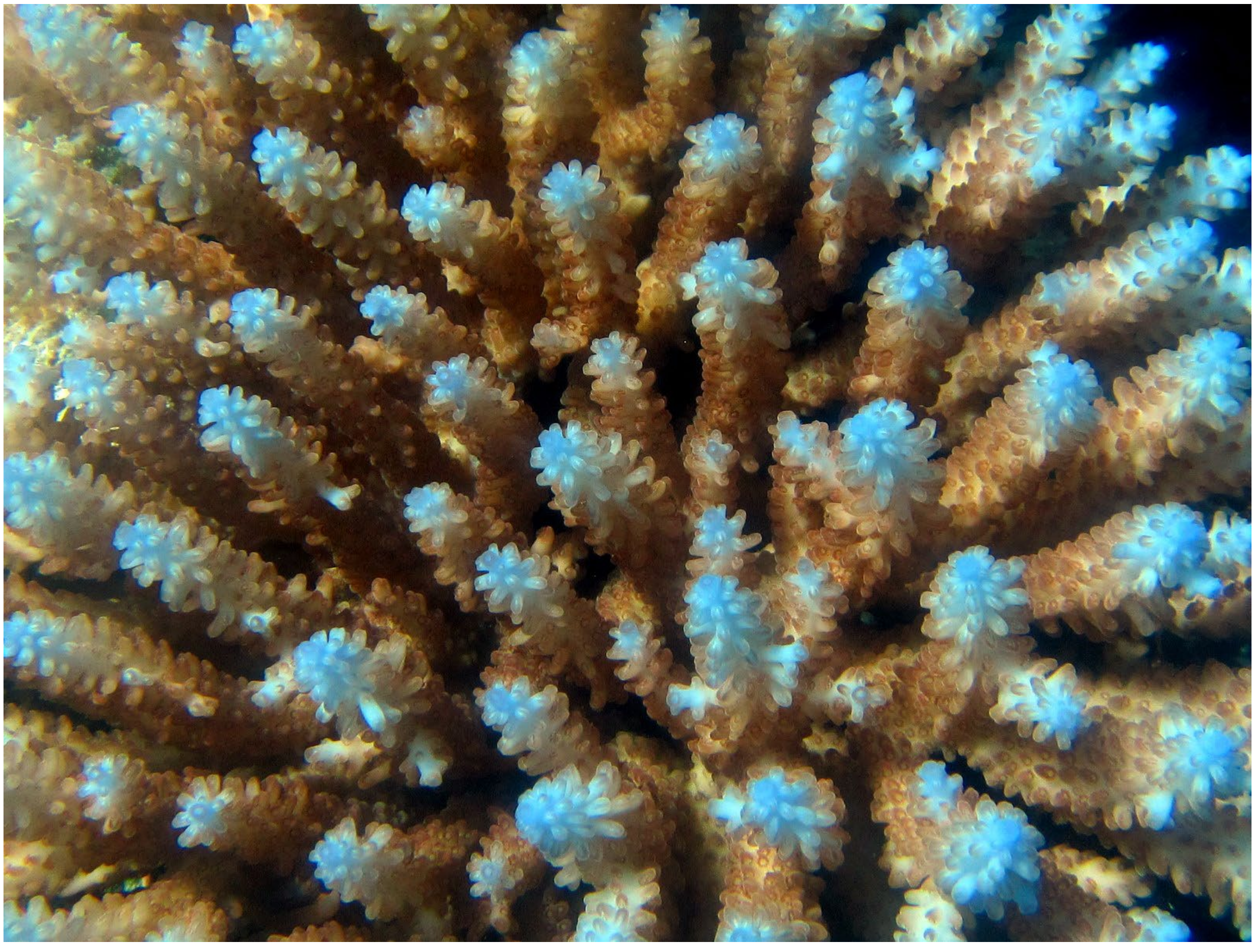


A close-up photo of *Acropora nasuta*.

Acropora cerealis *"corymbose"*

Colonies are corymbose, with vertical, parallel branchlets. Axial corallites are small and radial corallites are tubular with upward facing openings. The branches are thinner than on *Acropora nasuta* so that the radial corallites are a larger proportion of the whole branch diameter. The branches are thicker and radial corallits are longer on *Acropora polystoma*.

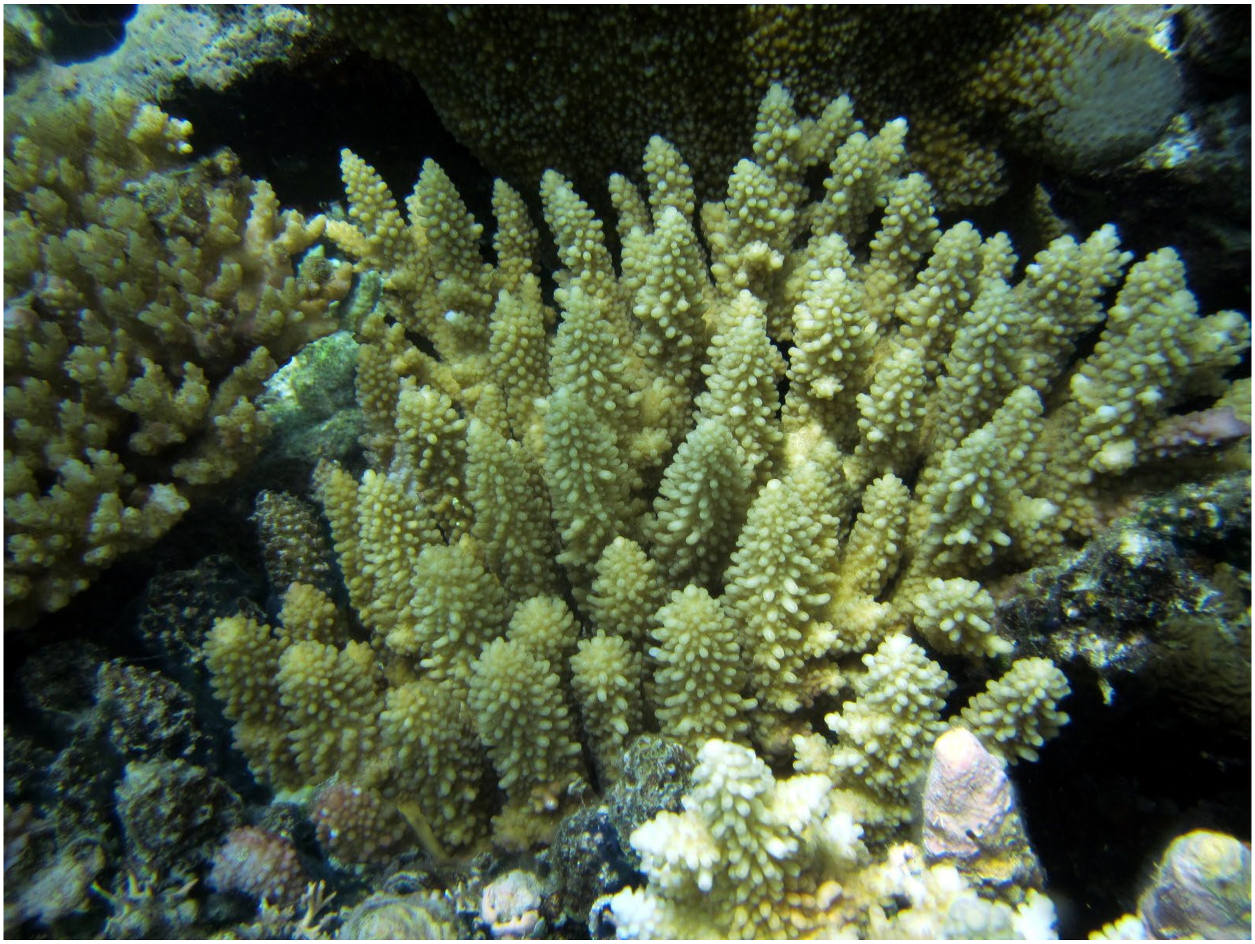
A colony of *Acropora cerealis*.



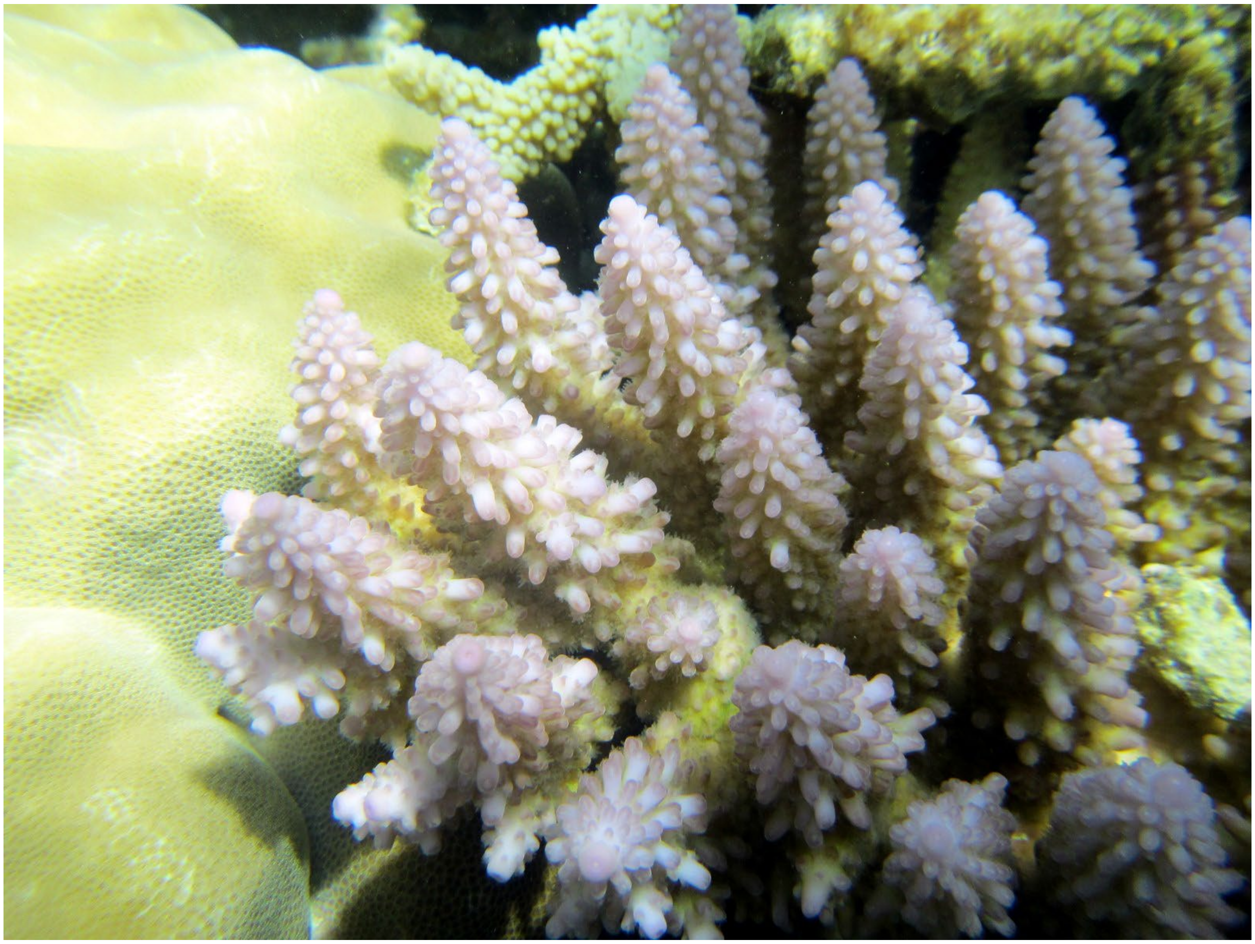
A close-up photo of *Acropora cerealis*.

Acropora polystoma

Colonies are digitate, and branches may be sturdy at the base and taper to the tip. Axial corallites are small. Radial corallites are tubular and fairly long, and openings point up towards the branch tip. Branches are thicker than most corymbos species and the radial corallites are longer.



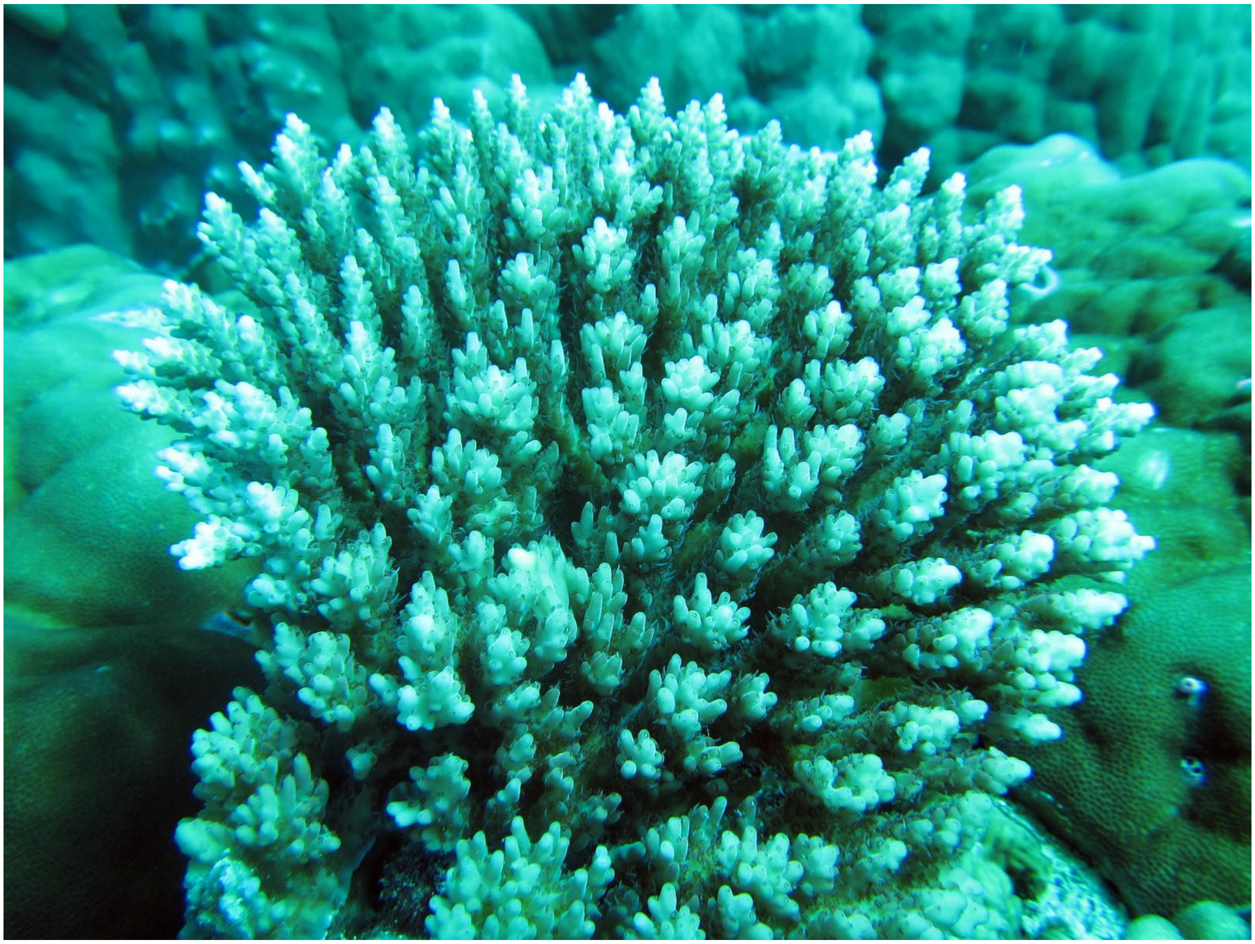
A colony of *Acropora polystoma*.



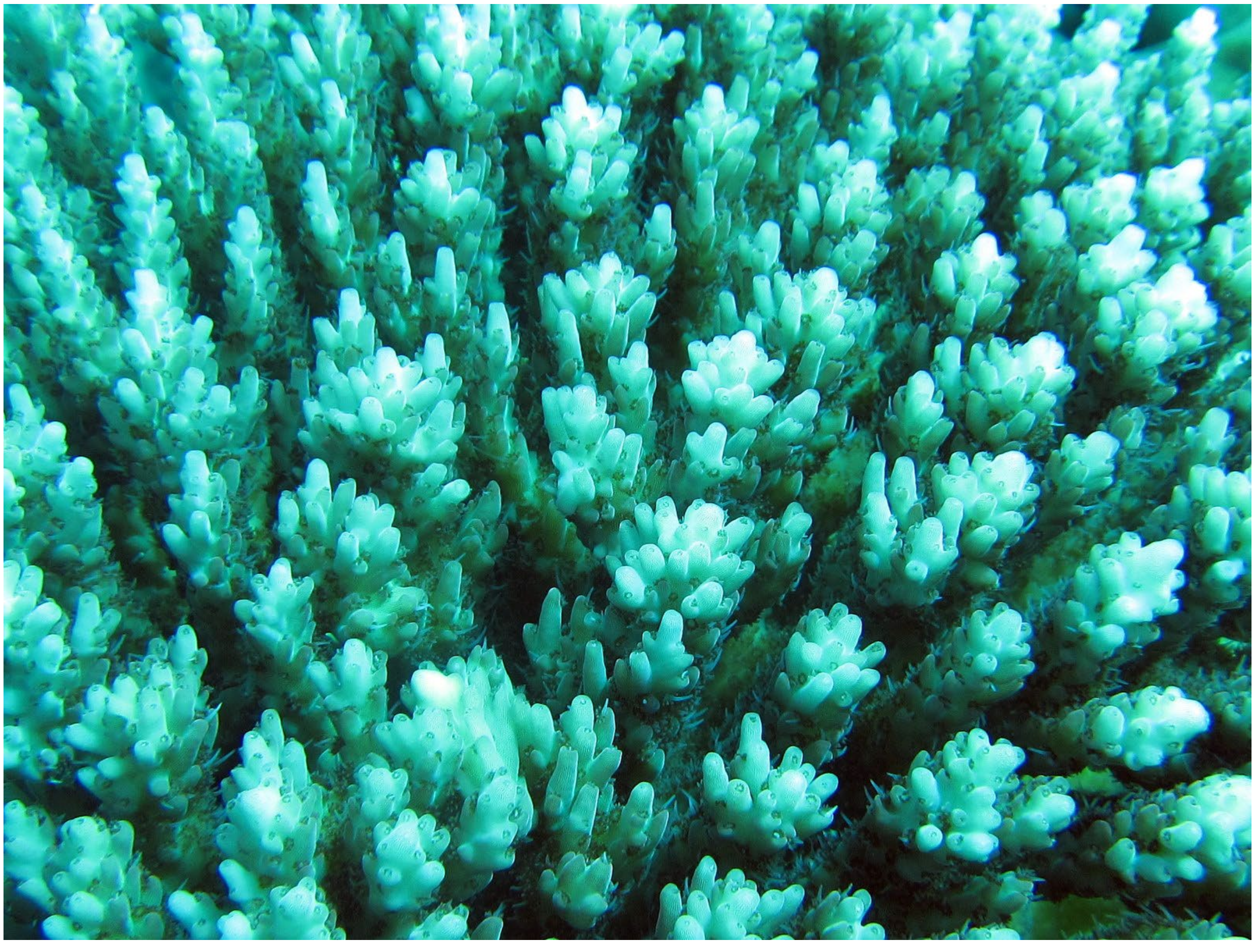
A close-up photo of *Acropora polystoma*.

Acropora anthocercis

Colonies are corymbose with parallel vertical branchlets. Axial corallites are long and tubular, and some branchlets have multiple axials or incipient axials. Branchlets are variable in diameter near the branch tip, some thicker than others. Radial corallites often have an upwardly extended narrow lower lip. Other corymbose species don't have as long axial corallites nor multiple axials, nor radials with upward inclined lower lips.



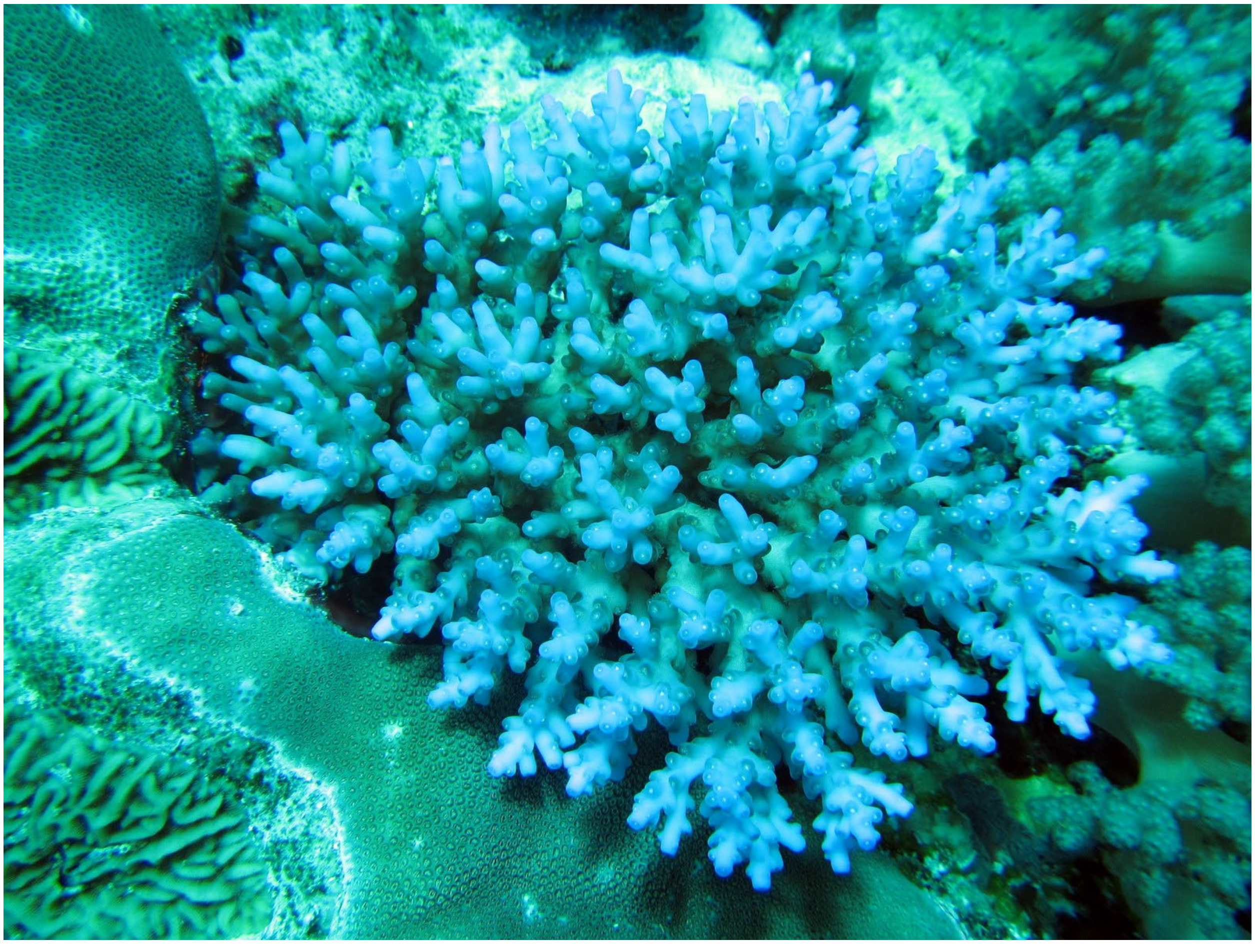
A colony of *Acropora anthocercis*.



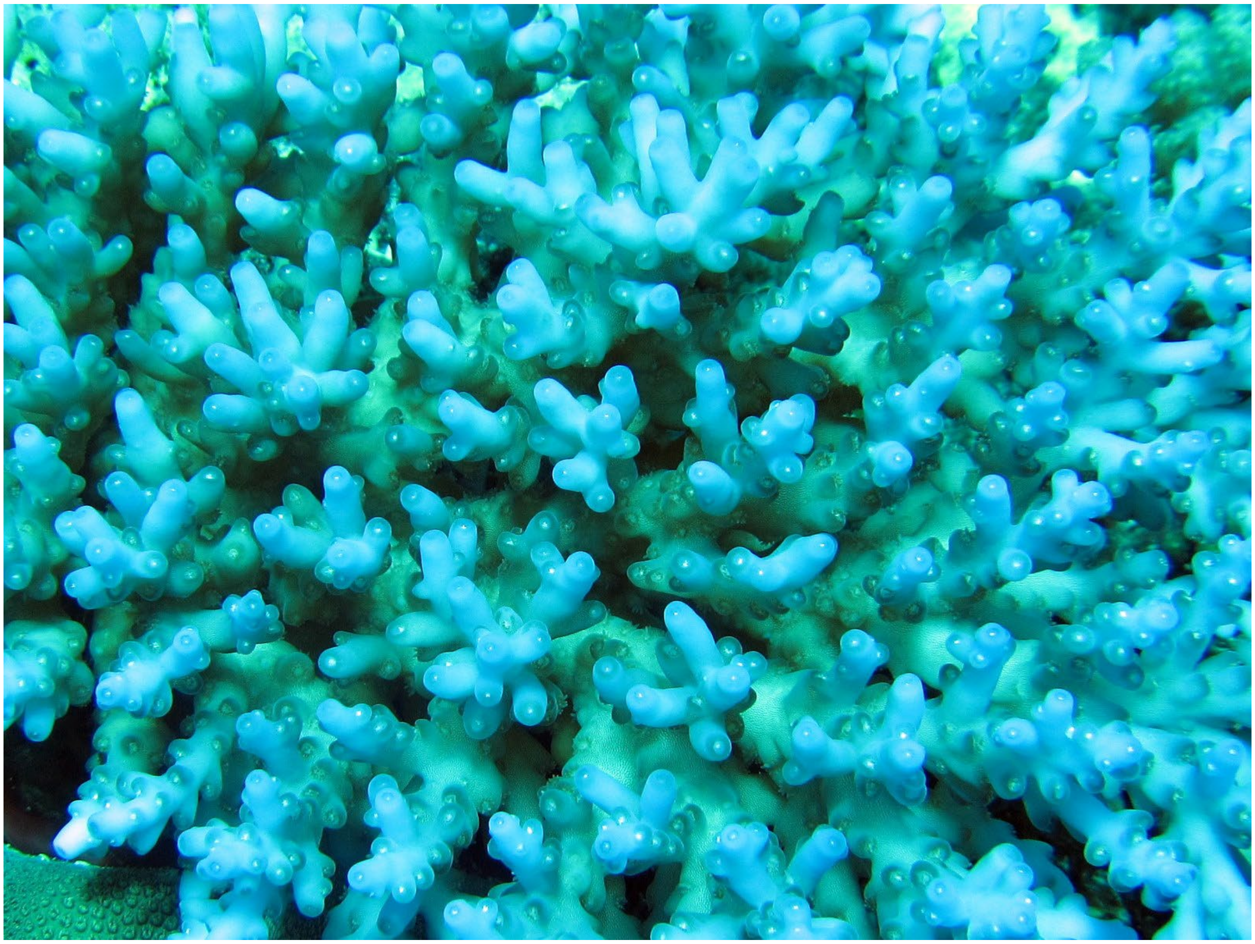
A close-up photo of *Acropora anthocercis*.

Acropora granulosa

Colonies are modest size with flat tops, and may be corymbose. Branchlets have long tubular axial corallites and incipient axial corallites that are smooth. There are few radial corallites, which are short and shelf-like and have space between them. Axial and incipient axial corallites are thicker than on *Acropora speciosa*.



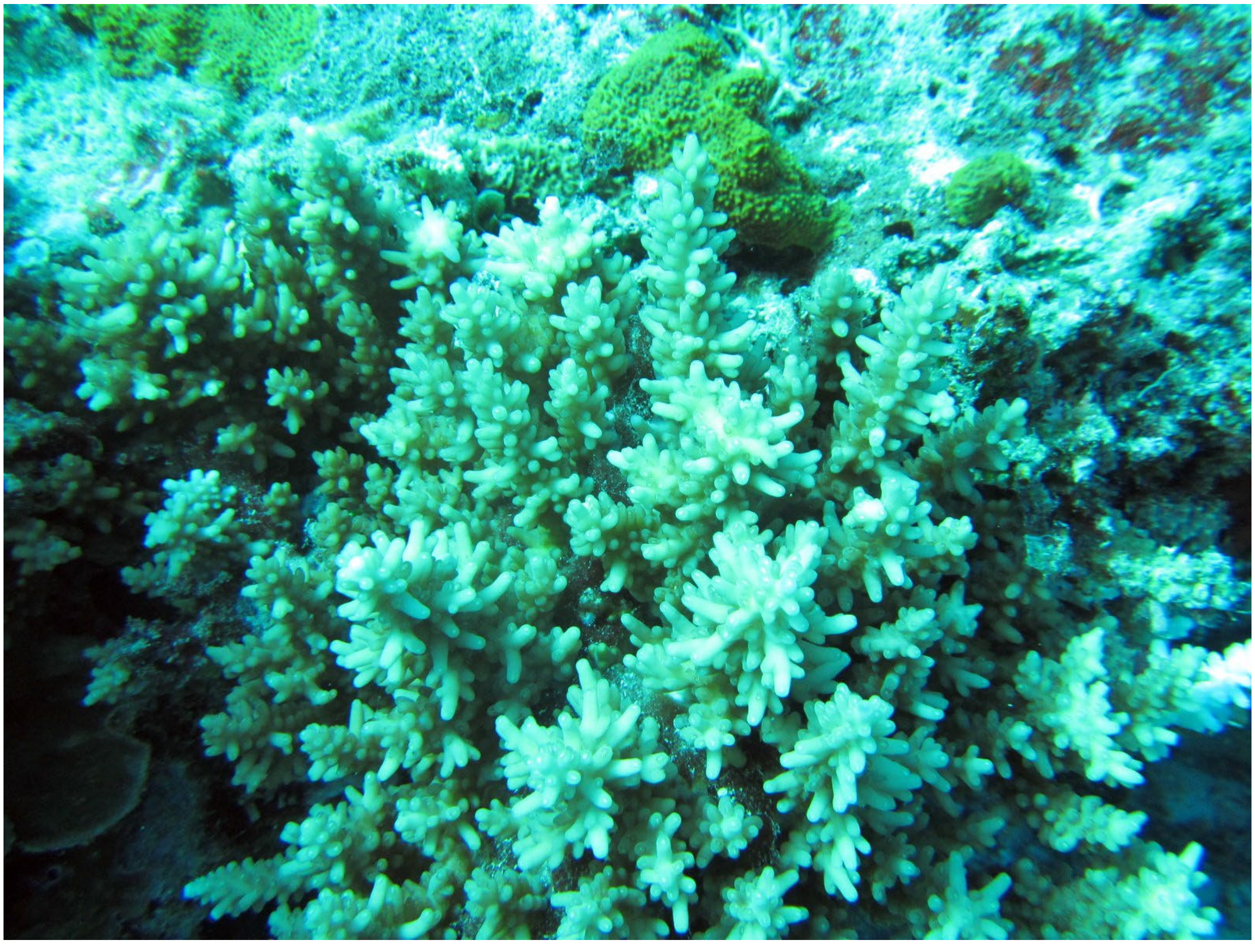
A colony of *Acropora granulosa*.



A close-up photo of *Acropora granulosa*.

Acropora carolineana

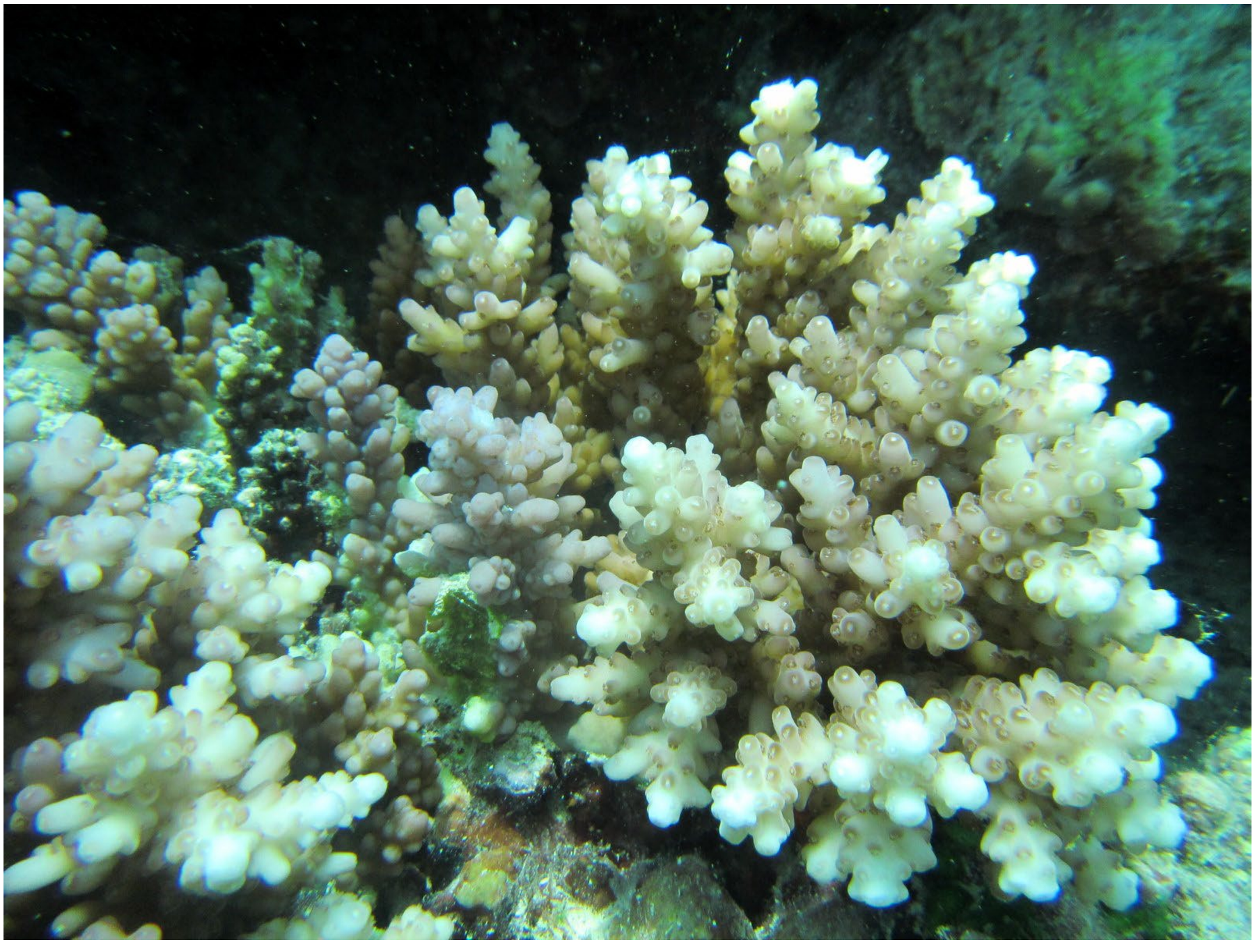
Colonies are modest-sized with flat tops. Axial and incipient axial corallites are tubular and smooth. Axial and incipient axial corallites taper and/or can have radiating incipient axials that make a formation in a shape like a Christmas tree. Colonies are like *Acropora granulosa* but have tapering corallites and/or Christmas tree formations.



A colony of *Acropora carolineana* with Christmas-tree like formations.

Acropora rosaria

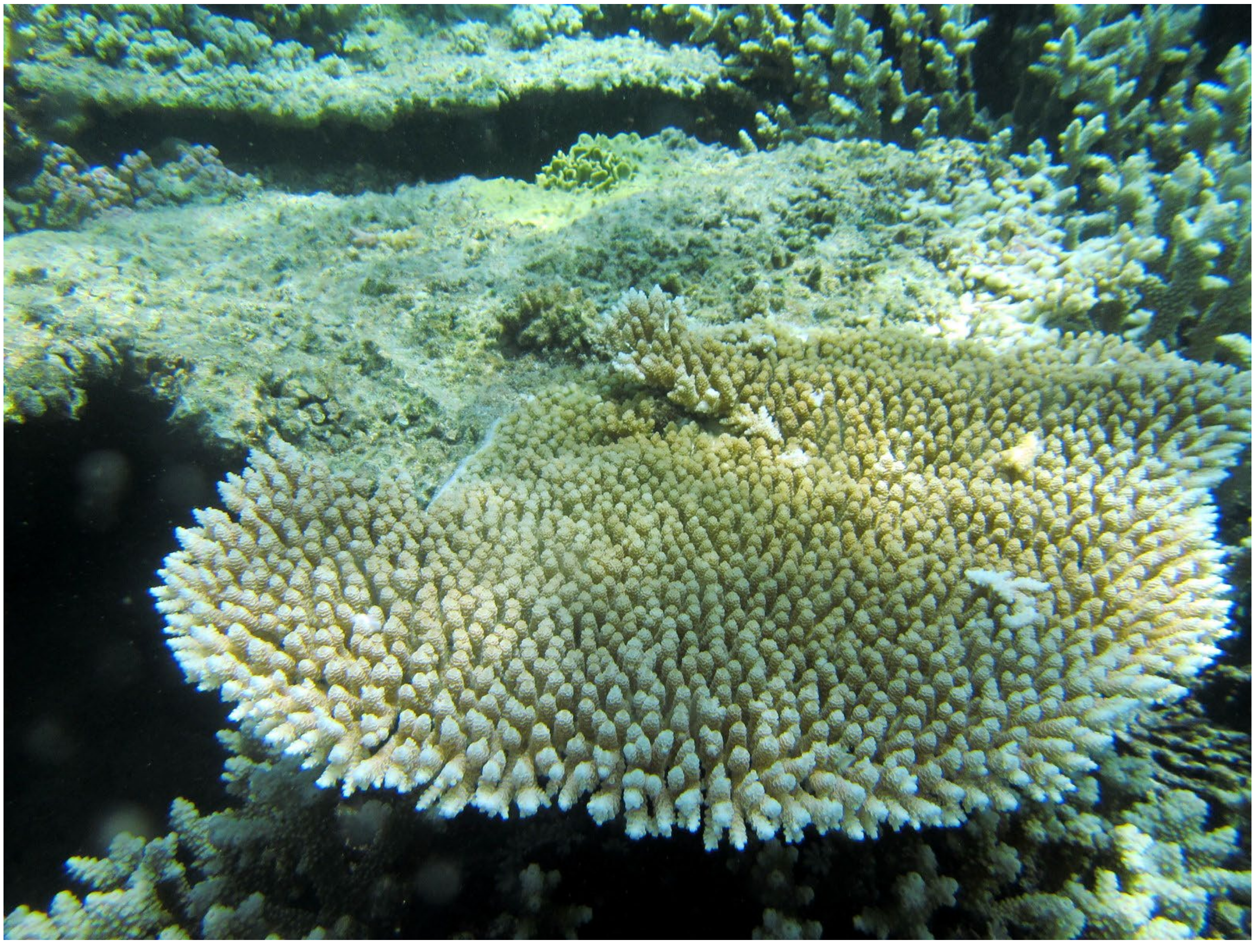
Colonies are often bushy, but don't have to be. Axial corallites are tubular with thick walls and look bead-like. Usually bushy and not corymbose like *Acropora granulosa,* and corallites are shorter.



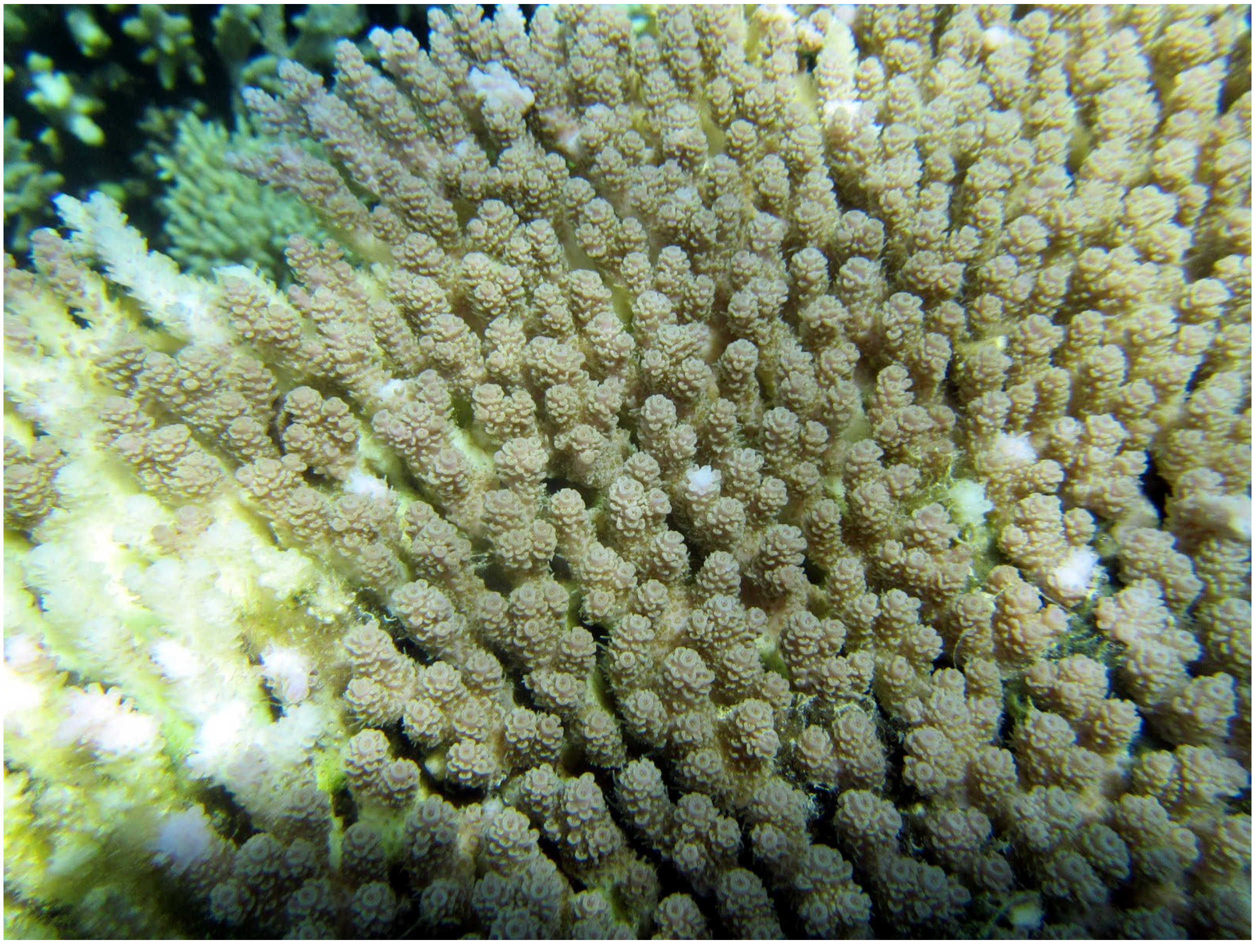
A colony of *Acropora rosaria*.

Acropora hyacinthus *"table coral"*

Colonies are table corals, with a central stalk and a near flat table top that can reach large sizes. Fast growing. The upper surface has small vertical branchlets that are much thicker than on *Acropora cytherea.*



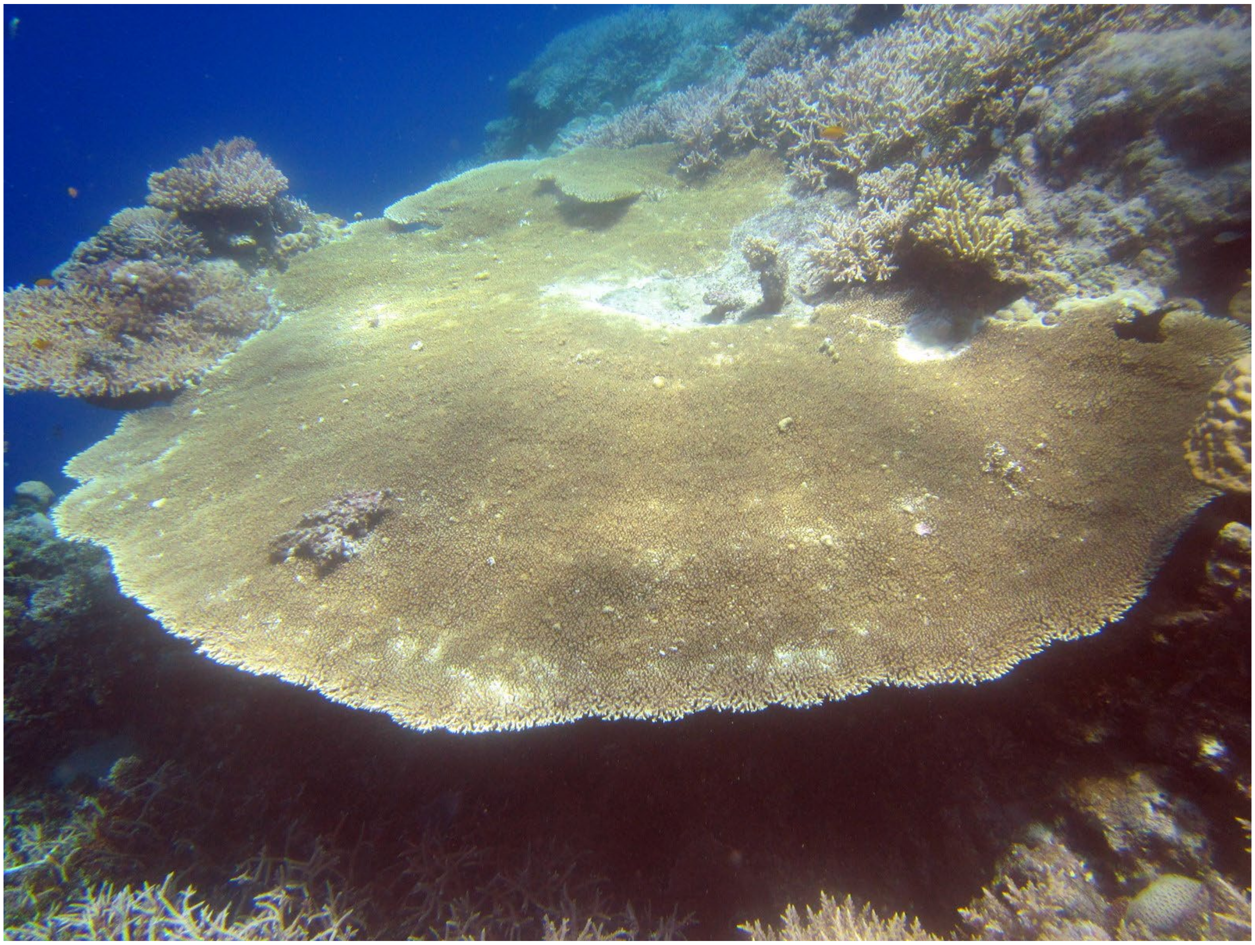
A colony of *Acropora hyacinthus*.



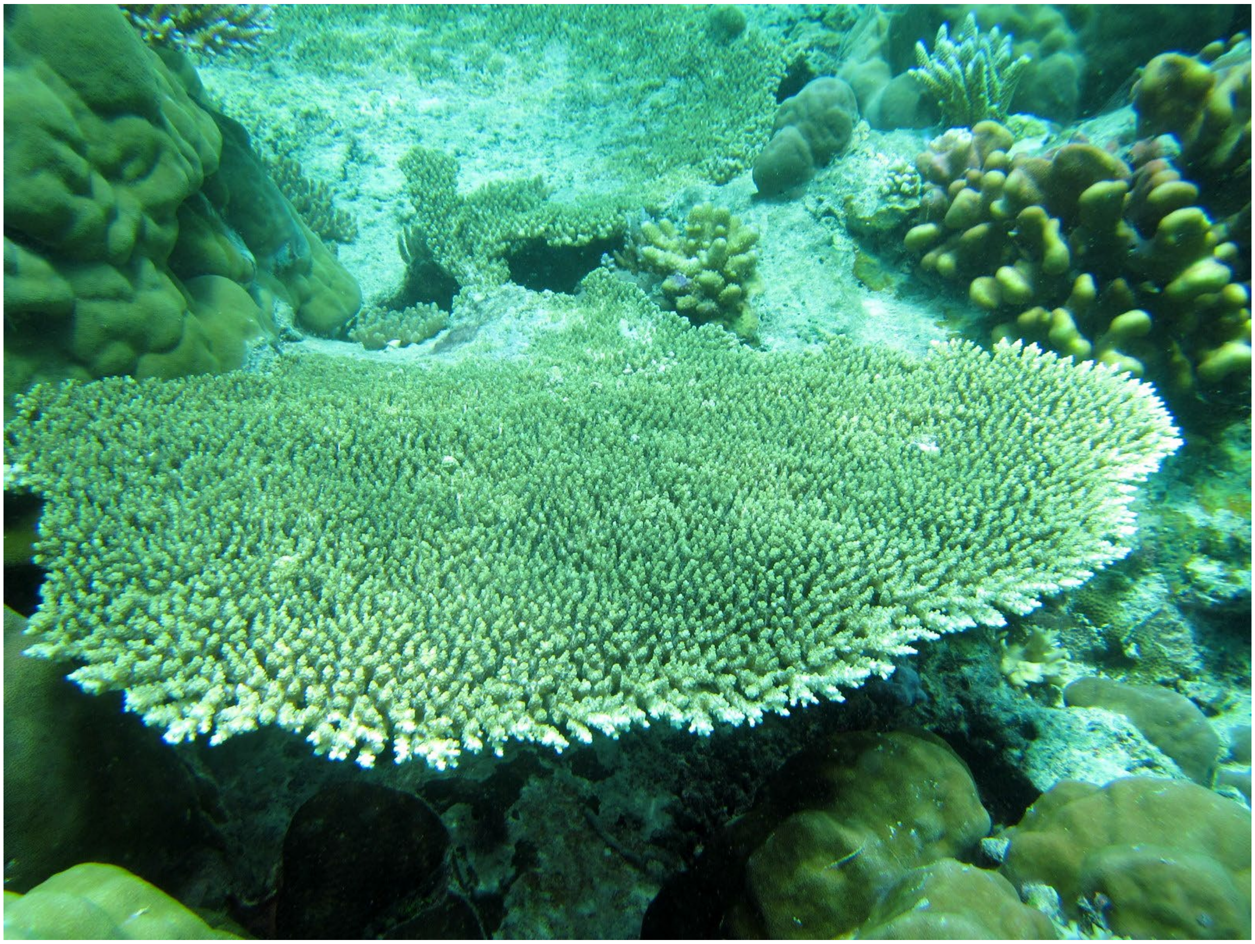
A close-up photo of *Acropora hyacinthus*.

Acropora cytherea *“table coral”*

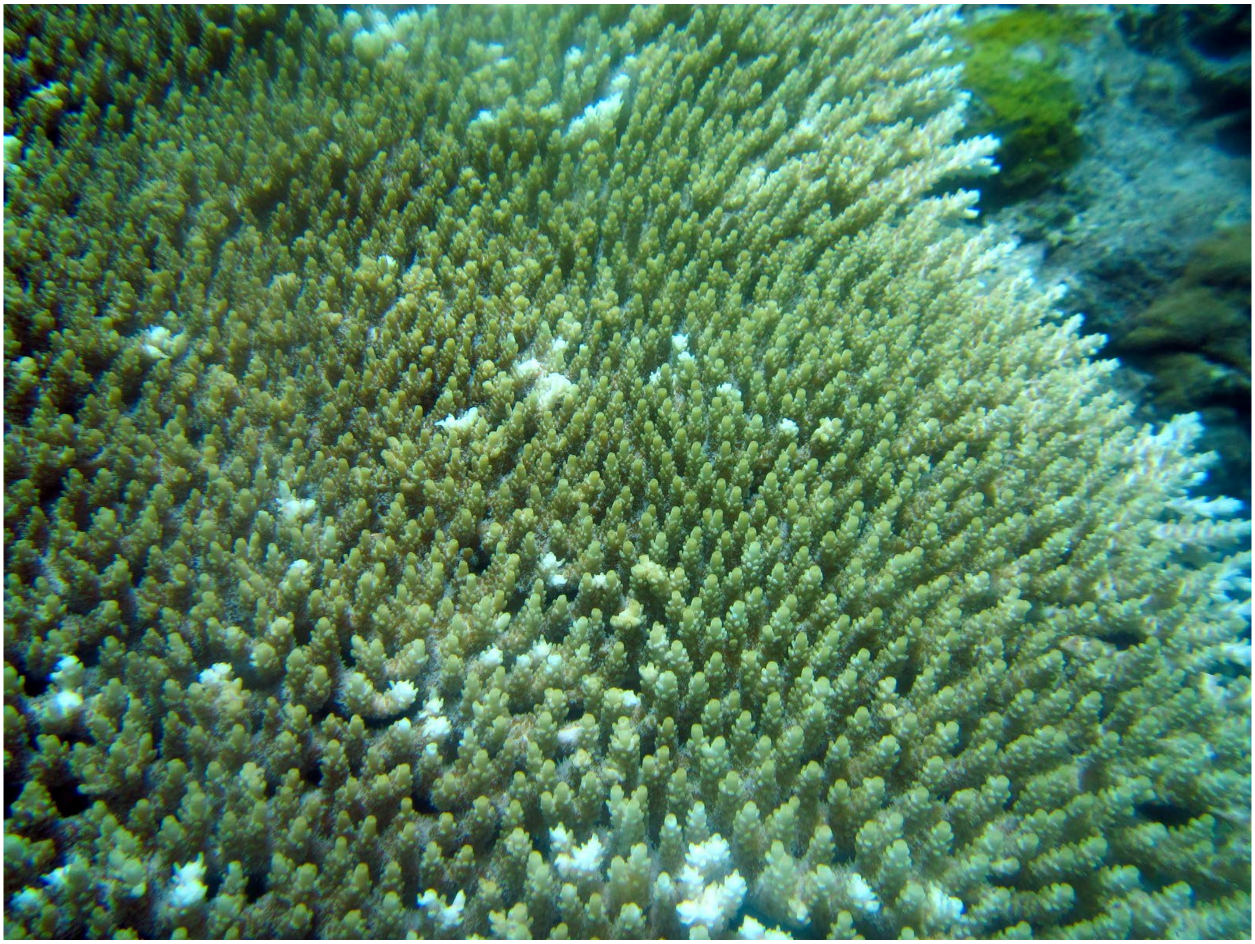
This species forms table corals. It has a central column that holds up a wide flat table top. The upper surface has small branchlets that are narrow, especially at their top. Branchlets are thinner than on *Acropora hyacinthus*.



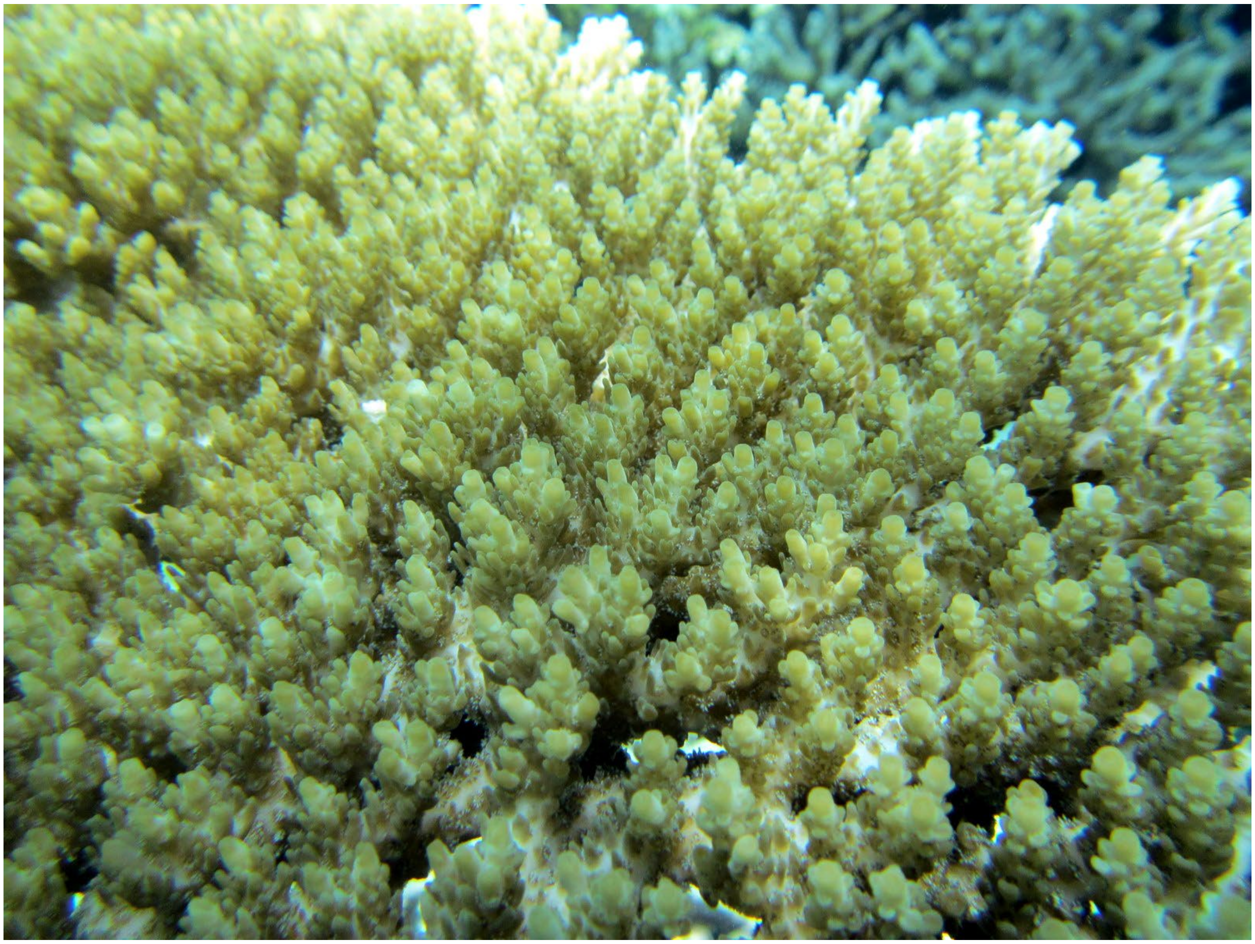
A colony of *Acropora cytherea*.



A colony of *Acropora cytherea*.



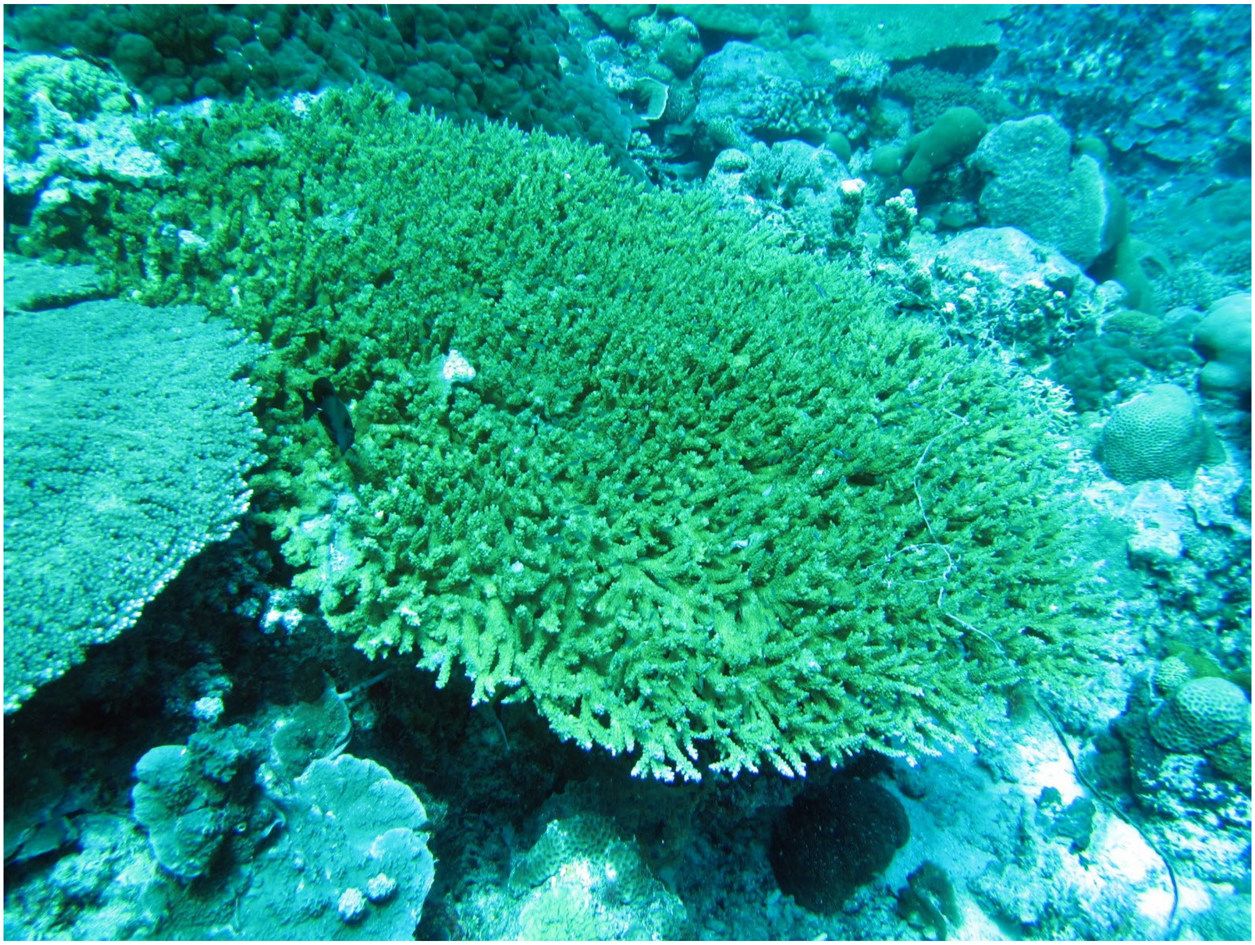
A closer photo of *Acropora cytherea*.



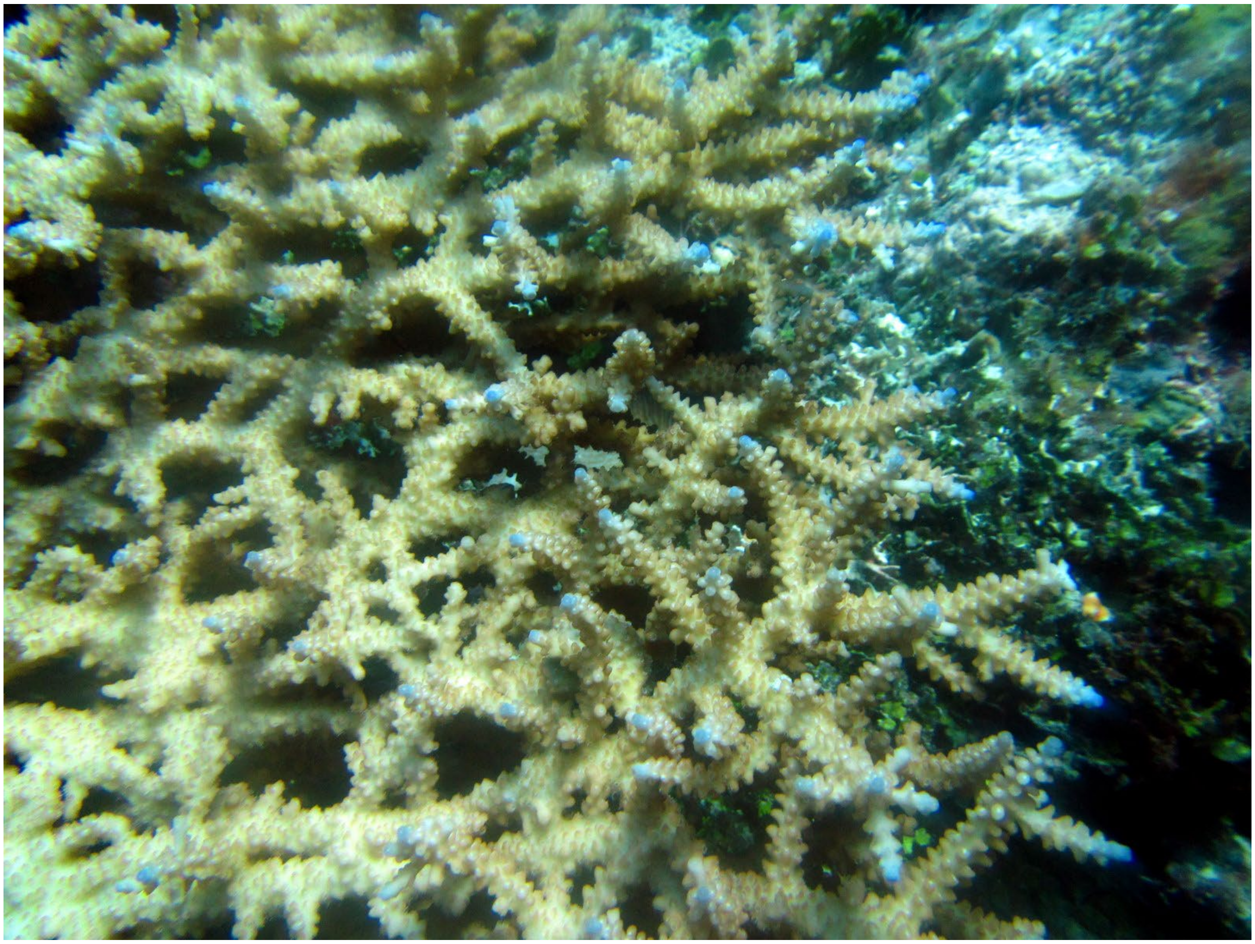
A close-up photo of *Acropora cytherea*.

Acropora solitaryensis

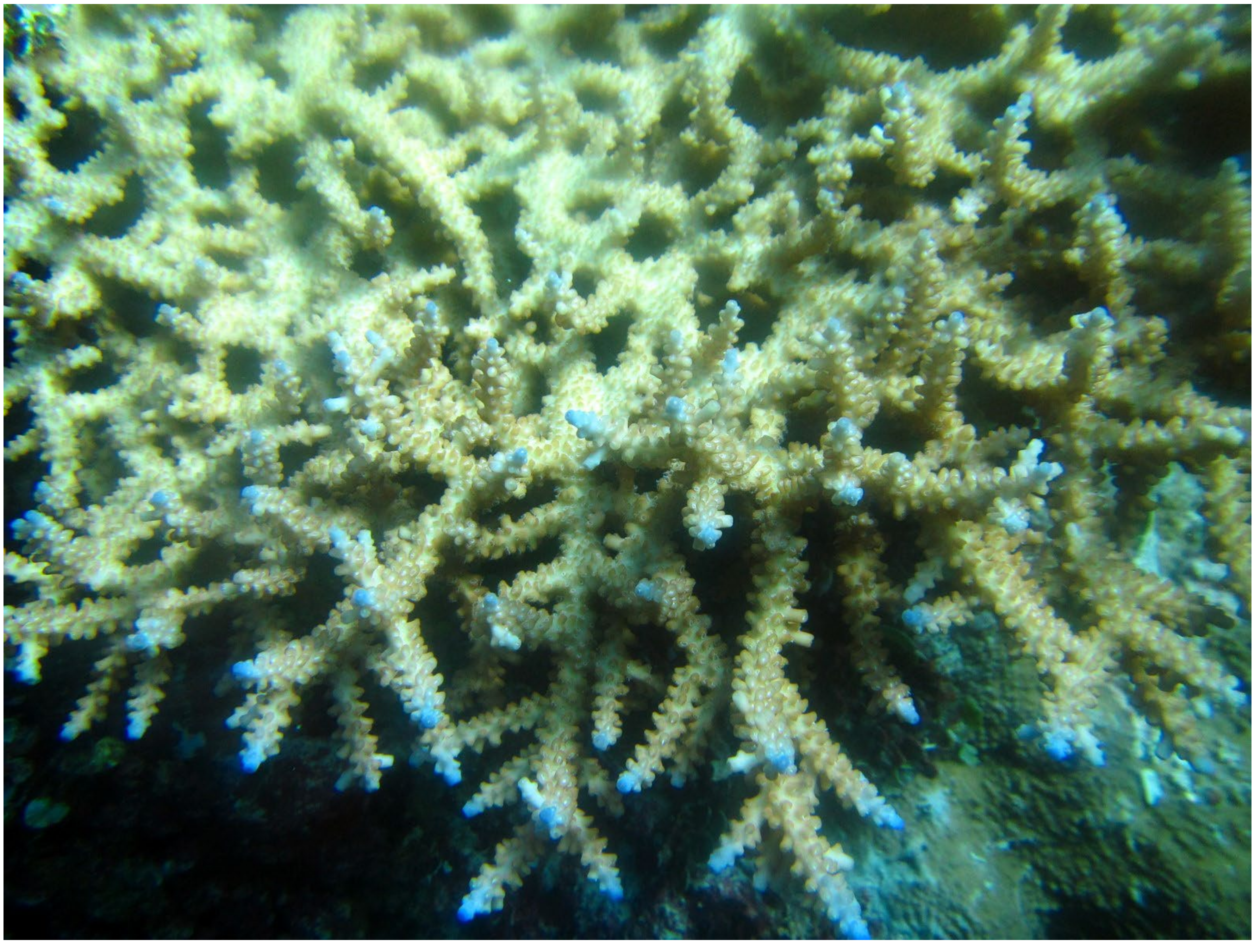
Colonies form table-like structures with loosely anastamosed horizontal branches and widely spaced branchlets growing upward. Branchlets on the upper surface can grow in a variety of directions. Branchlets are farther apart than on *Acropora hyacinthus* and *Acropora cytherea*.



A colony of *Acropora solitaryensis*.



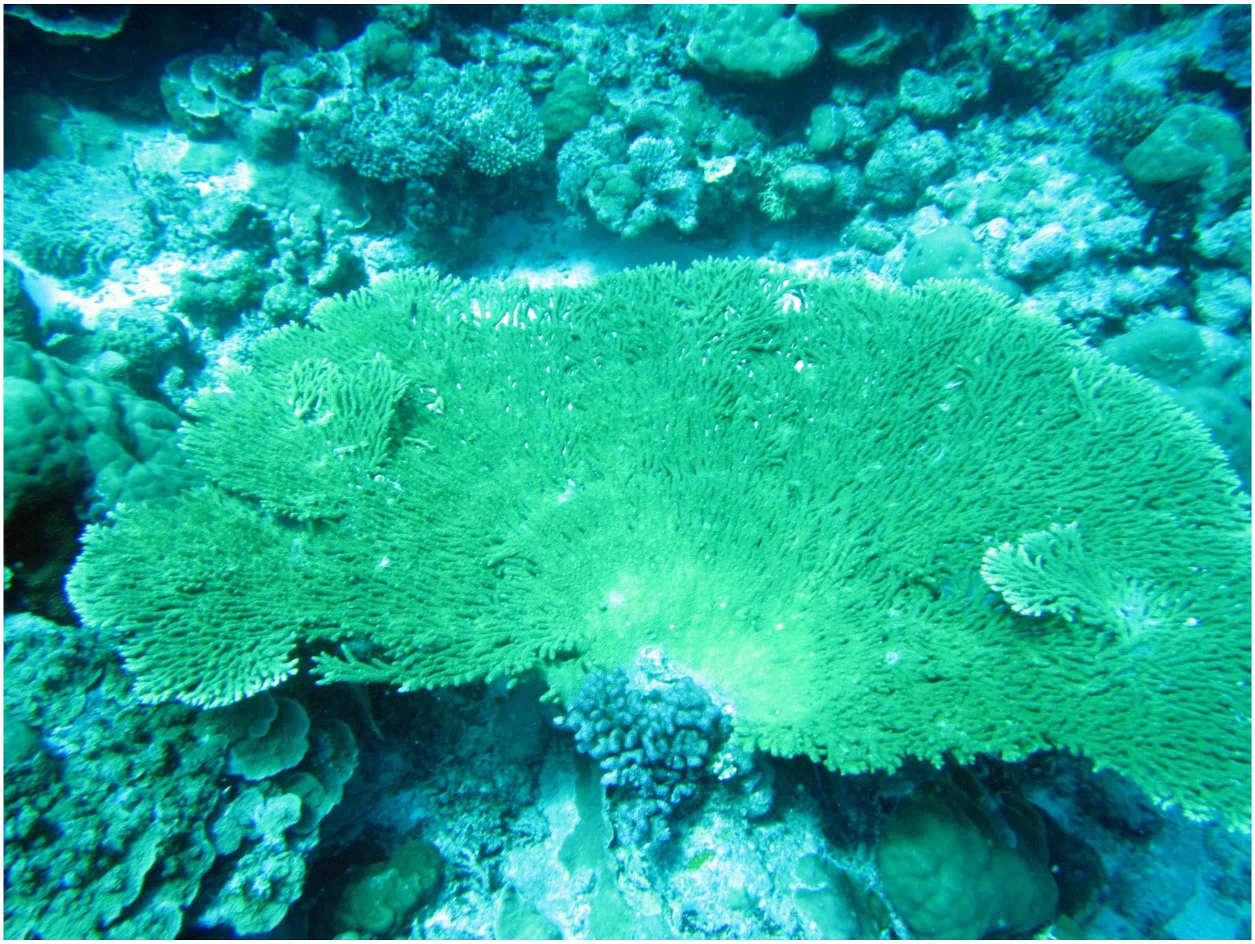
A closer photo of *Acropora solitaryensis*.



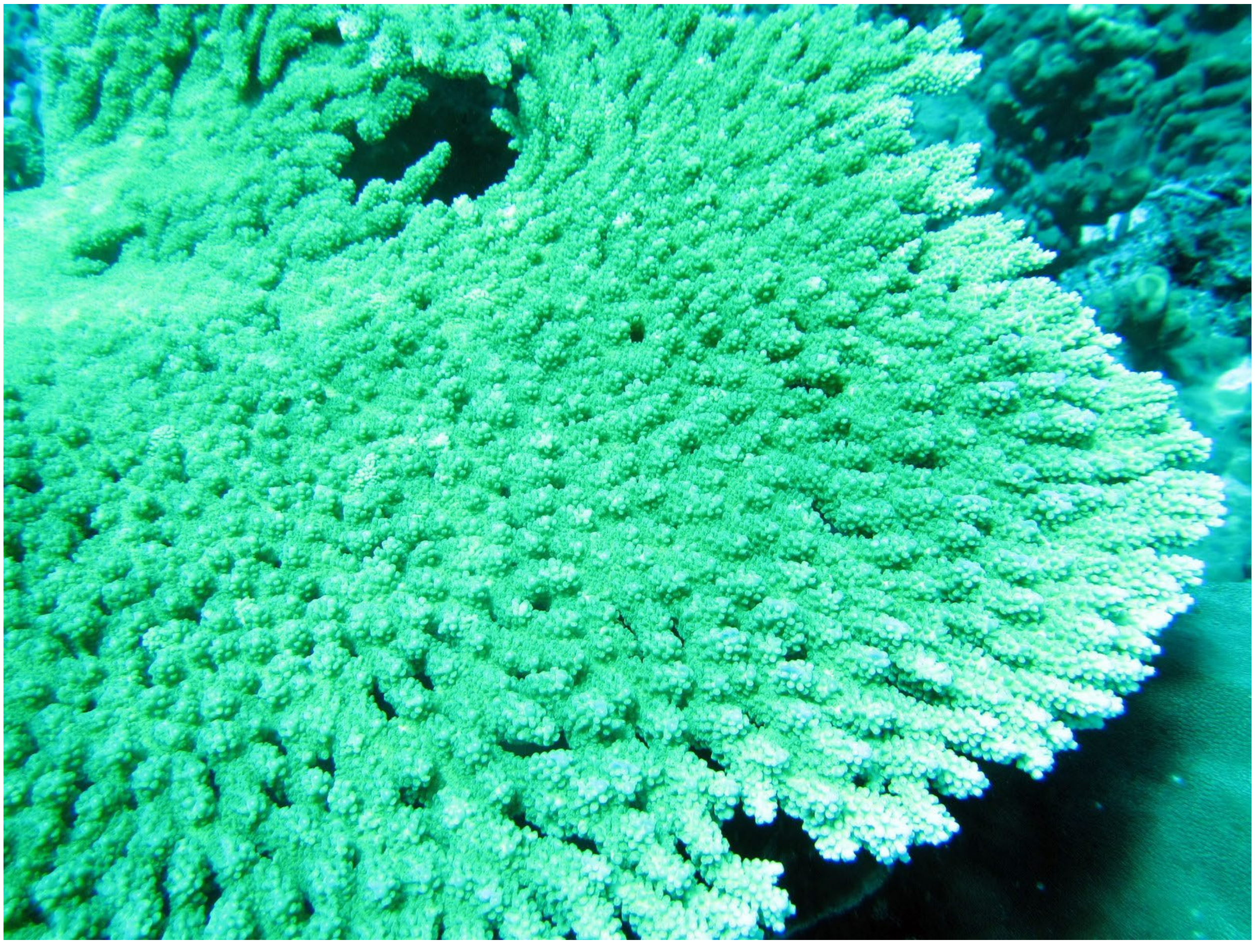
A close photo of *Acropora solitaryensis*.

Acropora clathrata *"table coral"*

Colonies form tables with a central column holding up a large horizontal table top. The table top is made up of uniform sized horizontal branches that are anything from completely fused into a solid structure to having many spaces between anastomosing radiating branches. Branch tips are slightly elevated above the plane of the plate and point outwards. This and *Acropora plumsoa* are the only table that don't have vertical branchlets.



An *Acropora clathrata* colony.

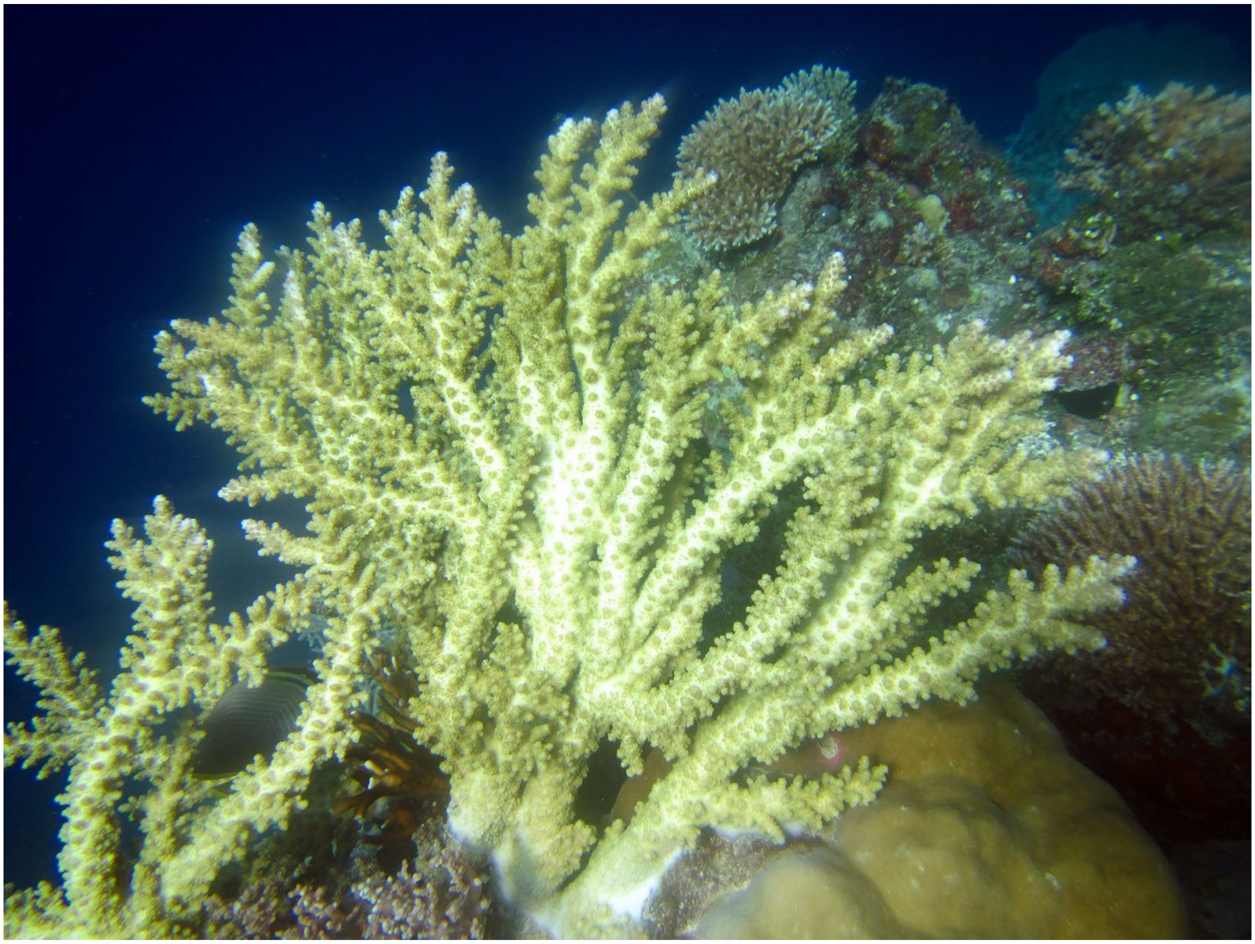


A close photo of a colony of *Acropora clathrata* which has a nearly completely fused table top.

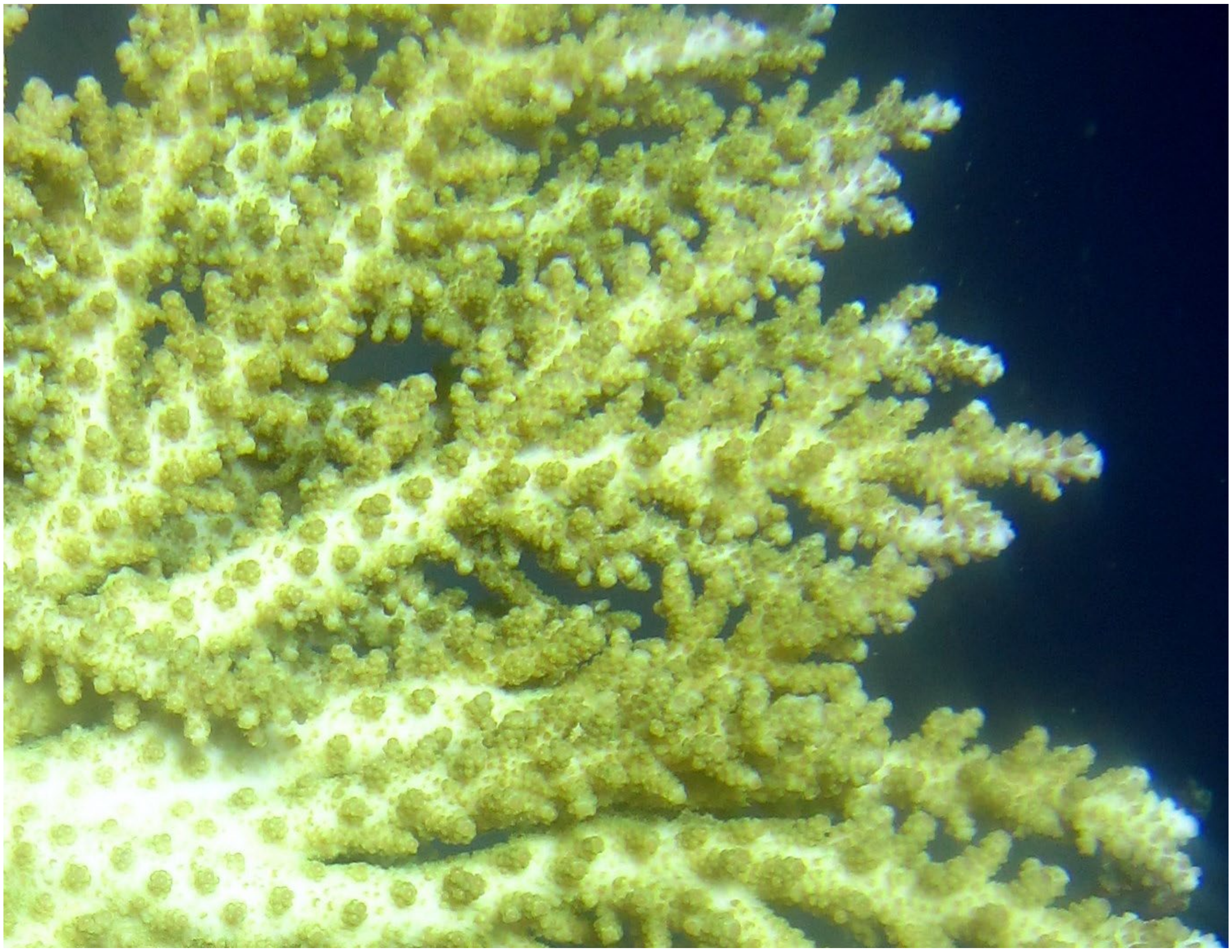
A close-up photo of an *Acropora clathrata* colony with spaces between anastomosing branches.

Acropora florida

Colonies are branching. Colonies may either have cylindrical branches or flattened branches. Branches have uniform short stubby thick branchlets with large axial corallites and radials that have projecting lower lips. *Acropora sarmentosa* is corymbose but has similar branchlets (which are longer).



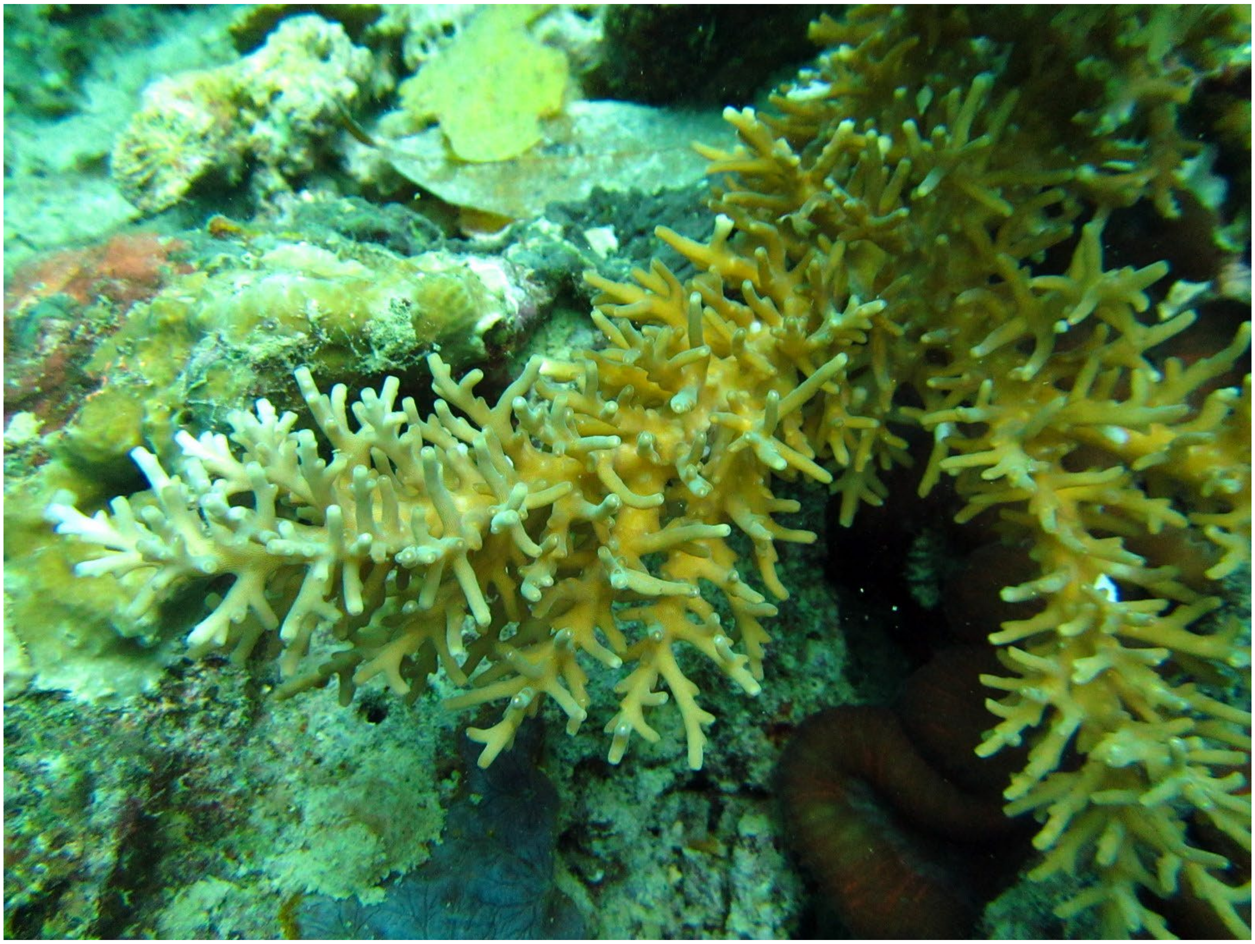
A photo of *Acropora florida* with cylindrical branches.



A closer photo of *Acropora florida*.

Acropora echinata *"hispidose" or "bottlebrush"*

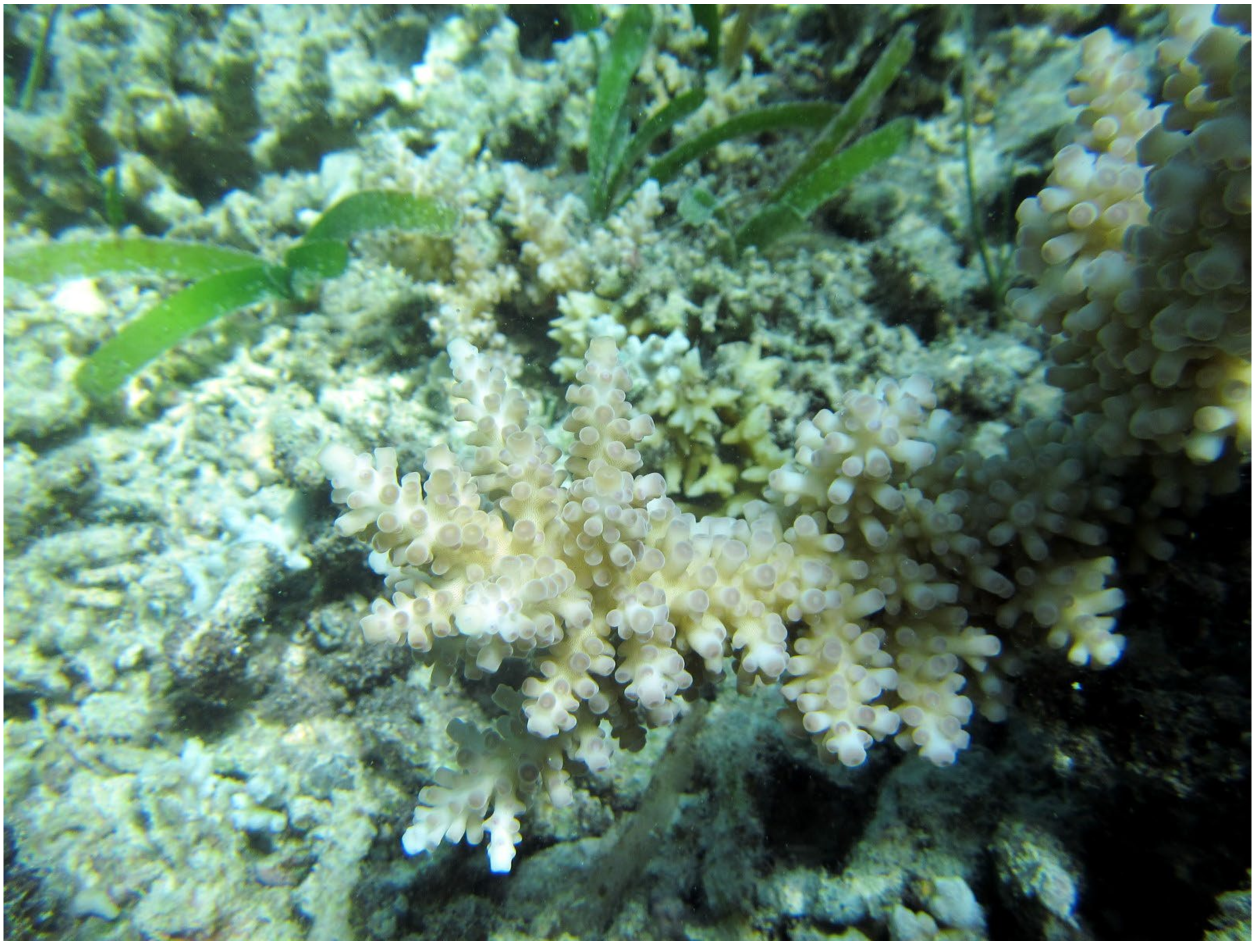
Colonies are branching with main branches which are surrounded by a uniform set of thin branchlets and/or elongated incipient axials. Colonies resemble a bottlebrush. Branchlets are much thinner than on *Acropora florida*. *Acropora longicyathus* has thicker corallites.



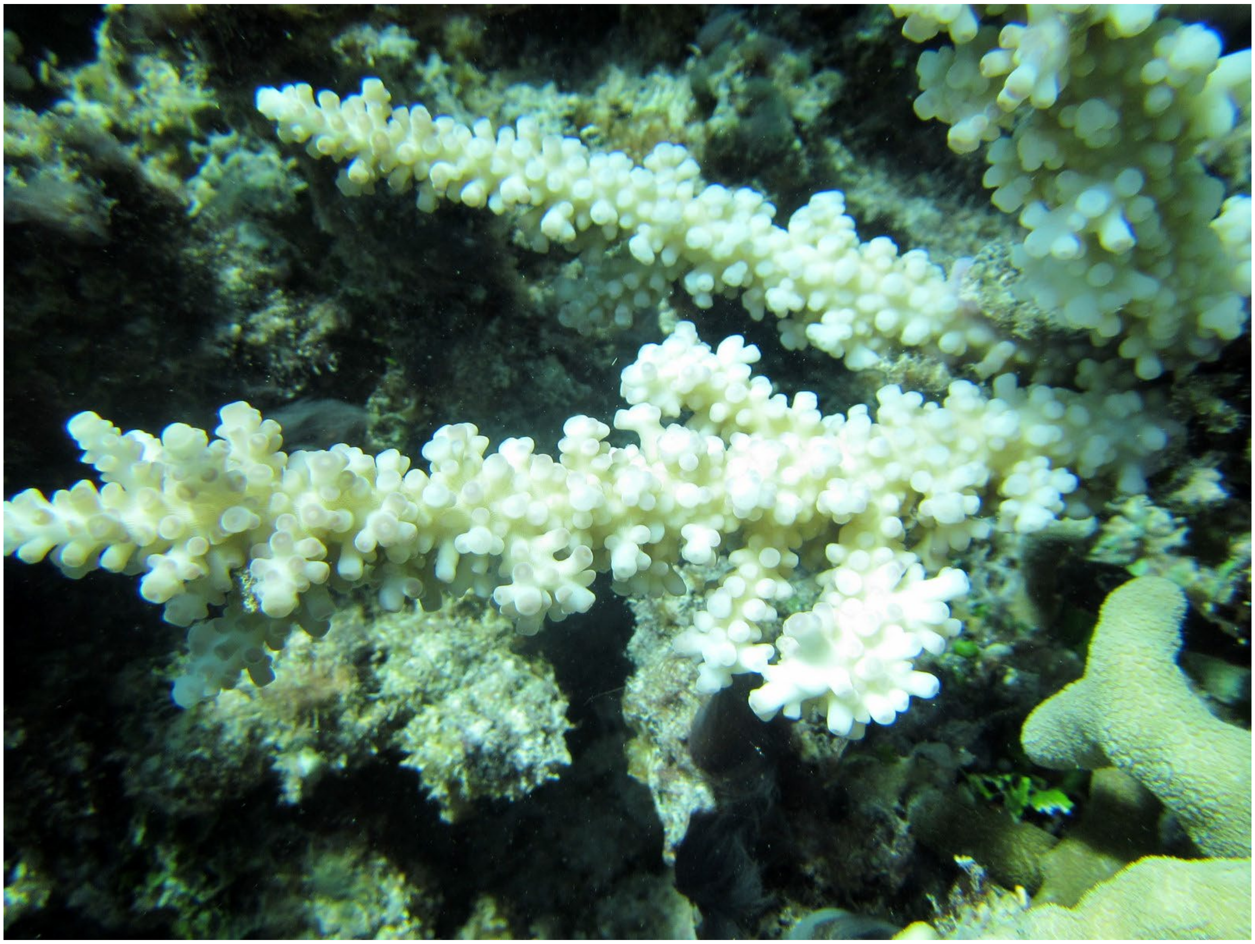
A colony of *Acropora echinata*.

Acropora sp. longicyathus-like *"Bottlebrush" or hispidose*

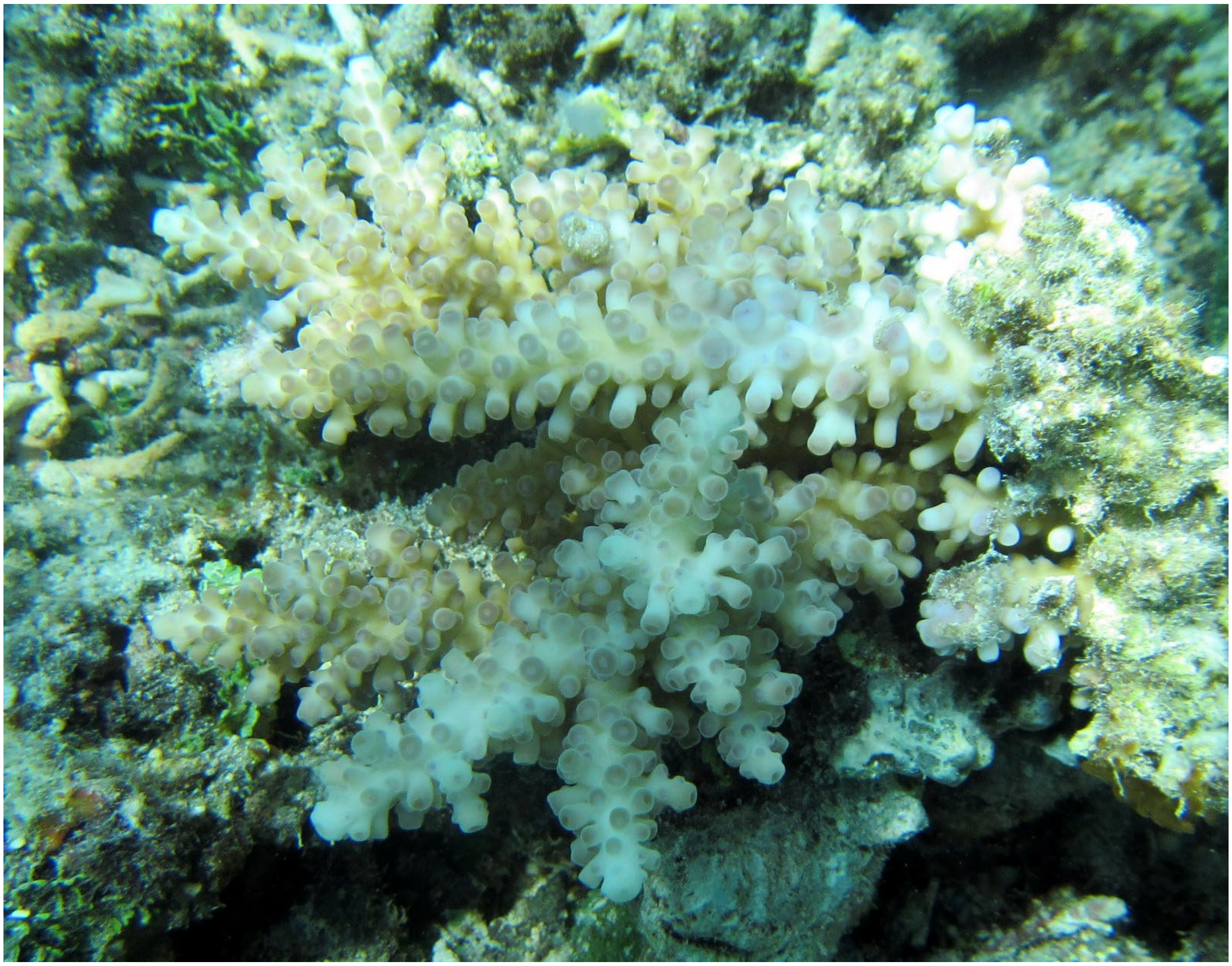
Colonies are branching and have long thick walled tubular radial corallites and incipient axials (with their own radials) extending from the branch sides. The corallites are thicker walled than on other hispidose species such as *Acropora echinata*. *Acropora gomezi* lacks incipient axials with their own radials.



A colony of *Acropora* sp. *longicyathus*-like.



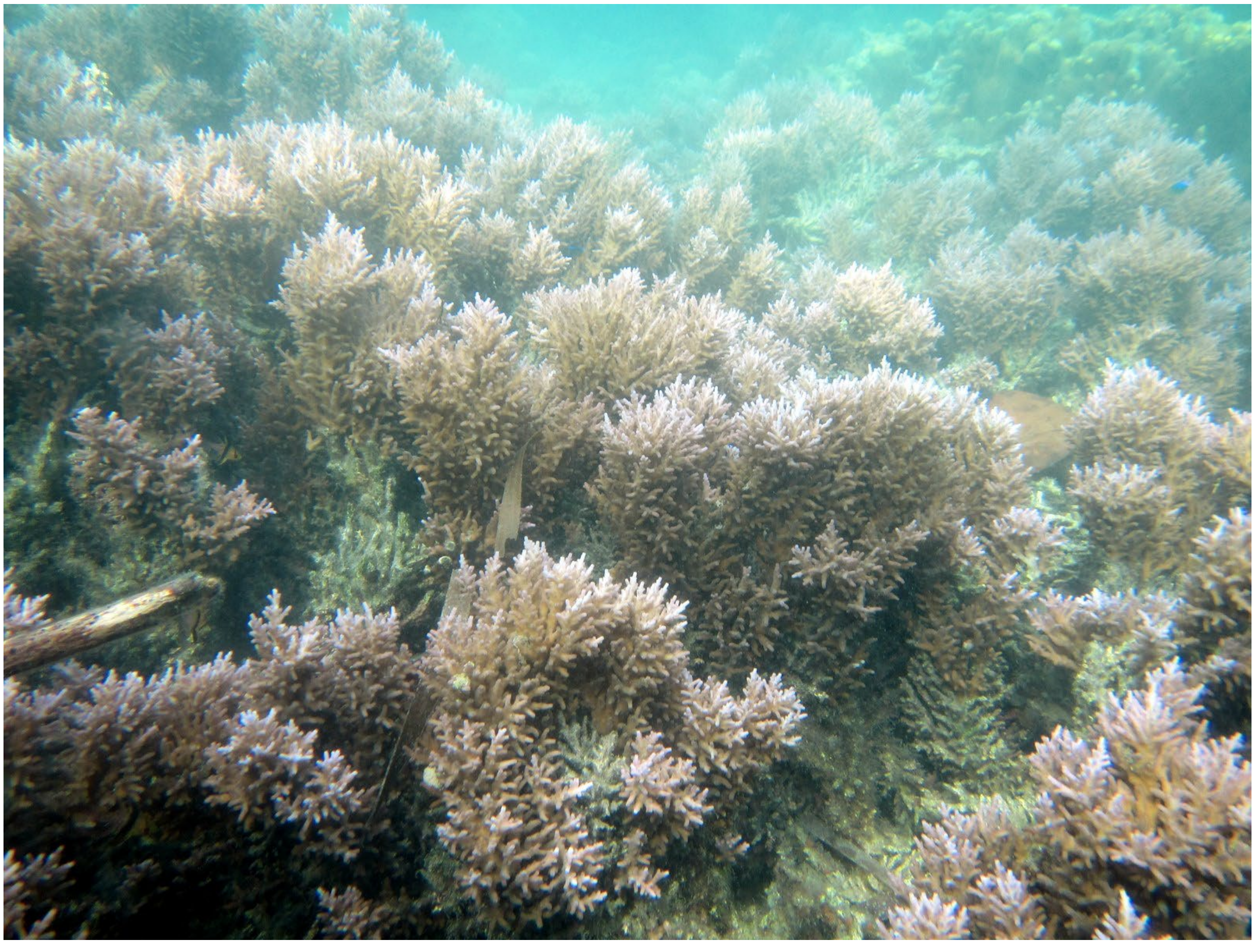
A colony of *Acropora* sp. *longicyathus*-like with incipient axials developing into branchlets.



A close photo of *Acropora* sp. *longicyathus*-like.

Acropora subglabra *"hispidose" or "bottlebrush"*

Colonies are bottlebrush, with many incipient axials radiating from the main branches, all about the same length. Colonies are bushy and can form thickets. Colonies are more bushy than *Acropora echinata* and *Acropora longicyathus*.

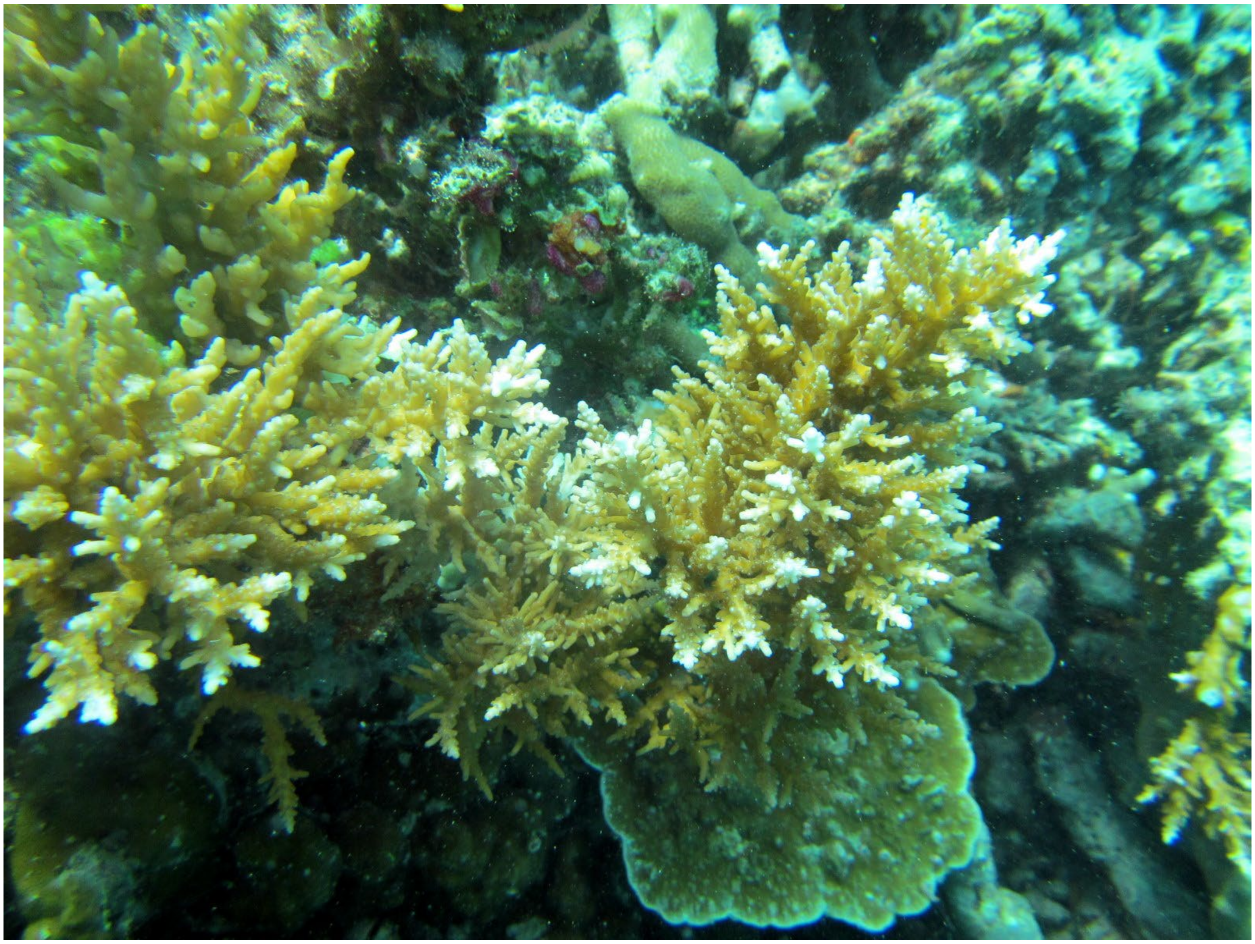


Colonies of *Acropora subglabra*.

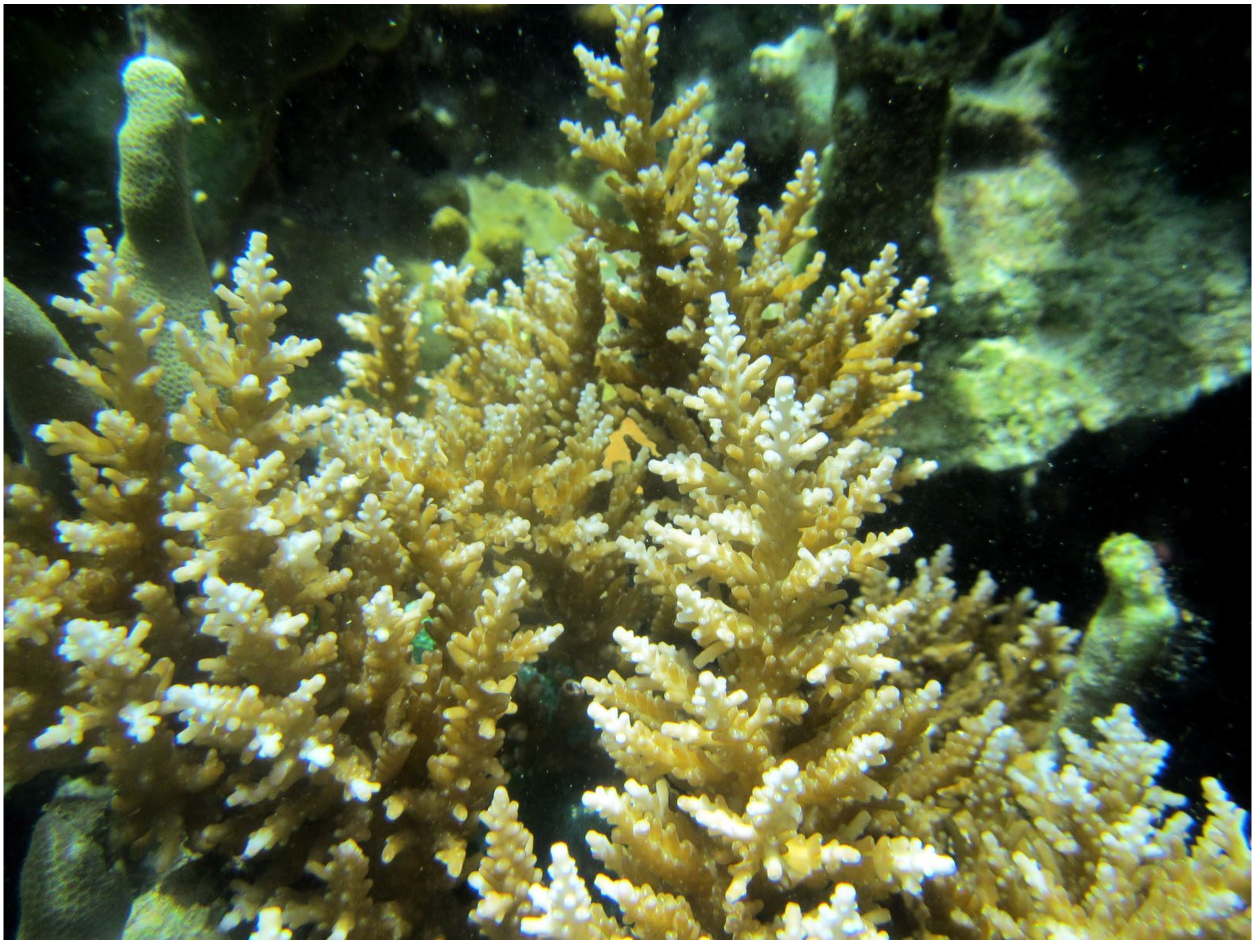
A close-up of *Acropora subglabra*.

Acropora elseyi

Colonies are bushy, and it can be viewed as bottlebrush-like due to many, uniform, thick branchlets on the sides of major branches. Radial corallites near branch tips are often uniform and short. Branchlets are thicker and have radial corallites on them unlike most other hispidose *Acropora*.



Colonies of *Acropora elseyi*.



A close-up photo of *Acropora elseyi*.

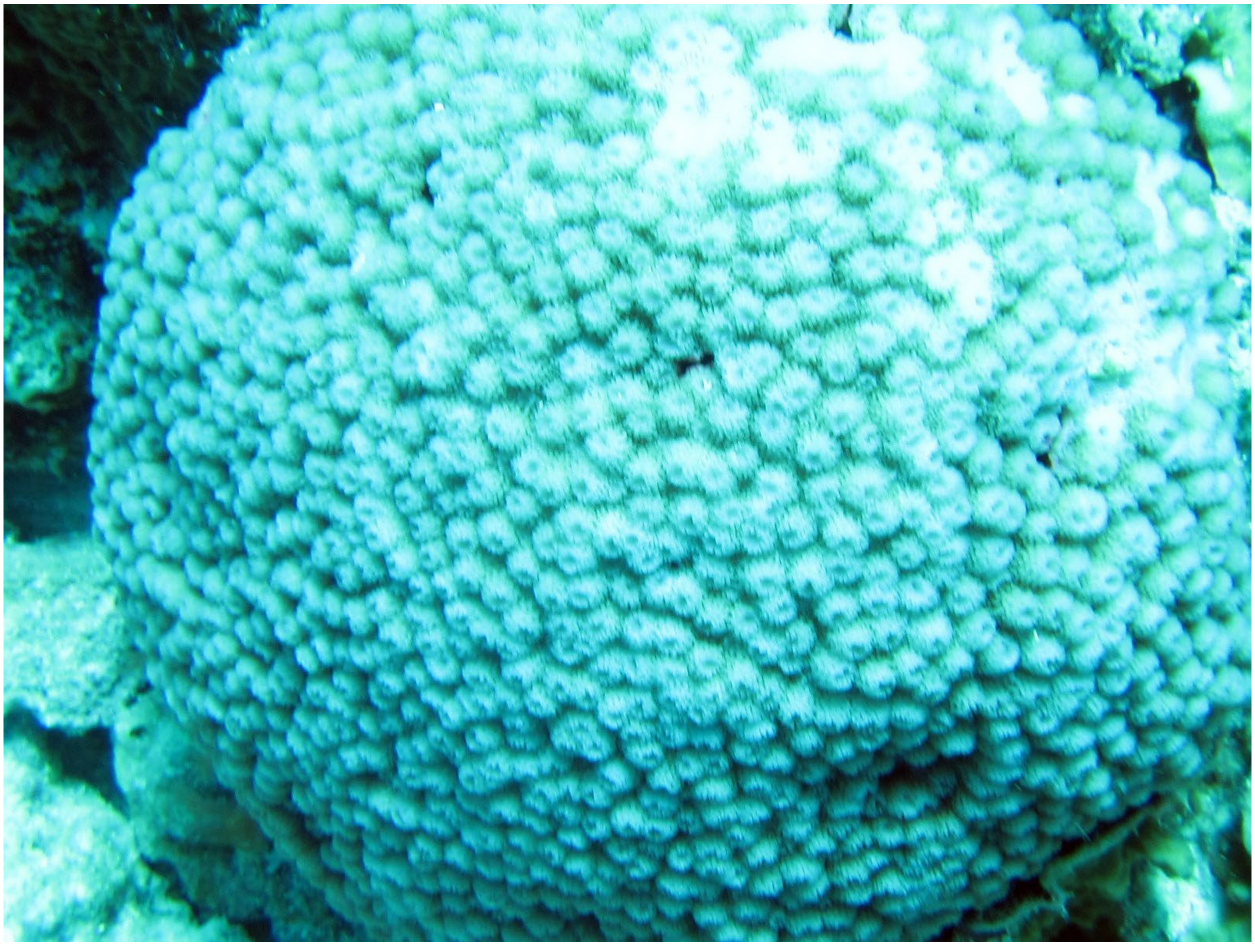
Astreopora

This genus mostly forms massive colonies, though in a few species colonies are encrusting, plates, or branching. The corallites are small and cone-shaped, with the outer part of the cone being larger than corallites in genera like *Acropora*. Surfaces are spiny and corallites are close together unlike on *Turbinaria*, and most species are massive instead of plating.

Astreopora myriophthalma

Colonies are massive. Corallites are cone shaped like little volcanoes. Surfaces of the corallites and in between corallites are spiny. The corallites in this species are uniform in size and point away from the surface at right angles to the surface.

A colony of *Astreopora myriophthalma*.



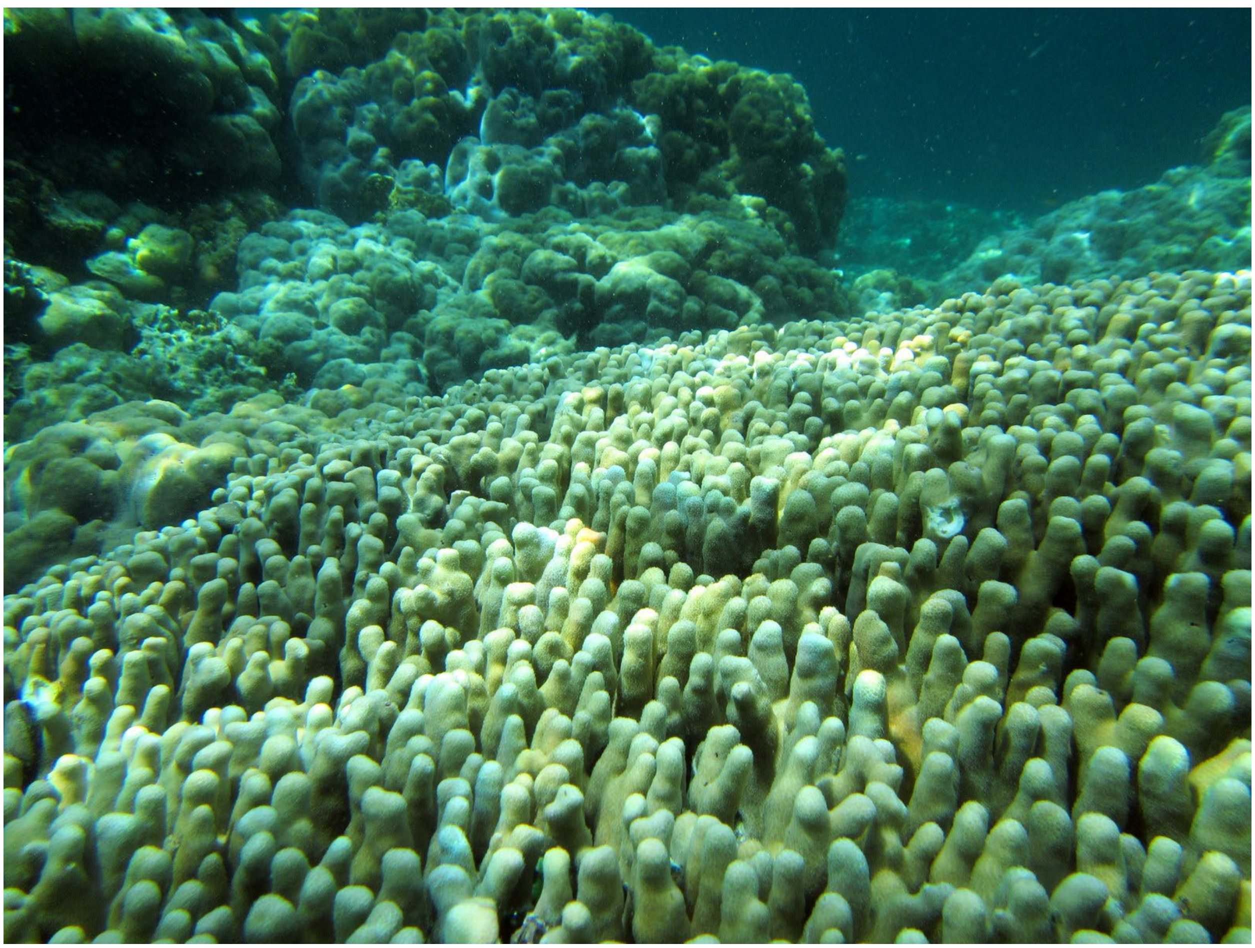
A close-up photo of *Astreopora myriophthalma*, showing the relatively uniform, volcano-shaped corallites.

Porites

This genus forms colonies that are massive, foliose (plates), branching, columns or encrusting. Corallites are tiny, about 1 mm diameter, and usually close together, but sometimes farther apart and may be separated by small lumps. Septa in the corallites are also used in the taxonomy, but are not normally visible under water. *Porites* is the third largest genus of corals with about 65 species currently recognized. Massive *Porites* species are the most difficult of all corals to identify. *Montipora* can sometimes look similar, but has corallites that are almost always not close together and often has spines or bumps between coralltes.

Porites cylindrica *"finger coral"*

This species forms branching colonies with smooth cylindrical branches with rounded tips. The corallites are flush with the branch surface. Tentacles may be extended as a tiny fuzz. If the tentacles are extended, touching the surface will cause the tentacles to retract and the surface can be seen to be smooth. Branches taper a little. Branches may be close together or diverging, uniform or irregular. Usually light grey, light brown, or yellow-green. Colonies are near identical but corallites are slightly recessed on *Porites attenuata*. *Porites nigrescens* has smaller branches with more recessed corallites .



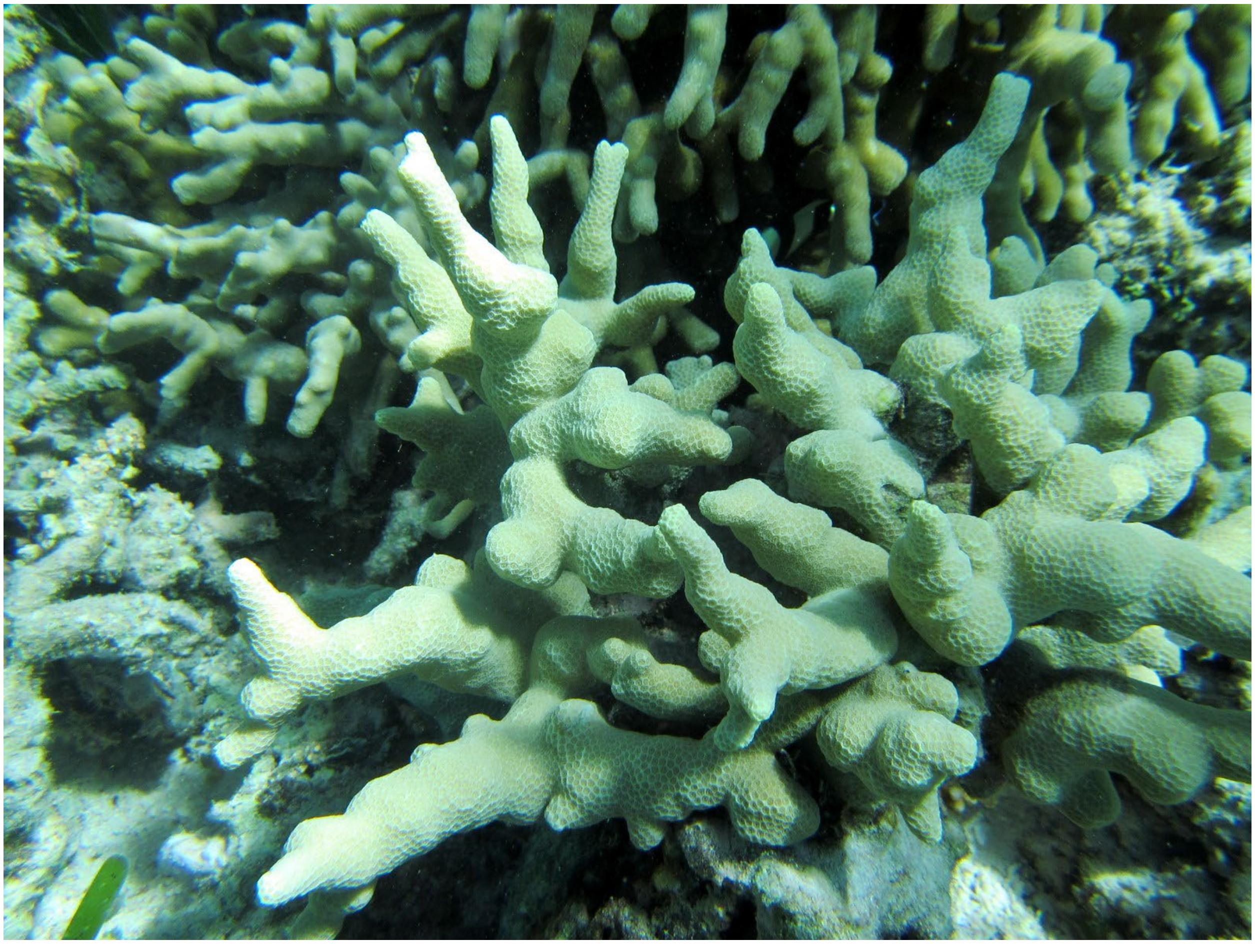
A field of *Porites cylindrica* with uniform, compact branches.

A yellow-green colony of *Porites cyclindrica*.

A close-up photo of *Porites cylindrica*.

Porites attenuata

This species forms branching colonies with cylindrical branches with rounded ends. Corallites are slightly recessed. Colonies are near identical to *Porites cylindrica*, except the corallites are recessed. *Porites nigrescens* has smaller branches with more deeply recessed corallites.

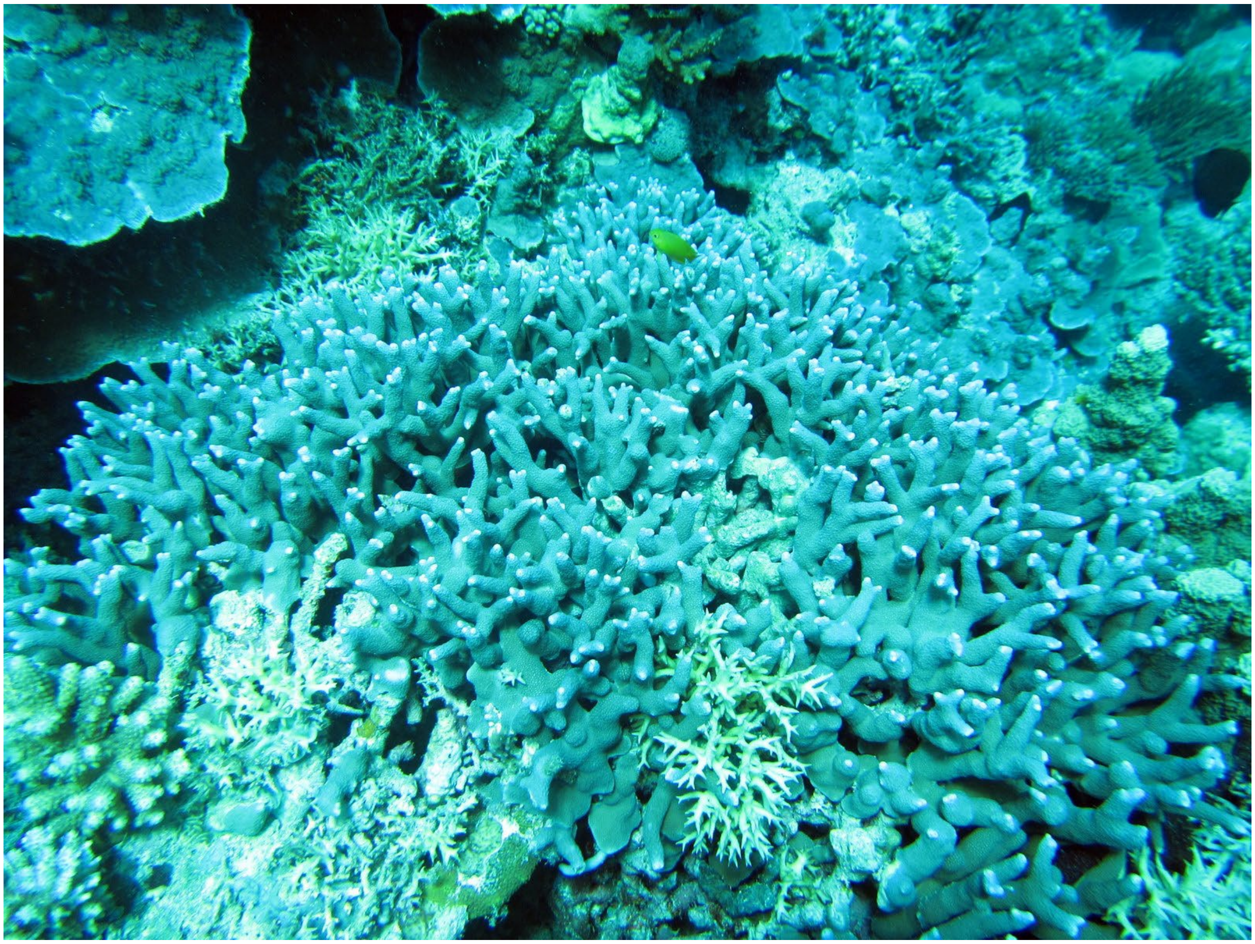


A colony of *Porites attenuata*.

A close-up photo of *Porites attenuata*.

Porites nigrescens

Colonies are branching, with cylindrical branches that are moderately thin and slightly rough. Corallites are recessed. Branches are thinner than on *Porites cylindrica* and *Porites attenuata*, and the corallites are more recessed than on *Porites attenuata*.

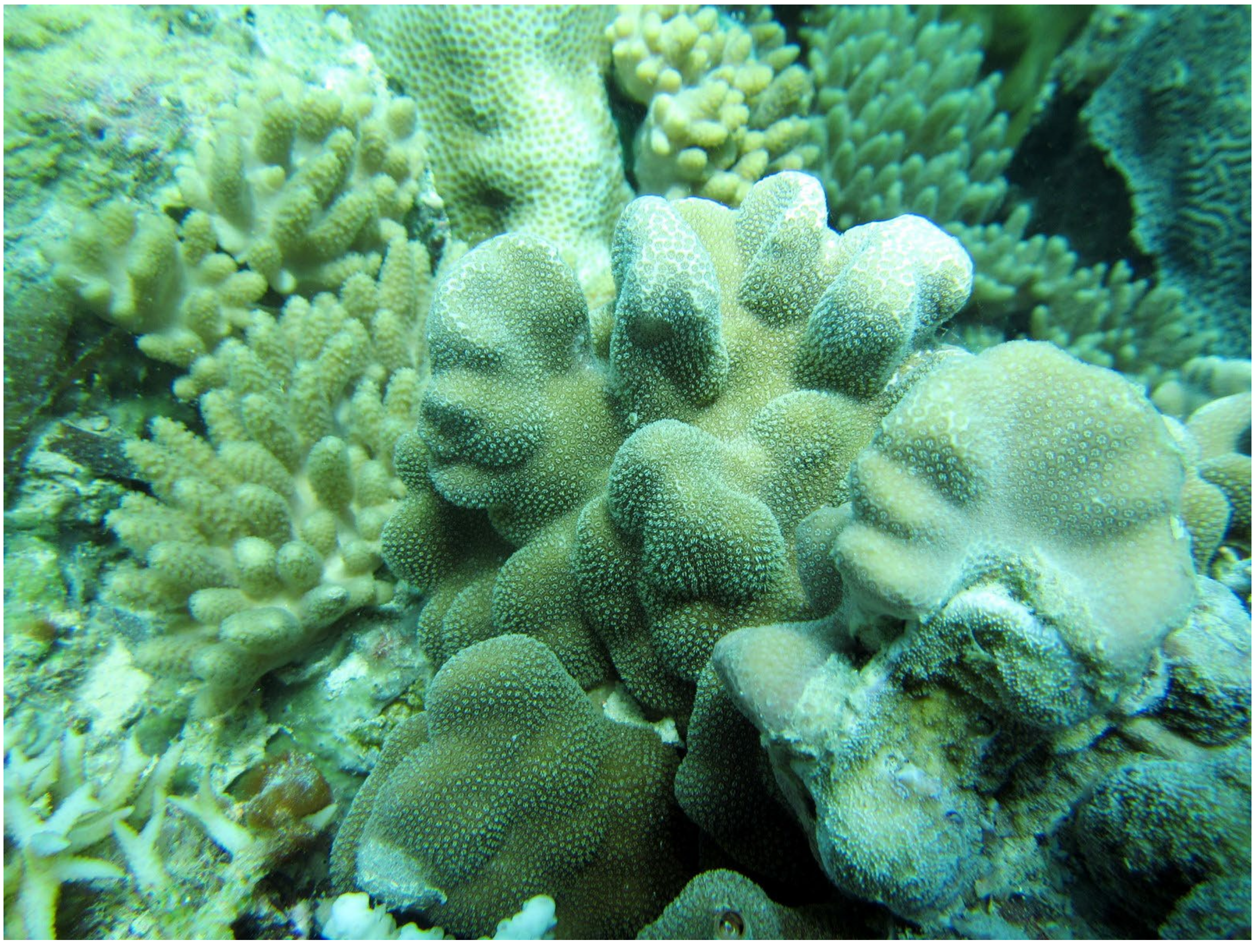


A colony of *Porites nigrescens*.

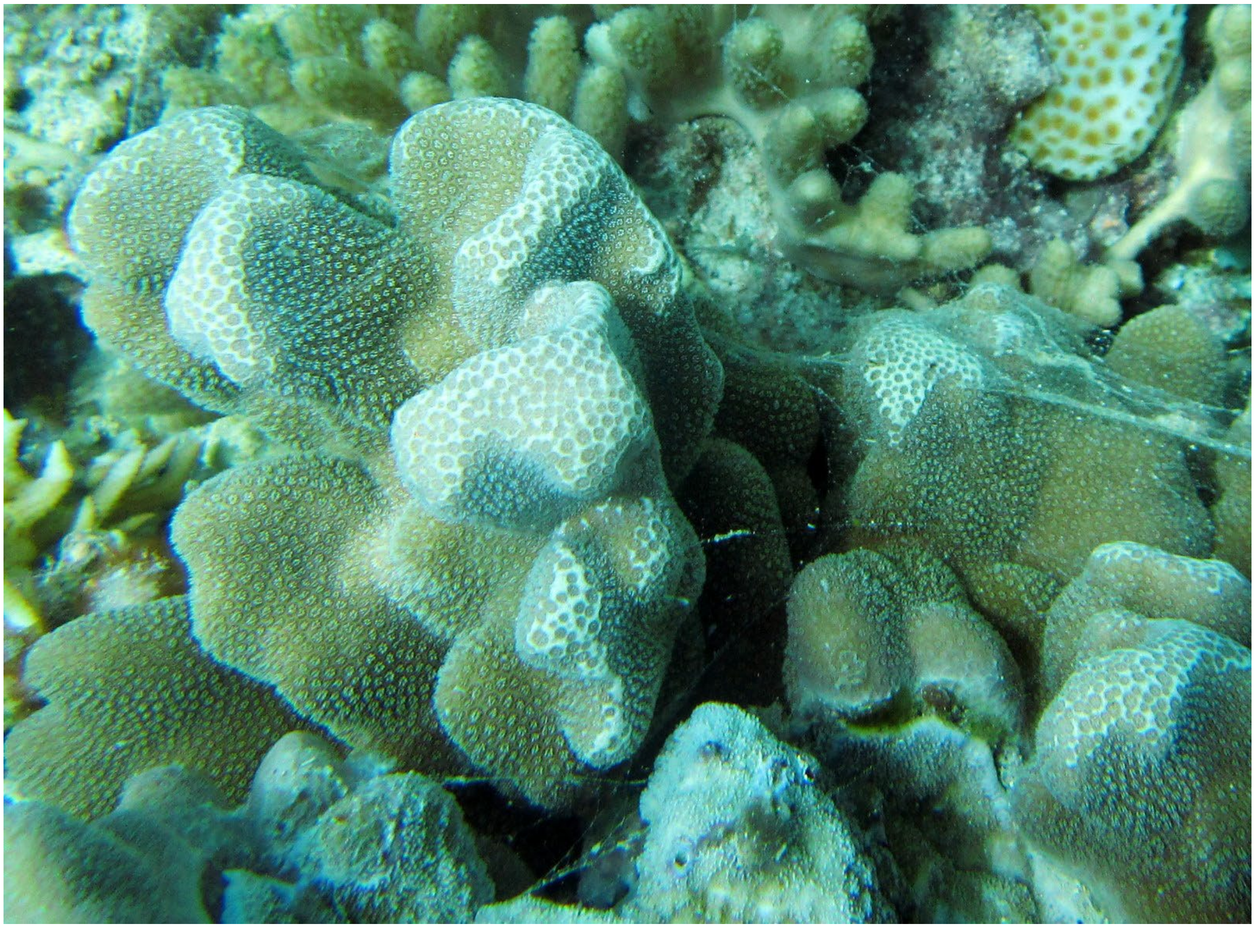
A close-up photo of *Porites nigrescens*.

Porites annae

Colonies grow upward as lumpy, fused columns, but may have encrusting bases and columns may be represented only as bumps. Tentacles are almost always extended in the center of the corallite. Colonies are brown except the tops of columns which are white. Colonies are small unlike *Porites evermanni* and columnar instead of massive. There are no thin horizontal plates as on *Porites lichen* or *Porites rus*, and lumping is rounded unlike the irregular bumps on *Porites rus*. Columns on *Porites lichen* are smooth.



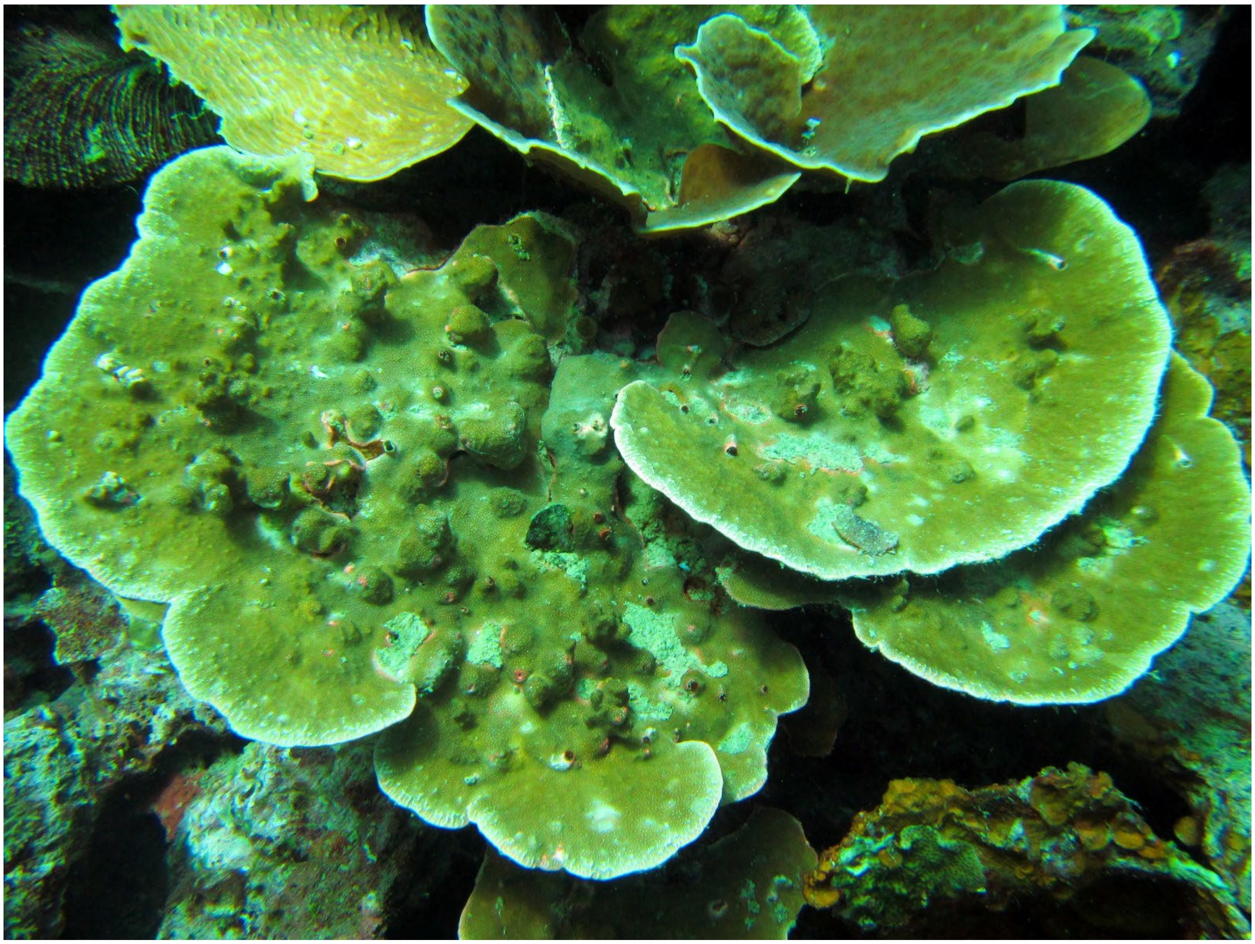
A colony of *Porites annae*.



A close-up photo of *Porites annae*, showing the extended tentacles on column sides, and white of column tops where tentacles are not extended.

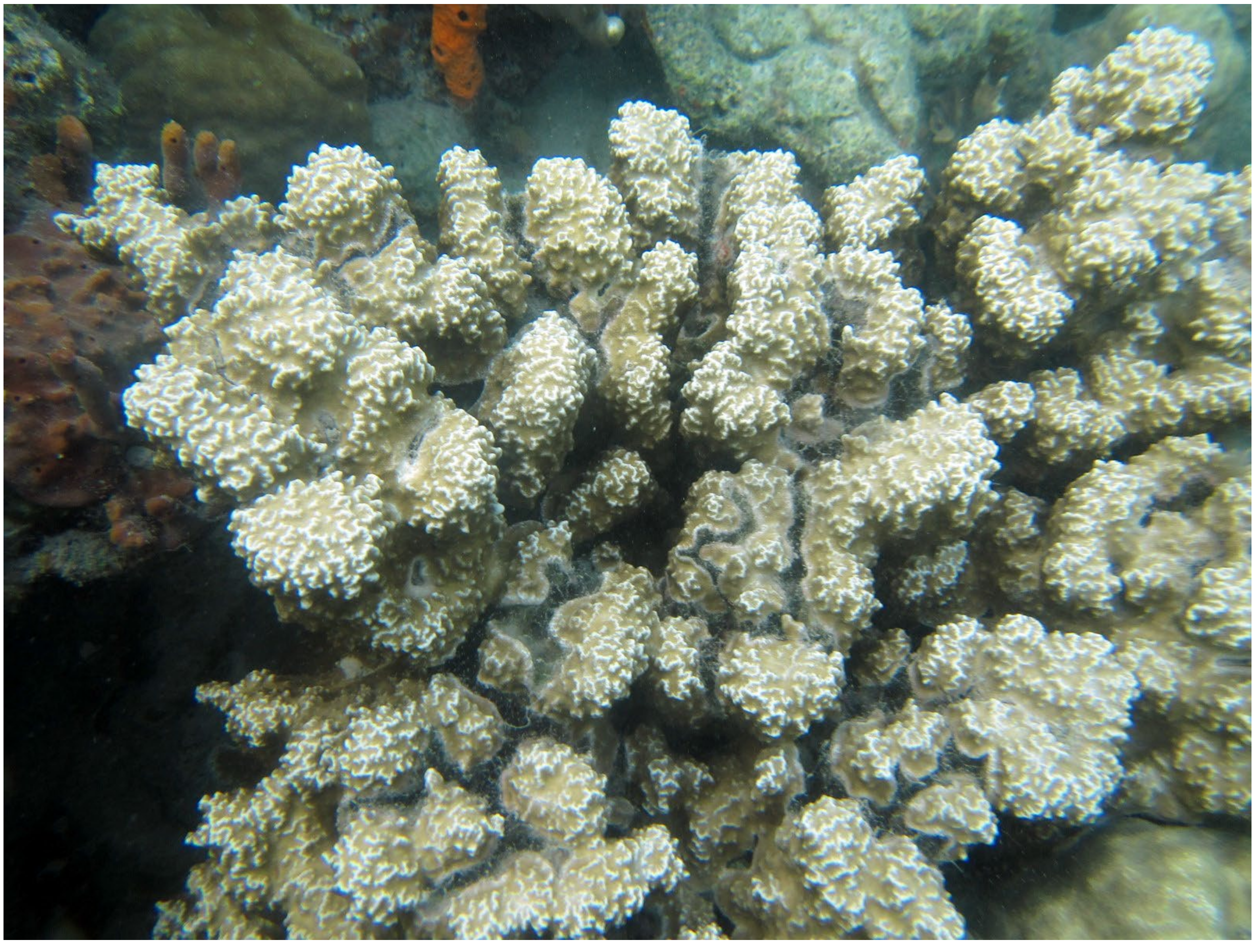
Porites rus

Colonies consist of thin horizontal plates and/or irregular columns. Many colonies have both, but the proportion varies widely. When both are present, the columns grow up from the plates. Columns can vary greatly in size and shape between colonies. Surfaces commonly have small winding ridges on them, but can be smooth. The polyps usually appear to be tiny white dots. Most other *Porites* species do not have both plates and columns. *Porites lichen* has plates with smooth, finger-shaped columns and no small ridges.

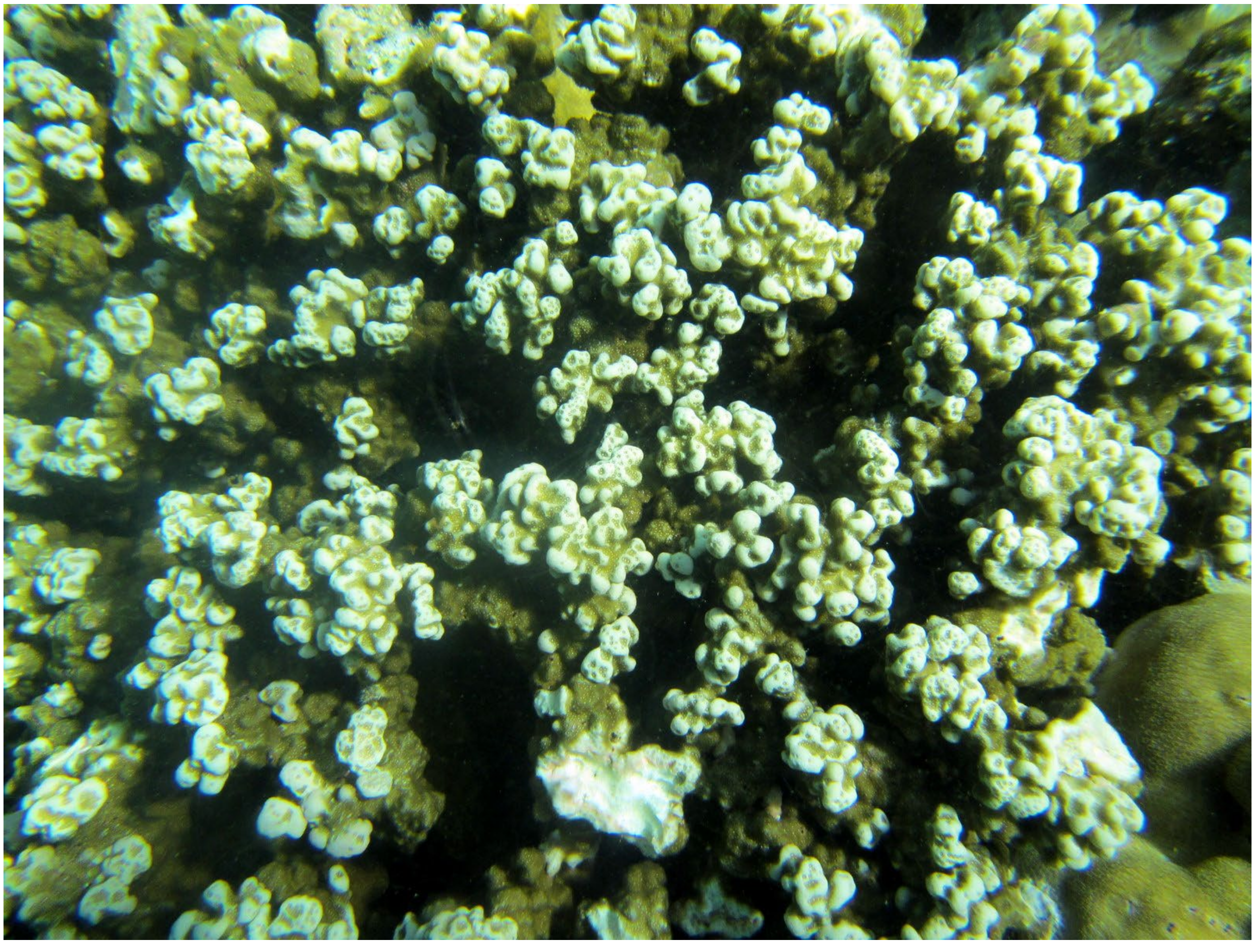


A colony of *Porites rus* which mostly consists of plates, but also has small rounded nodules growing up from the plates.

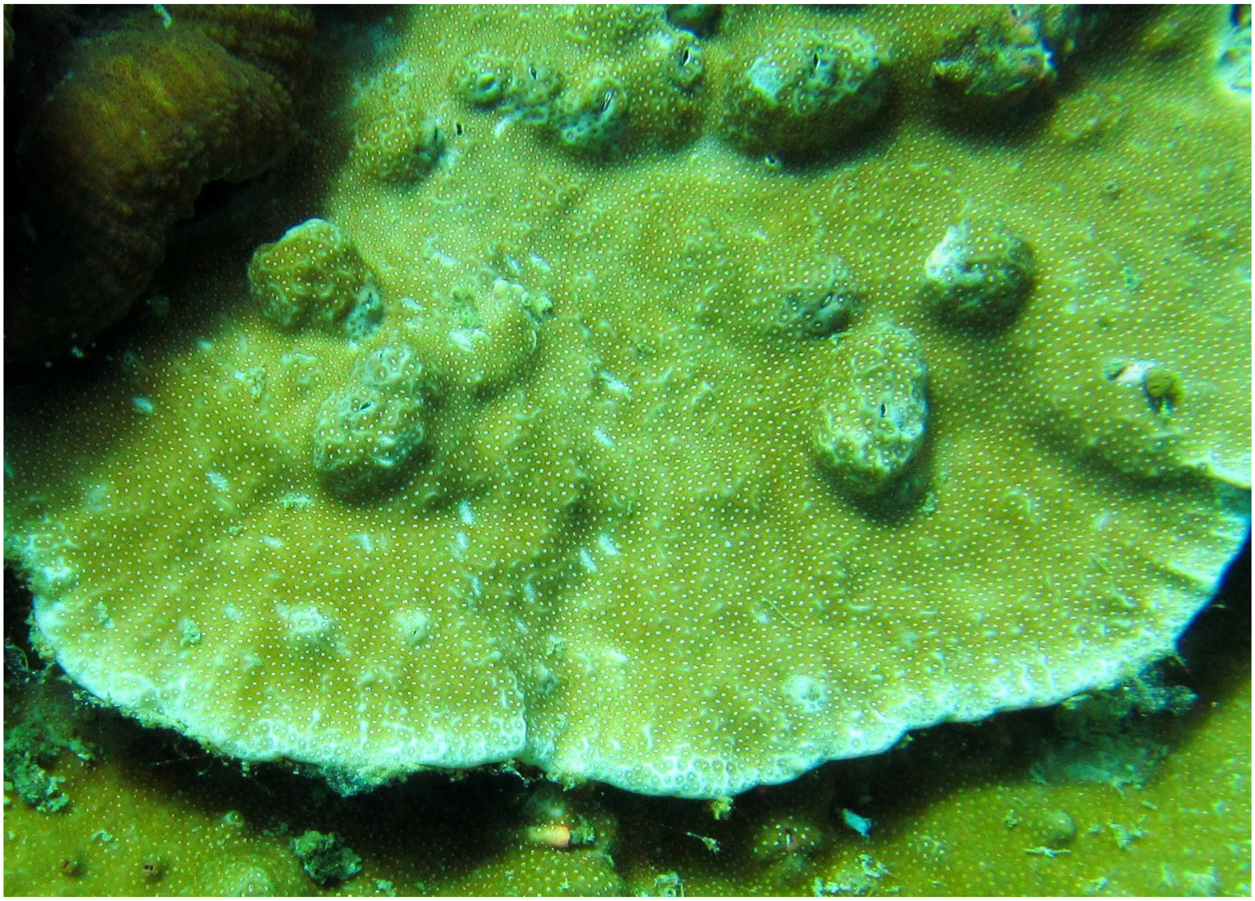
This colony of *Porites rus* consists entirely of plates, which have small winding ridges on them.



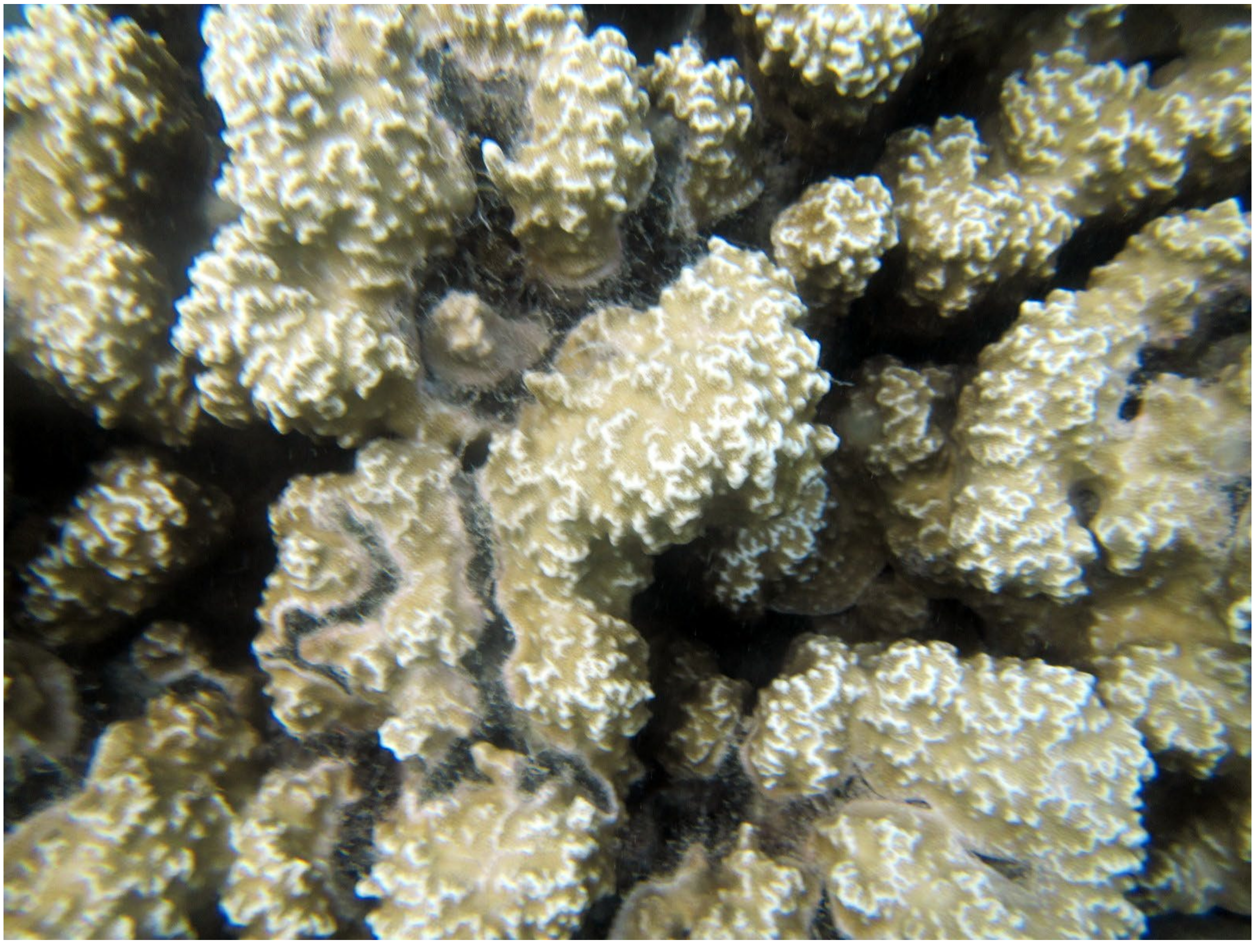
A colony of *Porites rus* that consists entirely of columns.



A colony of *Porites rus* in which the columns consist of clusters of fused rounded nodules.



A close-up photo of *Porites rus* showing the tiny white dots where the polyps are, on a smooth plate with some short columns (bumps).

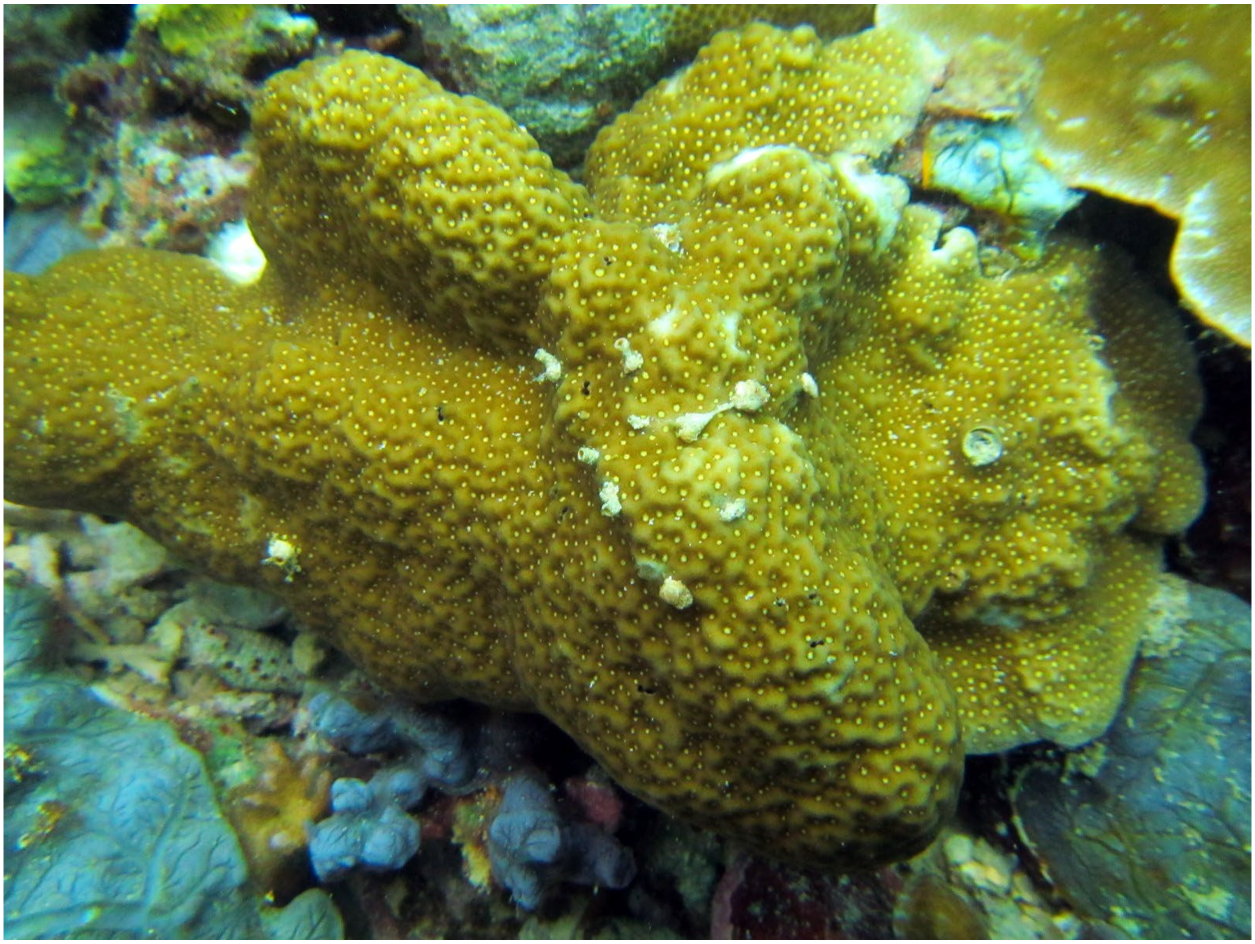


A close-up photo of the tops of some columns, showing the typical ridges.

Porites horizontallata

Colonies can be plates or encrusting, and in some places they form branches. The little corallites are indented into the surface, with raised, rounded ridges and bumps between them. Polyps on some colonies are light colored. Few *Porites* species have recessed corallites, none with plates.

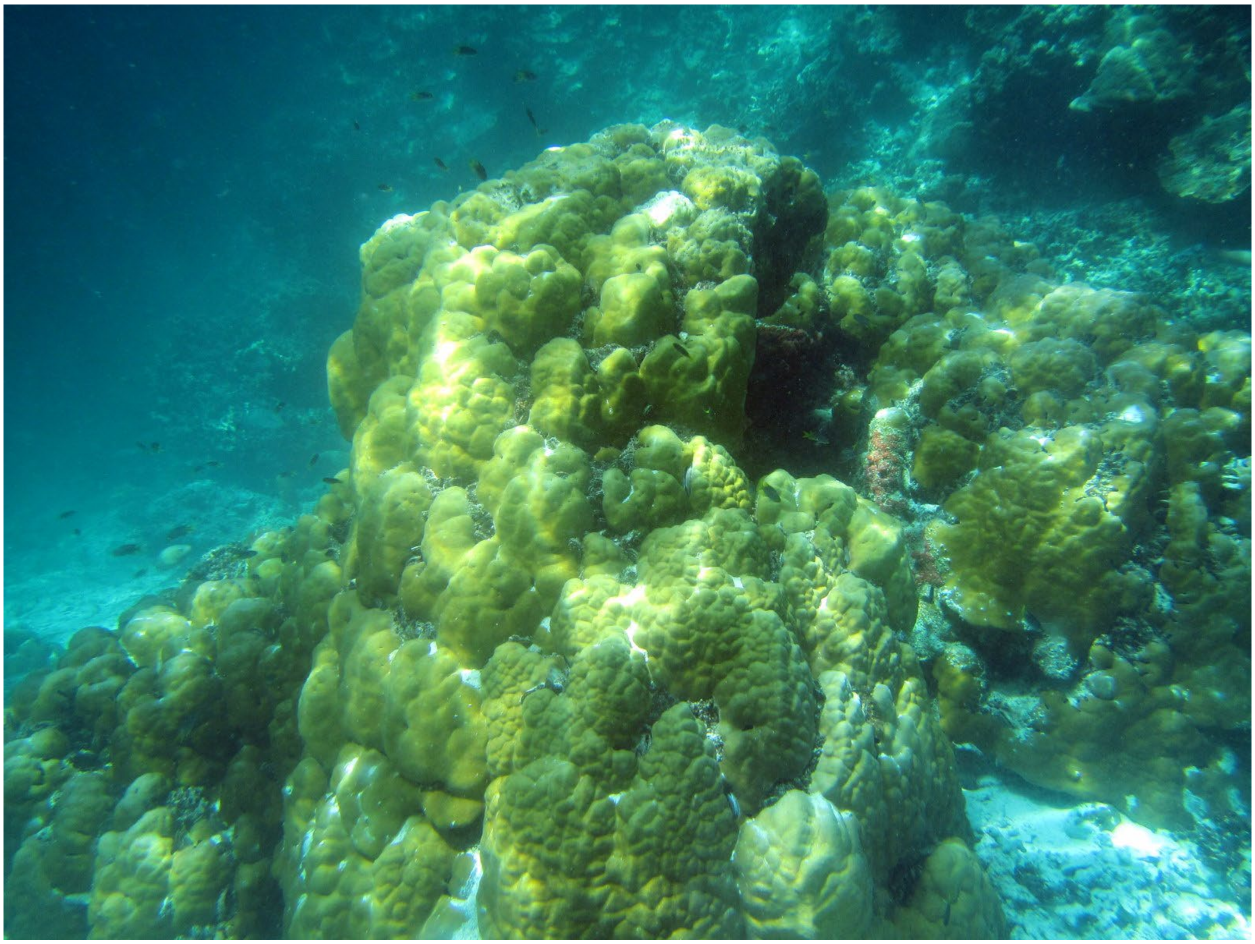
A plating colony of *Porites horizontallata*.



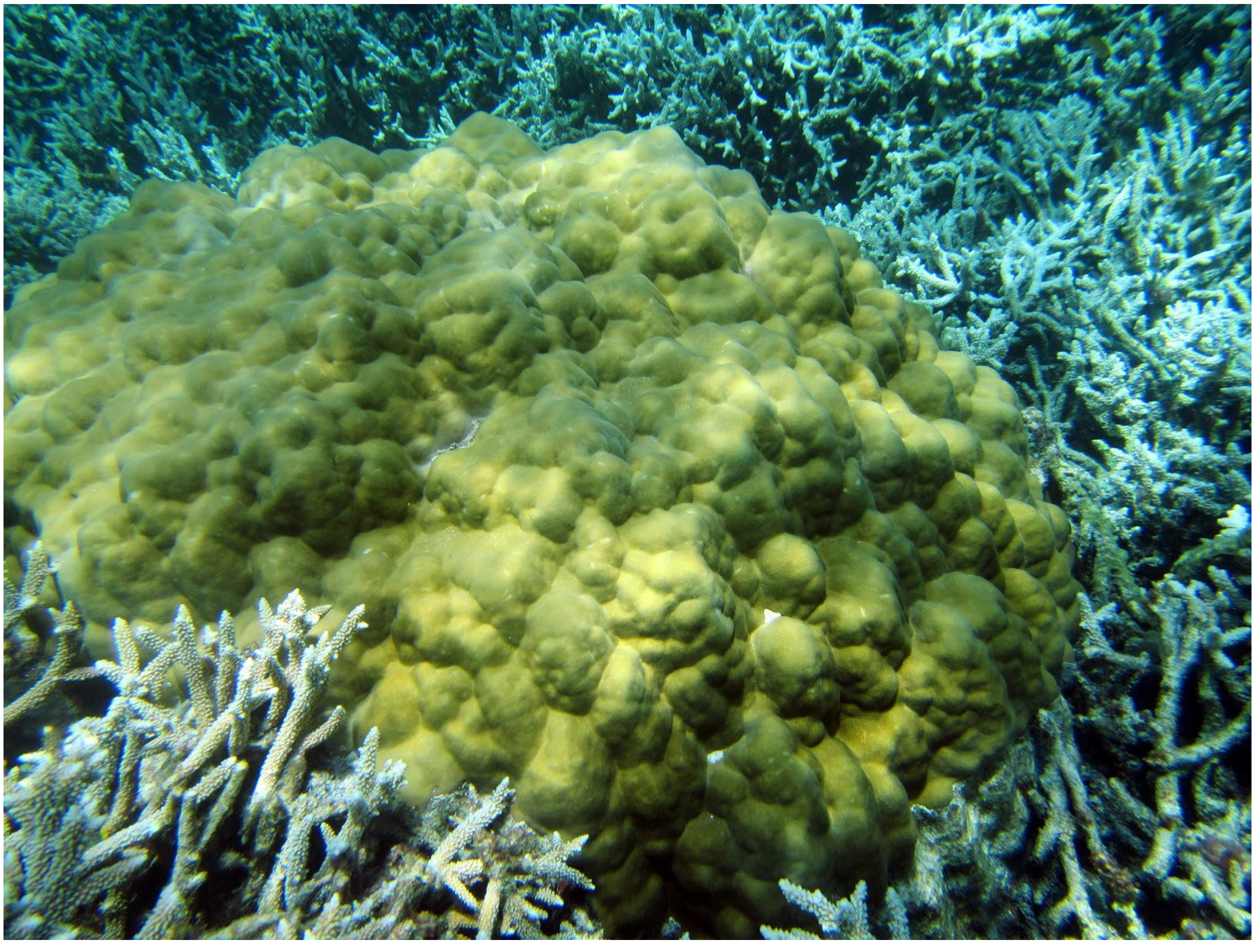
A closer photo of an encrusting colony of *Porites horizontallata*, showing the rounded ridges and bumps between the corallites and the white polyps.

Porites "massive"

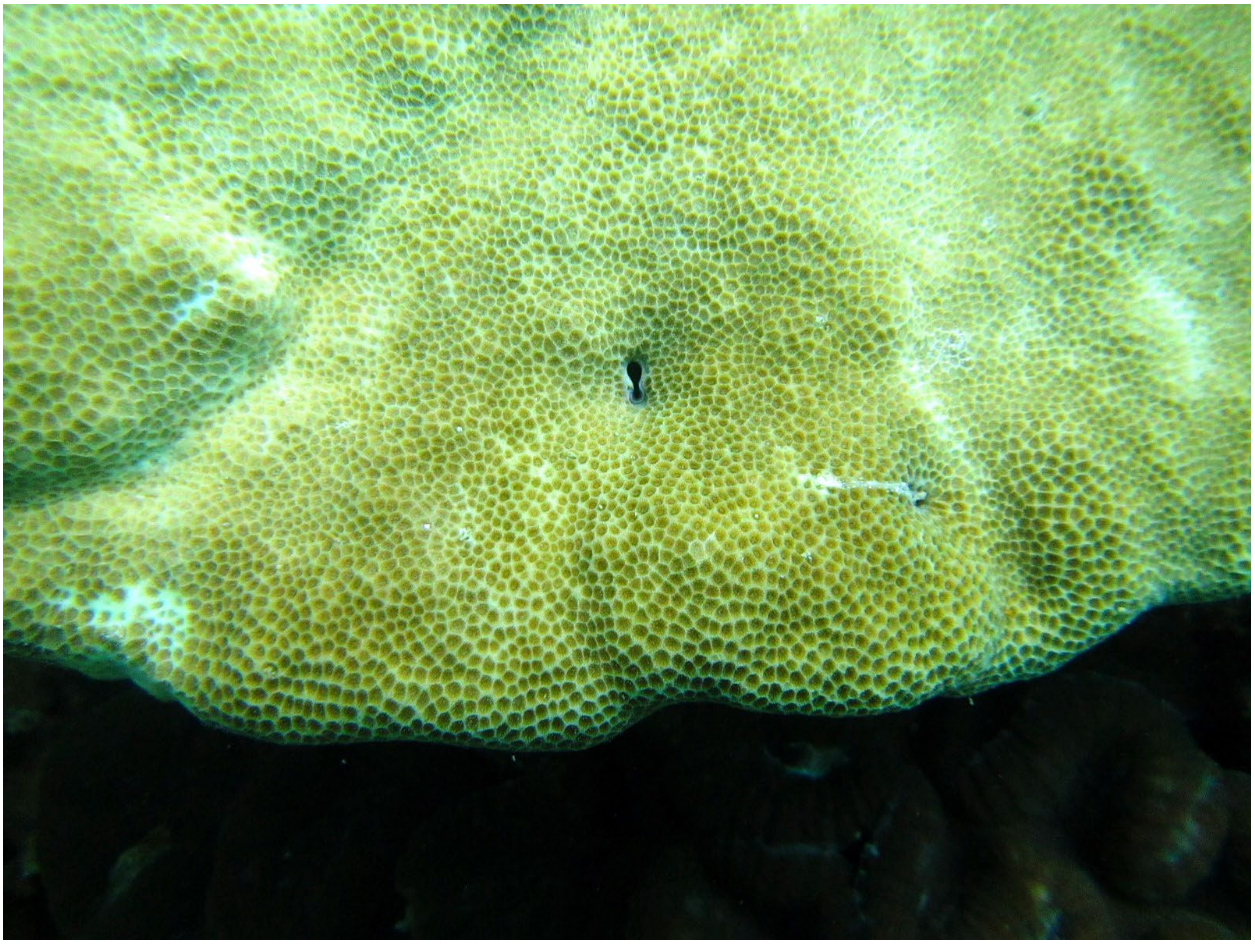
Colonies are domes or hemispheres, often are irregularly lumpy, and range in size from tiny to huge. The corallites are only about 1 mm in diameter, as is typical for *Porites*, and are often, but not always, close together. The tiny tentacles may be either retracted or partway extended during the daytime. This category includes several species, such as *P. lobata*, *P. australensis*, and *P. lutea*, which cannot be reliably identified underwater at this time. Massive *Porites* species are the most difficult of all coral species to identify, but a few can be readily identified once you know how.



A massive *Porites* colony.



Another massive *Porites* colony.

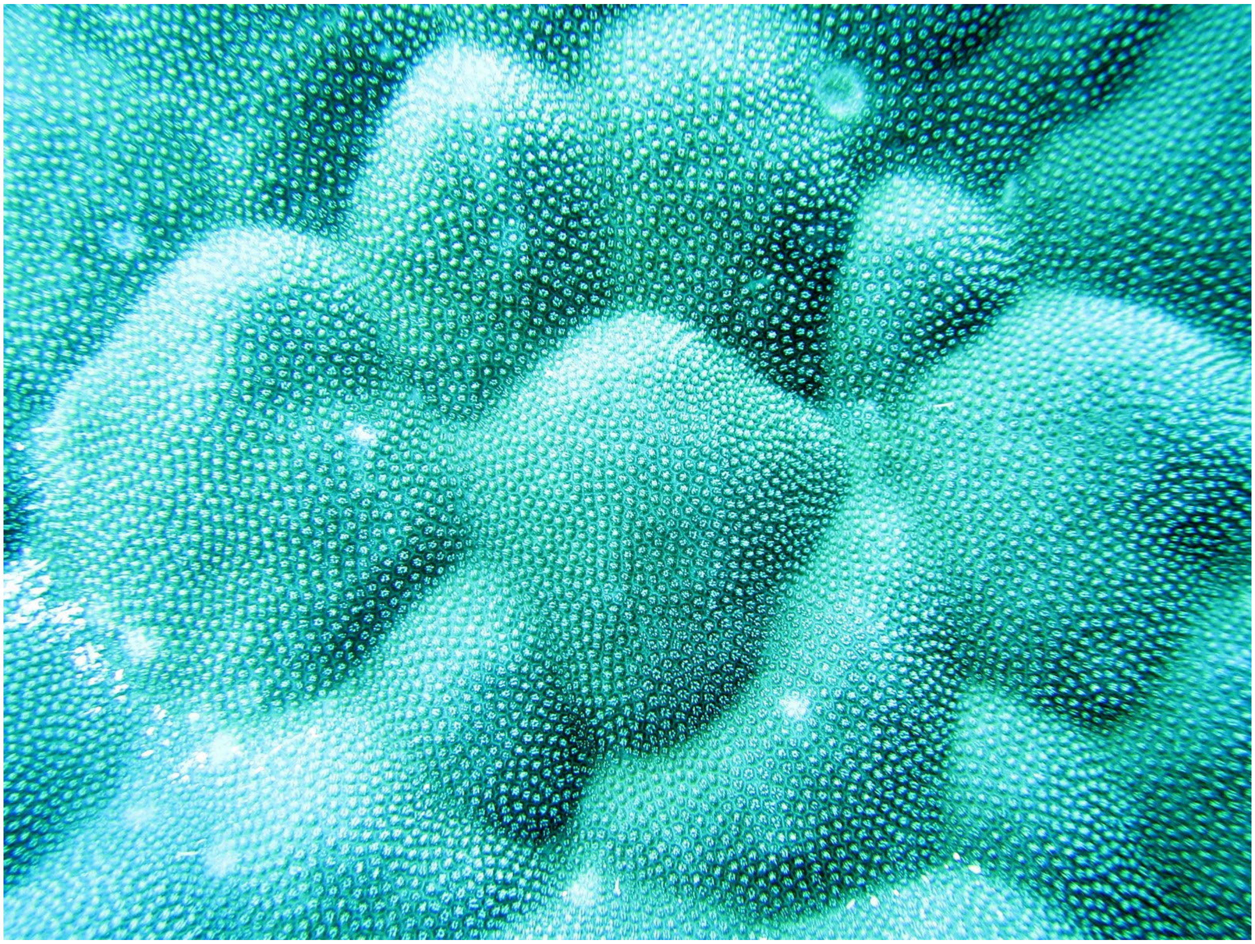


A close-up of a massive *Porites* colony with the tentacles retracted. The corallites are about 1 mm diameter.

Porites evermanni

Colonies are massive with relatively small, rounded, uniform bumps. The tentacles are partway extended during the day as a tiny tuft of tentacles in the center of the polyp, not as a ring of tentacles. Colonies are most often dark brown, but can have bluish tints. This is very similar to *Porites annae*, but *P. annae* forms small lumpy colonies that grow lumpy columns. *Porites lichen* has simiilary extended tentacles, but has finger shaped columns growing up from thin plates.

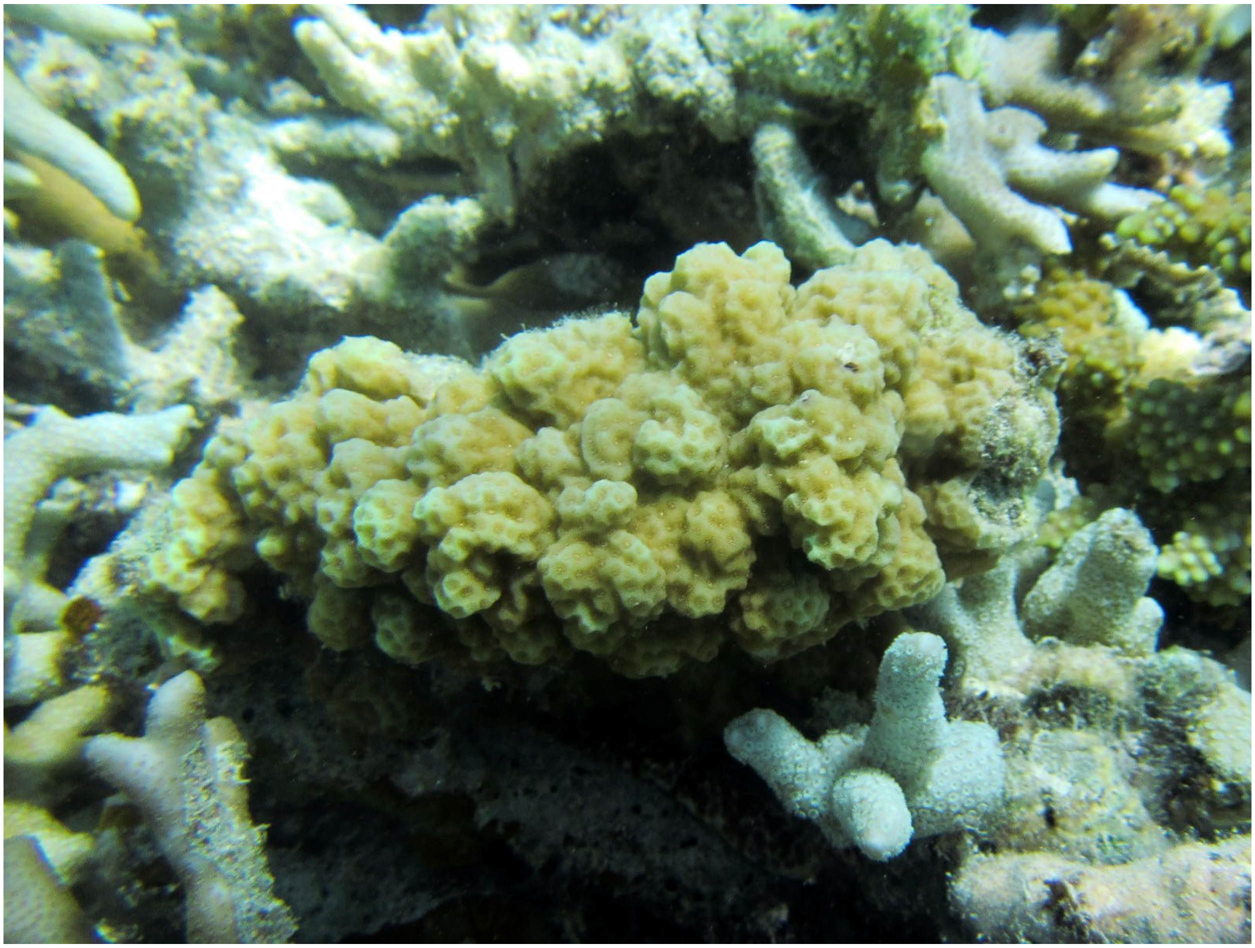
A *Porites evermanni* colony. Colonies are most often chocolate brown, but may be slightly bluish.



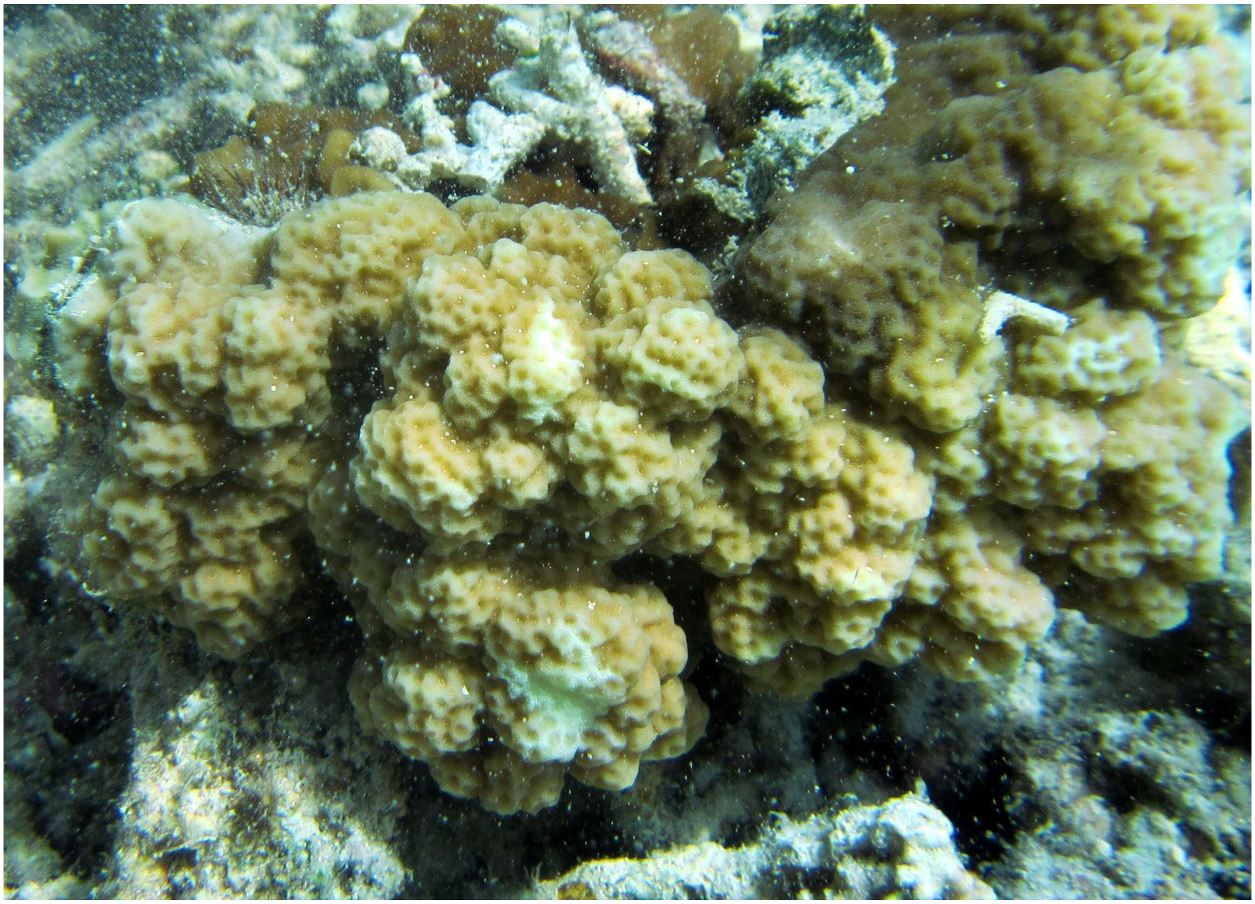
A close-up photo of *Porites evermanni* showing the tiny tentacles extended. The color of the photo is shifted towards blue due to the camera and depth.

Porites myrmidonensis

Colonies are small and massive or encrusting. The surface has small irregular lumps that are about finger width. The corallites are recessed with space between them, and some are in rows. Usually yellow-brown but may have pinkish tints. This species forms large colonies on the Great Barrier Reef. Other massive *Porites* do not have the combination of small round lumps and recessed corallites in rows.



A close photo of a small colony of *Porites myrmidonensis*.



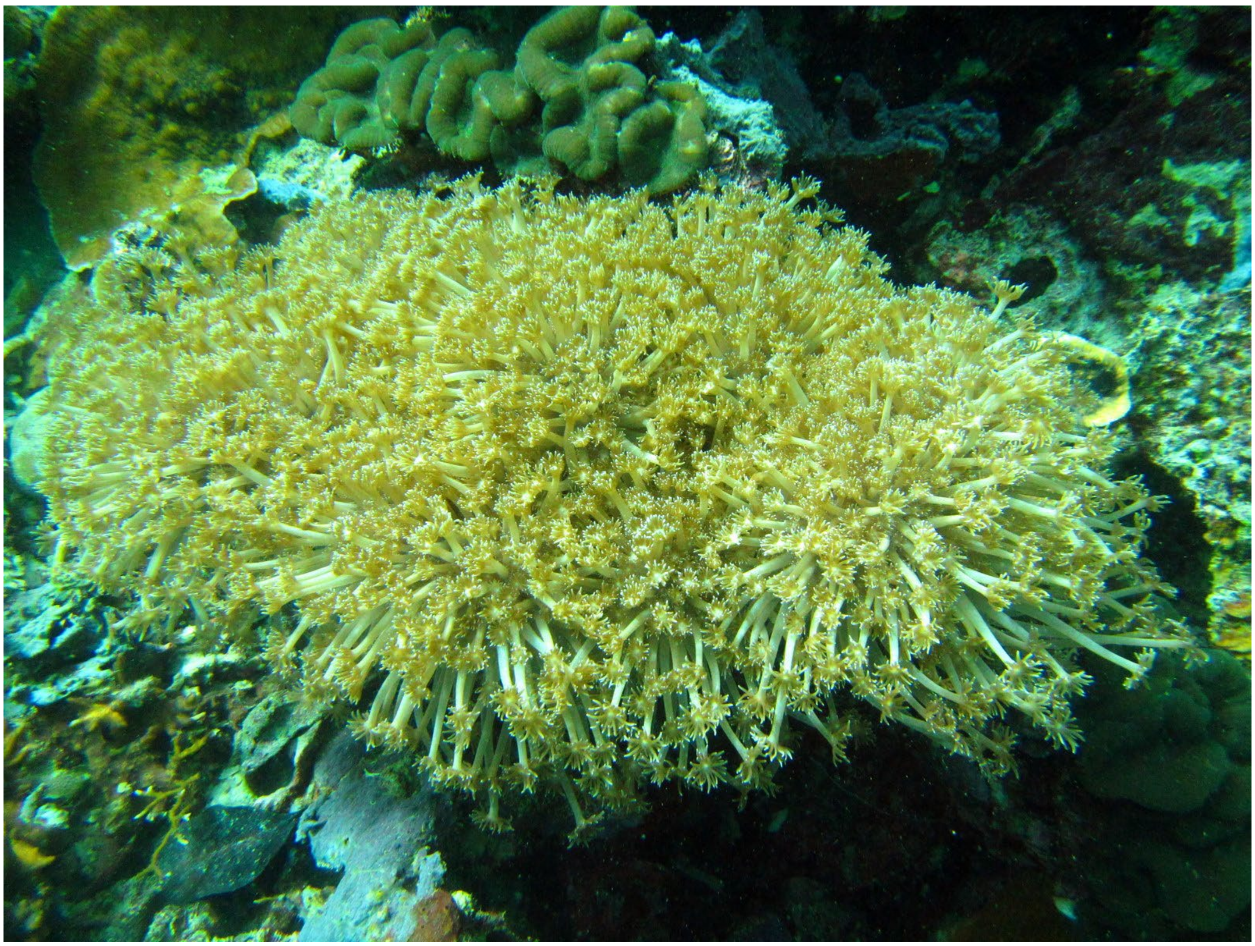
A close-up photo of a colony of *Porites myrmidonensis*.

Goniopora

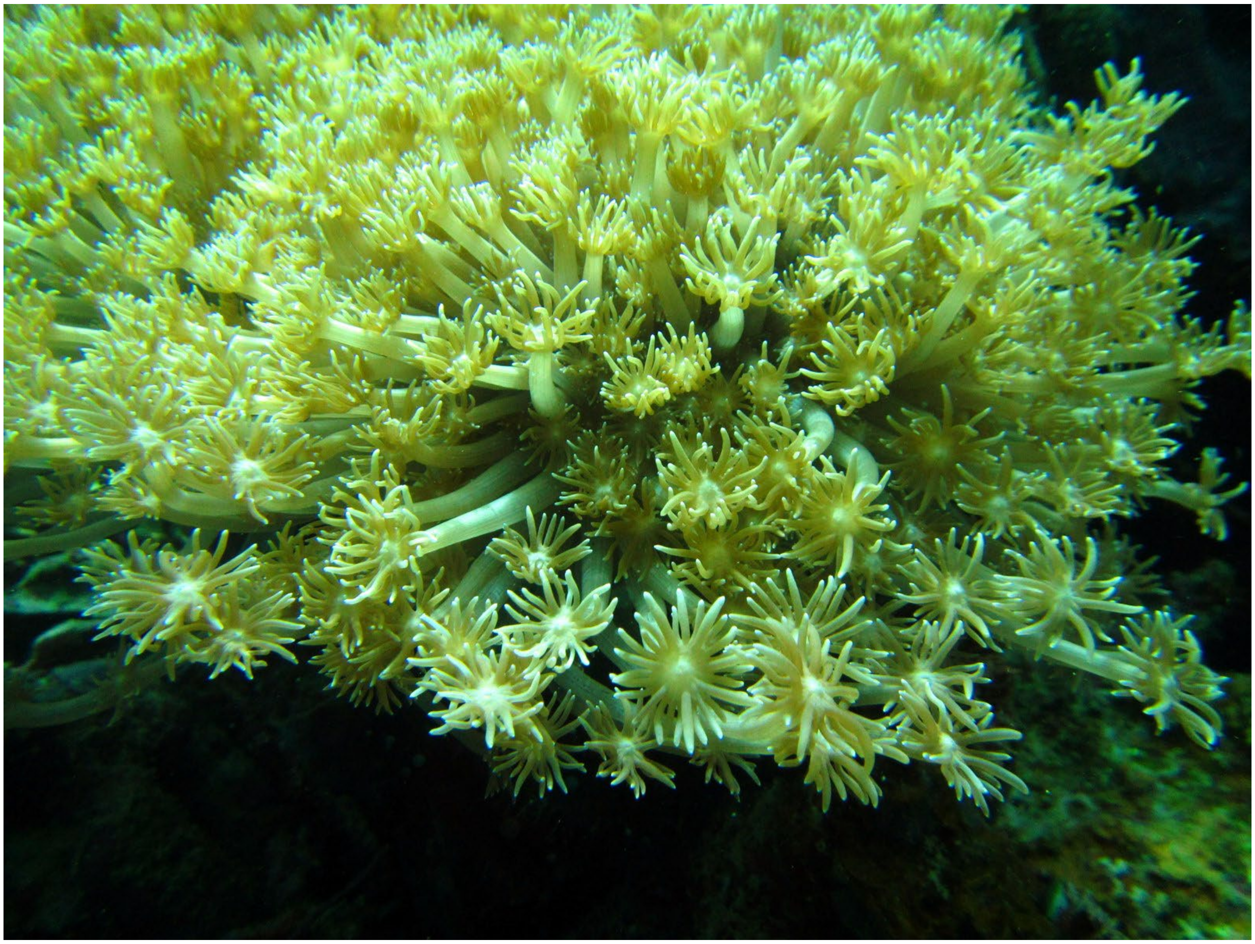
This genus forms colonies that may be encrusting, massive, branching or columnar. Colonies with large polyps have polyps that look like daisies, with a long column like the stem on a flower and a ring of tentacles at the end like petals on a flower. The polyps have 24 tentacles, which are too many to count in the water and hard to count in photos. Polyps range from large to small, almost getting as small as *Porites* polyps. The skeleton is very solid. *Goniopora* species are hard to identify. *Alveopora* has very similar looking polyps but only 12 tentacles, and it's skeleton is full of holes and thus very soft.

Goniopora sp. 1

Colonies are lumpy or branching and have long thin polyps with thin tentacles and small oral discs. *Goniopora* sp. 2 and especially *Goniopora* sp. 3 have smaller polyps.



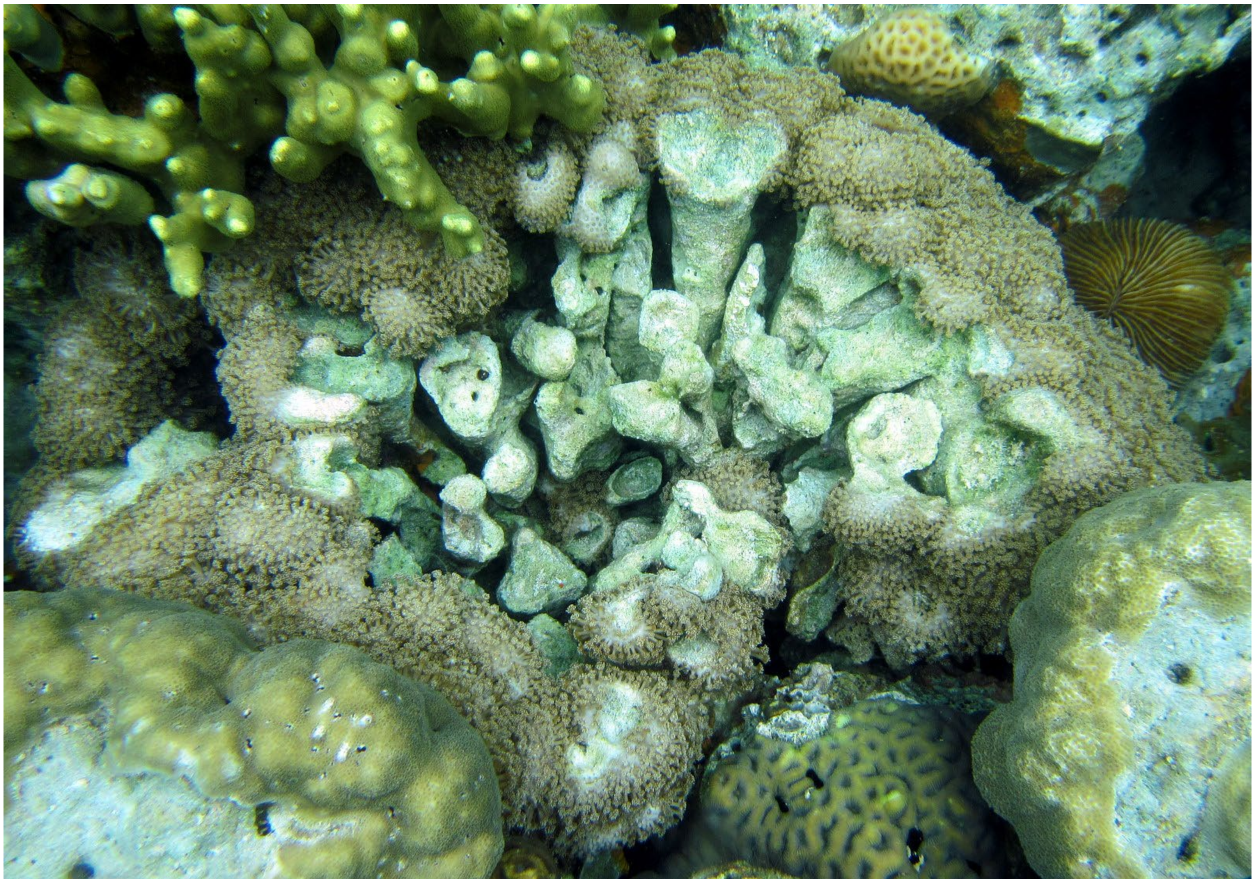
A small colony of *Goniopora* sp. 1.



A close-up photo of the polyps of *Goniopora* sp. 1. The polyp columns are long but thin, the tentacles are thin, and the oral disk is small.

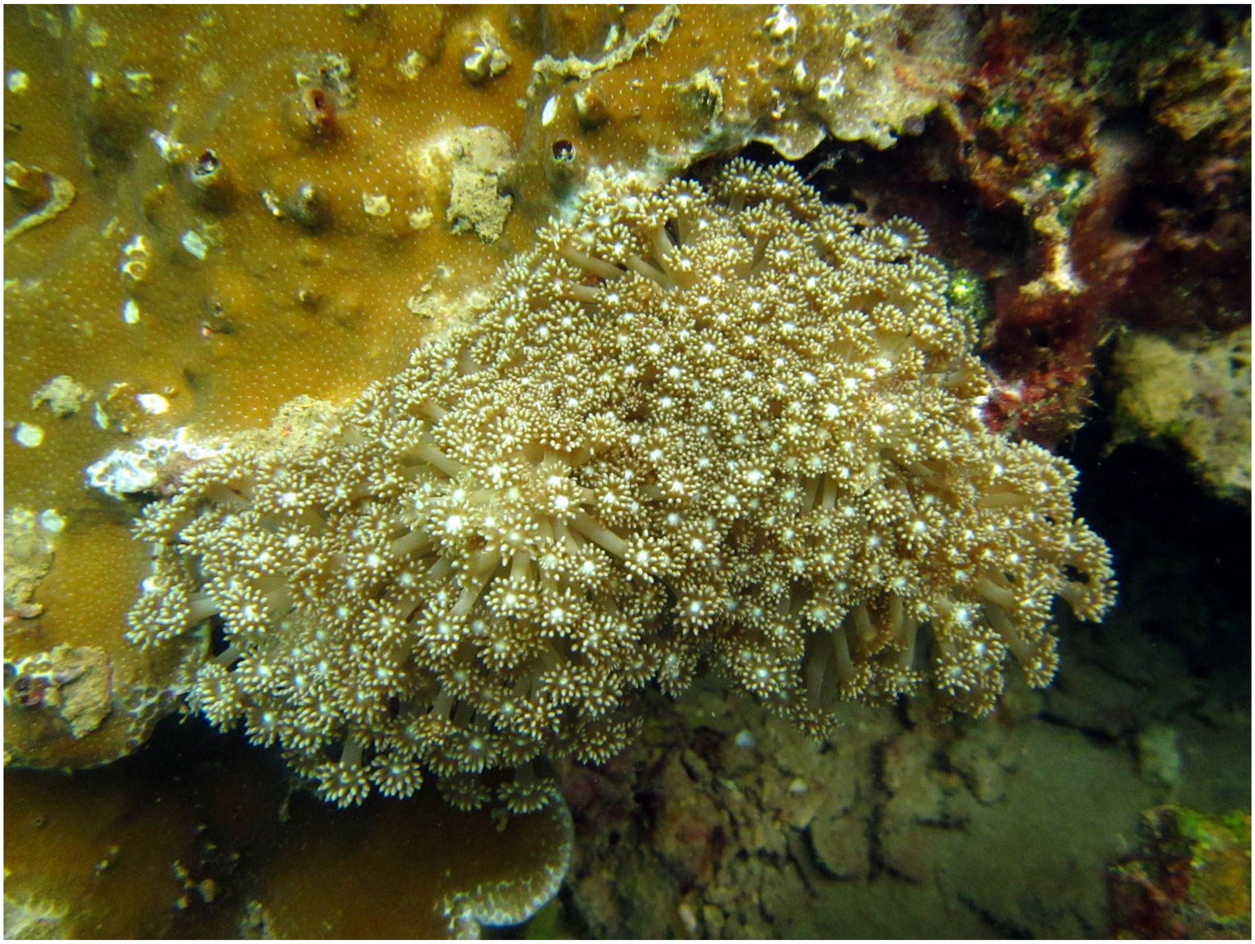
Goniopora sp. 2

This species forms small lumpy or columnar colonies with medium size polyps. The tentacles are small and short and have white tips; the fairly large oral disc is also white. *Goniopora* sp. 1 has larger polyps and *Goniopora* sp. 3 has smaller polyps.

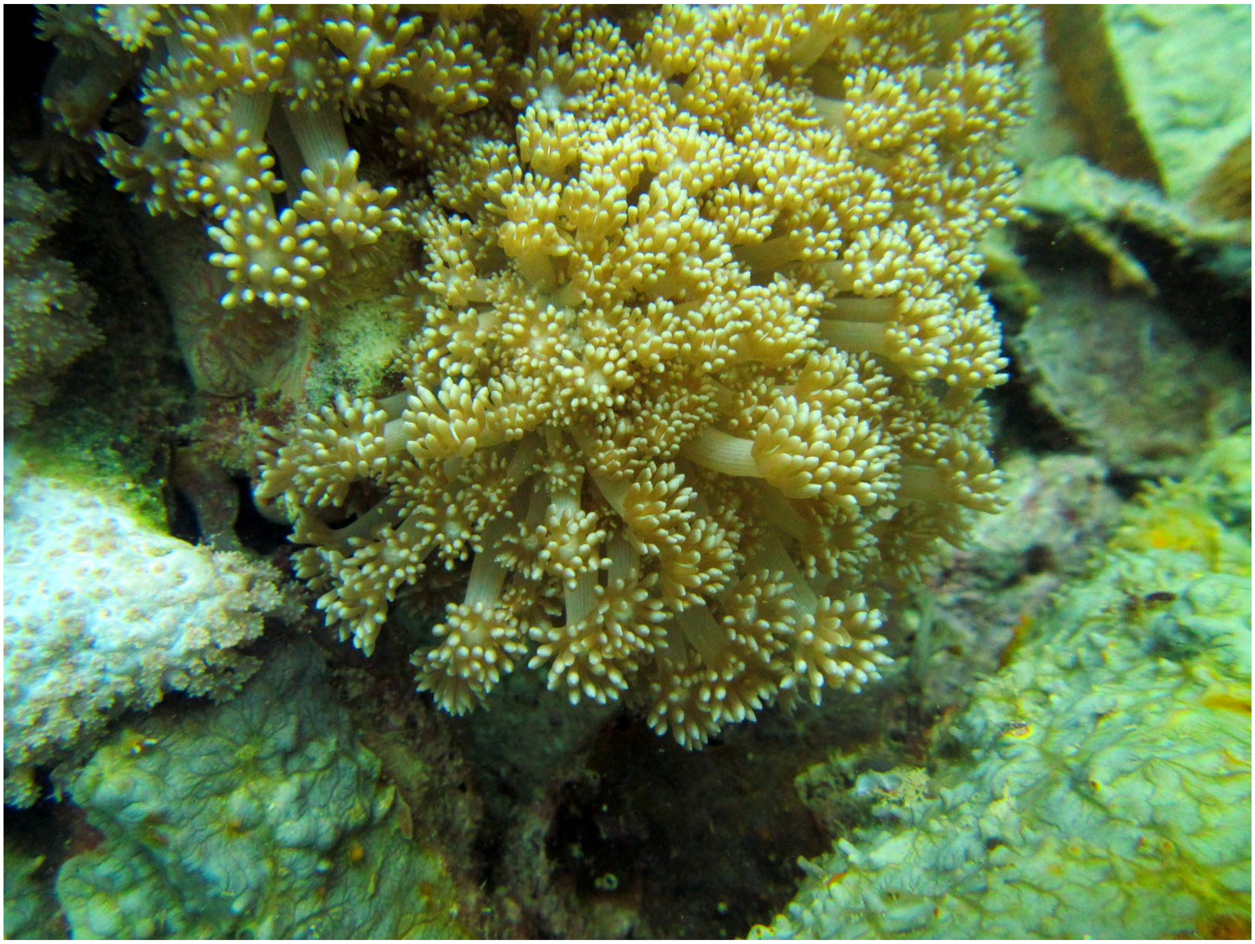


A broken colony of *Goniopora* sp. 2 showing the columns.

A colony of *Goniopora* sp. 2.



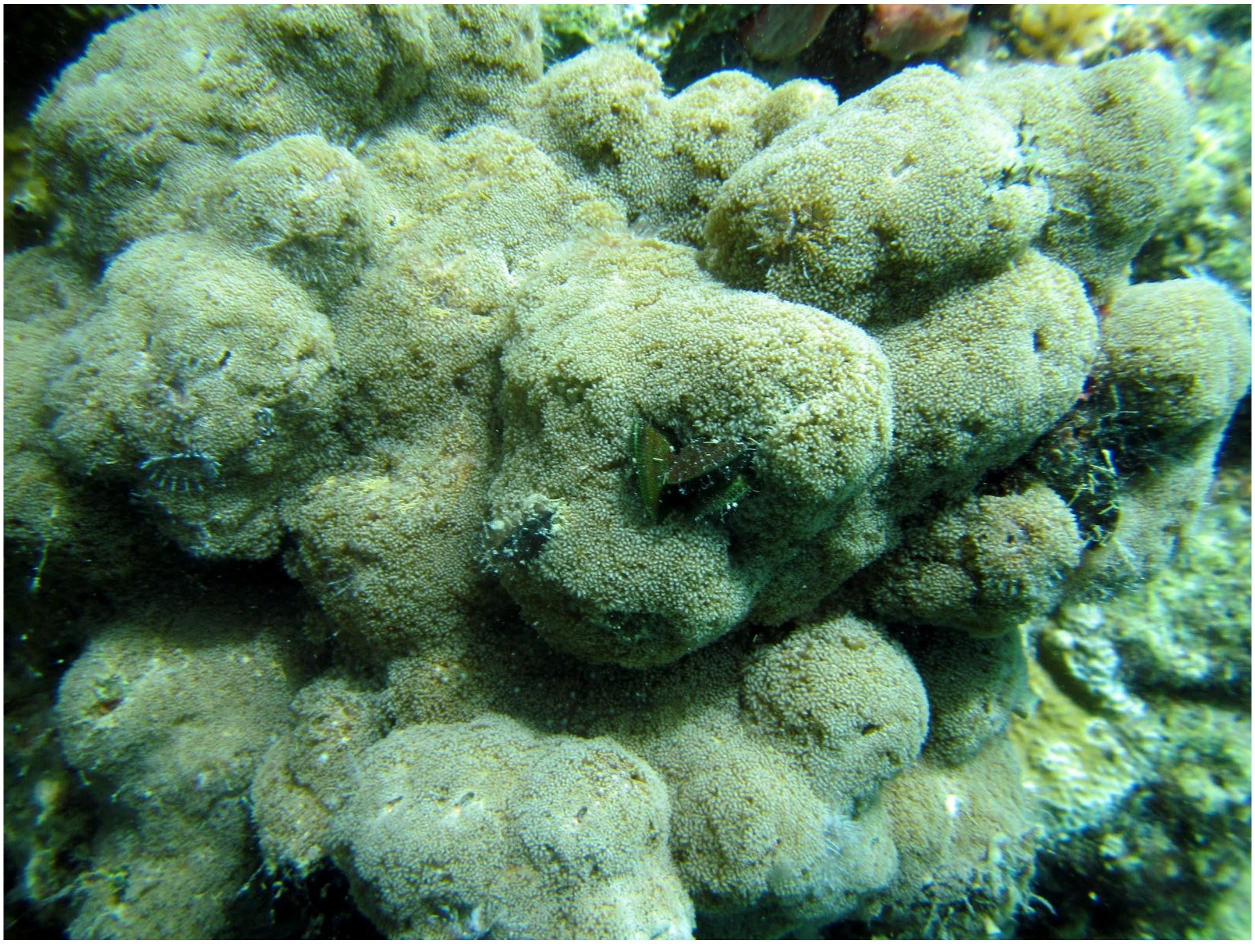
A colony of *Goniopora* sp. 2 showing the white oral discs.



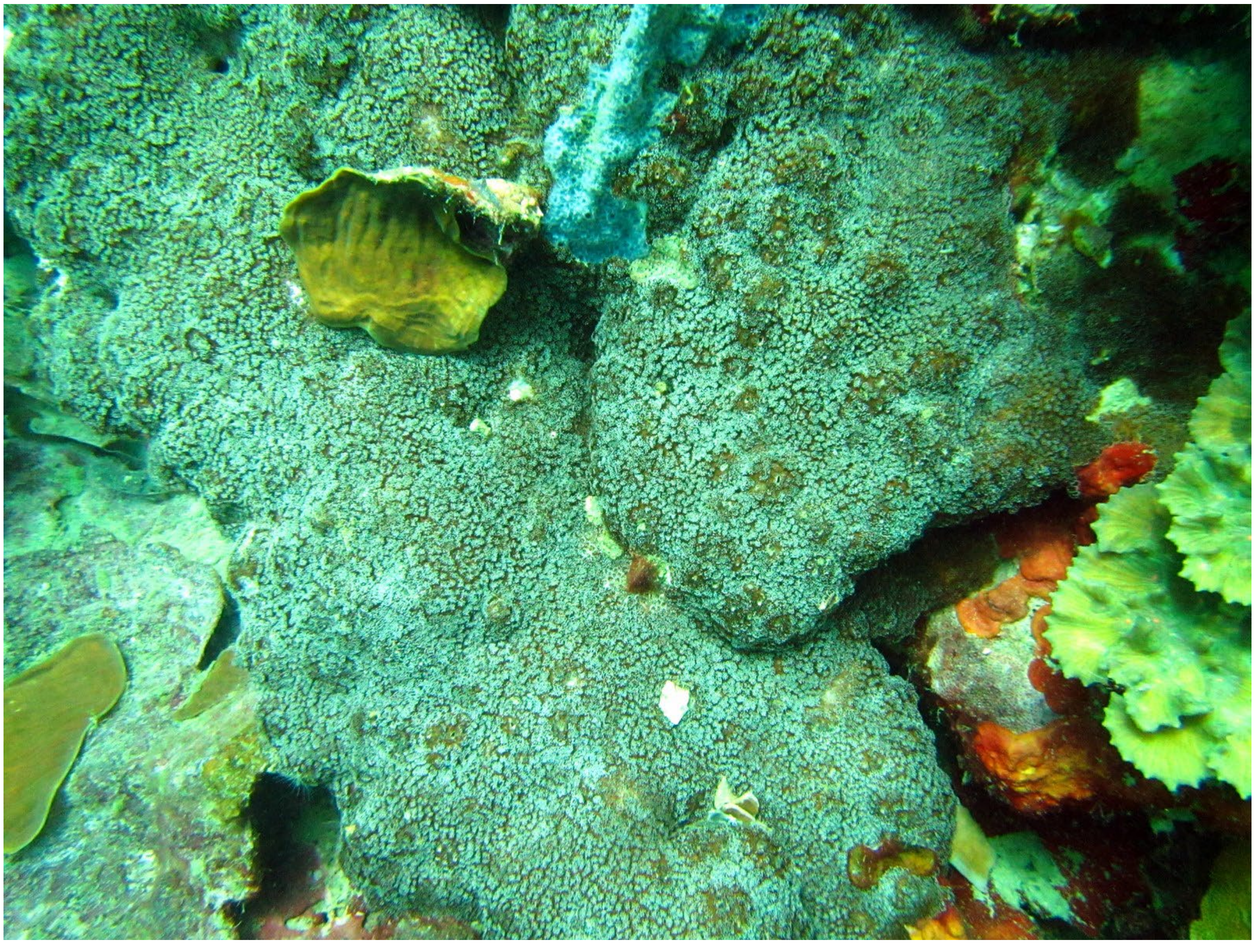
A close-up photo of *Goniopora* sp. 2.

Goniopora sp. 3

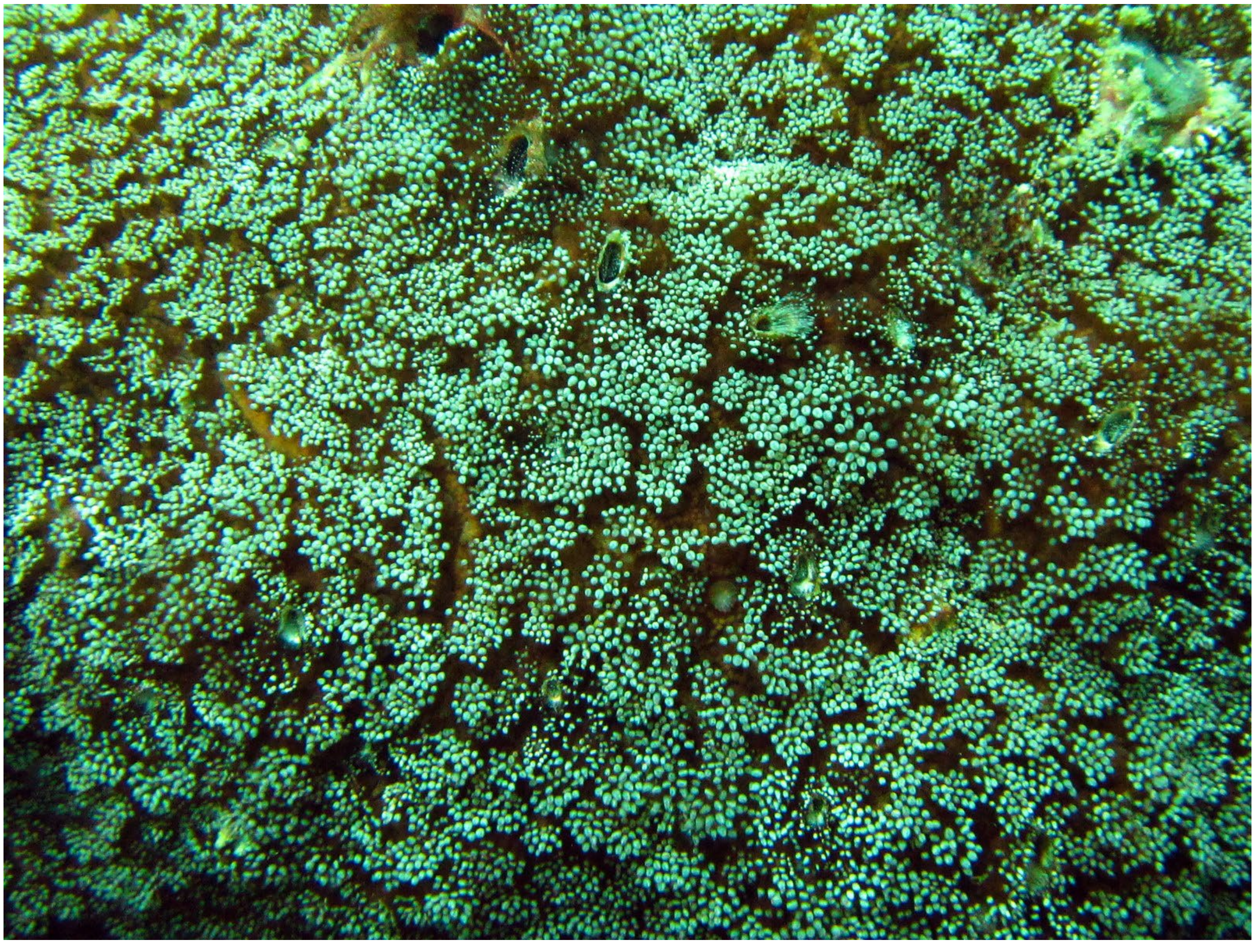
Colonies of this species are lumpy or encrusting. The polyps are small with very short columns, so that all is seen is a fine carpet of tentacles. *Goniopora* sp. 2 and especially *Goniopora* sp. 1 have larger polyps.



A lumpy colony of *Goniopora* sp. 3.



An encrusting colony of *Goniopor*a sp. 3. Smooth dark areas with a spot in the middle are barnacles.



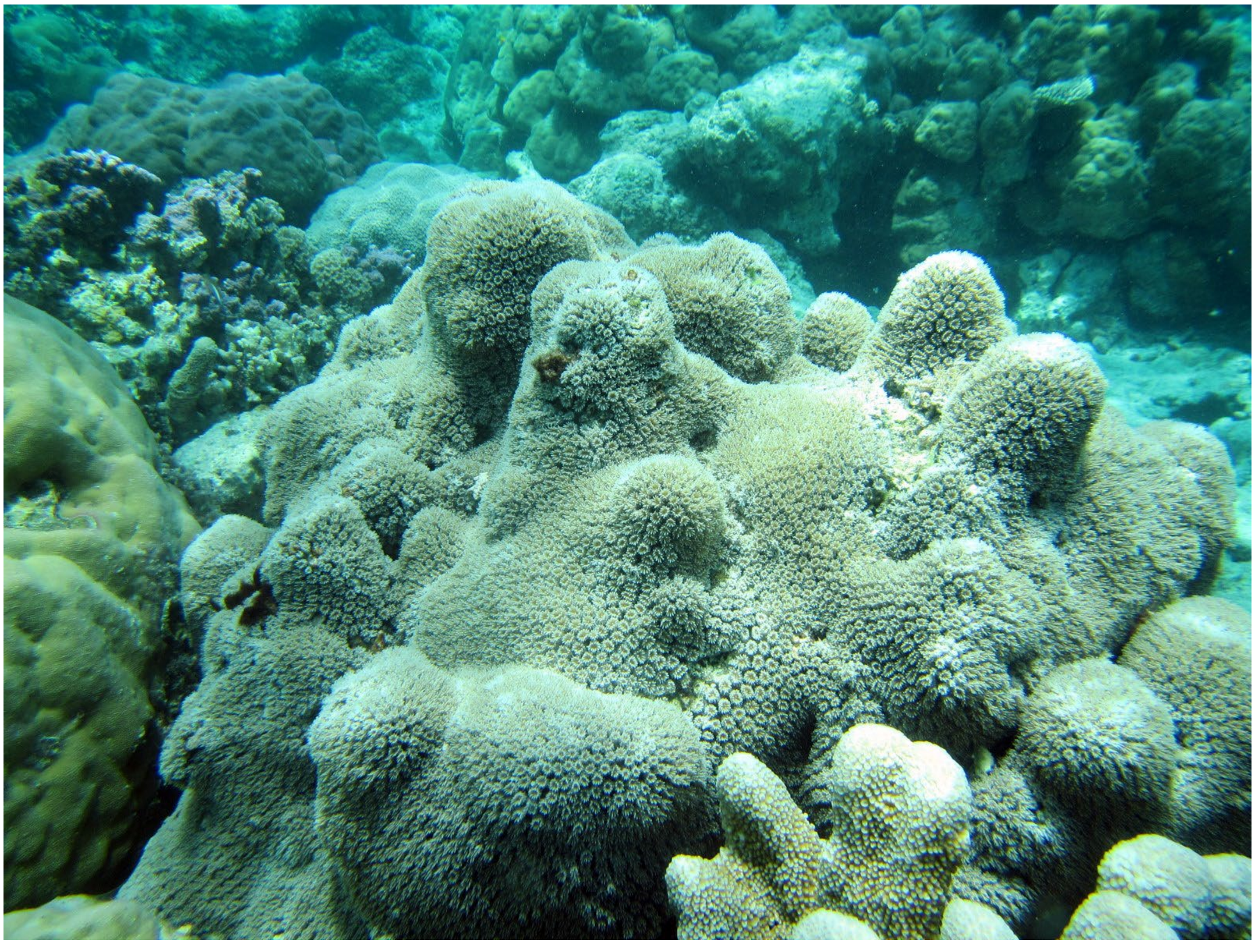
A close-up of the tentacles of *Goniopora* sp. 3.

Galaxea

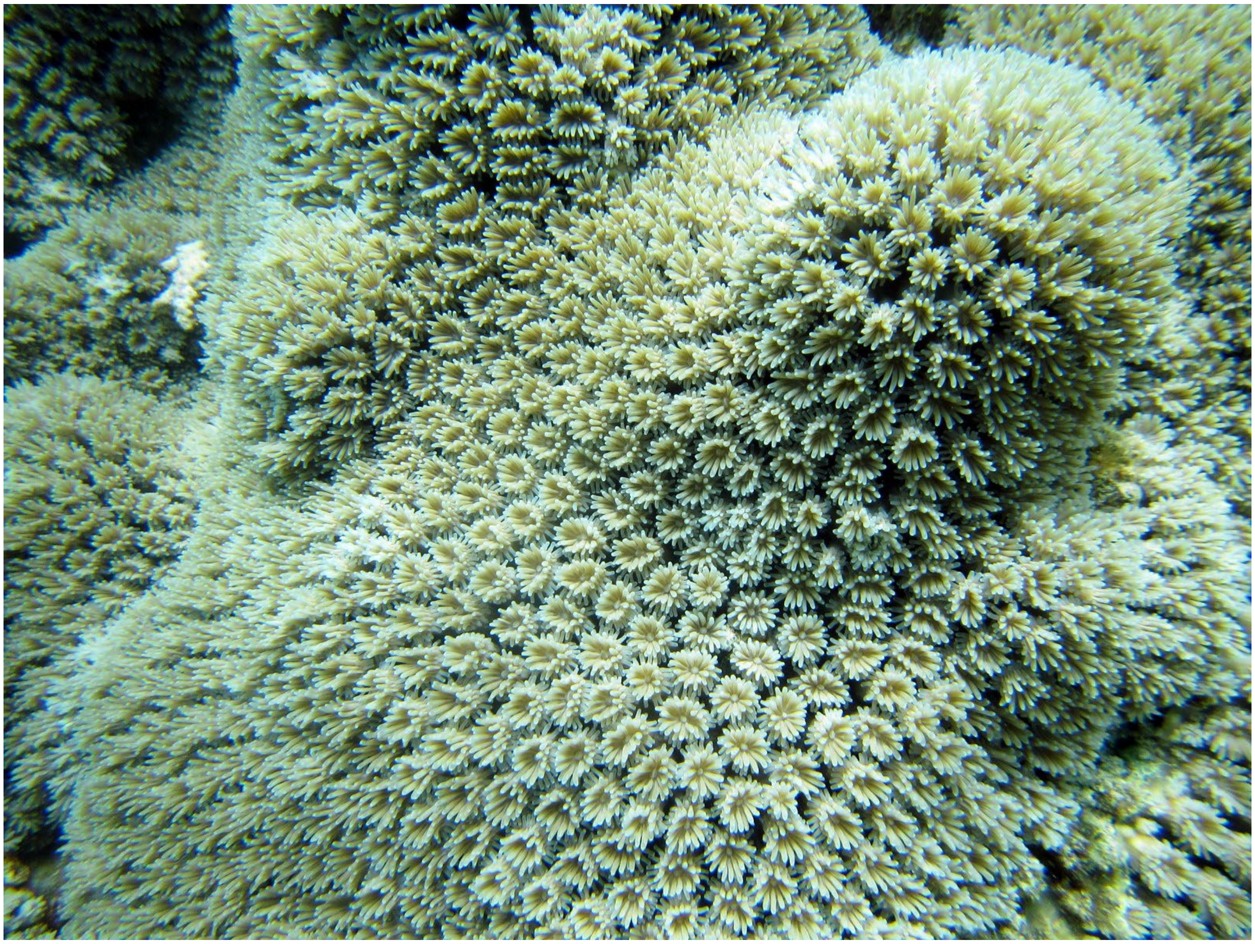
This genus forms encrusting, lumpy, or branching colonies with medium to small size corallites which often have septa which extend from the edge of the corallite as spines. This genus forms corallites about 3-10 mm diameter. This is the only genus of corals wth septa projecting as spines.

Galaxea fascicularis

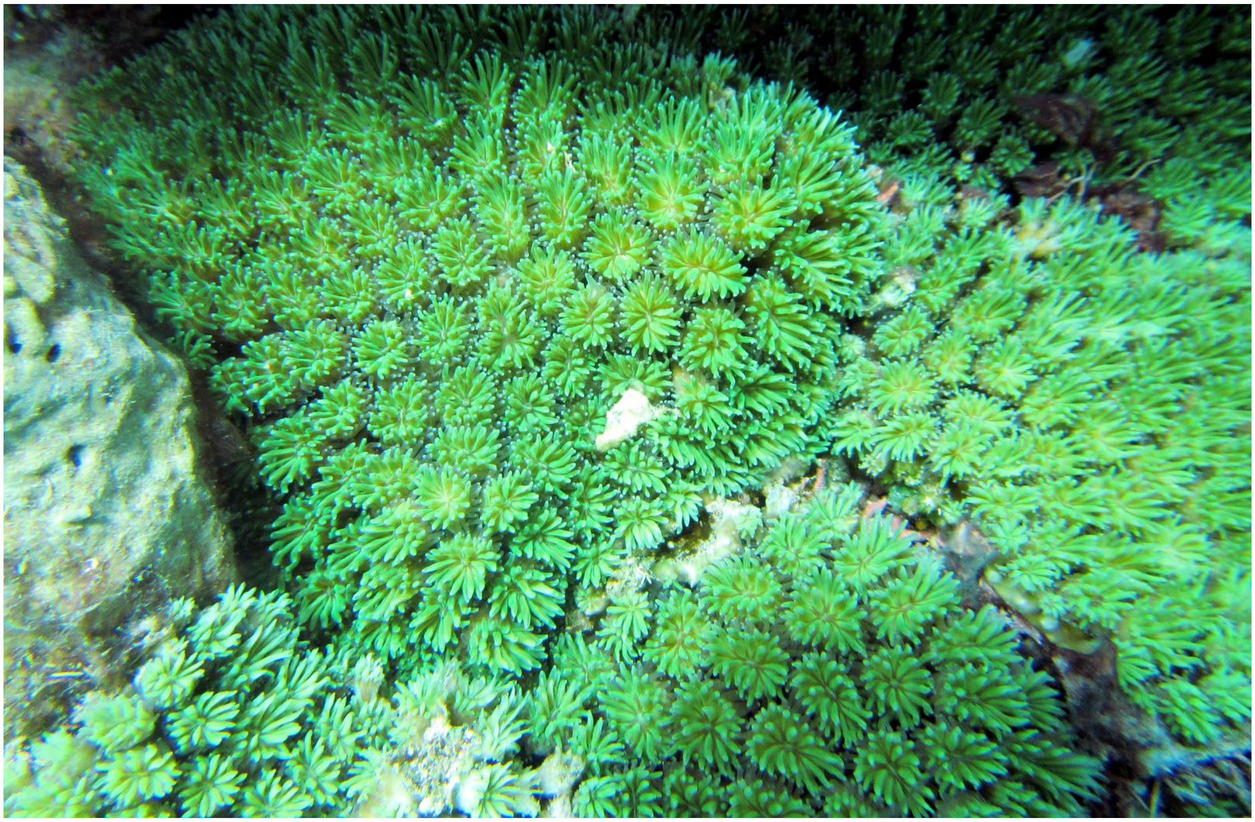
This species forms lumpy or encrusting colonies. The corallites are about the size of a finger tip and have a ring of septa extending from the edge of the corallites and tentacles often about the same length. Colonies are often tan or gray but can be fluorescent green. This is often the most common species of *Galaxea* and has larger corallites than *Galaxea astreata* and *Galaxea paucis*epta but sorter septa extending than *Galaxea longisepta*.



A colony of *Galaxea fascicularis*.



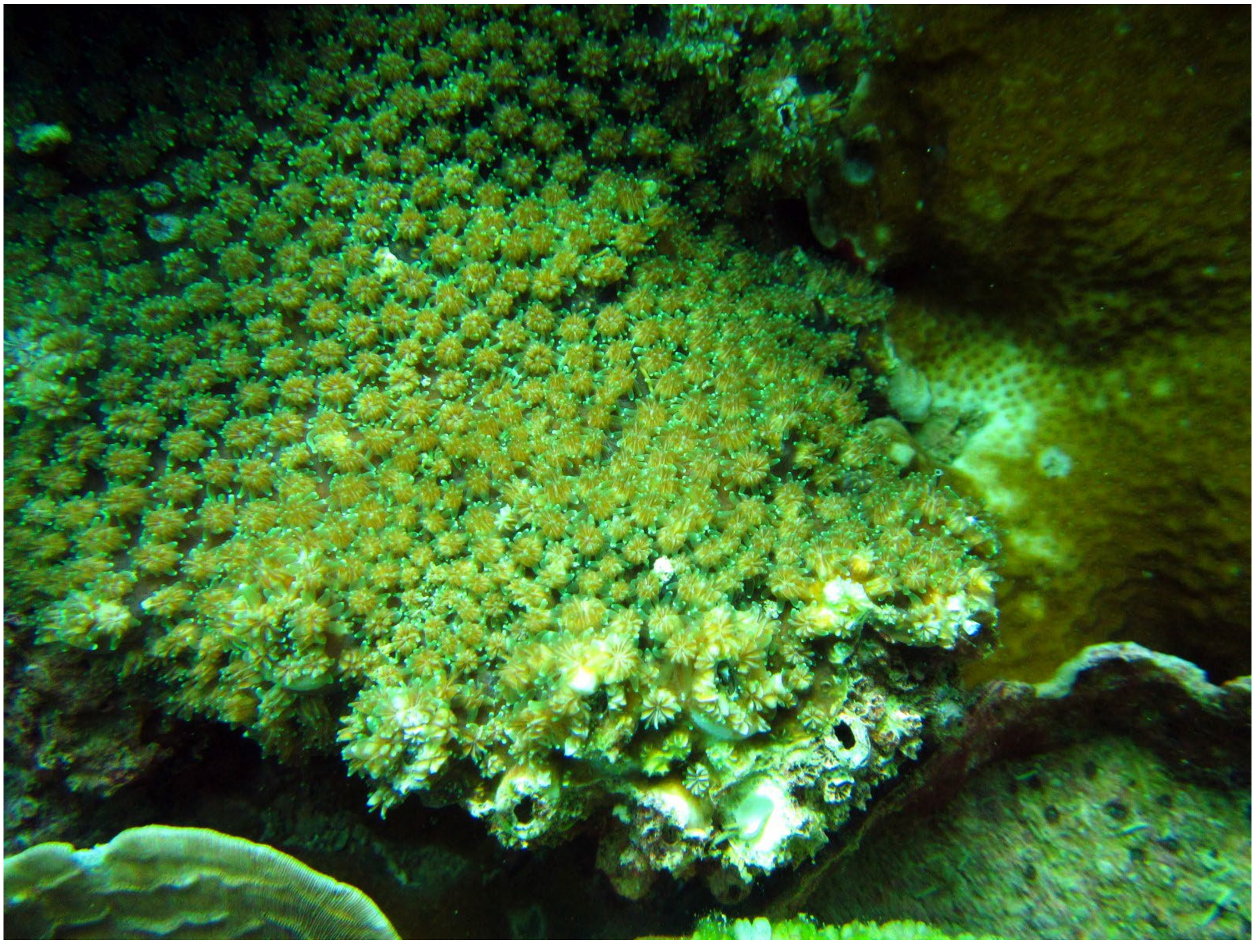
A closer photo of *Galaxea fascicularis*.



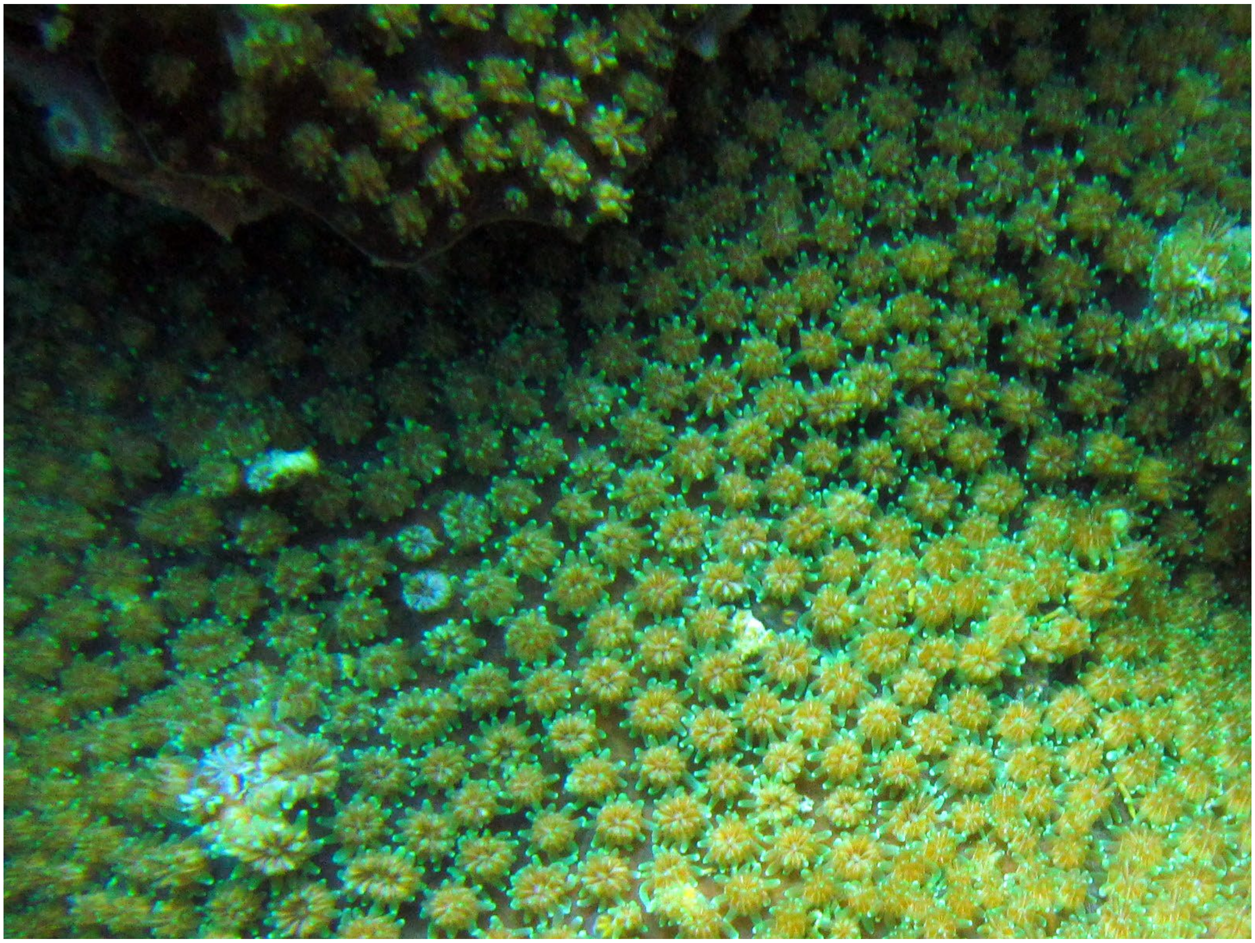
A close-up photo of *Galaxea fascicularis*.

Galaxea astreata *Vulnerable*

This species has small corallites about half the diameter of a little finger, which septa projecting around the rim of the corallites like spines. Corallites are smaller than on *G. fascicularis* but larger than on *G. paucisepta.*



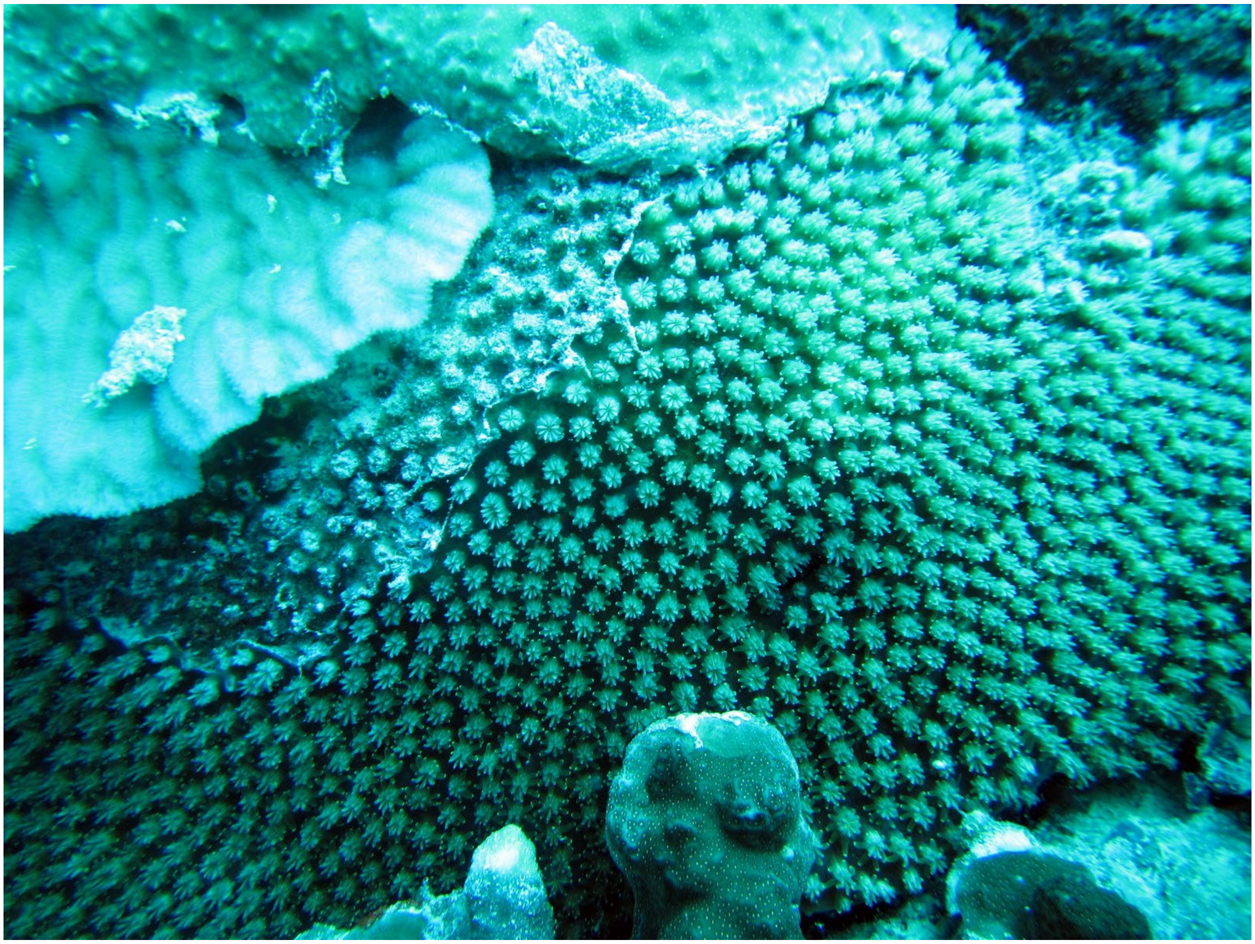
A photo of *Galaxea astreata*.



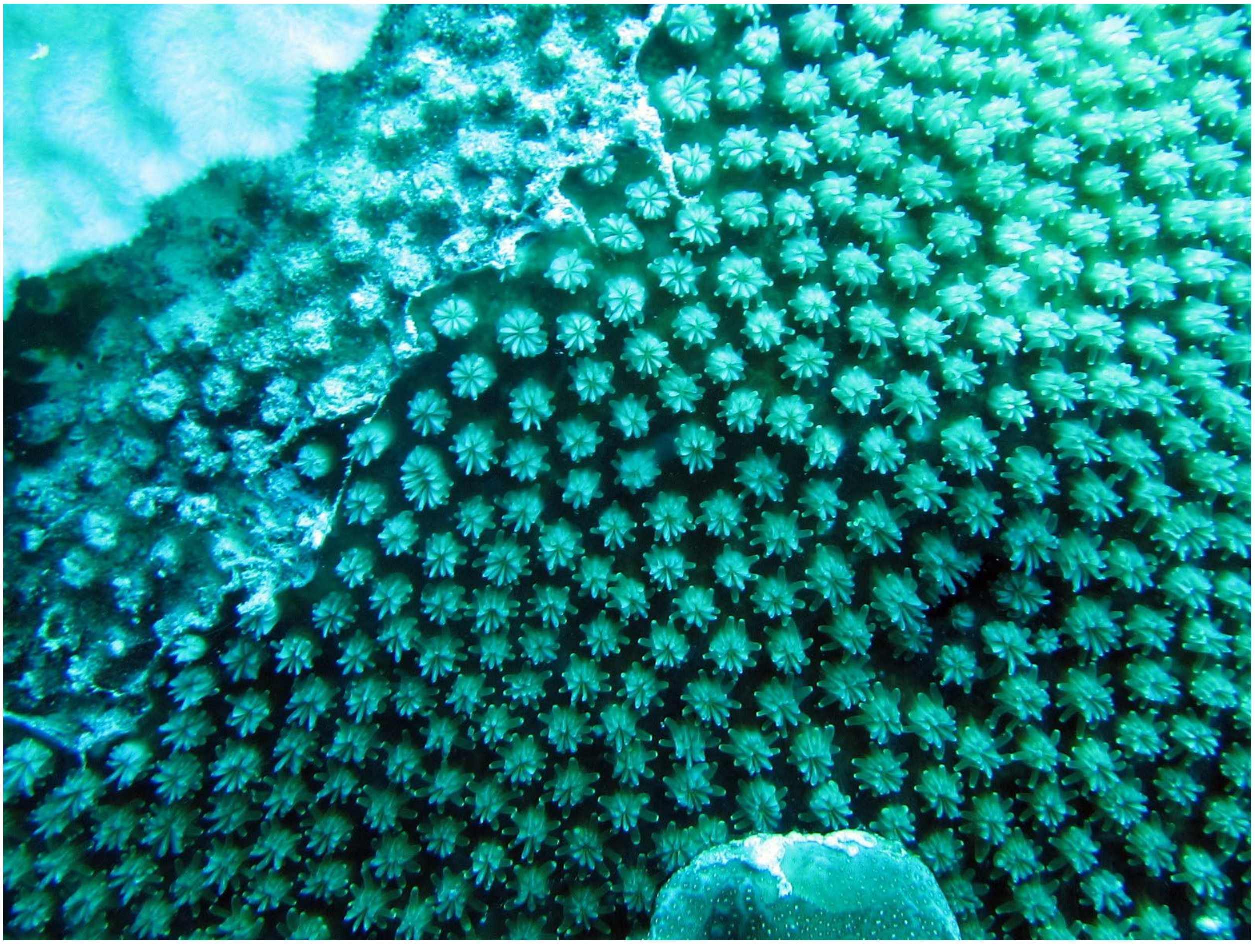
A close-up photo of *Galaxea astreata*. In this photo the tentacles radiate from corallites.

Galaxea paucisepta

Colonies are encrusting and have small corallites only about 2-3 mm diameter. Corallites are smaller than on *G. astreata* and *G. fascicularis*.



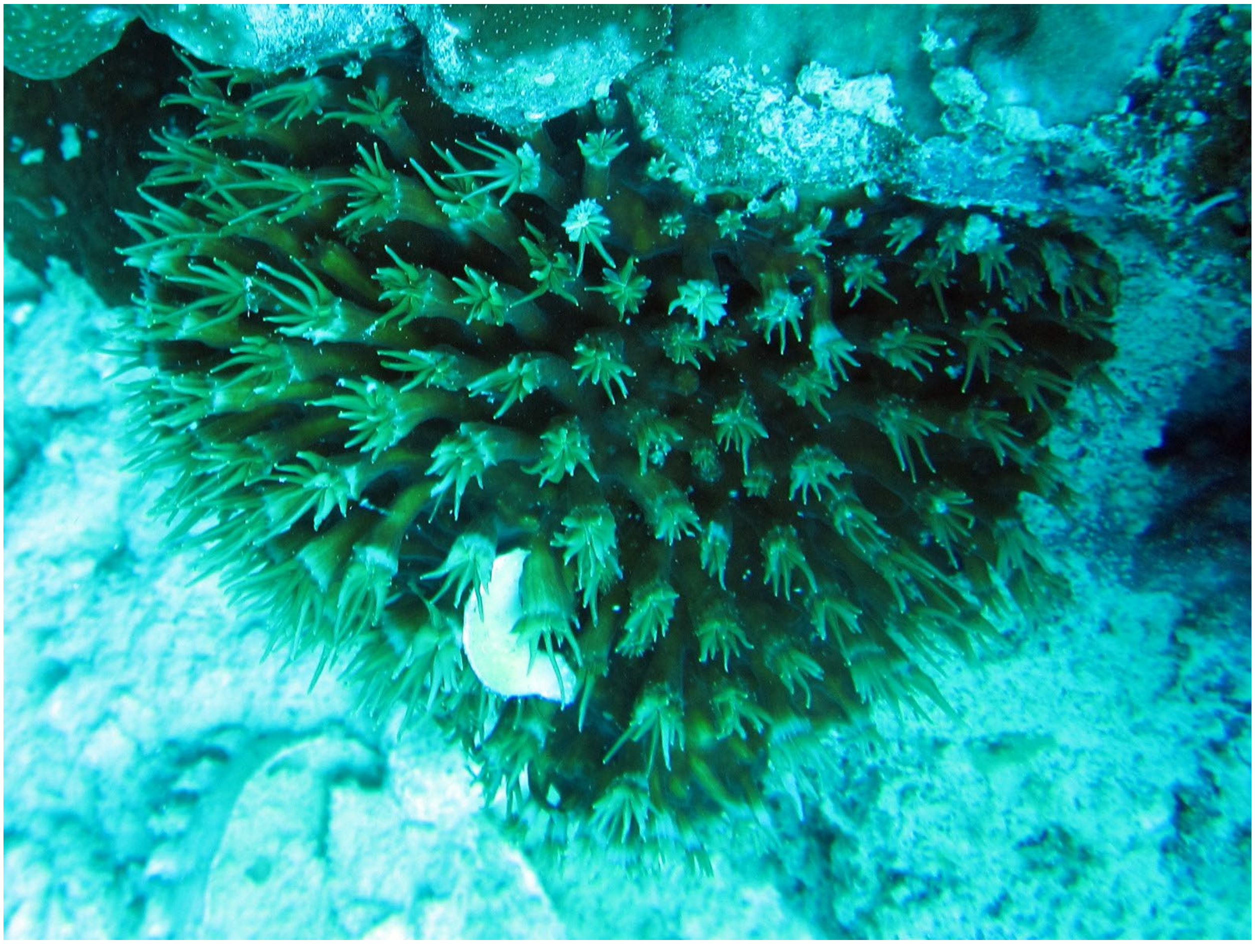
A photo of a *Galaxea paucisepta* colony.



A close-up photo of the corallites of *Galaxea paucisepta*.

Galaxea longisepta

Colonies are encrusting or may be thin overlapping plates. The corallites are small and may be variable in size within a colony. The corallites have very long septa extending as spines from the edges of the corallites. This species has corallites about the size of *Galaxea astreata*, but the septa extend much farther than any other encrusting species.



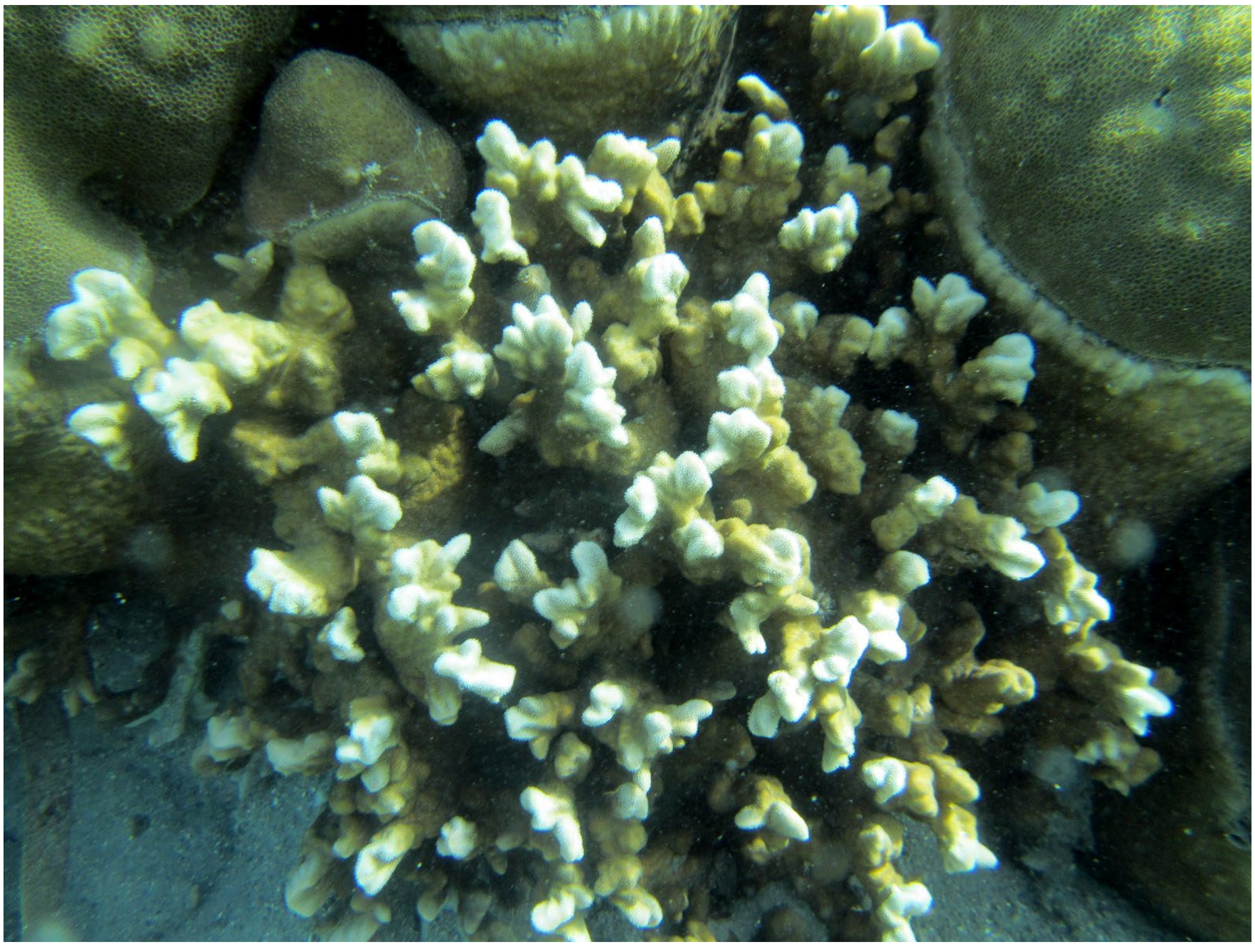
A close-up photo of a colony of *Galaxea longisepta*.

Psammocora

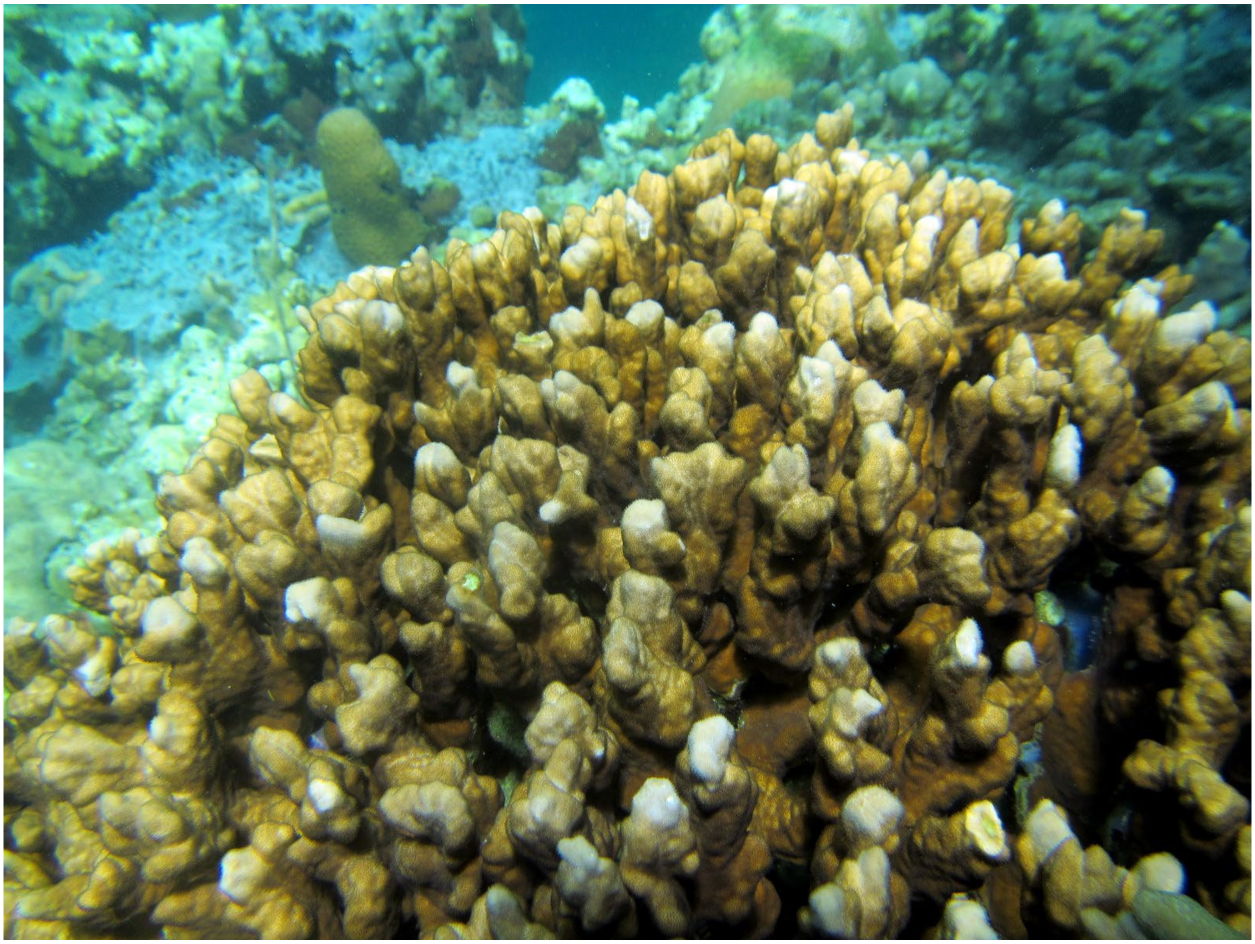
This genus has small corallites that in most species are flush with the surface and can't be distinguished underwater, though a few species have distinuguishable corallites. Colonies are encrusting, branching, columnar or massive.

Psammocora contigua

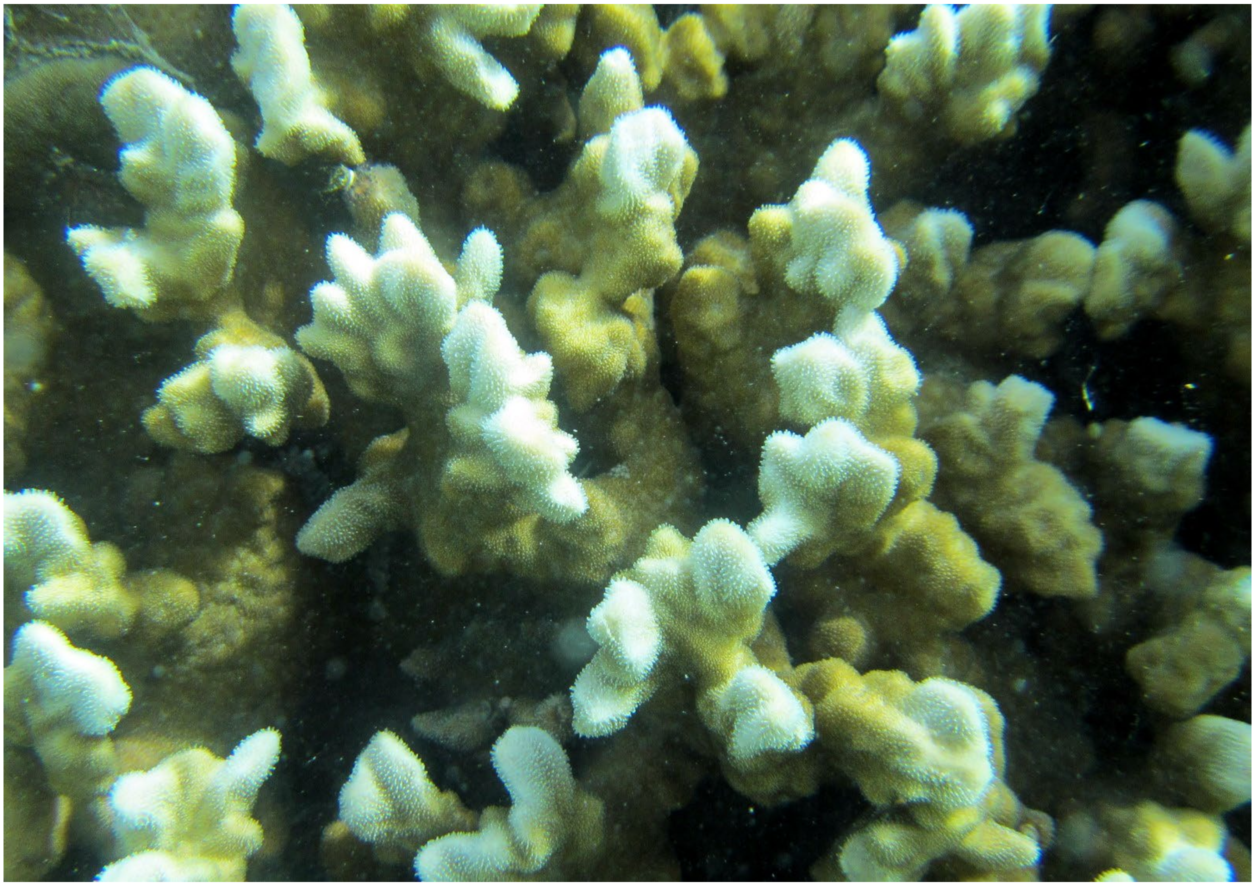
Colonies are branching, with irregular branches that are about 1 cm diameter. Surfaces have a very fine granular texture that may not be visible, but which is the tiny tentacles. Colonies are most often light brown with white branch tips, but may be green. Branching *Montipora* usually has polyps or corallites visible. The columns and corallites of *Psammocora haimiana* are much larger.



A typical colony of *Psammocora contigua*.



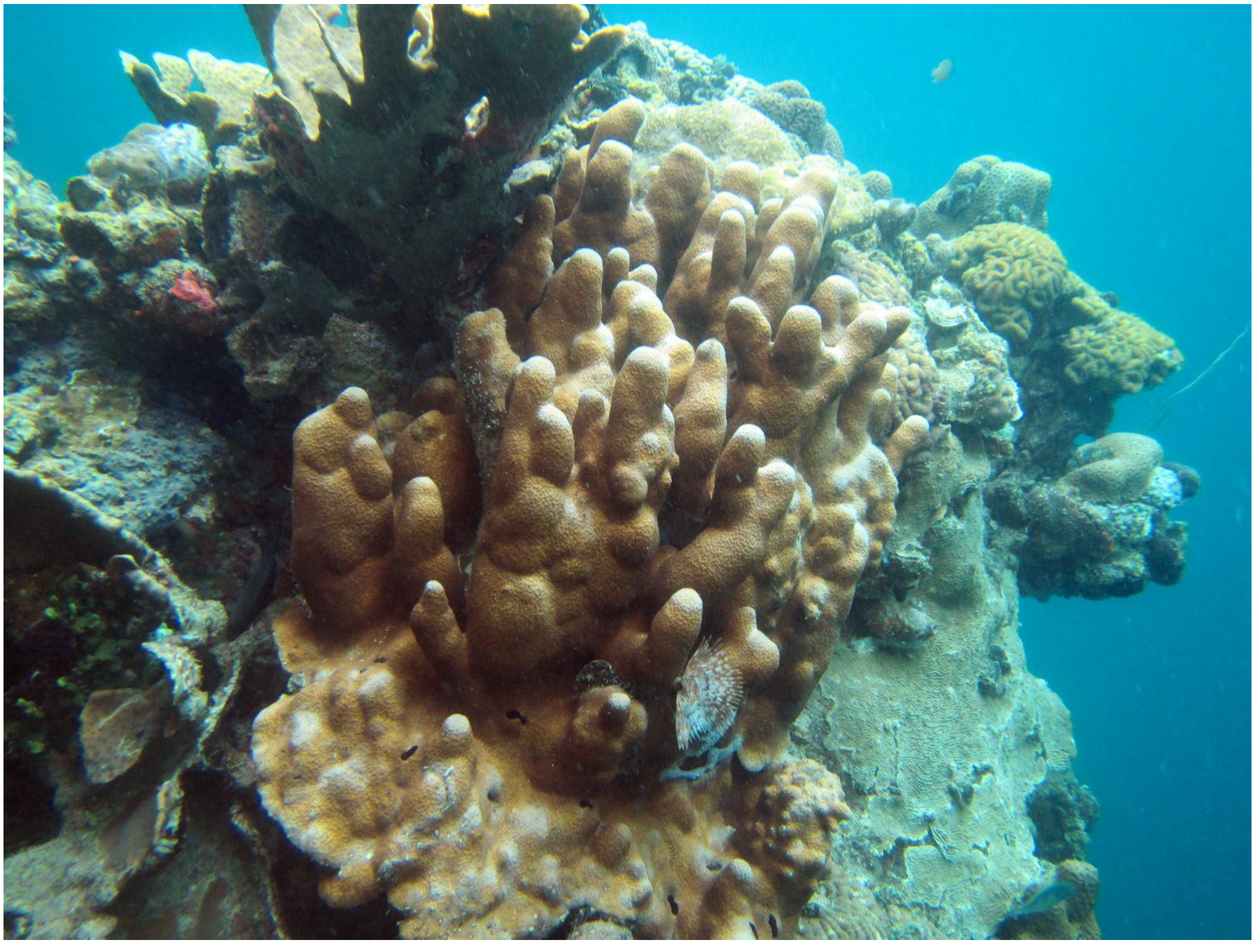
A colony of *Psammocora contigua* that is a bit more brown.



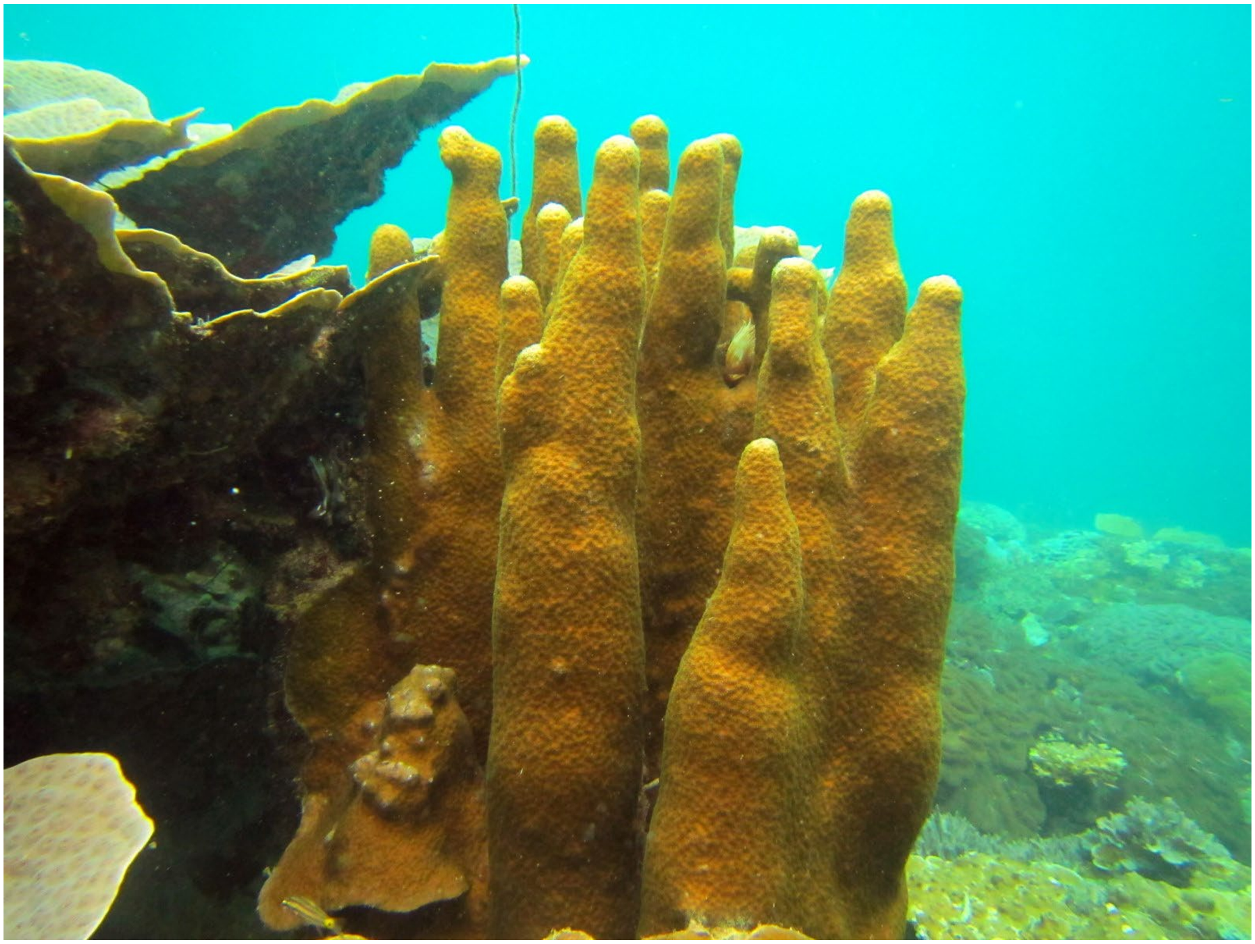
A close-up photo of *Psammocora contigua* showing the tiny tentacles.

Psammocora haimiana

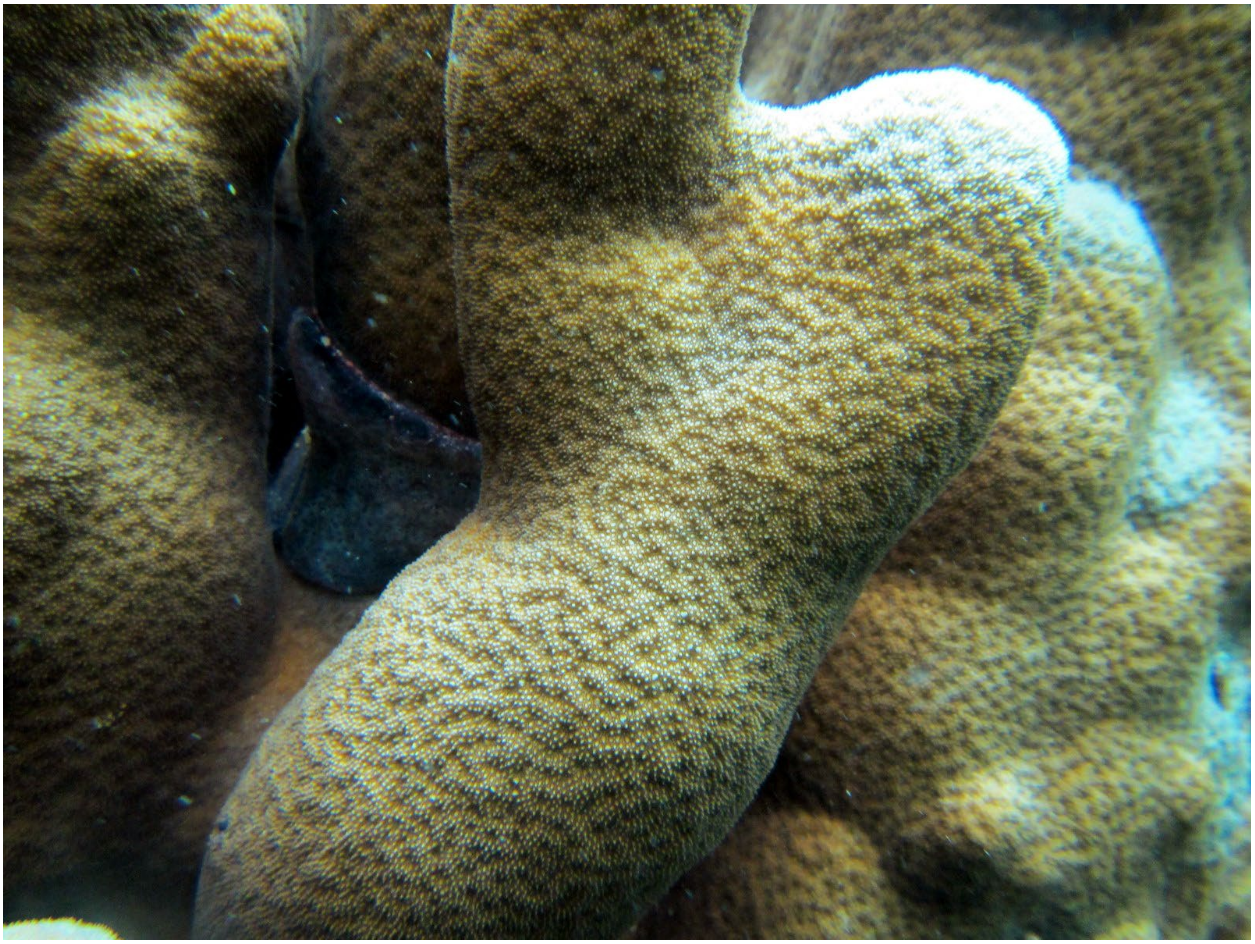
Colonies are columnar, more often not tapering than tapering. Corallites are visible as slight depressions and tiny granules and/or tentacles can be seen on the ridges between the depressions. The columns and coralltes are much bigger than the branches and corallites on *Psammocora contigua*.



Columns of *Psammocora haimiana* growing up from an encrusting base. Usually the columns are straighter than this.



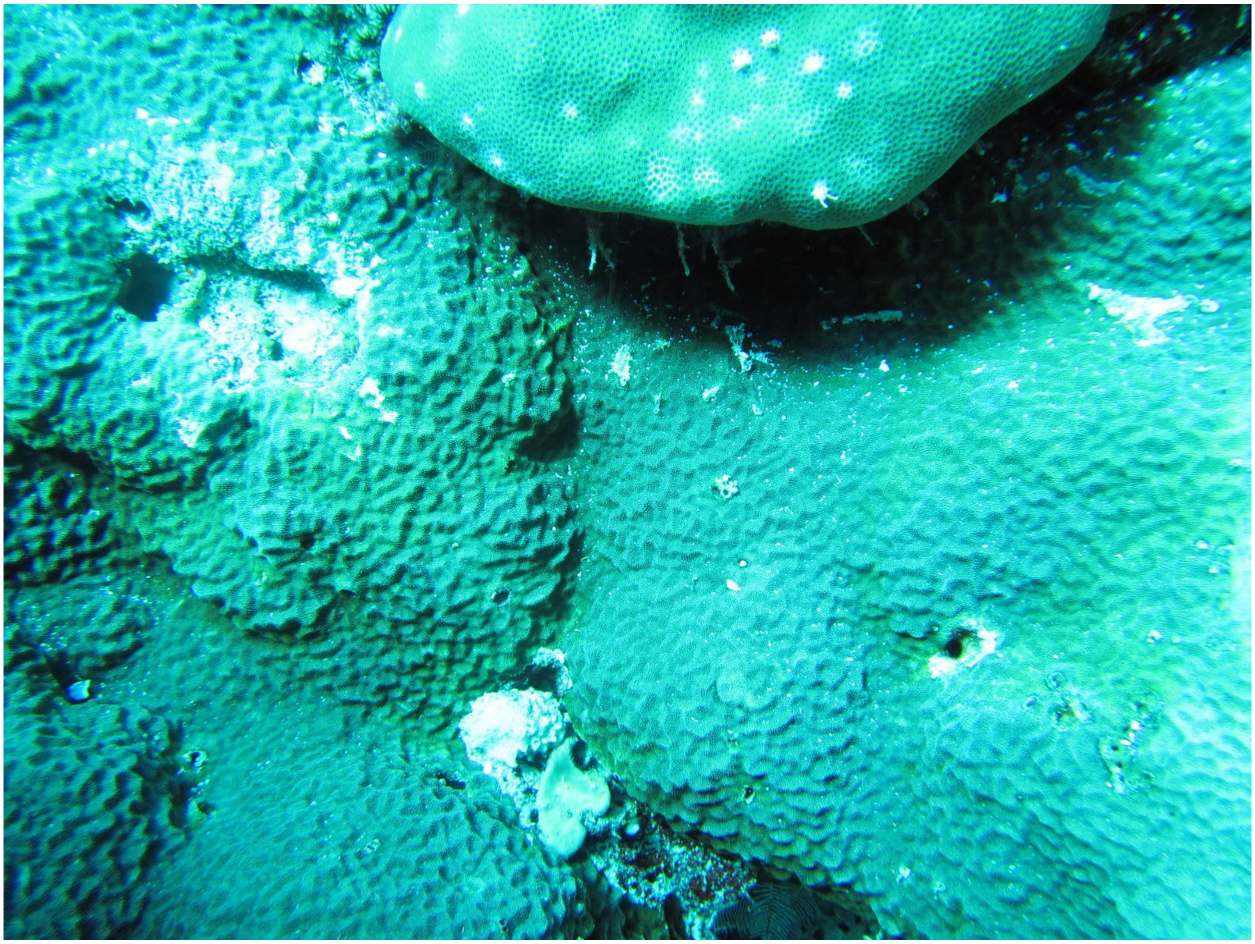
Tapering columns of *Psammocora haimiana*.



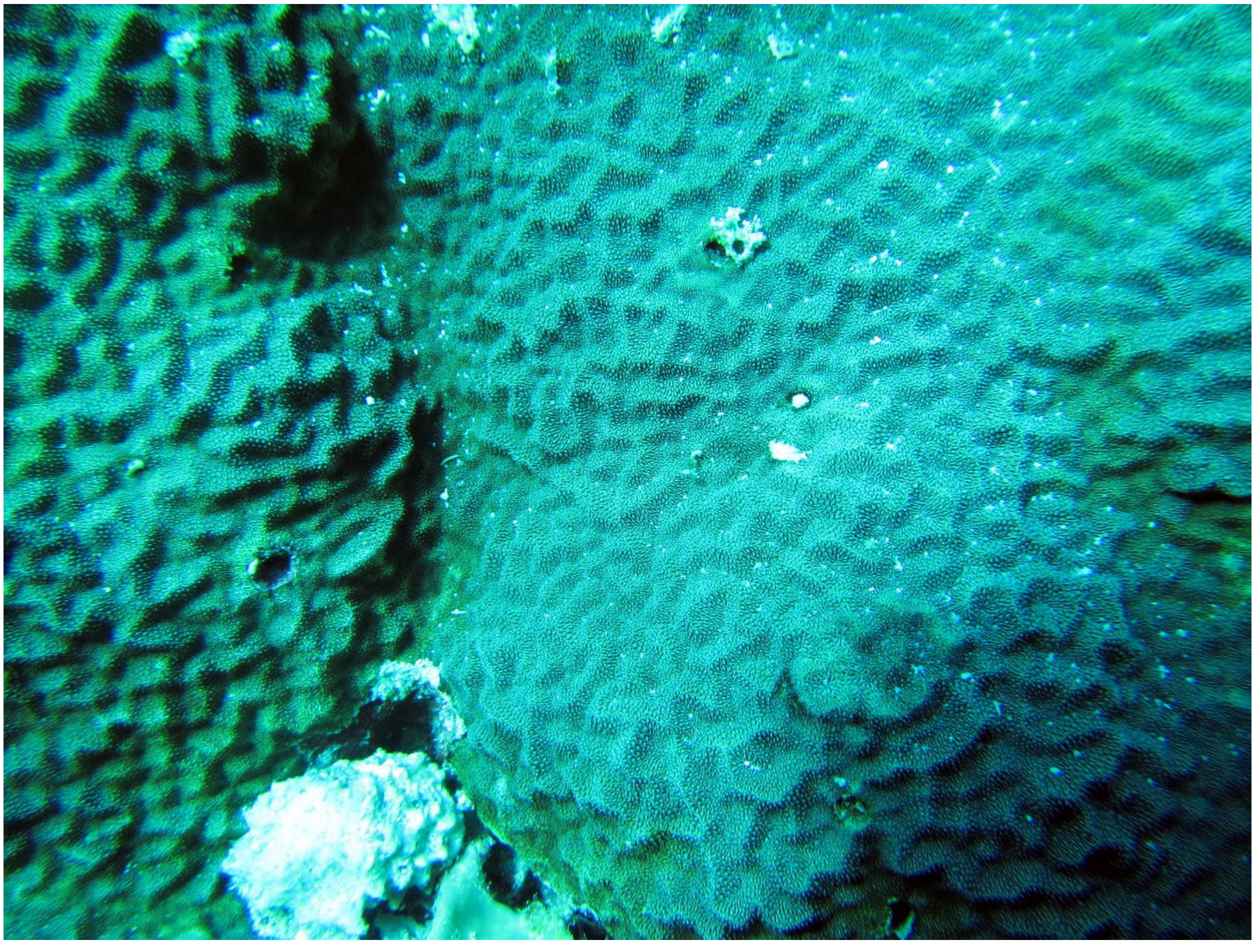
A close-up photo of the surface of *Psammocora haimiana*.

Psammocora nierstraszi

Colonies are encrusting with short ridges all over the surface. The surface has a fine granular appearance. The ridges do not connect and do not have septa running down their sides, unlike *Pavona varians*.



A colony of *Psammocora nierstraszi* showing the small ridges.



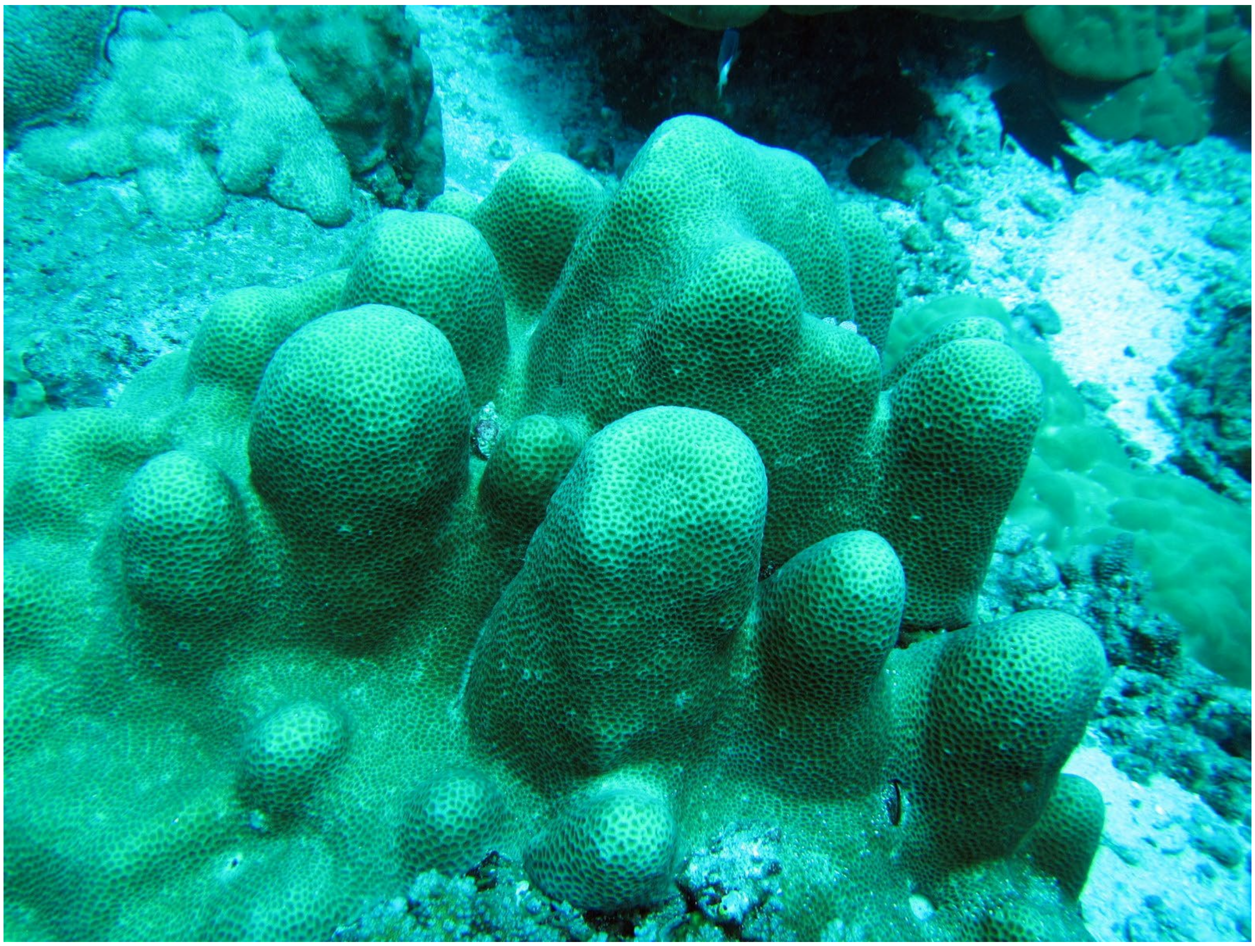
A close-up photo of *Psammocora nierstraszi* showing the ridges and the fine granular texture.

Coeloseris

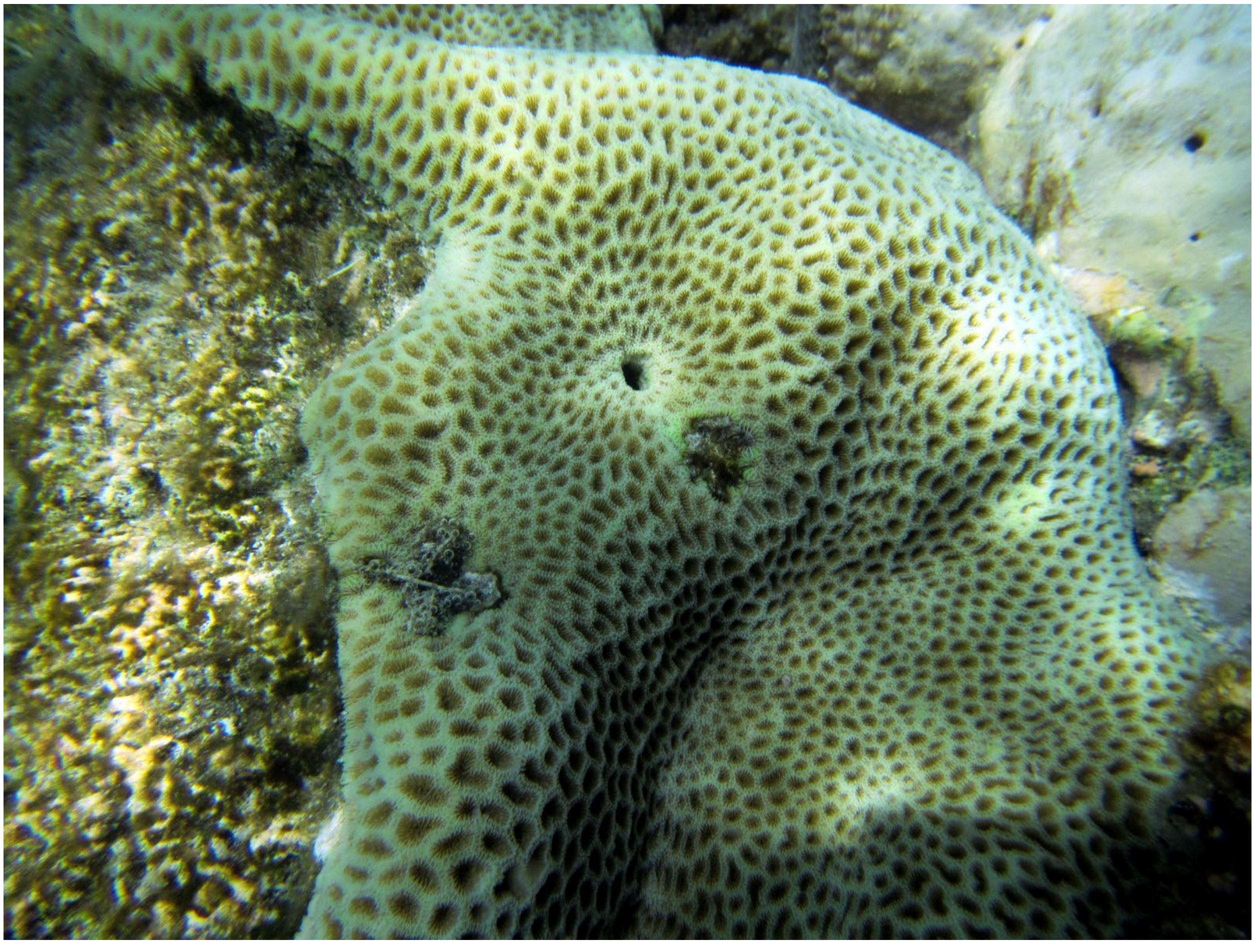
Colonies are massive with small corallites that share common walls that have flat tops. There is only one species.

Coeloseris mayeri

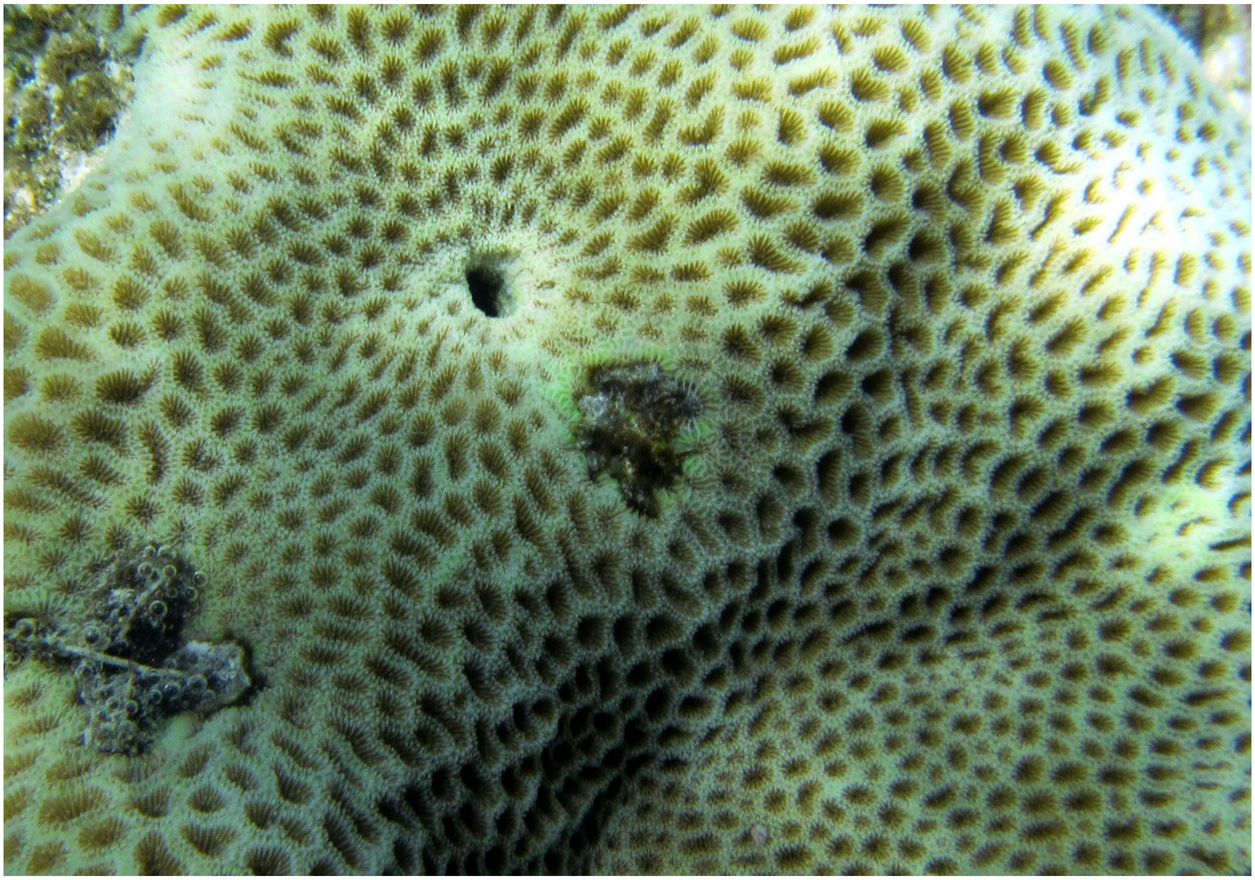
Colonies are massive. Corallites are small, 5 mm or less in diameter. Corallites share common walls which are thick and flat topped but do not have a groove separating them. Septa are on the edge of the corallite and very uniform. *Gardineroseris planulata* has a thinner wall between corallites. *Favia* and *Leptastrea transversa* have a groove between corallites, and *Favites* has a sharper ridge between corallites.



A columnar colony of *Coeloseris mayeri*.



A closer photo of *Coeloseris mayeri*.



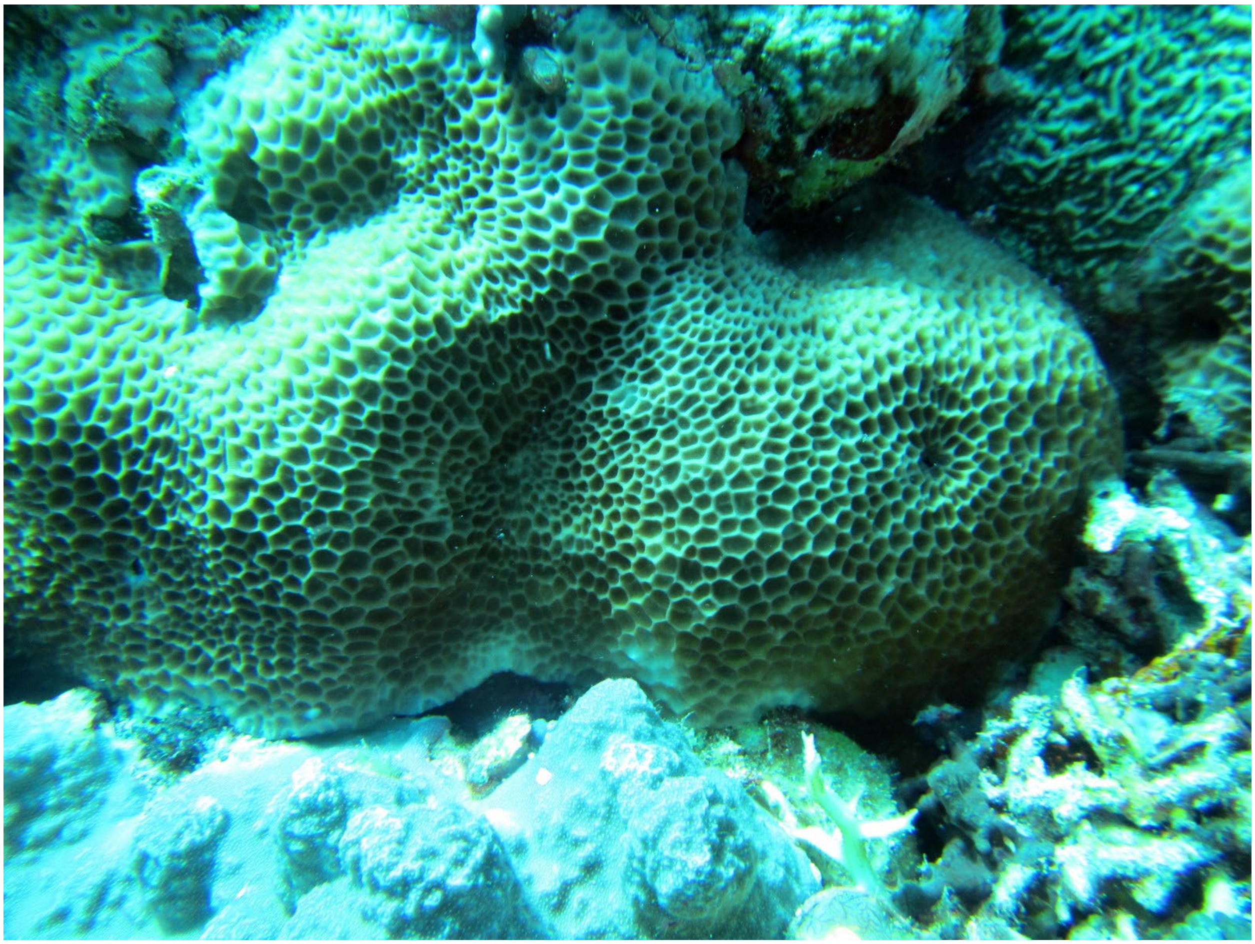
A close-up photo of *Coeloseris mayeri* showing the corallites with the flat topped ridges between them.

Gardineroseris

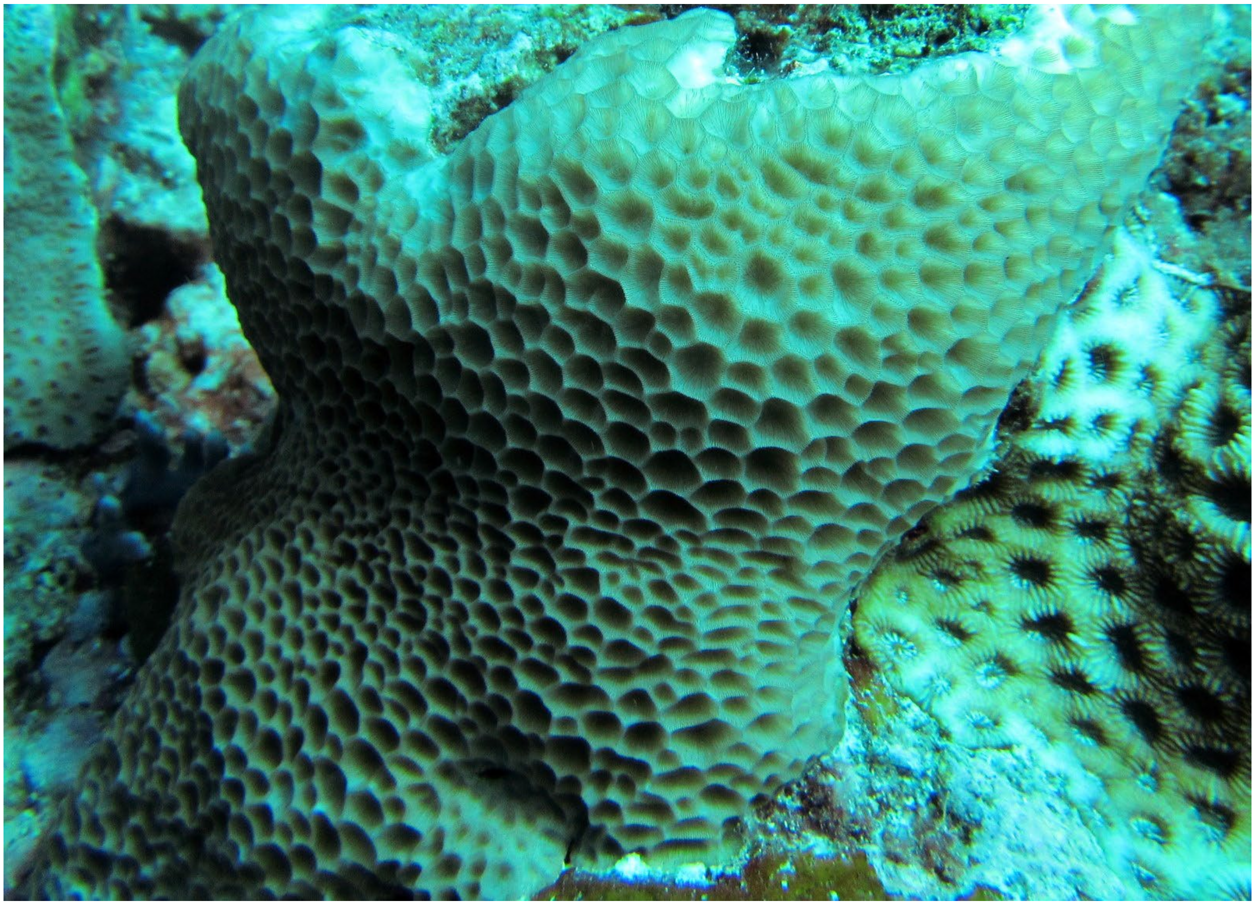
This genus forms massive, sometimes lumpy, colonies with small corallites that have very sharp walls dividing them. Colonies look like honeycomb except that the corallites are variable in size. There is only one species in the genus.

Gardineroseris planulata — *Honeycomb coral*

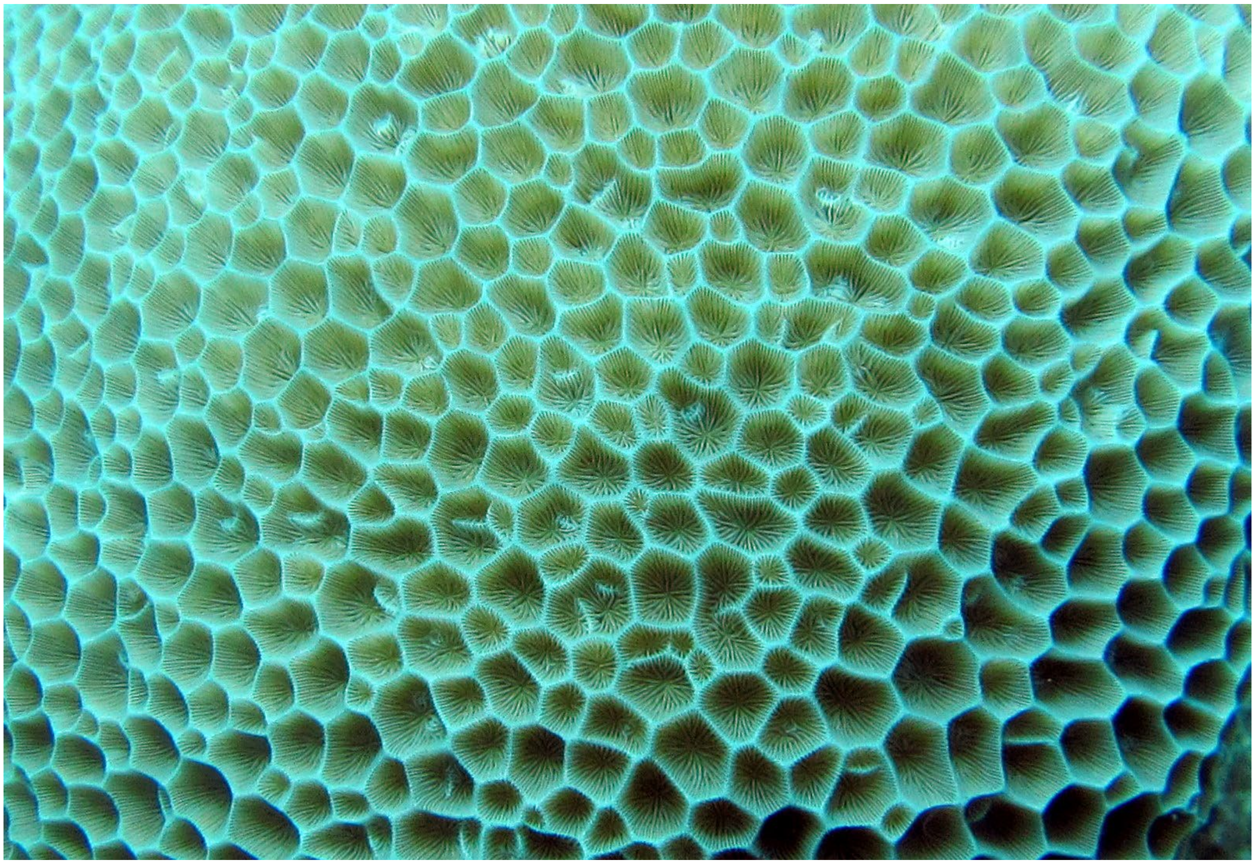
Colonies are massive and may be lumpy. Colonies look like honeycomb with small corallites separated by very sharp walls. The septa are so small and uniform that the inside of the corallites looks smooth (and deep). The corallites vary in size. Colonies can be yellow, brown, or green.



A colony of *Gardineroseris planulata*.



A closer photo of a colony of *Gardineroseris planulata*.



A close-up photo of *Gardineroseris planulata* in which the septa can be seen.

Pavona

Colonies are branching, massive, encrusting, or form plates. There are no colony features common to species in this genus, but corallites usually have little or no walls and always have septa that continue between corallites as what are called “septo-costae.” *Leptoseris* is similar but is more often plating, and is usually found in low-light conditions not out in full sunlight like *Pavona*.

Pavona cactus — *Potato Chip Coral*

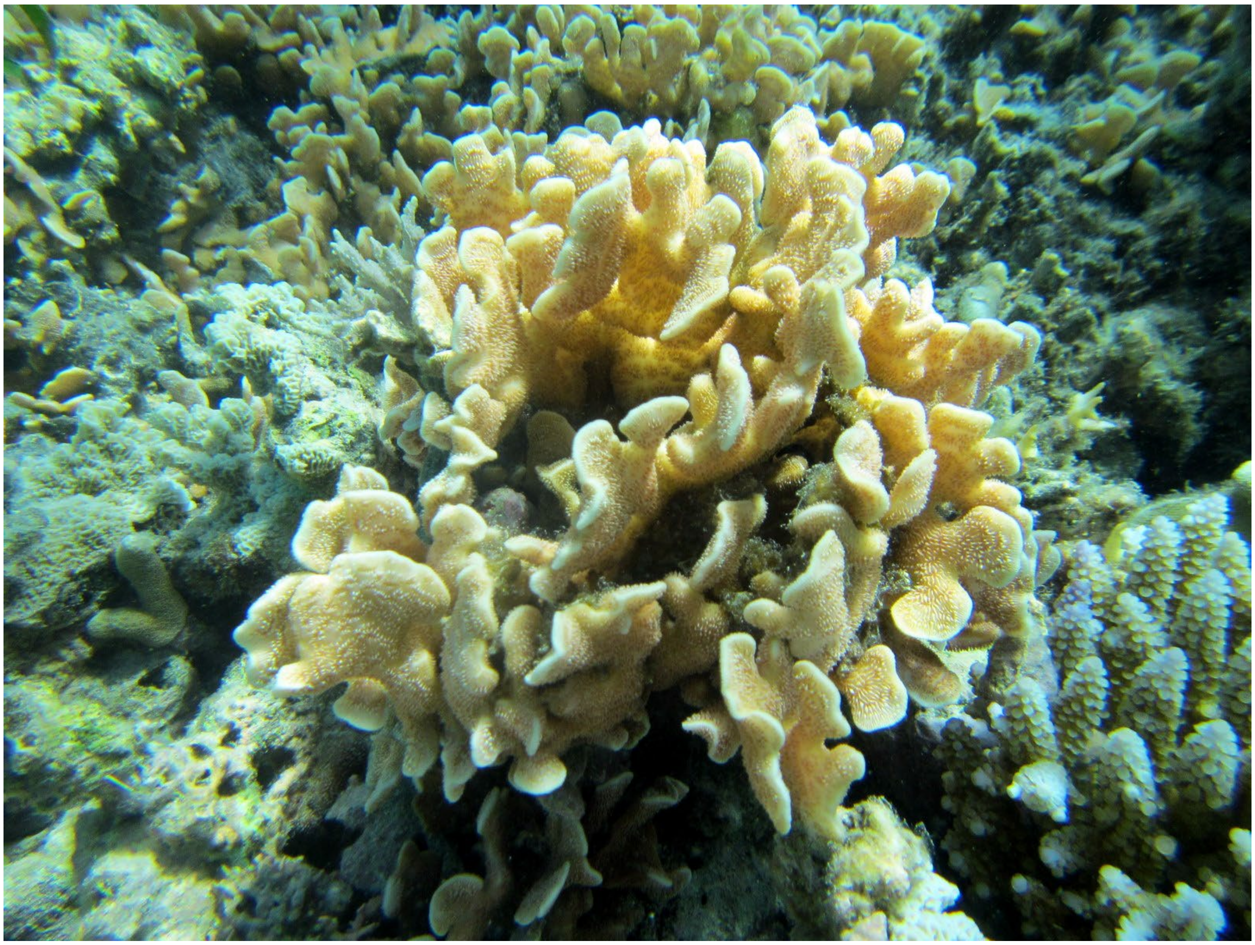
Colonies are small thin plates that project upward and are often curved or twisted. Both sides are nearly smooth but have tiny corallites that are indented very little if any and usually near impossible to see underwater. Colonies can make thickets, which are usually small. The plates are much larger than on *Leptoseris papyracea*. The plates are thinner and the corallites much smaller than on *Pavona decussata*.

A colony of *Pavona cactus*.

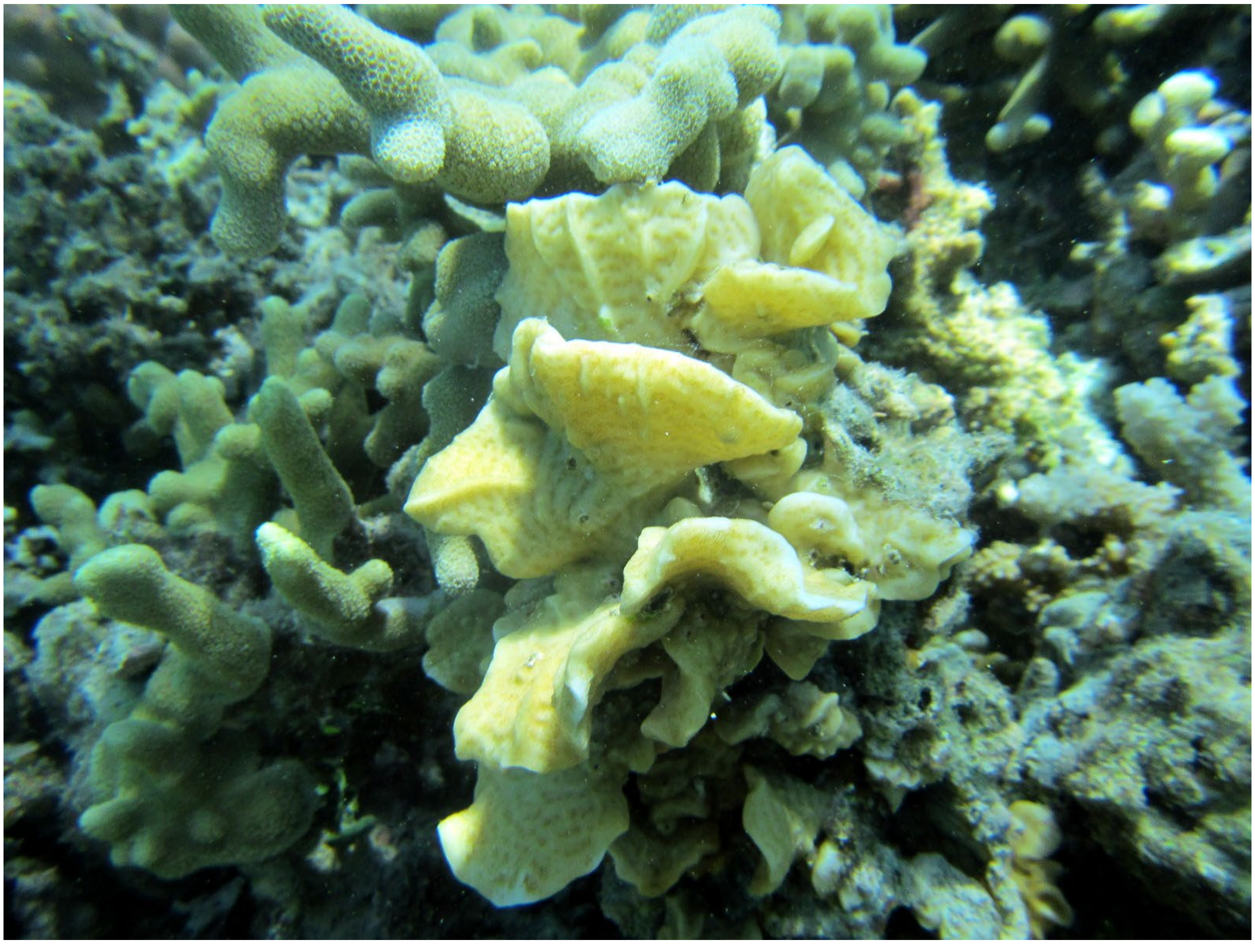
A colony of *Pavona cactus*.

Pavona decussata *Vulnerable*

Colonies form thick plates that can range from small to at least 15 cm across. The plates are usually vertical, usually not curved or twisted, and intersect infrequently. Although corallites are small, they are readily visible and may have short tentacles extended. Here they are tan but some other places they can be darker brown or green. The plates are thicker than on *Pavona cactus* and the corallites larger. There are many fewer side plates than on *Pavona frondifera* and so it doesn't look crinkley, and the plates can be much larger.



A colony of *Pavona decussata*.

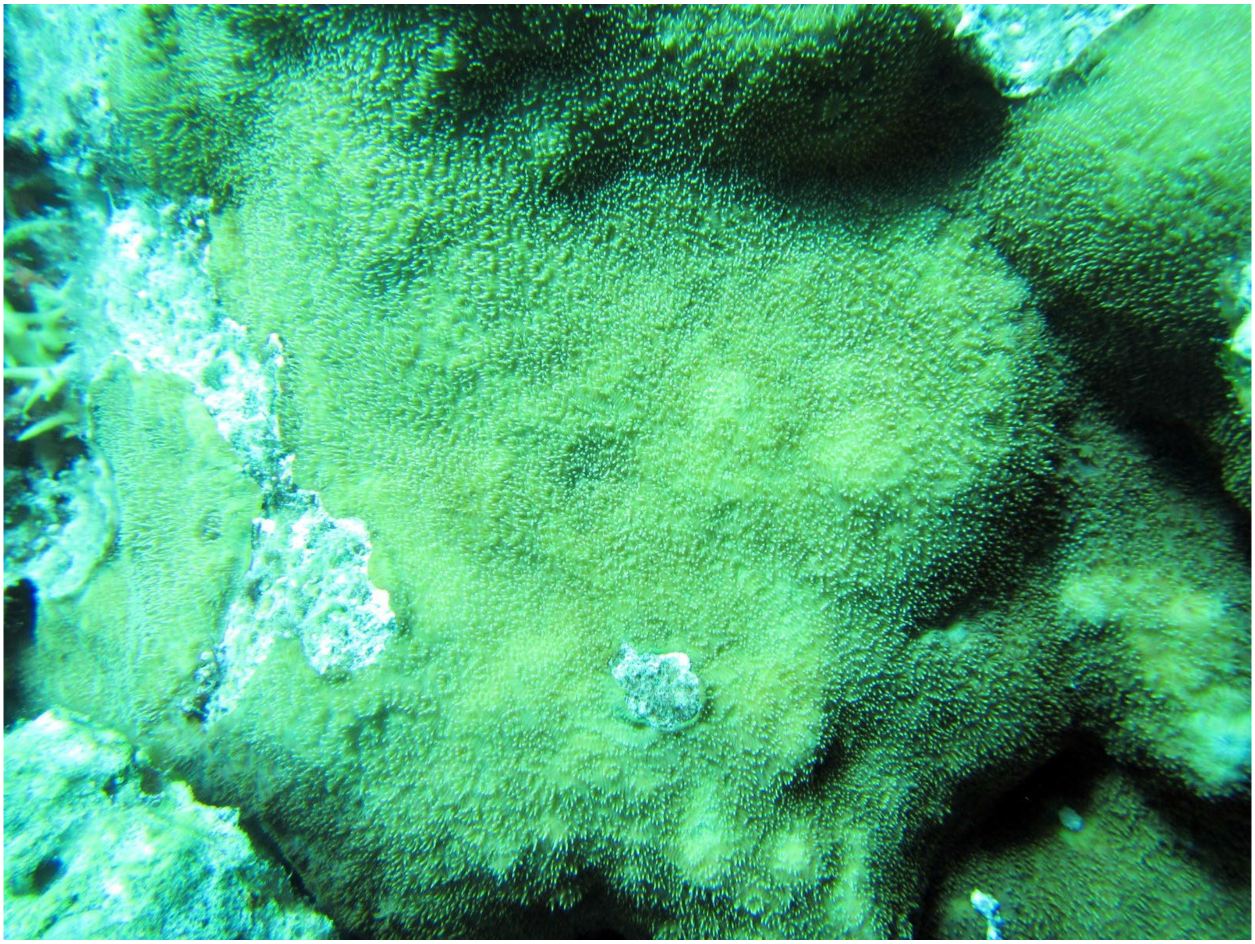


A colony of *Pavona decussata* with larger plates.

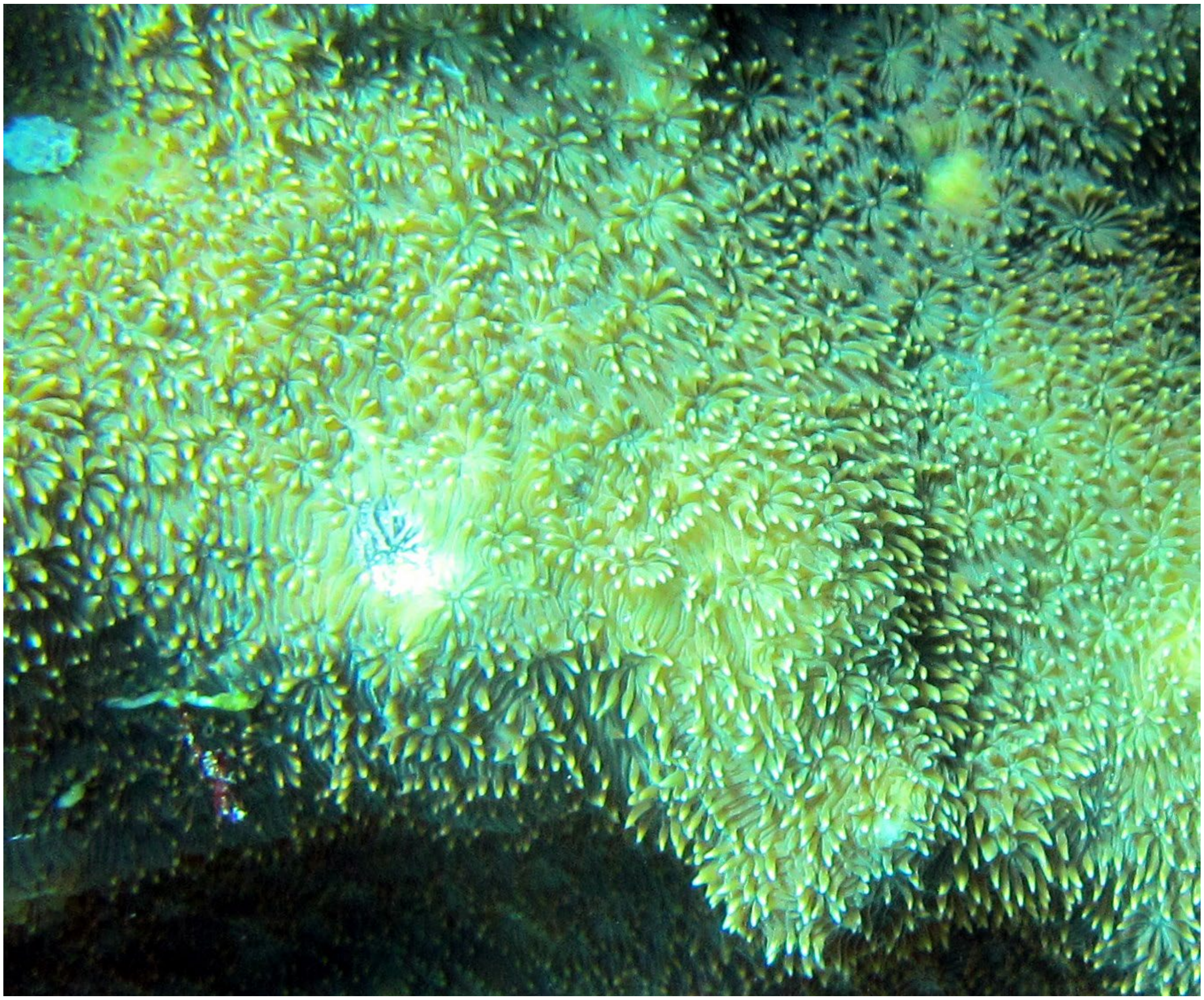
A close-up photo of *Pavona decussata* showing corallites and septa.

Pavona explanulata

Colonies are encrusting and may have plate edges. Corallites are small and may have tentacles extended as a ring. If the tentacles are retraced then septo-costae can be seen running between shallow corallites, with a ring of short septa blades around corallites. Colonies are encrusting with plate edges unlike most *Pavona*. It is not massive like *Pavona gigantea,* which has similar corallites.



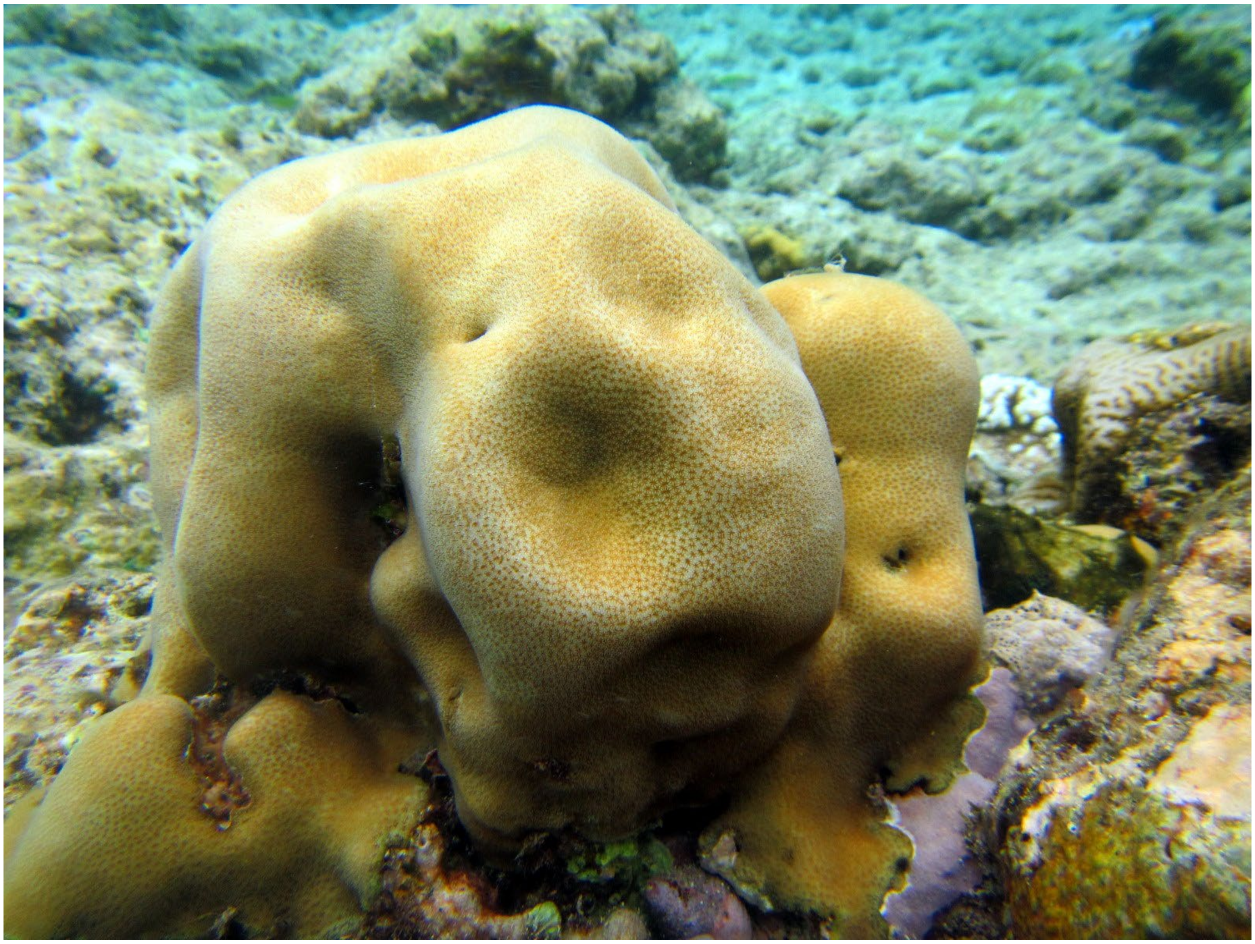
A colony of *Pavona explanulata*.



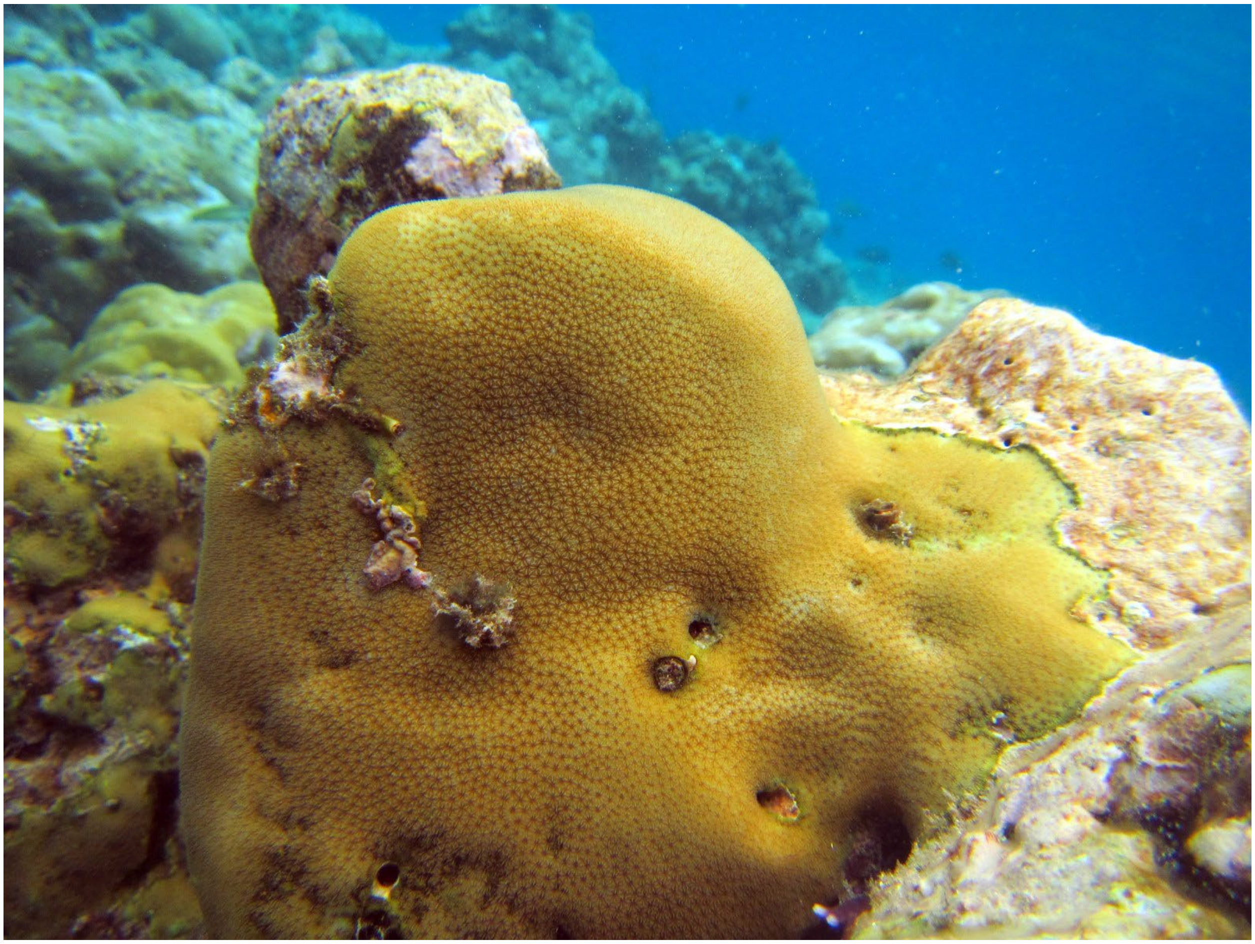
A close-up photo of *Pavona explanulata*.

Pavona duedeni

Colonies are massive, and often form thick vertical walls. Corallites are tiny, about 2 mm diameter, and can be difficult to see. *Pavona bipartita* has larger corallites and does not form thick vertical walls.



A colony of *Pavona duerdeni*.

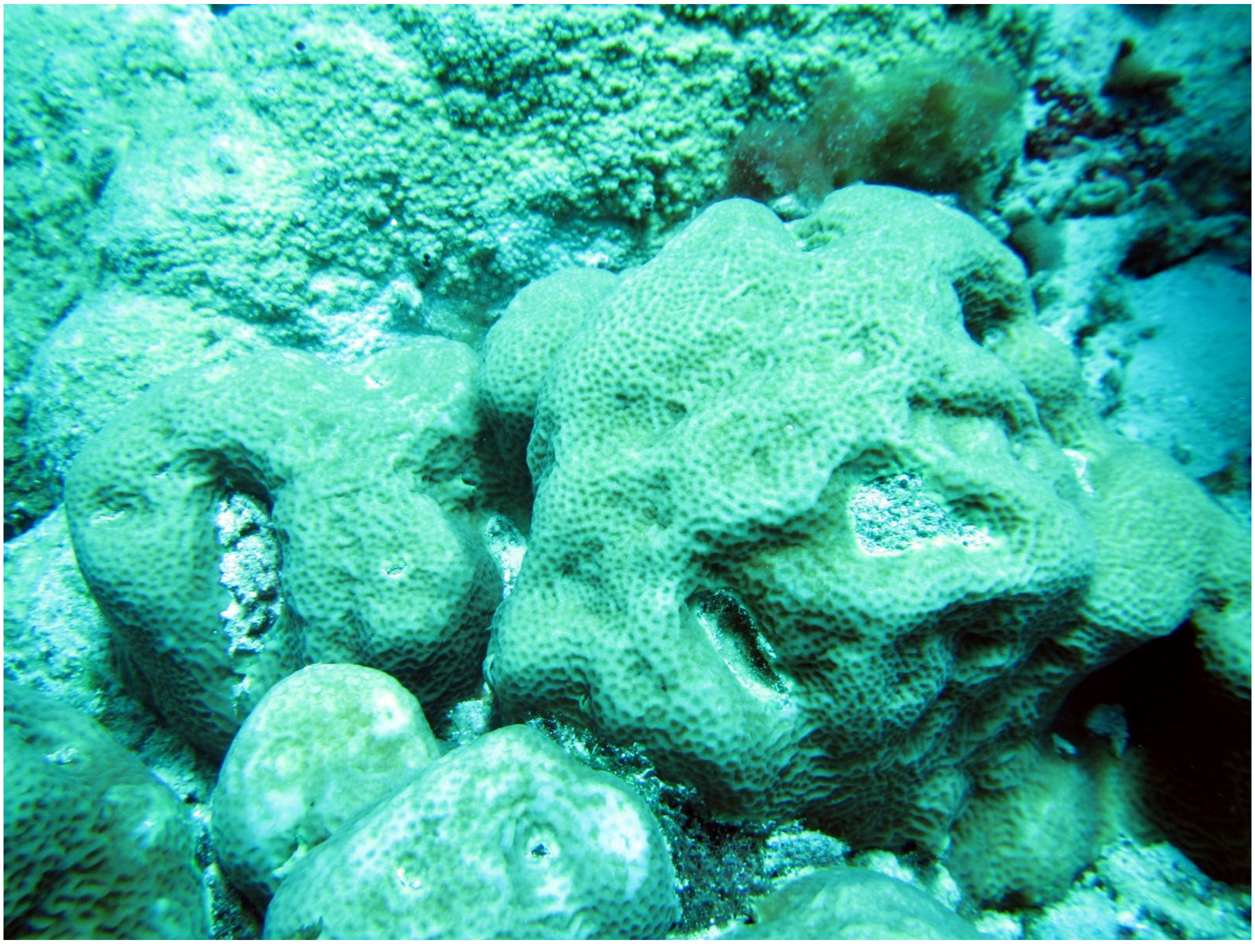


A colony of *Pavona duerdeni*.

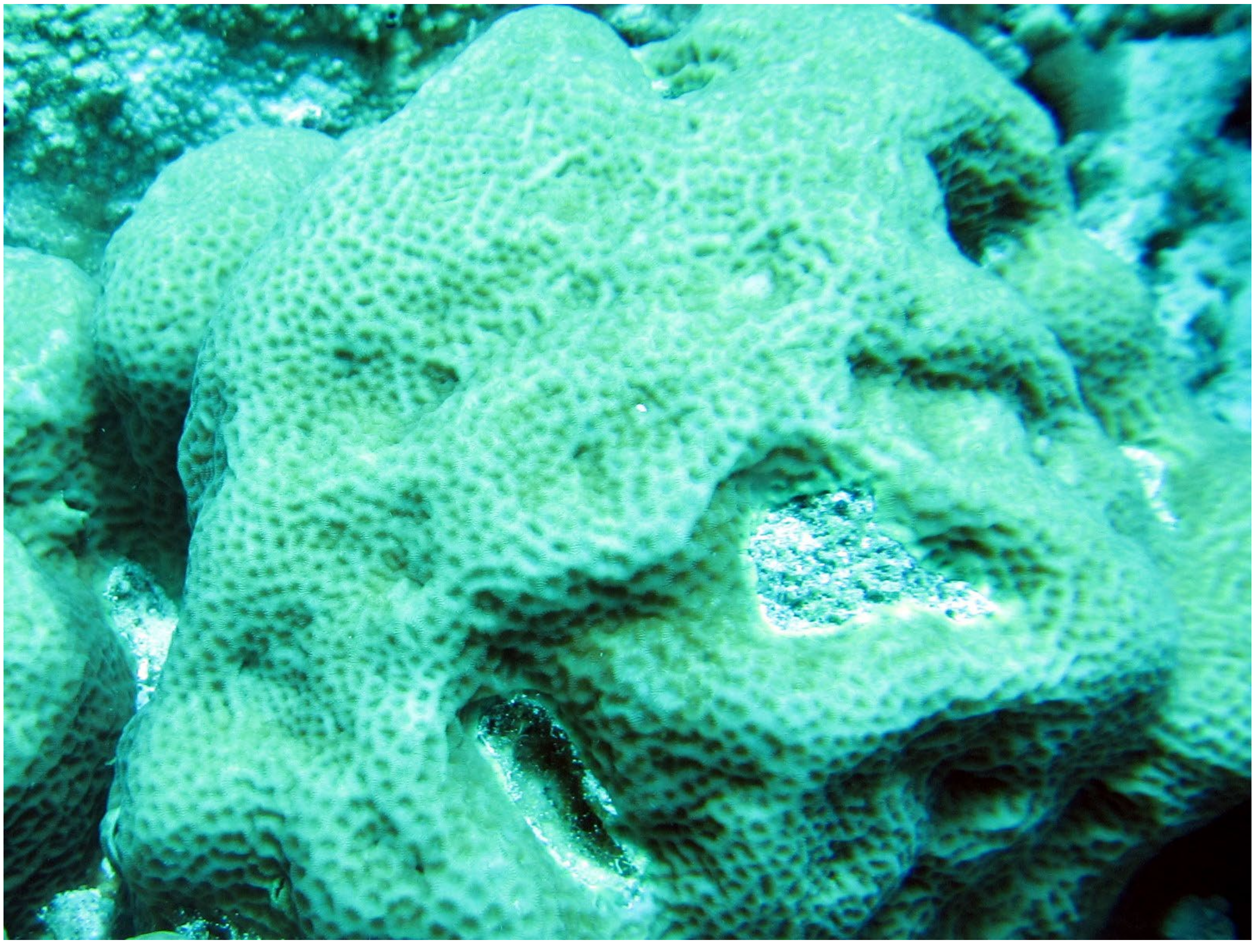
A close-up photo of *Pavona duerdeni*.

Pavona bipartita *Vulnerable*

Colonies are irregular lumps and may have encrusting areas between lumps. The corallite centers are tiny dimples in the colony surface. *Pavona clavus* has almost identical corallites but forms cylindrical columns. Colonies are usually tan or brown.



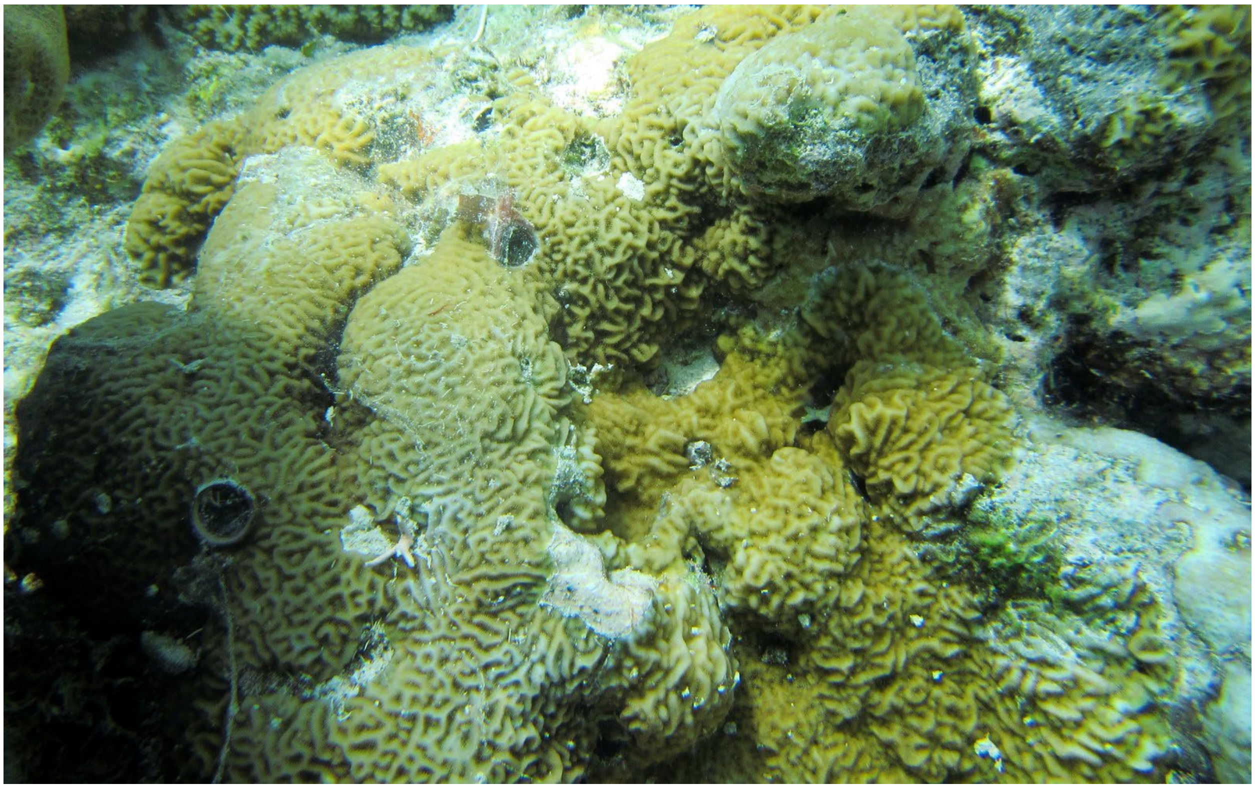
A *Pavona bipartita* colony. The green color is because of the camera.



A close-up photo of *Pavona bipartita*.

Pavona varians

Colonies are usually encrusting but may have plate edges. Colonies are covered with small ridges which wind and meander over the surface, so it could be called meandroid or a “brain coral”. Tiny ridges on the sides of the small ridges can be seen in close-up photos, and are septa. The corallite centers are between the ridges. Colonies are usually brown. *Psammocora nierstraszi* has more rounded ridges that usually don’t connect. *Pavona chiriquiensis* is nearly identical to this species, but has the ridges broken into short sections as lumps. This is likely to be a species complex.

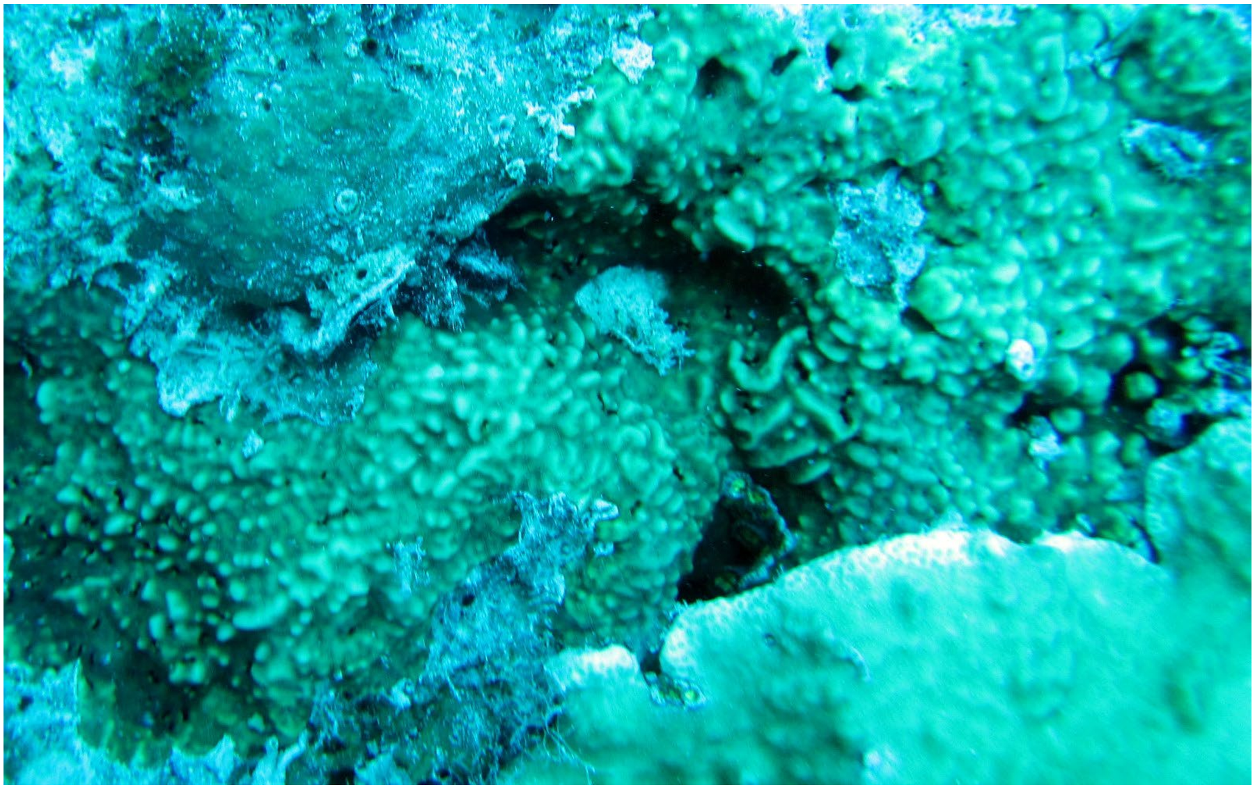


A colony of *Pavona varians*.

A close-up photo of *Pavona varians*.

Pavona chiriquiensis

Colonies are encrusting. The surface has short ridges and bumps. Identical to *Pavona varians* except that the ridges are divided into bumps.



Pavona chiriquiensis

Pavona venosa *Vulnerable*

Colonies are lumpy and the surface is covered with thin, sharp ridges that divide the surface into corallites. So corallites share a common (thin) wall, and there is no groove separating corallites. Corallites are more irregular in outline than on *Gardineroseris* or *Goniastrea* and the color is golden. The ridges have sharper edges than *Psammocora profundacella*.

A colony of *Pavona venosa*.

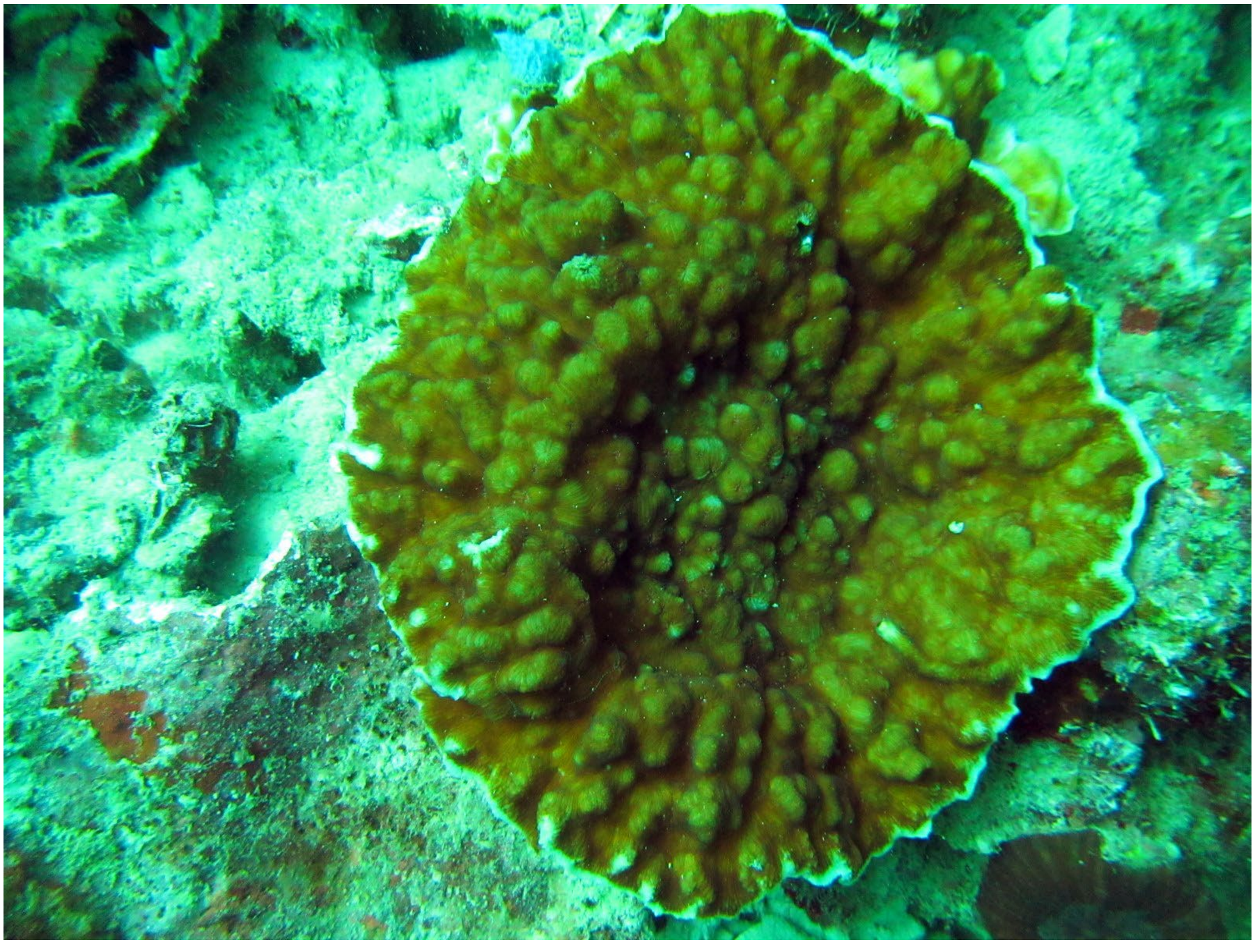
A close-up photo of *Pavona venosa*.

Leptoseris

Colonies are thin plates or encrusting. Corallites can be raised as cushions or not, or there may be non-corallite bumps of similar size. Some species prefer low light conditions like under overhangs or deeper water. *Pavona* is most often massive and in light, but has similar corallites.

Leptoseris incrustans *Vulnerable*

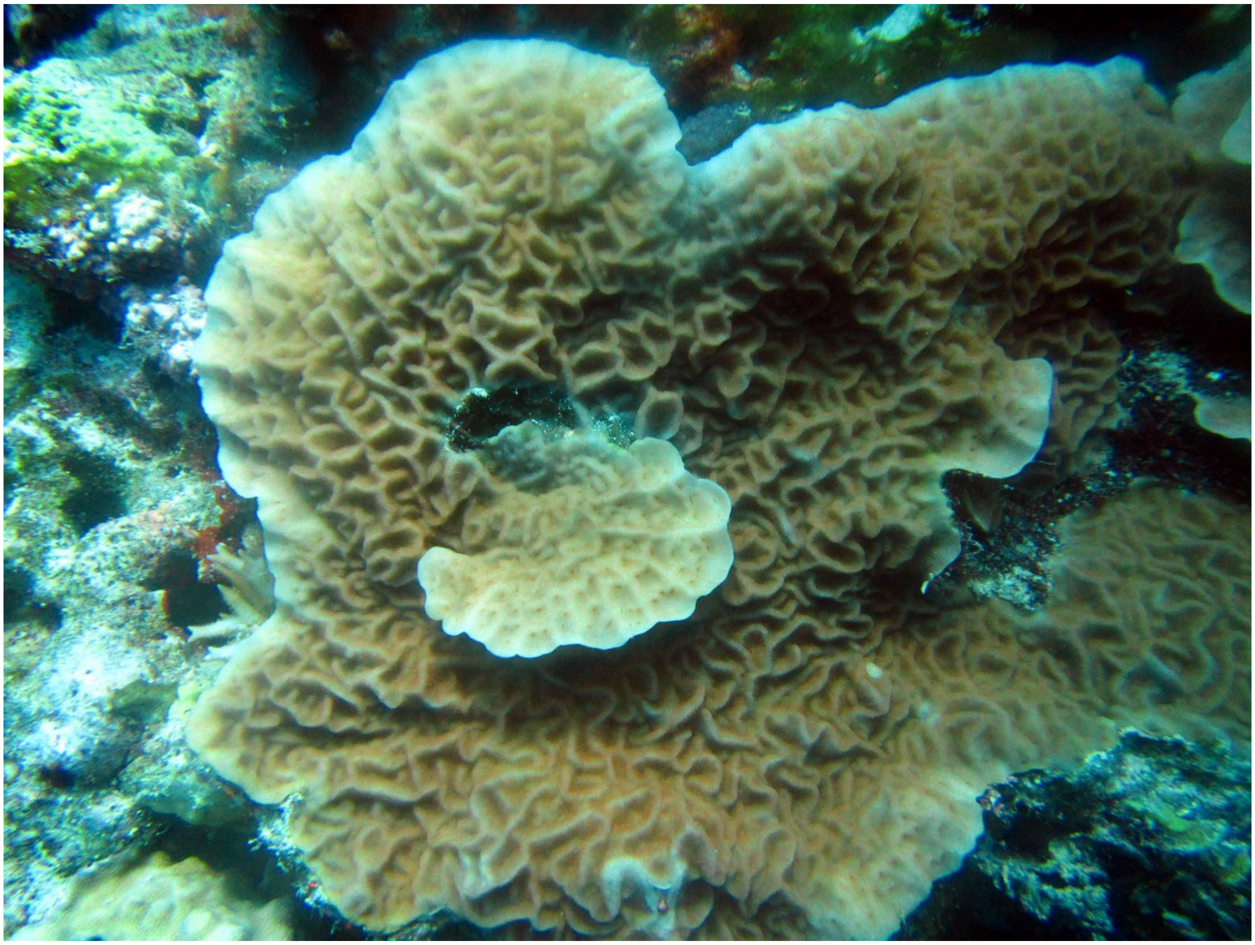
Colonies are encrusting but may have a slightly raised thin edge. The surface has many small bumps on it, but the bumps are not corallites, the corallites are between the bumps (but very hard to see). Colonies are almost always on overhangs. Several other species have bumps, but they are corallites inclined towards the outer edge, wth a depresson in the center of the cushion-shaped corallite.



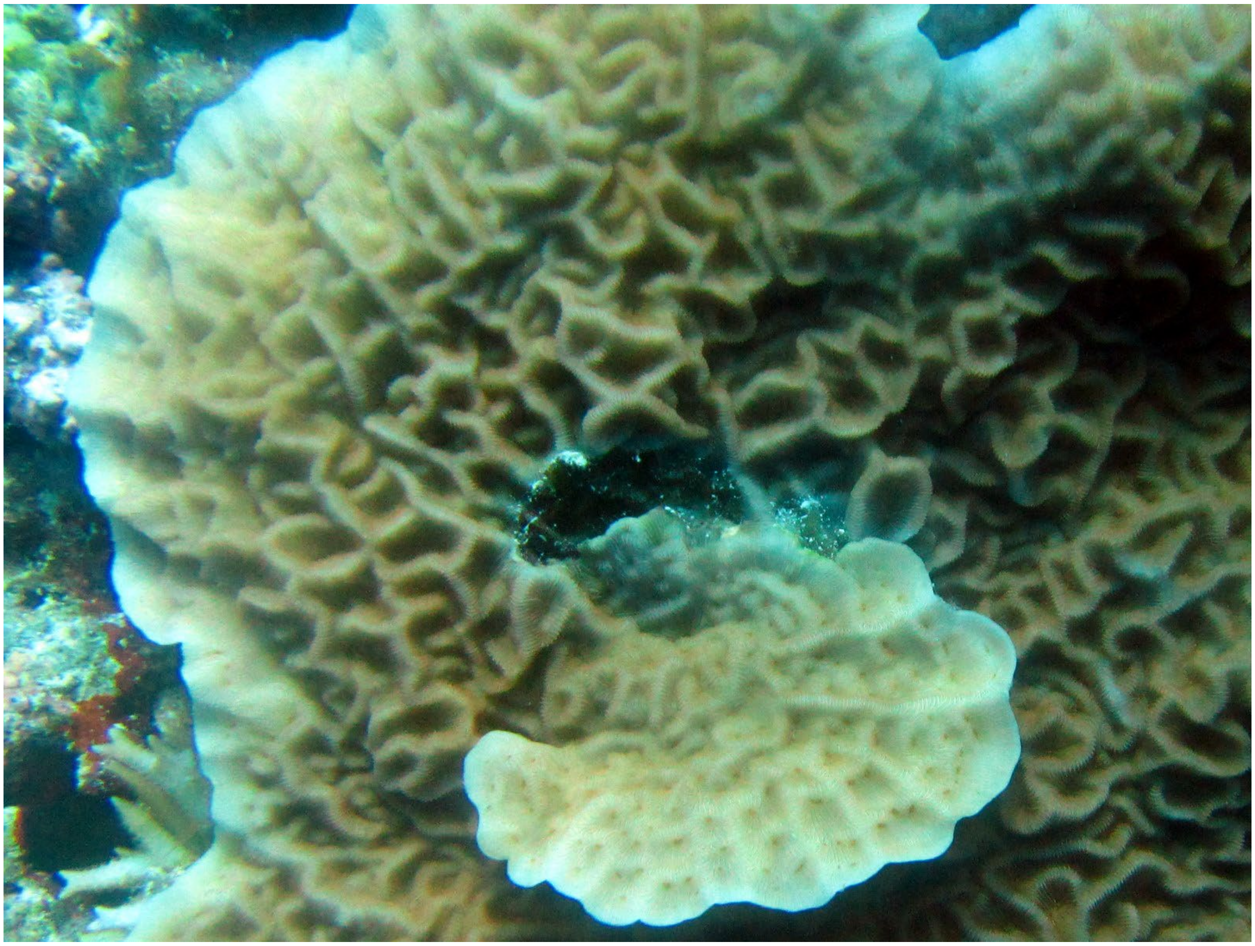
A colony of *Leptoseris incrustans*.

Leptoseris yabei

Colonies are thin plates with ridges on the upper surface. Some ridges run radially to the edge of the plates, and other ridges run concentrically or more randomly. *Leptoseris mycetoseroides* is encrusting and has similar ridges, but they run in random directions.



A colony of *Leptoseris yabei*.



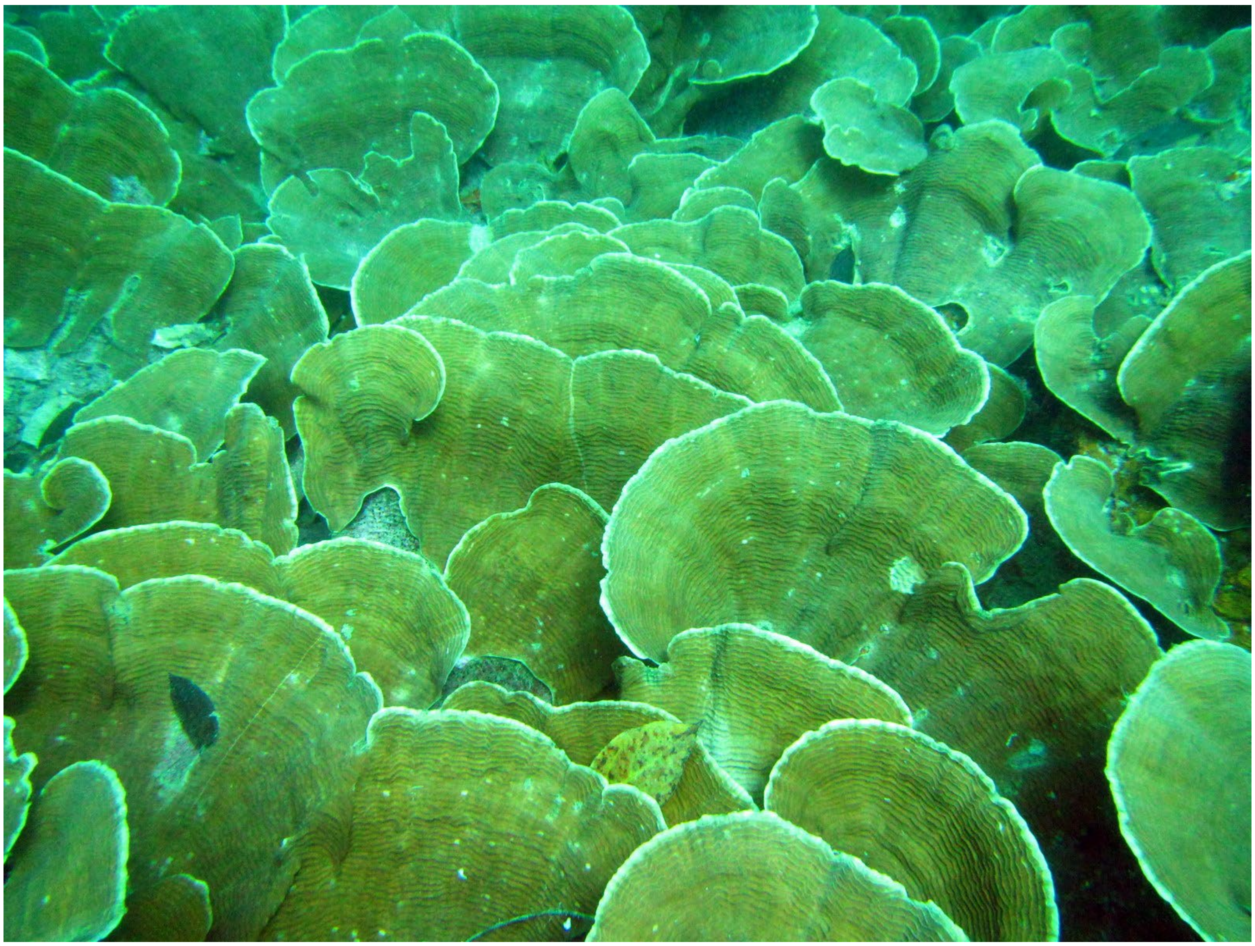
A close-up photo of *Leptoseris yabei*.

Pachyseris

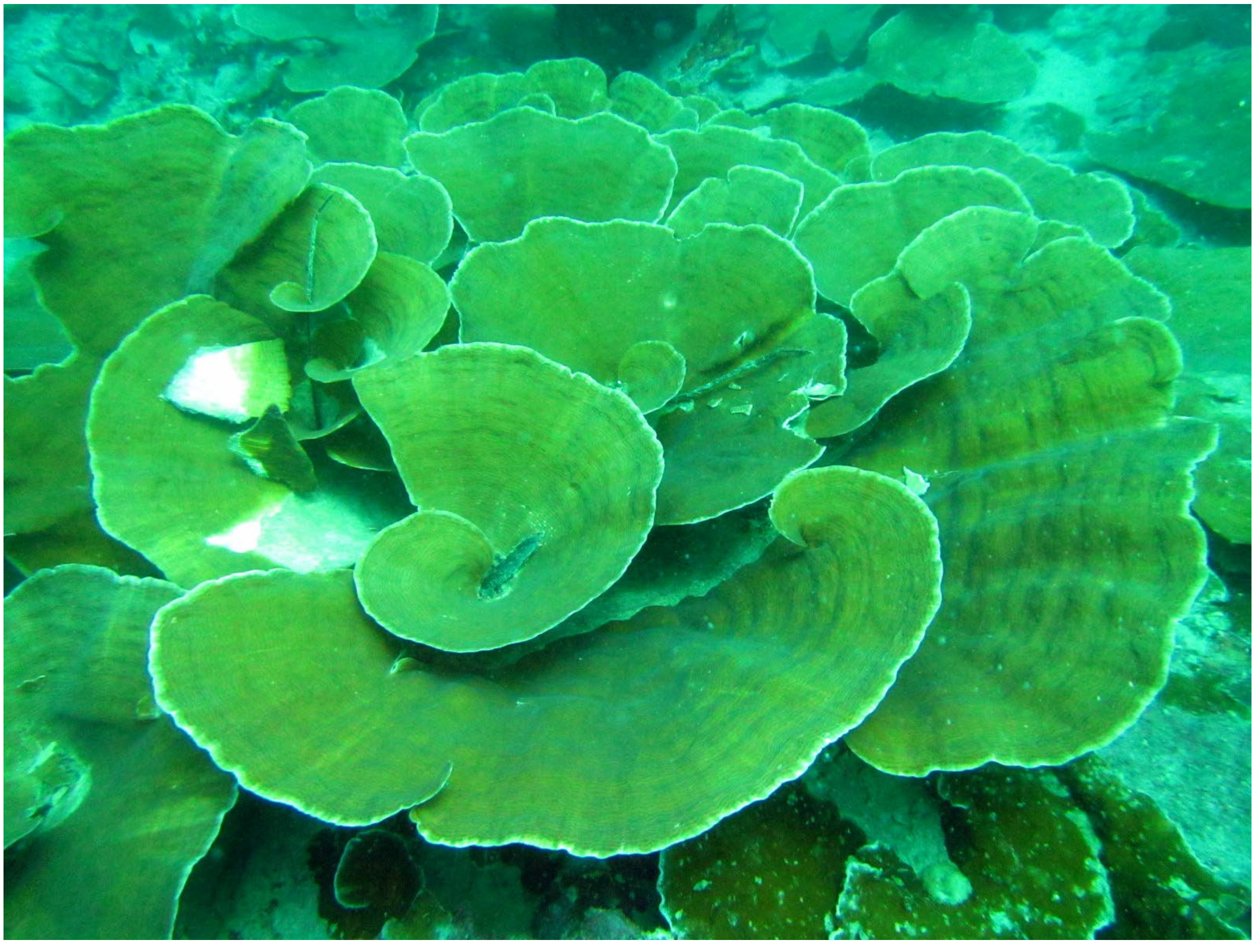
Colonies are foliose, with small ridges on the surfaces. The ridges may be concentric or wind around. The plates can grow at a variety of angles from horizontal to vertical. When the plates are vertical there are ridges (and corallites) on both sides of the plates. When plates are not vertical, the ridges and corallites are only on the upper surface, the lower surface is smooth. The corallite centers are in the valleys between the ridges. *Montipora* can have ridges on plates, but they run radially and are more irregular.

Pachyseris foliosa

Colonies are plates that grow upward and outward at an angle. The plates may form whorls or be wedge-shaped. The ridges on the upper surface are concentric, narrow, and have a flat space between them. The corallites, which are not easily visible, are at the outer base of the ridge. *Pachyseris foliosa* has more circular plates with concentric ridges with no flat space between them.



A field of *Pachyseris foliosa*.



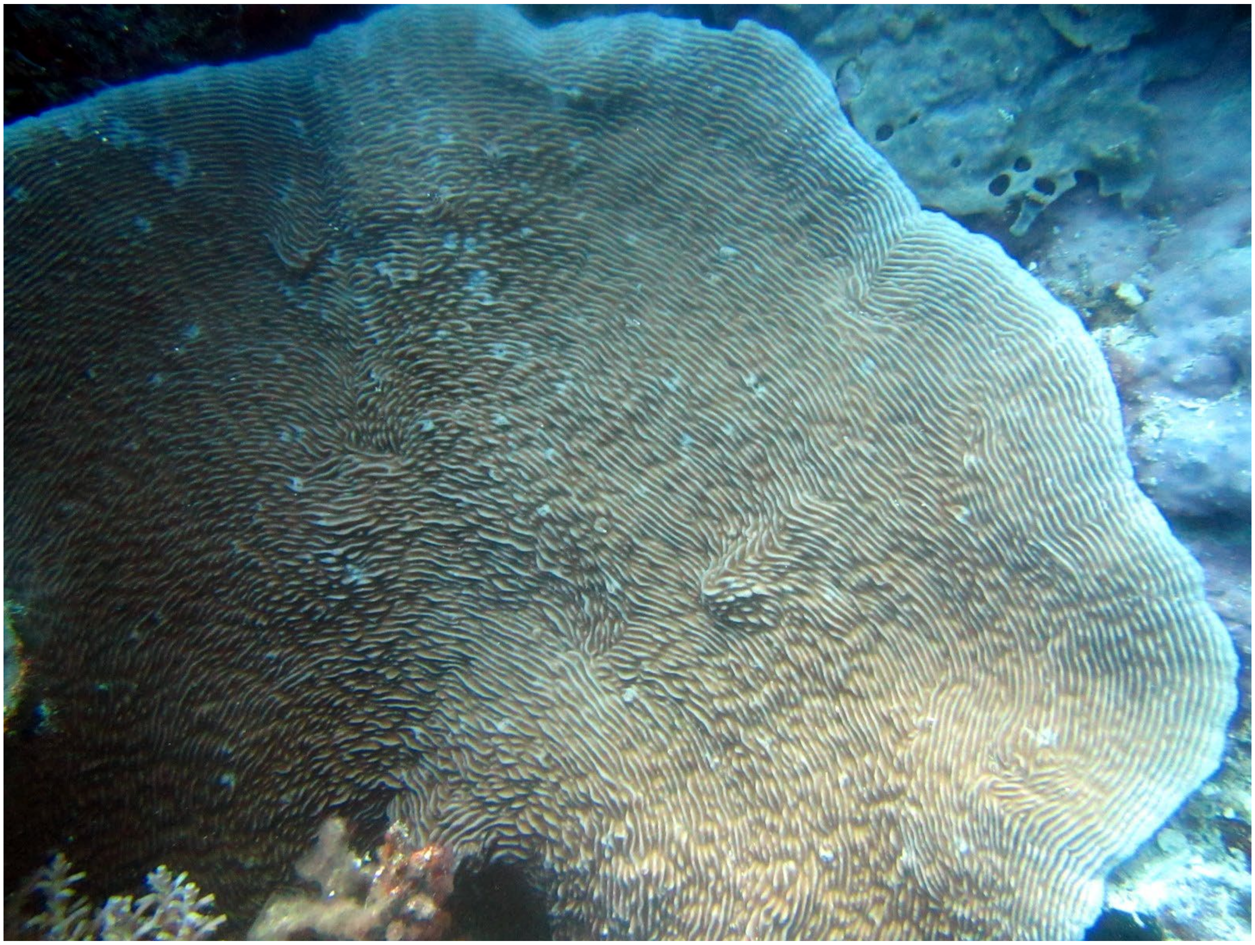
Pachyseris foliosa colonies forming whorls.

A closer photo of *Pachyseris foliosa*.

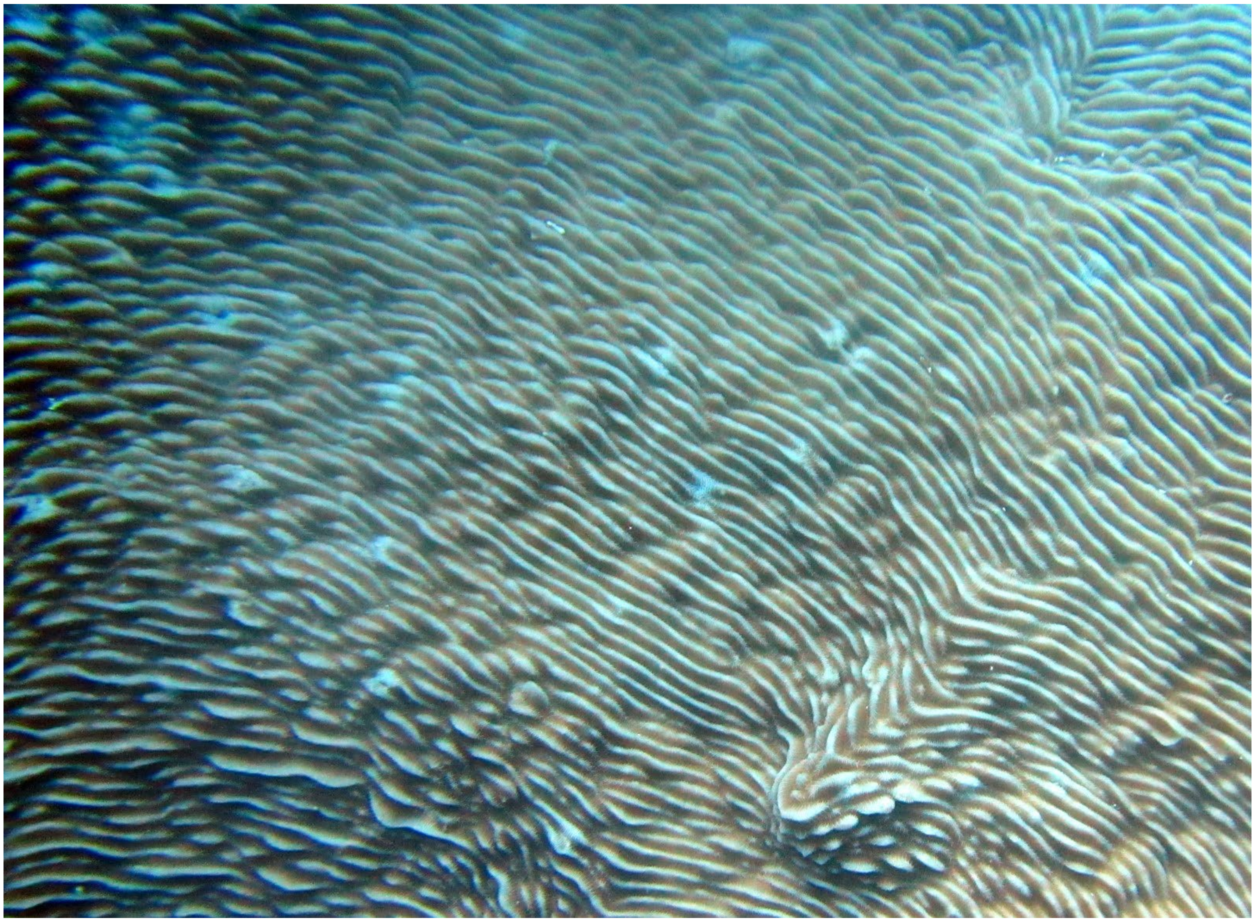
A close-up photo of *Pachyseris foliosa*, showing the flat areas between ridges and the corallite centers on the upper, outer side of the ridges.

Pachyseris gemmae

Colonies form thin plates with small concentric ridges. The ridges form waves in parts of the colony, increasing and decreasing in size along the length of the ridge. *Pachyseris speciosa* is very similar but the ridges are even and not wavy.



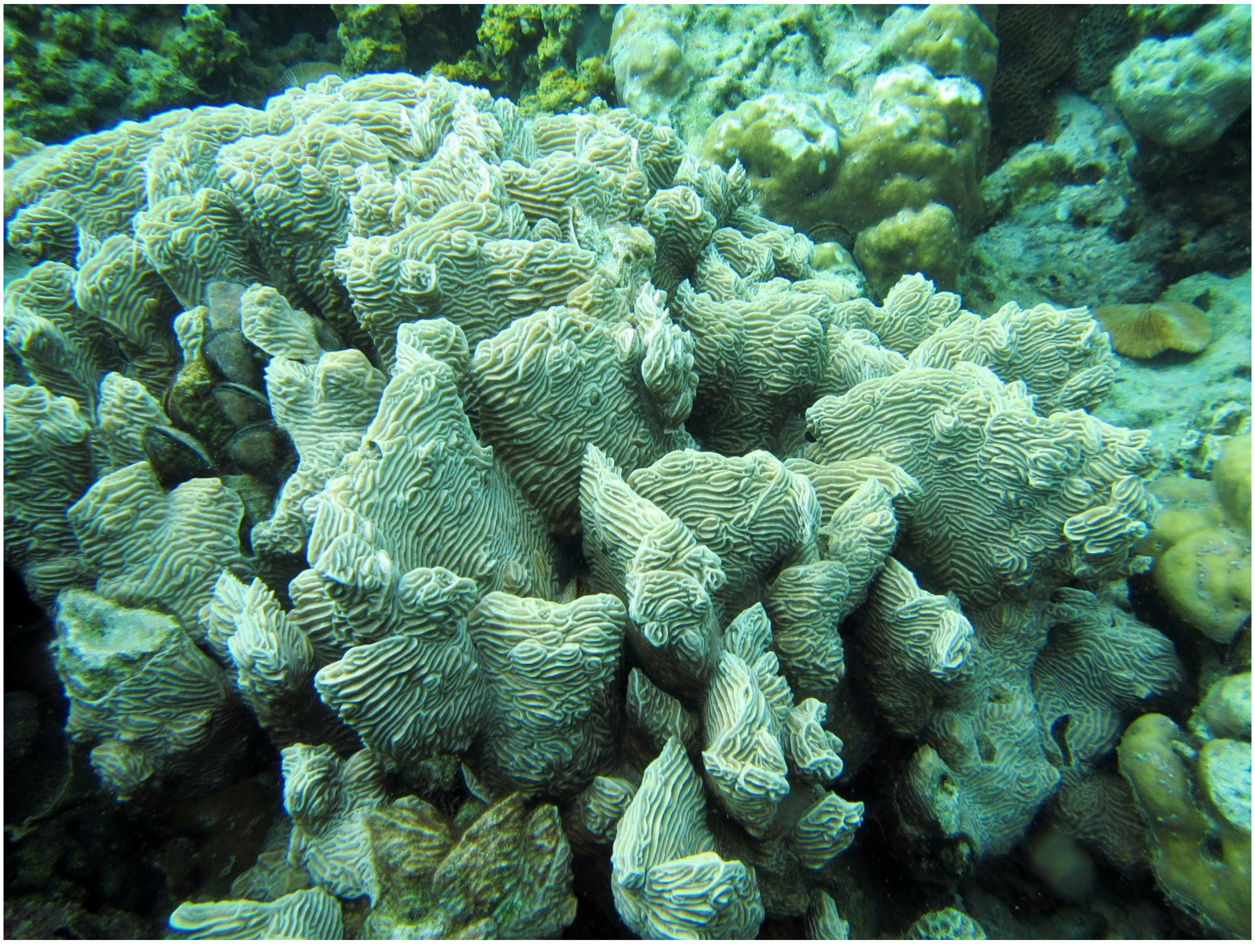
A photo of a colony of *Pachyseris gemmae*.



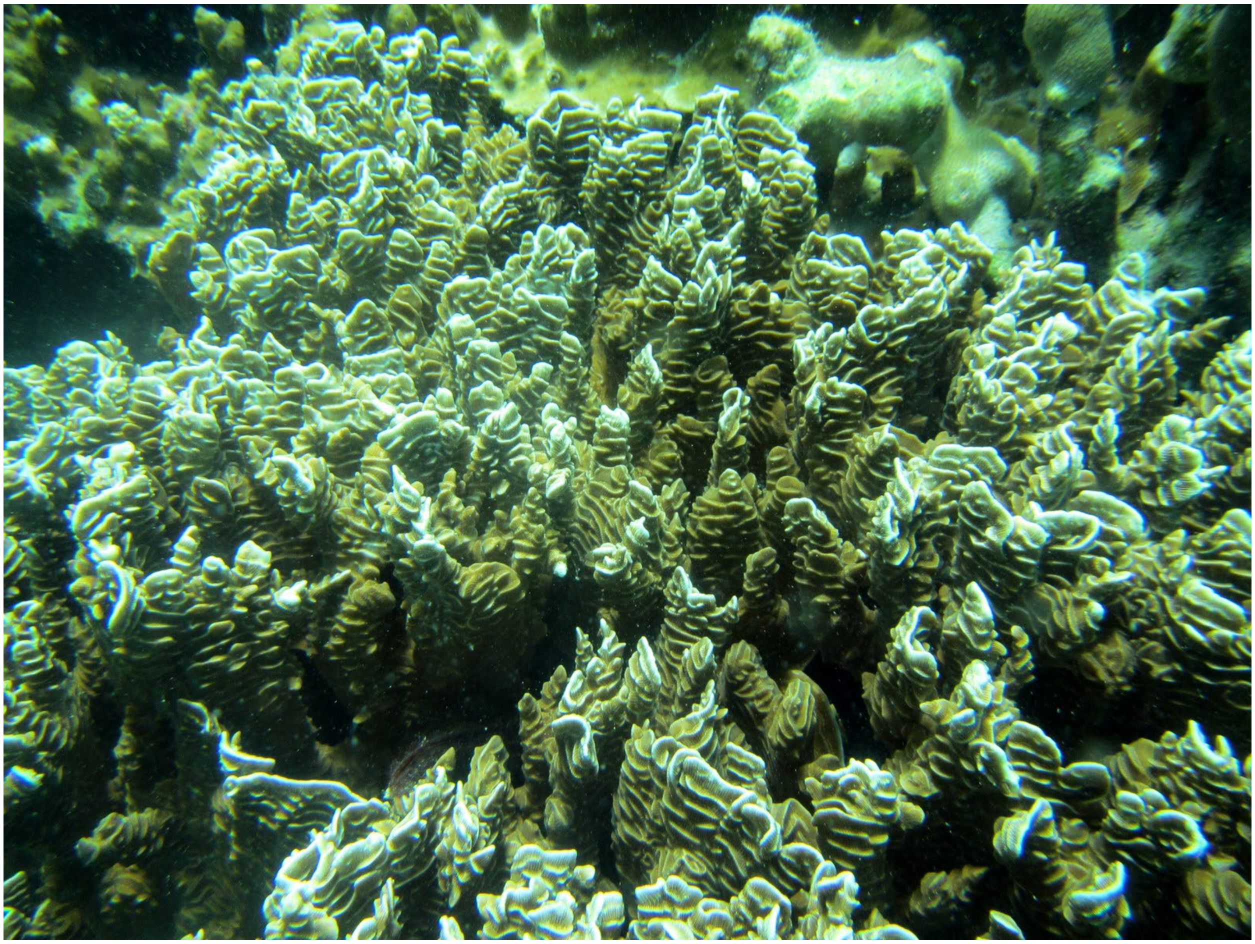
A closer photo of *Pachyseris gemmae*.

Pachyseris rugosa *Vulnerable EDGE*

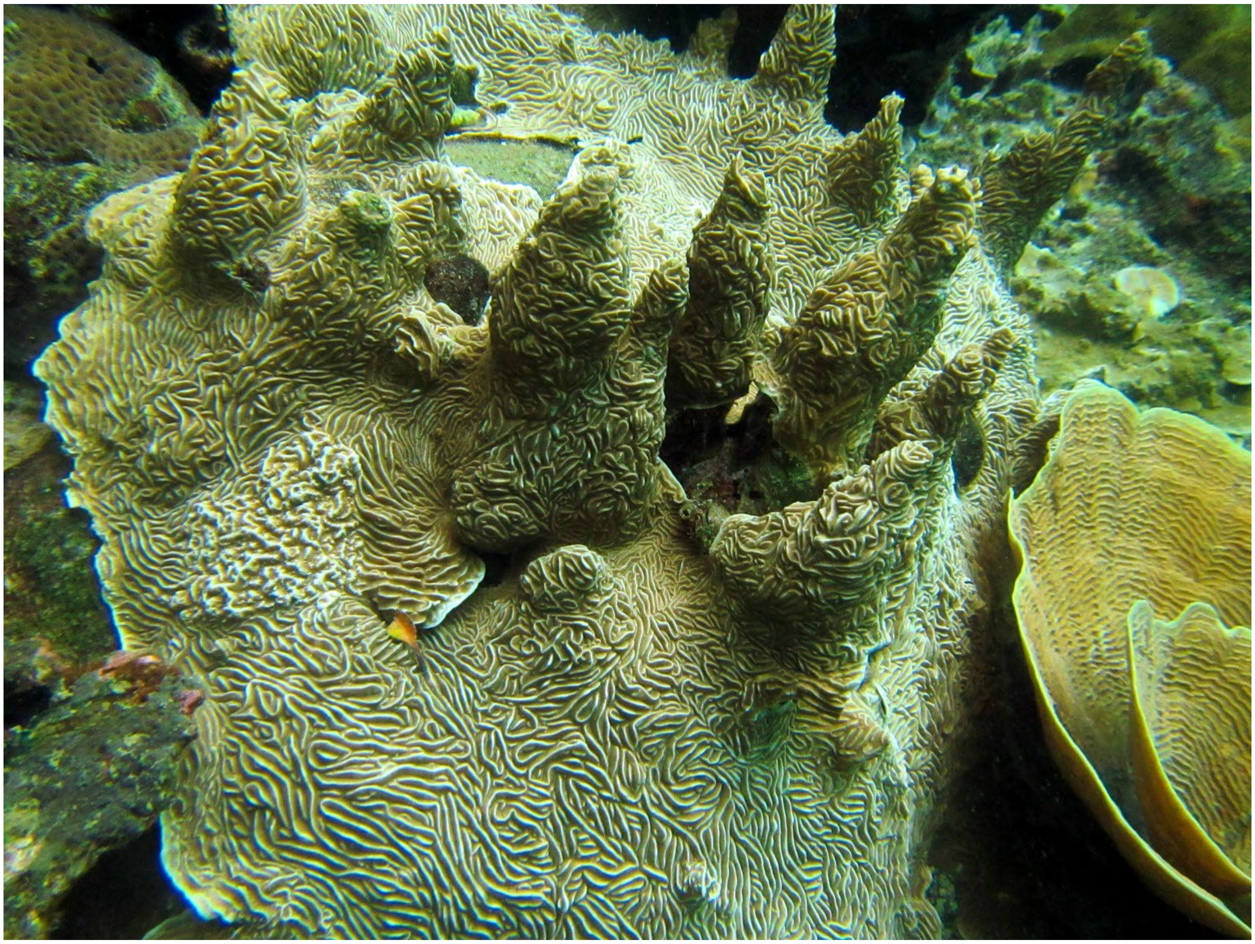
Colonies form vertical plates which are thick and have ridges on both sides. Plates vary in size and shape between and within colonies. Sometimes colonies have encrusting bases or are massive, and some colonies form columns. The ridges wind around each other irregularly instead of being concentric. This is the only *Pachyseris* with thick vertical plates with ridges on both sides and winding ridges.



A colony of *Pavona rugosa* forming thick plates.



A colony of *Pachyseris rugosa* with smaller plates.



A colony of *Pachyseris rugosa* with an encrusting base and tapering columns. Note the winding ridges on the encrusting part of the colony.

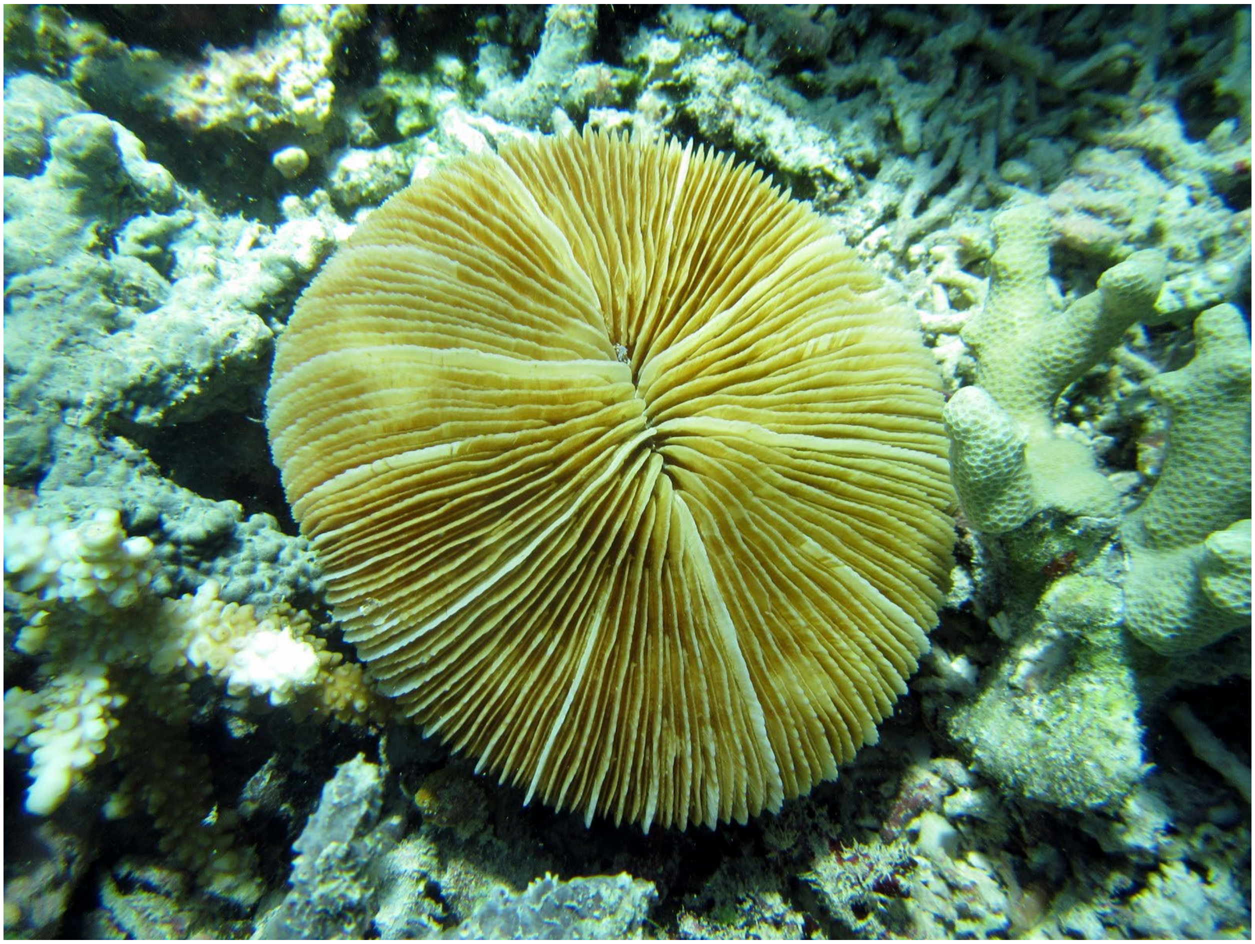
Lithophyllon "mushroom corals"

Corals can have either of two different shapes. One is small, thin, attached plates with multiple mouths, the other is solitary, unattached discs, that is they consist of a single large polyp and corallite. Corals are discs that are not attached, with a central mouth-crack, and radiating septa that make it look like an overturned mushroom cap. Hence the name "mushroom corals." Corals can be up to about 15 cm in diameter. The underside has radiating rows of small spines.

Lithophyllon concinna or Lithophyllon repanda *These used to be in Fungia.*

Individuals have radiating sept that have very small teeth on their edges, which can be felt better than seen. Septa may be widely spaced. These two species can only be reliably distinguished by examination of skeleton under a microscope. Teeth are usually too small to see unlike on *Fungia fungites*, and the septa are farther apart, and tentacles are not extended. *Danafungia scruposa* has larger teeth.

A *Fungia concinna* or *Lithophyllon repanda* coral.



Fungia concinna or *Lithophyllon repanda* with a distinctive coloration pattern that might be genetically produced or from a disease.

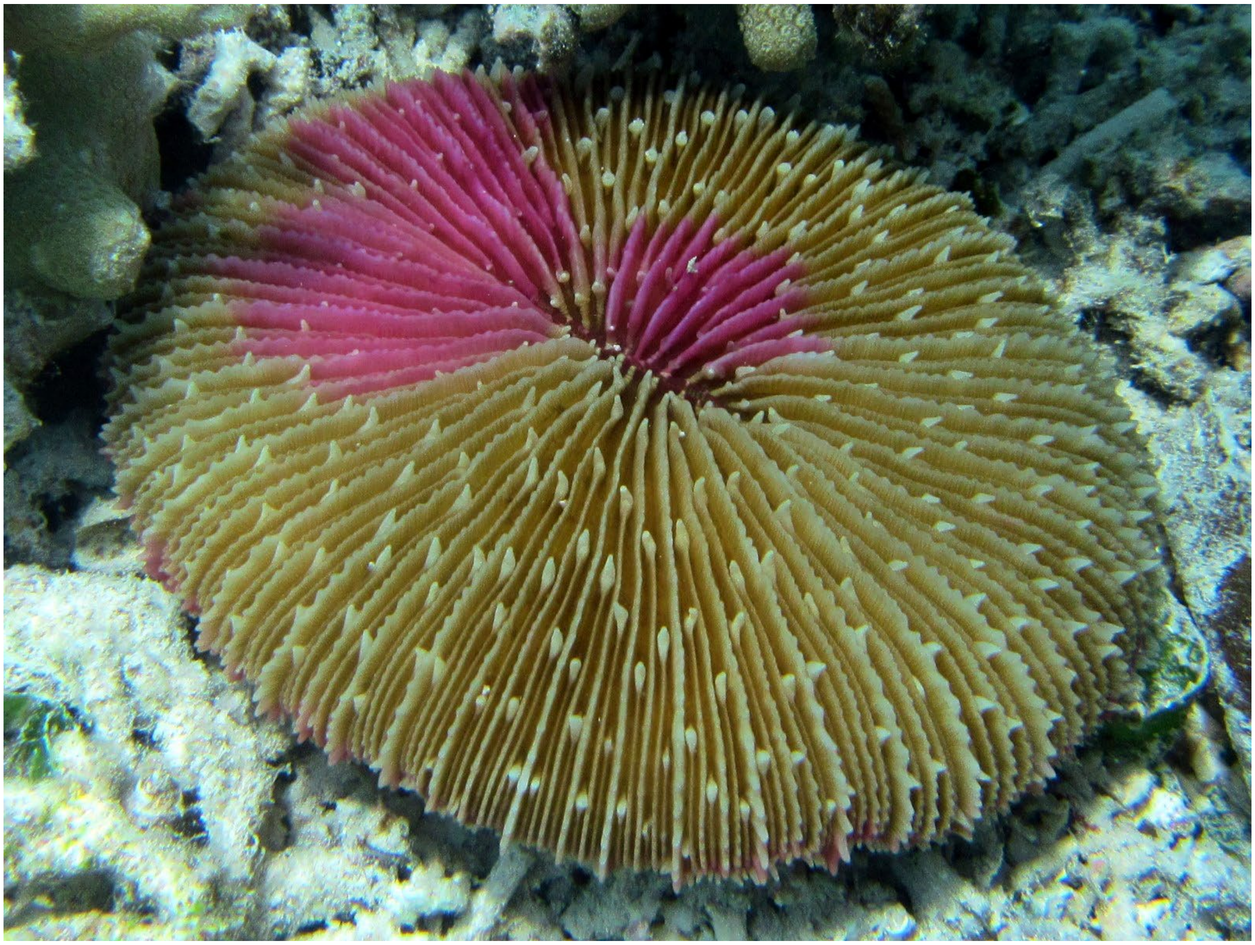
Fungia “mushroom corals”

Corals are solitary, that is they consist of a single large polyp and corallite. Corals are discs that are not attached, with a central mouth-crack, and radiating septa that make it look like an overturned mushroom cap. Hence the name “mushroom corals.” Corals can be up to one foot in diameter, though usually they are smaller. Most species are circular but a few are oval. The underside usually has radiating rows of small spines, but in some species there is an even carpet of tiny granules.

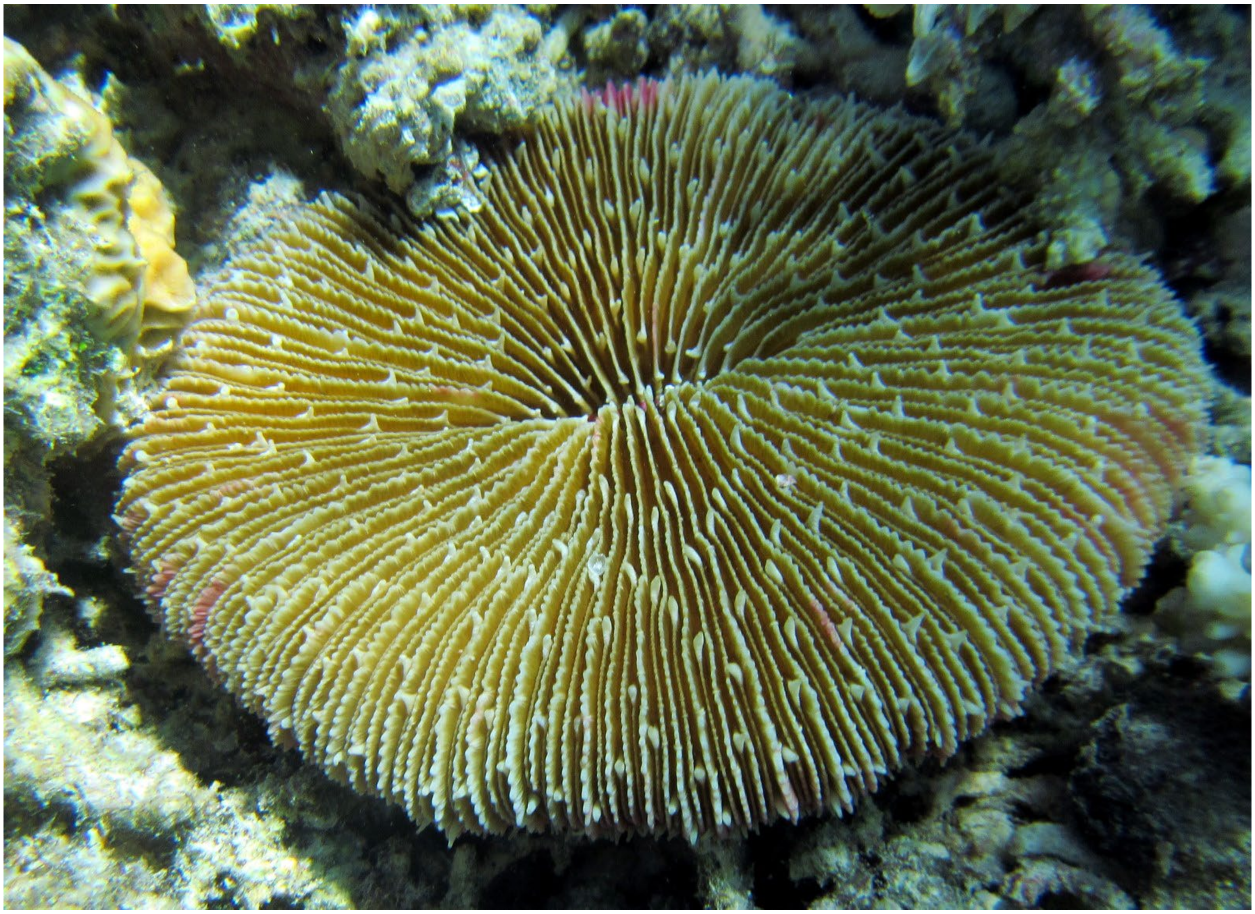
Fungia fungites

Corals have septa relatively close together and small uniform teeth that can be seen on the edge of the septa. They often have small tentacles extended. They are often yellow-green but may be purple or red, or have purple patches or edges. Septa are closer together and teeth are larger than on *Fungia concinna* or *Fungia repanda,* and tentacles are extended. *Fungia scruposa* has larger teeth, no tentacles extended, and a few raised septa.

A photo of *Fungia fungites* with obvious tentacles.



A *Fungia fungites* with a purple patch.



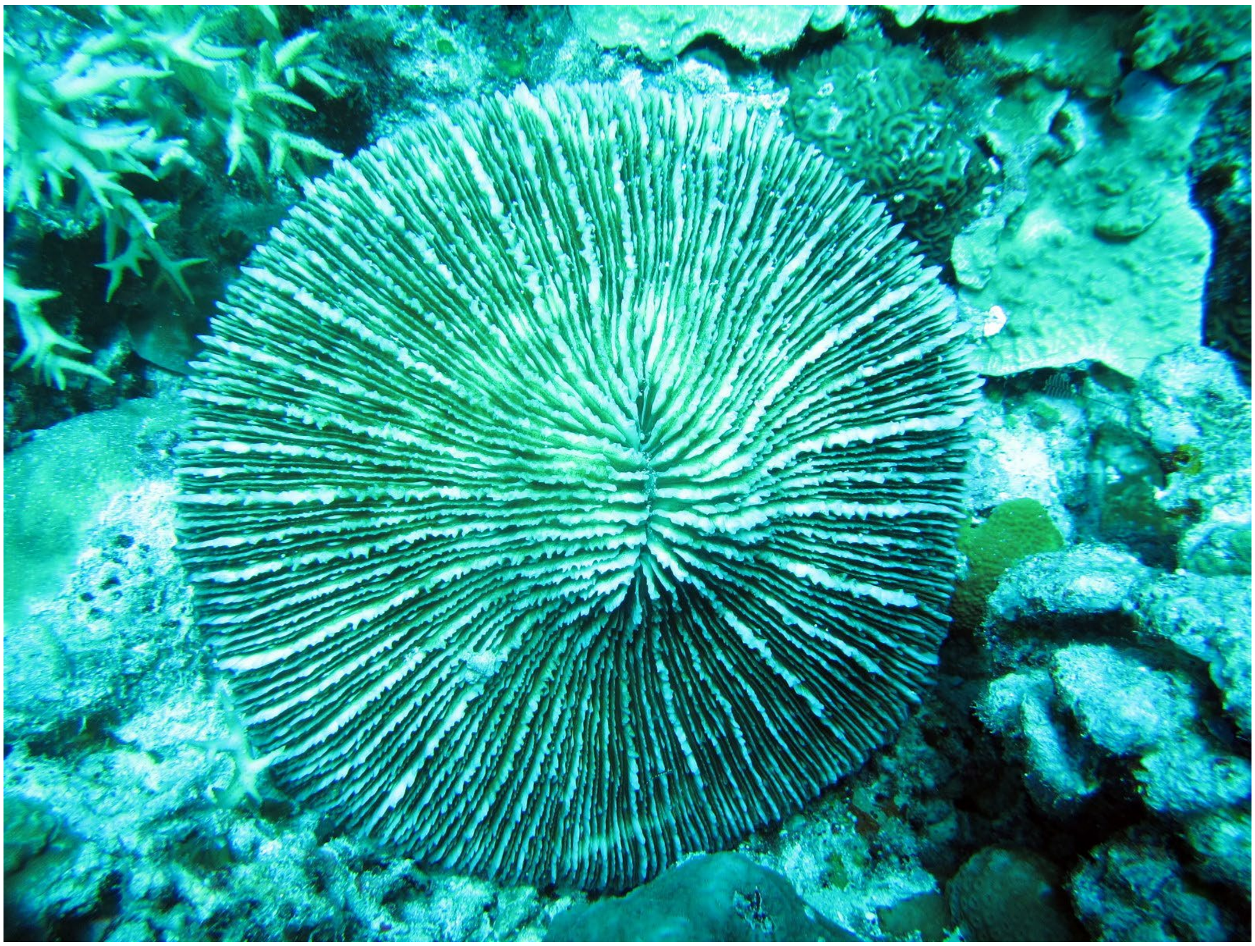
A *Fungia fungites* without large purple patches.

Danafungia This used to be part of *Fungia.*

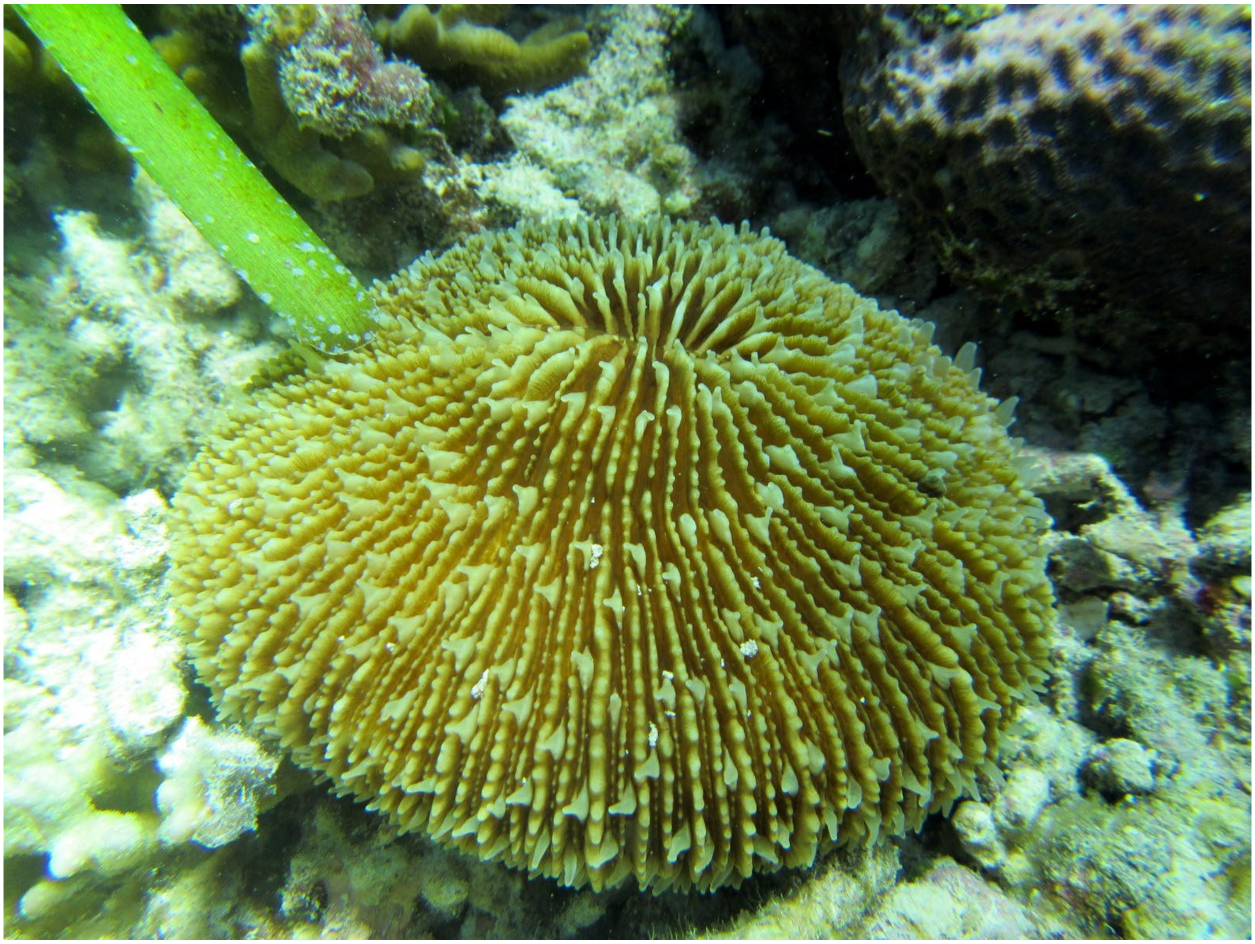
Corals are solitary, unattached discs, much like *Fungia*. The septal teeth are larger than on *Fungia*.

Danafungia scruposa

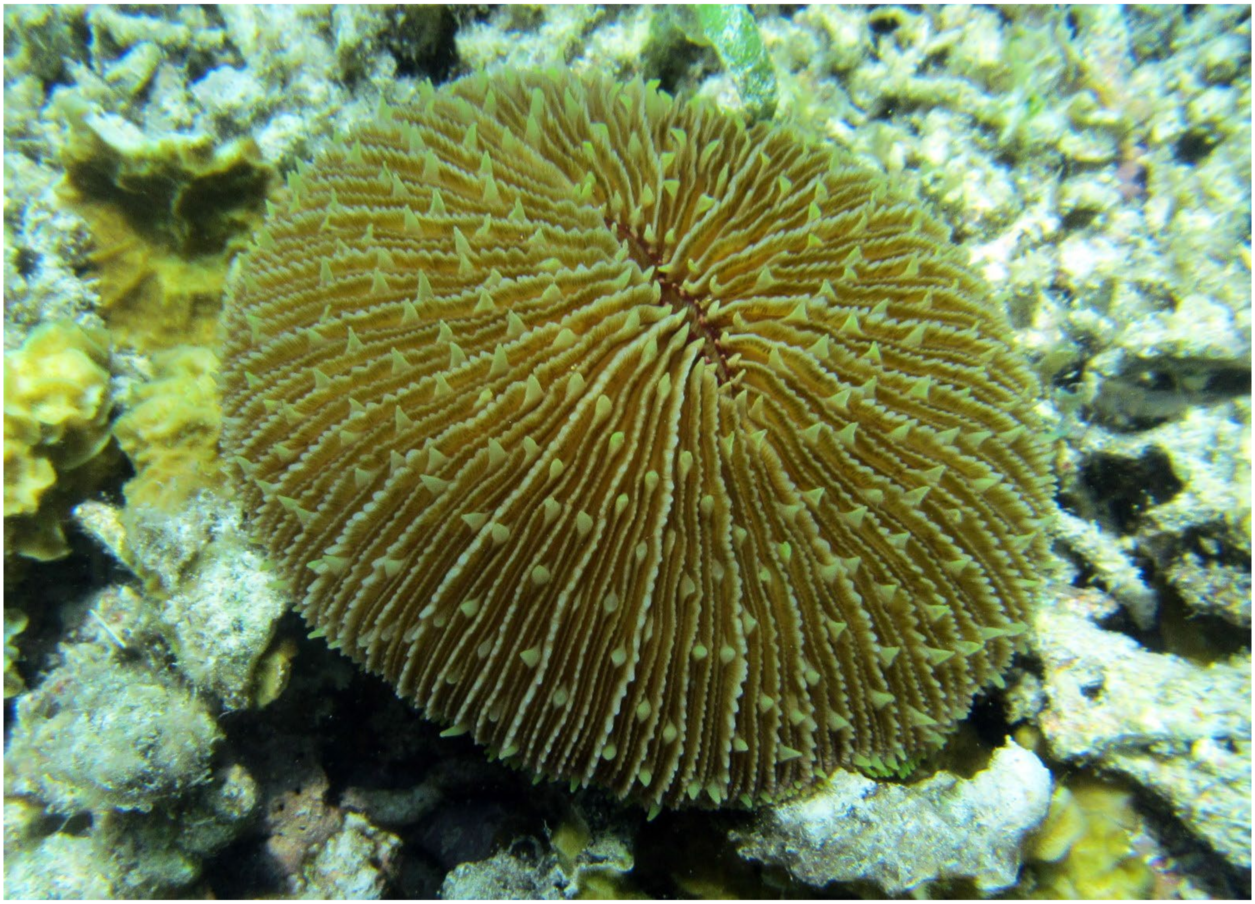
Corals often have a central hump or the upper surface is raised like the outside surface of a cone (highest in the center). Often a few septa are higher than others. Teeth on the septa are large enough to see easily and often uniform. Tentacles are usually not extended. *Lithophyllon concinna* and *Lithophyllon repanda* have smaller teeth as does *Fungia fungites*, which also has no raised septa and may have purple patches.



An individual of *Danafungia scruposa*.



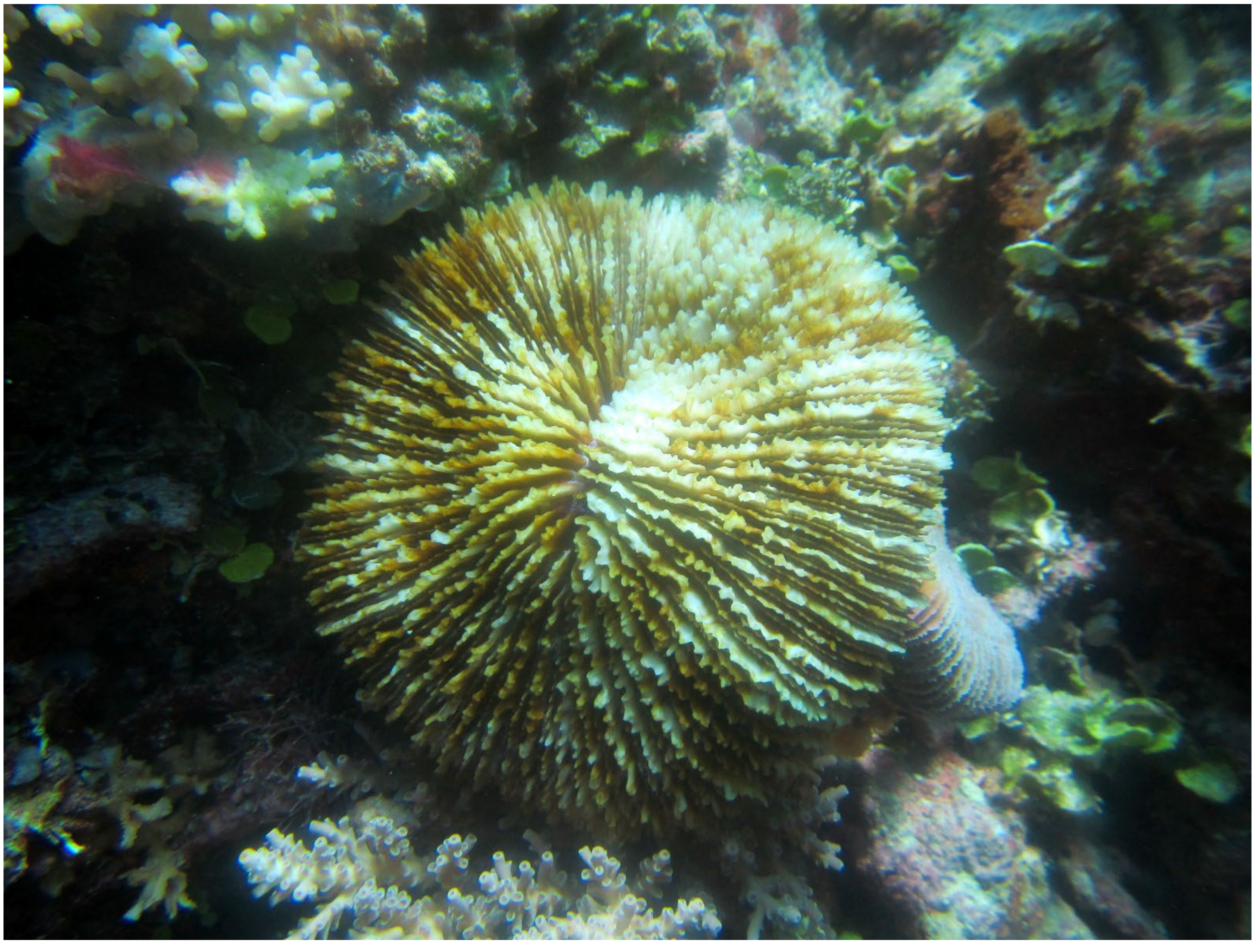
An individual of *Danafungia scruposa*.



An individual of *Fungia scruposa*.

Danafungia horrida *This used to be in Fungia.*

Corals are circular discs and have very large teeth on the septa. Other disc-shaped Fungiids have smaller teeth on the septa.



A photo of *Danafungia horrida*.

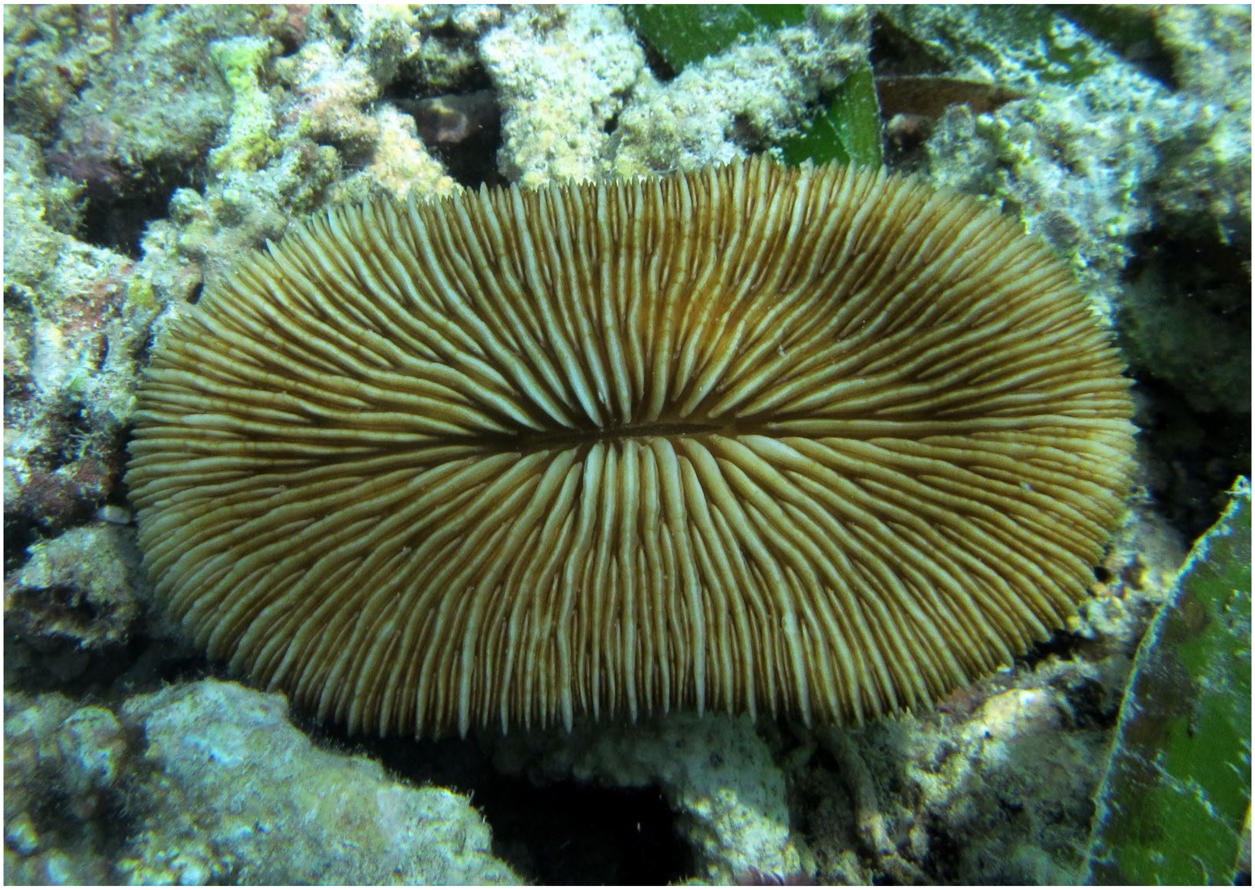
Pleuractis This used to be in *Fungia*.

Most corals in this genus are oval, but one forms circular discs. They are not attached, and solitary. The underside has tiny granules instead of spines.

Pleuractis paumotensis *This used to be in Fungia.*

Corals are oval and have an even covering of granules on the underside. The septa are reletively straight. There are no visible tentacle lobes on the septa as there are on *Fungia scutaria*. Corals are oval unlike many discoid Fungiids.

An individual of *Pleuractis paumotensis*.



An individual *Pleuractis paumotensis*.

Lobactis This used to be in *Fungia*.

Corals are oval, solitary, and not attached. The underside has tiny granules instead of spines. Septa have extensions called "tentacle lobes."

Lobactis scutaria *This used to be in Fungia.*

Corals are oval and the underside is covered with fine granules. Septa have tentacle lobes which are usually obvious as small semicircular blades extending from the septa. This species has the most prominent tentacle lobes of any other Fungiid. Oval unlike *Fungia*, *Lithophyllon*, and *Danafunga*.

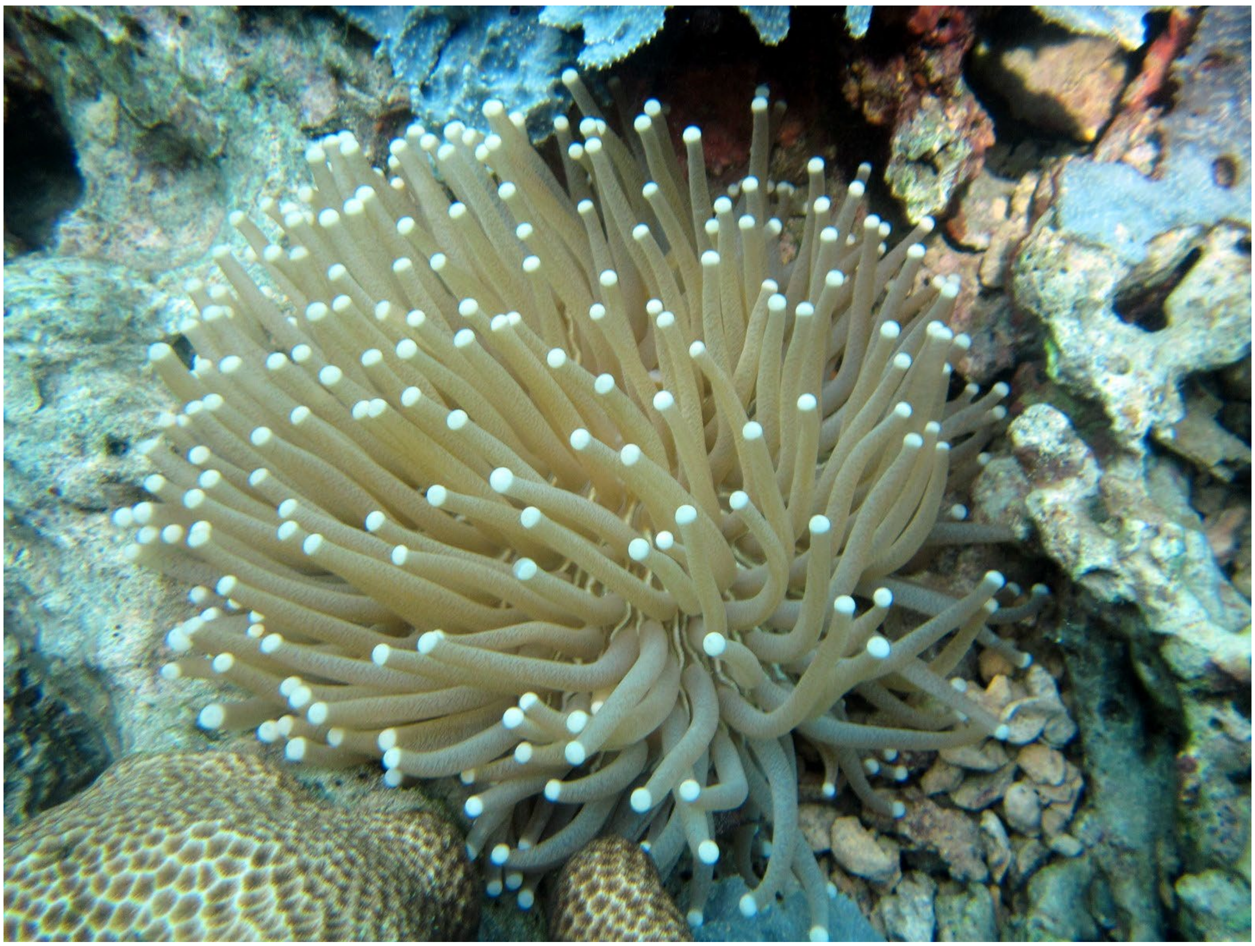
An individual *Lobactis scutaria*.

Heliofungia

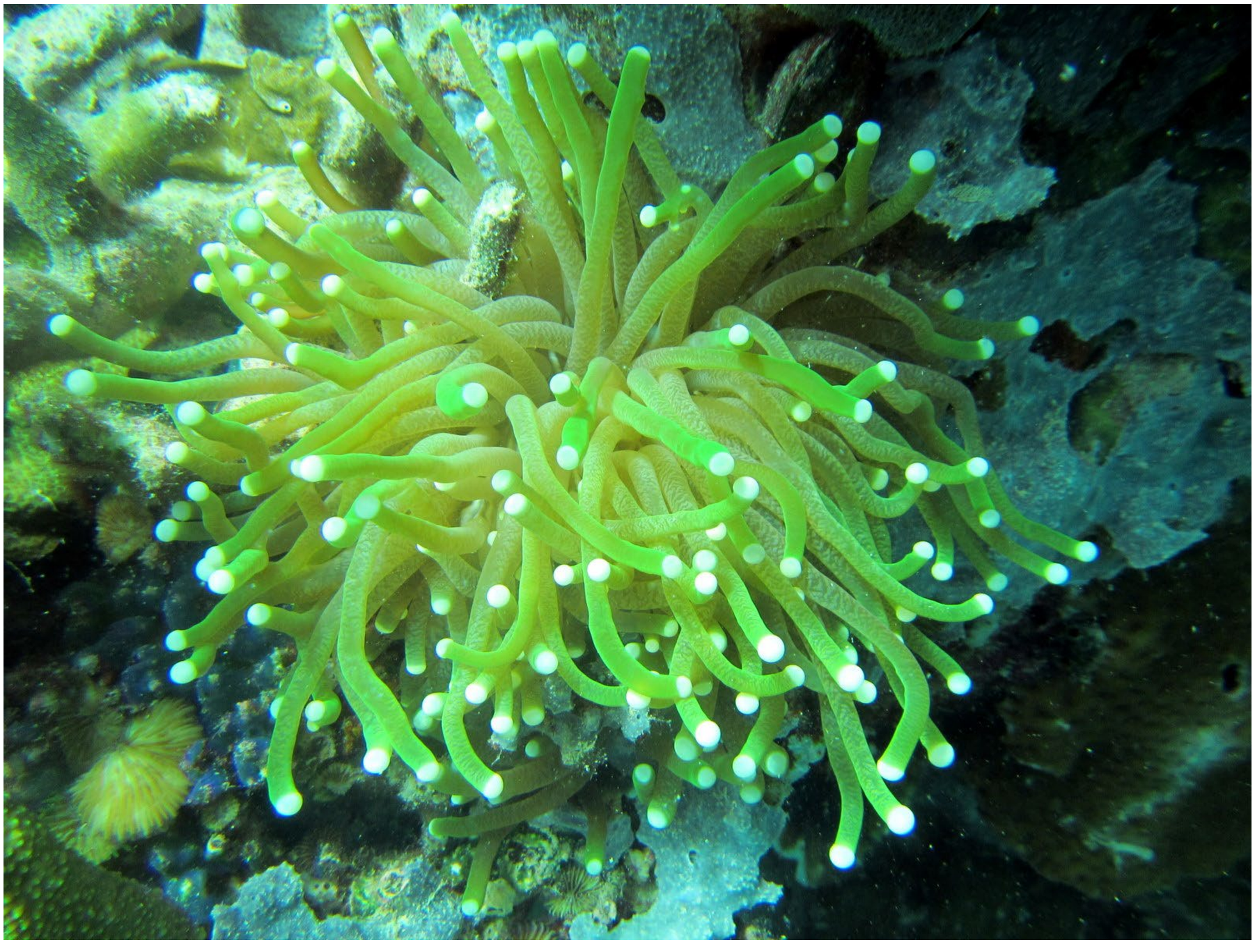
Corals are solitary (single polyp) disc and not attached. The upper surface is covered with large tentacles. Their skeleton is similar to *Fungia, Lithophyllon, and Danafungia,* but they have large, rounded teeth on their septa.

Heliofungia actiniformis

Corals have the largest tentacles of any coral, which completely cover the skeleton and make it look like an anemone. The tips of tentacles are white. The skeleton is similar to *Fungia* except the teeth are larger and more rounded. If in doubt whether an individual is an anemone or not, it can be picked up and the skeleton underside felt and/or seen. *Fimbriaphyllia glabrescens* has similar tentacles but they are smaller and it has multiple polyps, branches, and is attached.



An individual of *Heliofungia actiniformis*.



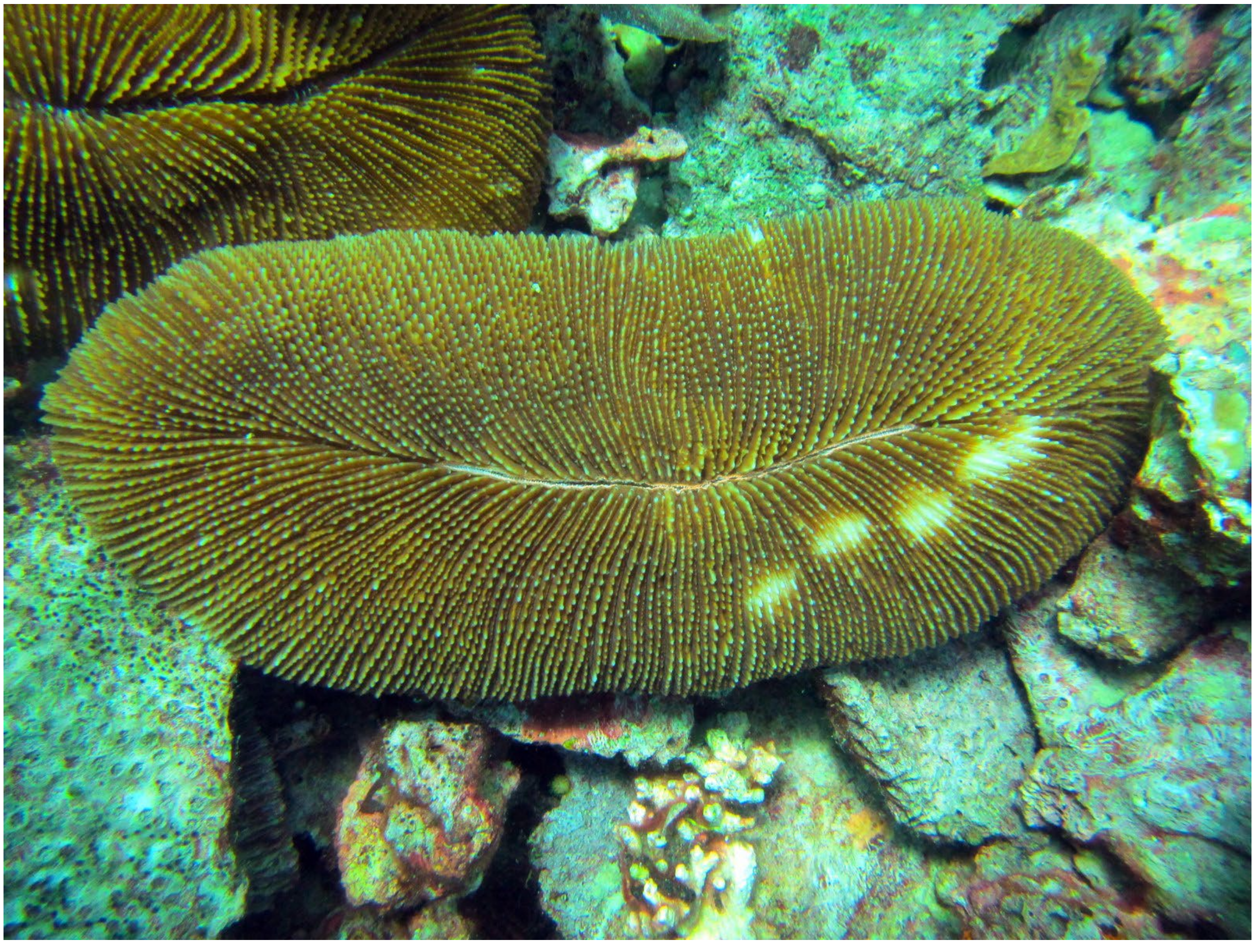
An individual *Heliofungia actiniformis*.

Ctenactis

Corals are elongate ovals with rounded ends and a long crack in the middle. Septa extend from the crack to the outer margin, and have uniform teeth on them. Corals are not attached. They are usually wider than *Herpolitha*, and the septa have visible teeth which *Herpolitha* doesn't have.

Ctenactis echinata

Corals have one long continuous crack in the middle which is one long mouth. Tentacles are not extended. *Ctenactis crassa* has the crack divided into sections, each of which is a mouth. *Ctenactis albitentaculata* has small white tentacles extended.

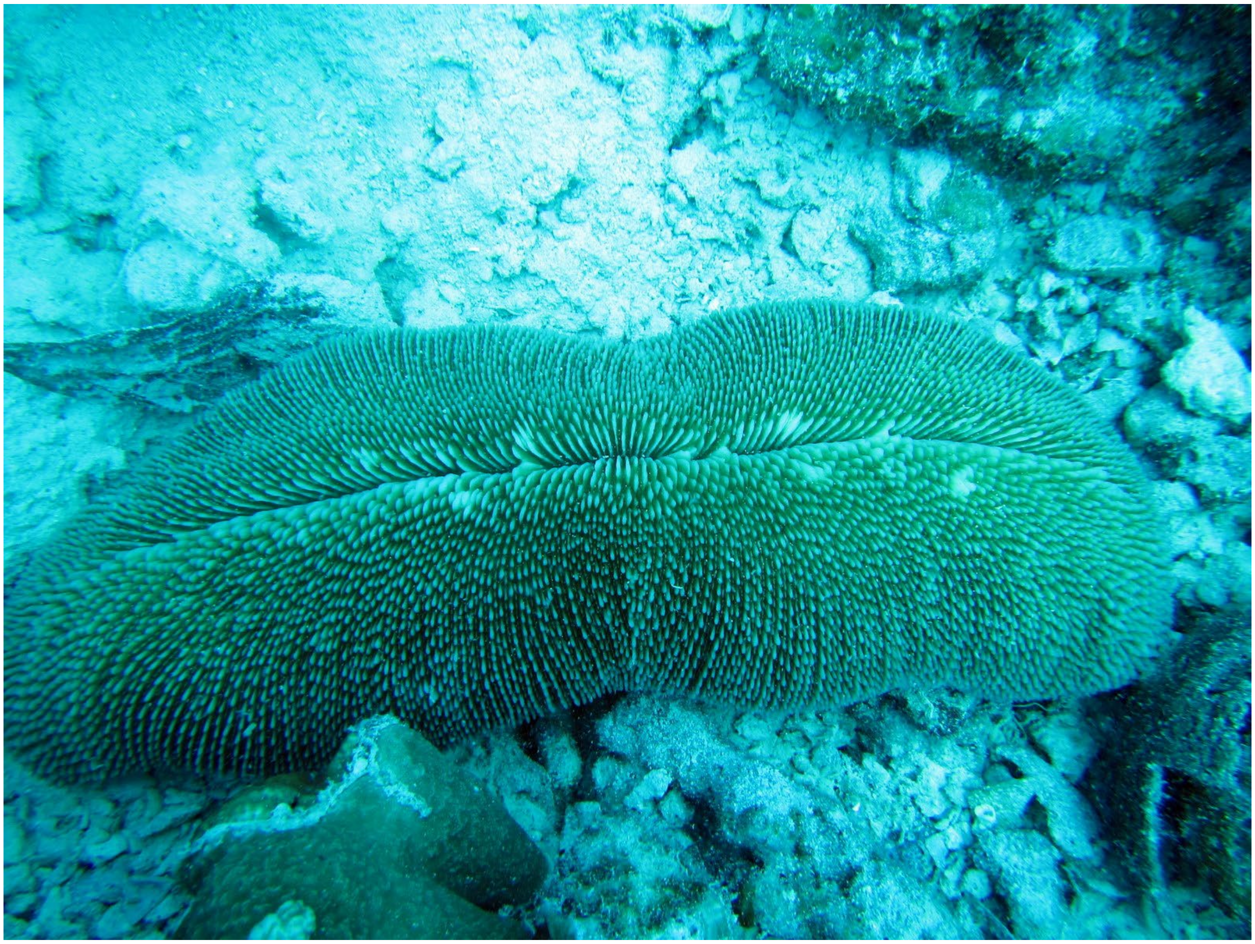


An individual *Ctenactis echinata*. The white patches are a disease.

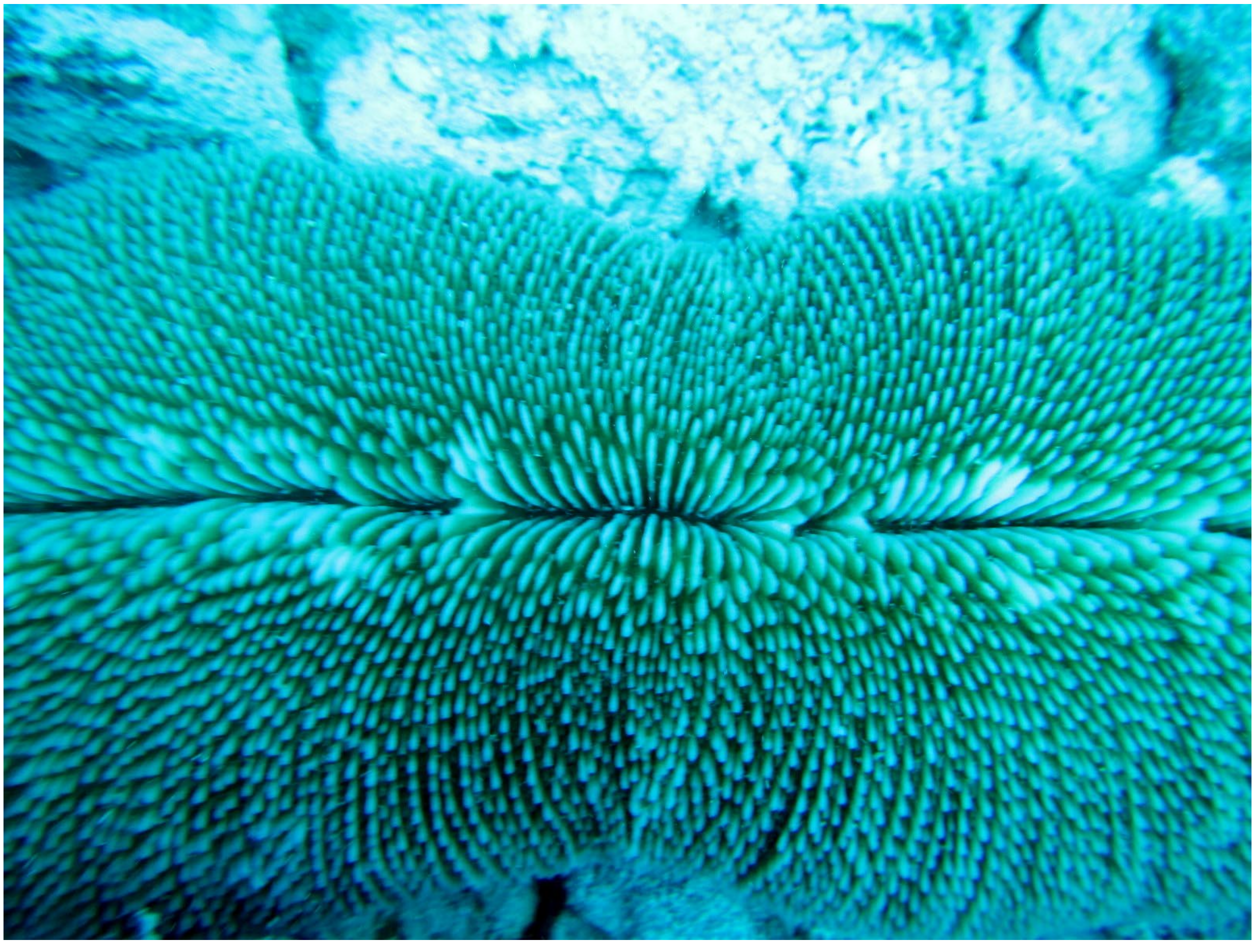
An individual *Ctenactis echinata*.

Ctenactis crassa

Corals have the long central crack divided into sections, each of which is a mouth. Tentacles are not extended as on *Ctenactis albitentaculata*.and the crack is not continuous as on *Ctenactis echinata*.



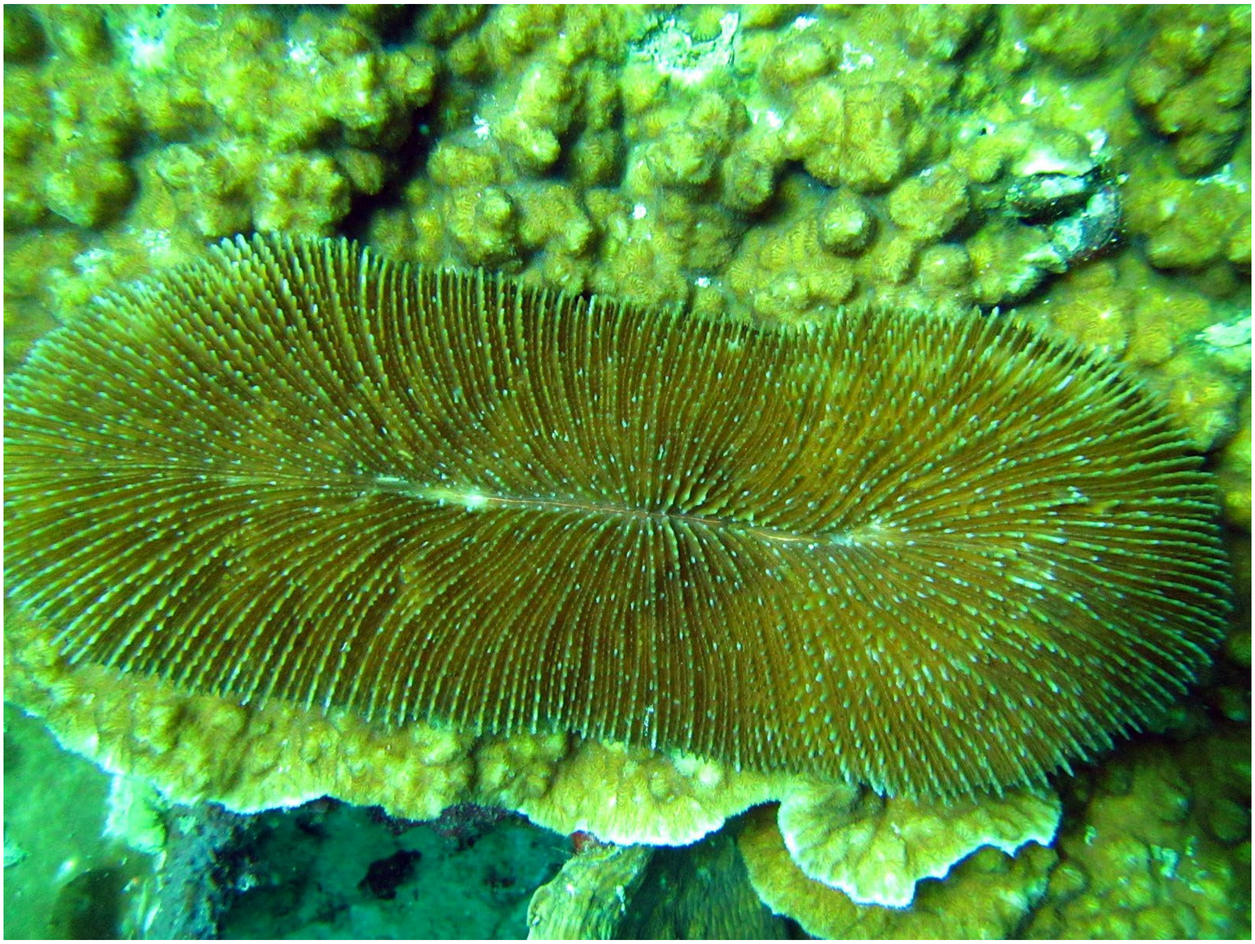
A photo of *Ctenactis crassa*.



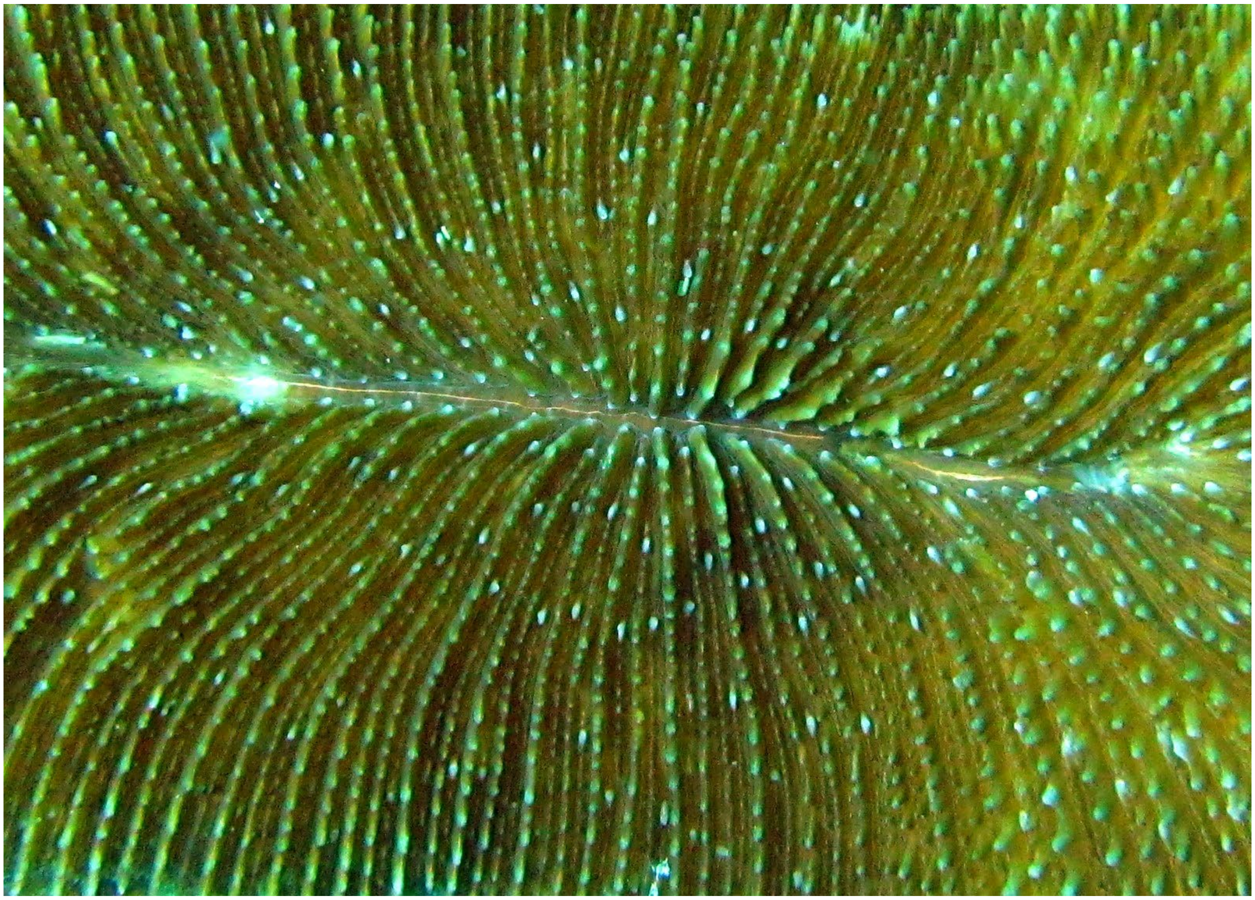
A close-up photo of *Ctenactis crassa* showing the division of the crack into short sections and the teeth on the septa.

Ctenactis albitentacula

Corals have white tentacles and the septa are more widely spaced than in other species of *Ctenactis*.



A photo of *Ctenactis albitentaculata*. The white tentacles are contracted on this coral and so appear tiny.



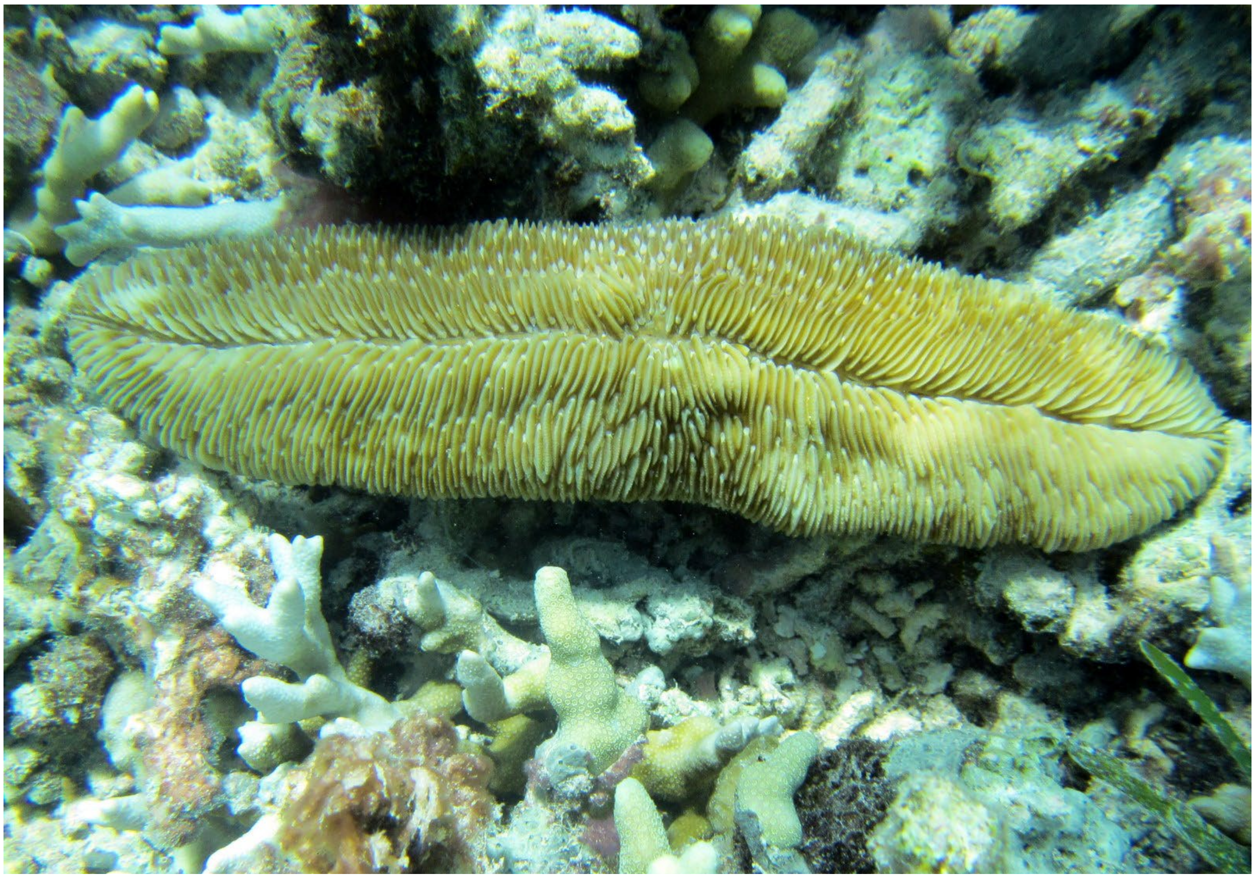
A closer photo of *Ctenactis albitentaculata*.

Herpolitha

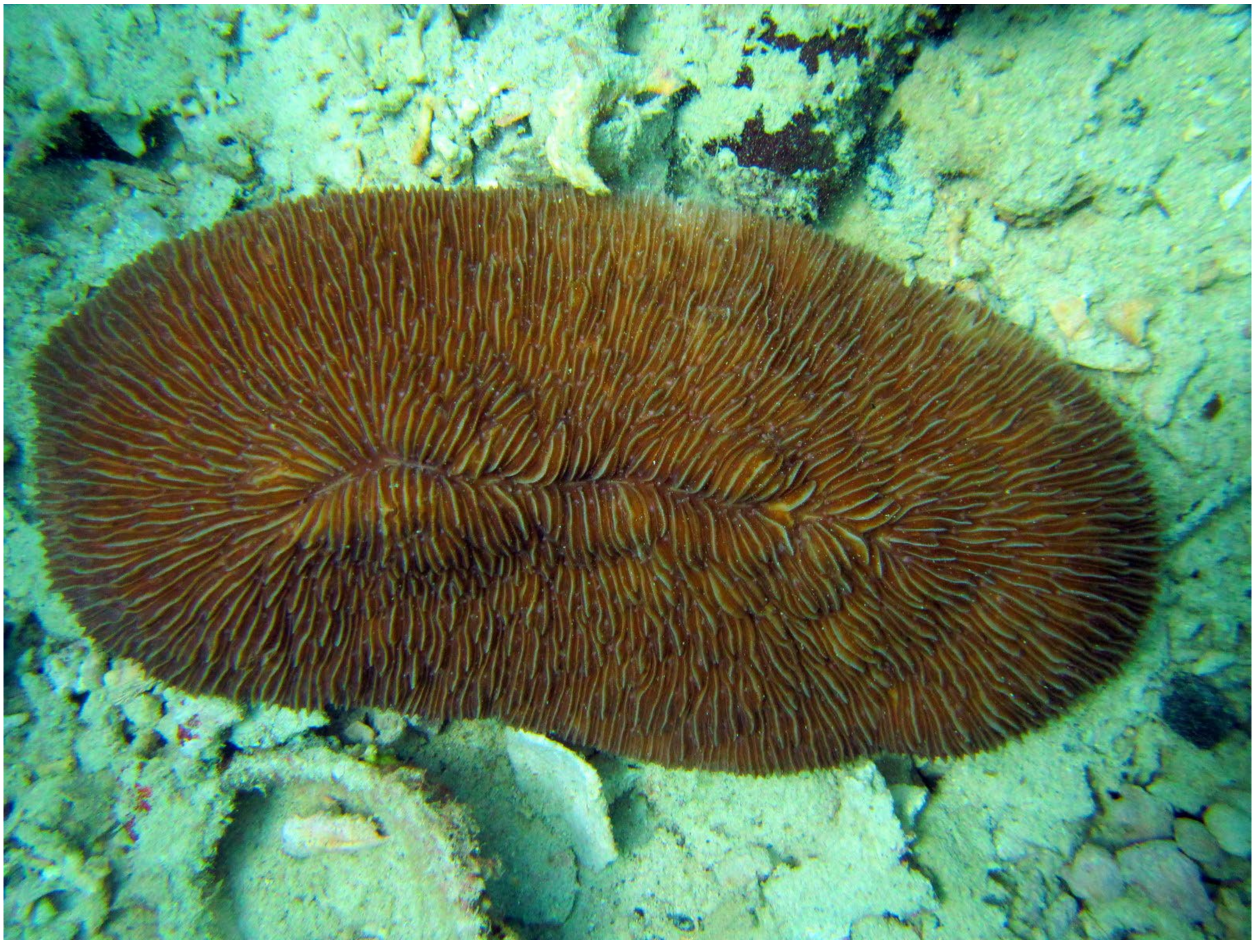
Colonies are elongated and narrower than *Ctenactis*. Colonies have multiple mouths in the long crack in the center. Septa run from the central crack towards the edge, and do not have visible teeth. Colonies are not attached. The ends of the coral are not as rounded as on *Ctenactis* and *Ctenactis* has visible teeth on the septa.

Herpolitha limax

Corals are described in the genus description above. Also, the septa do not continue all the way from the central crack to the edge but are replaced by other septa.



A colony of *Herpolitha limax*.



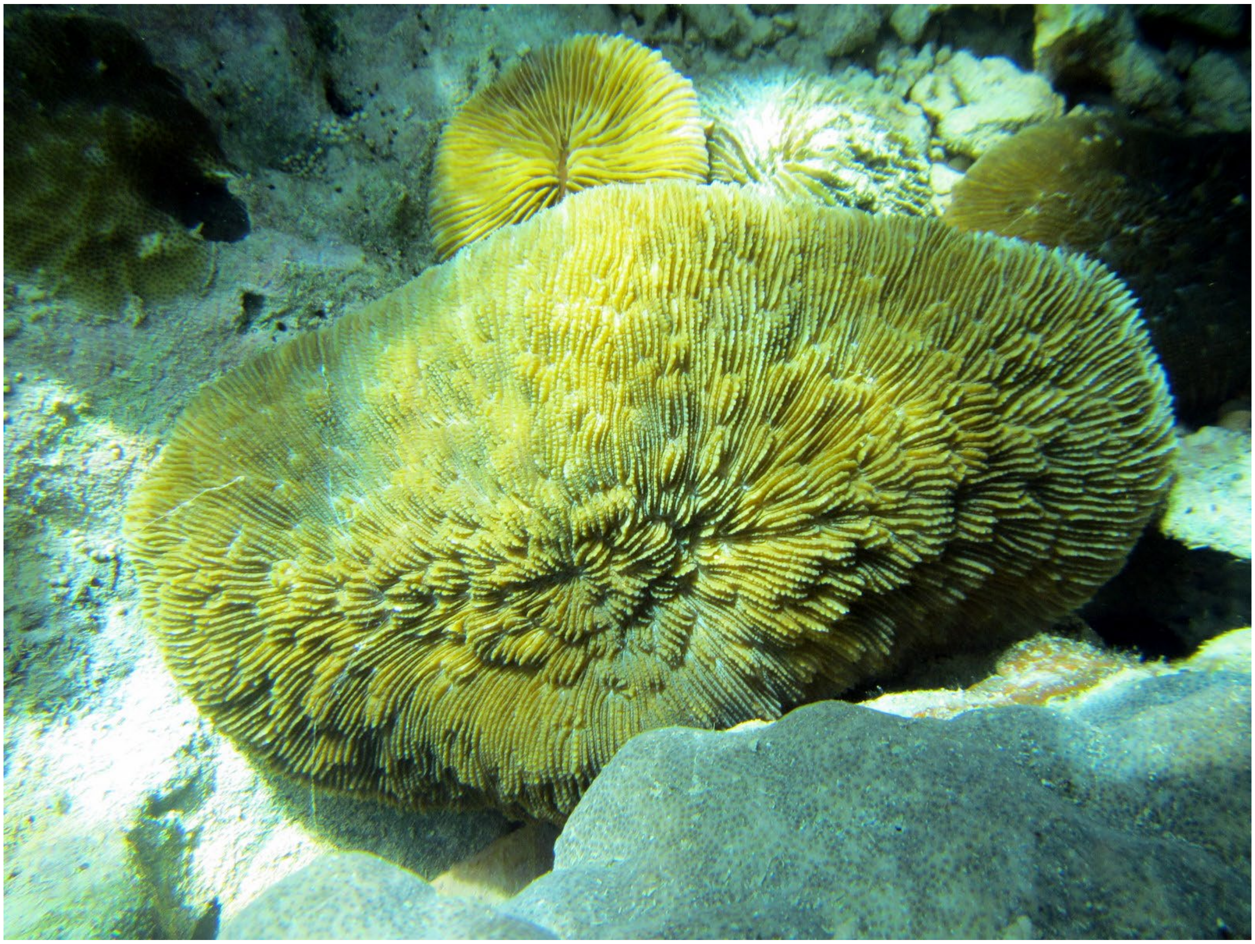
A colony of *Herpolitha limax* that is unusually wide.

Sandalolitha

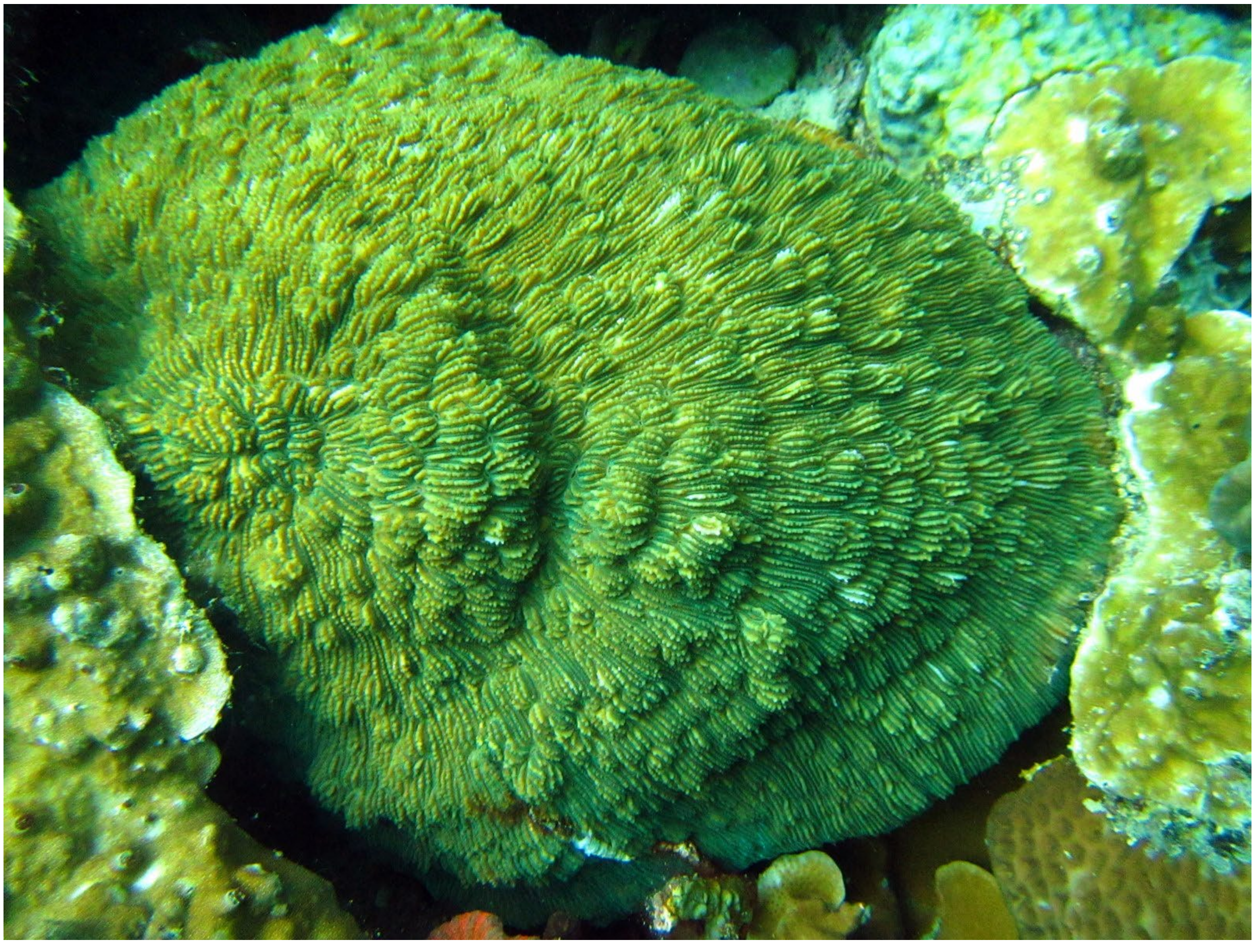
Colonies are oval, usually moderately domed, and not attached. Mouths are spread over part or all of the colony and there is no long central groove. Septa extend the short distances between corallites. Colonies are not circular like *Halomitra* and do not have white mouths.

Sandalolitha robusta

Colonies have mouths that are evenly spread across the whole coral. The mouths are not obvious but the septa are raised in clusters that end where the mouths are. In *Sandalolitha dentata* the mouths are clustered in the center.



A colony of *Sandalolitha robusta*.



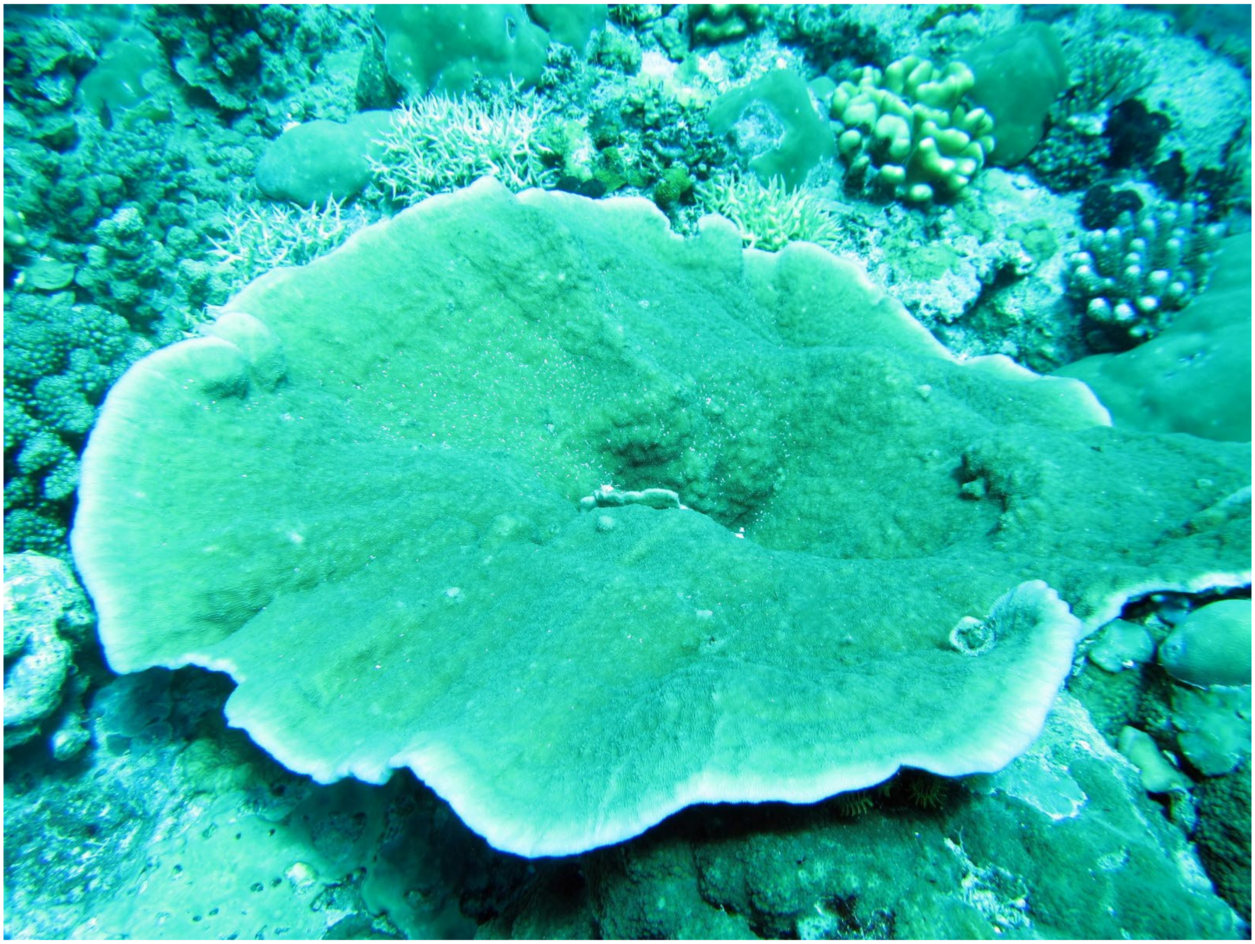
A colony of *Sandalolitha robusta*.

Podabacia

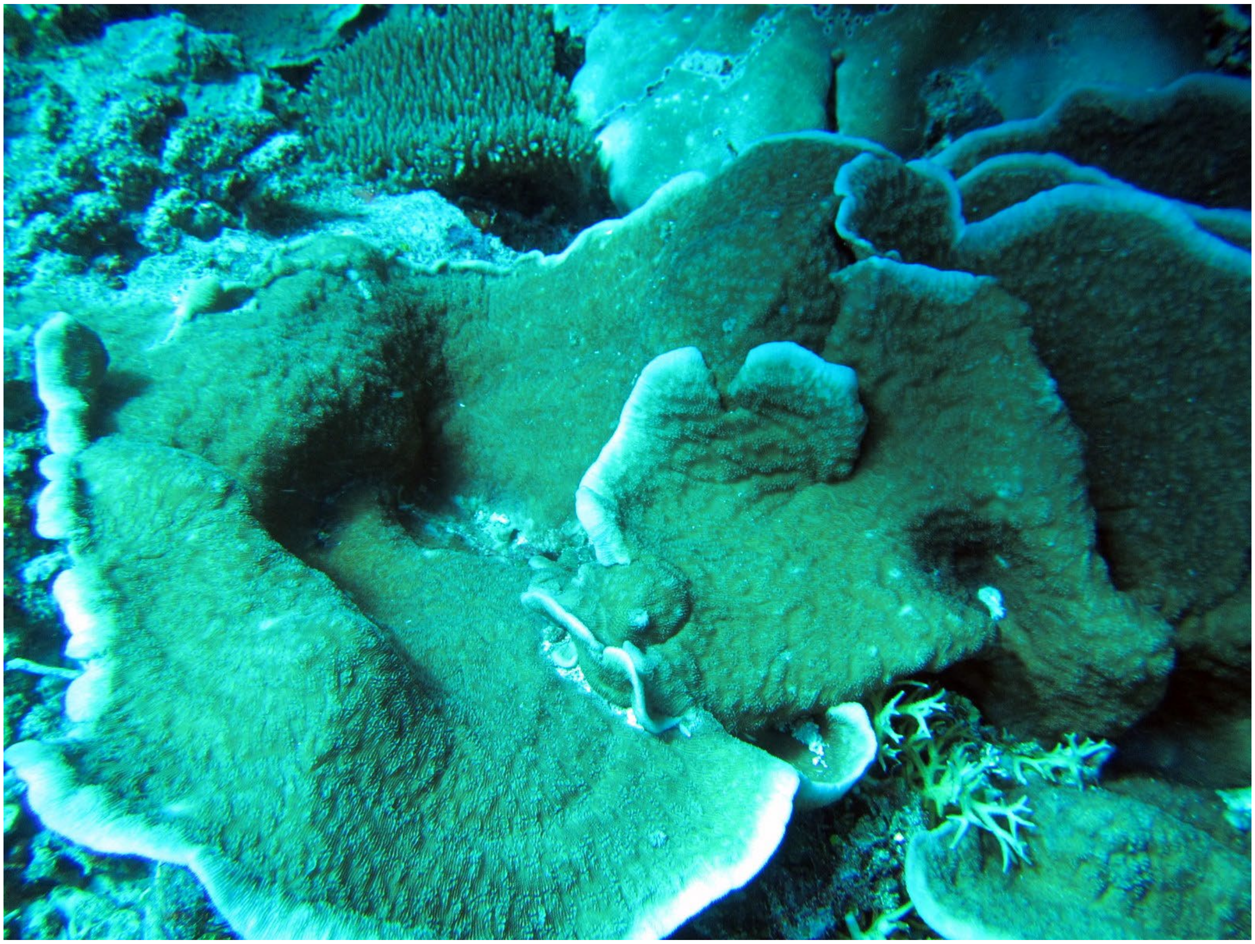
Colonies are foliose and attached. Plates are usually fairly close to horizontal. There are many small corallites spread across the upper surface. *Halomitra* and *Sandalolitha* are not attached and have larger mouths.

Podabacia motuporensis

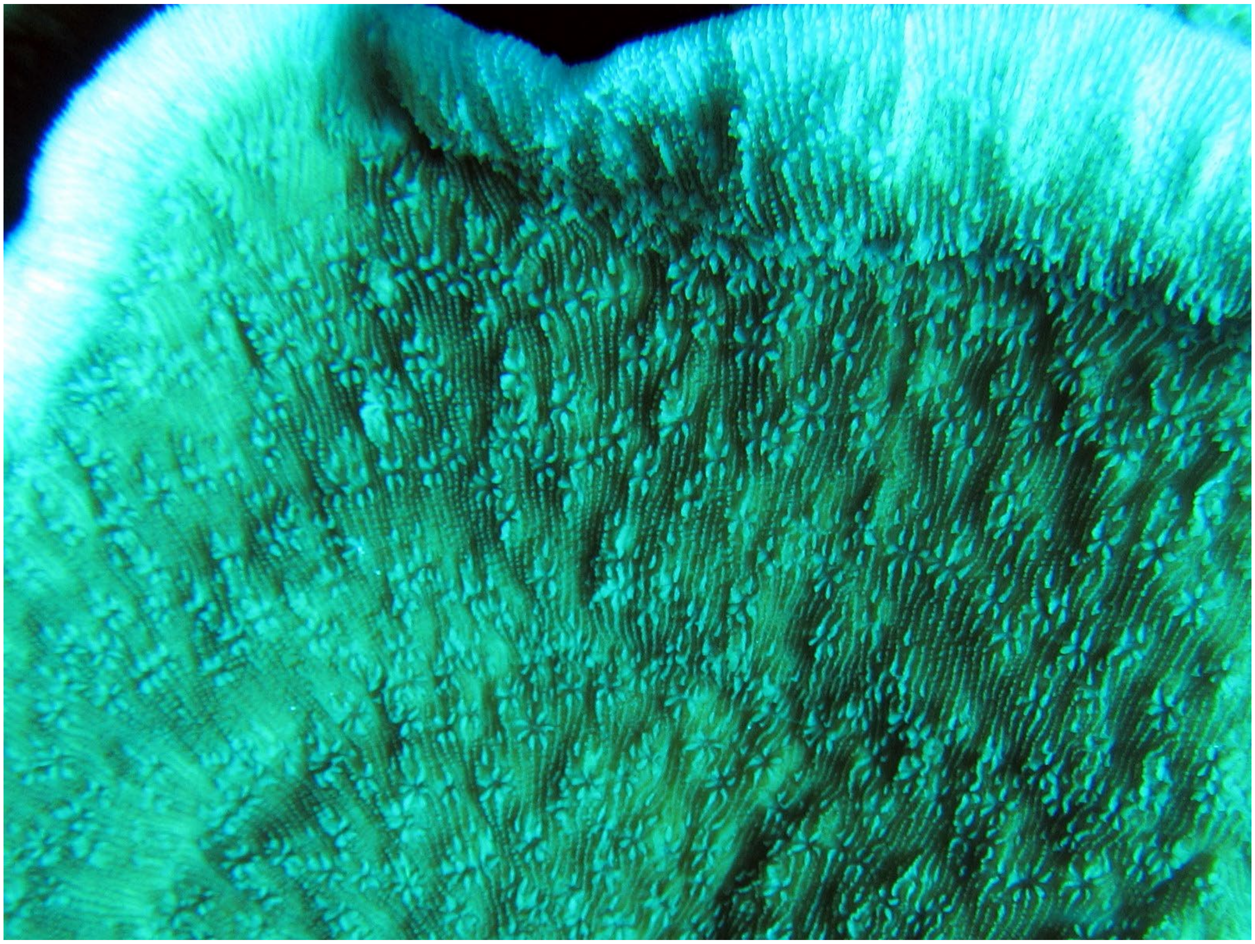
Corallites are small, around 3 mm diameter, and not obviously inclined towards the edge of the plate unlike on *Podabacia crustacea* where corallites are larger and outwardly inclined. *Leptoseris* usually has corallites raised as rounded mounds.



A colony of *Podabacia motuporensis*.



A colony of *Podabacia motuporensis*. The septa and corallites are barely visible.



A close-up photo of *Podabacia motuporensis* showing the small corallites and radiating septocostae.

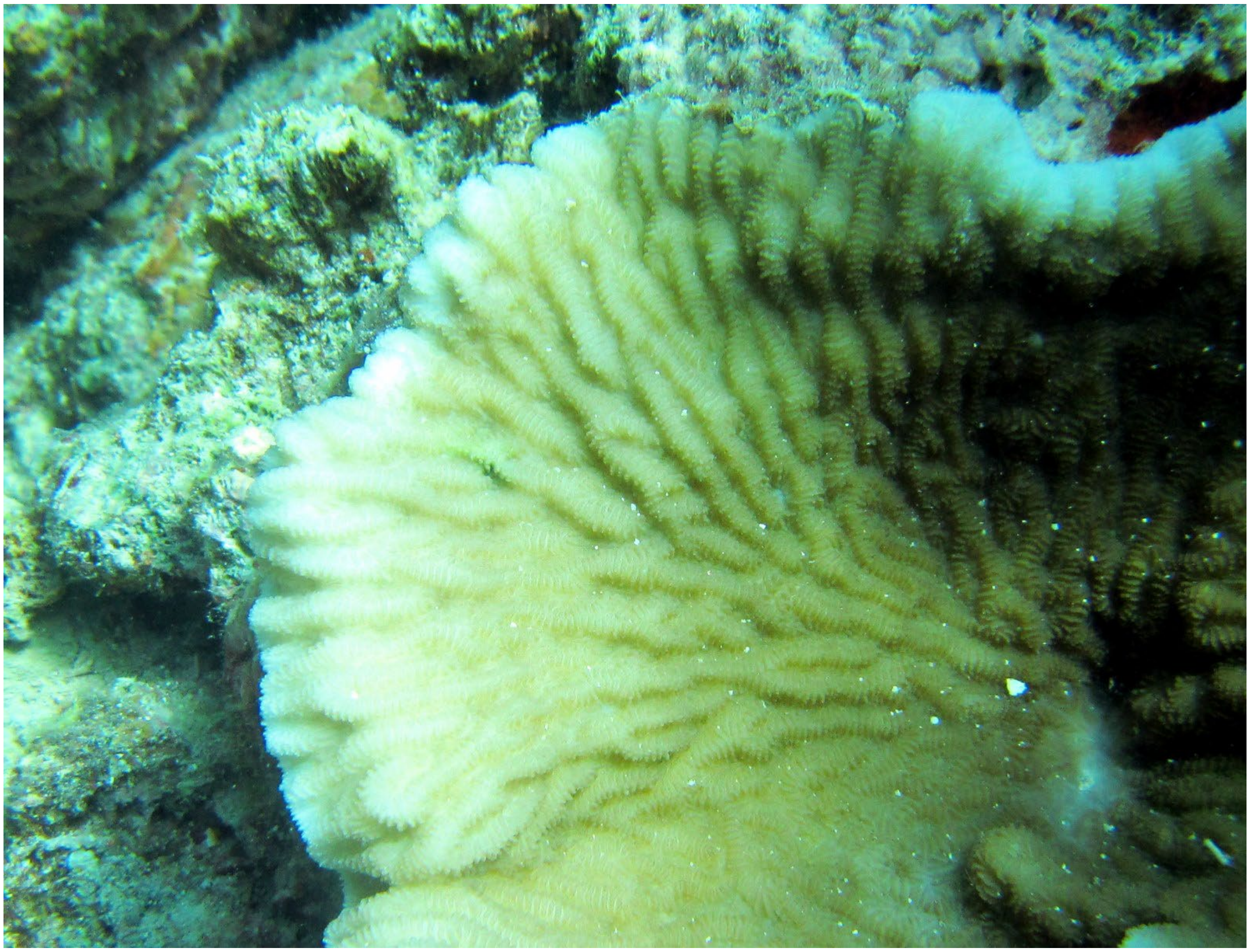
Merulina

Colonies are foliose or encrusting. The upper surface is covered with radiating ridges which divide and anastamose some. The corallites are between the ridges. Some colonies may also have nodules and/or columns growing upward from the upper surface of the colony. The columns are somewhat irregular in shape and are about finger to thumb width. Columns on *Scapophyllia* are much larger and smoother. Meandroid ("brain") corals are massive or encrusting and the ridges meander but don't radiate.

Merulina ampliata

The radiating ridges are relatively large, rounded, and smooth. They are up to about 3 mm wide. *Merulina speciosa* has thinner ridges.

A colony of *Merulina ampliata* showing the radiating ridges and knob growths.

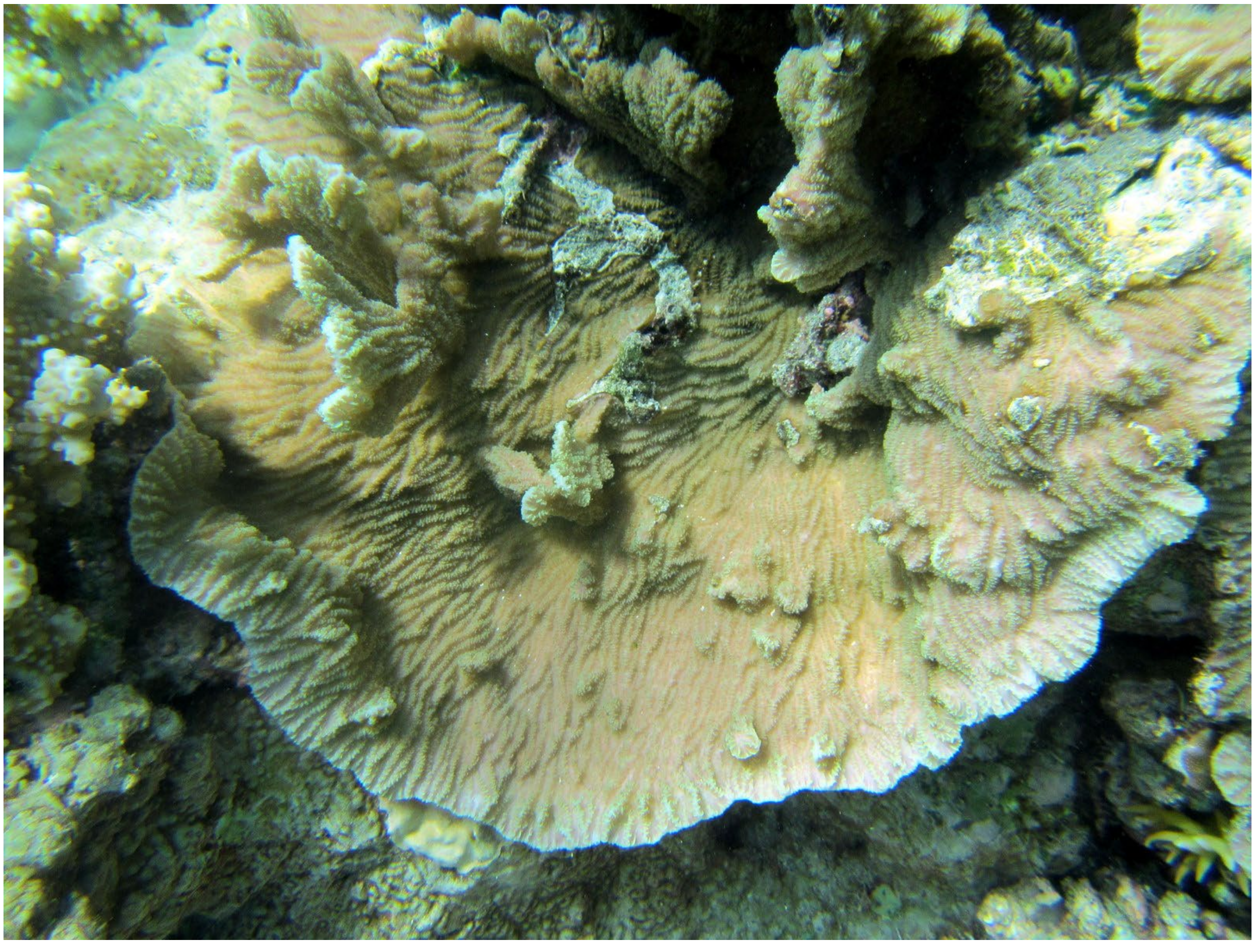


A close photo of *Merulina ampliata*, showing the pattern of divergence and anastomosing of ridges.

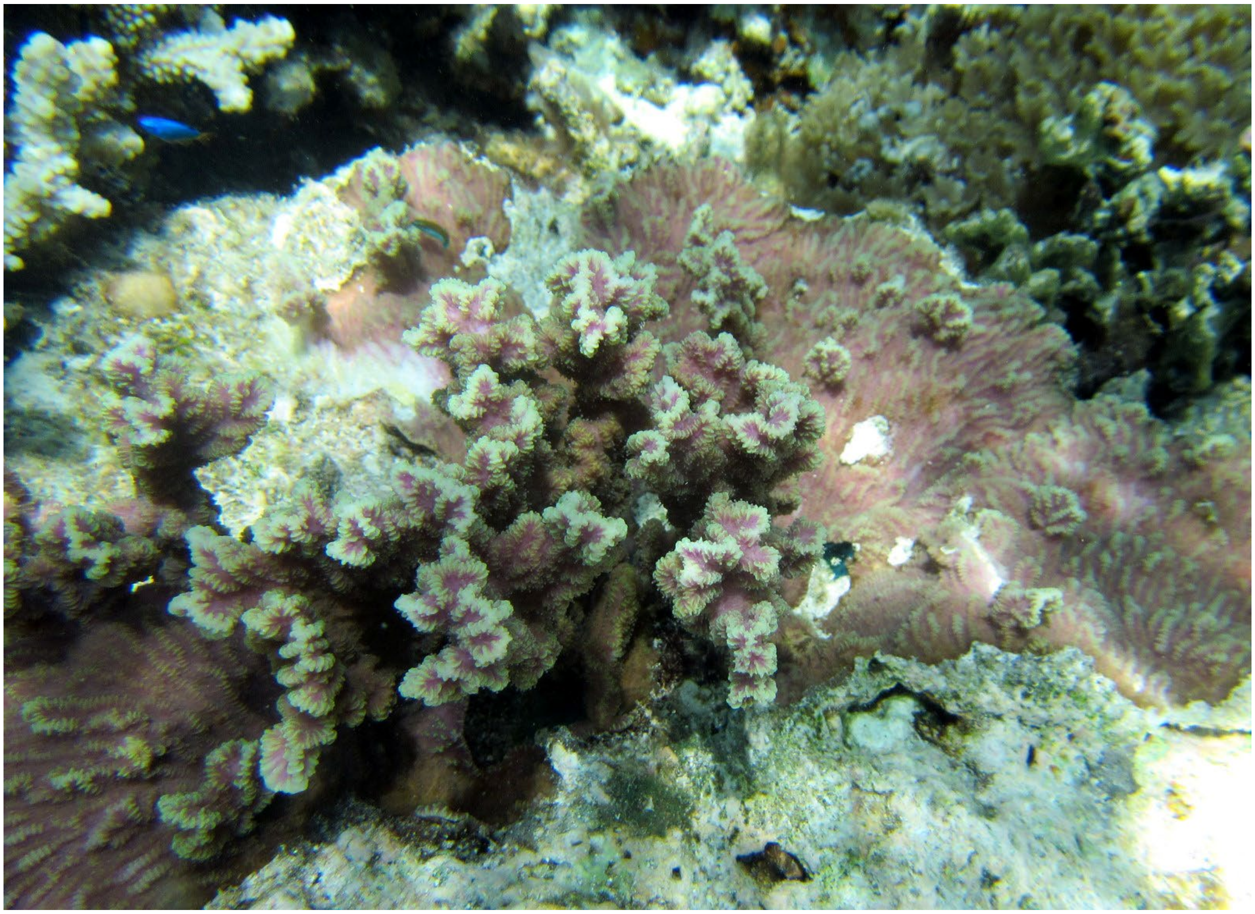
A close-up photo of *Merulina ampliata*, showing the ridges. The smaller cross-wise ridges are septa.

Merulina speciosa *This used to be called Merulina scabricula*

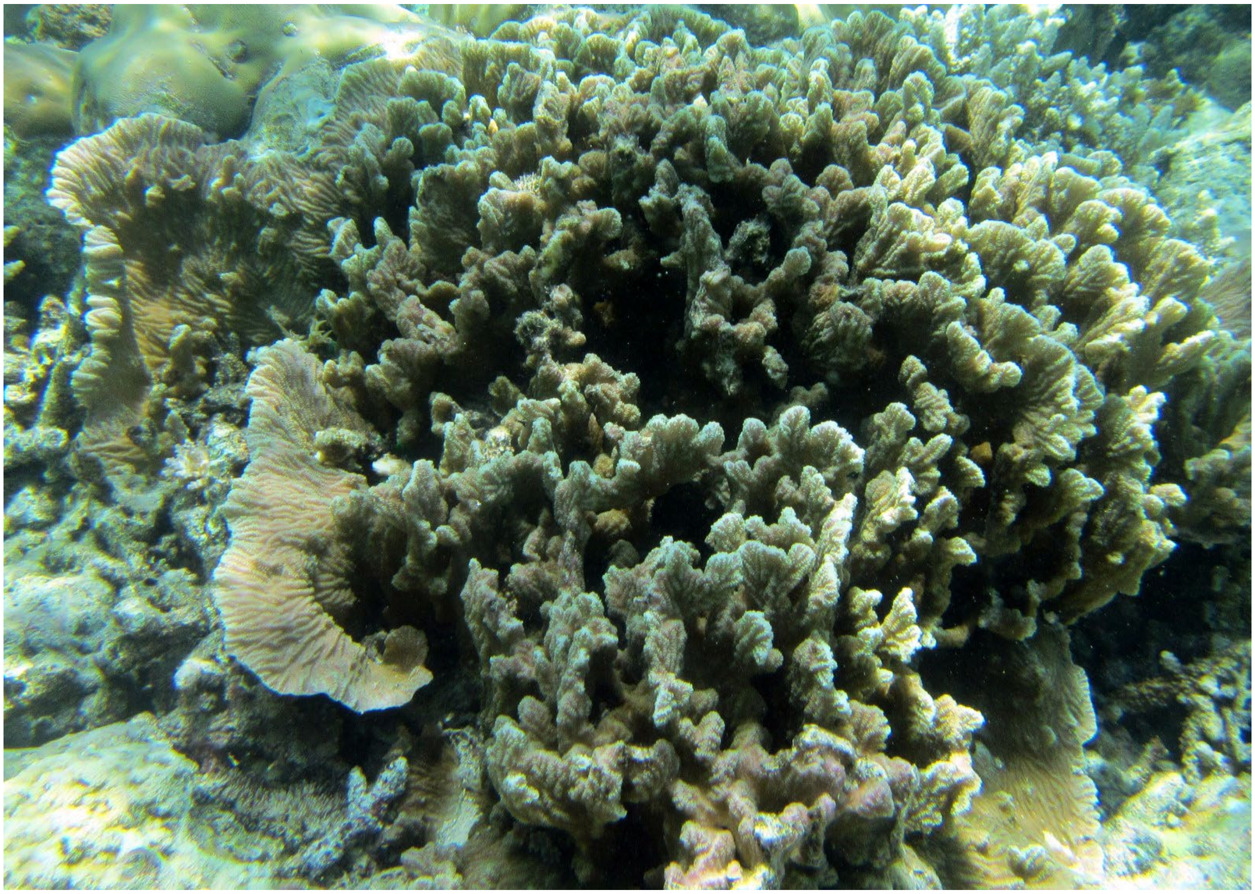
Colonies are thin plates which may have knobs, columns, or paddles growing up from it. Surfaces have radiating anastomosing ridges that are thinner than on *Merulina ampliata*. The type specimen of *Merulina scabricula* is branching with thick ridges, whle the type of *Merulina speciosa* has thin plates with thin ridges, which this species has.



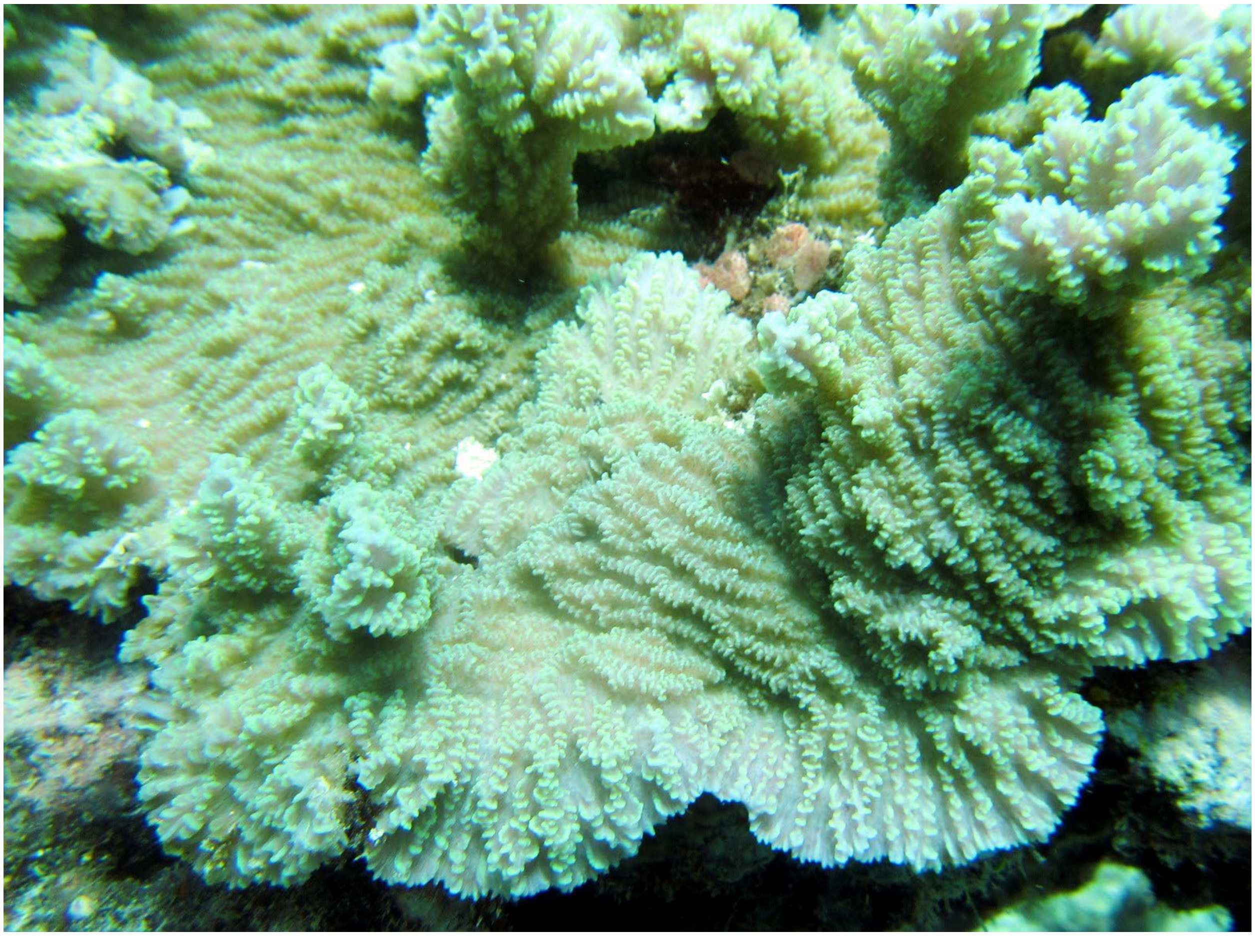
A colony of *Merulina speciosa* forming thin plates with upgrowths on it. The radiating ridges can just be seen.



A colony of *Merulina speciosa* with upgrowths that form an irregular cluster of winding, contorted columns and walls.



A colony of *Merulina speciosa* almost completely covered by upgrowths that are irregular but mostly wall-like.



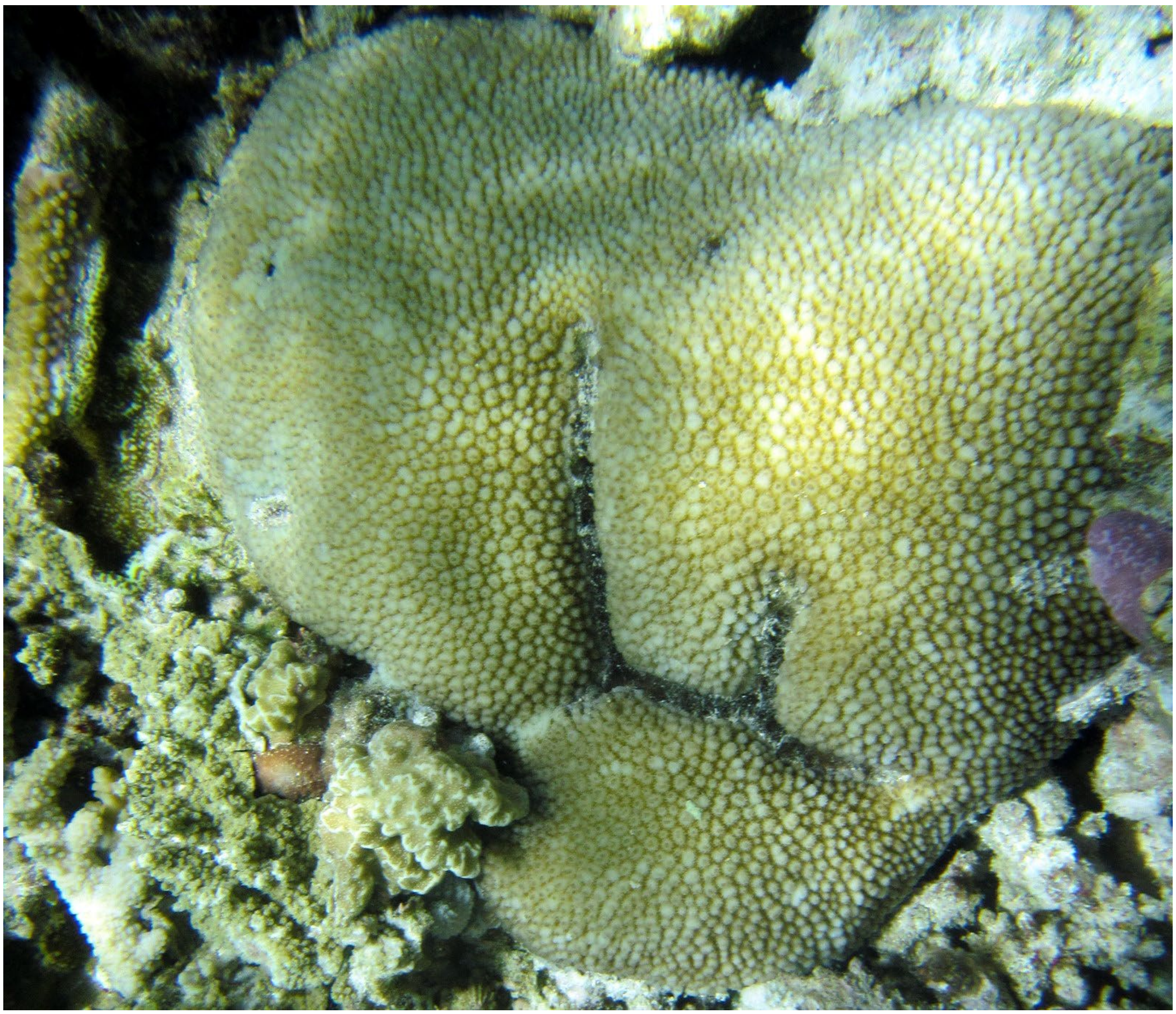
A close-up photo of a colony of *Merulina speciosa* showing the thin ridges and the irregular septa that form the ridges.

Hydnophora

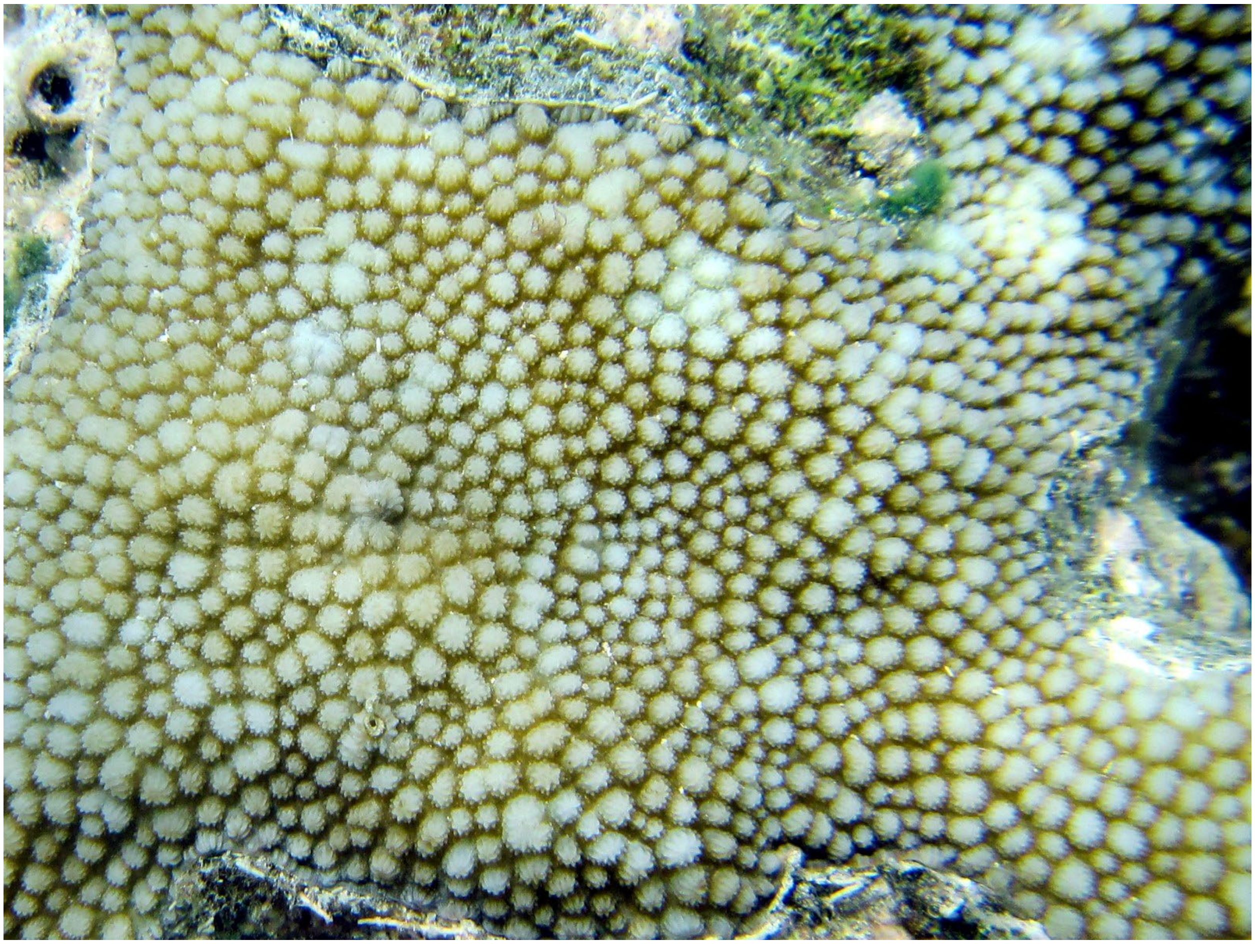
Colonies are massive, branching or plates. The surfaces are covered with small bumps called "hynophores." The corallites are between the hydnophores and there are septa on the sides of the hydnophores. On most but not all species, the hydnophores are oval or elongated. On branching species their long axis is parallel to the branch. Tentacles may be extended, partially or completely hiding the hyndophores. Verrucae on *Pocillopora* have corallites all over them and between them. Verrucae on *Montipora* are rounded and smooth and have no septa on their sides.

Hydnophora microconos

Colonies are massive and hynophores are small to tiny, about 1-3 mm diameter, and circular. Tentacles are not extended. The hynophores on other species are larger and oval, and this is the only massive species.



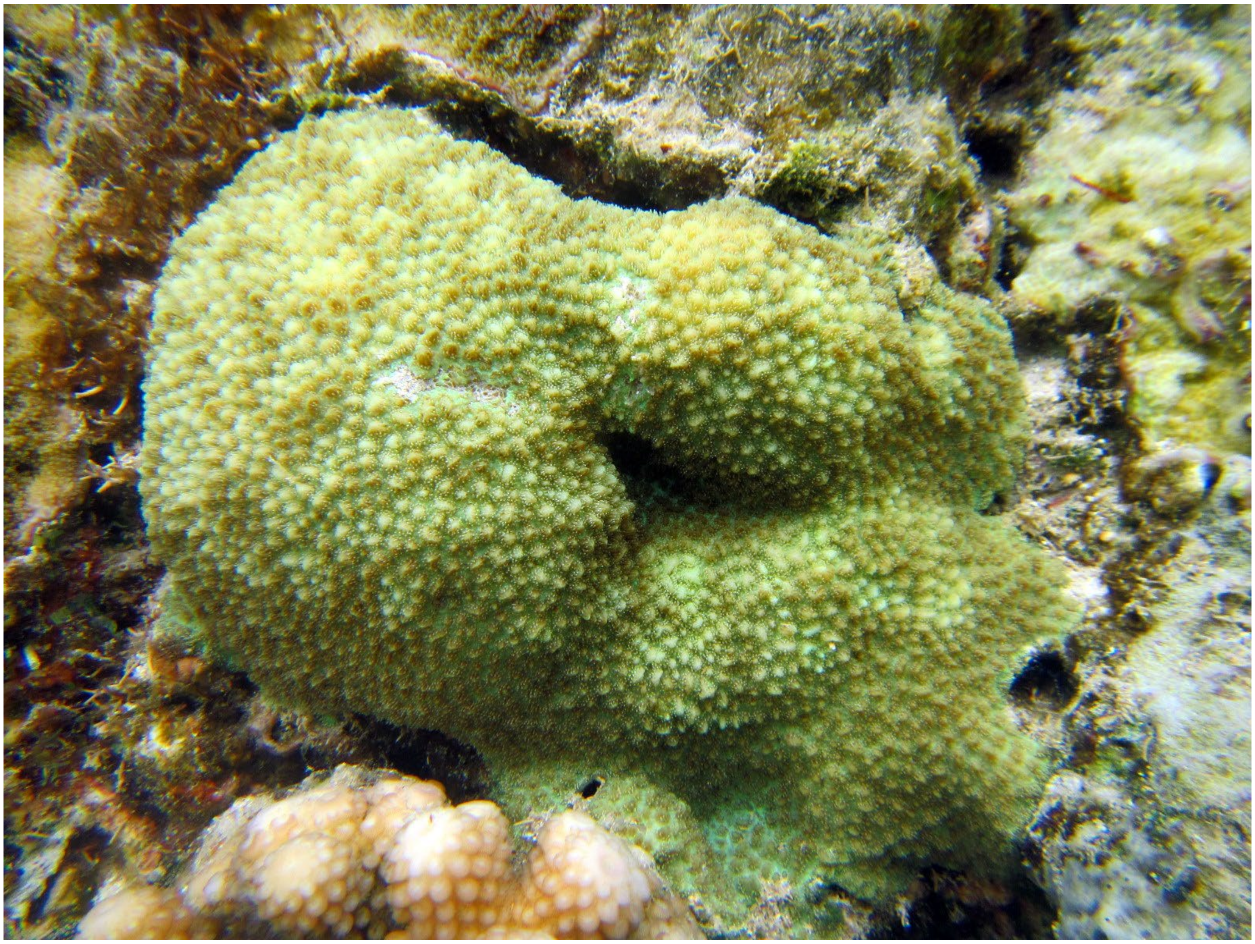
A colony of *Hynophora microconos*.



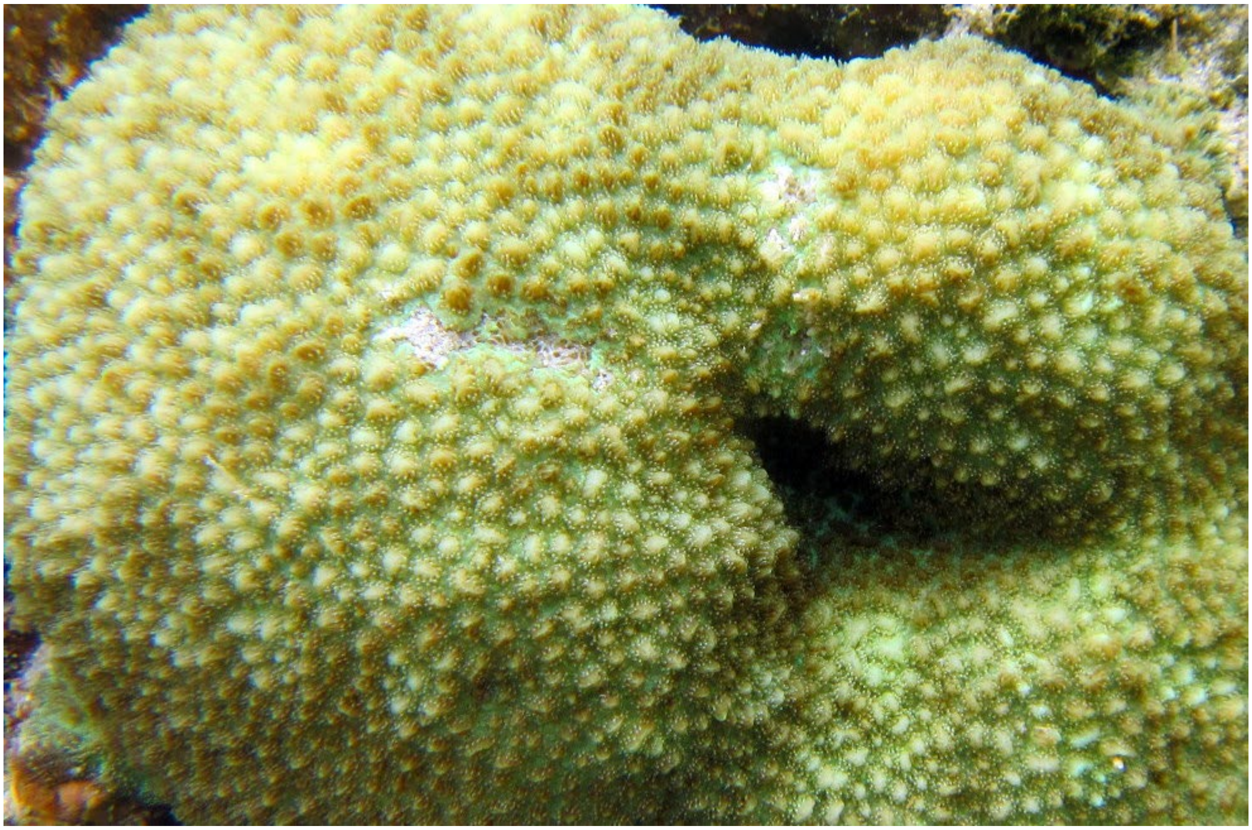
A close-up photo of *Hydnophora microconos*. The tiny ridges on the sides of the hydnophores are septa.

Hydnophora exesa

Colonies are encrusting, but may have thick, irregular lumps or branches. Hydnophores vary in size, with some being oval. Tentacles are often extended as a ring around hydnophores. *Hydnophora microconos* has smaller, more circular hydnophores and does not have tentacles extended. *Hydnophora rigida* is entirely branching, with long, thin branches with pointed tips.



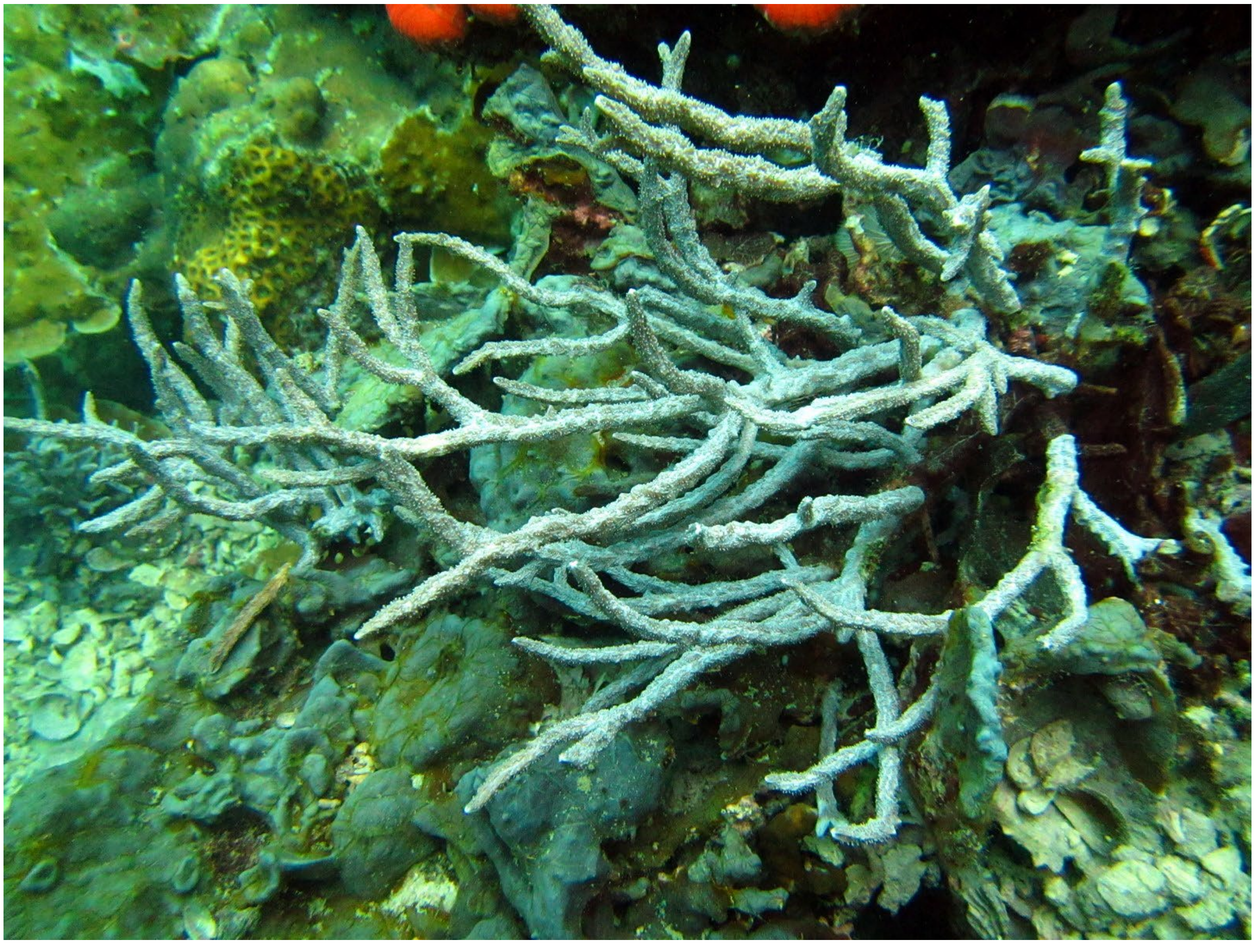
A colony of *Hynophora exesa*.



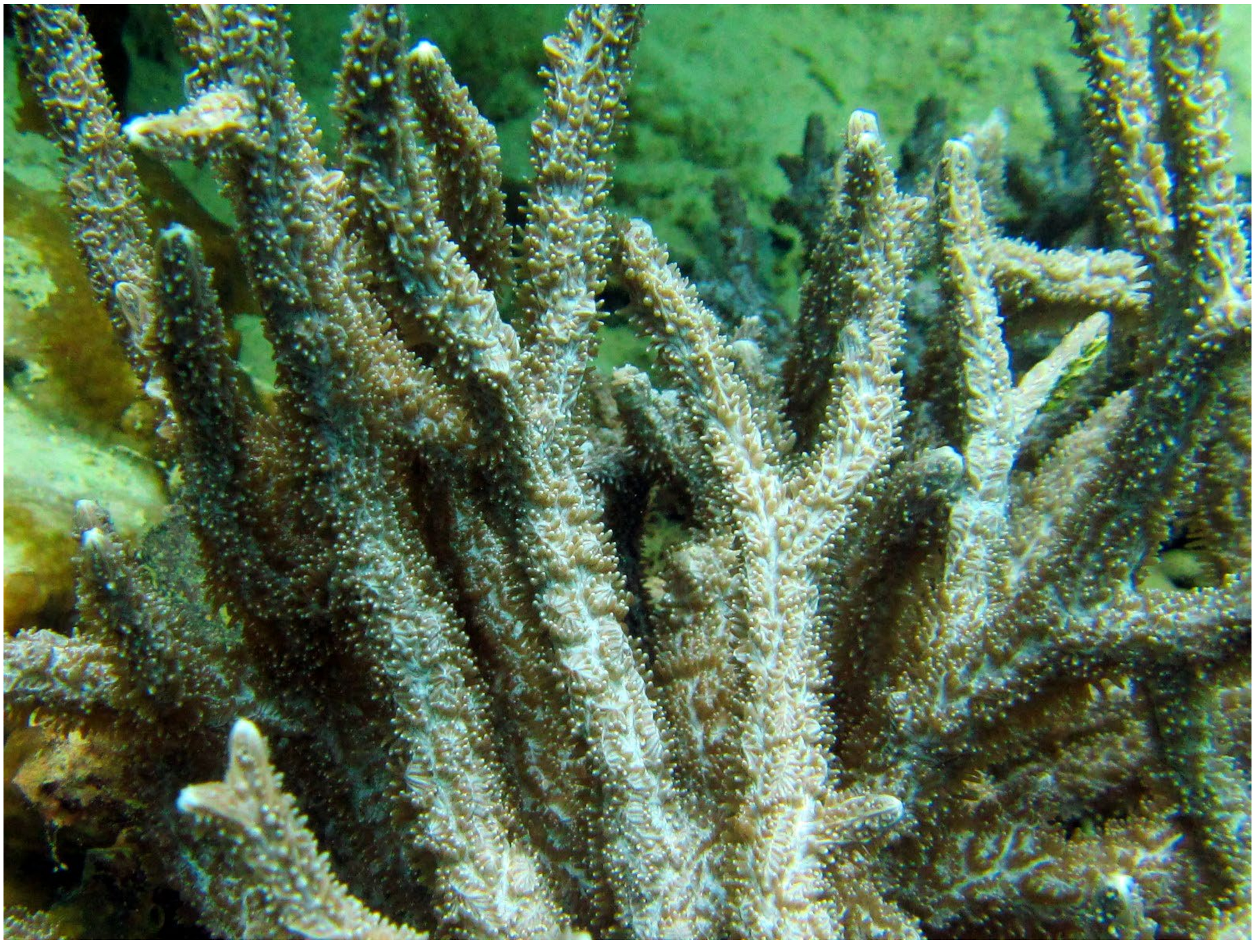
A close photo of *Hydnophora exesa*.

Hydnophora rigida

Colonies are branching, with branches that are finger width or less. Hydnophores are elongated on branches. In some colonies tentacles may be extended and obscure the hydnophores. Other *Hydnophora* species are not branching.



A colony of *Hydnophora rigida*.



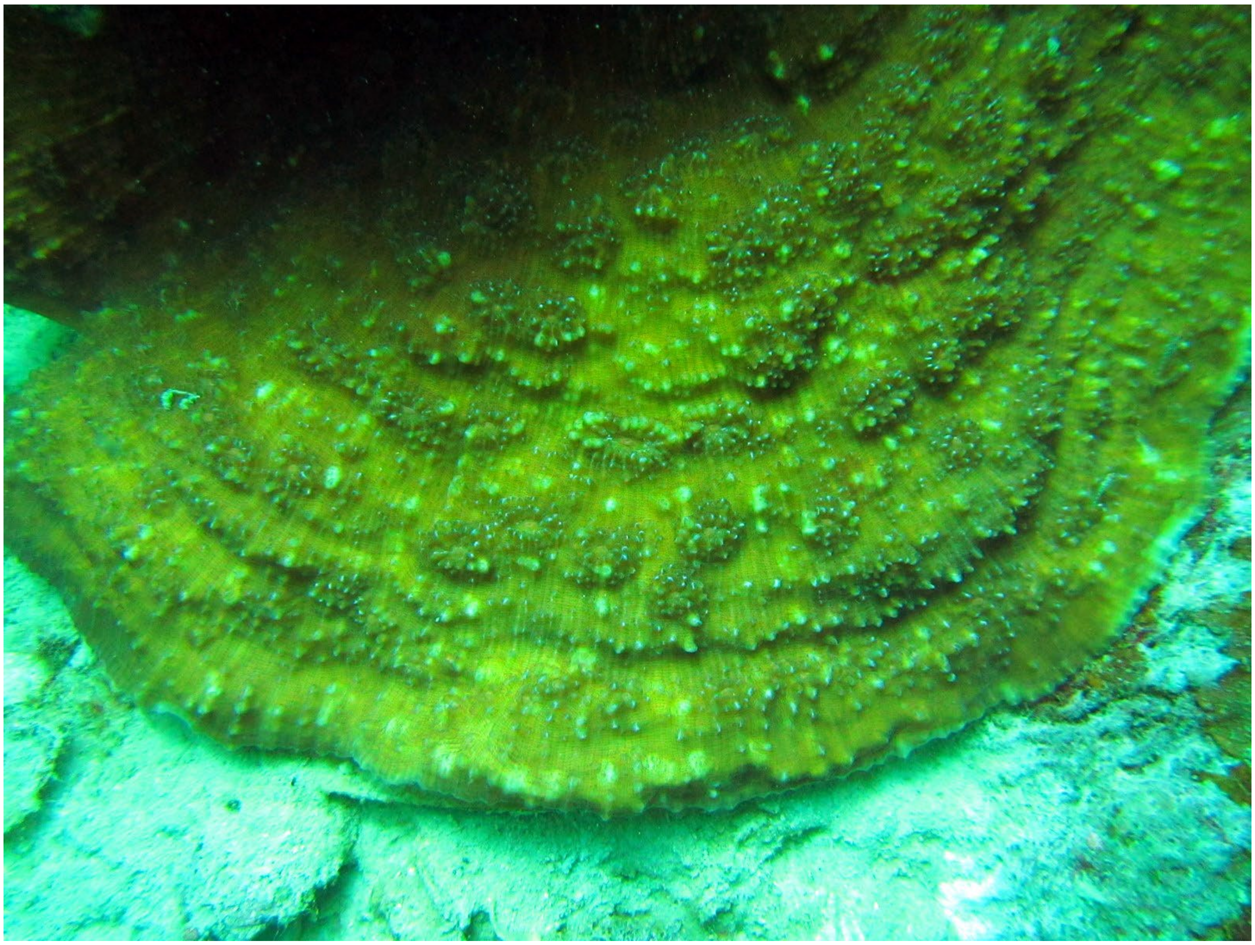
A close-up photo of *Hydnophora rigida*. Rings of tentacles are extended around the sides of hydnophores, so hydnophores are in the center of tentacles rings.

Echinophyllia

Colonies are thin plates or encrusting. Corallites are small to medium, usually less than finger diameter. Corallites may be difficult to distinguish on some colonies, consisting of small mounds of spines. Some species are quite spiny.

Echinophyllia aspera

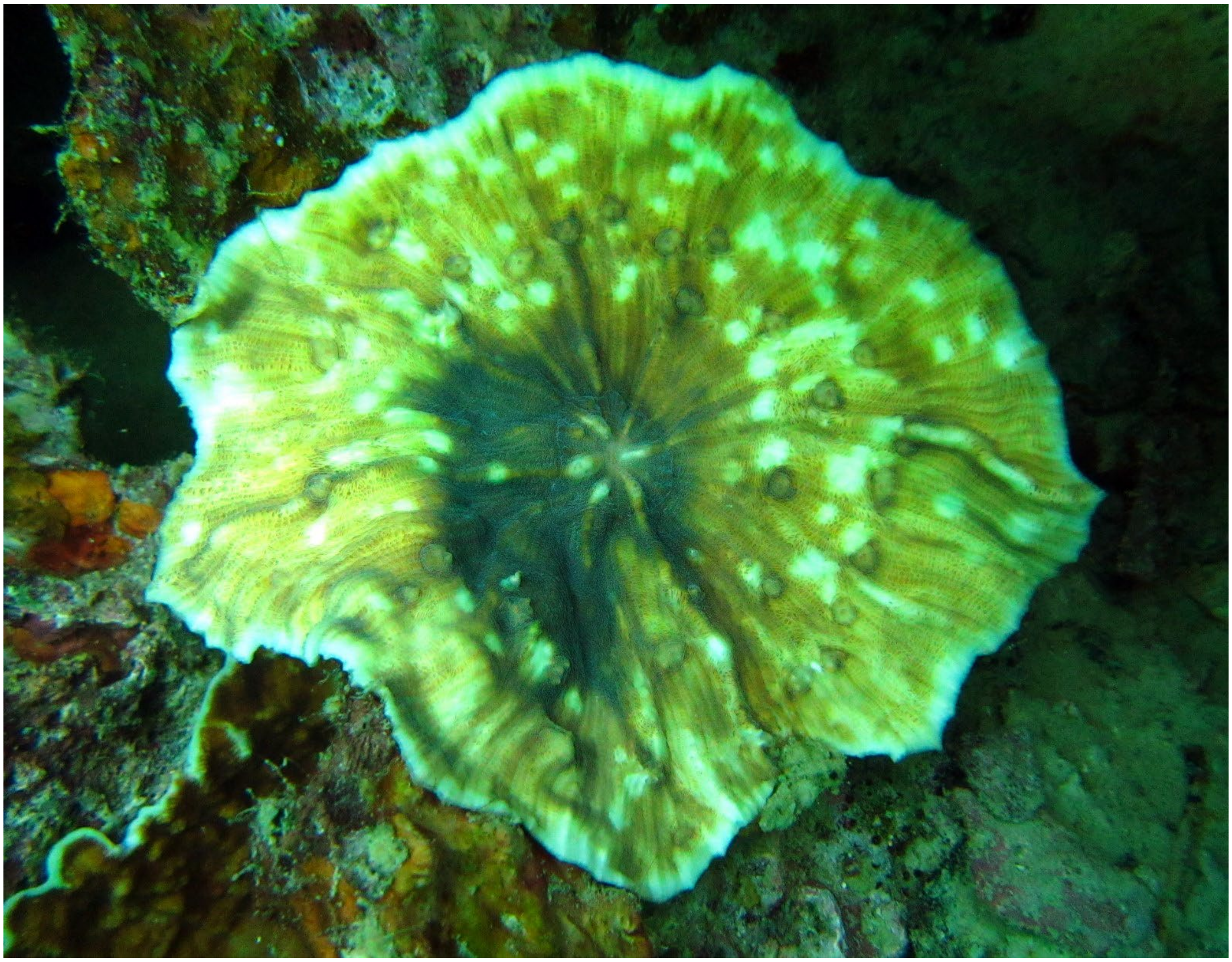
Colonies are encrusting or thin plates, and spiny. Corallites are about the size of the tip of a small finger. Corallites are raised clusters of spines, larger corallites can be oval, and usually the center of the corallite is depressed without spines. *Oxypora lacera* looks similar but the corallites are not as large or raised.



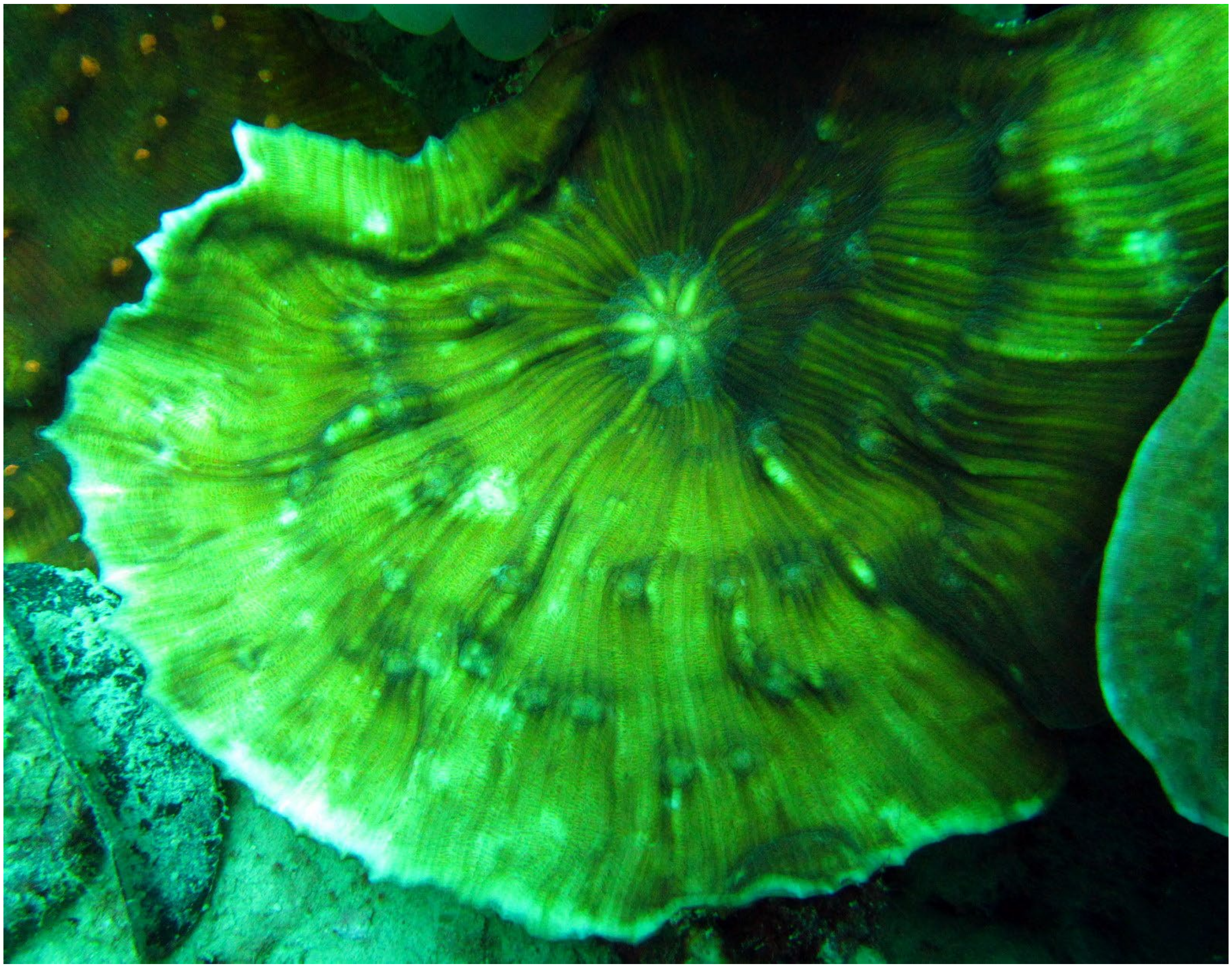
A colony of *Echinophyllia aspera*.

Echinophllia echinata

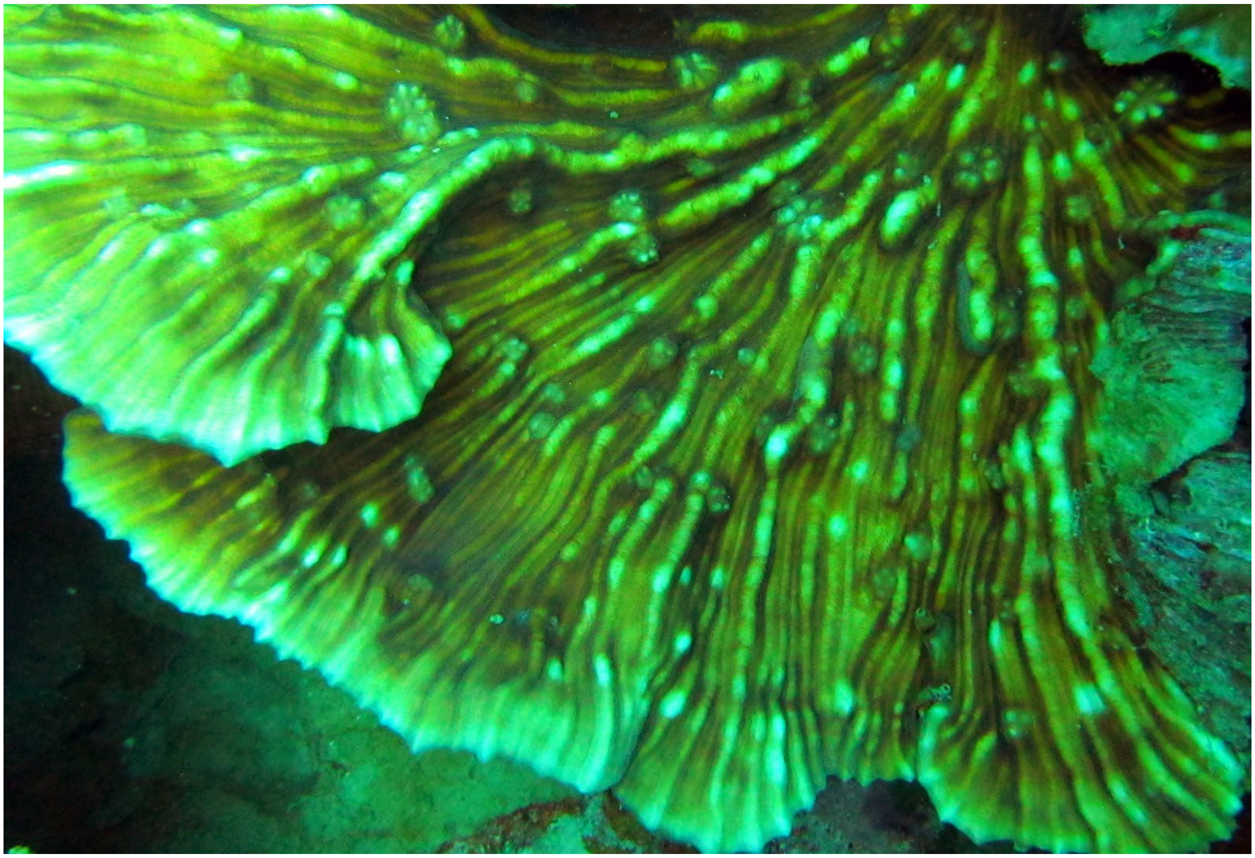
Colonies are thin plates with a large central corallite, a few large septo-costae radiating from that corallite, and smaller, hard to distinguish corallites on the rest of the plate. *Oxypora* cf. *crassispinosa* also has radating ridges from a central corallite, but has large thick spines.



A colony of *Echinophyllia echinata*. A large corallite in the center has a first cycle of six septa visible. Large septo-costae radiate from that corallite. Small dark circles elsewhere on the plate are small corallites.



A colony of *Echinophyllia echinata*.



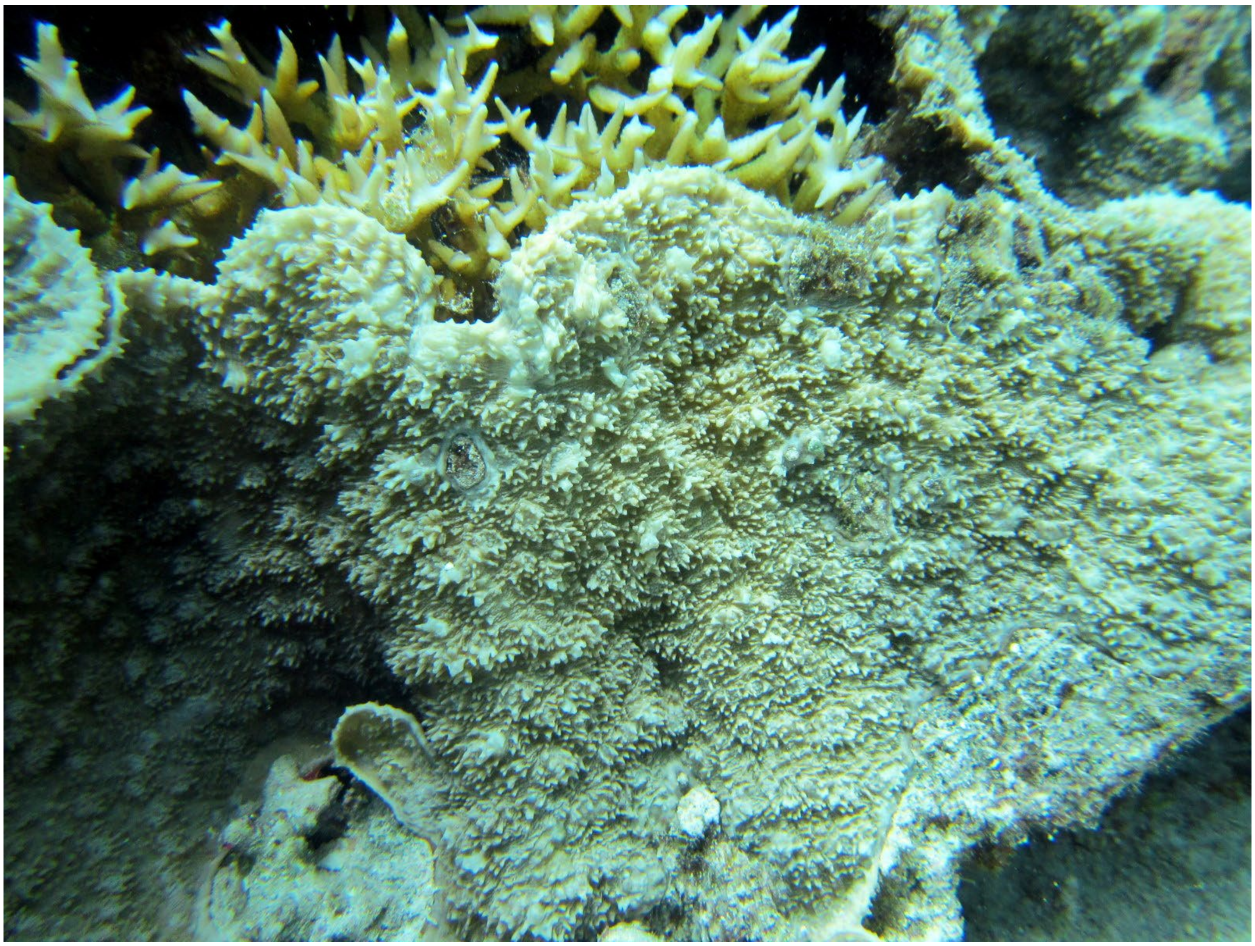
A close-up photo of part of a colony of *Echinophyllia echinata*. Many more radiating septo-costae are visible here than on the previous colonies. Some of the septo-costae have bumps on them. Septa can be seen on the small corallites.

Oxypora

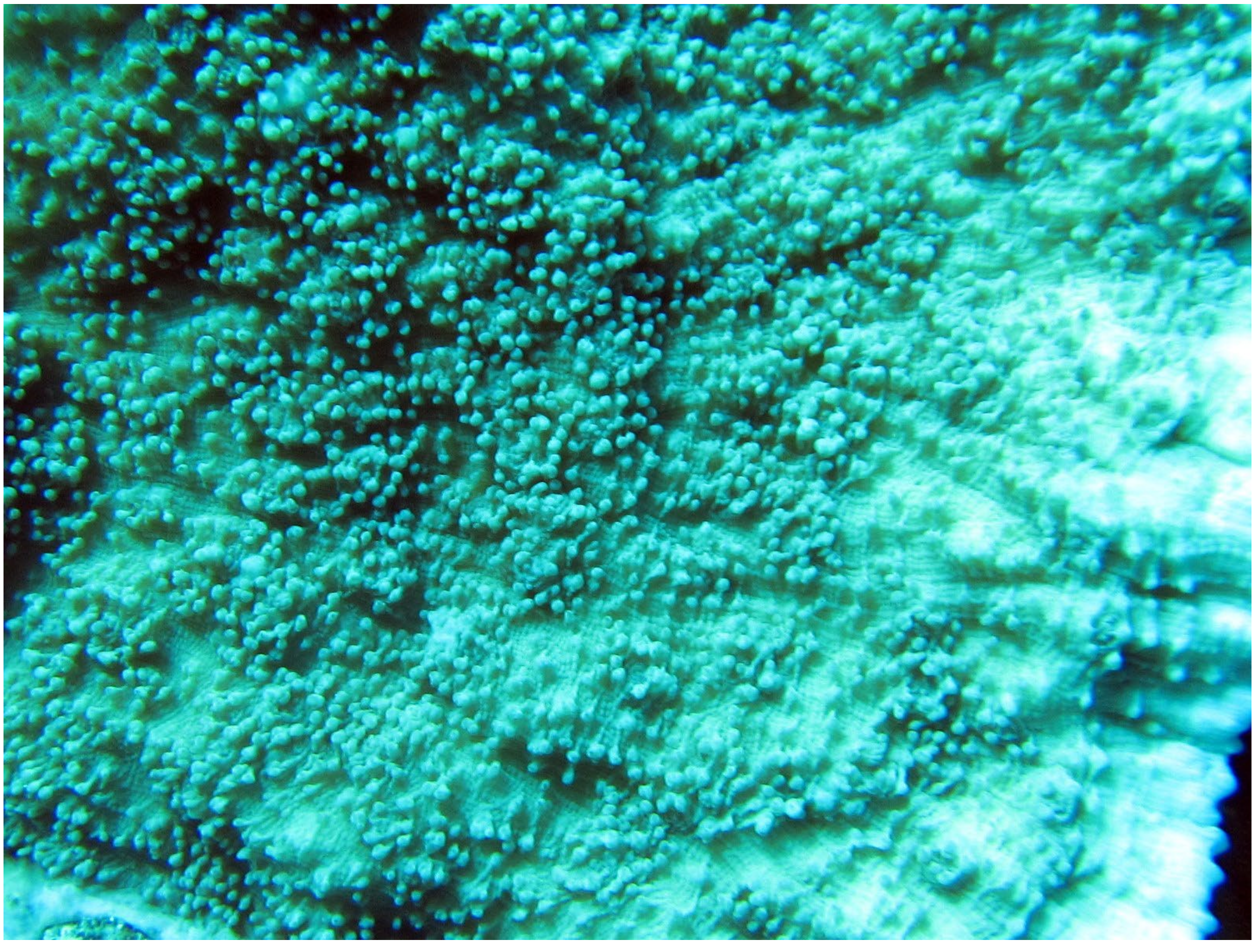
Colonies are thin plates. Most colonies are quite spiny, and corallites may be difficult to locate among the spines unless the mouth is a different color from the rest of the colony. One species has almost no spines. *Echinophyllia aspera* is also very spiny but has slightly largre corallites.

Oxypora lacera

Colonies are thin plates and/or encrusting. Plates are covered with a dense and somewhat irregular forest of spines that make it difficult or impossible to locate the corallites unless the corallite mouths are in a contrasting color. *Echinophyllia aspera* is similar but the corallites are a lttle larger and extend upwards a little in a rounded mound.



A colony of *Oxypora lacera* where corallites are difficult to locate among the spines.



Close-up photo of a colony of *Oxypora lacera*.

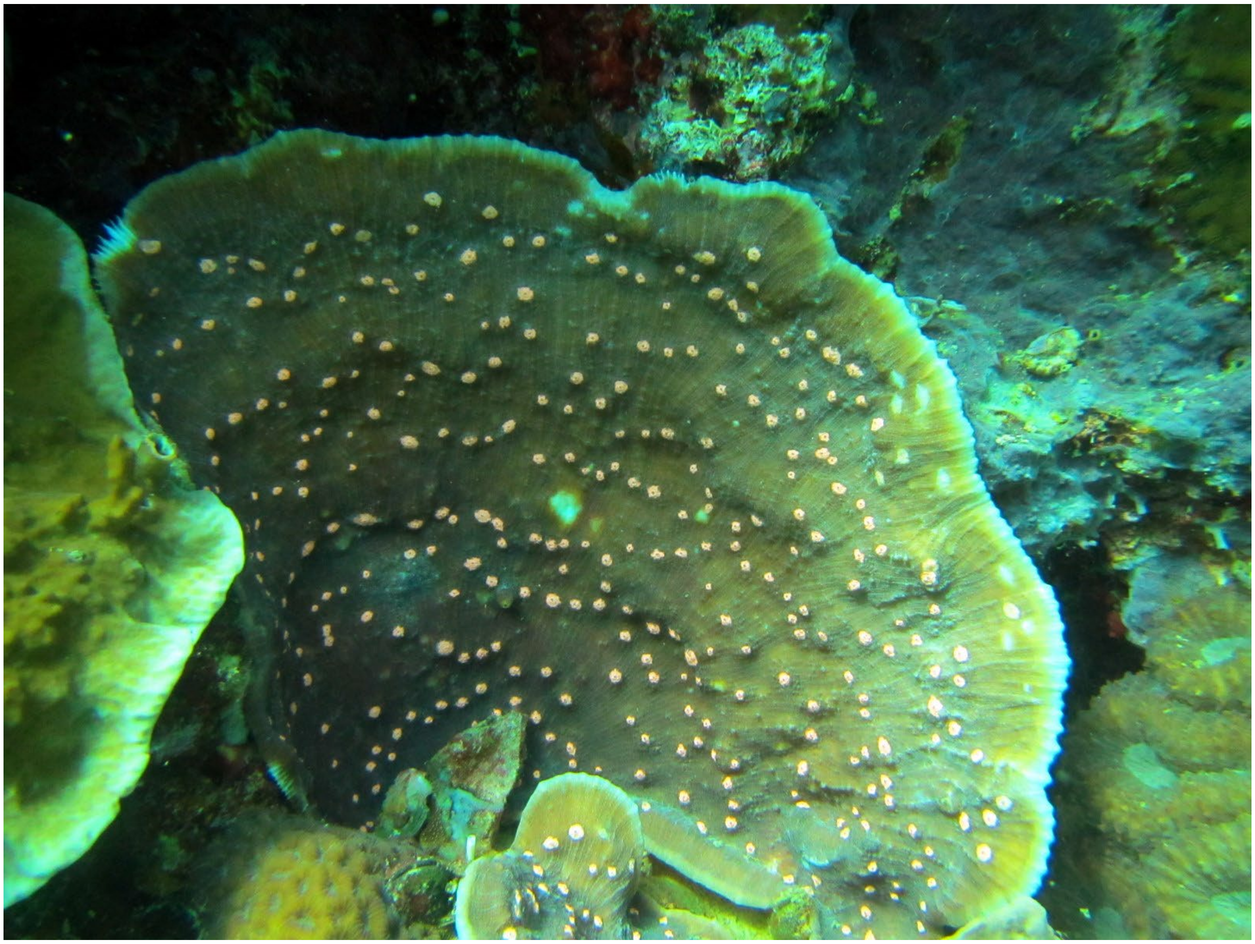
Oxypora cf. crassispinosa

Colonies have very large, thickened spines along radiating septo-costae. *Echinophyllia echinata* also has a single central corallite with radiating septo-costae, but does not have the large spines.

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

Oxypora glabra

Colonies are thin plates. All features are like *Oxypora lacera* except it has few if any spines on the plates.



A colony of *Oxypora glabra*. The Pink spots are the polyp mouths. Few if any spines can be seen.

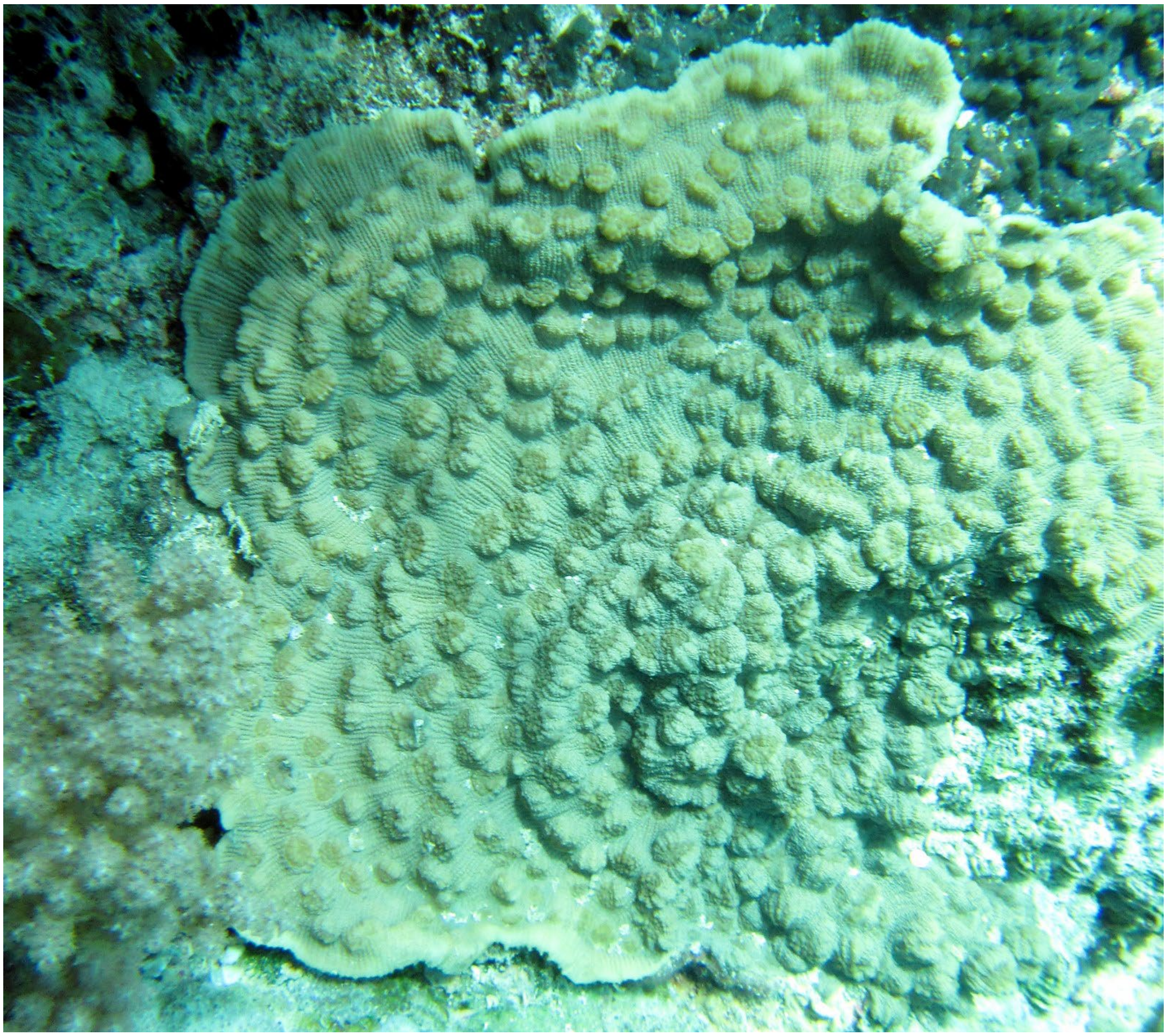
A close-up of *Oxypora glabra*. The orange spots are polyps.

Mycedium

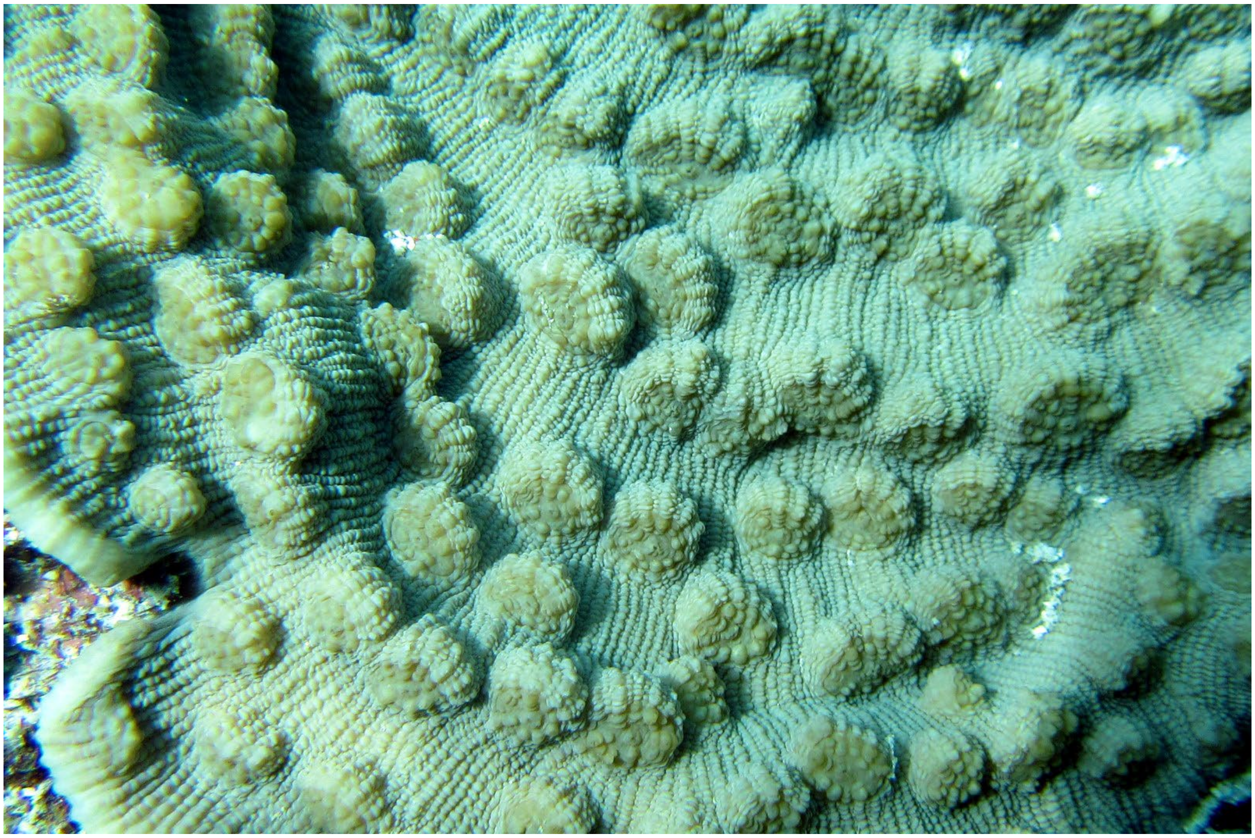
Colonies are thin plates. Corallites project and are inclined towards the outer edge of the plate. Polyps are often colored differently from other parts of the colony. *Leptoseris* can have outwardly inclined corallites on plates, but the plates are usually smaller and the corallites are shorter, smaller, and rounded.

Mycedium elephantotus

Corallites are about the diameter of a finger, project, and are strongly inclined towards the outer edge of the colony. Corallites are larger than on *M. robokakai*.



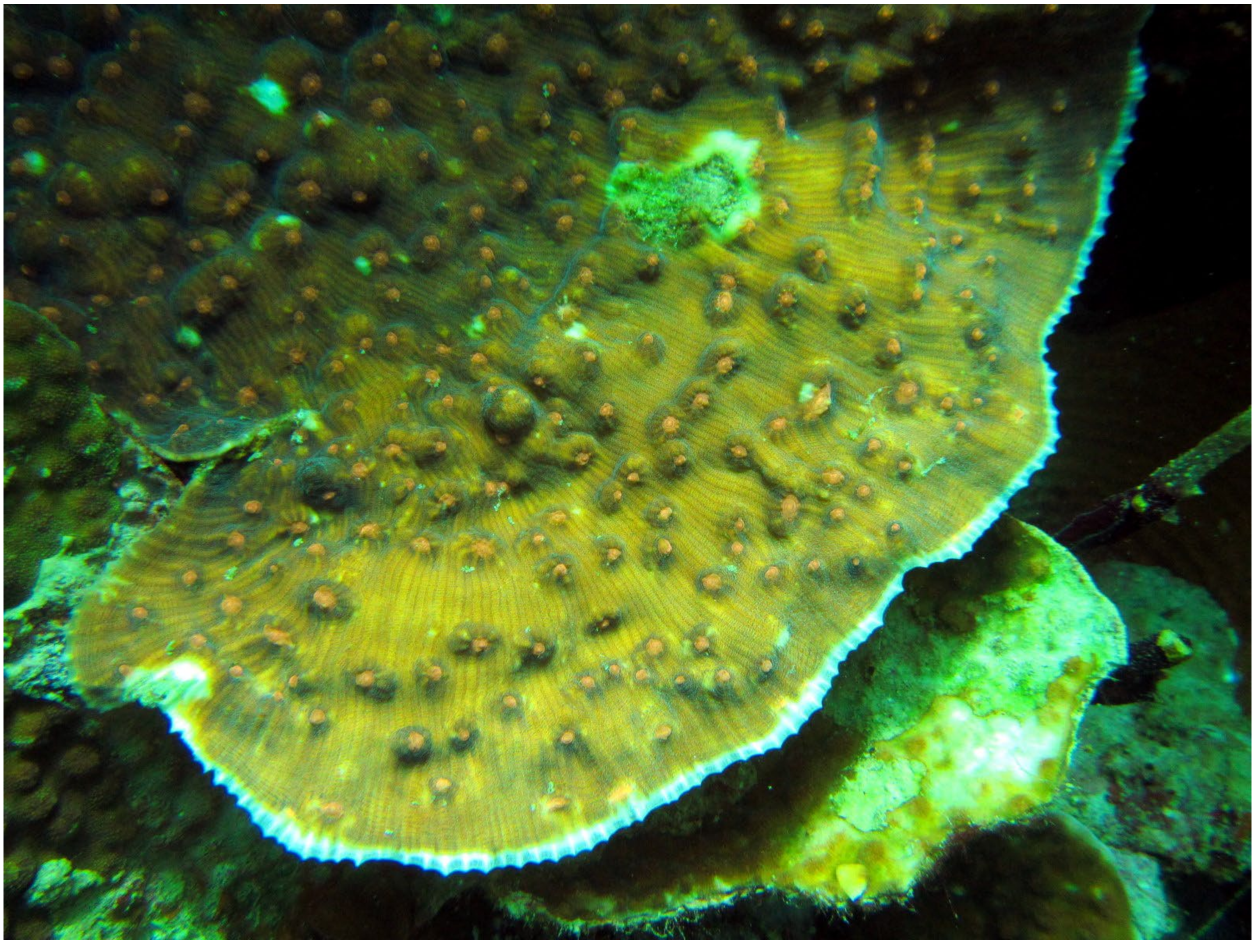
A colony of *Mycedium elephantotus*.



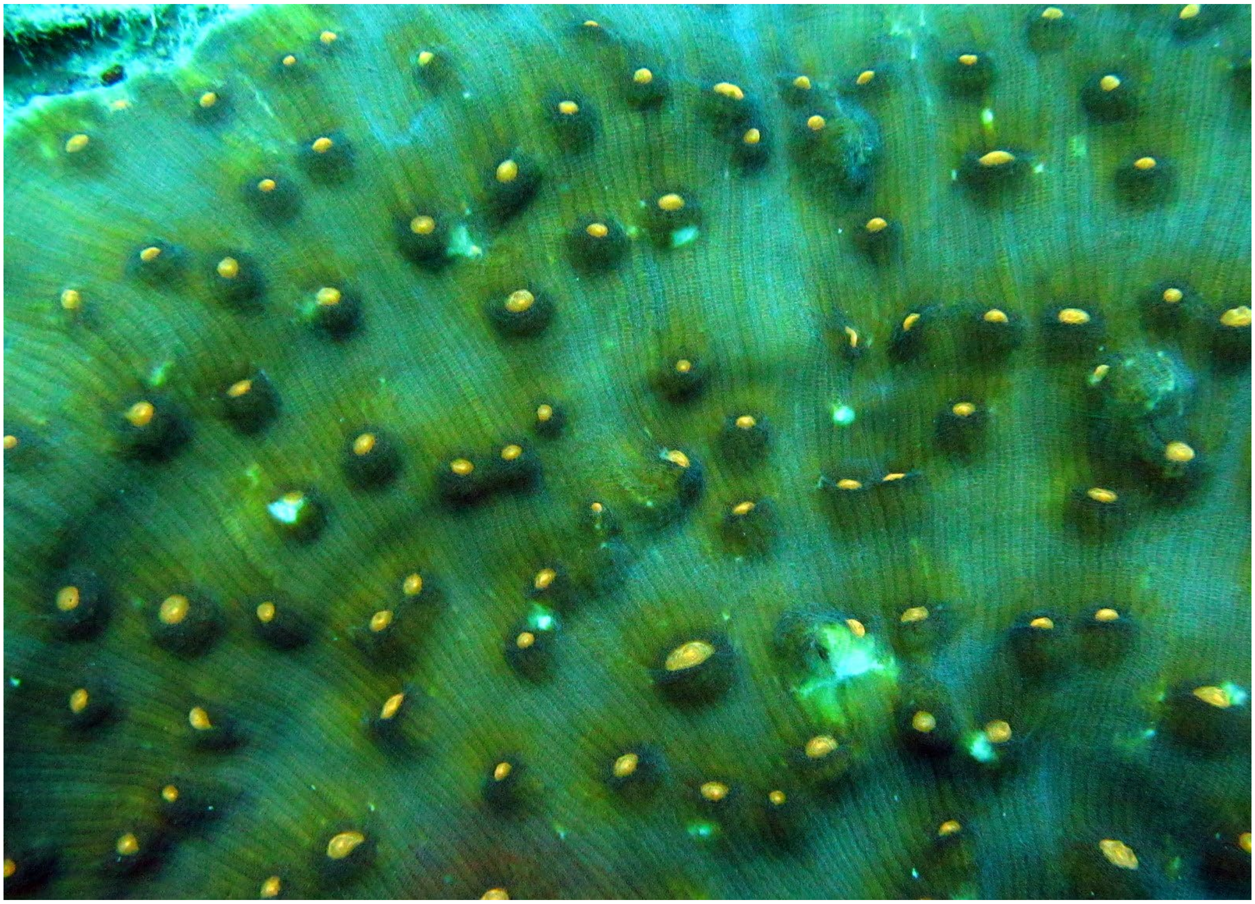
A close-up photo of *Mycedium elephantotus*.

Mycedium robokakai

Colonies are very similar to *Mycedium elephantotus*, except that the corallites are smaller.



A colony of *Mycedium robokakai*.



A close-up photo of *Mycedium robokakai*.

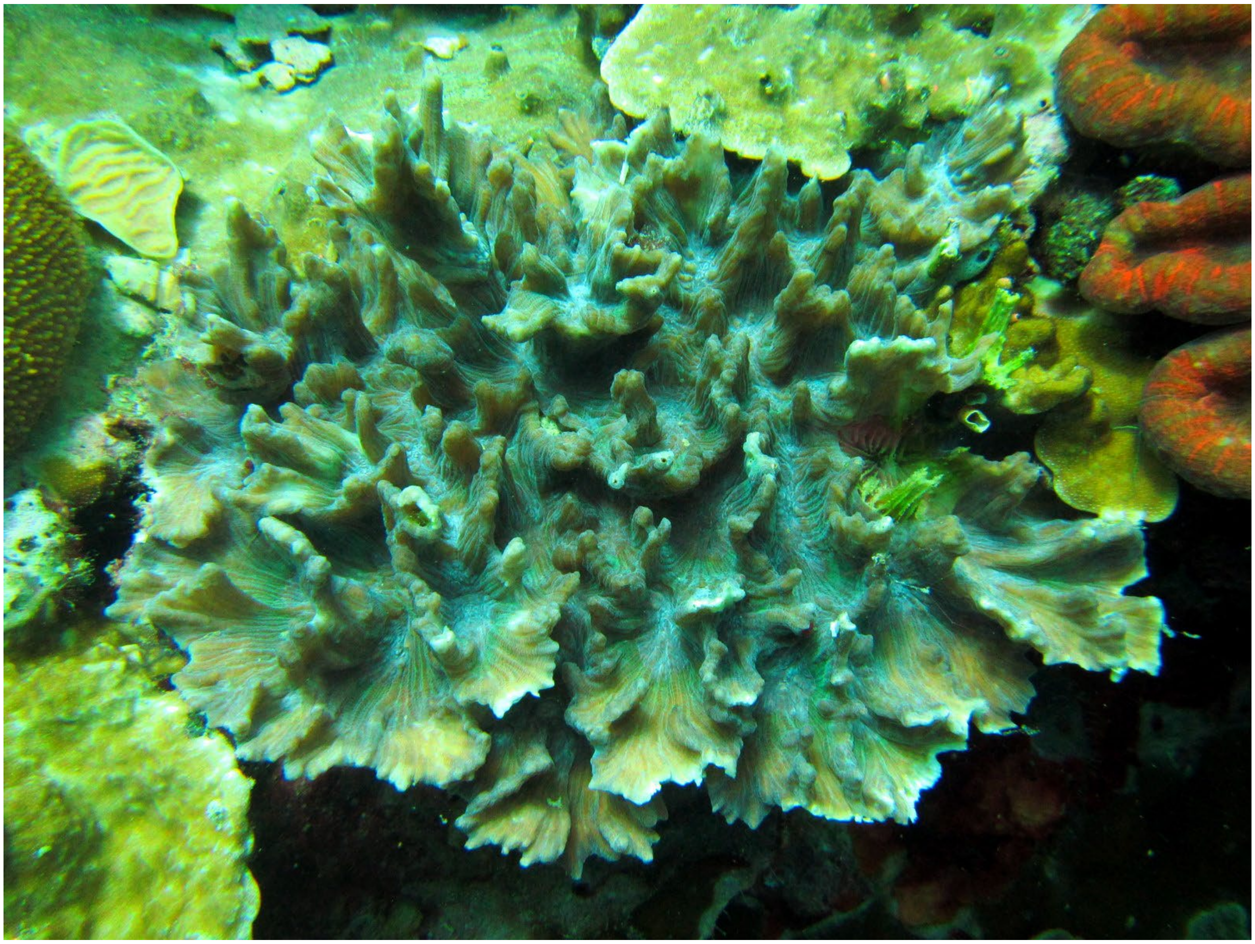
Pectinia

Colonies begin as flat plates and then spires grow upward with both costae and corallites on them. The degree of development and shapes of the spires differs greatly between species and colonies. One species (*Pectinia lactuca*) has walls without spires. No other corals have spires.

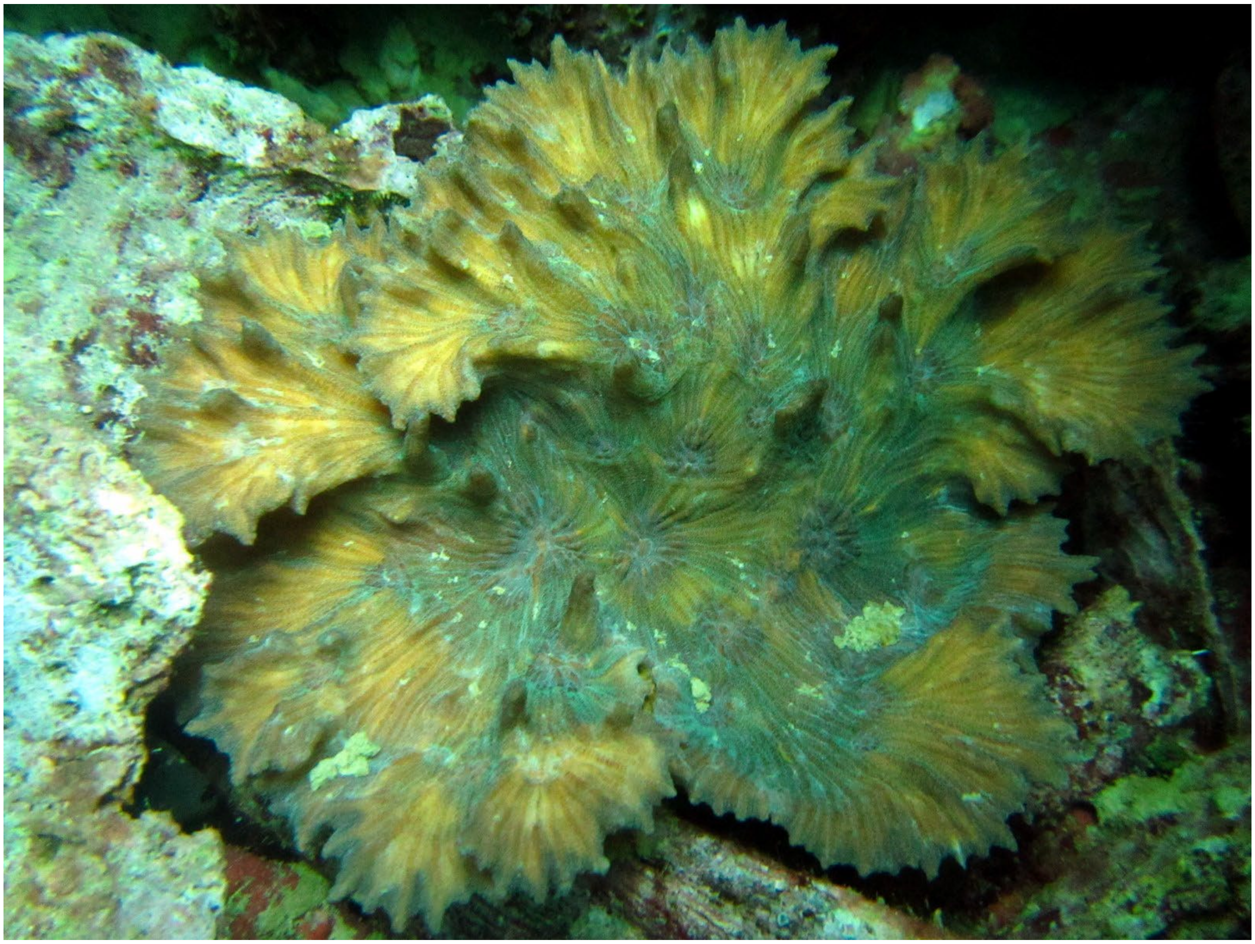
Pectinia alcicornis

Colonies have a very large columella area in the center of the founding polyp, which is the largest polyp. The development of the spires varies but they are mostly unbranching and do not carry much plate webbing with them. Some spires grow long enough that they become columns or start to branch. There are tiny spines that can be felt on them. *Pectinia paonea* has a smaller founding polyp center and less spines. *Pectinia teres* has more spire development.

A colony of *Pectinia alcicornis* with a large columella in the center of the polyp on the right.



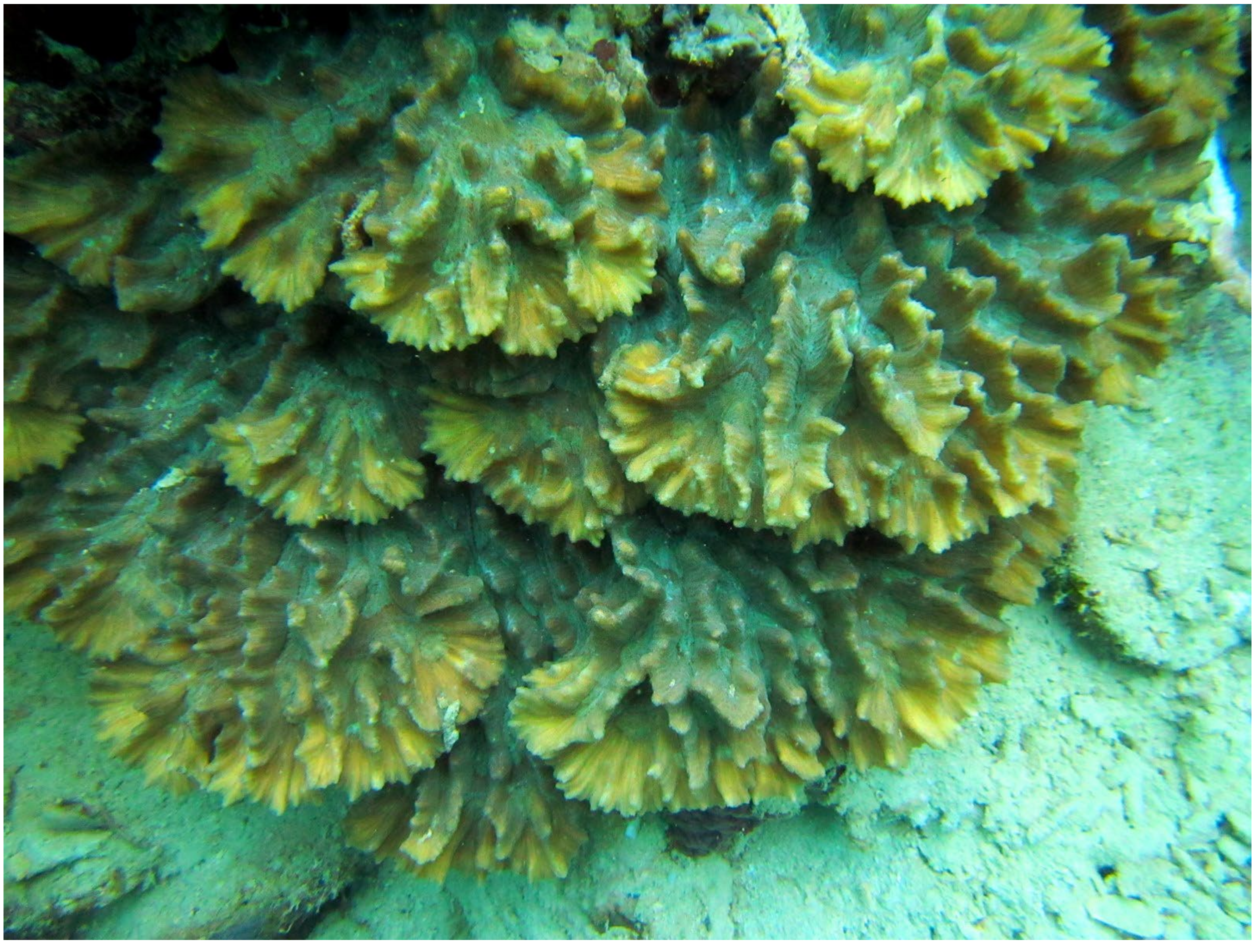
A colony of *Pectinia alcicornis* with many spires.



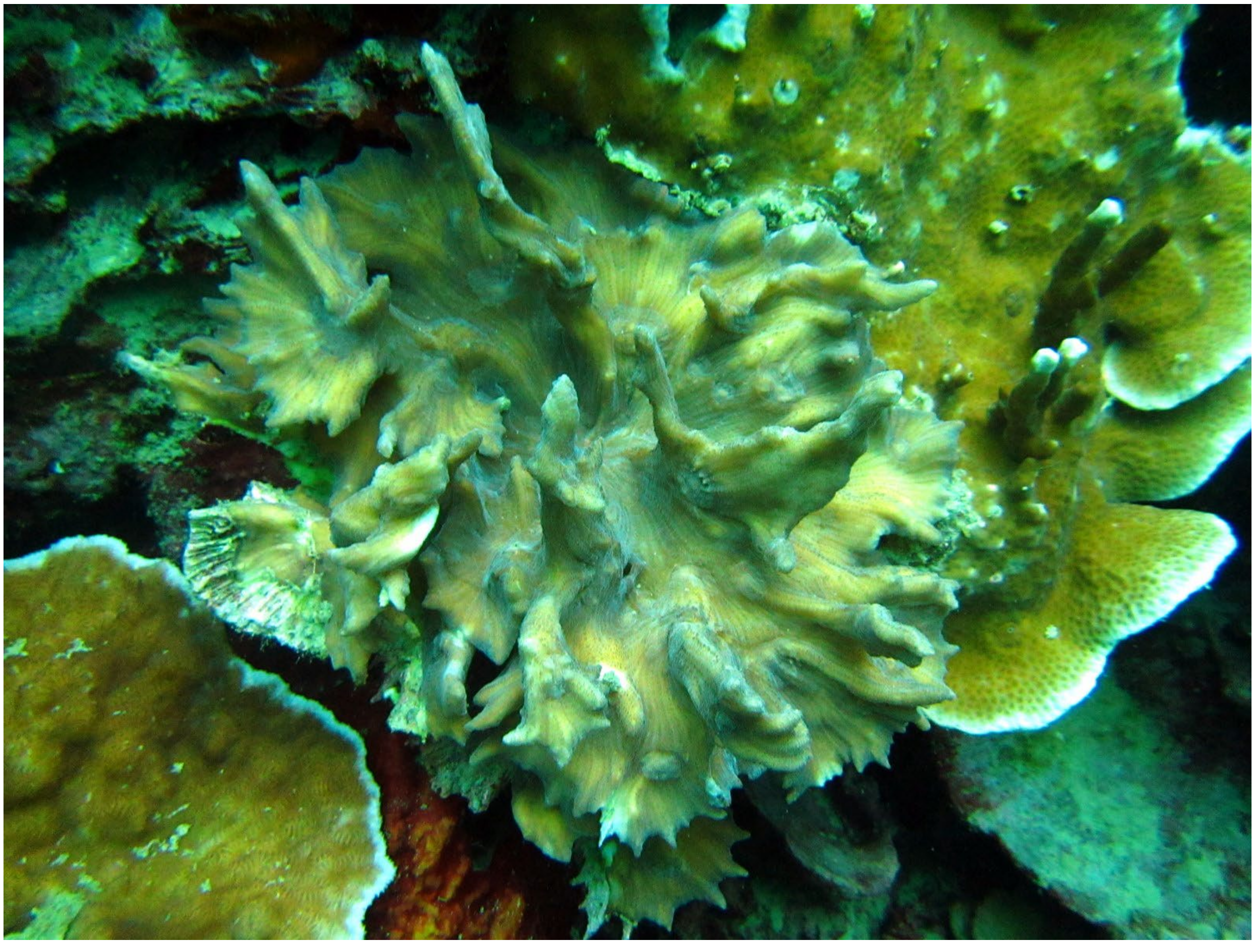
A colony of *Pectinia alcicornis* with little spire development.

Pectinia paeonea

Colonies have more of the spires fused into paddles or short walls than happens on *Pectinia alcicornis*. The arrangement of plates and spires varies widely and it is not completely clear what the dividing line is between these two species. The polyp centers are larger on *Pectinia alcicornis*.



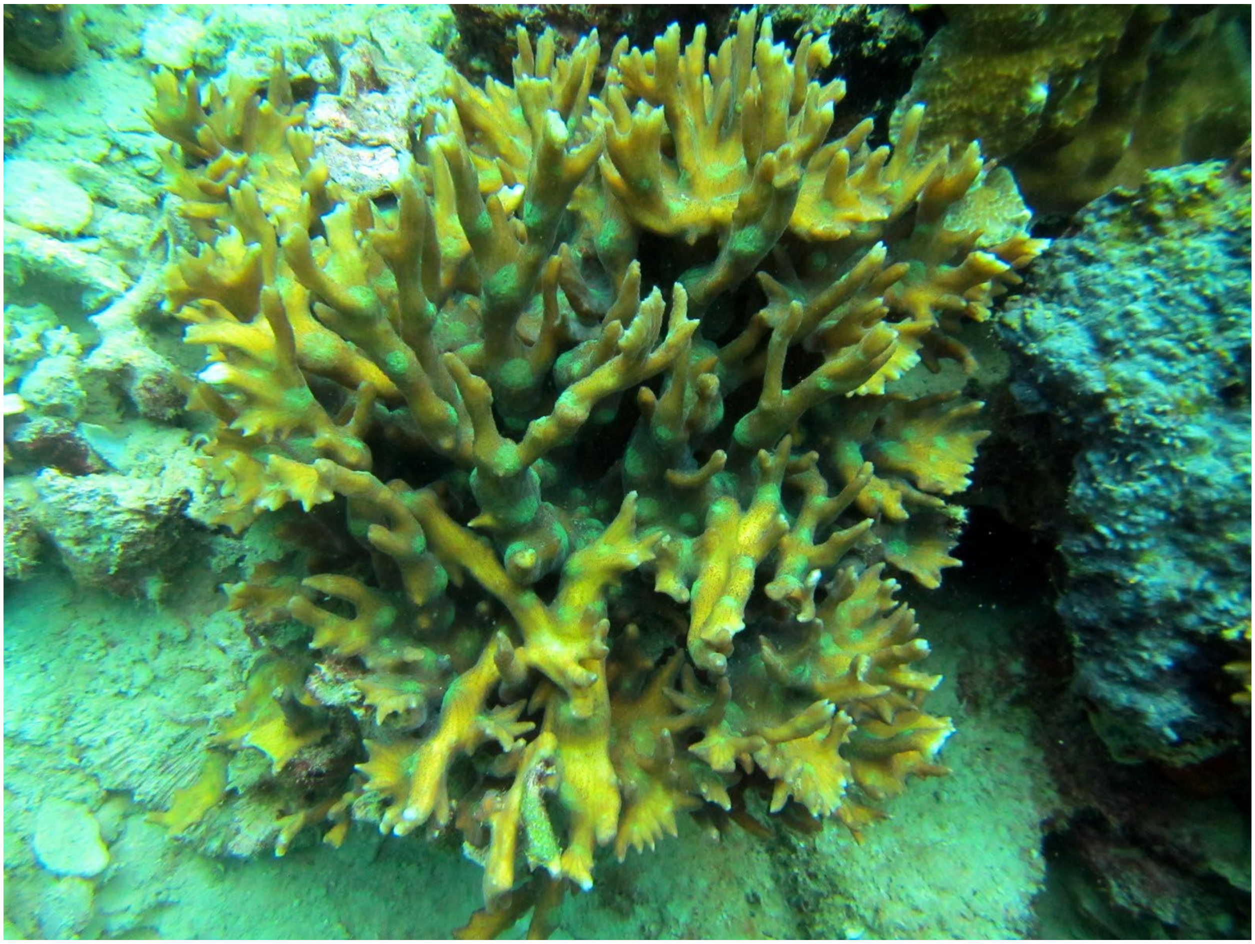
A colony of *Pectinia paeonea* with tiers and forming some sections of vertical walls.



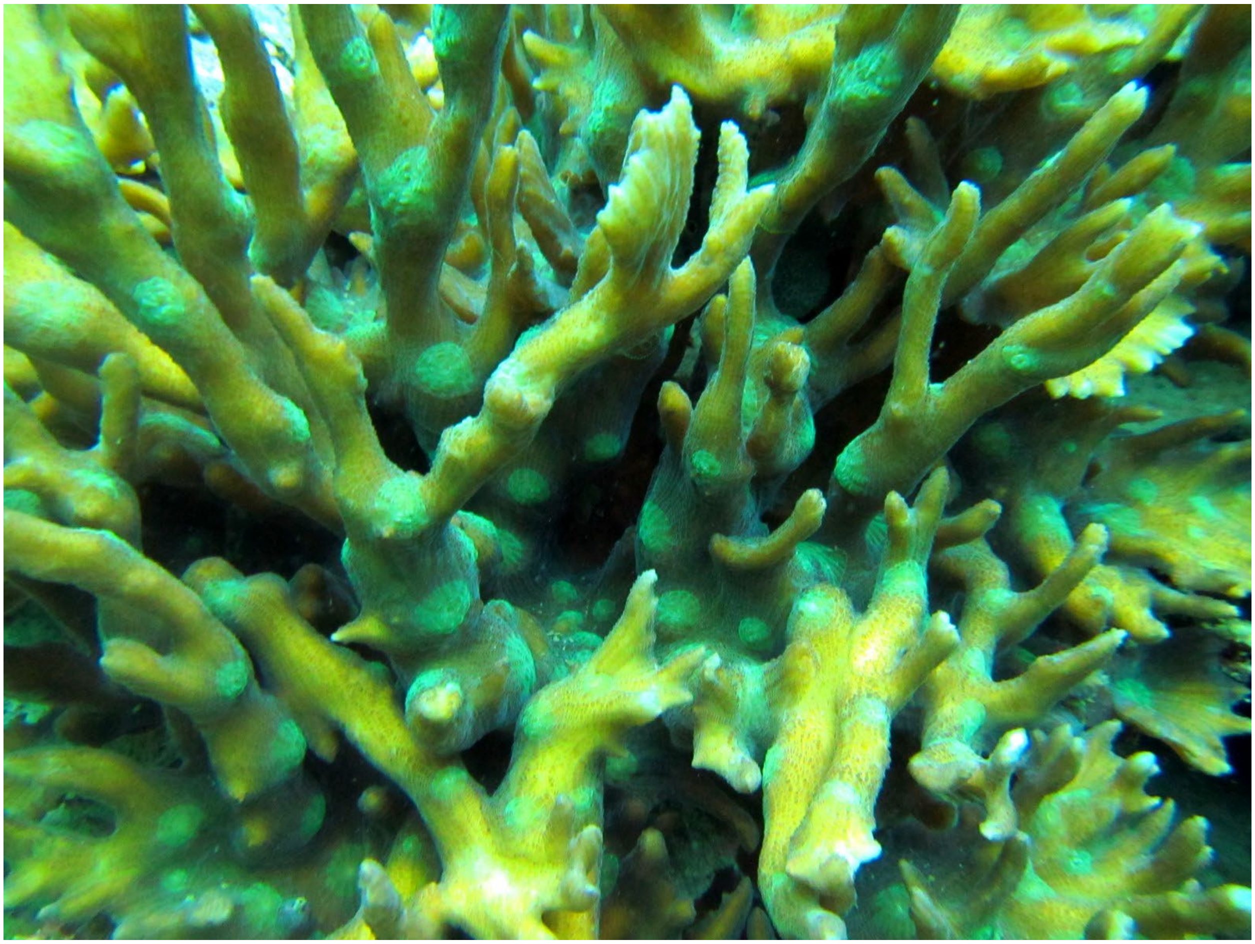
A colony of *Pectinia paeonea* with a few wall or curtain-shaped spires.

Pectinia teres

Colonies have large spires growing up from the plate base. There are many large spires and they may branch. There are corallite centers on the spires that may stand out as a different color from the rest of the spires. The spires are more developed than on *Pectinia alcicornis* or *Pectinia paeonea*.



A colony of *Pectinia teres*.



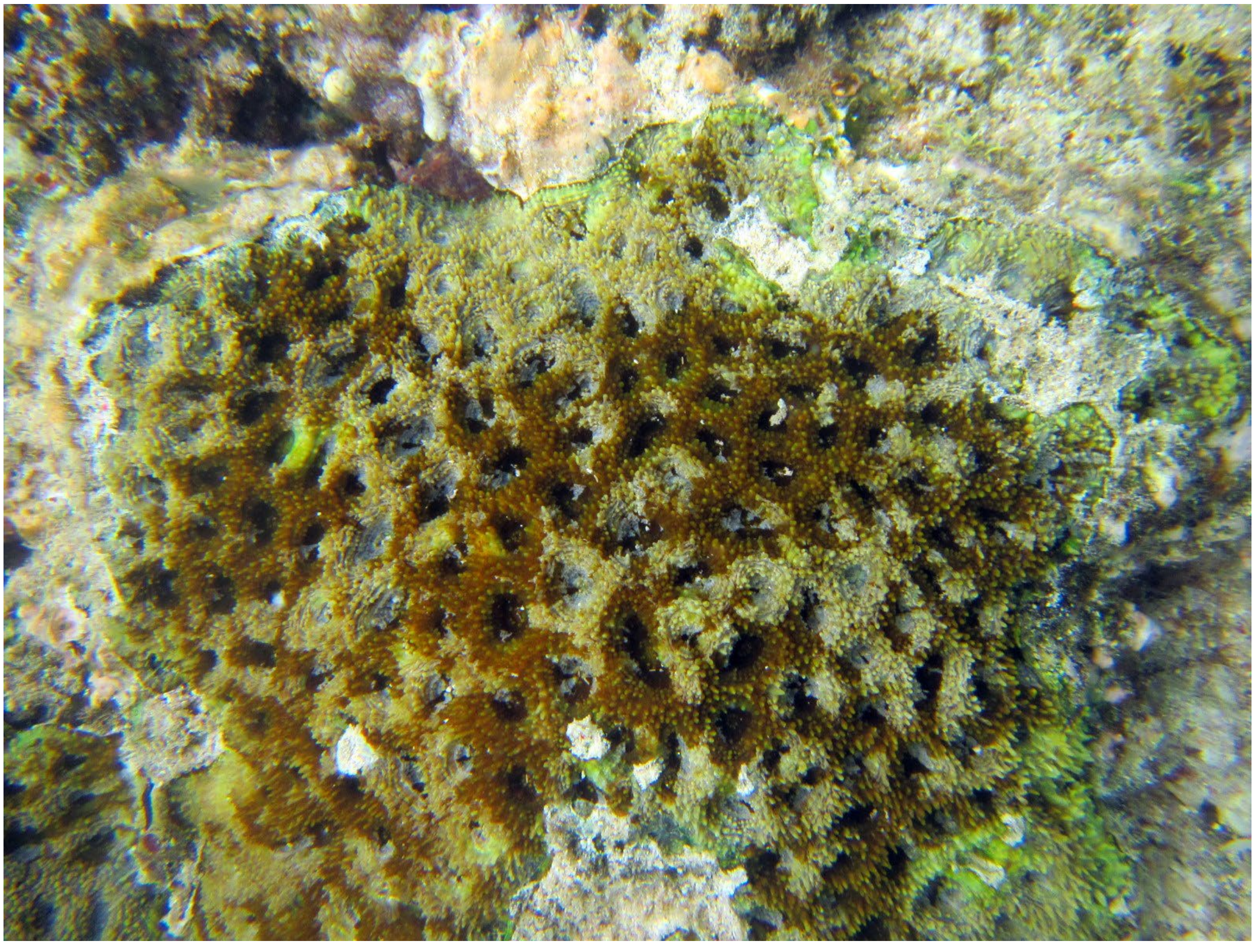
A close-up photo of *Pectinia teres*.

Acanthastrea

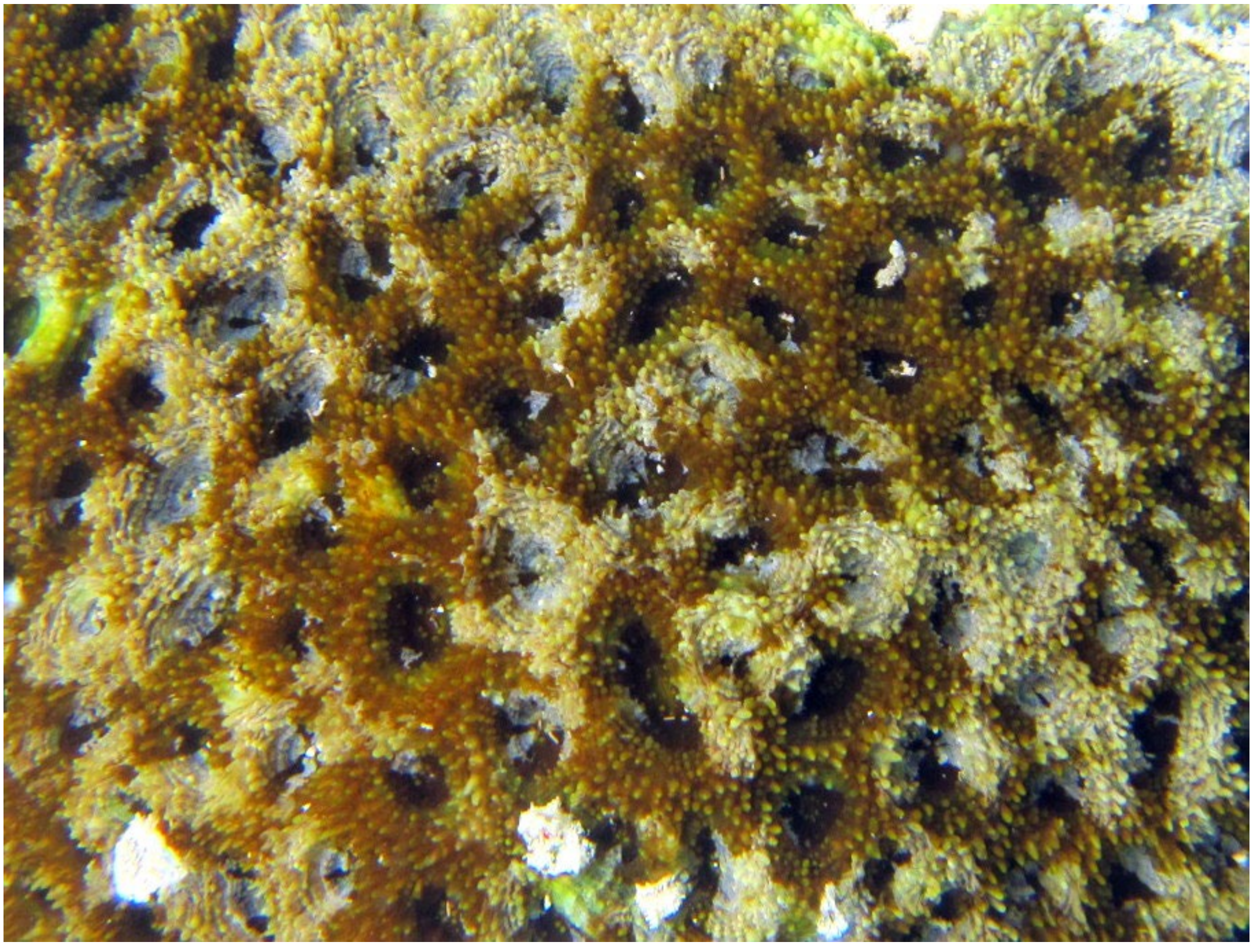
Colonies are usually encrusting but can be massive. Corallites are about finger or thumb diameter. All species have spines, some have more than others. Colonies are spinier and fleshier than *Dipsastrea*. Colonies are not branching or have ridges like *Lobophyllia*.

Acanthastrea echinata

Colonies are encrusting. Corallites are circular depressions, with flat or rounded surfaces between them. Surfaces have spines, but the spines are not especially large. There is enough tissue so that there are concentric rings of tissue folds around corallites. Other *Acanthastrea* do not have concentric tissue folds. *Acanthastrea brevis* has larger spines, *Acanthastrea hemprichii* has narrower walls.



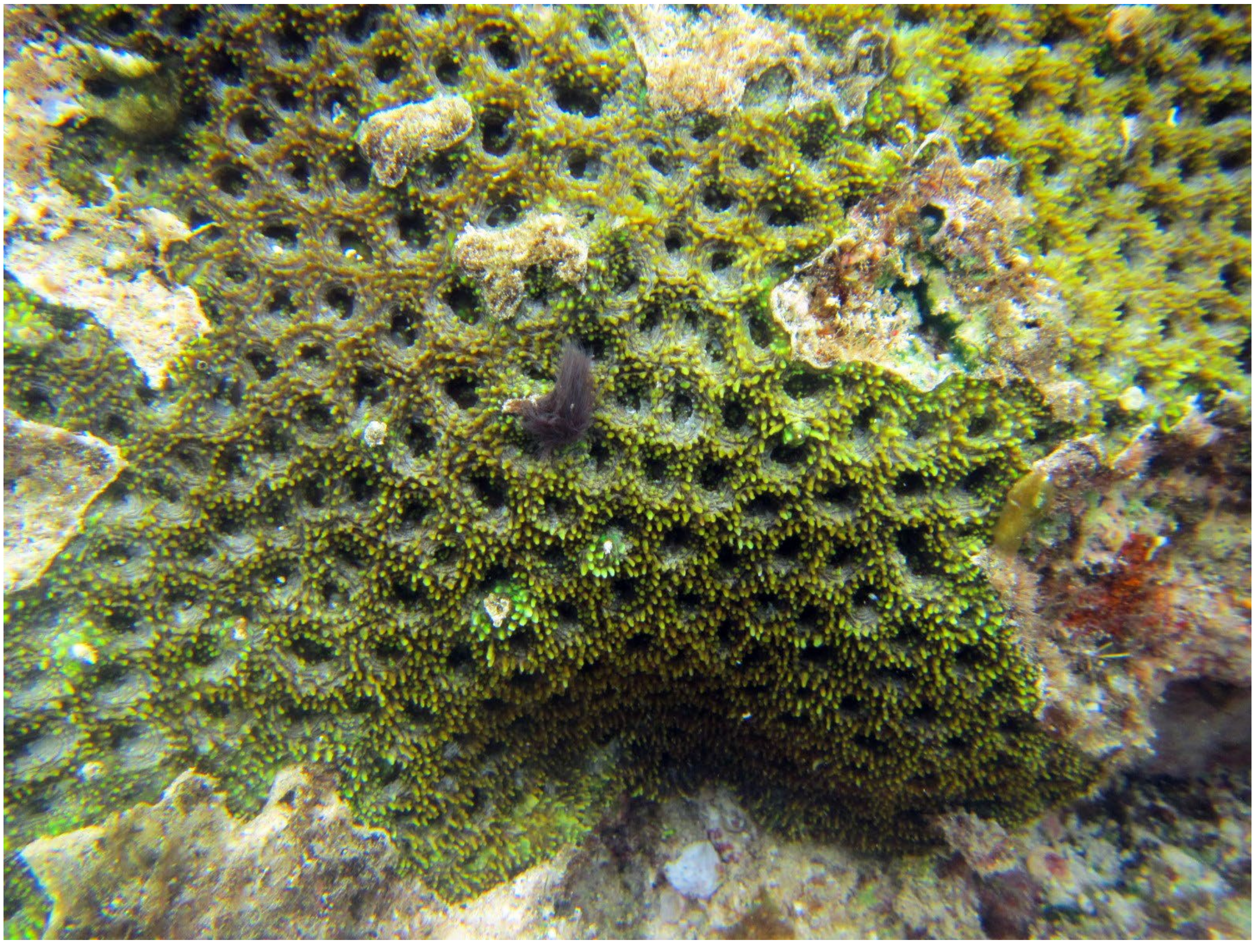
A colony of *Acanthastrea echinata*.



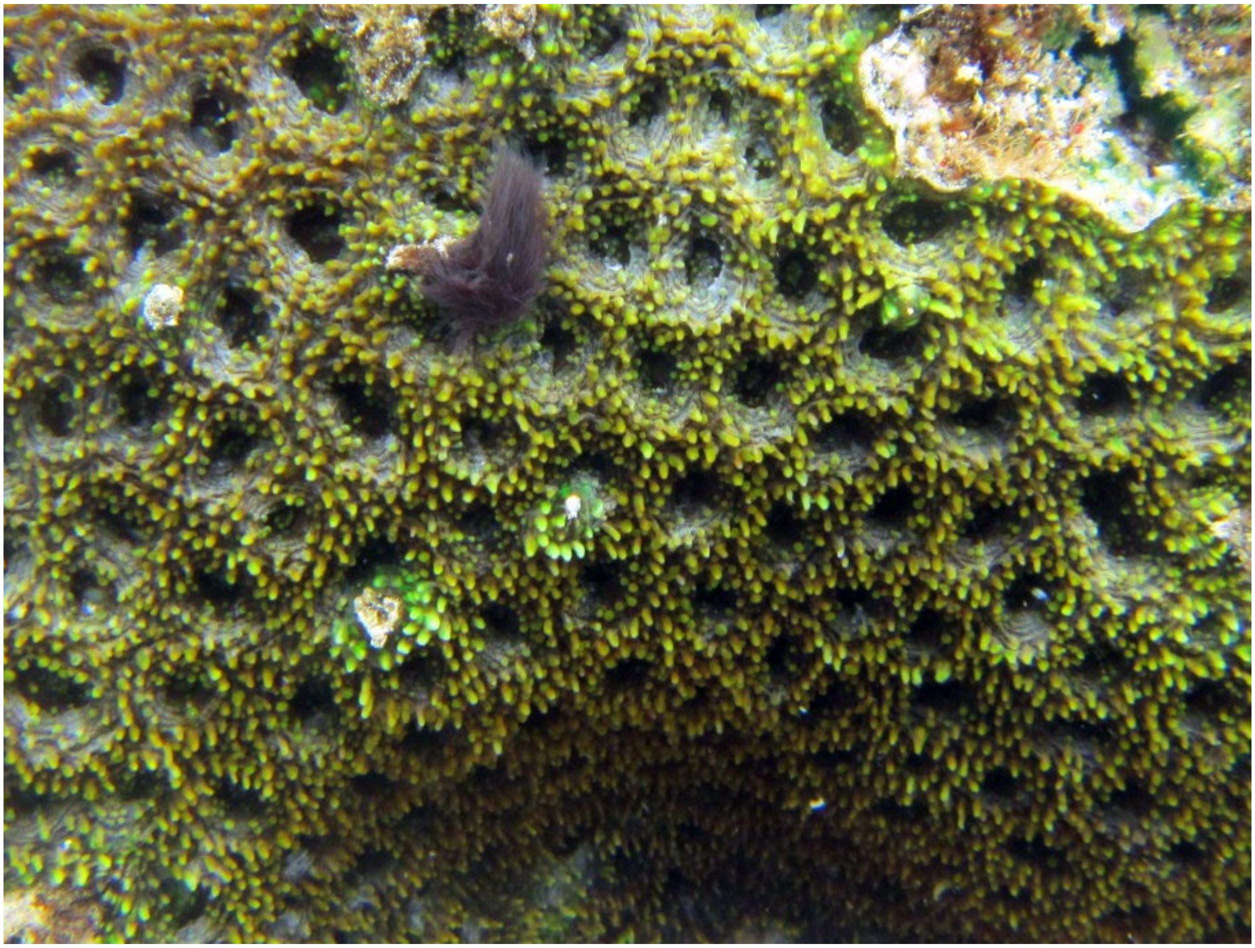
A close photo of *Acanthastrea echinata*.

Acanthastrea brevis

Colonies are usually fairly small and usually encrusting. Walls between corallites are not thick, and spines are tall. The spines are taller than on other *Acanthastrea*.



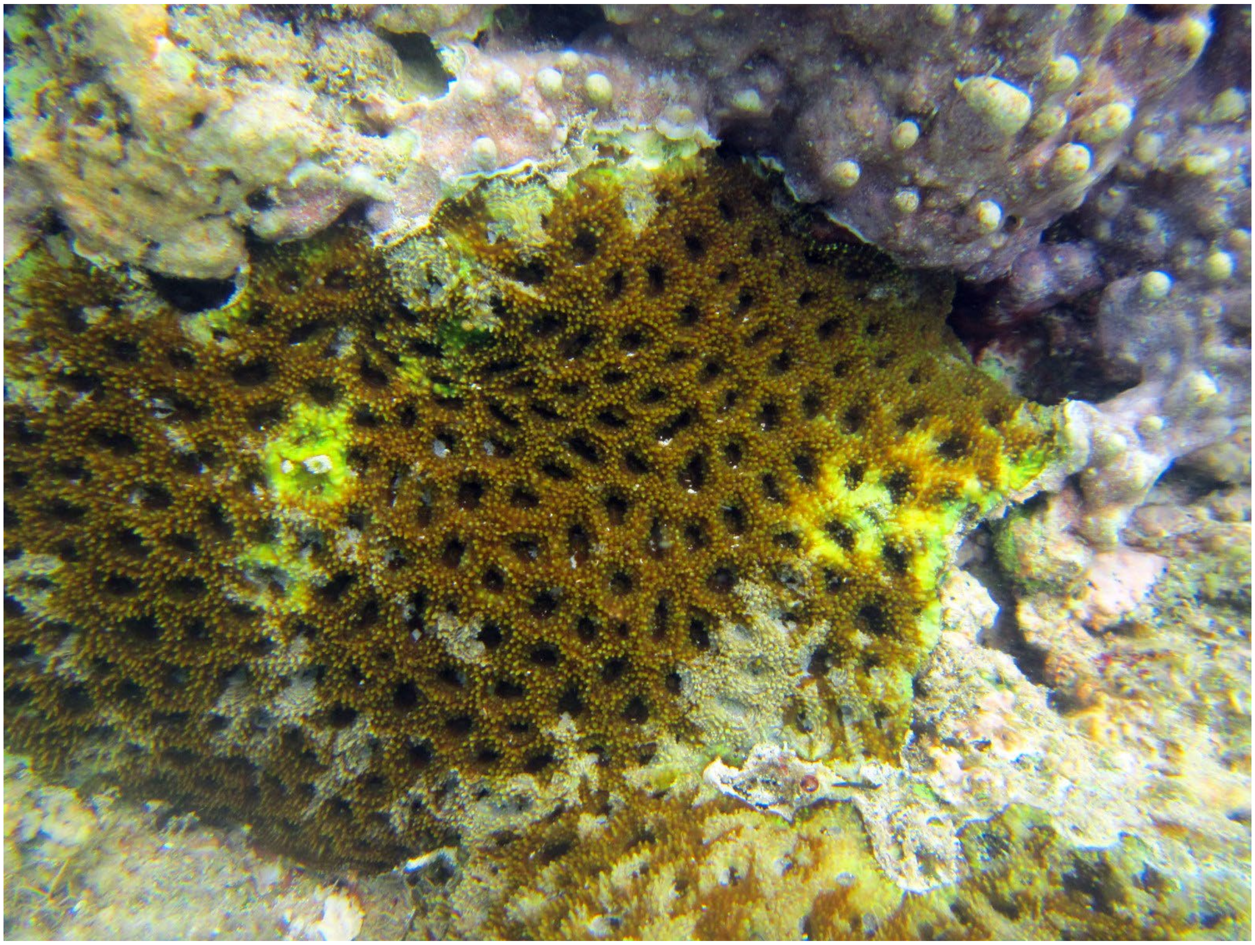
A photo of a colony of *Acanthastrea brevis*.



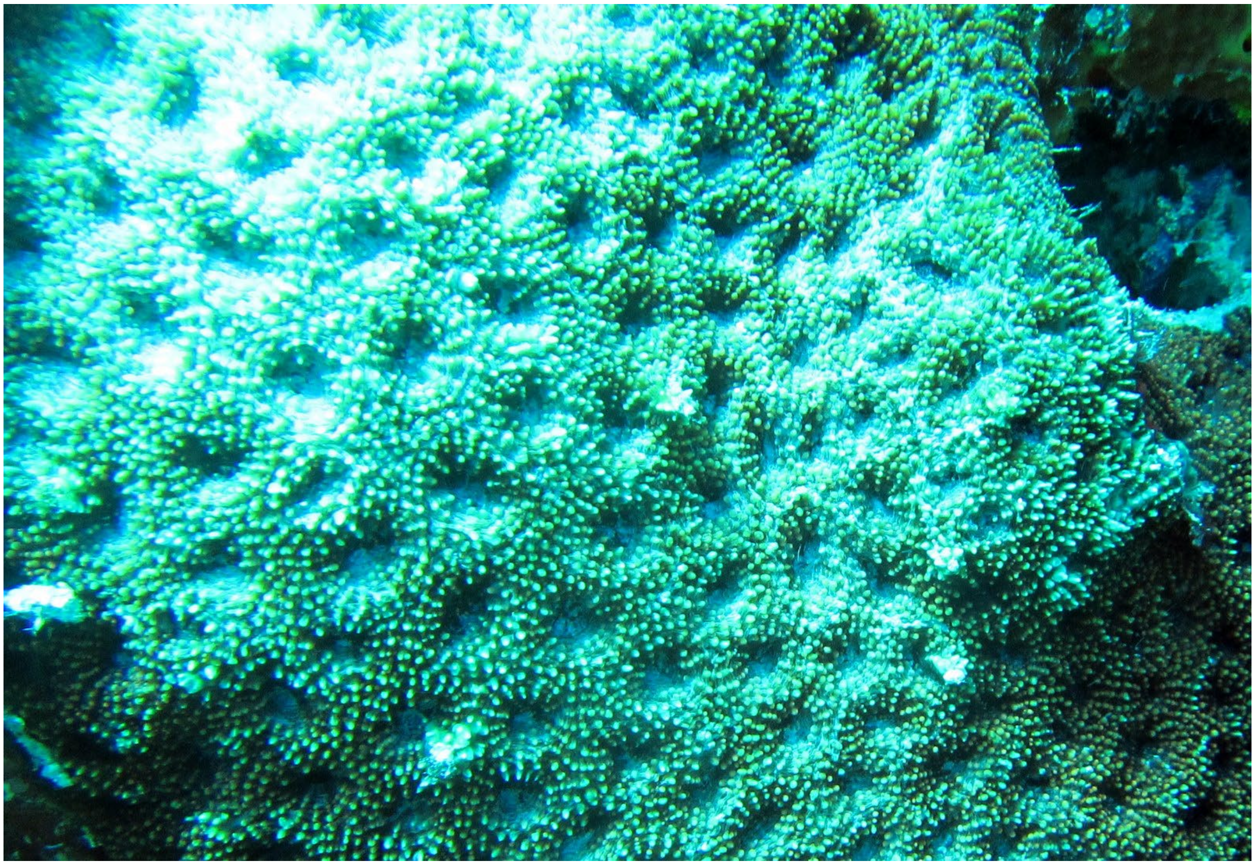
A close-up photo of *Acanthastrea brevis*.

Acanthastrea hemprichii *Vulnerable*

Colonies do not have thick walls, do not have concentric tissue folds, and the spines are relatively short. *Acanthastea echinata* has concentric tissue folds and thicker walls, *Acanthastrea brevis* has larger spines.



A colony of *Acanthastrea hemprichii*.



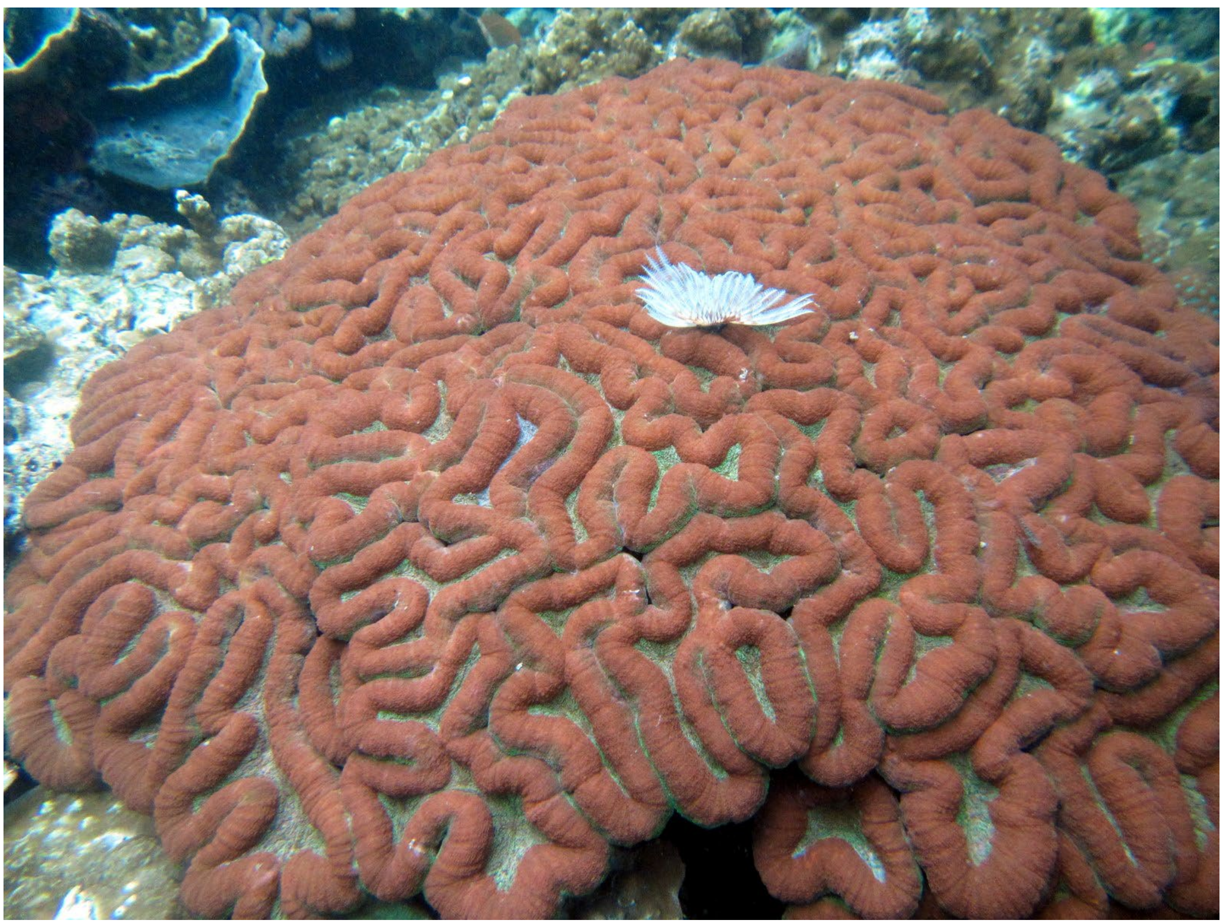
A close-up photo of *Acanthasrea hemprichii*.

Lobophyllia

Colonies appear to be massive; some are and some are not. Colonies that have long been called *Lobphyllia* have large polyps from one to four or more inches in diameter. The polyps are actually at the ends of branches which are very close together, and so colonies are called “submassive.” Sometimes small cracks can be seen between polyps or a small finger or knife can be inserted between polyps, proving that there are branches. On broken colonies the branches can be seen and seen not to have any living tissue cover except on the ends of branches. If any branches are dead on an intact colony the crack between branches can also be seen. Colonies that have long been called *Symphyllia* can look very similar, but are massive and solid, with no branches. Genetics shows that these colonies are also in genus *Lobophyllia*, which fits with the fact that there are a few species that are intermediate between these two extremes, one (*Lobophyllia hataii*) that can have separate polyp lobes on the edges of the colonies which are fused together in a solid mass in the center of the colony.

Lobophyllia hemprichii *“submassive”*

Colonies are branching and can be large and have large polyps, up to 15 cm in diameter or more. Polyps have a raised rounded rim about the thickness of a finger, and a lower center. The rim is usually smooth, but may have tiny spines or bumps. Polyps range from circular to oval to lobed. There are many color variations. Other species of branchinig *Lobophyllia* have larger or smaller polyps.



A fairly large colony of *Lobophyllia hemprichii*.

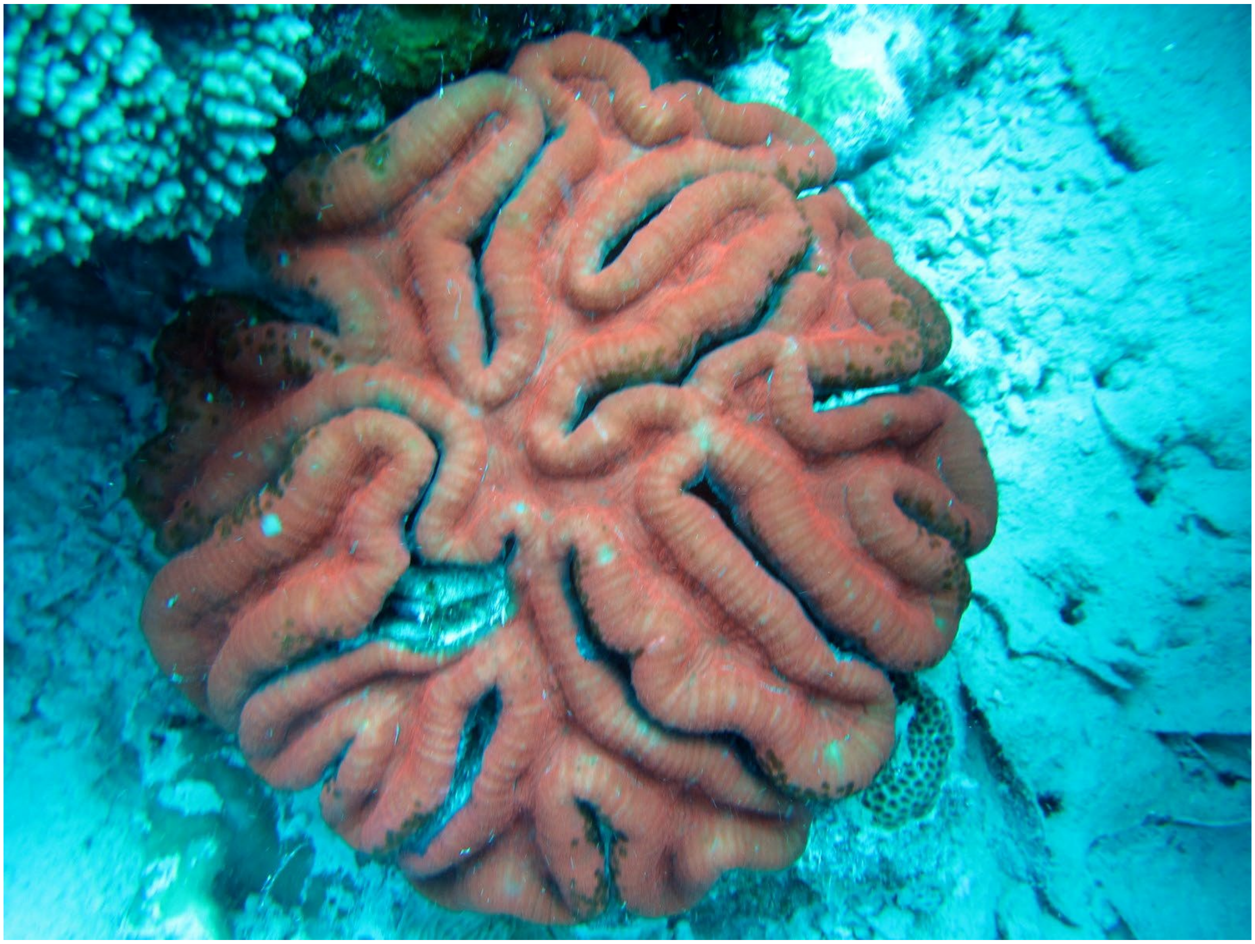
A broken colony of *Lobophyllia hemprichii* showing the branches with narrow cracks between them.

A close-up photo of *Lobophyllia hemprichii*.

A close-up photo of *Lobophyllia hemprichii*.

Lobophyllia hataii *"submassive"*

Colonies have very large polyps with a single large, winding valley for each polyp. The floor of the polyp between the rims may be wider than on *Lobophyllia hemprichii*. Otherwise they are near identical in appearance to *Lobophyllia hemprichii*.



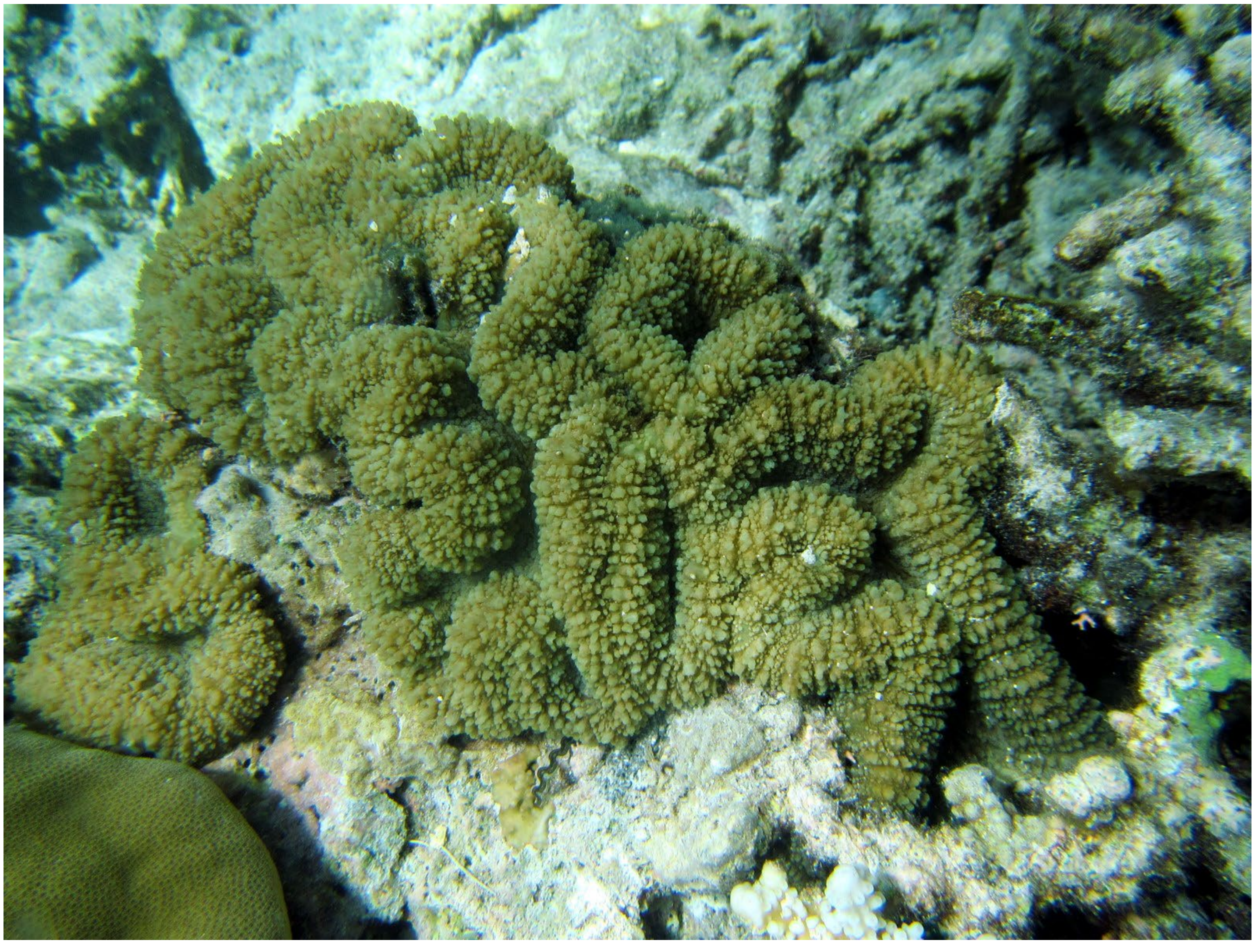
A colony of *Lobophyllia hataii*.

A colony of *Lobophyllia hataii*.

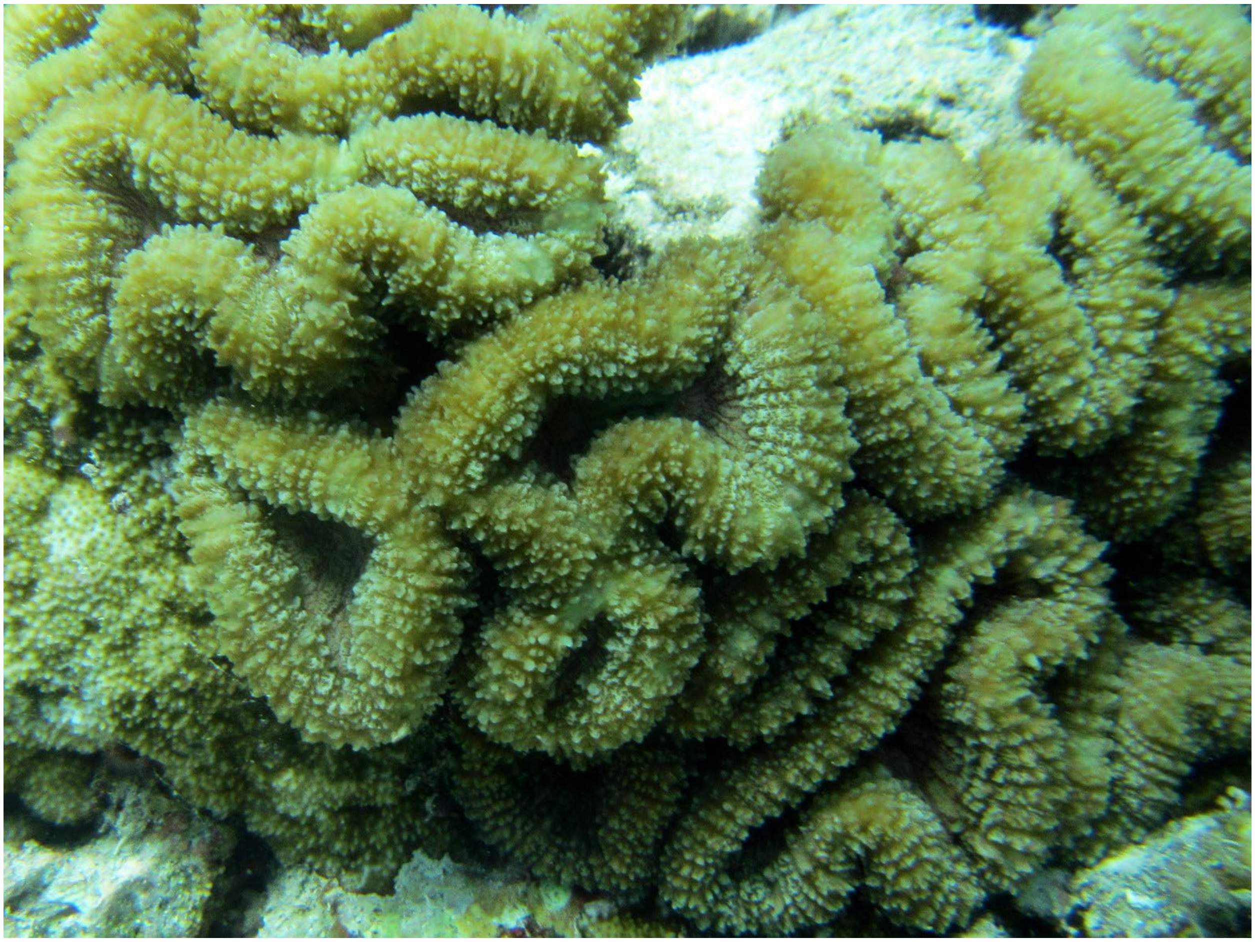
A colony of *Lobophyllia hataii*.

Lobophyllia robusta *"submassive"*

Colonies are branching and have large polyps like *Lobophyllia hemprichii*, but the surfaces of the polyp rims are rougher. The polyps are also fleshier than *Lobophyllia hemprichii*.



A colony of *Lobophyllia robusta*.

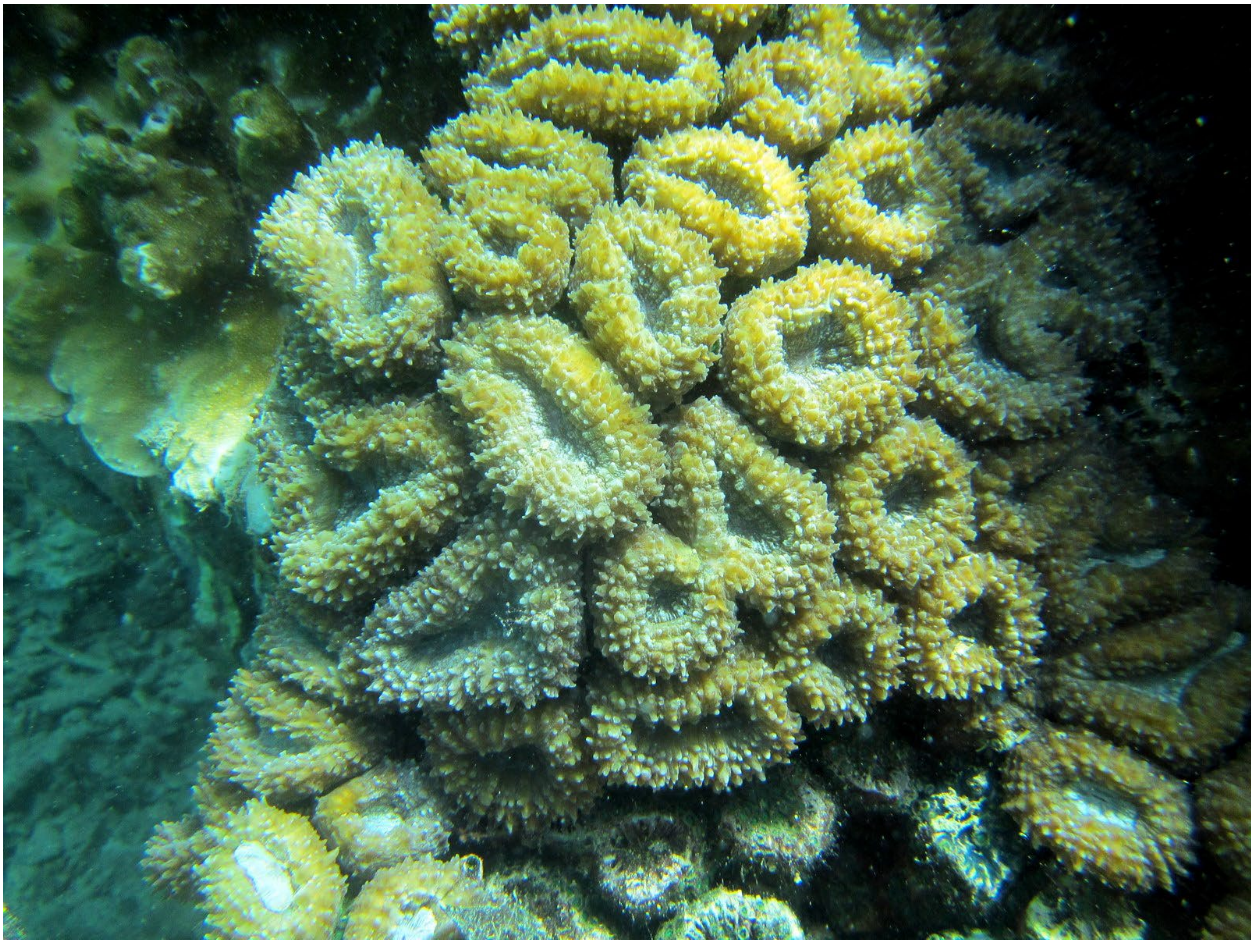


A close photo of *Lobophyllia robusta*.

Lobophyllia corymbosa *"submassive"*

Colonies are branching and have smaller corallites than *Lobophyllia hemprichii*, and most are circular in shape and have only one mouth. The corallites are also spinier than *Lobophyllia hemprichii*.

A colony of *Lobophyllia corymbosa*.



A colony of *Lobophyllia corymbosa*.

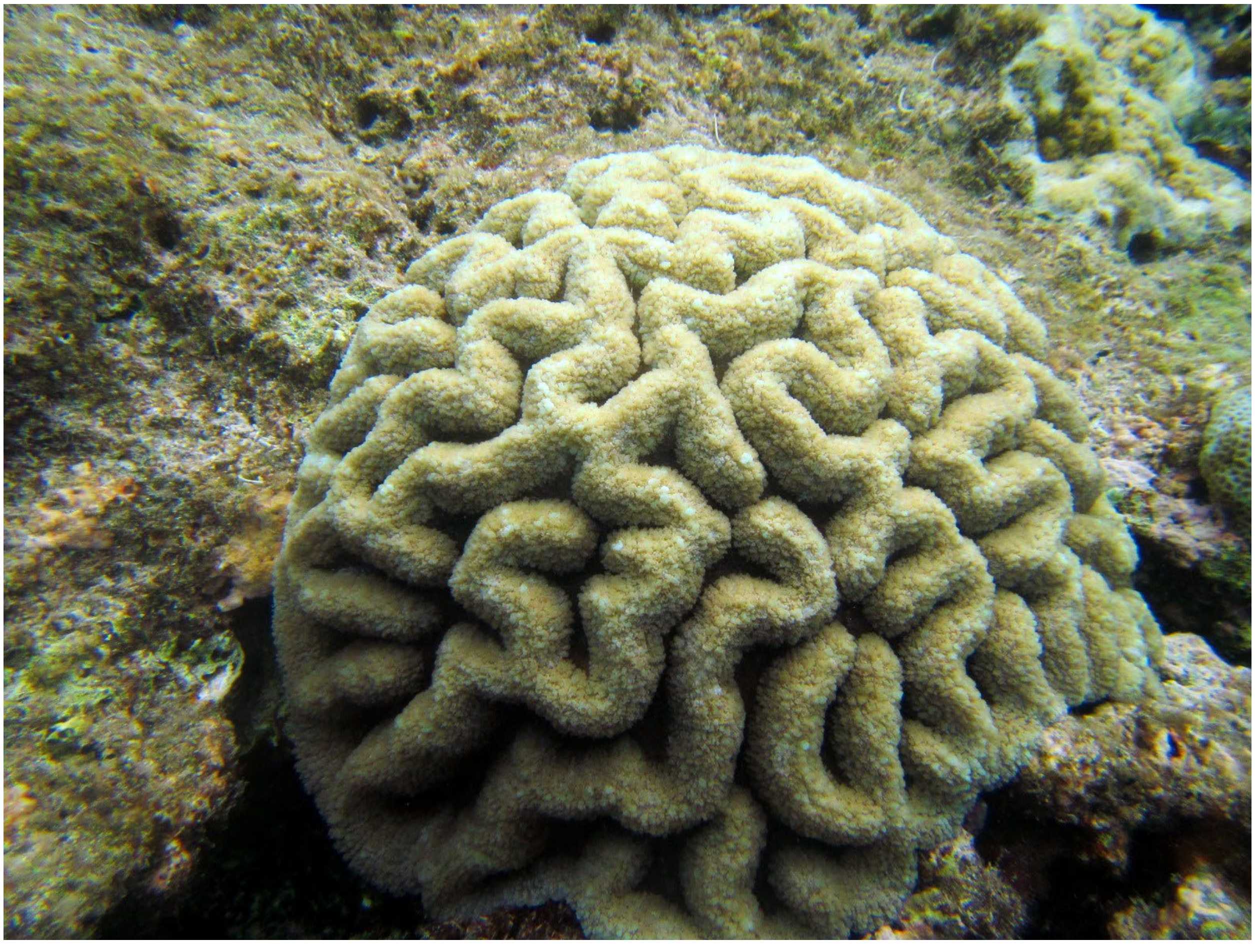
A close-up photo of *Lobophyllia corymbosa*.

A close photo of *Lobophyllia corymbosa*. The white spots are mouths. This colony is less spiny looking than the others shown above, but has mostly small, single-mouth polyps.

Lobphyllia agaricia *meandroid = "brain coral"*

This species used to be in *Symphyllia*. That genus no longer exists.

Colonies are massive not branchinig and have the largest ridges of any brain coral, averaging 3.5 cm from crest to crest. The ridges are rounded and meander more than *Lobophyllia radians*.



A colony of *Lobophyllia agaricia*.

A close photo of *Lobophyllia agaricia*, showing the large, meandering ridges.

Lobophyllia radians   *meandroid = "brain coral"*

This species used to be in *Symphyllia*. That genus no longer exists.

Colonies are massive and have rounded ridges which are smaller than on *Lobophyllia agaricia* and straighter, especially on flat colonies.

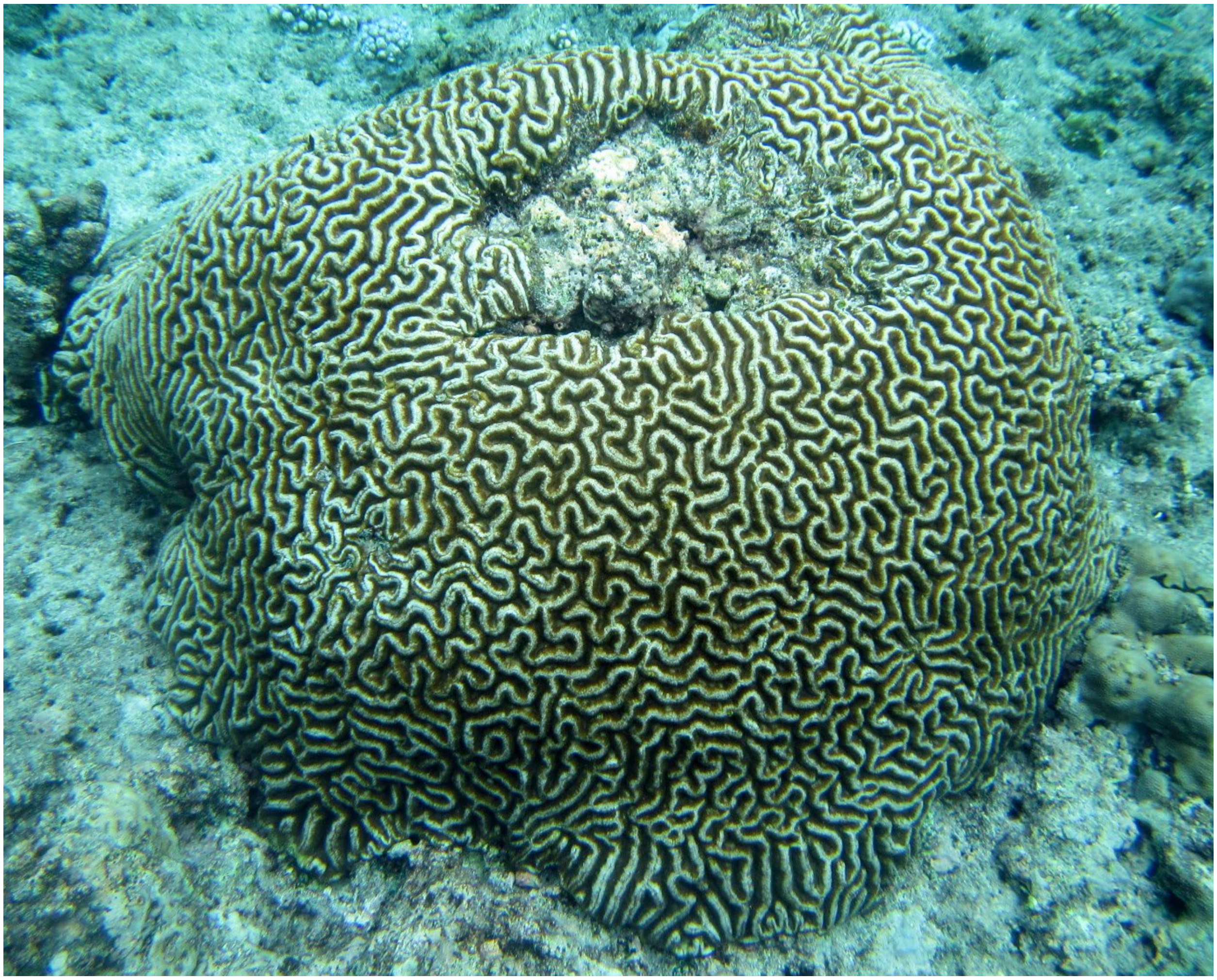
A colony of *Lobophyllia radians*.

A close-up photo of *Lobophyllia radians*.

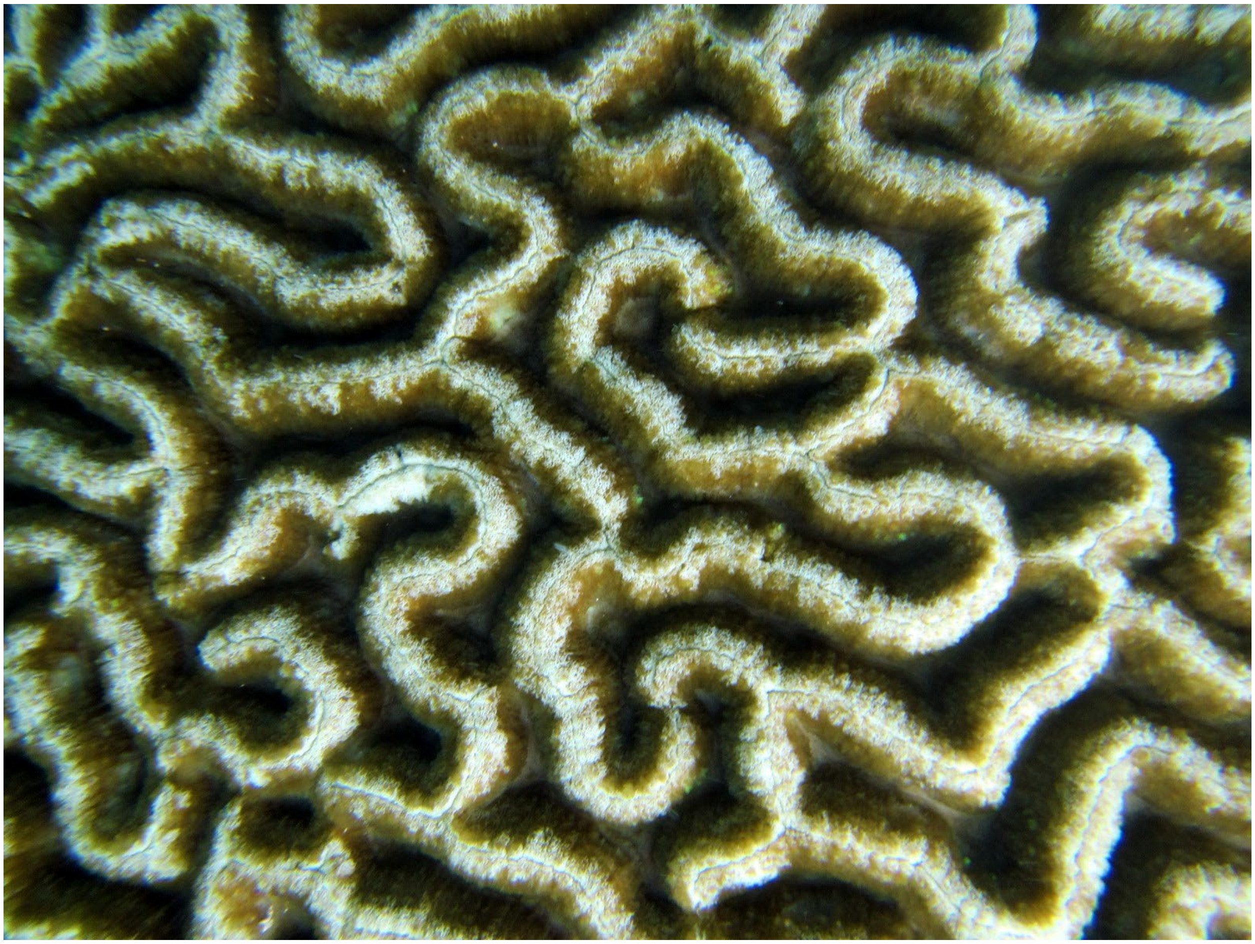
Lobophyllia recta *meandroid = “brain coral”*

This used to be in *Symphyllia*. That genus no longer exists.

Colonies are massive or encrusting, and covered with meandering rounded ridges. The ridges are about the diameter of a small finger. All other massive *Lobophyllia* have larger ridges. *Platygyra* has smaller ridges.



A photo of a large colony of *Lobophyllia recta*.



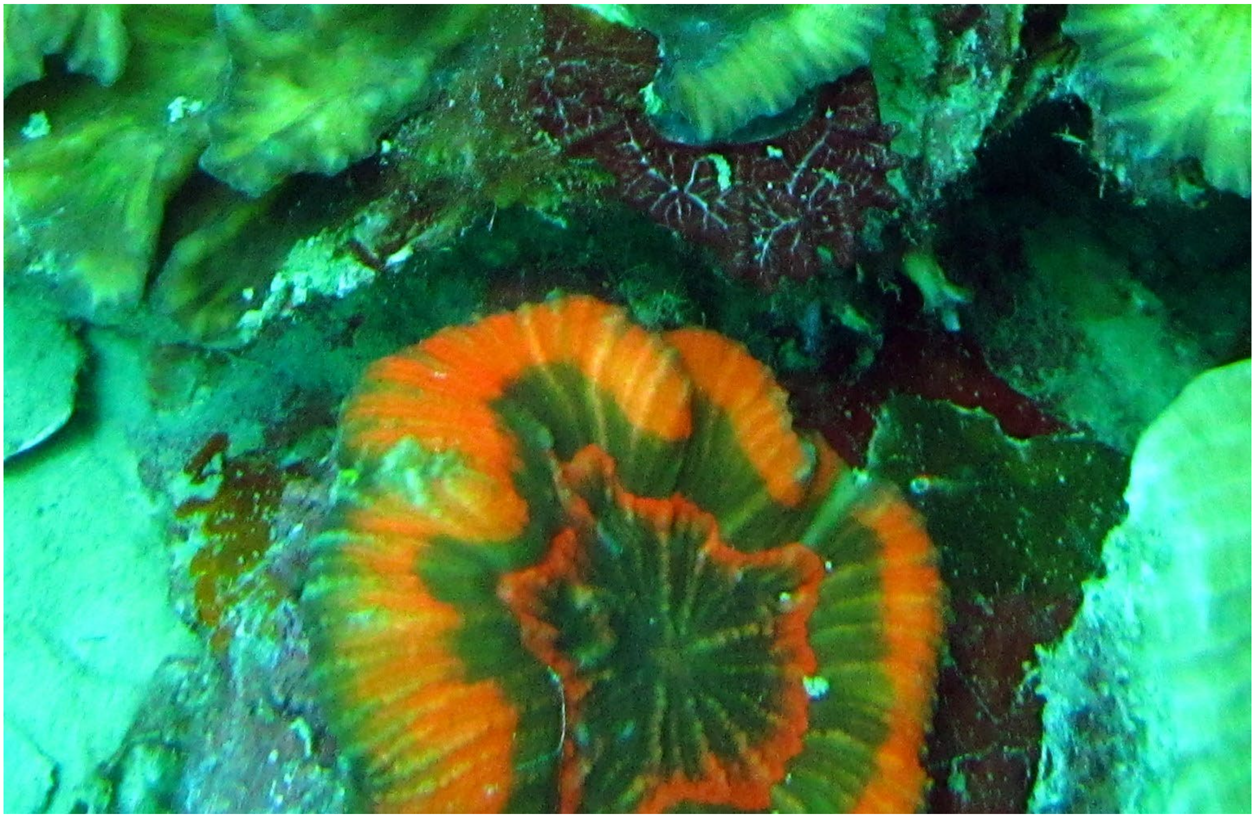
A close photo of *Lobophyllia recta*.

Parascolymia

Corals are attached discs which are usually solitary. Corals have a larger depressed center and radiating rows of spines without concentric tissue folds like *Echinomorpha*.

Parascolymia vitiensis

Corals are up to 3-4 inches in diameter. The upper surface can be almost flat, but the inside of the cup may be a different color from the rest of the corallite. Radiating rows of spines are along the top edge of septa. *Parascolymia australis* has a smaller disc shape and usually a more raised outer rounded rim.



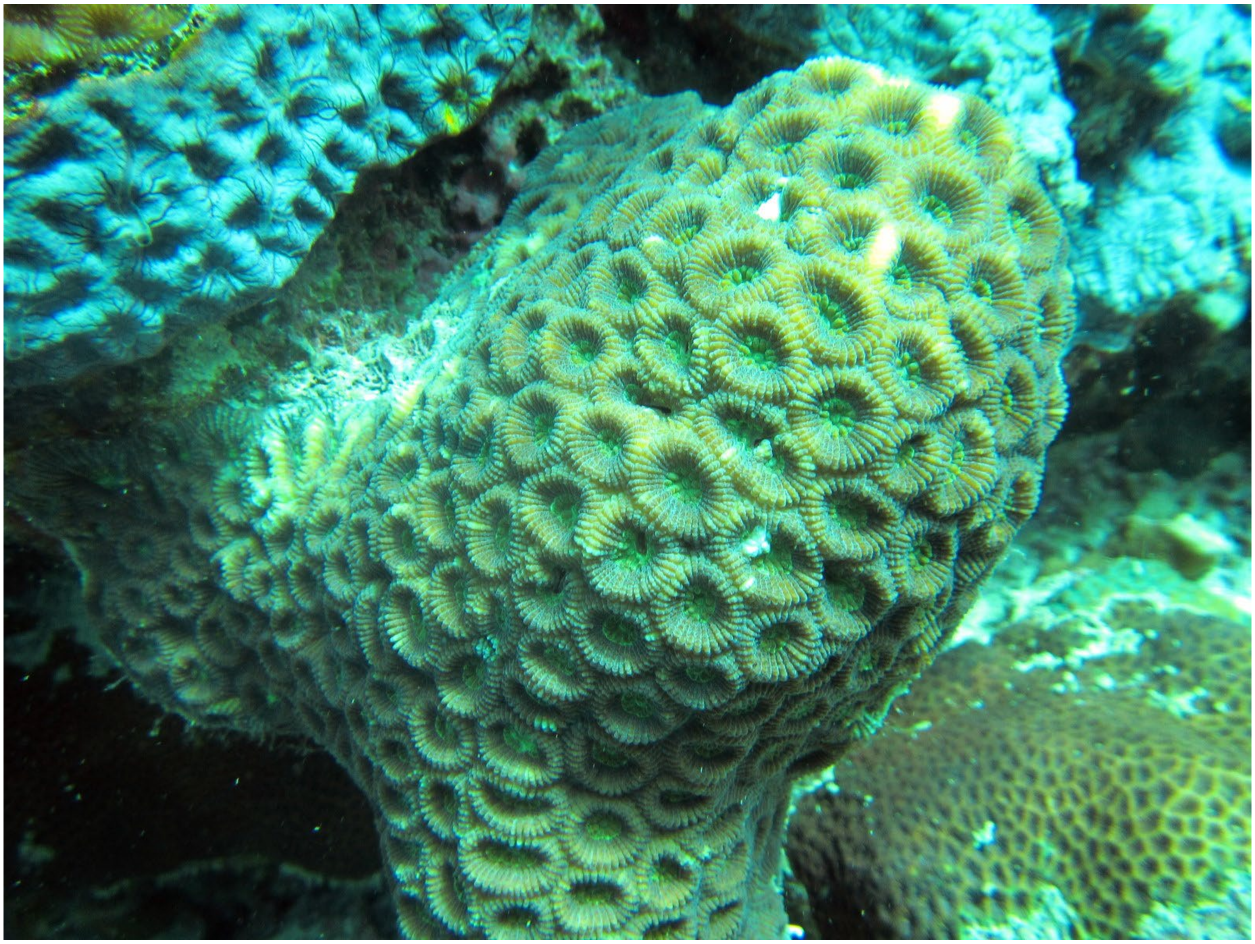
An individual *Parascolymia vitiensis*. The inner orange ring is the outer edge of the inside of the corallite.

Dipsastrea This used to be called "*Favia*."

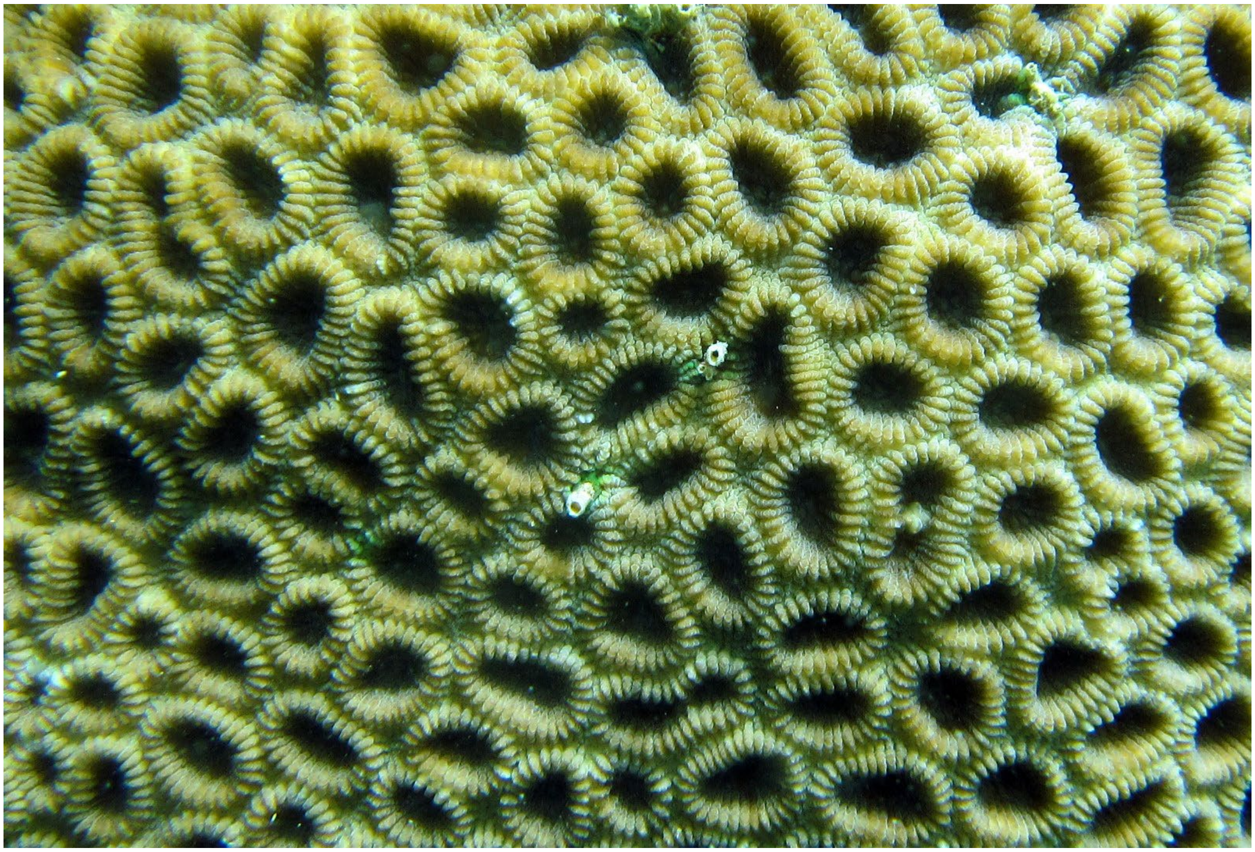
Colonies are massive or encrusting. Corallites are usually about the diameter of a finger. Adjacent corallites have separate walls with a groove between them. Most *Dipsastrea* species are difficult to identify. *Favites* is similar but has only a single wall between corallites, no groove.

Dipsastrea sp.

This colony was chosen to illustrate the features of this genus, it has not been identified to species.



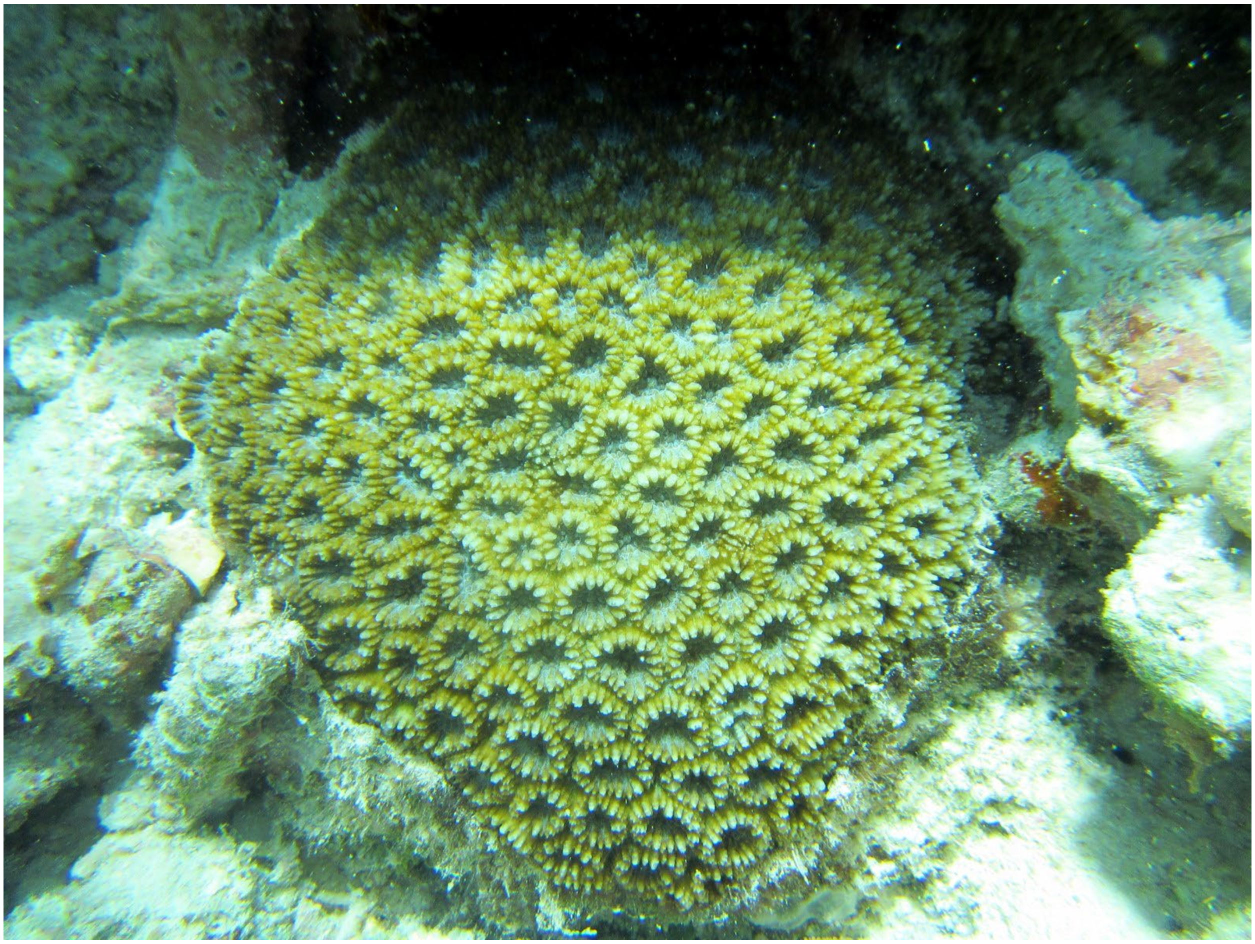
A colony of *Dipsastrea* sp.



A close-up photo of a colony of *Dipsastrea* sp., probably a different species than the previous photo.

Dipsastrea matthaii

Colonies have corallites very close to each other but with a clear groove between them. Septa are large enough to be easily seen at the corallite rim projecting in toward the center. Corallites on the sides of colonies are not downwardly inclined like on *Dipsastrea trucata*. Septa are more prominent than on *Dipsastrea pallida*.



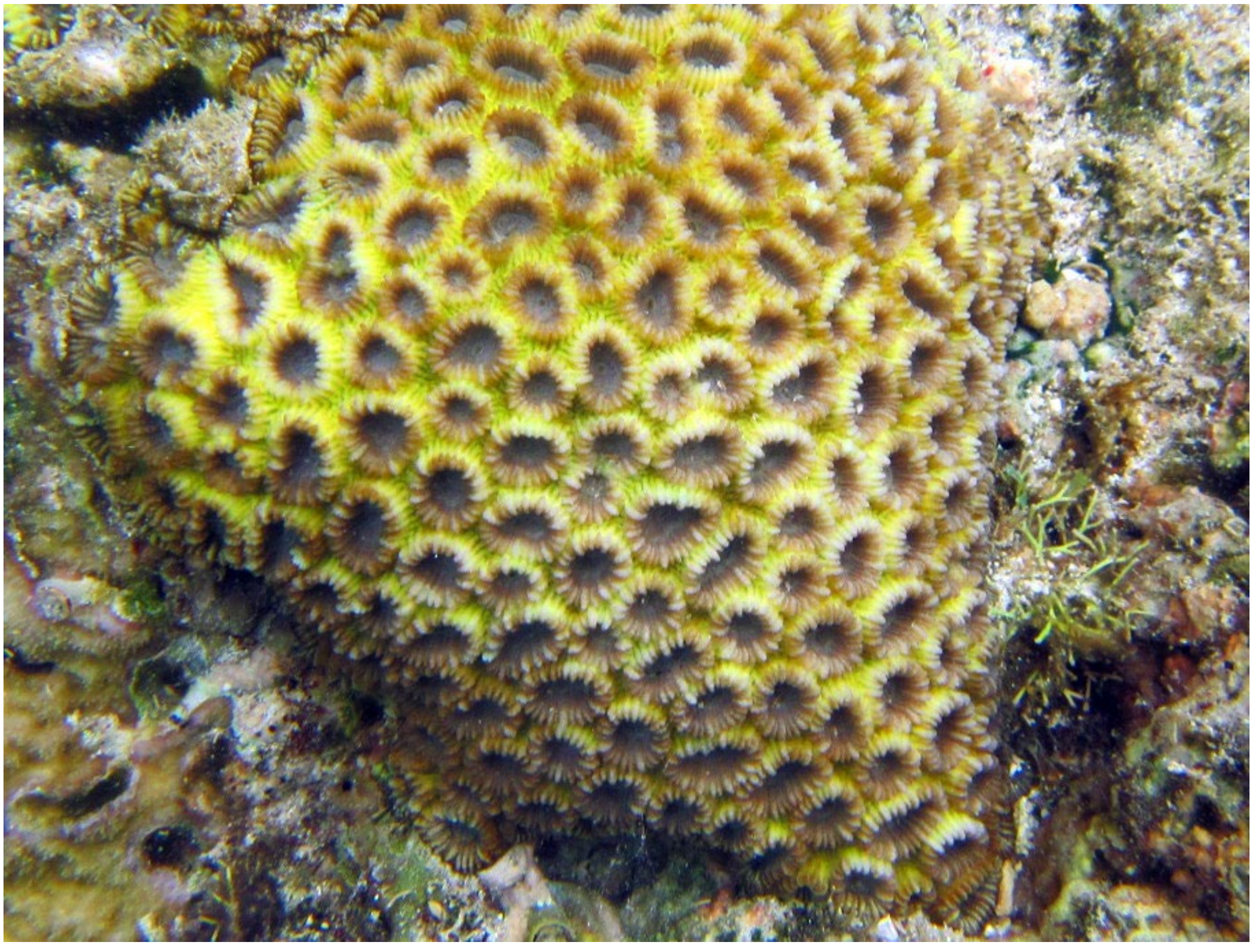
A colony of *Dipsastrea matthaii*.

A close-up photo of *Dipsastrea matthaii*.

Dipsastrea truncata

Colonies are massive and not large. The corallites are circular to oval, and have some variation in the size of septa. On inclined surfaces of the colony, corallites are downwardly inclined so their upper edge projects farther than the corallite above them. Corallites on other *Favia* species are not inclined. This species was originally named "*Favia truncatus*" but the gender of "*truncatus*" does not agree with that of "*Favia*" so it had to be changed to "*truncata*."

A photo of *Dipsastrea truncata*.



A close-up photo of *Dipsastrea truncata*.

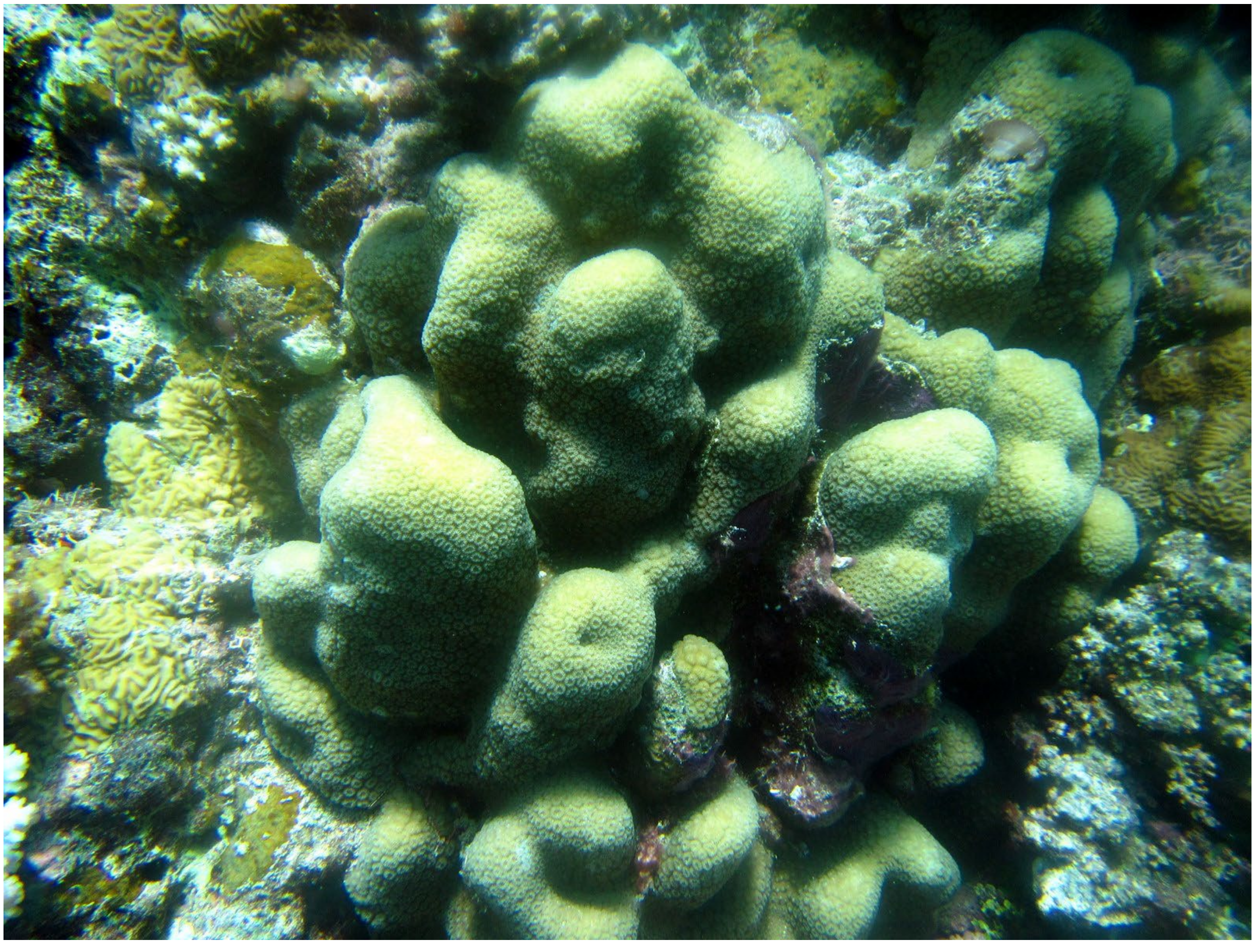
Dipsastrea pallida

Colonies have a flat space between corallites, with a tiny groove to separate corallites. Colonies are yellow and the corallites are dark. Septa are less prominent than on *Dipsastrea matthaii*.

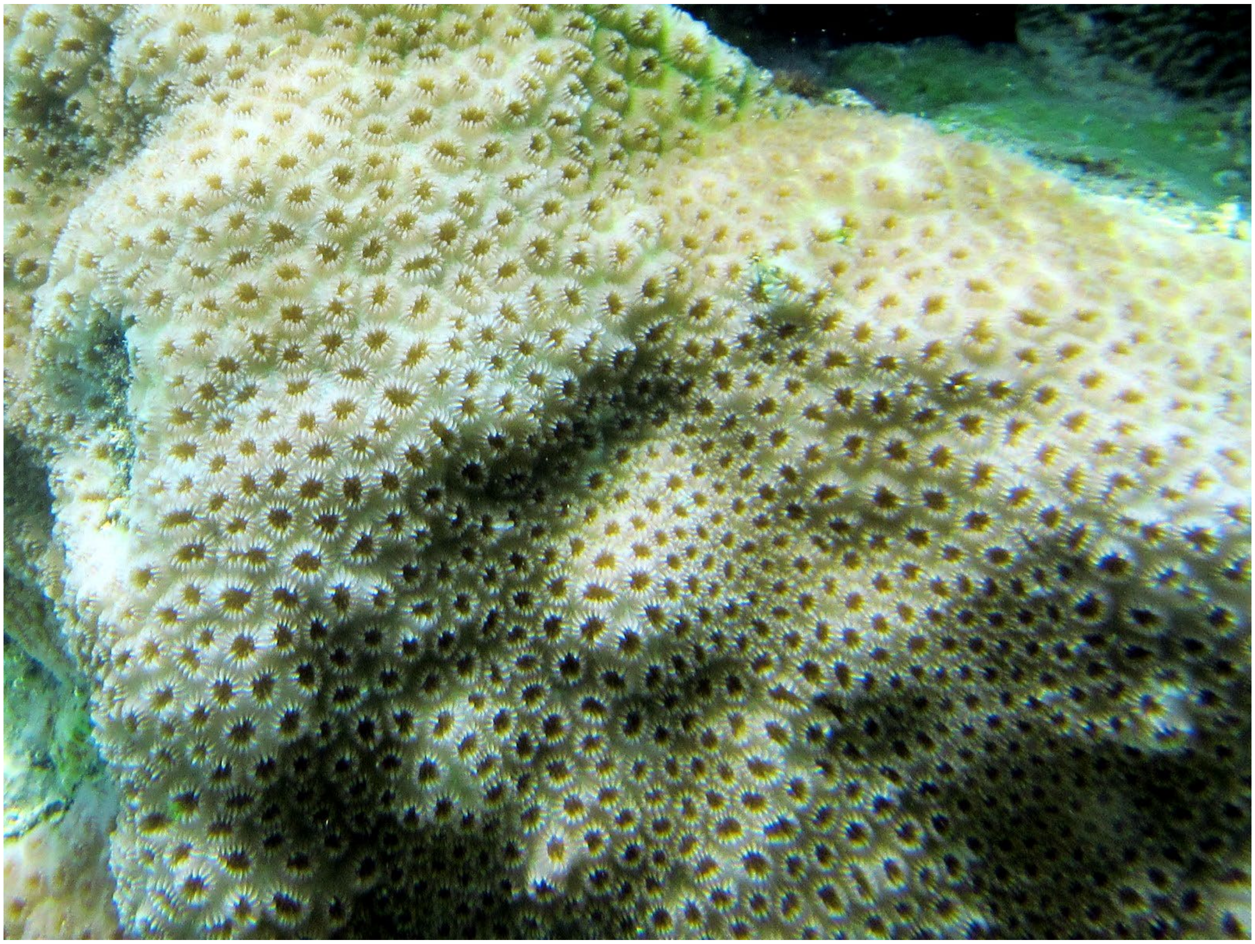
A close photo of a colony of *Favia pallida*.

Goniastrea stelligera This species used to be in *Favia*. Genetics showsi it is in *Goniastrea*.

Colonies are usually columnar, but may be massive with lobes, and may have an encrusting base. The corallites are smaller than all *Dipsastrea* species, being only about 3-4 mm diameter. Although this specie is in *Goniastrea*, it appears more similar to *Dipsastrea* and so Is placed here in this guide.



A colony of *Goniastrea stelligera*.



A close-up photo of *Goniastrea stelligera*.

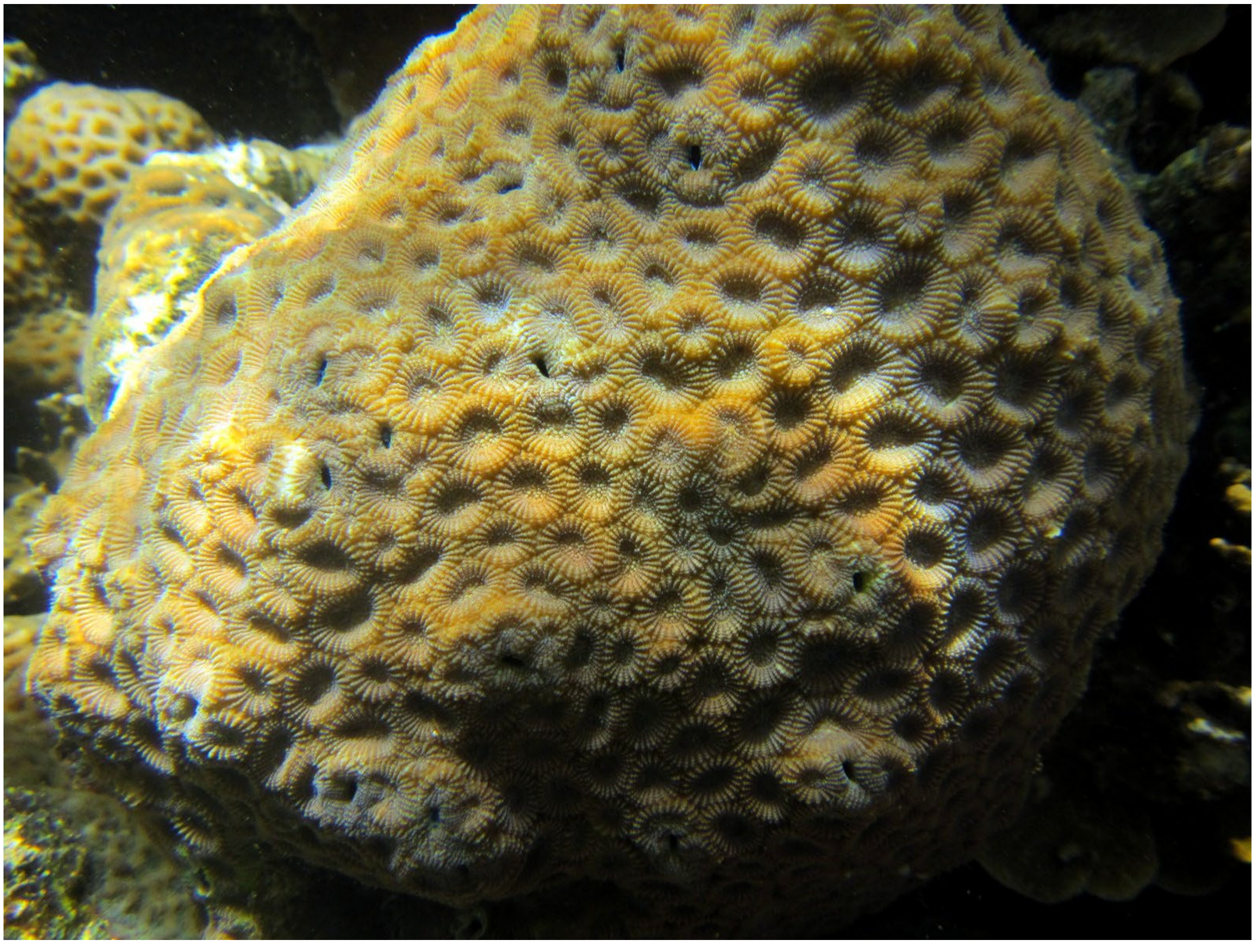
Phymastrea

This genus used to be part of "*Montastraea*."

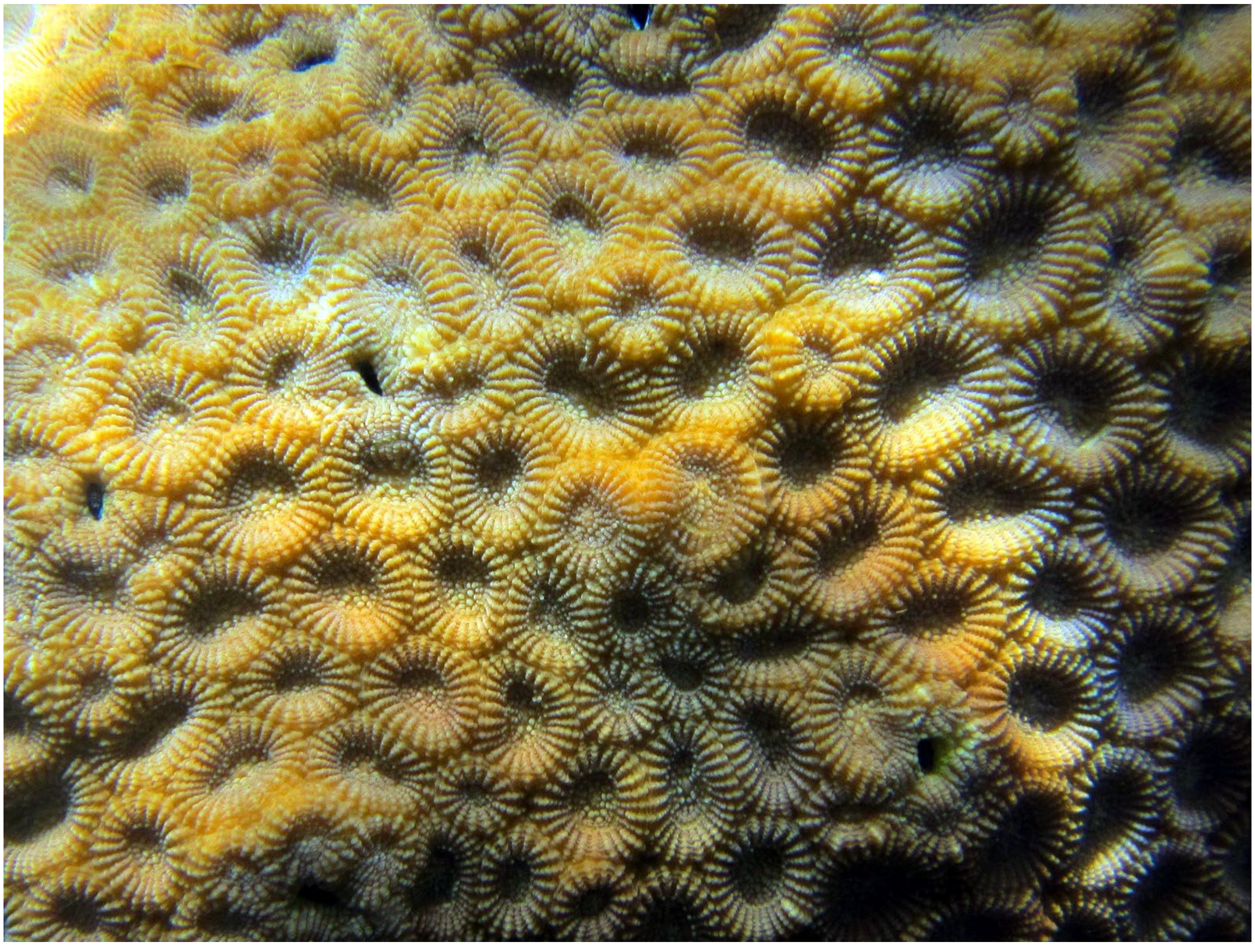
Colonies are encrusting or massive. The corallites have separate walls, with a groove or space between them. There are no easily observed features of living colonies that distinguish this genus from *Favia*, so it is usually necessary to distinguish the species and that tells you which genus they are in.

Phymastrea magnistellata

Colonies are massive. Corallites are compacted together with just a small crack between them. Corallites are near to circular and have a fairly thick rim with short even septa. Tiny bumps in the center are the columella. The rim is a little thicker than on most *Dipsastrea*.



A photo of *Phymastrea magnistellata*.



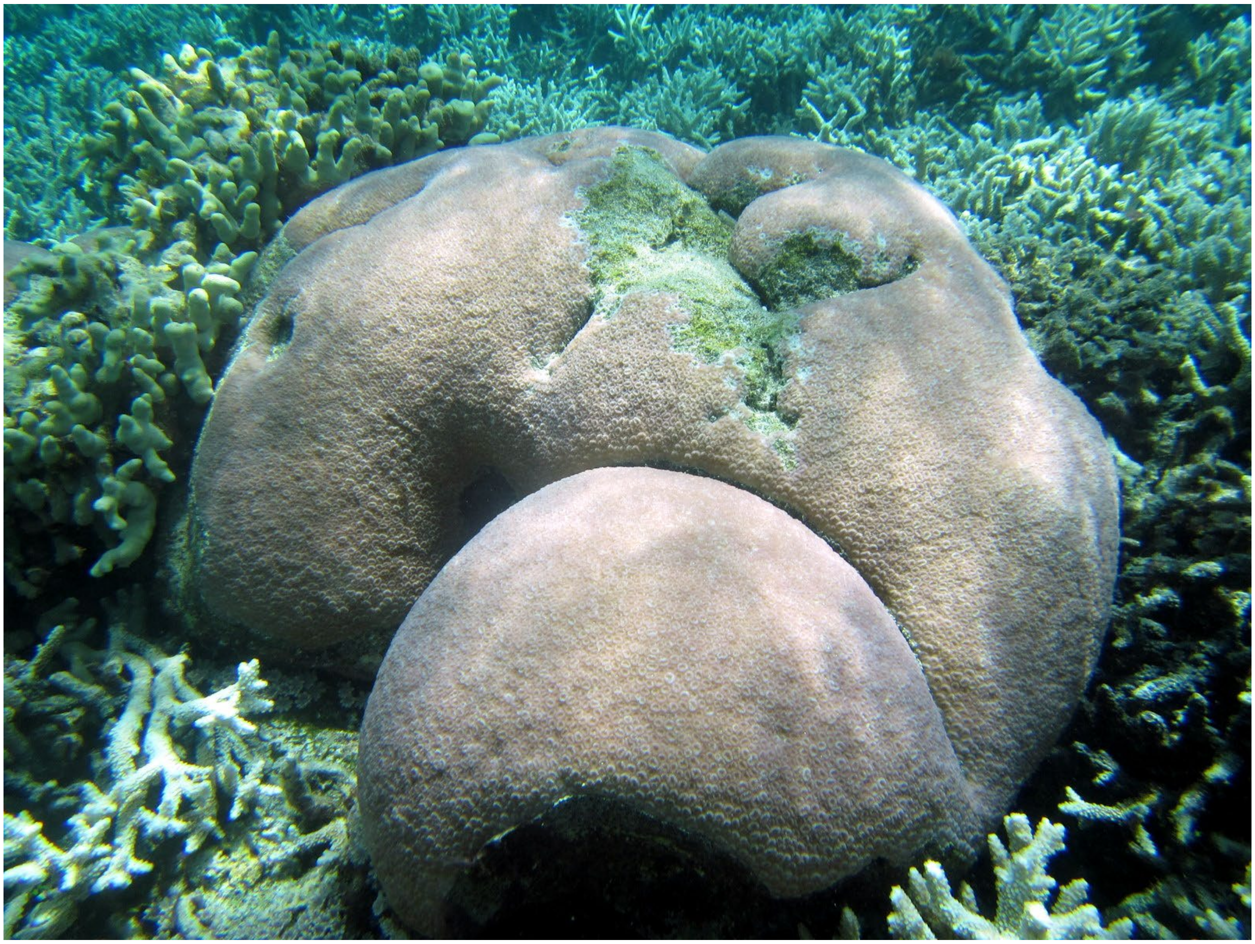
A close-up photo of *Phymastrea magnistellata*.

Paramontastraea This genus used to be part of "*Montastraea*."

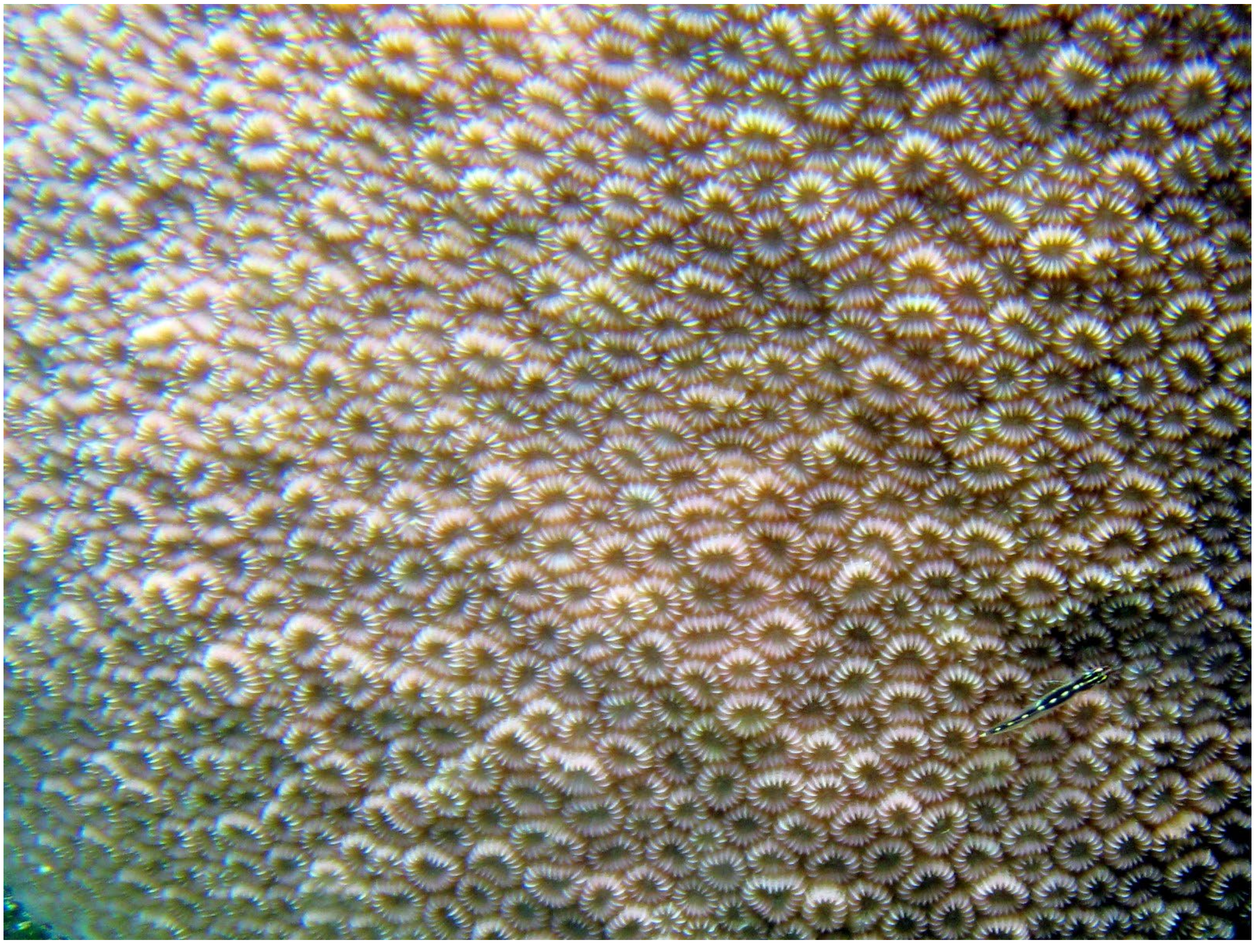
Colonies are massive with small corallites that are close together but separated by a groove.

Paramontastraea salebrosa

Colonies can get fairly large. Corallites are round to oval, separated by a narrow crack, and some corallites project more than others. This species looks similar to *Goniastrea stelligera*, except colonies are massive and can get large, some corallites project more than others, and septa are smaller.



A large colony of *Paramontastraea salebrosa.*



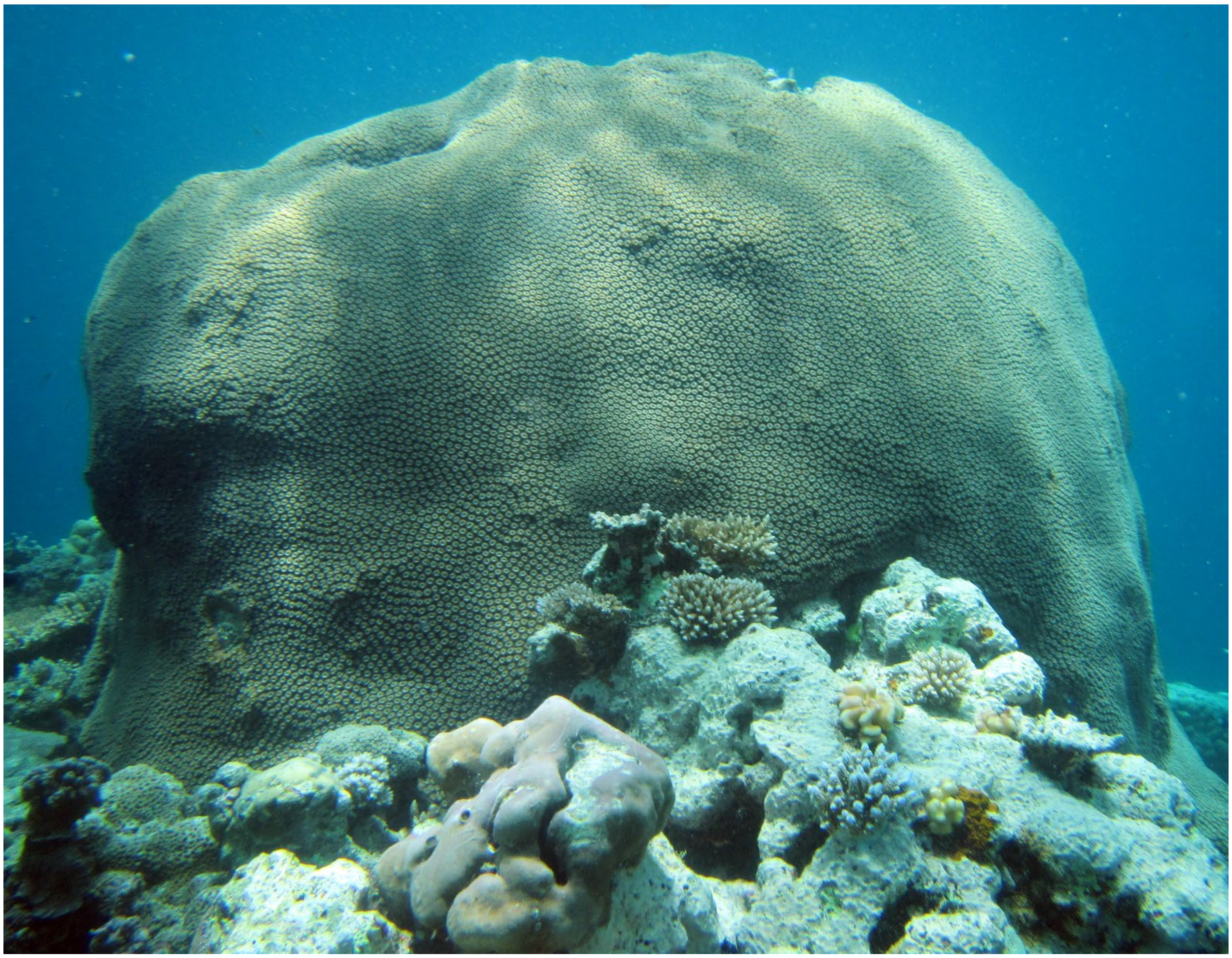
A close-up photo of the corallites of *Paramontastraea salebrosa*.

Diploastrea

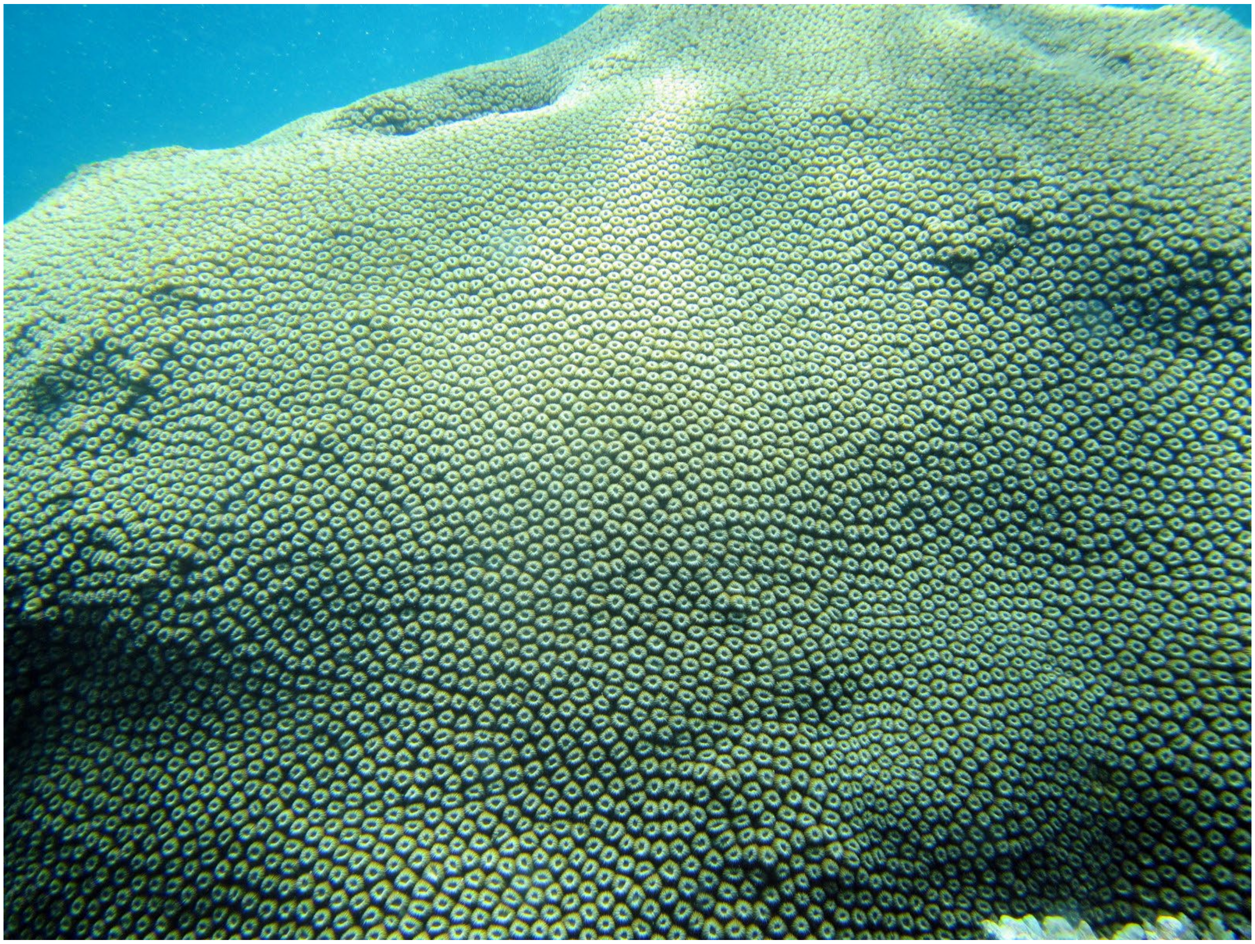
There is only one species in this genus, so the properties of the genus are those of the one species. This is one of the most distinctive of all corals.

Diploastrea heliopora

Colonies are massive or encrusting, and can get quite large. Corallites are about the size of a finger tip. Corallites project, taper, and have a recessed center, making them look a little like volcanoes. The sloping outer surfaces of the corallites have small uniform ridges running down their sides, which are costae. This is perhaps the most distinctive and easy species to identify in the Indo-Pacific.



A large colony of *Diploastrea heliopora*.



A closer photo of *Diploastrea heliopora*.

A close-up photo of *Diploastrea heliopora*.

Echinopora

Colonies are plates or encrusting and have small, circular, projecting corallites. *Dipsastrea* can have larger corallites and is massive. *Cyphastrea* has smaller corallites.

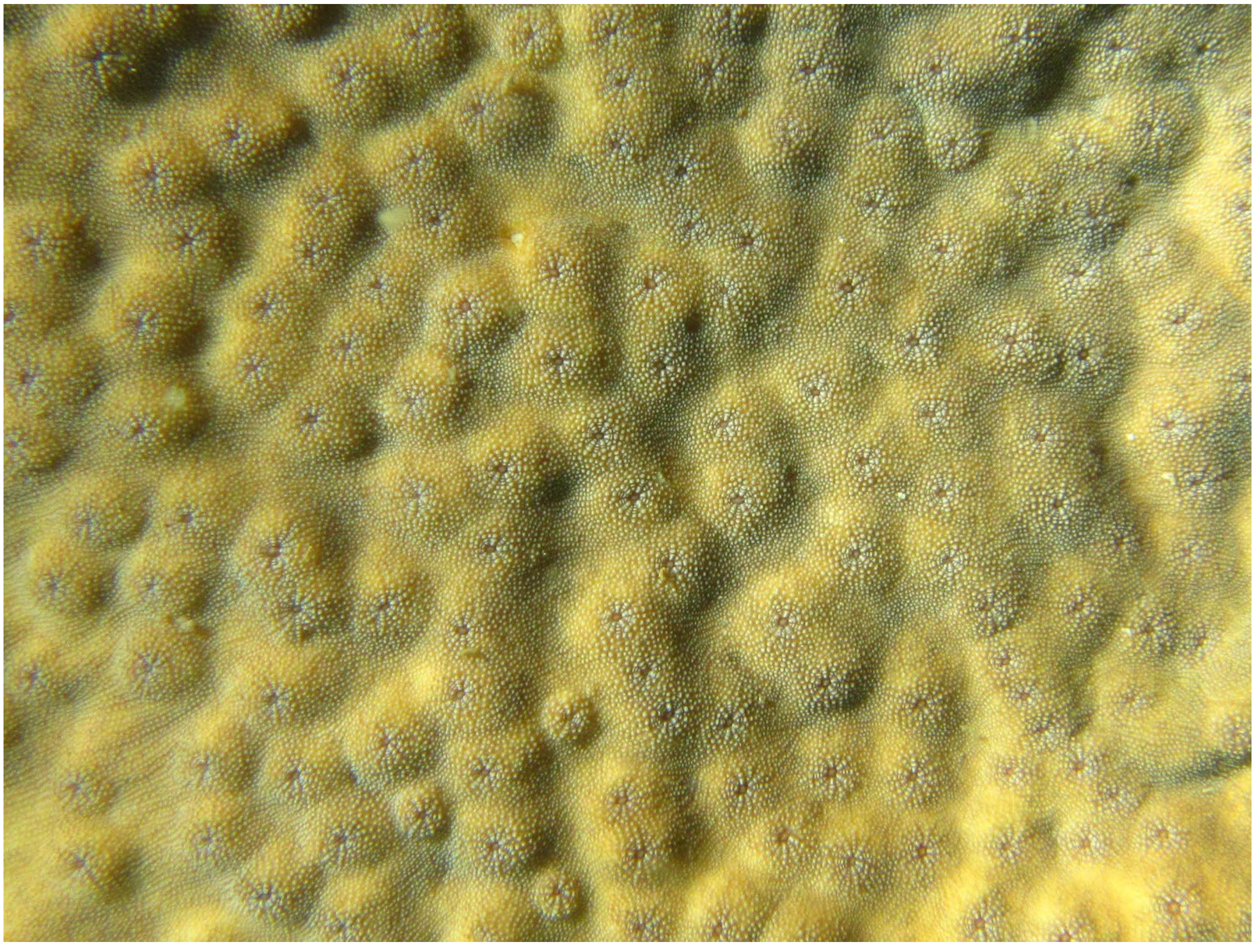
Echinopora taylorae

Colonies are plates which can have fronds or be circular plates. Corallites are usually raised so little they are hard to distinguish clearly unless they are a different color from the plate, but sometimes the corallites are raised more. Corallites are smaller than the end of a little finger. The spines are very fine. The corallites are larger than on *Echinopora lamellosa*. *Echinopora gemmacea* is mostly encrusting, spinier, and can have knobs or lumpy columns. *Echinopora pacificus* has larger corallites and is usually encrusting in the center with slightly raised edges.

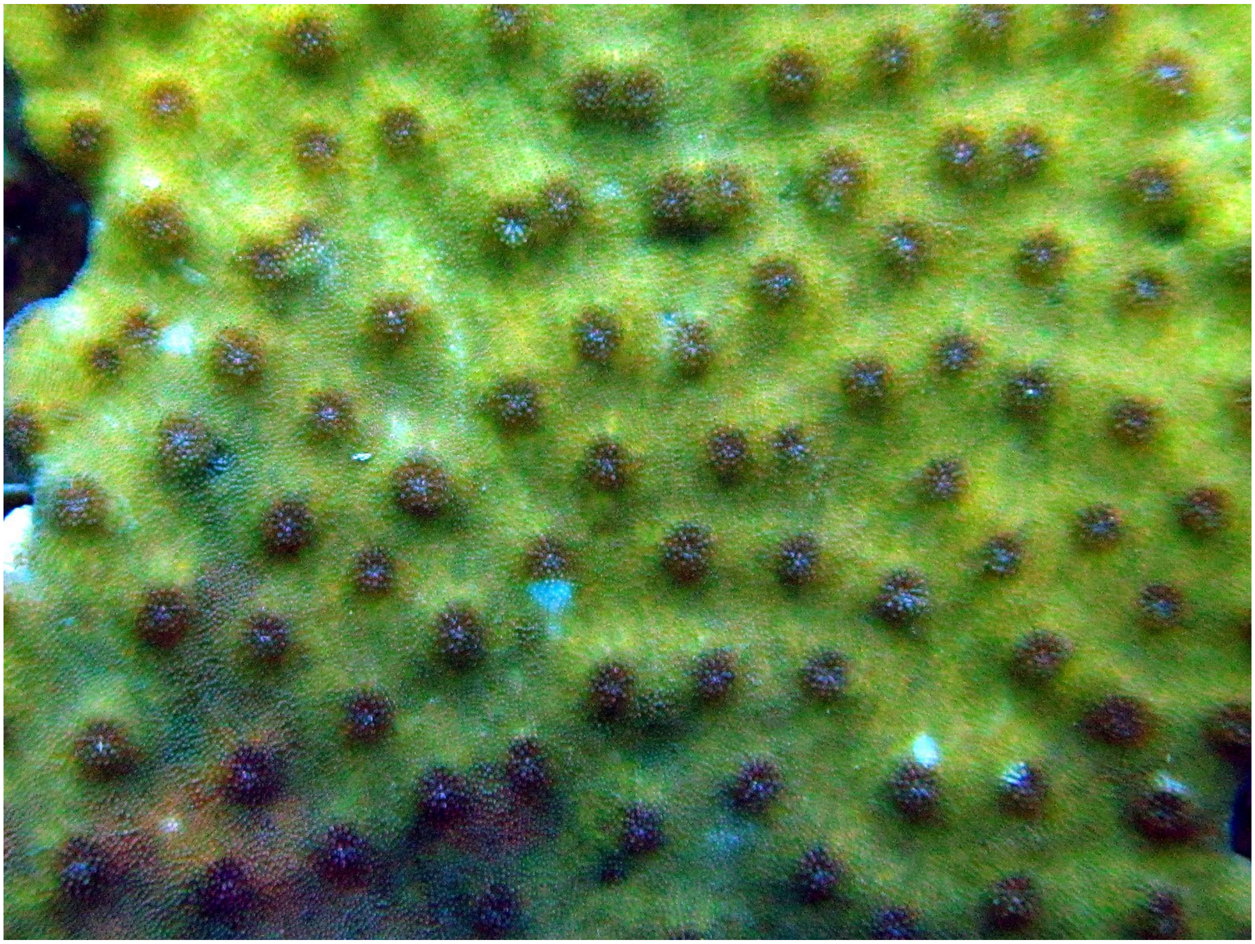
A colony of *Echinopora taylorae* with plates in whorls.

Colonies of *Echinopora taylorae* with corallites raised more than in many colonies.

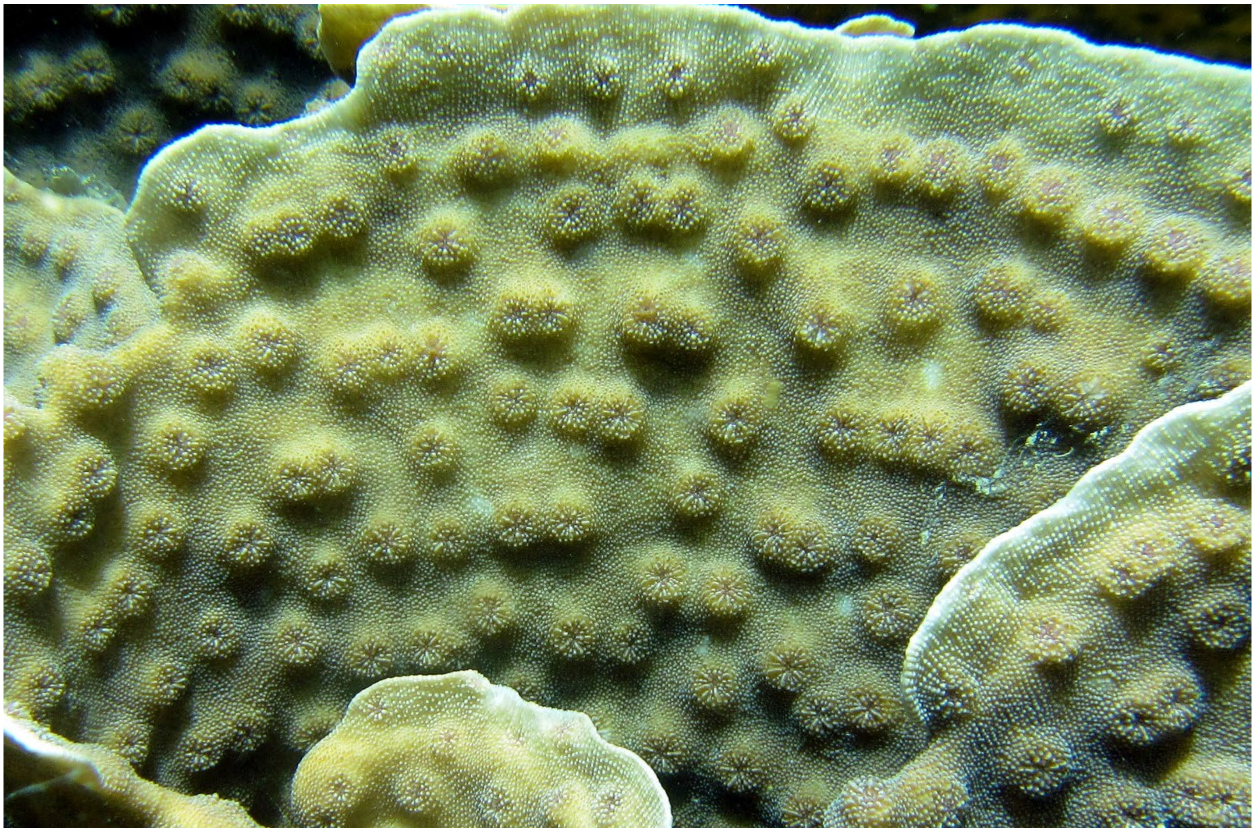
A close-up photo of a colony with slightly larger corallite centers.



A close-up photo of *Echinopora taylorae*.



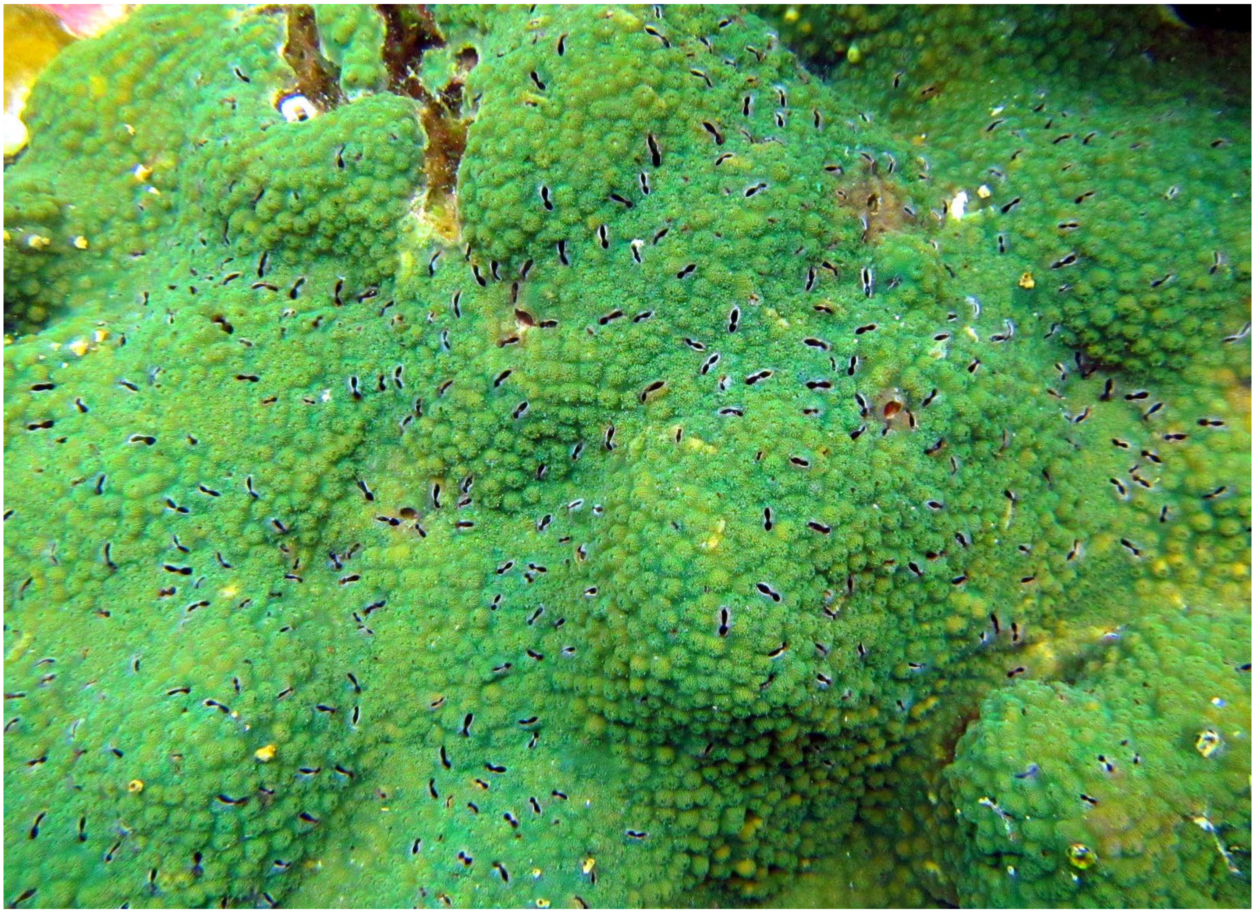
An *Echinopora taylorae* colony with corallites that appear to have filled centers.



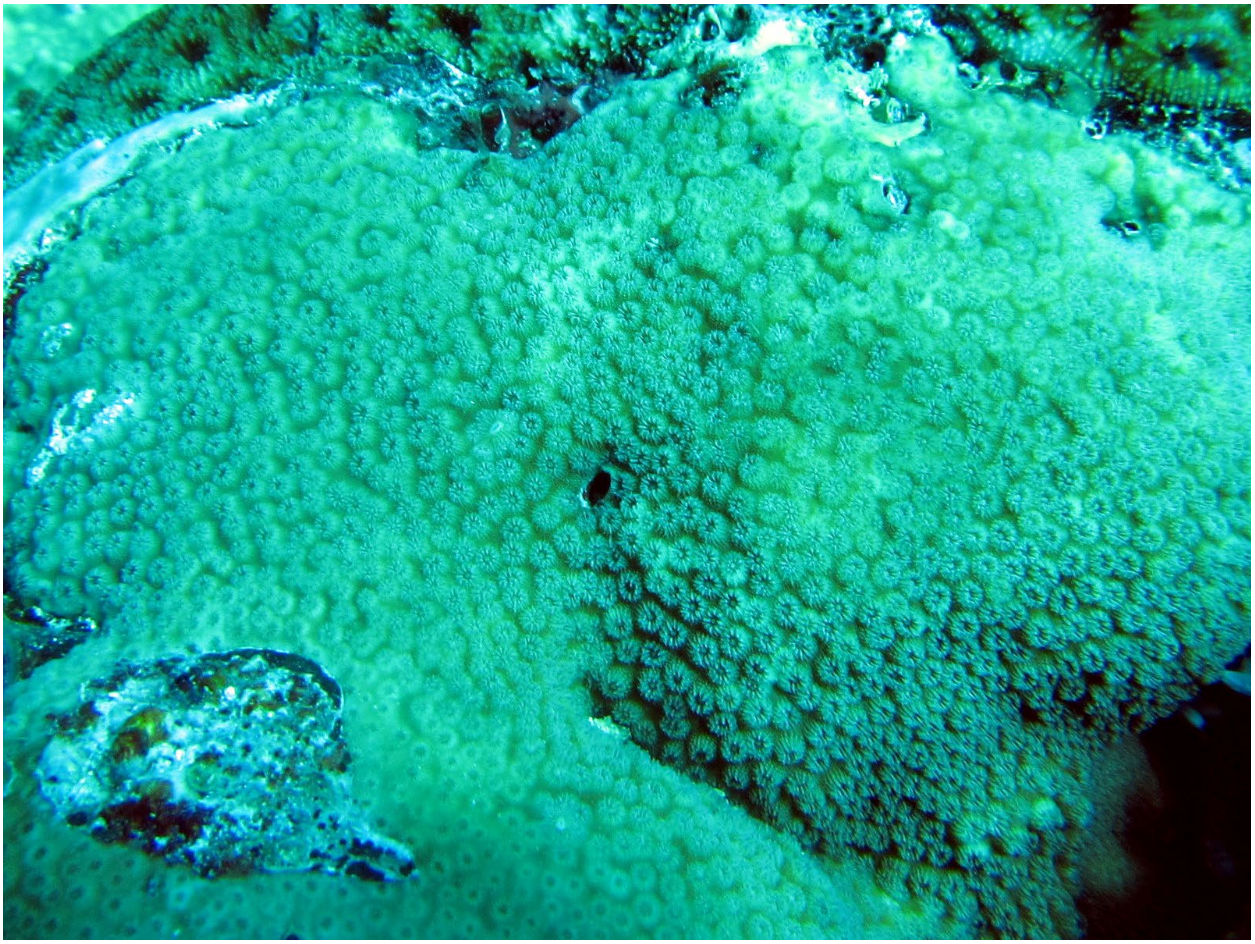
A close-up photo of *Echinopora taylorae*.

Cyphastrea

Colonies are usually encrusting or massive. Most species are difficult to identify under water because the corallites are so small, only about 2 mm diameter. The number of costae is needed to identify most species. Two species can be readily identified but photos of them from Palau are not available yet. *Cyphastrea* has smaller corallites than *Echinopora*.



A colony of *Cyphastrea* showing the tiny corallites. The short black lines are the siphon holes of a small species of boring clam in the skeleton.



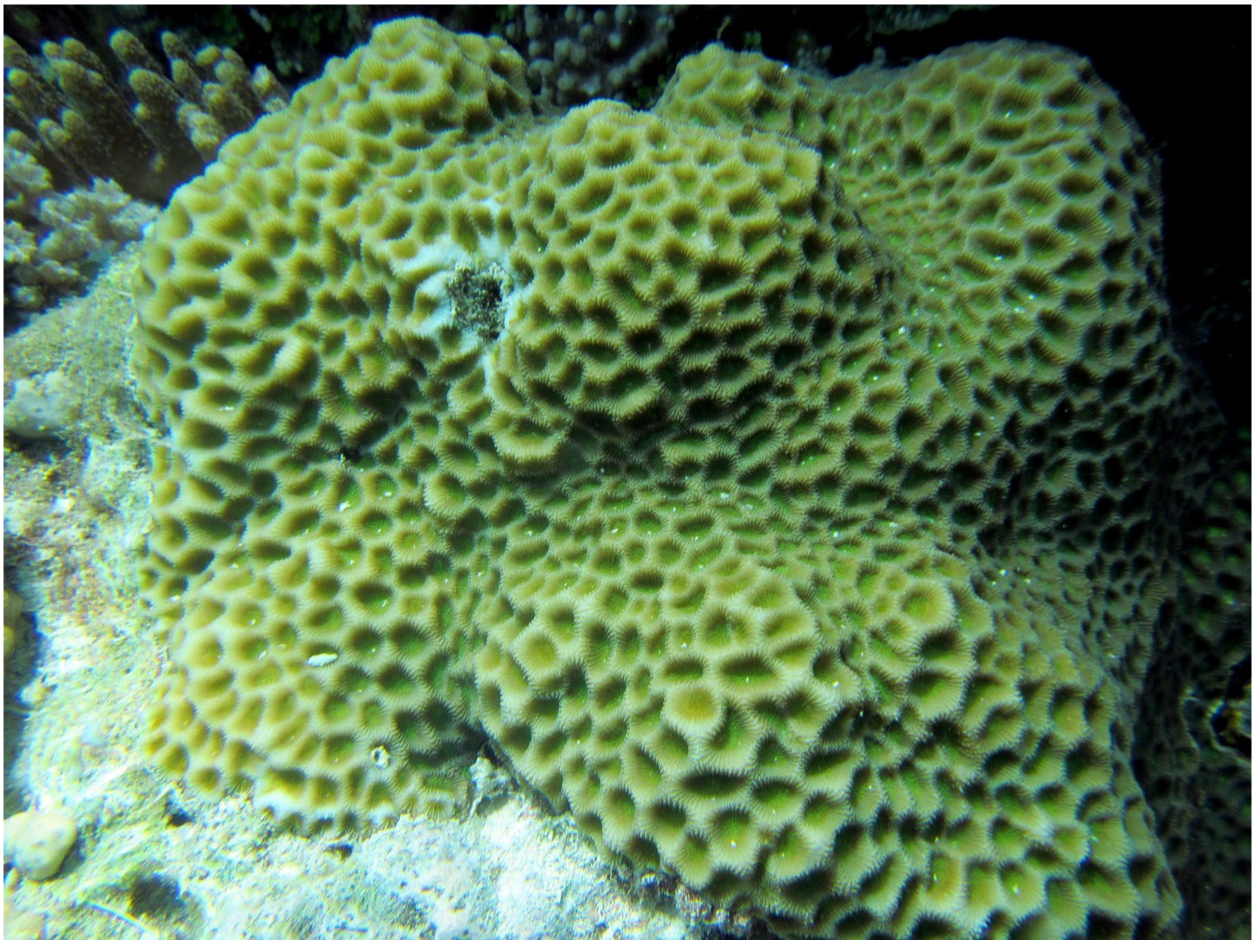
A close-up photo of *Cyphastrea*.

Favites

Colonies are massive or encrusting. Corallites vary in size between species, ranging from about the diameter of a thumb down to smaller than the tip of a small finger. Adjacent corallites share a common wall, there is no groove or space between corallites, only one single wall. *Dipsastrea* is similar but corallites do not share a common wall, there is a groove or separation between corallites.

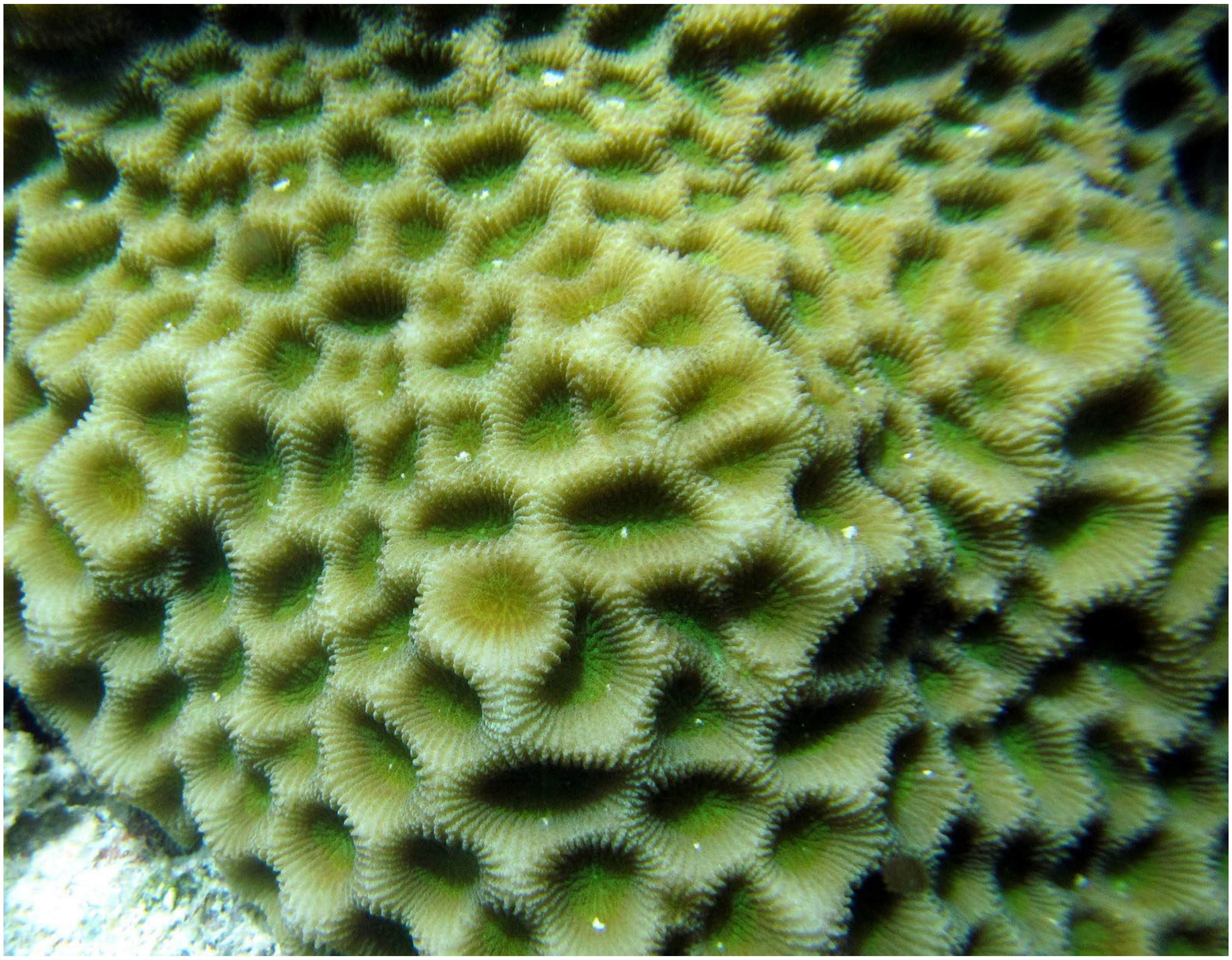
Favites abdita

Colonies are encrusting, massive, or lumpy. The corallites are about the size of the tip of a finger. They are separated by fairly sharp walls. *Favites halicora* has thicker, more rounded walls.



A colony of *Favites abdita*.

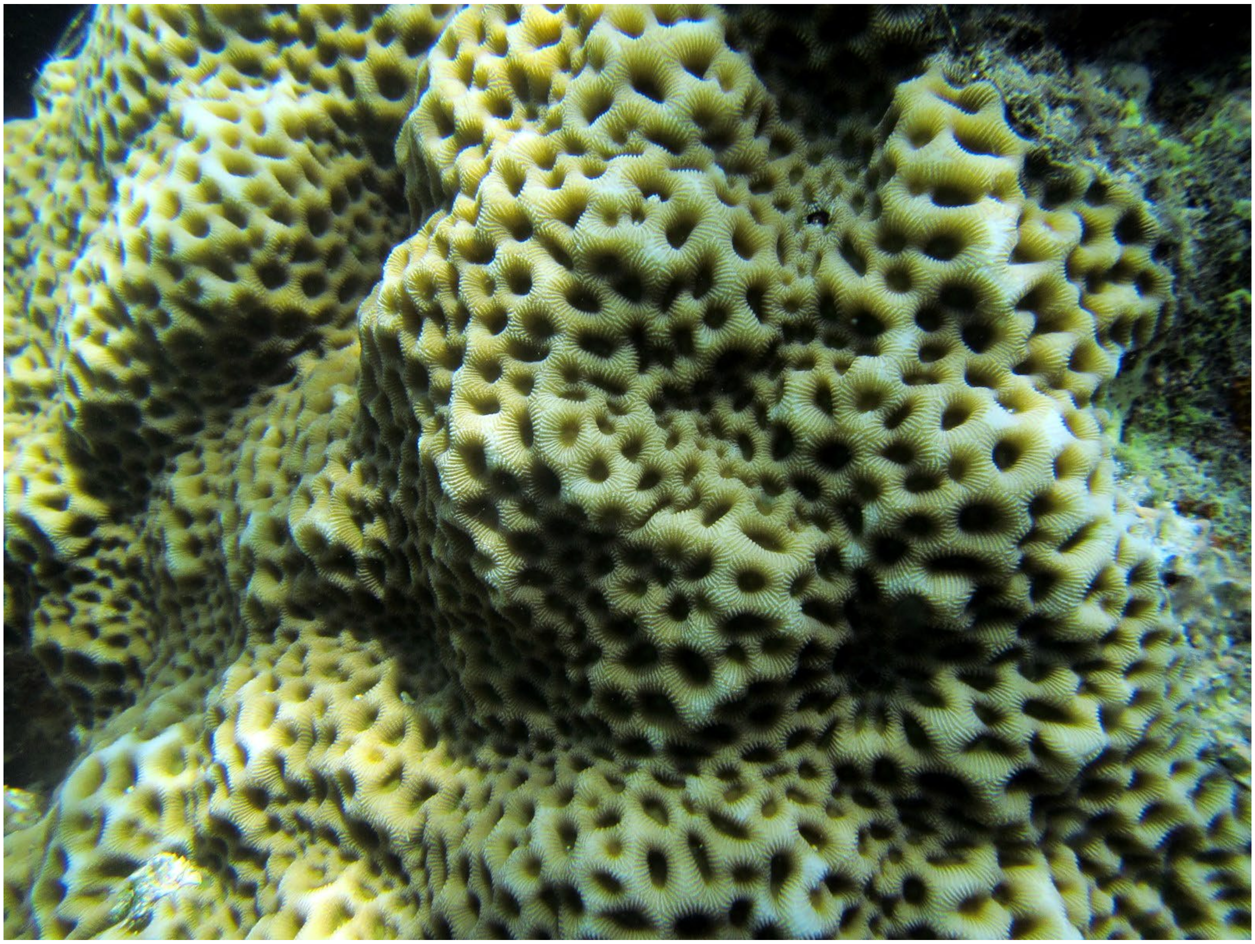
A colony of *Favites abdita*.



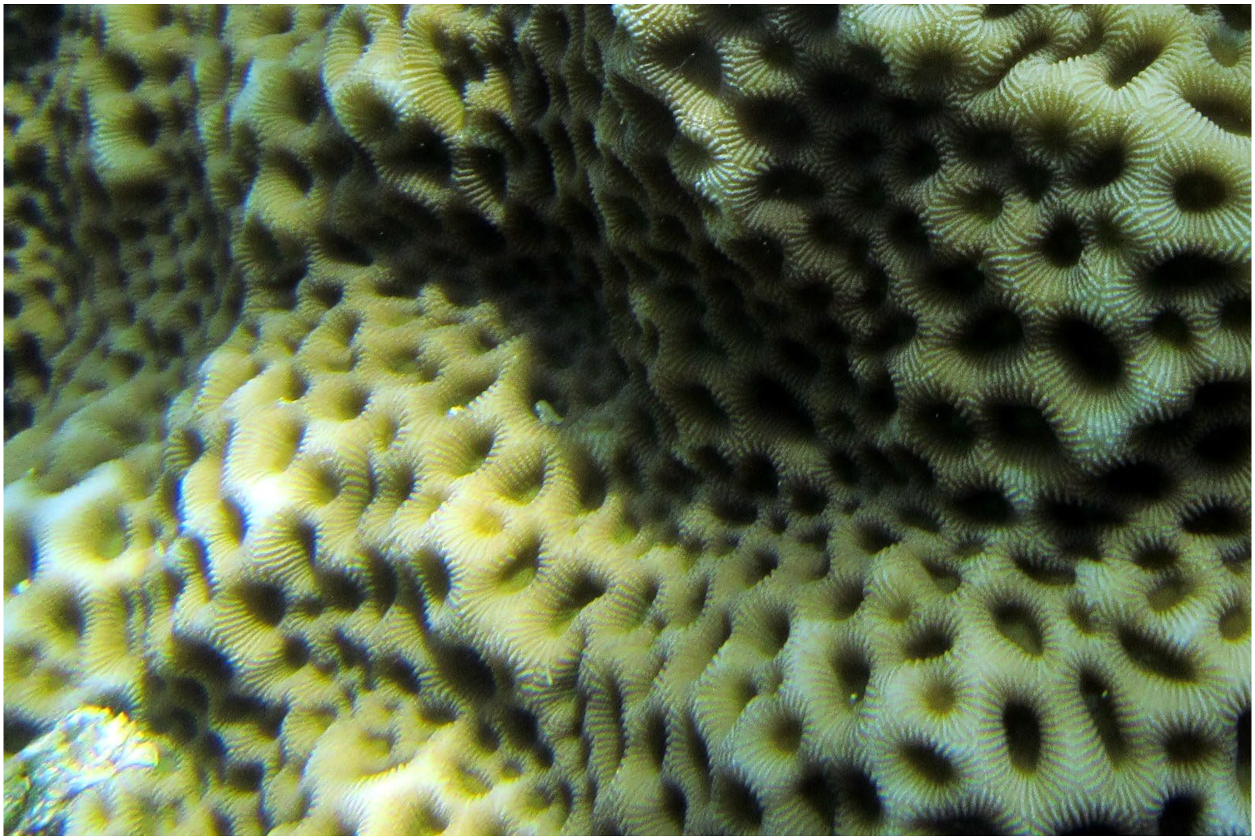
A close-up photo of *Favites abdita*.

Favites halicora

Colonies are encrusting, massive, or lumpy, and corallites are about the size of the end of a finger, and are separated by rounded walls. *Favites abdita* has sharper walls.



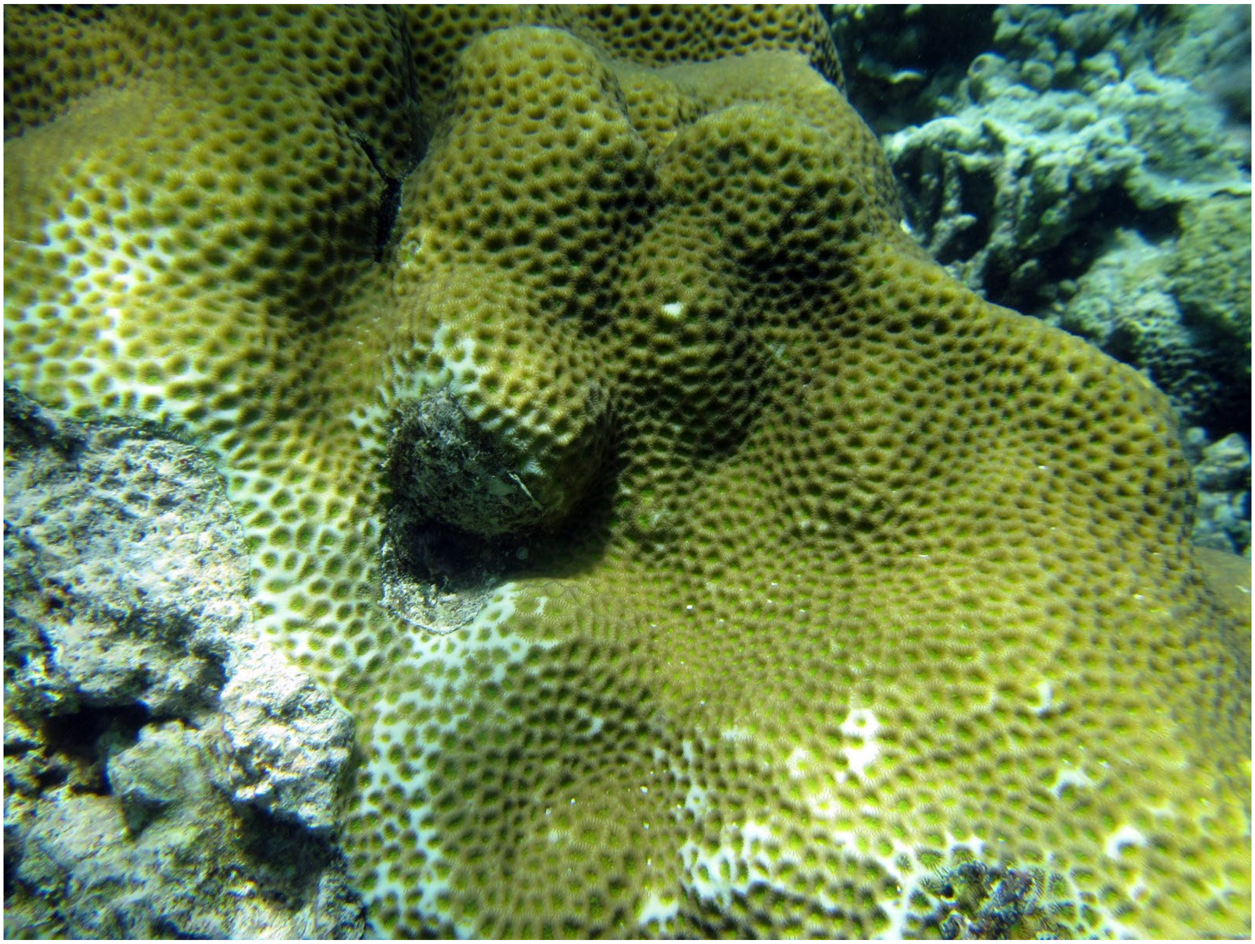
A colony of *Favites halicora*.



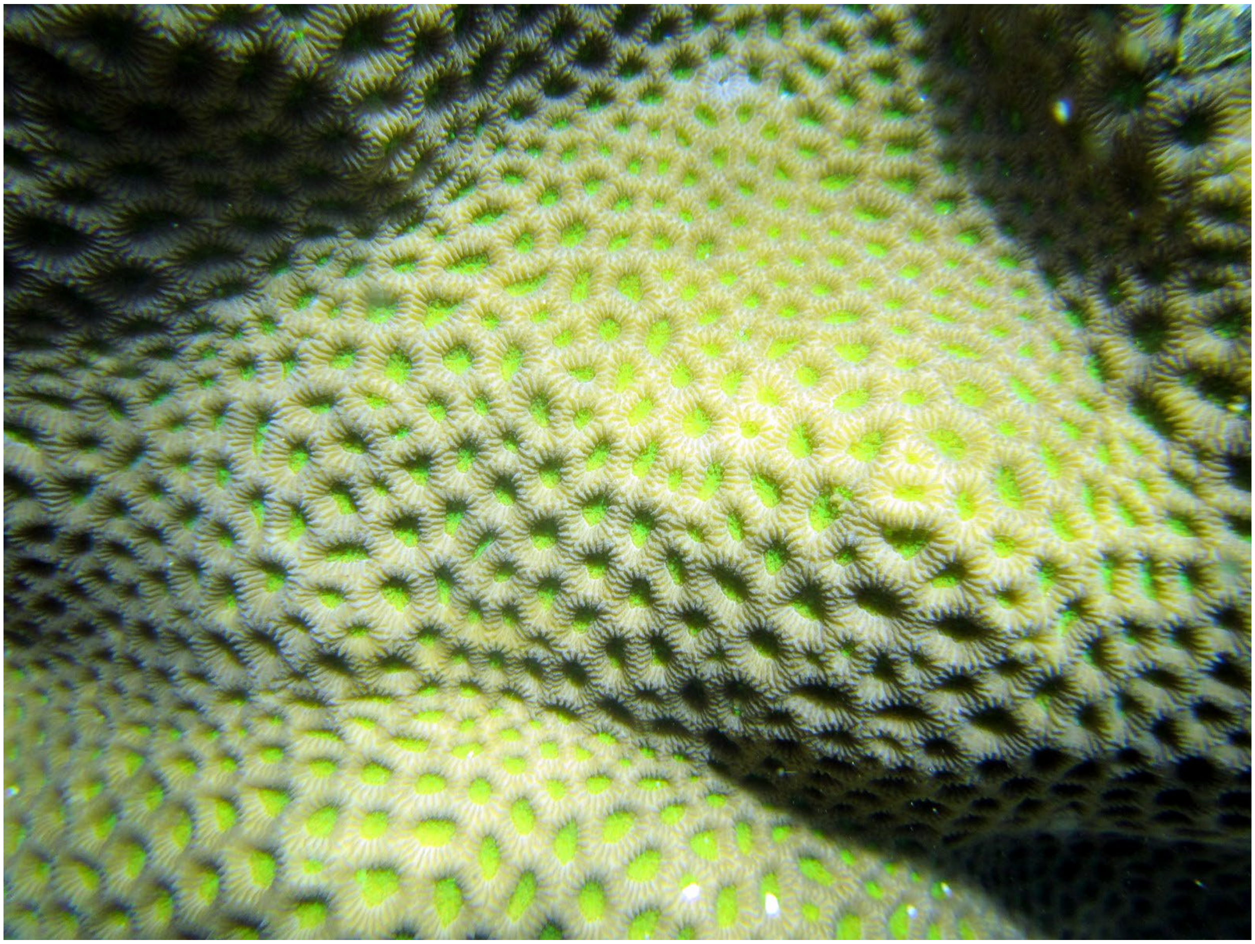
A close-up photo of *Favites halichora*.

Favites pentagona

Colonies are encrusting or massive. Corallites are about the size of the tip of a little finger or a bit smaller. Corallites are smaller than on *Favites abdita* and *Favites halicora*.



A colony of *Favites pentagona*.



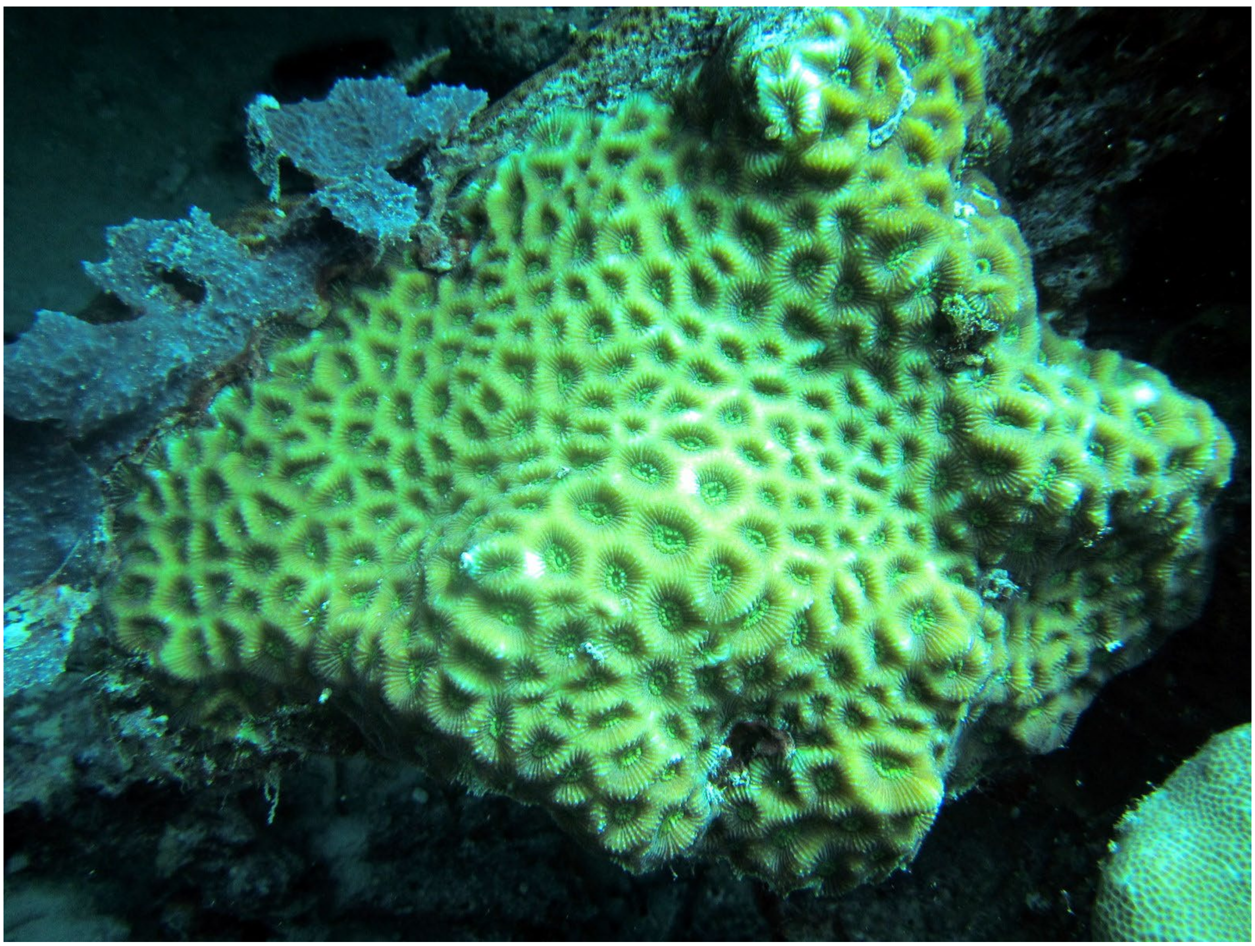
A close-up photo of *Favites pentagona*.

Goniastrea

Colonies can be encrusting, massive, or lumpy. Corallites vary in size from about the size of a thumb to only about 2-3 mm diameter. In most species corallites are polygonal, but in one they can be oval and in another they are long and meandroid. Some species are separated by thin walls, others by thick walls. The septa are usually uniform and a ring of tiny bumps inside the corallite is often present indicating the presence of pali. There doesn't seem to be a single easy way to distinguish *Goniastrea* from *Favites* as genera underwater, other than learning individual species.

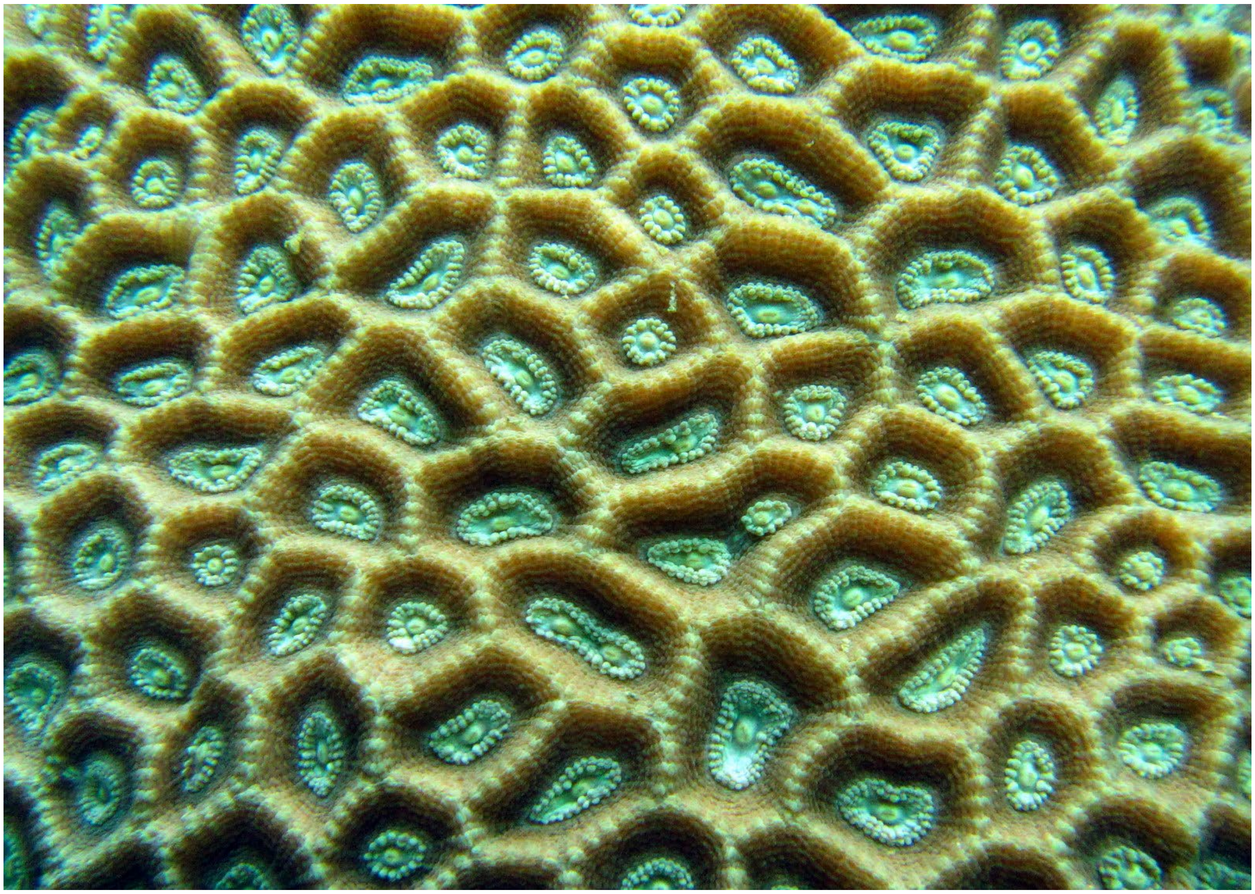
Goniastrea palauensis

Colonies are encrusting or massive. Corallites are about finger to thumb diameter. Corallites are deep and have relatively thick walls. In the center of the corallites, tiny cylindrical bumps are pali and a mouth may be visible in the center. *Oulophyllia* has always has some valleys with two or more corallites in them, and has slightly more irregular septa. *Goniastrea aspera* is similar but the tiny bumps in the center are elongated or may not be present. *Favites* does not have the bumps.



A *Goniastrea palauensis* colony.

A closer photo of *Goniastrea palauensis*.



A close-up photo of *Goniastrea palauensis*, showing the pali bumps in the middle of the corallite.

Goniastrea aspera

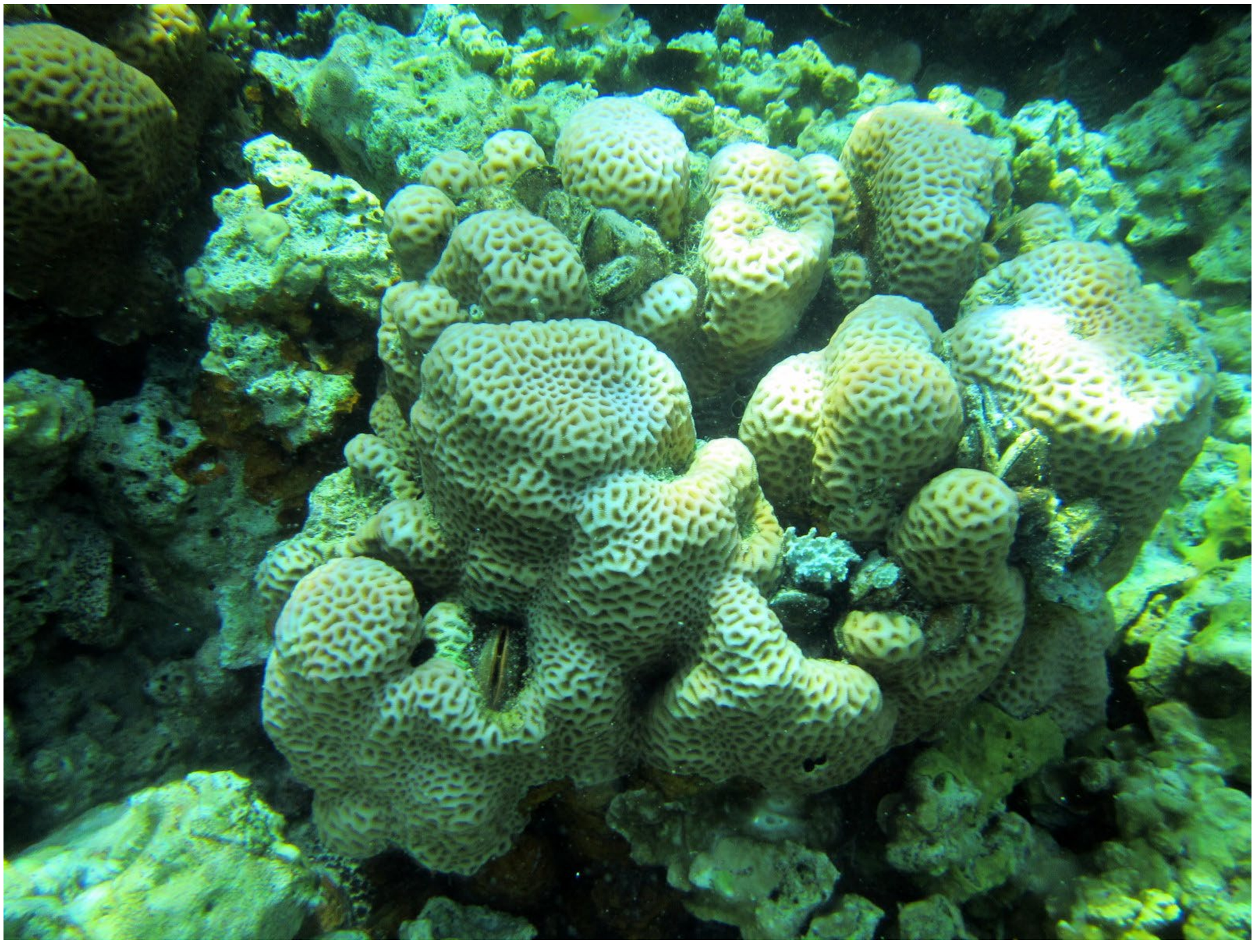
Colonies are massive and can range from small to large. Corallites are moderate size, in the range of pencil to small finger size. Corallites are polygonal, deep with very thin, high walls between them. Septa are very short and uniform size. *Gardineroseris planulata* has smaller corallites with even sharper walls and smaller septa. All other *Goniastrea* have thicker walls. *Goniastrea pectinata* has some elongated coralltíes.

A colony of *Goniastrea aspera*.

A close-up photo of *Goniastrea aspera*.

Goniastrea pectinata

Colonies are often lumpy but can be encrusting or massive. Corallites are small, but some are elongated enough to have two mouths. Corallites are polygonal and the wall between corallites is a bit sharp, not rounded. *Goniastrea aspera* and *Goniastrea edwardsi* are smooth rounded massive, and do not have any elongated corallites.



A colony of *Goniastrea pectinata*.

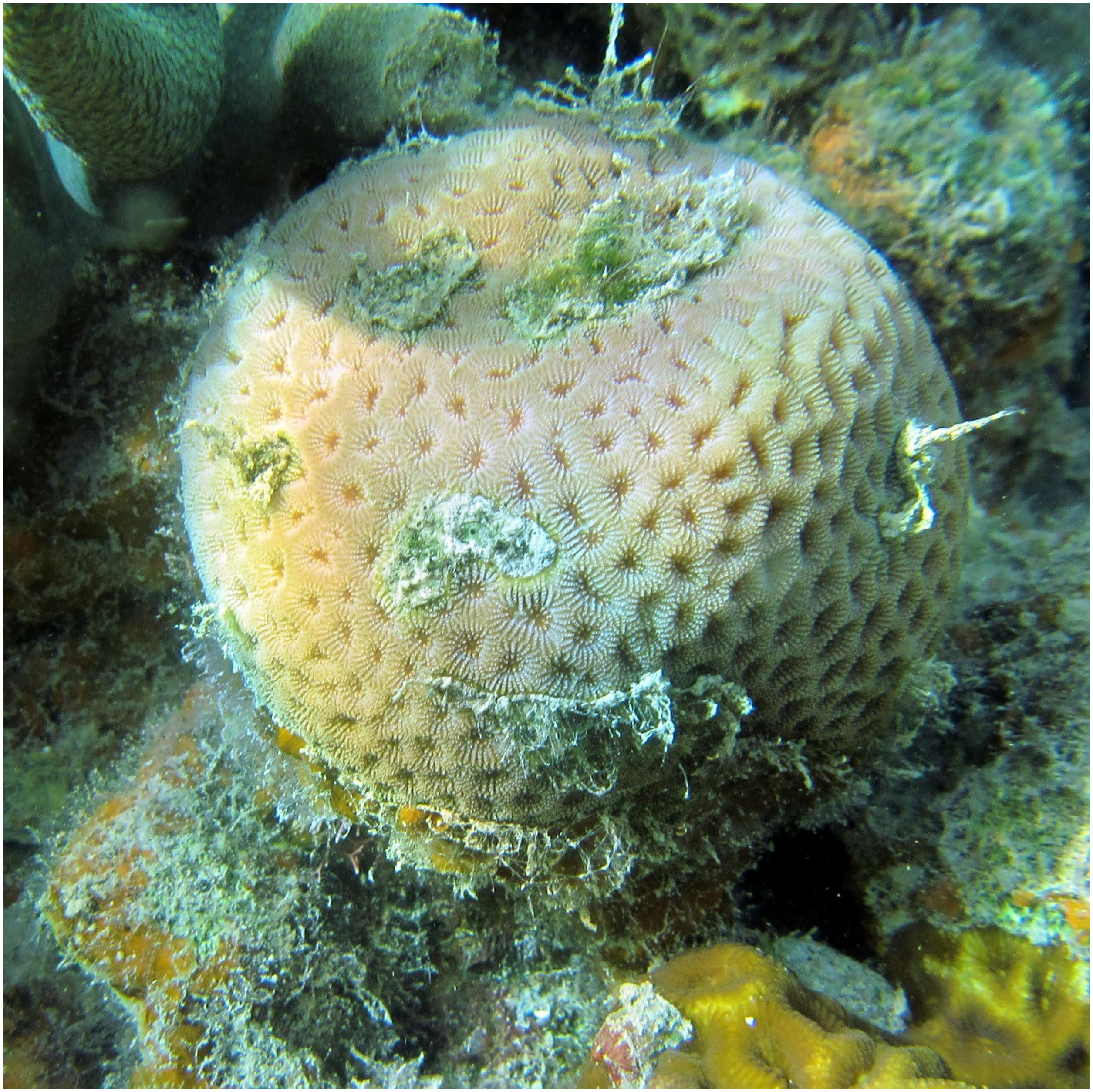
A colony of *Goniastrea pectinata*.

A closerup photo of *Goniastrea pectinata*.

Goniastrea edwardsi

Colonies are massive. The corallites are about 4-5 mm diameter, a bit smaller than a small finger tip. The walls are thick between corallites. *Goniastrea retiformis* and *Goniastrea minuta* have smaller corallites with thinner walls.

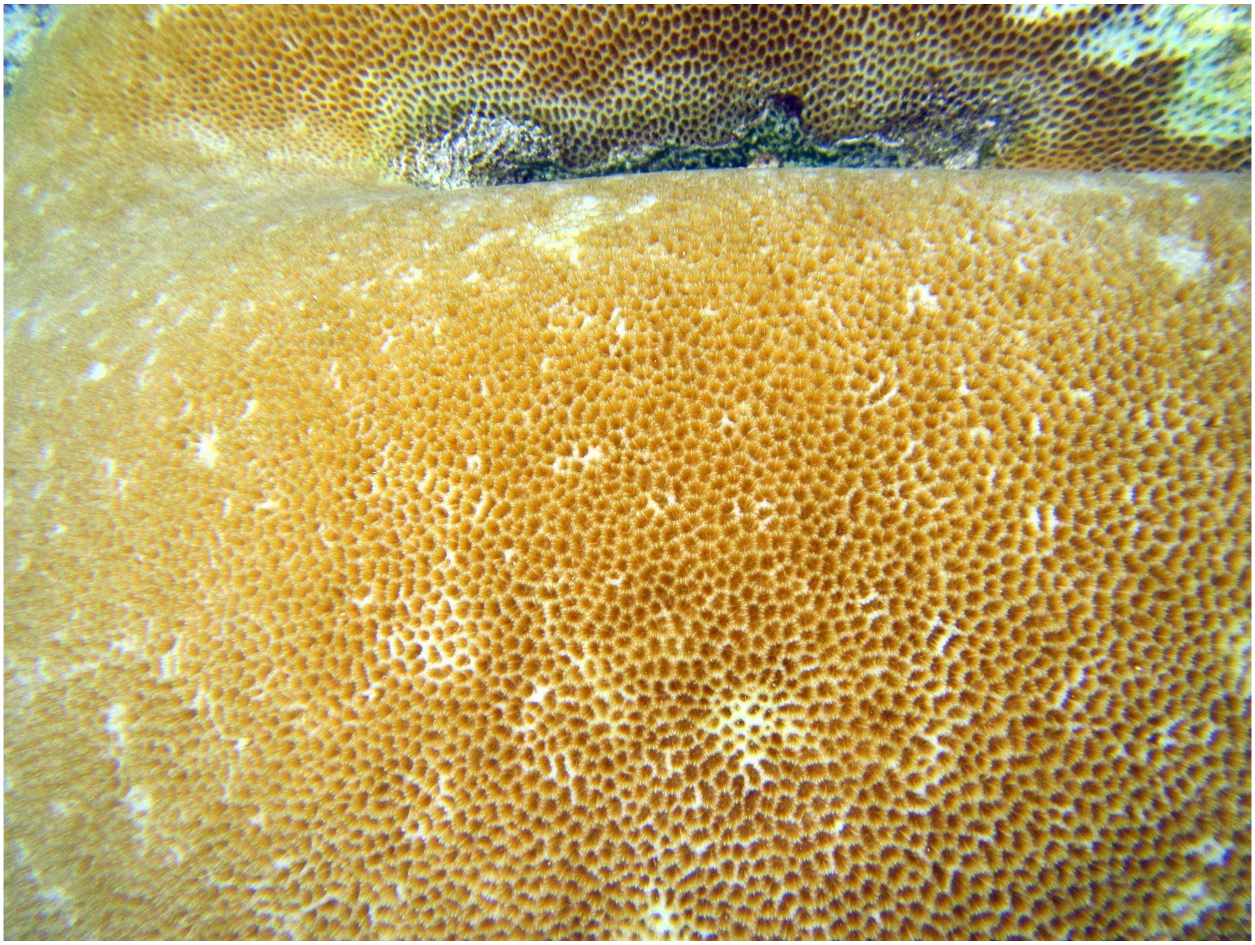
A colony of *Goniastrea edwardsi*.



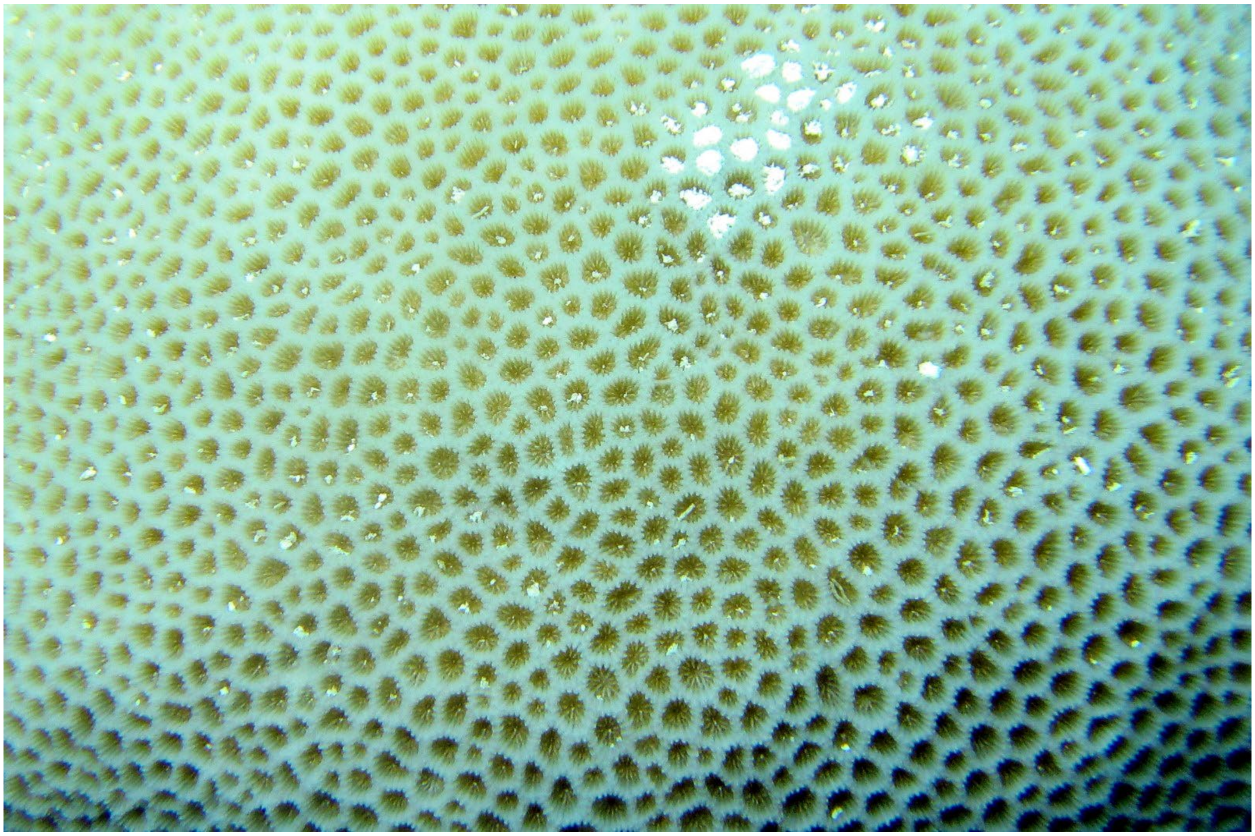
A closer photo of a colony of *Goniastrea edwardsi*.

Goniastrea retiformis

Colonies are massive and can range from small to large. Corallites are small, about 2-3 mm or smaller. The walls between corallites are fairly thin. Corals are more massive and smoother not lumpy, and corallites are deeper than on *Goniastrea minuta*.



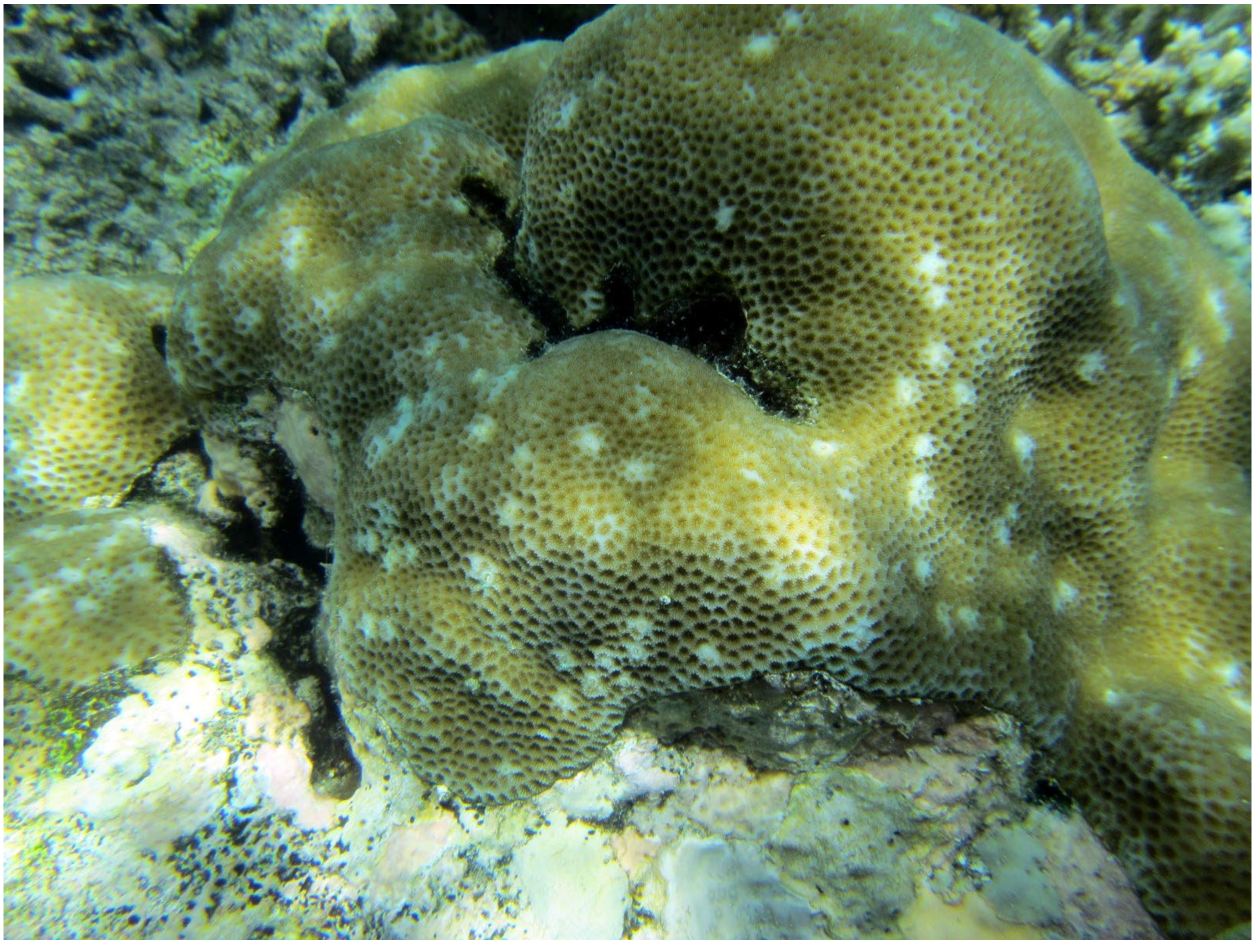
A colony of *Goniastrea retiformis*.



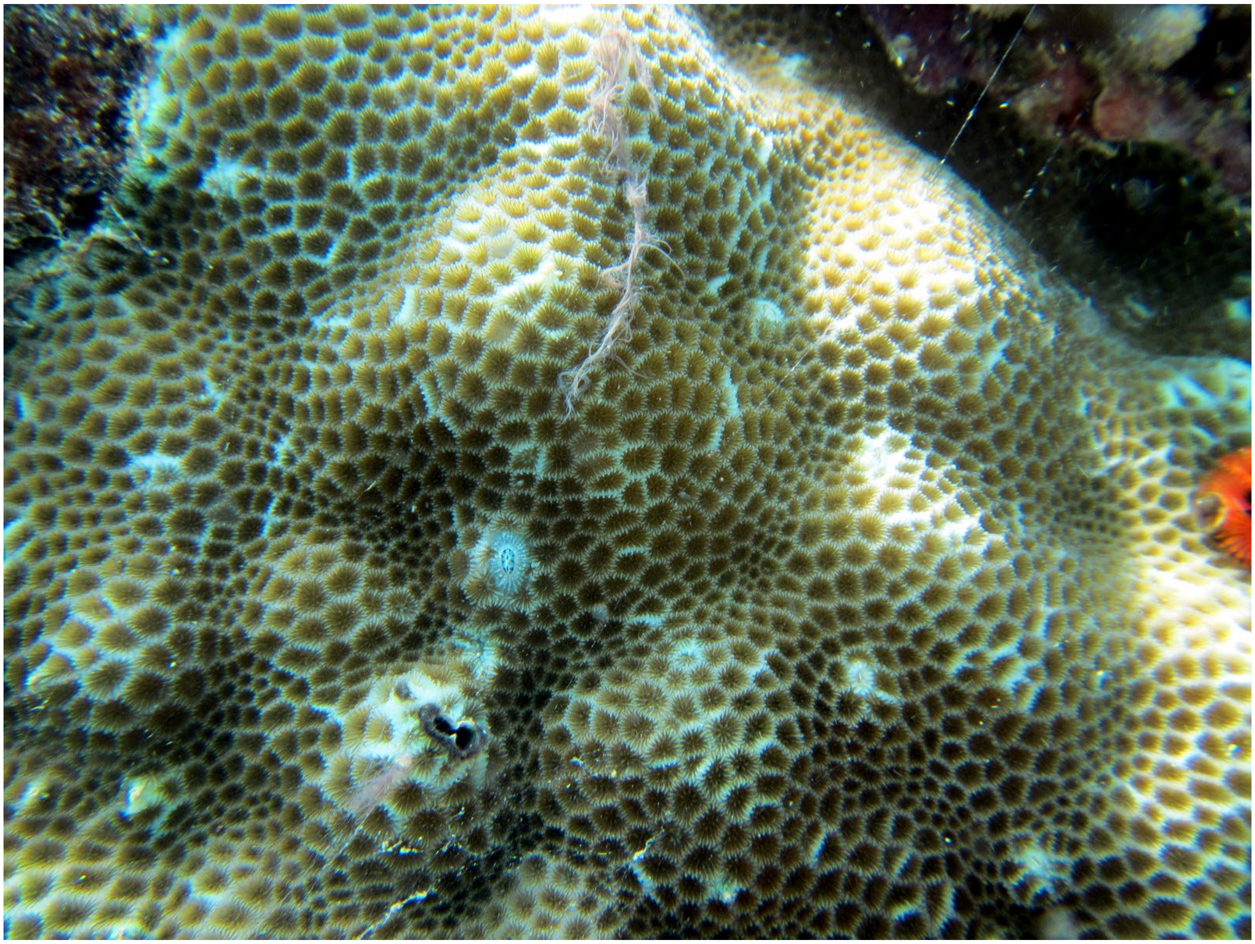
A close-up photo of *Goniastrea retiformis*.

Goniastrea minuta

Colonies are usually encrusting or lumpy. Corallites are tiny, about 2-3 mm diameter and shallow, with thin walls. Corallites are polygonal and rarely pinched. Some colonies have white spots which are barnacles. In some places colonies are more common near the top of reef slopes. On *Goniastrea retiformis*, coloniies are more massive and can be larger, and corallites are less rounded and deeper; *Goniastrea retiformis* does not have barnacles.



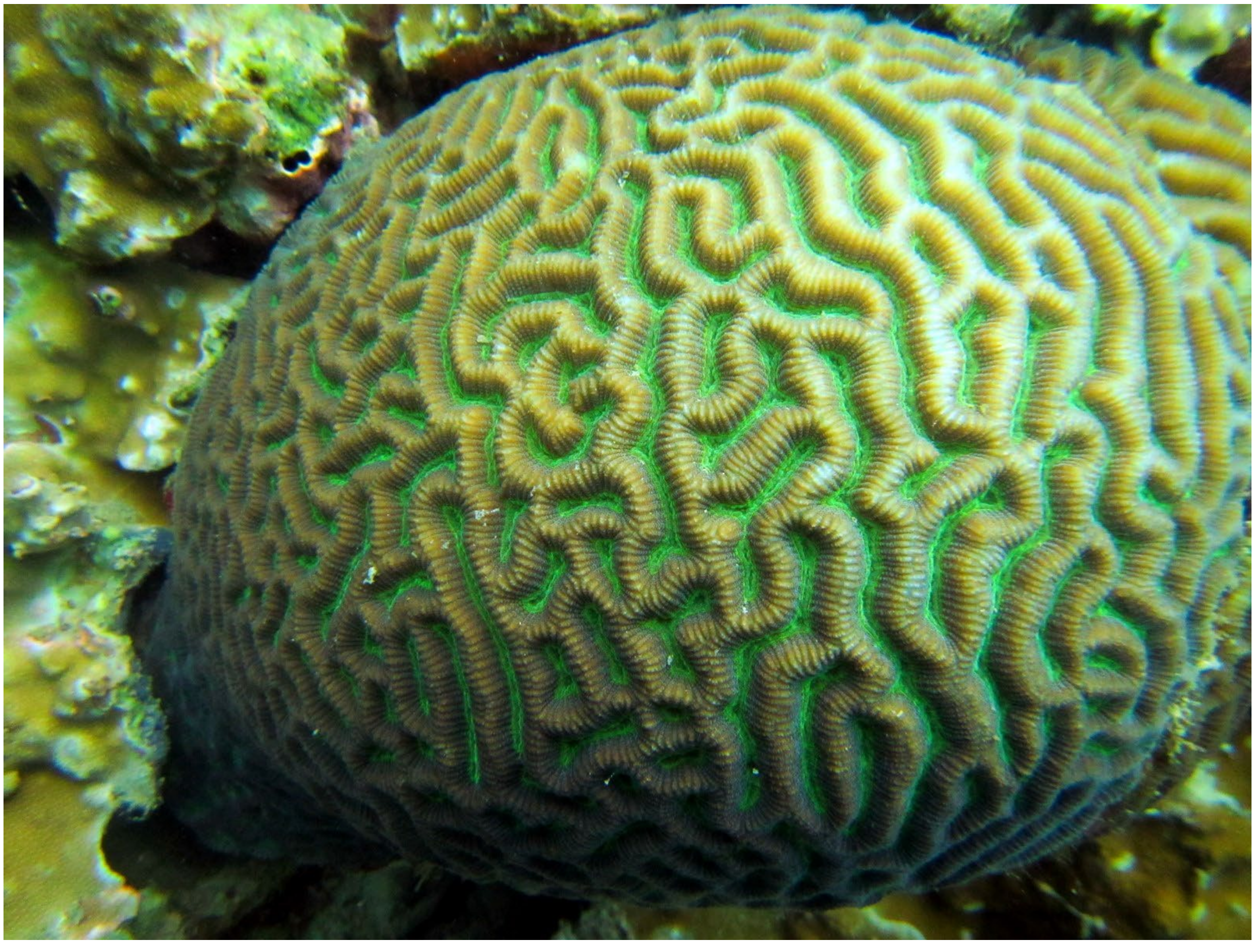
A colony of *Goniastrea minuta*.



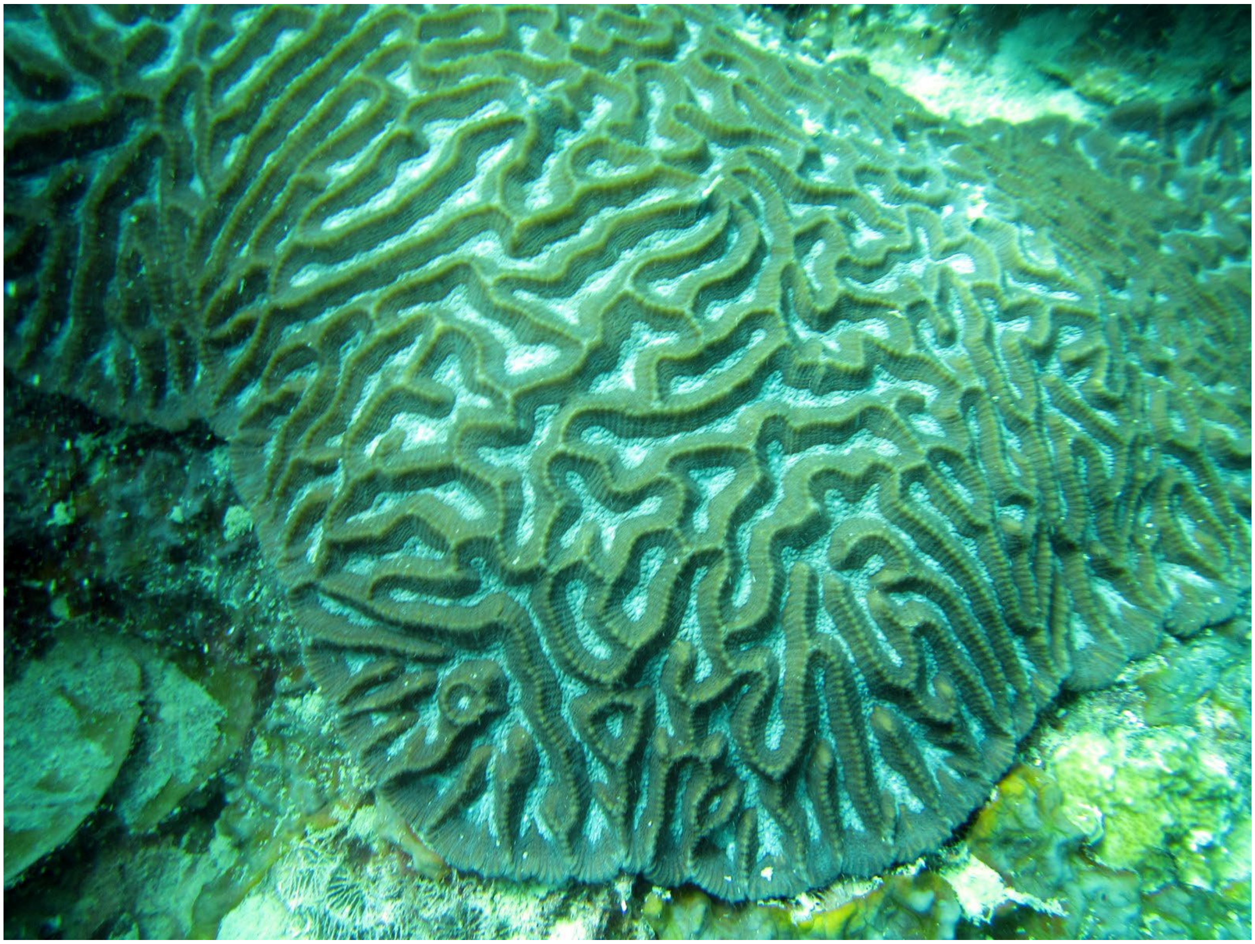
A close-up photo of a colony of *Goniastrea minuta*.

Goniastrea australensis *"meandroid" or "brain coral"*

Colonies are encrusting or massive. Corallites are greatly elongated to fill long, meandering valleys. The valleys are separated by ridges that may be rounded or have a sharper crest. Colonies have thicker ridges than most *Platygyra* colonies except *Platygyra lamellina,* but the floor of the valley often has tiny bumps that are pali and mouths may be visible. The ridges are smaller than on *Symphyllia*.



A colony of *Goniastrea australensis*.



A colony of *Goniastrea australensis*.

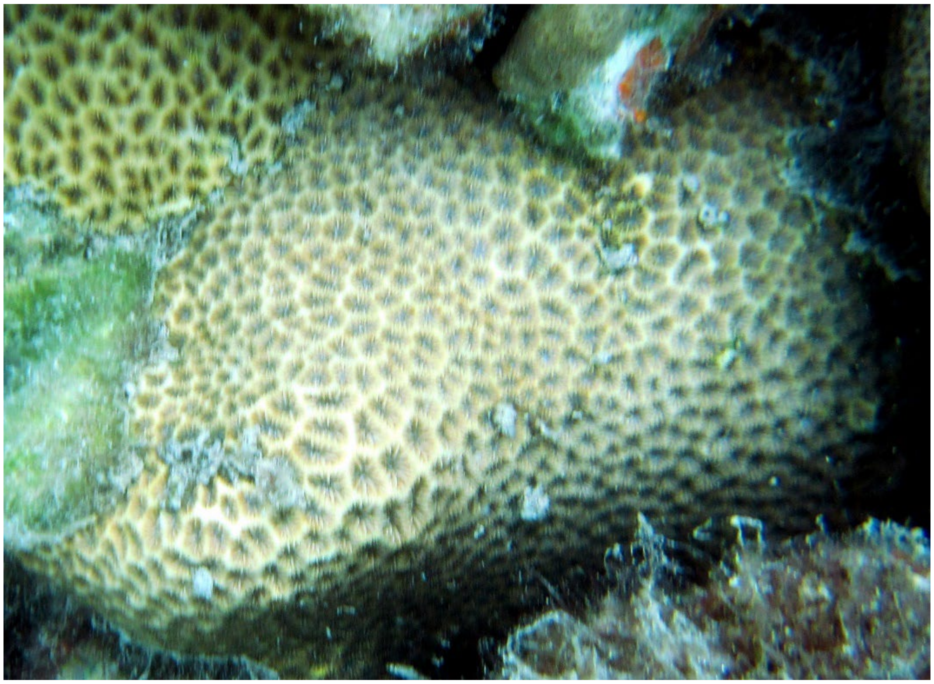
A close-up photo of *Goniastrea australensis*.

Leptastrea

Colonies are encrusting, with small corallites that are separated by a single wall. Corallites are not deep for their size. Corallites are smaller than on most *Favites* species.

Leptastrea purpurea

Colonies are encrusting. Larger colonies often have a variation in the size of corallites with concave areas having smaller corallites. Corallites are polygonal. Other *Leptastrea* species have less varation in the size of corallites, and *Leptastrea transversa* has a slight groove between corallites.

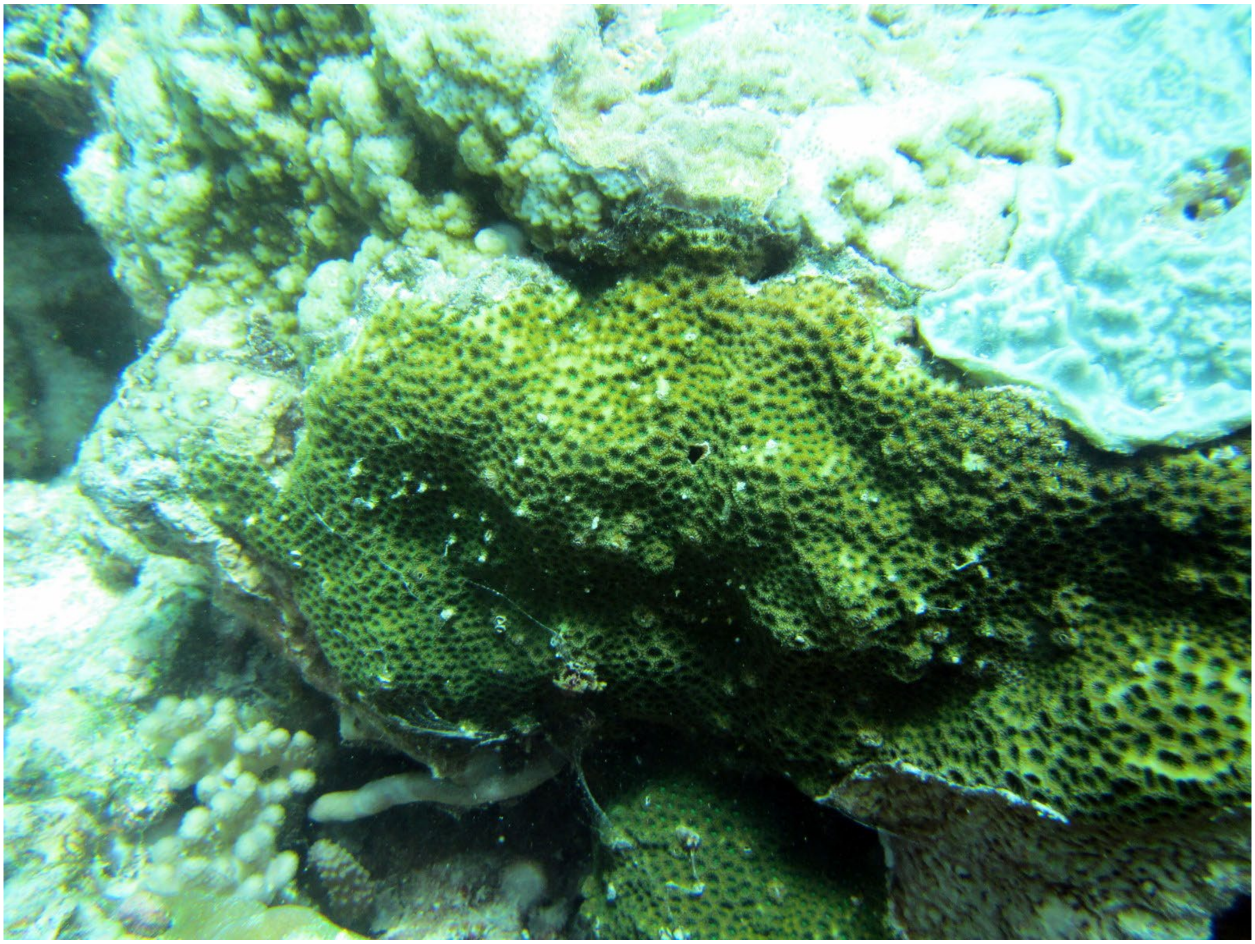


A colony of *Leptastrea purpurea*.

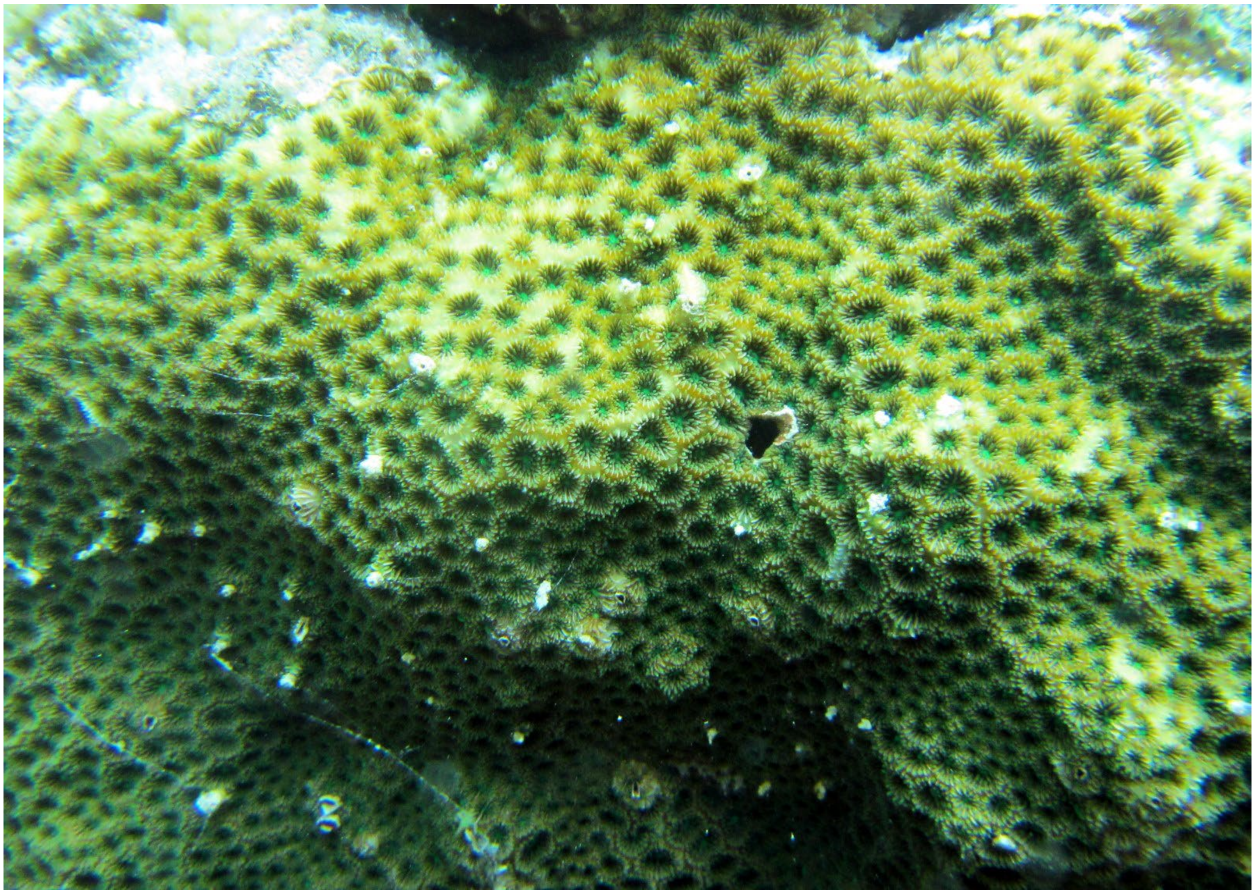
A small colony of *Leptastrea purpurea*. In some shallow habitats all colonies are small like this.

Leptastrea transversa

Colonies are encrusting. Septa project slightly at the edge of each corallite, making it look like there is a tiny groove between corallites. Other *Leptastrea* species do not have this groove. Corallite size varies less than on *Leptastrea purpurea*.



A colony of *Leptastrea transversa*.



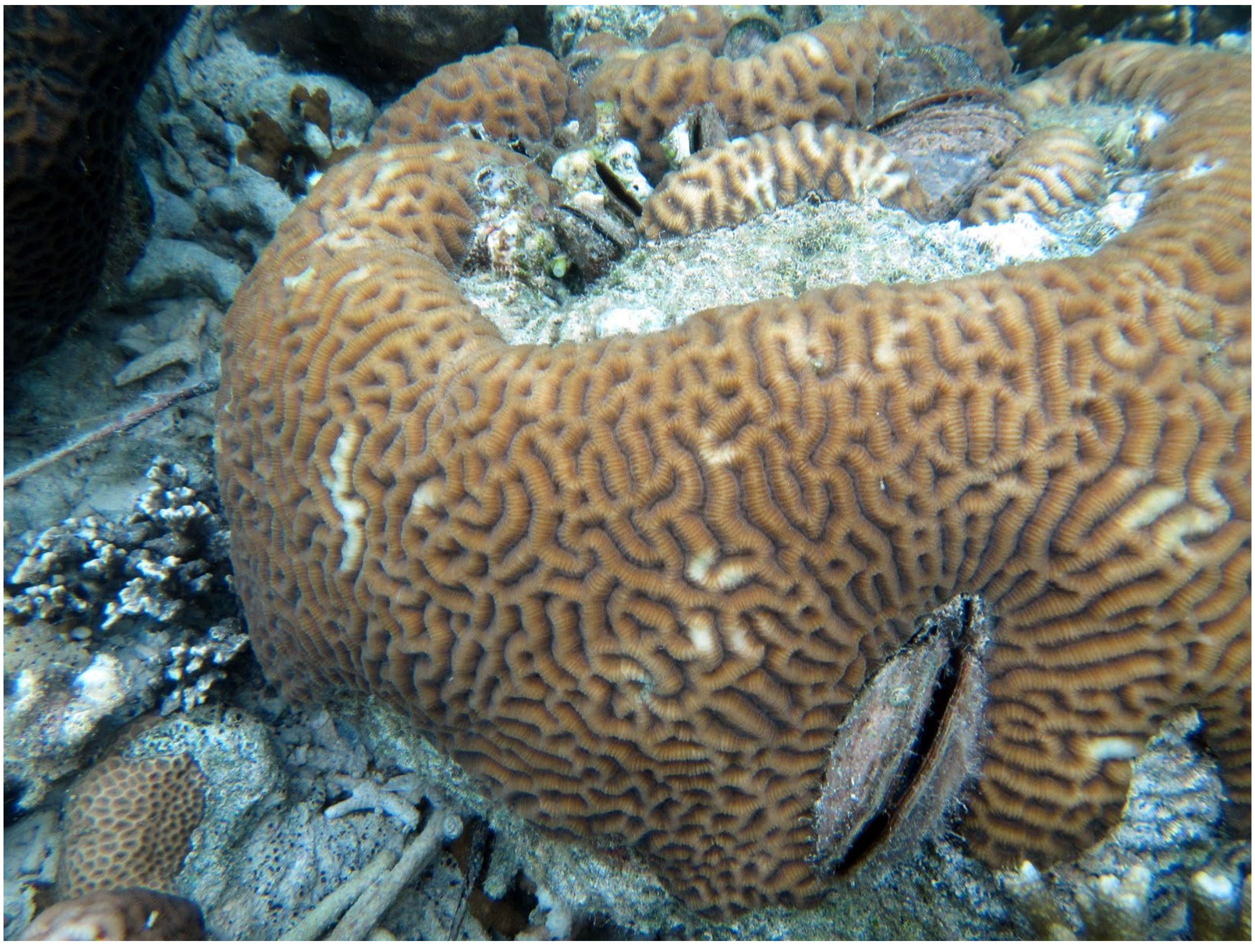
A close-up photo of *Leptastrea transversa*

Platygyra

Colonies are usually massive. In most colonies of most species, corallites are often elongated and fill long meandering valleys between meandering ridges. In some colonies corallites are shorter and vary from being polygonal to somewhat elongated, but not meandering. The ridges on most colonies are smaller than on *Goniastrea australensis* and tiny bumps are not present on the valley floors. The ridges and valleys are larger than on *Leptoria* but much smaller than on *Lobophyllia*.

Platygyra lamellina *"meandroid" or "brain coral"*

Colonies are massive, with thick, rounded ridges meandering on the surface. The ridges are larger than on *Platygyra sinensis* and similar to those on some colonies of *Goniastrea australensis*, but the latter has tiny bumps on the valley floors indicating pali.



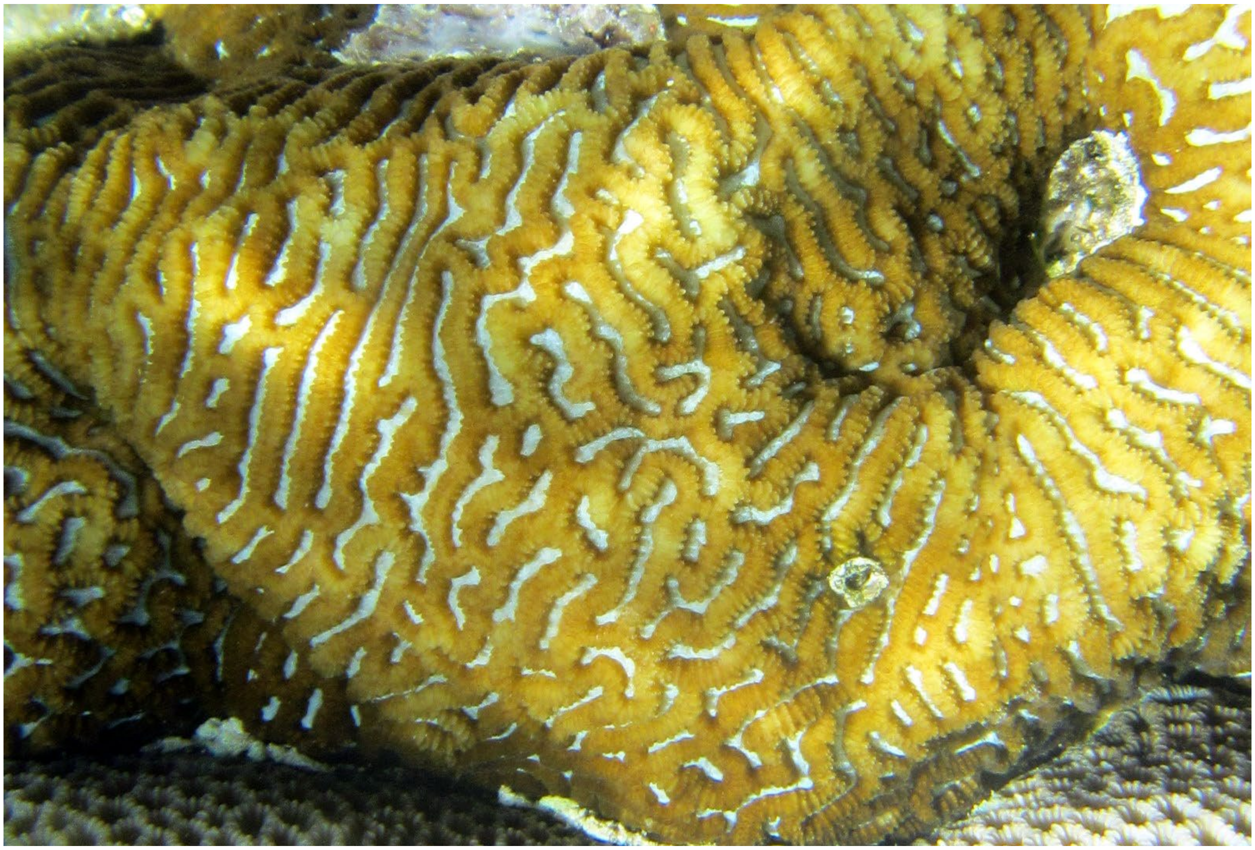
A colony of *Platygyra lamellina*.

A close-up photo of *Platygyra lamellina*.

Platygyra daedalea

Colonies are massive and are covered with meandering ridges and valleys. The ridges are smaller than on *Platygyra lamellina* and *Goniastrea australensis* and larger than on *Platygyra sinensis*.

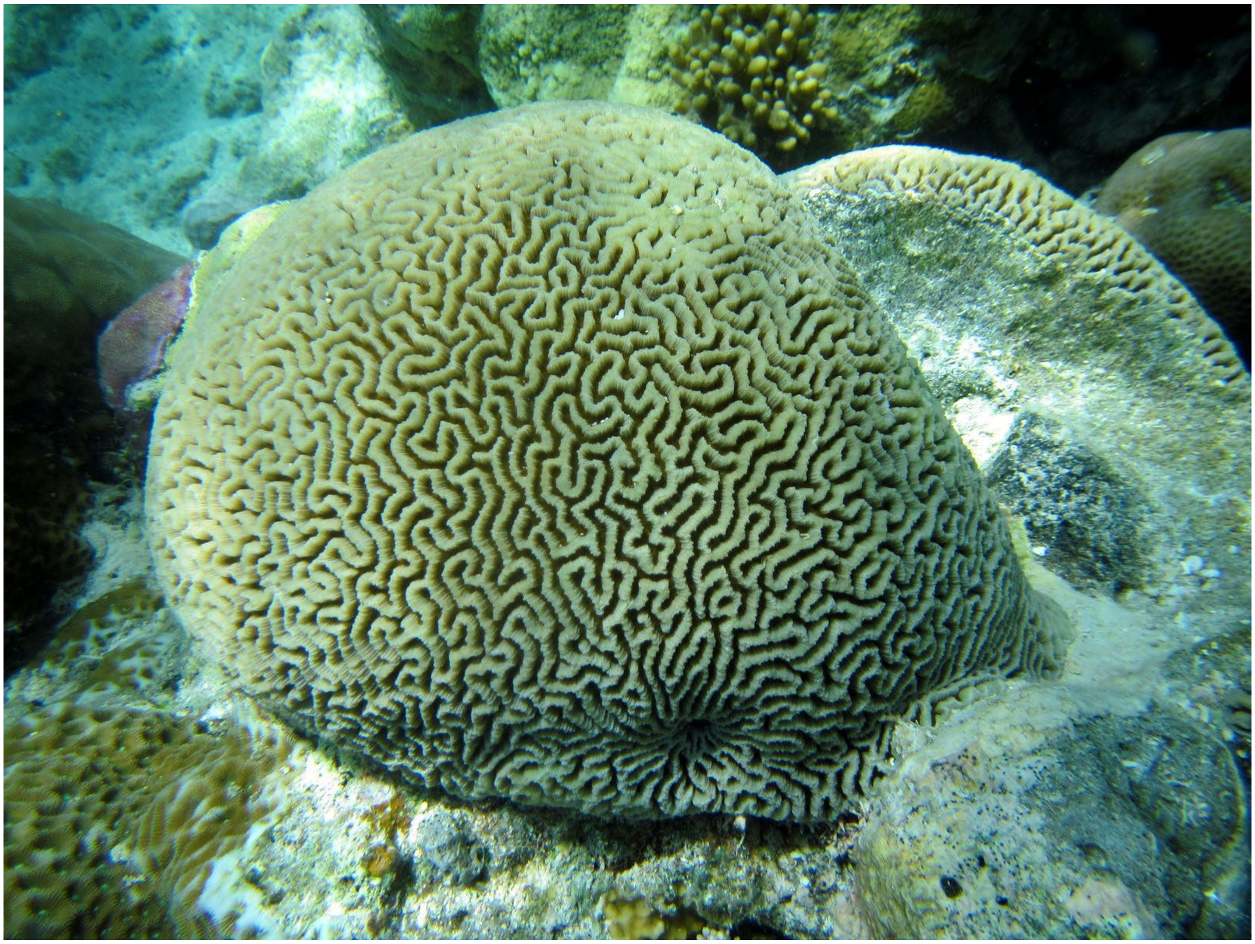
A colony of *Platygyra daedalea*.



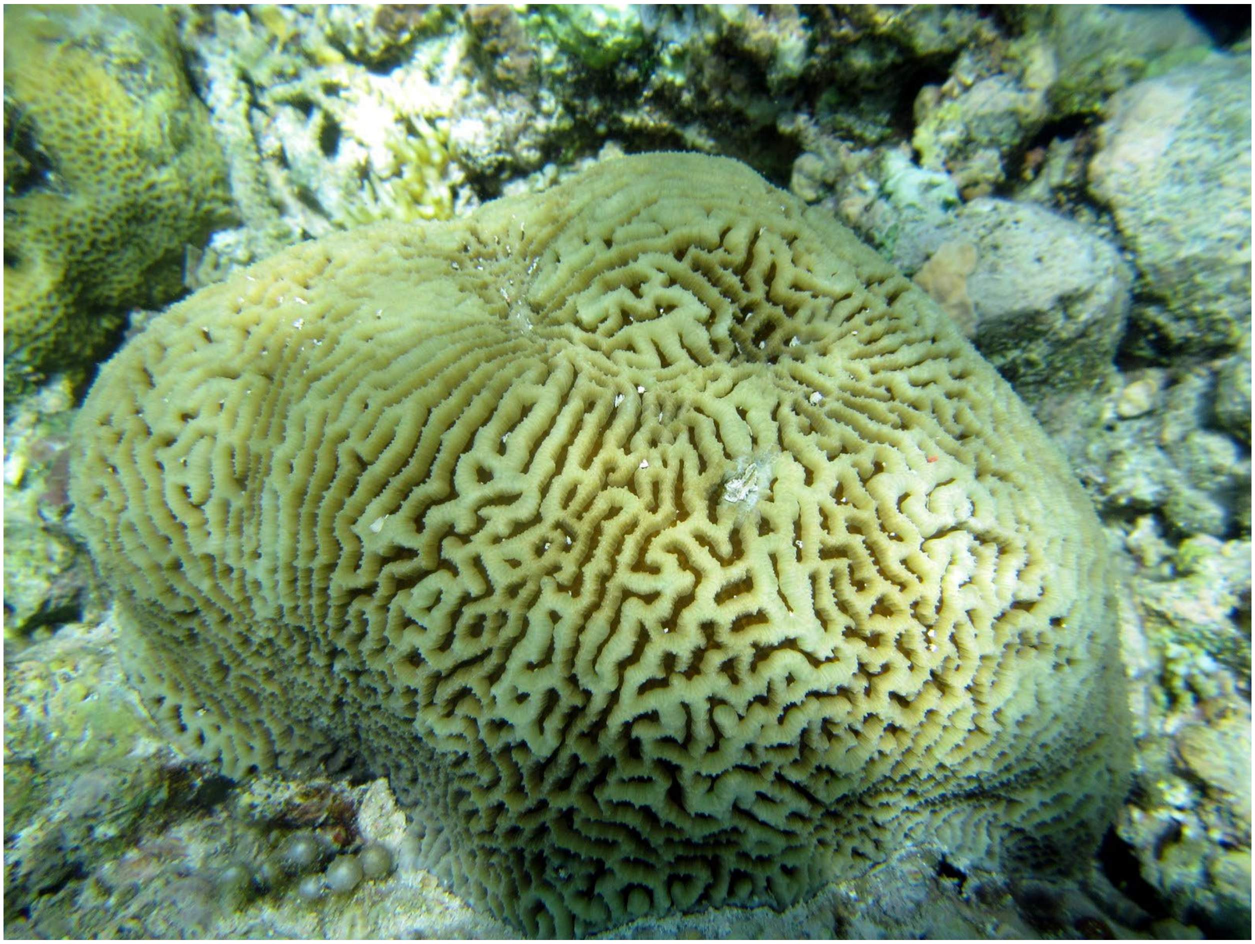
A close-up photo of *Platygyra daedalea*.

Platygyra yaeyamaensis *"meandroid" or "brain coral"*

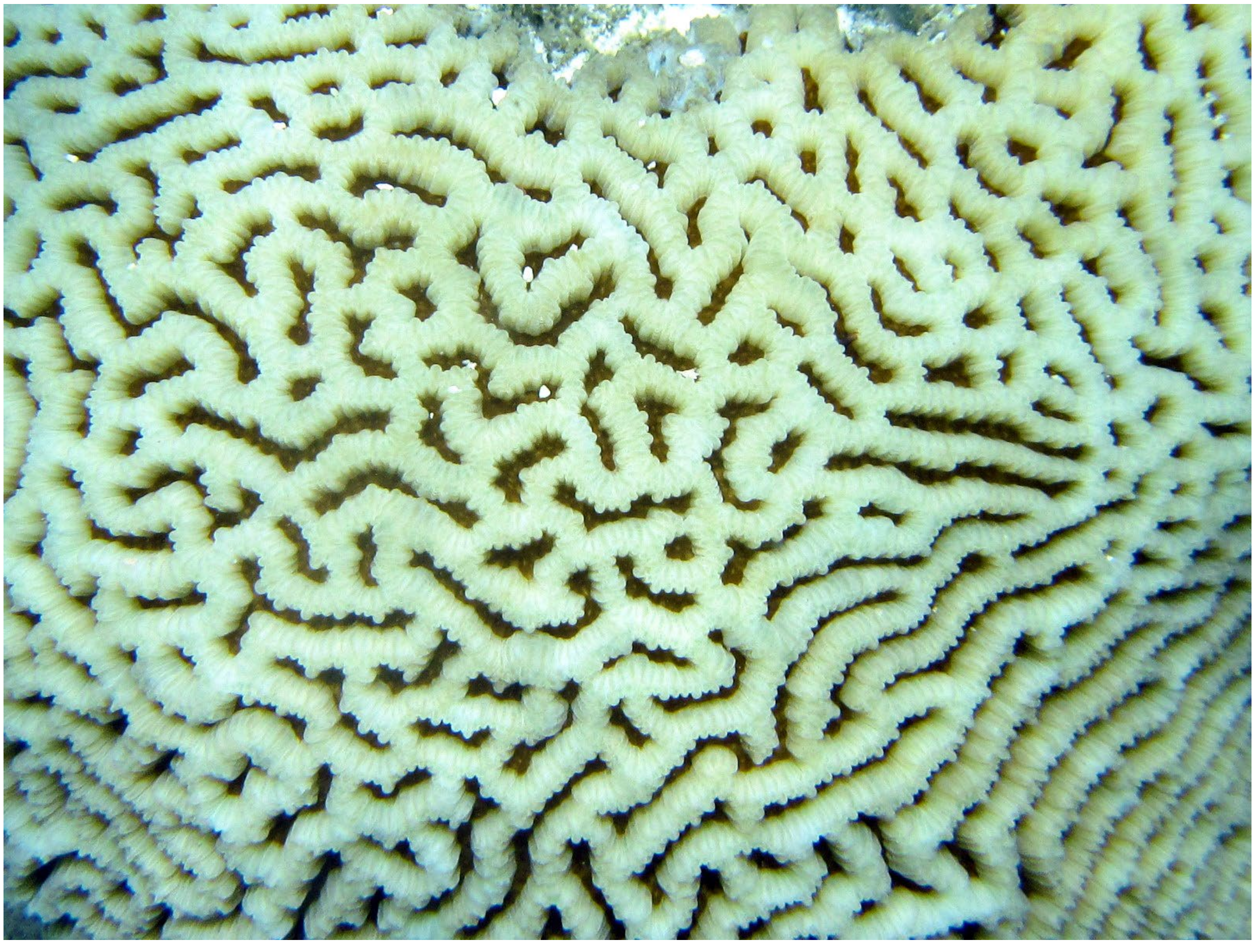
Colonies are massive and have meandering ridges that have irregular septa lengths. Valley lengths are variable, ranging from short to long both on and between colonies. On most colonies, flesh covers most of the septa, but when the flesh is retracted the variable septa lengths can be seen. The ridges are similar in size to *Platygyra daedalea*.



A colony of *Platygyra yaeyamaensis*.



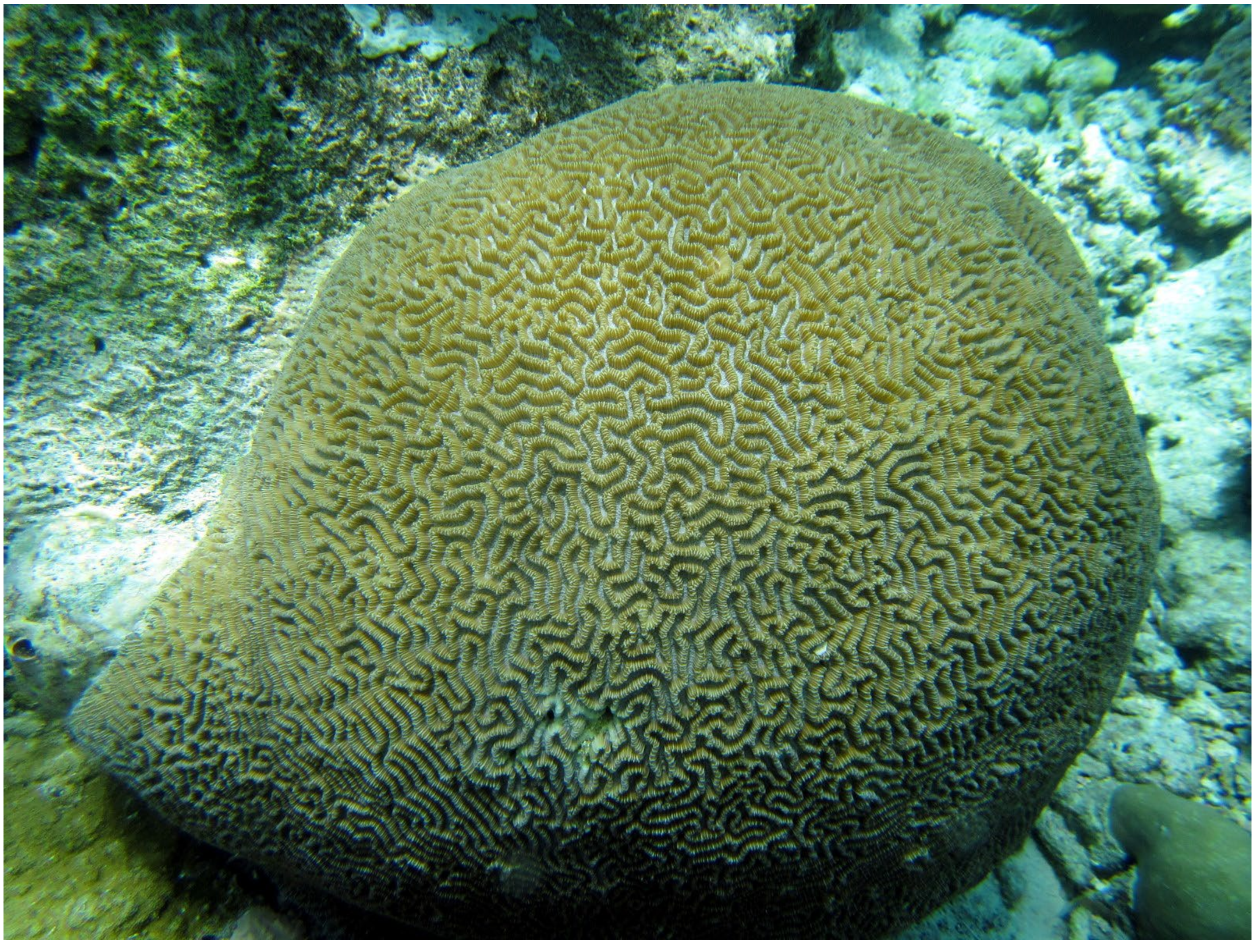
A colony of *Platygyra yaeyamaensis* with variation in both valley length and ridge width.



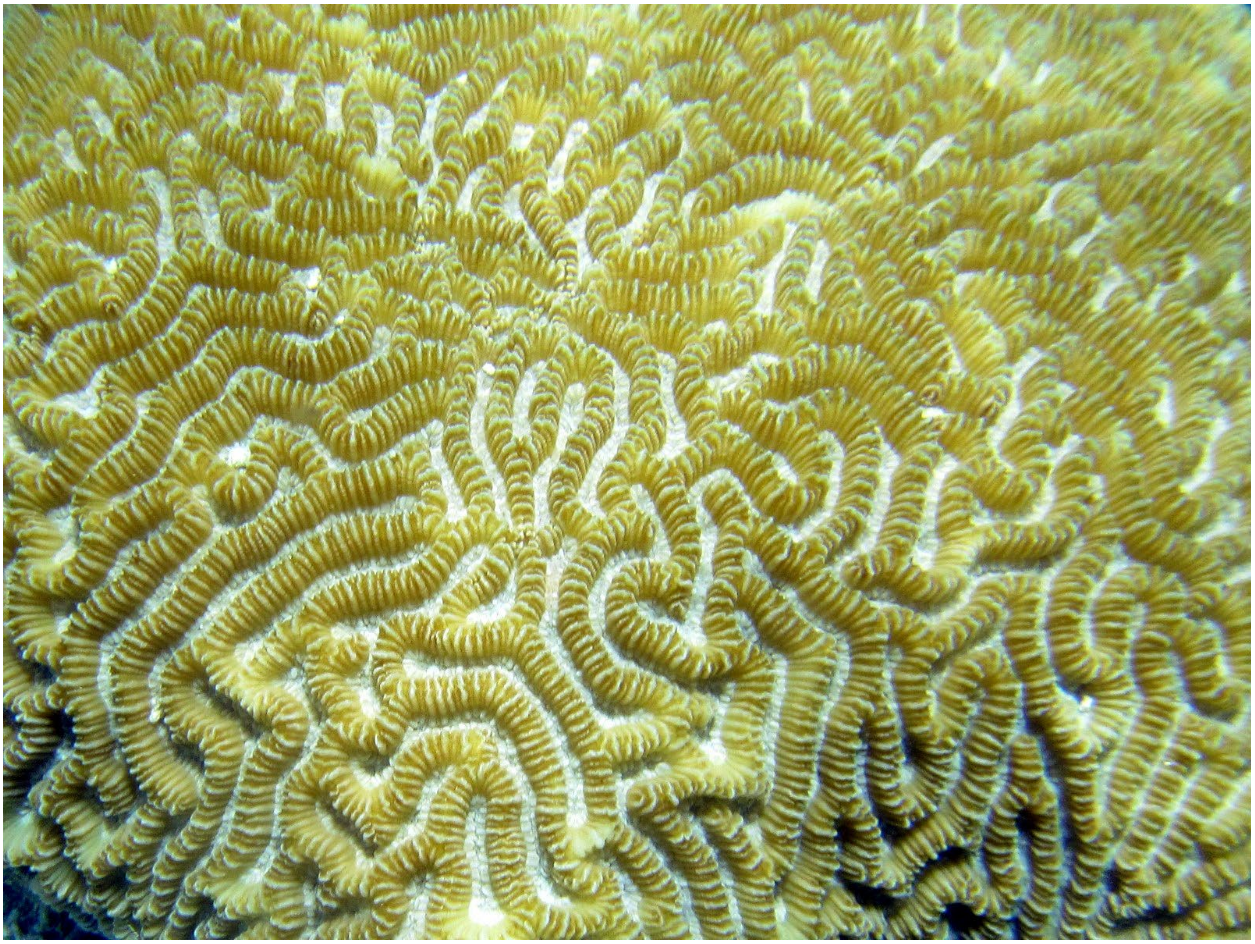
A close-up photo of *Platygyra yaeyamaensis* showing the variation in septa size, most easily seen on the side of the ridges.

Platygyra sinensis *"meandroid" or "brain coral"*

Colonies are massive with small meandering ridges and valleys. The septa often alternate between brown and white. The ridges are smaller than on *Goniastrea australensis* and slightly smaller than on *Platygyra daedalea*, but larger than on *Leptoria*.



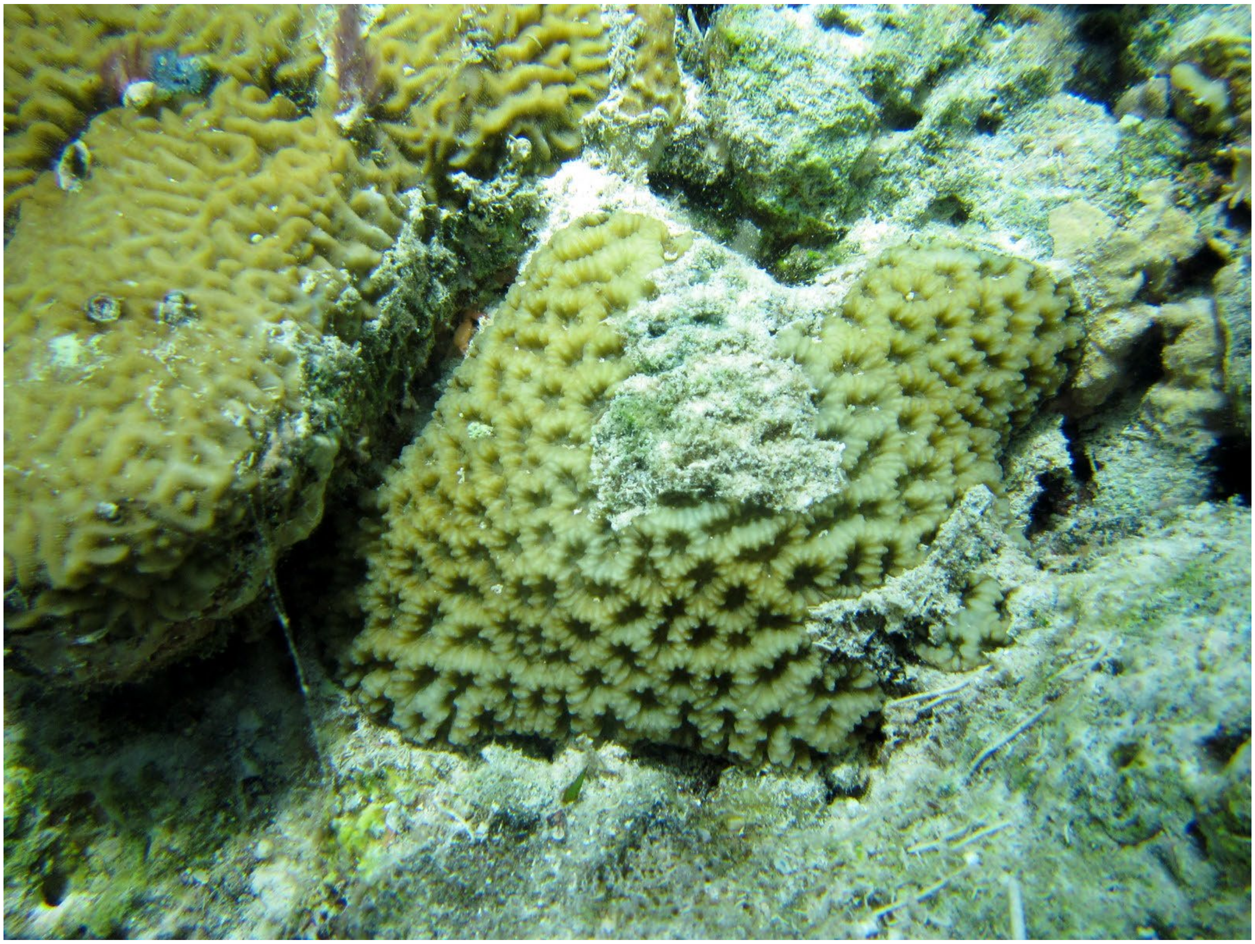
A colony of *Platygyra sinensis*.



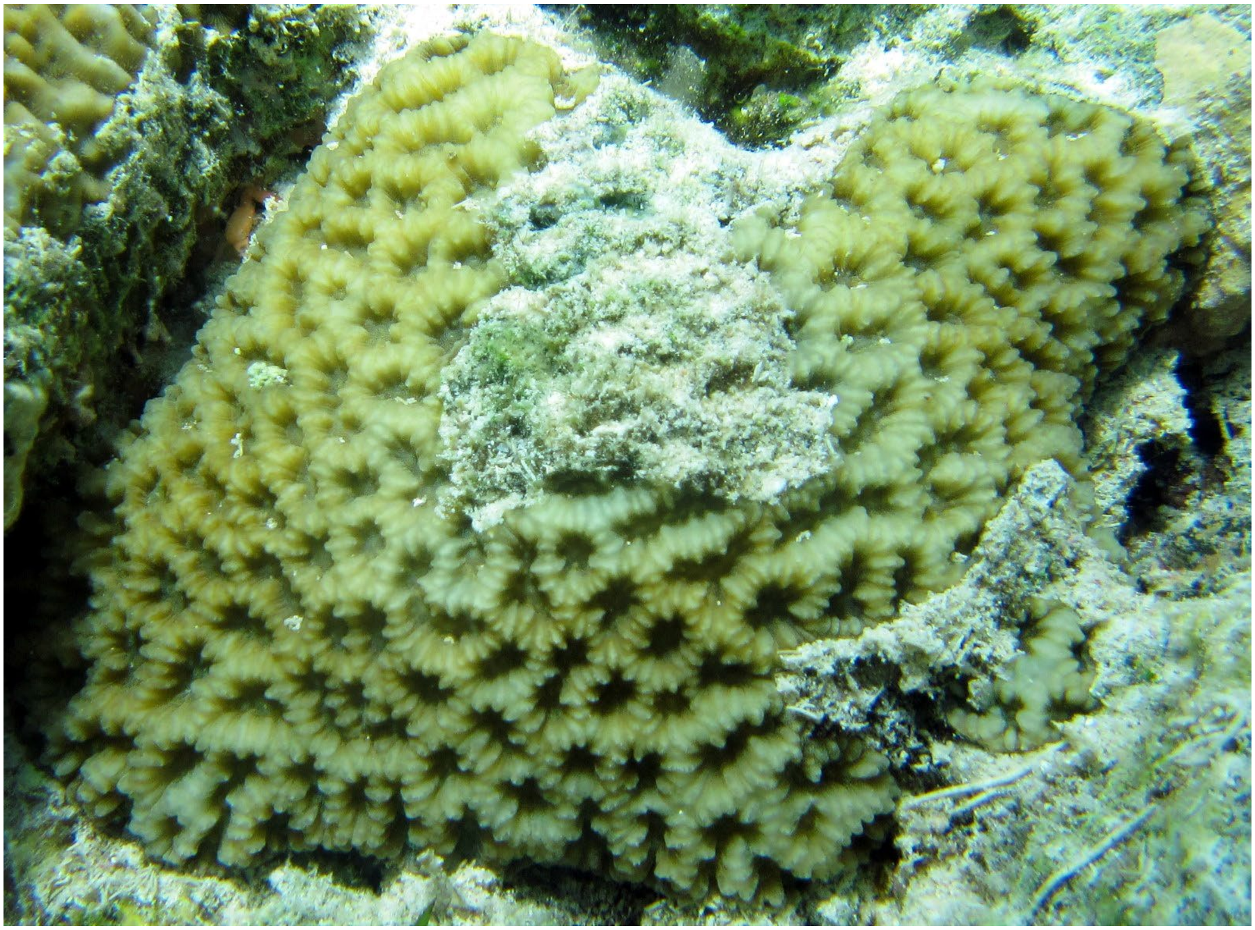
A close-up photo of *Platygyra sinensis*.

Platygyra verweyi

Colonies are massive or encrusting and are covered with ridges that intersect often, forming polygonal corallites. The ridges have variable length septa and are narrow. Ridges are narrower and septa more irregular than on *Platygyra pini*.



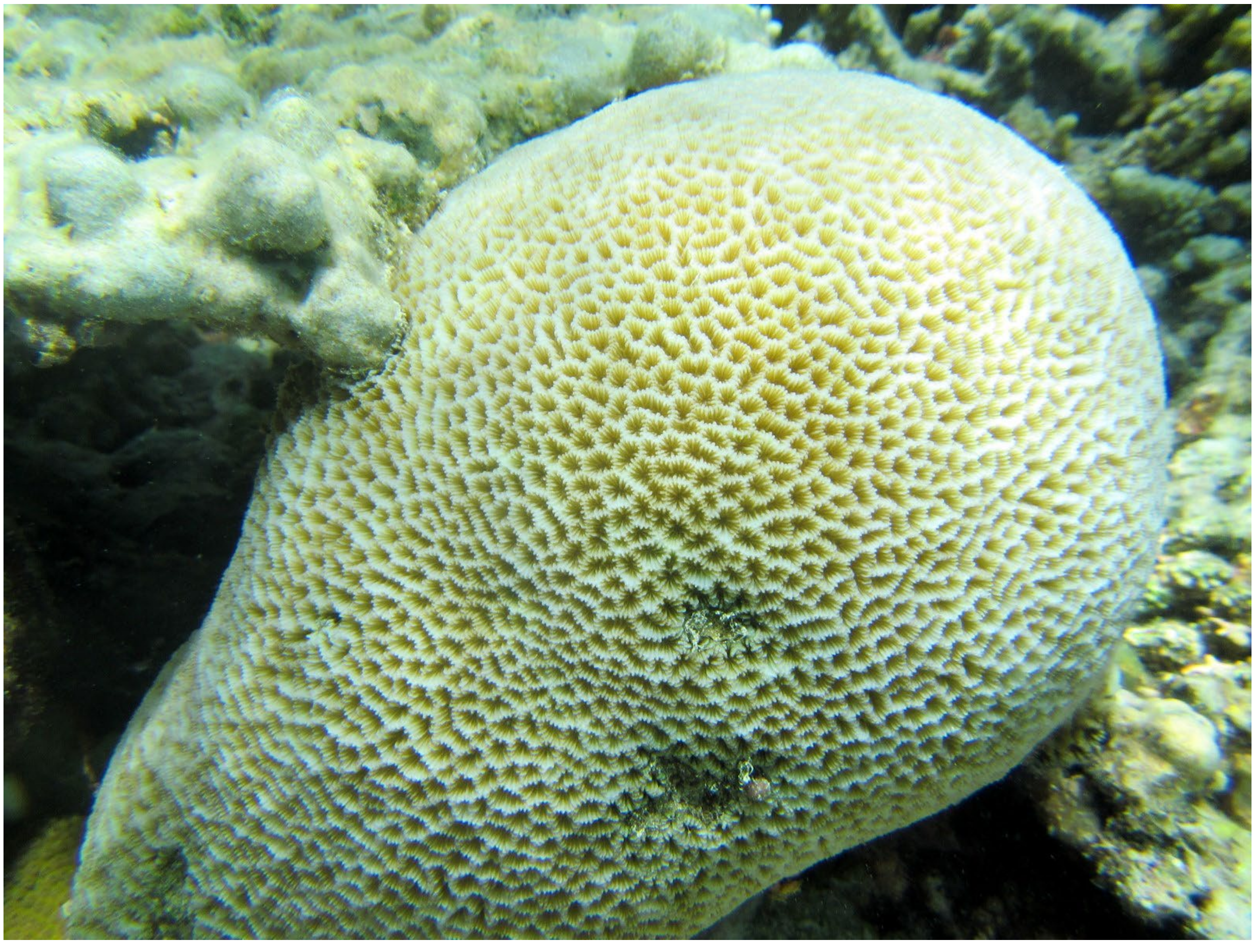
A photo of *Platygyra verweyi*.



A close-up photo of *Platygyra verweyi*.

Platygyra ryukyuensis

Colonies are massive. The walls separating corallites are thin, with septa that vary in size. Valleys are short, some monocentric to elongated just enough to have 2 or 3 mouths. Corallites are polygonal. The ridges and corallites are the smallest of any *Platygyra* species.



A photo of *Platygyra ryukyuensis*.

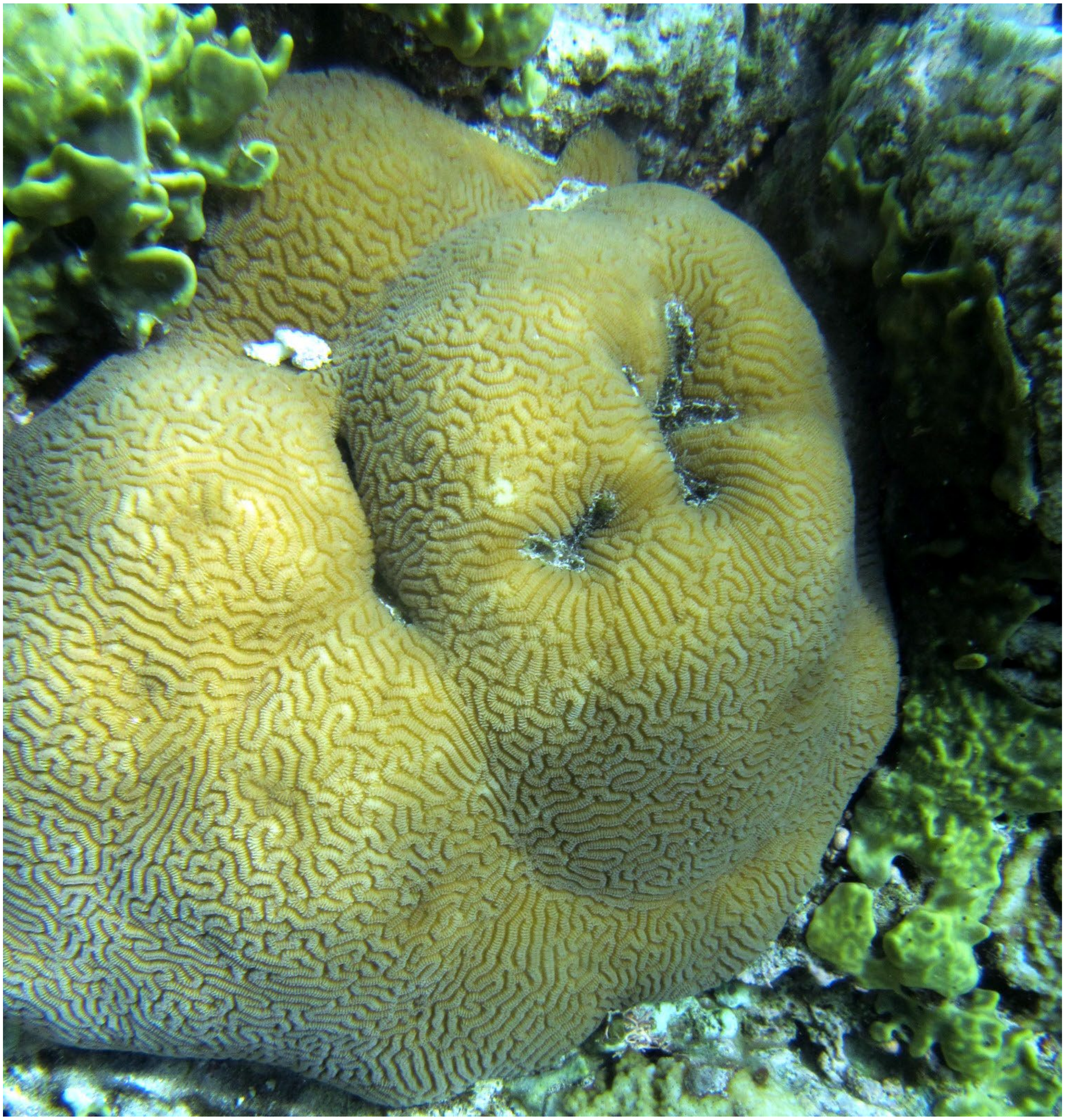
A close-up photo of *Platygyra ryukyuensis*.

Leptoria "meandroid" or "brain coral"

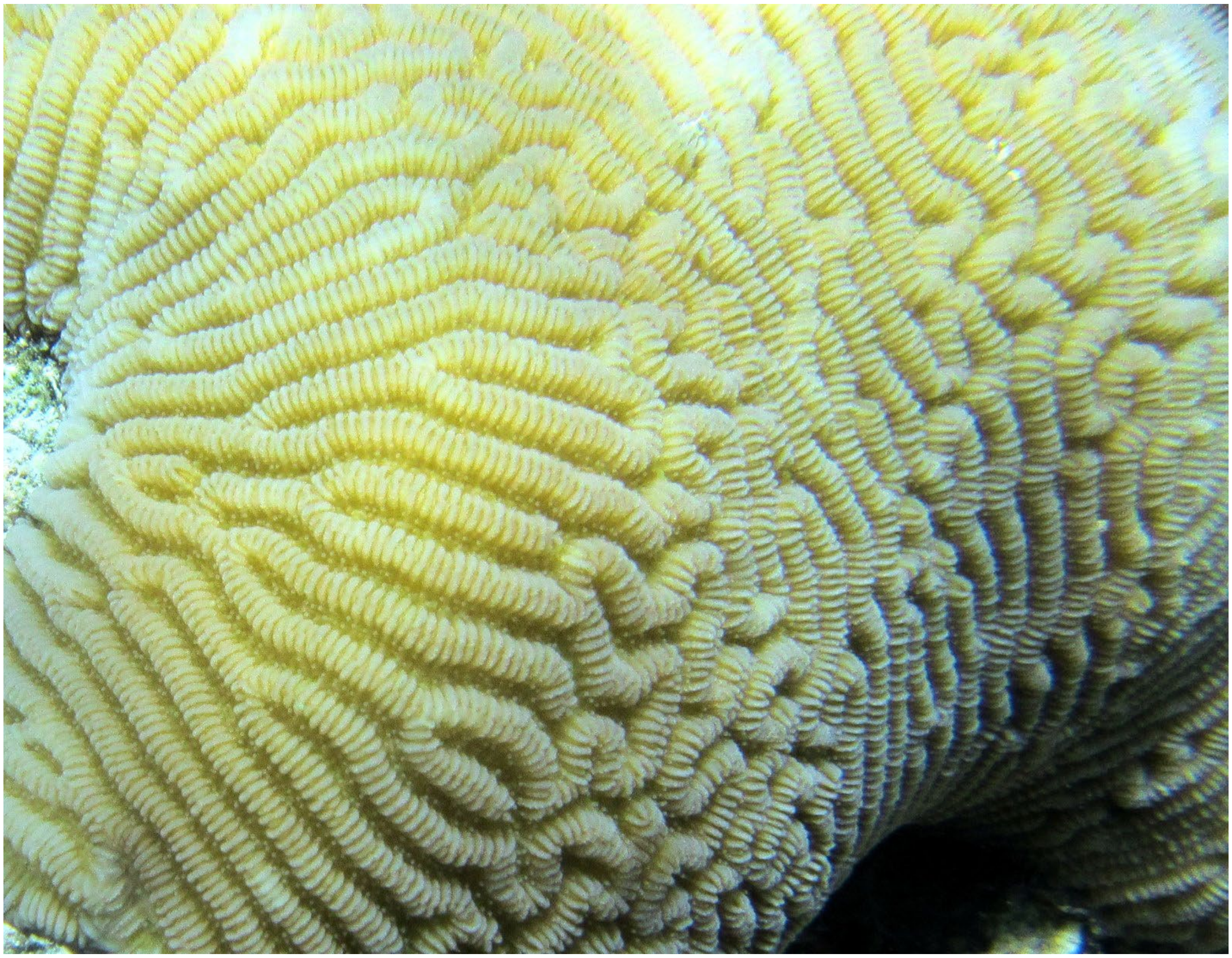
Colonies are massive, with meandering tiny ridges. Ridges are narrower and shorter than on *Platygyra* or any other meandroid coral.

Leptoria phrygia

Colonies are massive. Septa are uniform, unlike the one other species, where they are irregular.



A colony of *Leptoria phrygia*.



A close-up photo of a colony of *Leptoria phrygia*.

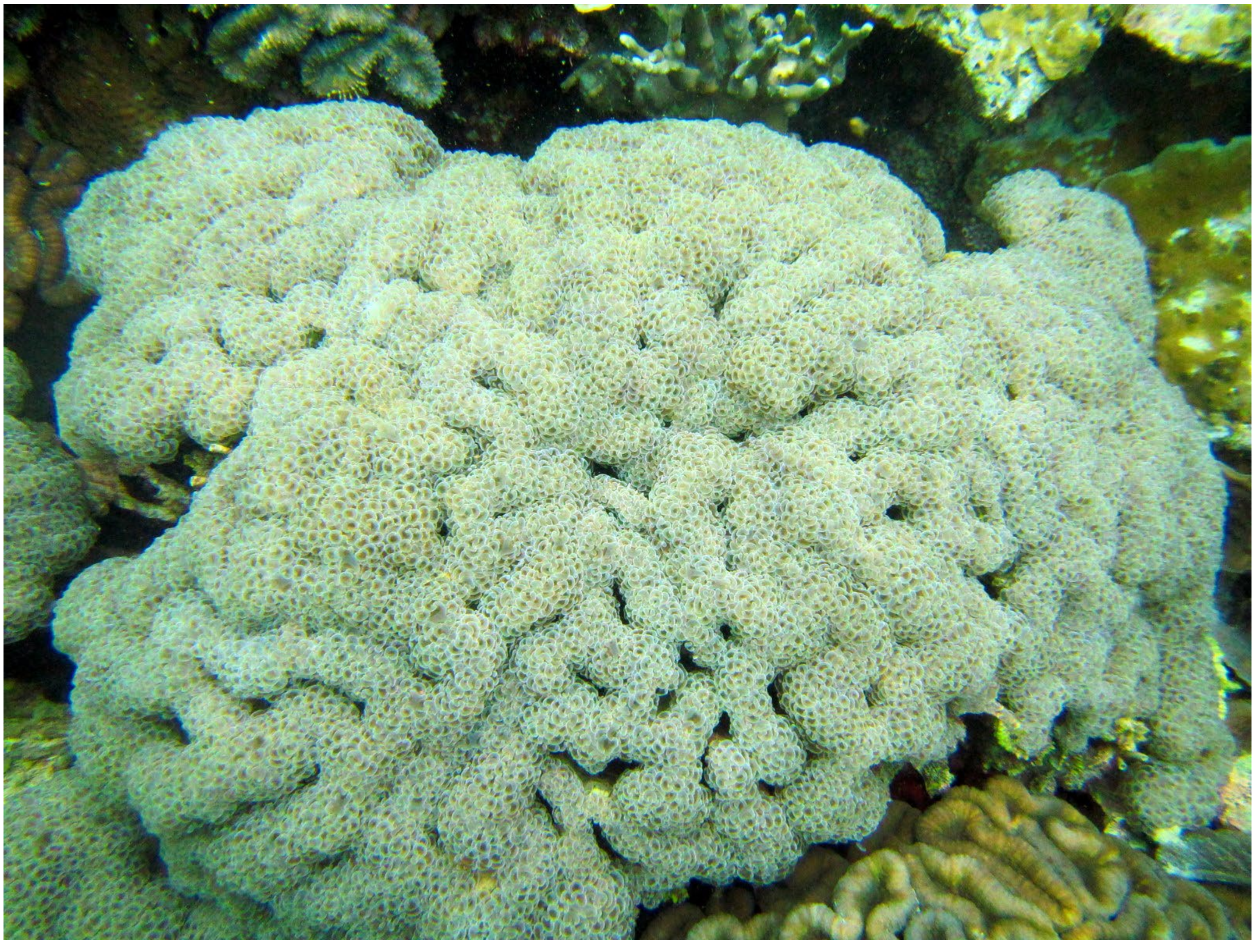
Fimbriaphyllia

This used to be Euphyllia

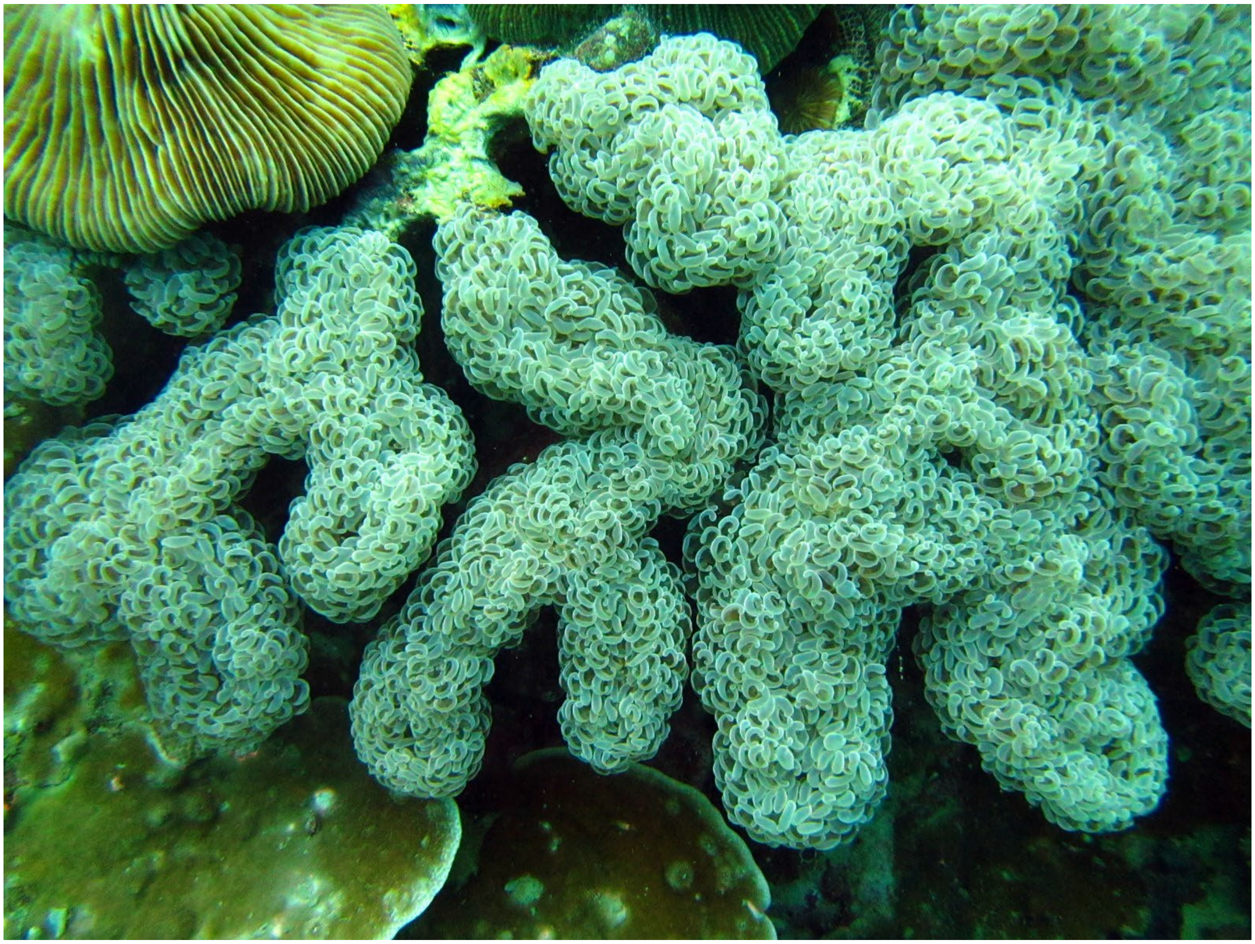
Colonies usually look massive, but are branching or flabello-meandroid (a thick, winding ridge with polyps along the top edge). The tentacles hide the skeleton shape unless they are contracted. Thus they could be called "submassive". Species within *Fimbriaphyllia* are distinguished by the combination of the skeleton shape and tentacle shapes. *Physogyra* and *Plerogyra* have bubbles extended in the daytime.

Fimbriaphyllia ancora

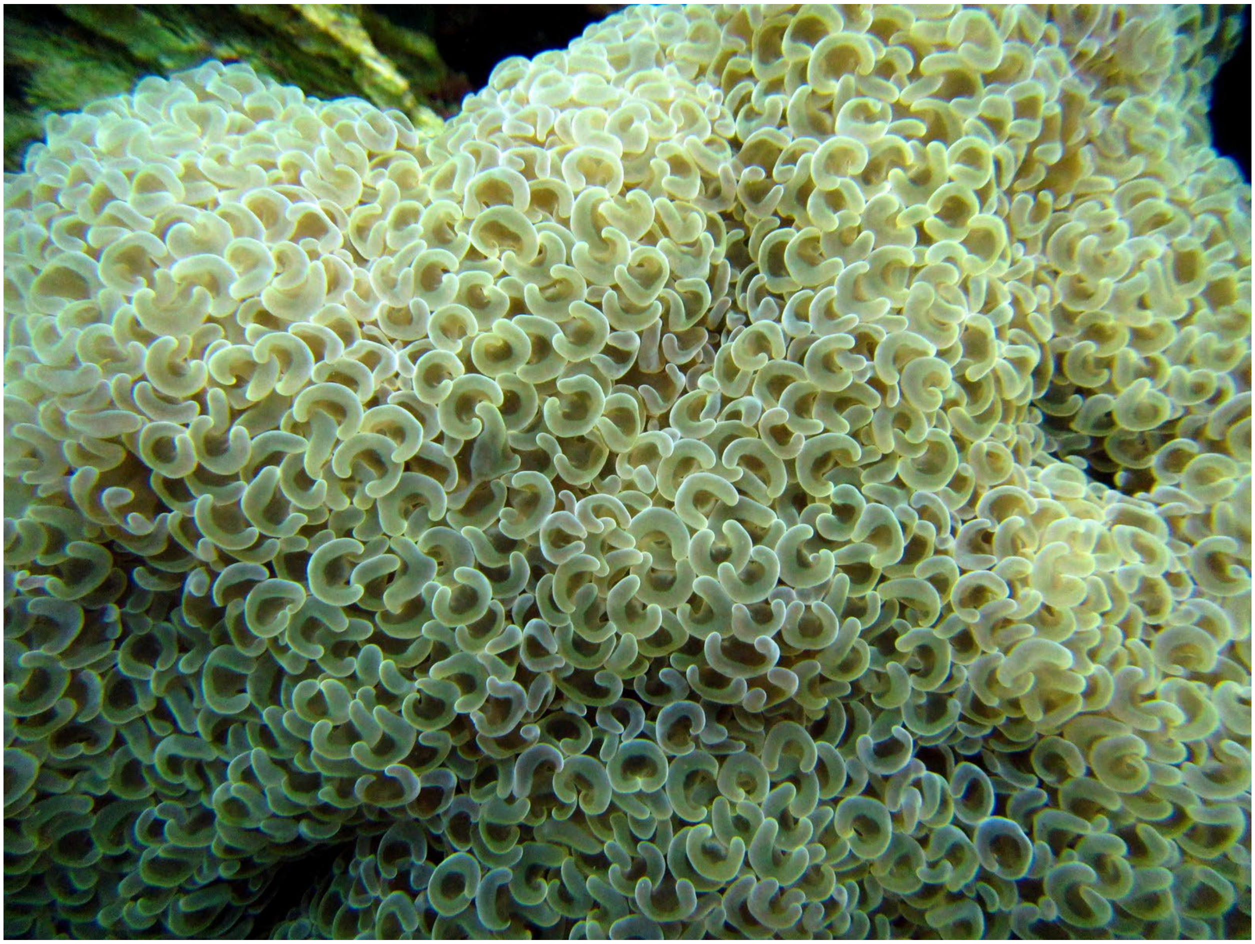
Colonies are flabello-meandroid and the tentacles have a half-moon shape on their end. *Fimbriaphyllia parancora* has similar tentacle tip shapes but the skeleton is branching.



A large colony of *Fimbriaphyllia ancora*. The gaps in the tentacle canopy are due to the winding thick ridges of skeleton the polyps are on.



Part of a colony of *Fimbriaphyllia ancora* in which the shape of the meandering underlying skeleton can be seen.



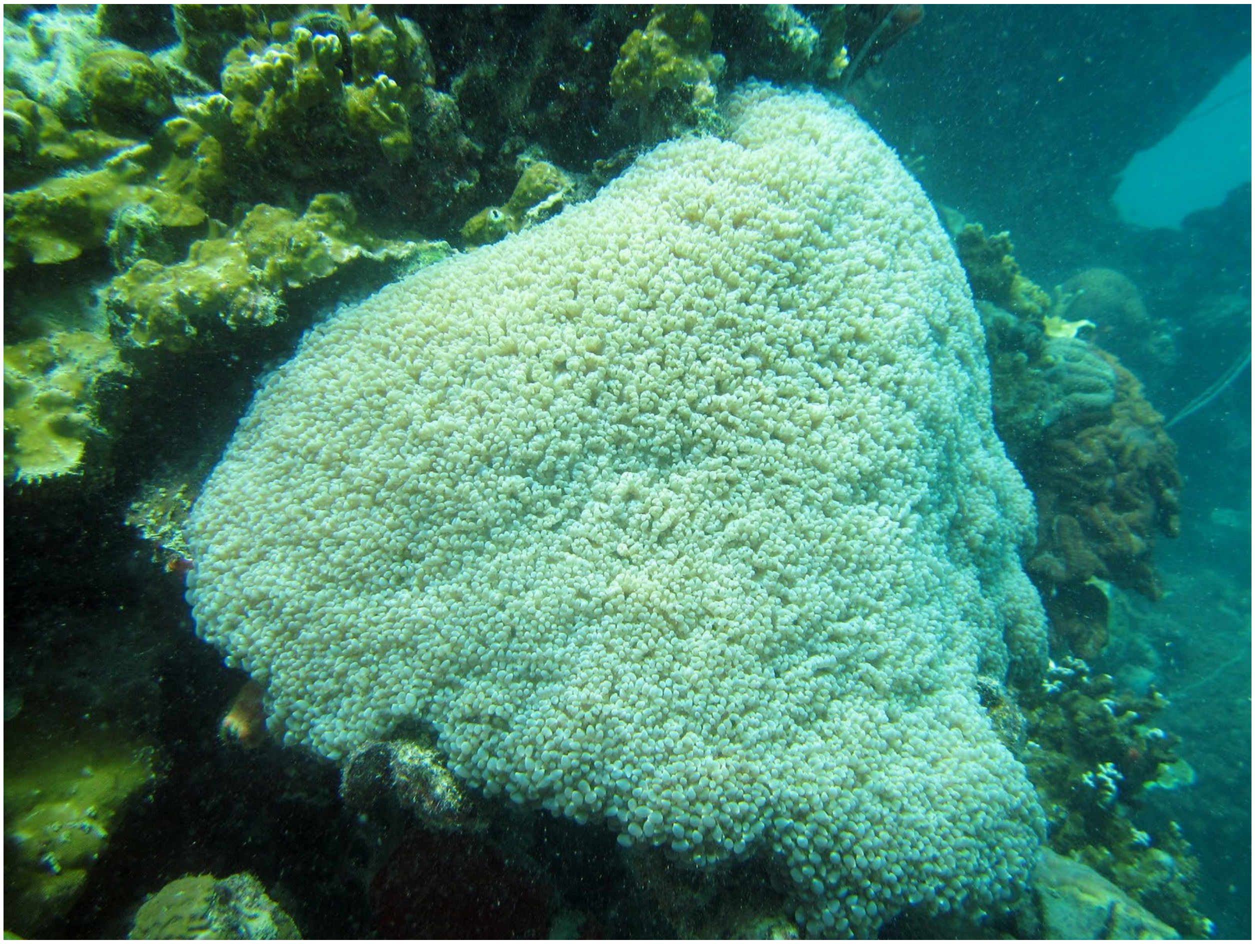
A close-up photo of the crescent-shaped tentacle tips of *Fimbriaphyllia ancora* can be seen.

Physogyra

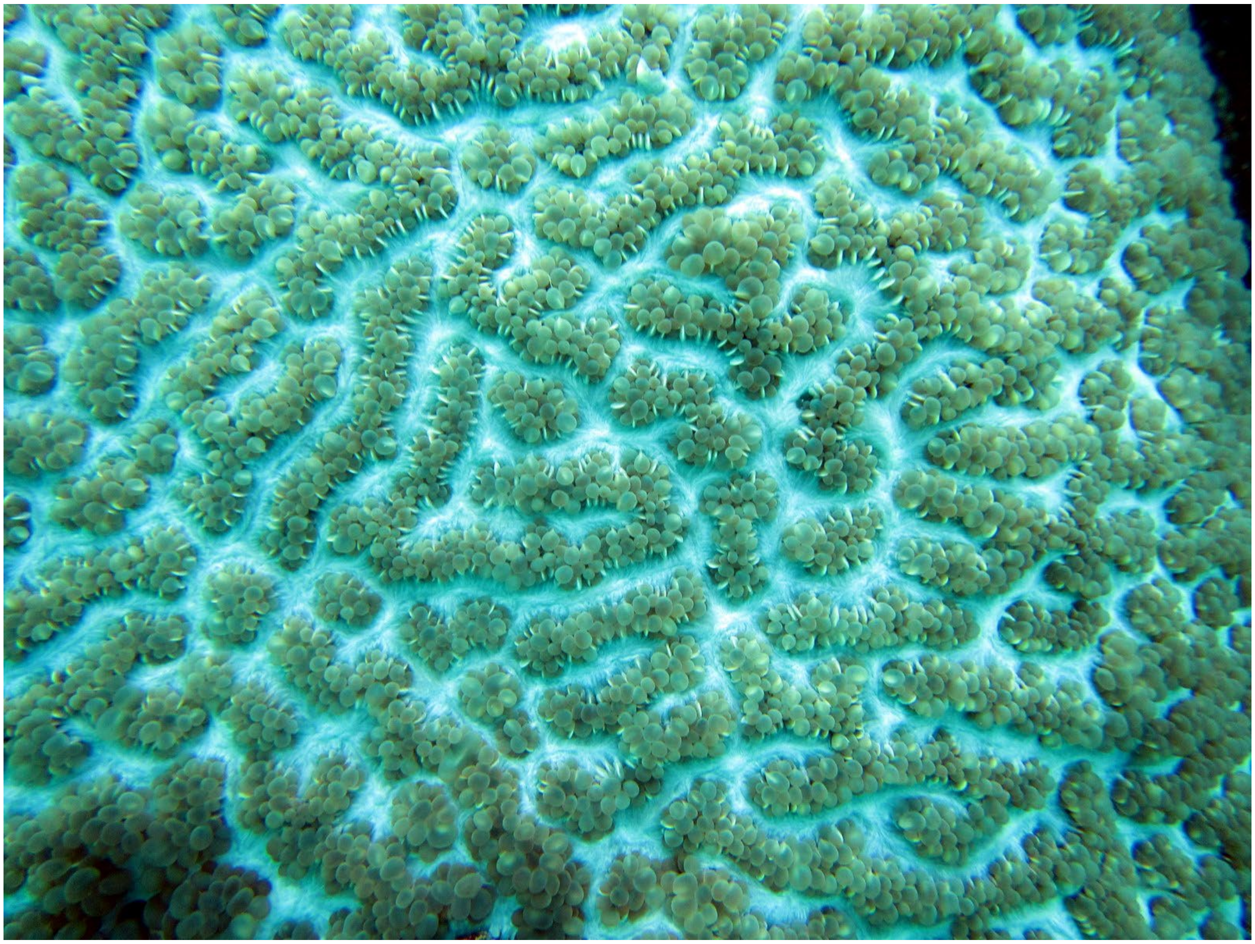
There is only one species in this genus so the properties of the genus are that of the species.

Physogyra lichtensteini

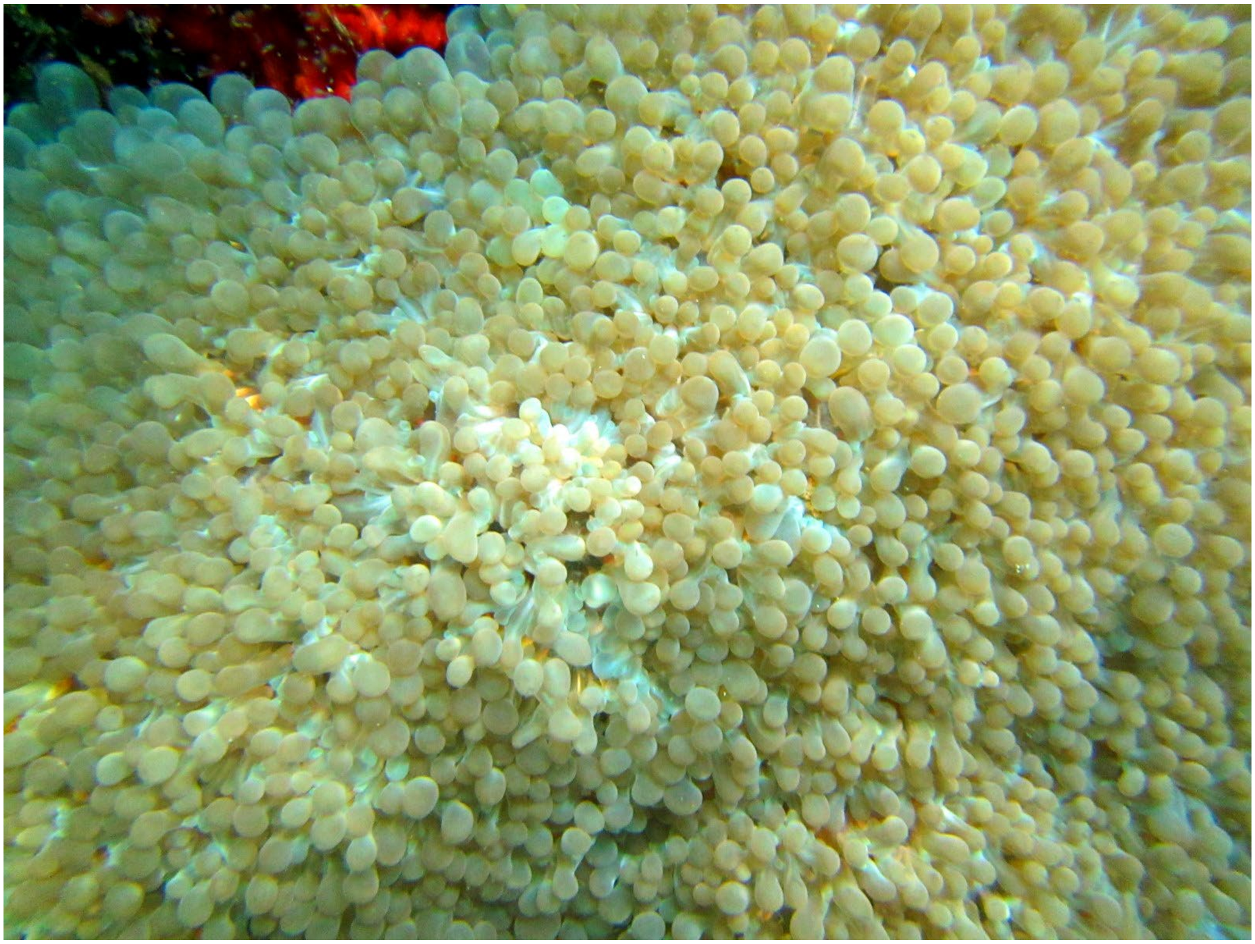
Colonies are massive can grow to at least 2 m diameter, and are covered with tiny bubbles about 3 mm diameter. Colonies can look like *Plerogyra sinuosa*, but the bubbles are much smaller.



A colony of *Physogyra lichtensteini*.



A closer photo of *Physogyra lichtensteini* when the bubbles are partly contracted, showing that the polyps are commonly elongated, and there is smooth surface between polyps.



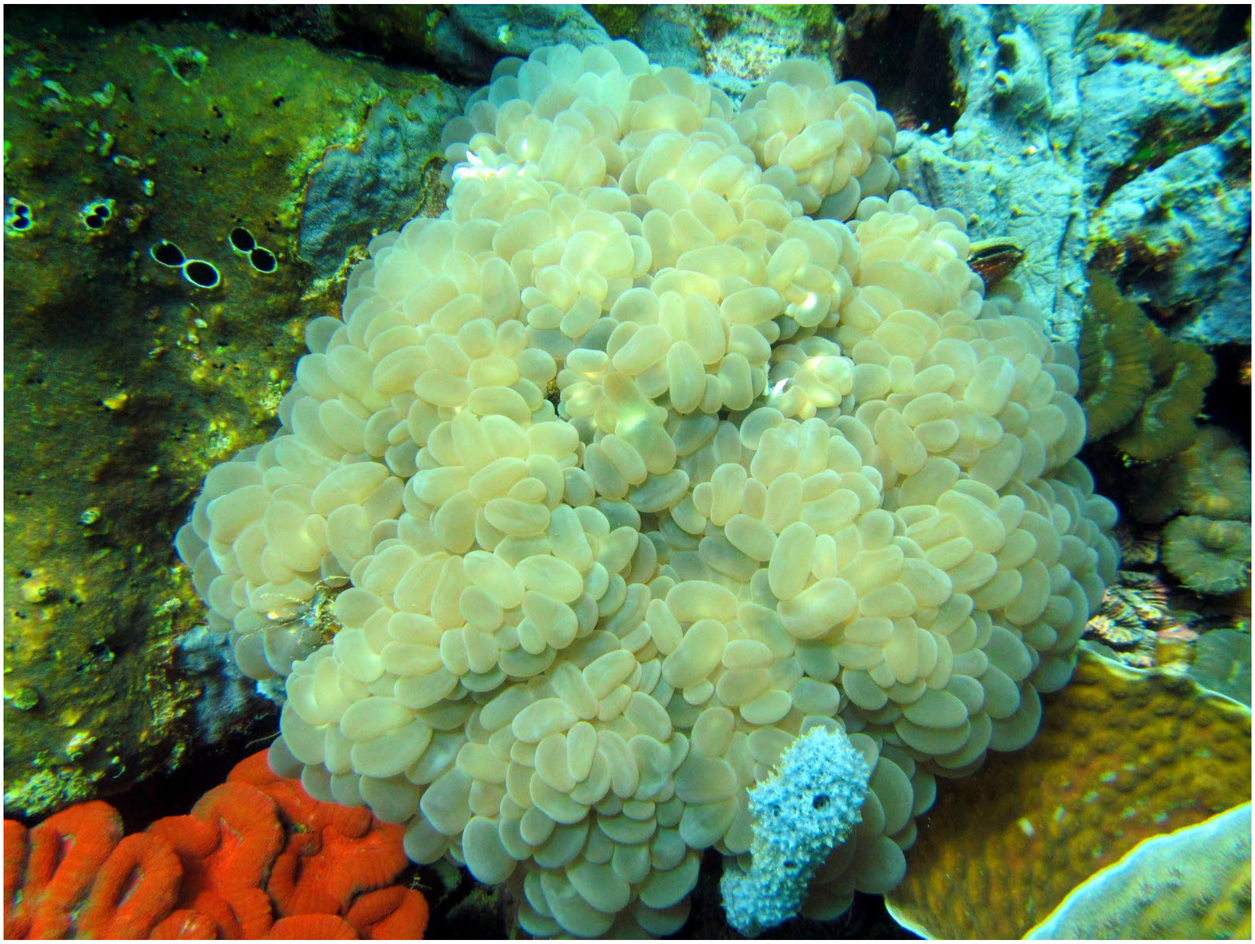
A close-up photo of *Physogyra lichtensteini* when the bubbles are expanded.

Plerogyra

Colonies can be flabello-meandroid or branching. In most species, colonies have large "bubbles" that are part of the body wall that are expanded during the day and contracted at night, when small tentacles are extended. The bubbles have zooxanthellae, and expand to expose the zooxanthellae to light. In one species, polyps have a very large oral disc. The bubbles are much larger than on *Physogyra*.

Plerogyra sinuosa

Colonies are flabello-meandroid but appear to be massive due to a covering of large "bubbles." The bubbles are usually oval and the size of large grapes. The bubbles are almost transparent, and sometimes have a slight white stripe going the long dimension. Colonies can get to at least about 1 m diameter but are often smaller. *Plerogyra simplex* is branching.



A colony of *Plerogyra sinuosa*.

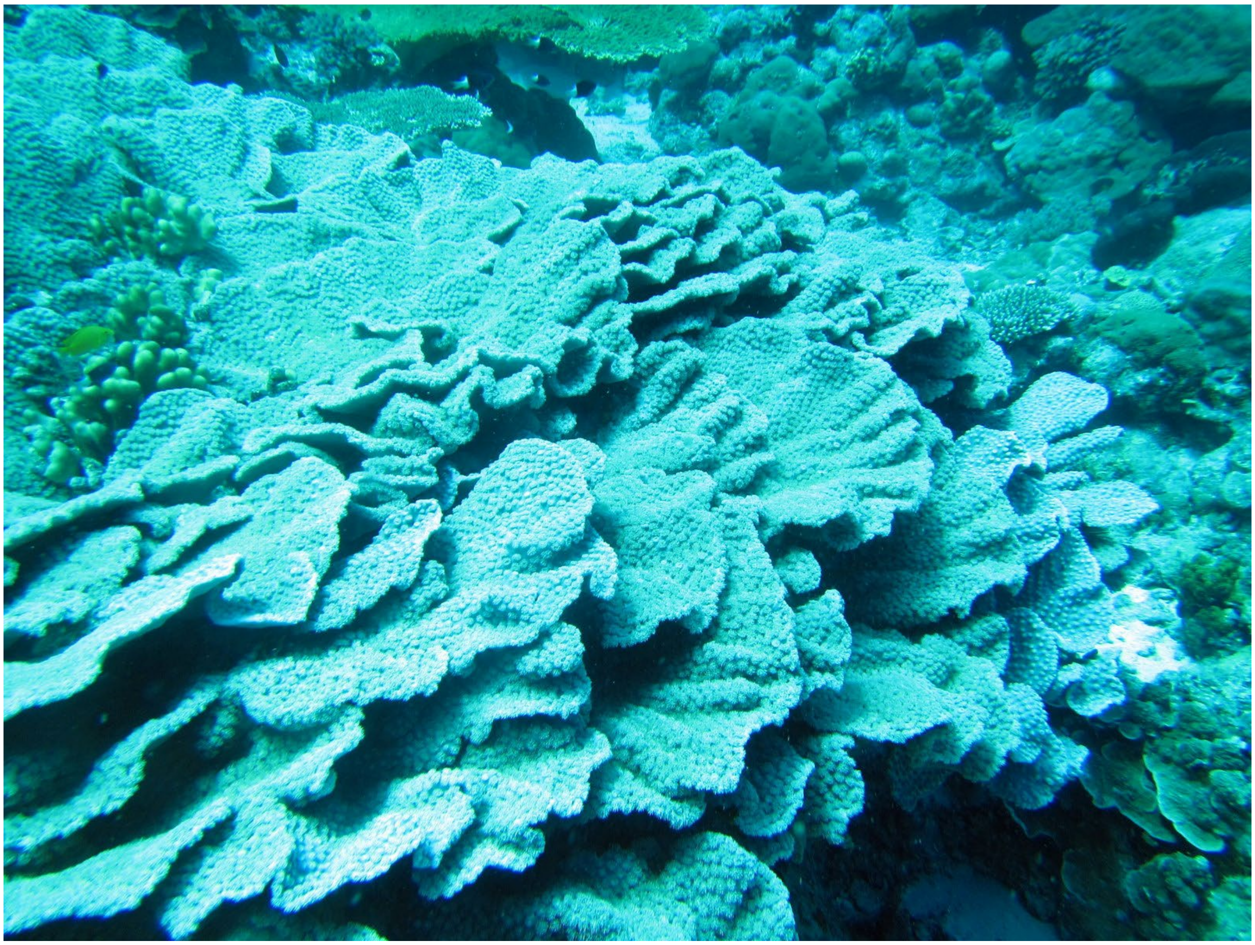
A closer picture of the bubbles on *Plerogyra sinuosa*.

Turbinaria

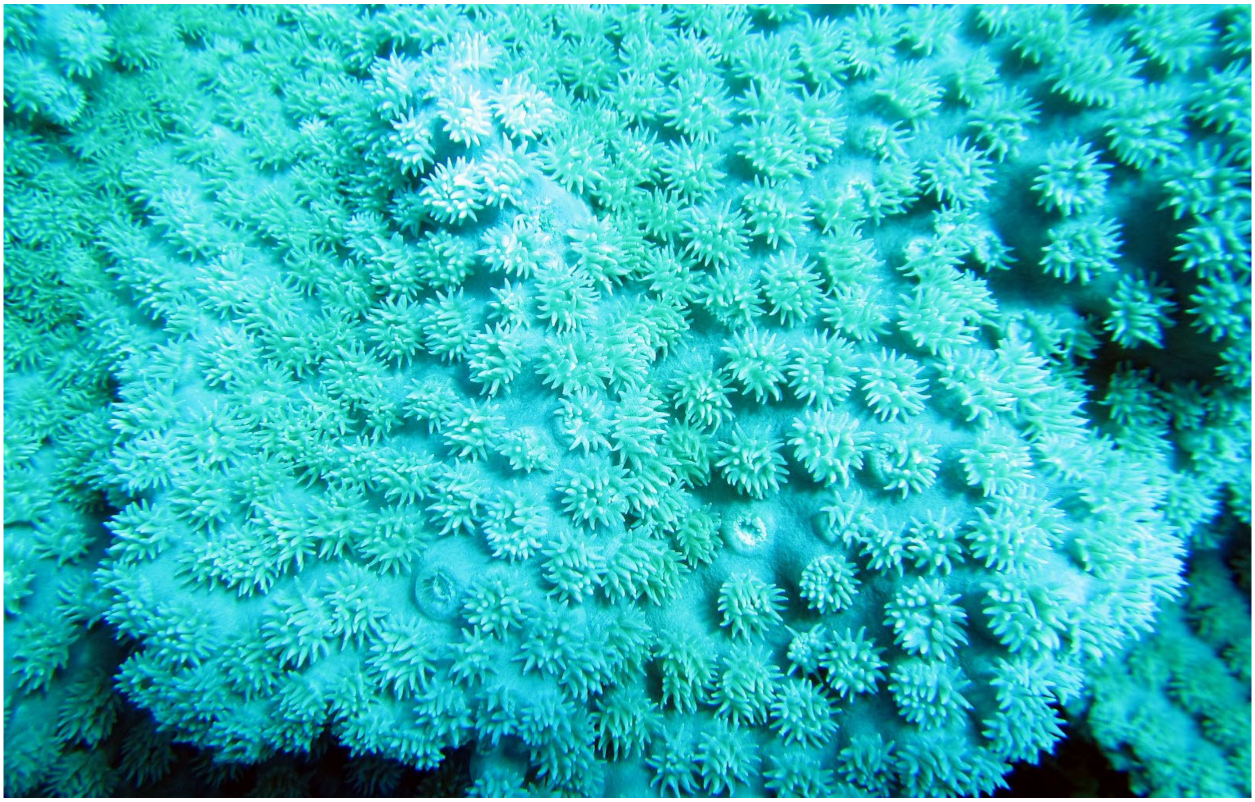
This genus has mostly foliose species, but has at least one encrusting or massive species. Corallites almost always project, and in some colonies tentacles are extended during the day. Corallites range from about finger-tip diameter to about 3 mm diameter. The surface on the sides of corallites and between corallites is smooth. *Echinopora* has thinner plates and finely spiny surfaces.

Turbinaria peltata *Vulnerable EDGE*

Colonies form plates that usually grow upward at angle. A small colony may have a single plate in a vase shape and a large colony may have many plates. The plates are thick, about 5-10 mm thick. The polyps are the largest in this genus, about the diameter of a finger. Colonies are gray.



A colony of *Turbinaria peltata* with many plates.

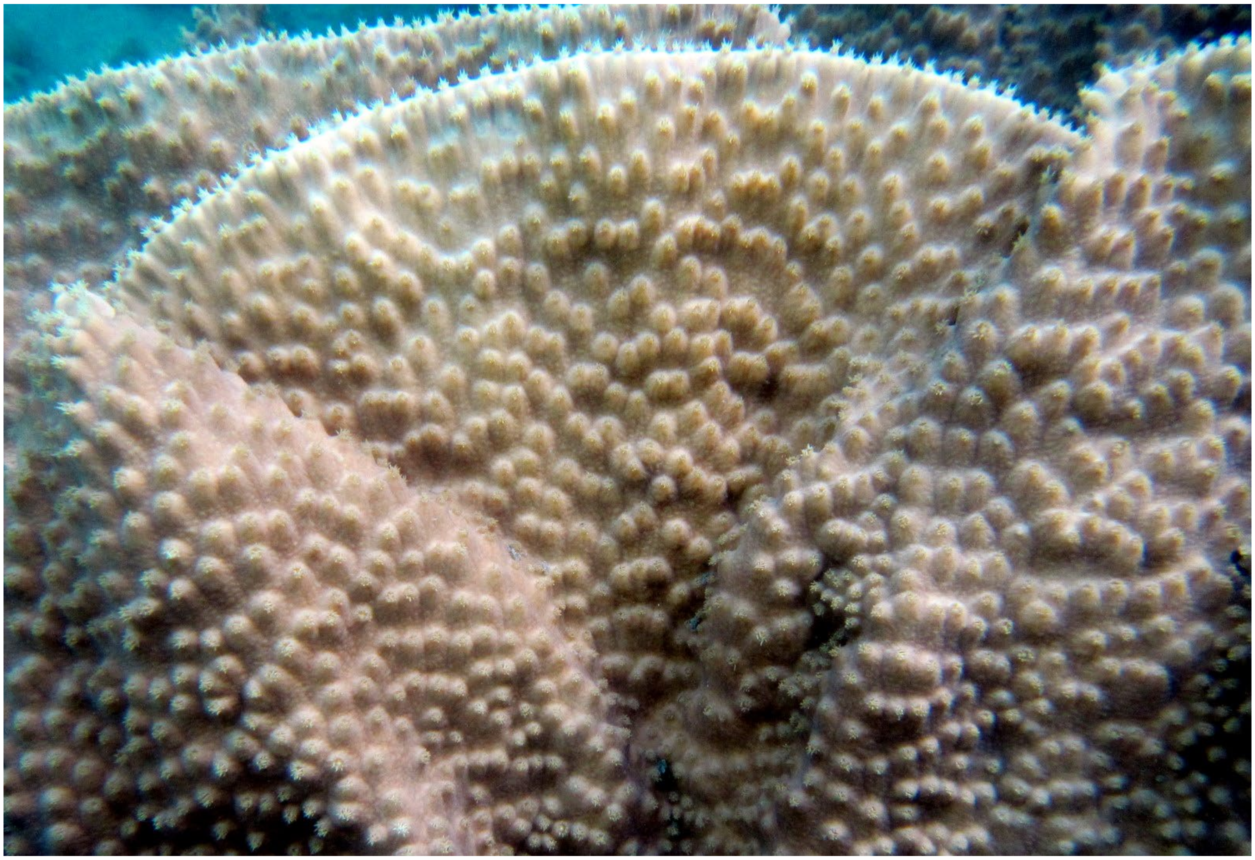


A close-up photo of a colony of *Turbinaria peltata* showing the extended polyps.

Turbinaria mesenterina *Vulnerable* *EDGE of Existence*

Colonies form thin plates which grow upward and can be large, or can be folded and wind around each other. The corallites and polyps are tiny, about 3 mm diameter. The corallites are much smaller than on *Turbinaria peltata*. *Turbinaria reniformis* is very similar but always has some yellow. *Echinopora* may look similar but is spinier.

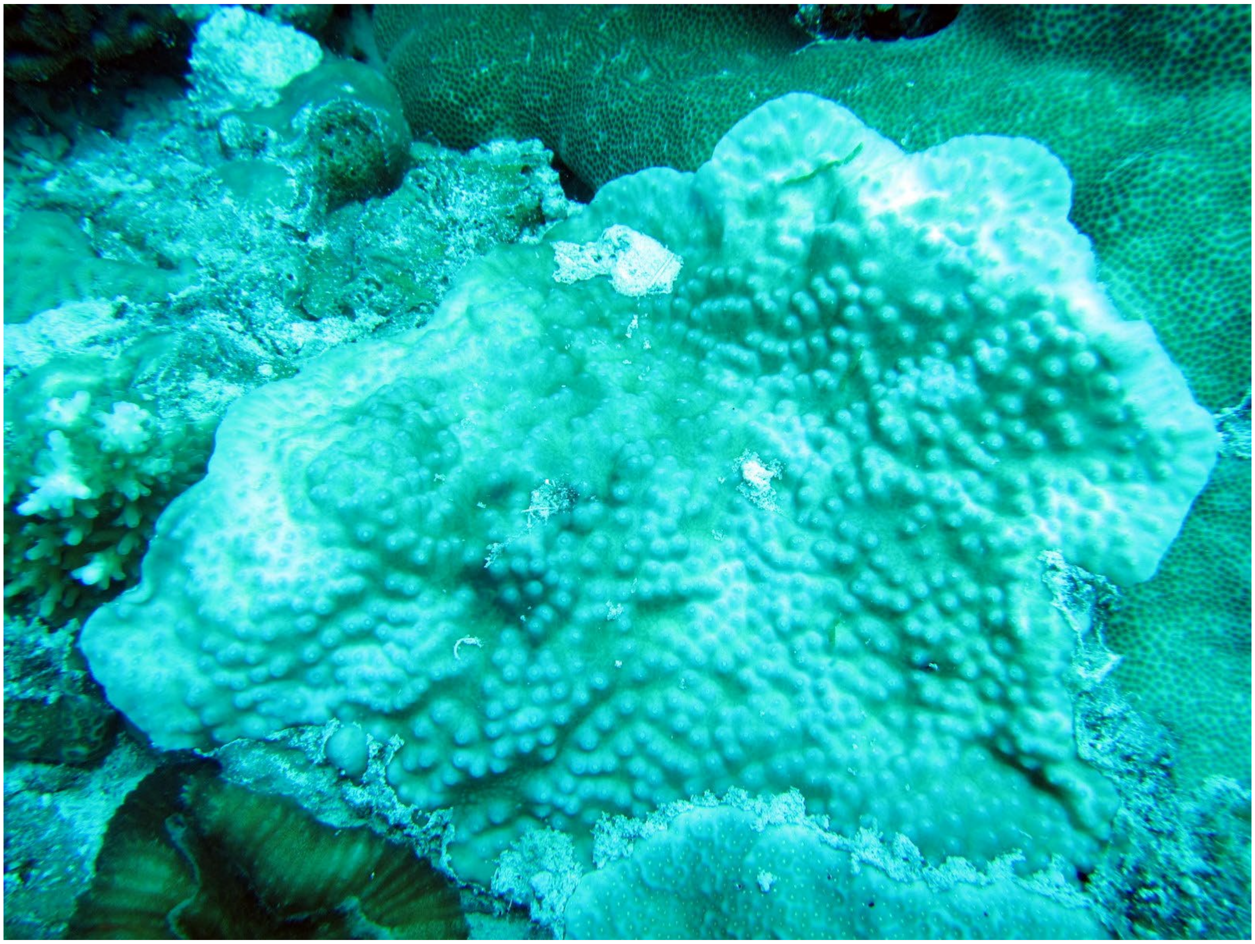
Colonies of *Turbinaria mesenteria*.



A close-up of a colony of *Turbinaria mesenterina*. The tentacles are contracted here but are often extended.

Turbinaria stellulata *Vulnerable* *EDGE of Existence*

Colonies are encrusting, with small corallites that are about 3 mm diameter. Other *Turbinaria* are plating.



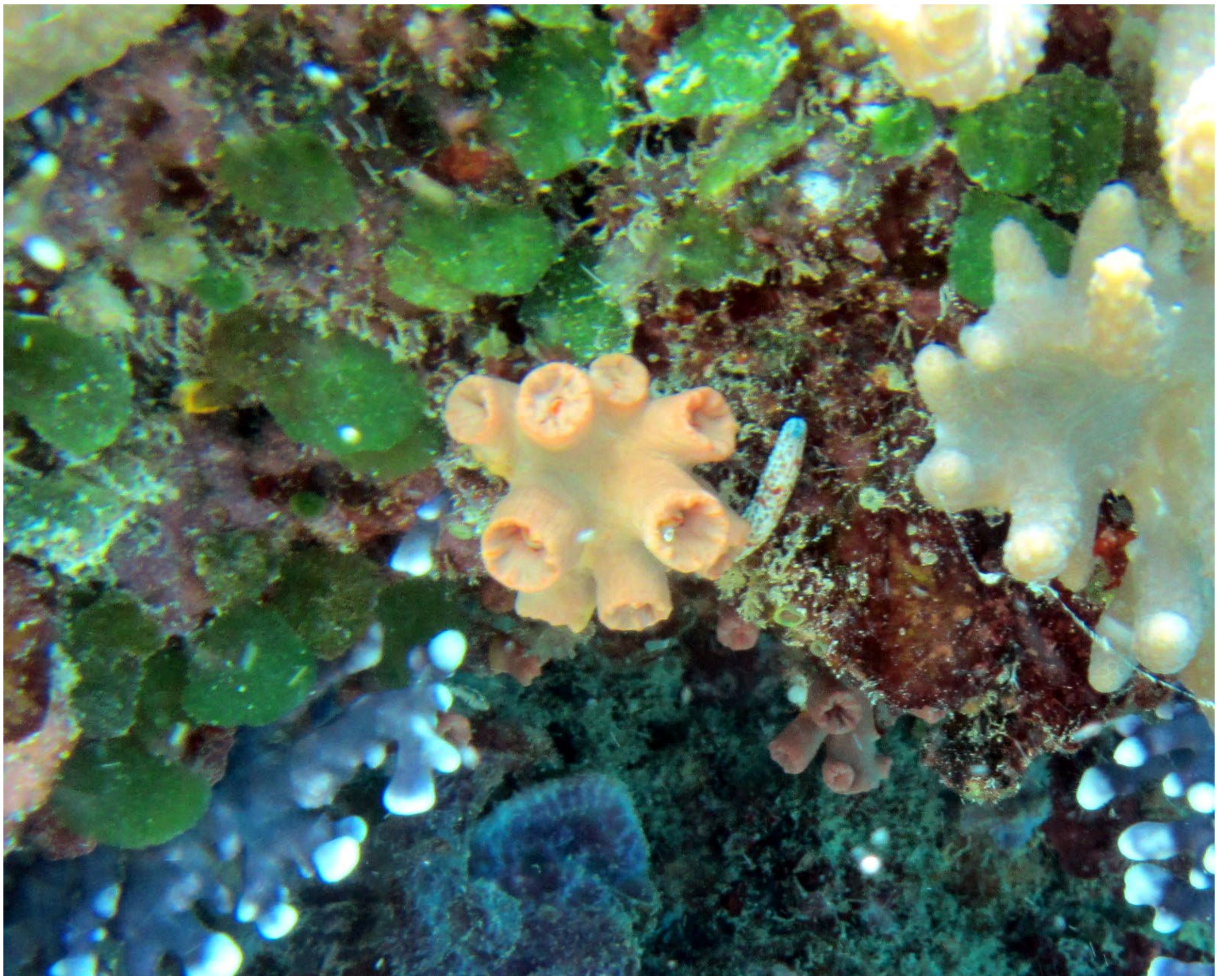
A colony of *Turbinaria stellulata*.

Tubastraea

Colonies may be branching or small massives. Colonies do not have zooxanthellae. At least two species can grow to sizes large enough to contribute significantly to reefs, the largest of which (*Tubastraea micranthus*) can form fans up to 2 m tall with a base at least 1 foot in diameter. The other (*Tubastraea coccinea*) can make massive colonies at least 15 cm diameter. Corallites have slightly curving septa in what is called a "Pourtales Plan" though it is not as strong as in *Rhizopsammia*.

Tubastraea coccinea

Colonies are massive, with tubular corallites projecting from the colony. Colonies are in shaded locations. Colonies are bright orange. *Rhizopsammia verrilli* has similar-appearing corallites but forms branching colonies.



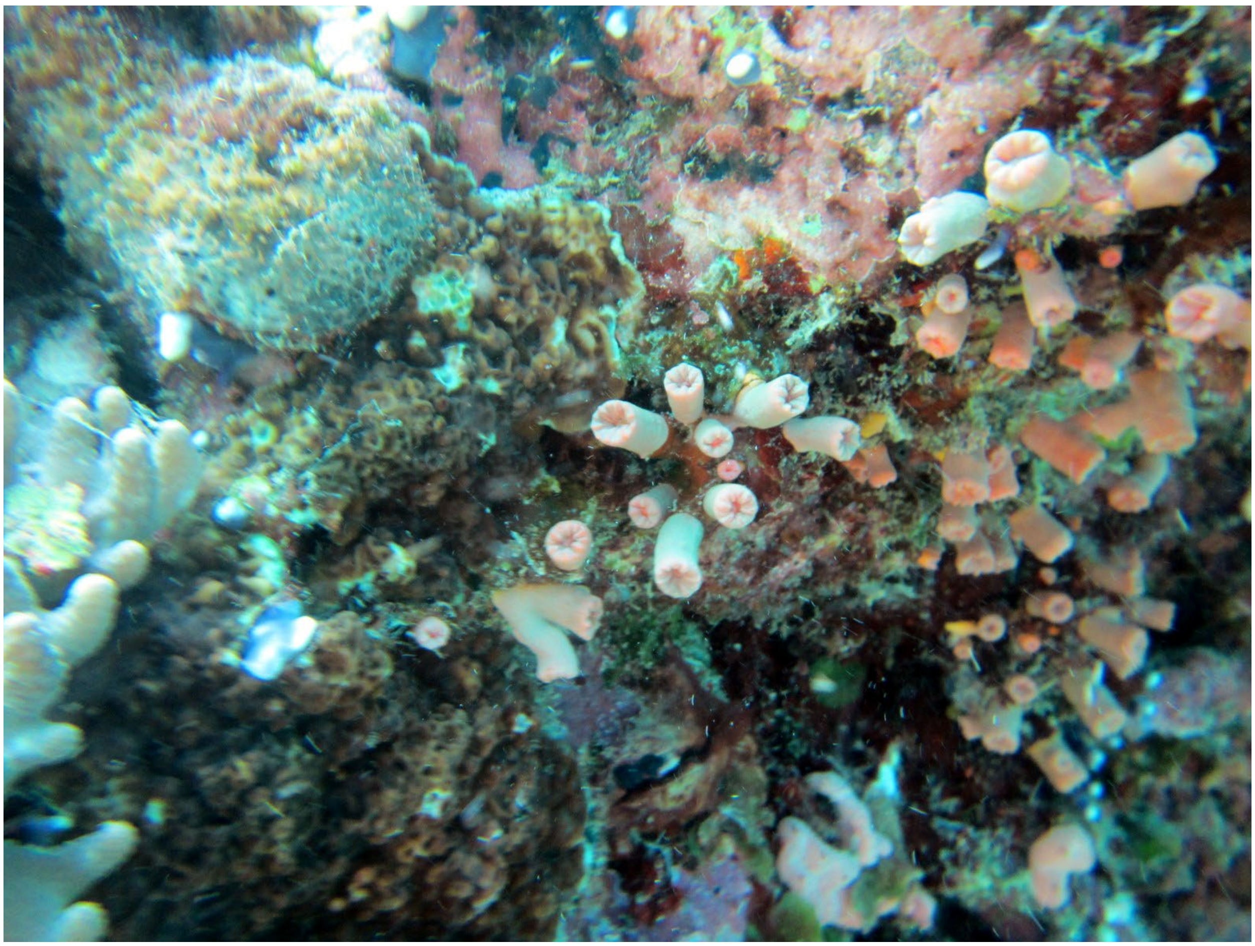
A small colony of *Tubastraea coccinea*.

Rhizopsammia

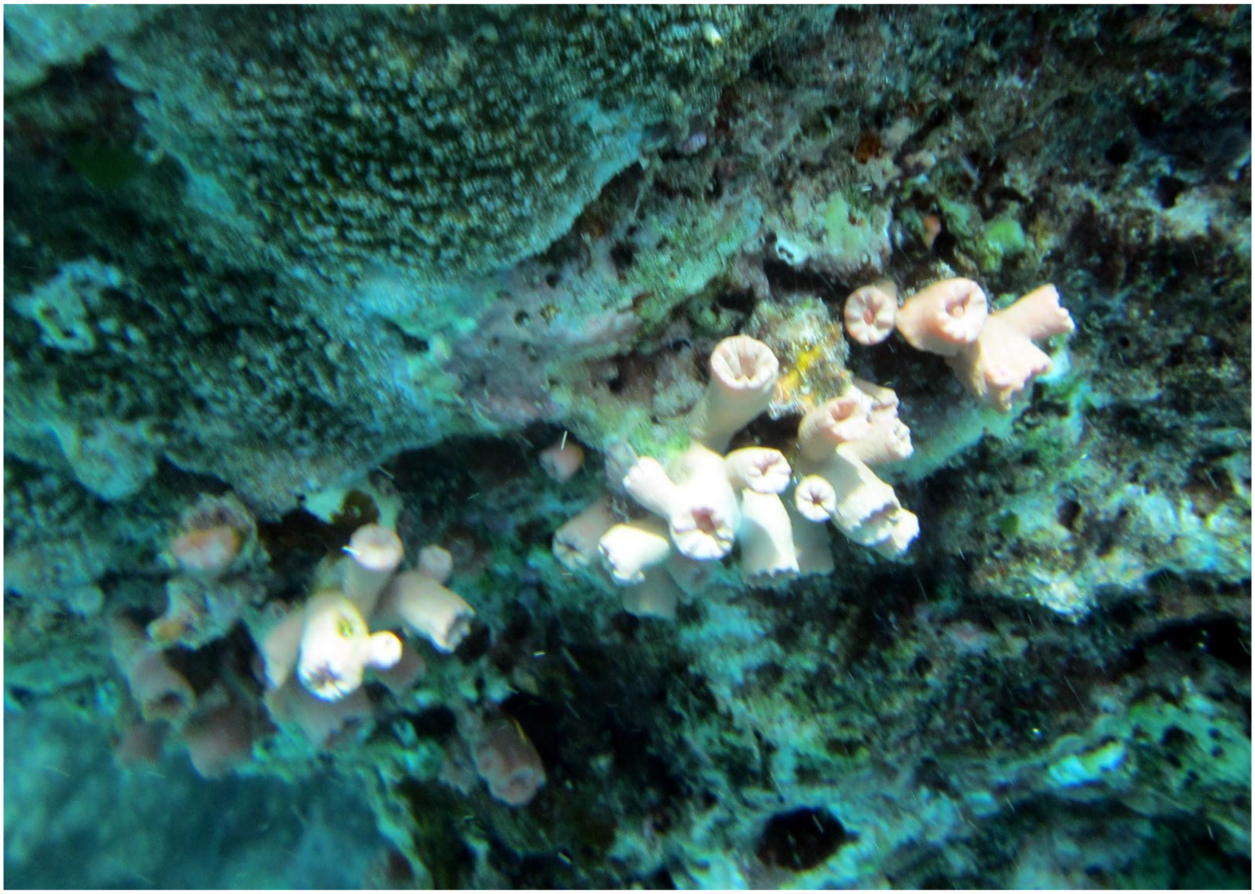
Colonies are branching and small. They do not have zooxanthellae. Corallites have a pattern of curving septa called a “Pourtales Plan” (after the discoverer) which other genera also have. However, it is the only one of these to grow small, rounded “runners” called “stolons” on the substrate to start new colonies.

Rhizopsammia verrilli

Colonies are small, tubular, and may have a few branches or none. Often the stolons can’t be seen because other life grows over them. Tentacles are usually contracted in the day. Colonies are usually under overhangs, and are bright orange. This is the only member of its genus common on coral reefs. *Tubastraea coccinea* has similar polyps, color, and preference for overhangs, but forms small massive colonies from which corallites extend instead of branching colonies.



Colonies of *Rhizopsammia verrilli*.



A closer photo of colonies of *Rhizopsammia verrilli*.

Subclass Octocorallia or Alcyonaria

Octocorals have exactly eight tentacles, and each tentacle has small regular side branches called "pini". This subclass contains 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 calcium carbonate (aragonite) skeletons with a thin tissue layer over them, much like Scleractinia. Soft corals are much fleshier than Scleractinia, but some do produce hard calcium carbonate (aragonite) underneath their tissues. They produce tiny knobs of calcium 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 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

There is only one family in this order:

Family Helioporidae

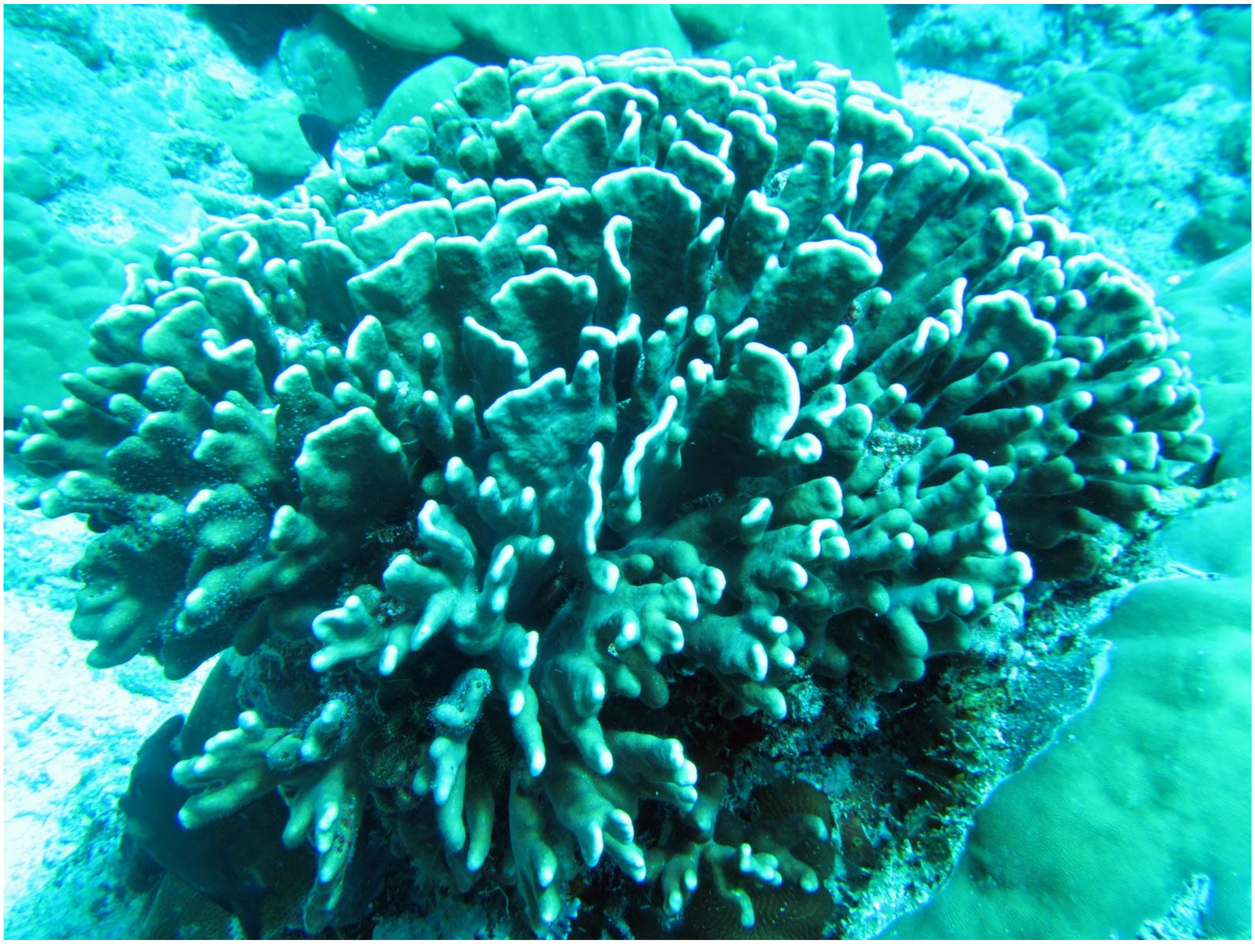
There is only one genus in this family:

Genus Heliopora

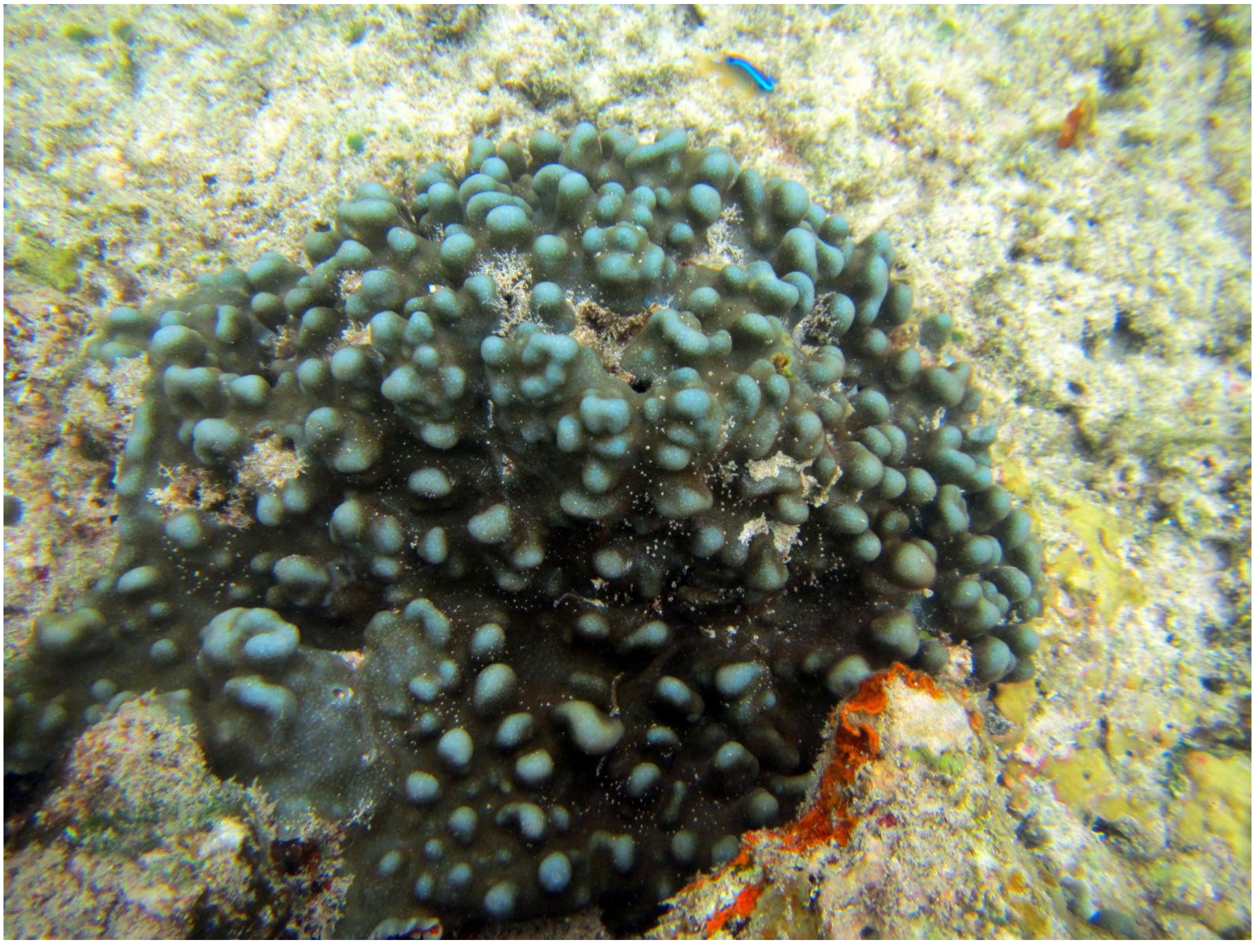
Colonies are branching, usually having a mixture of paddles and cylindrical columns. Colonies have a dark blue skeleton when broken. If the polyps are retracted, the surfaces appear smooth with no corallites. The corallites are too small to be seen underwater. If the polyps are extended, they are a white fuzz of tiny polyps on the surface. They are actually polyps not tentacles. This genus was long thought to only have one species, but a second species has been described recently.

Heliopora coerulea *"blue coral"* *Vulnerable*

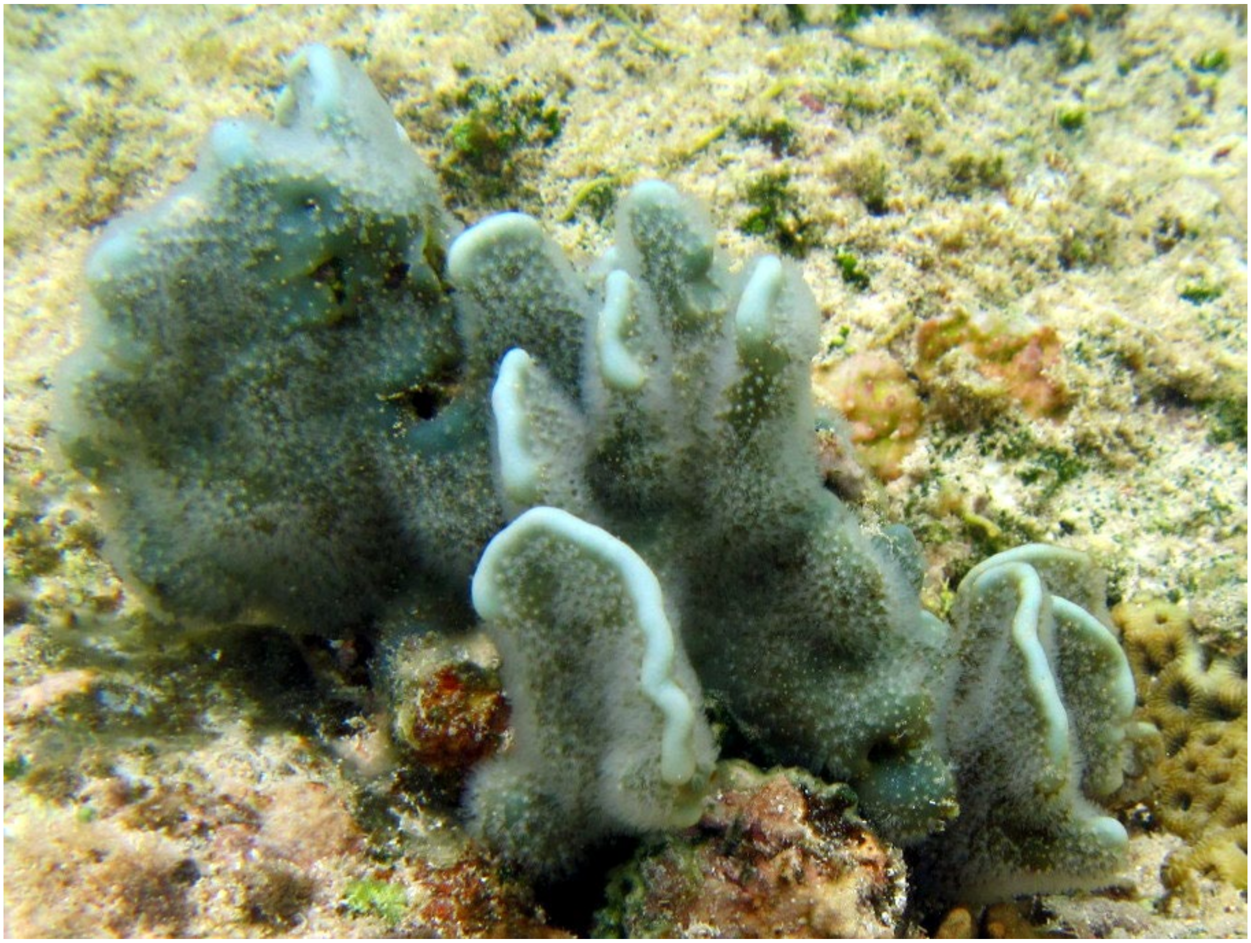
Colonies are branching with paddles and/or cylindrical columns. Colonies may appear either light blue or brown. This is the only species of hard coral wth a dark blue skeleton.



A colony of *Heliopora coerulea*.



A colony of *Heliopora coerulea* with small knobs instead of branches.



A close-up photo of *Heliopora coerulea* with polyps extended.

Order Alcyonacea Soft corals, gorgonians, and organ pipe coral

The Stolonifera Group

Family Tubiporidae

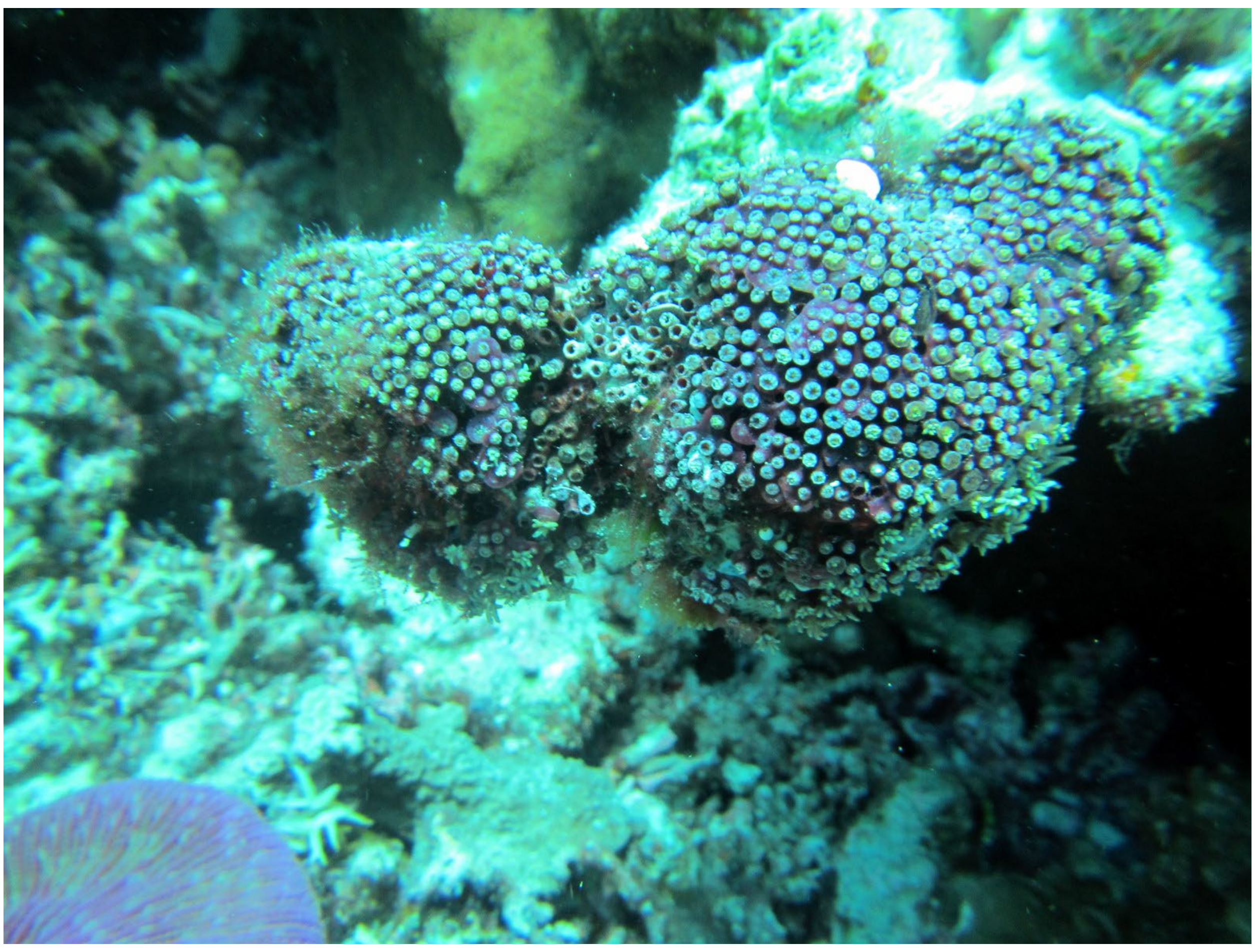
This family has only one genus:

Genus *Tubipora* "organ-pipe coral"

There is only one species in this genus, so the properties of the species are those of the genus as well.

Tubipora musica

Colonies form a bright red skeleton with a tube for each polyp to extend from. The tiny, greenish polyps commonly cover the skeleton making identification a bit harder. No other hard coral looks like it, but a soft coral, *Clavularia* looks like it when polyps are contracted. When *Clavularia* polyps are extended, the tentacles are larger. *Clavularia* has no hard skeleton; it is completely soft.



A colony of *Tubipora musica* with almost all polyps retracted. The red skeleton can be seen between the retracted polyps. A few extended polyps can be seen on the lower right.

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 forms that produce calcium 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:

Family Milleporidae

This family has only one genus:

Genus *Millepora* "Fire Corals"

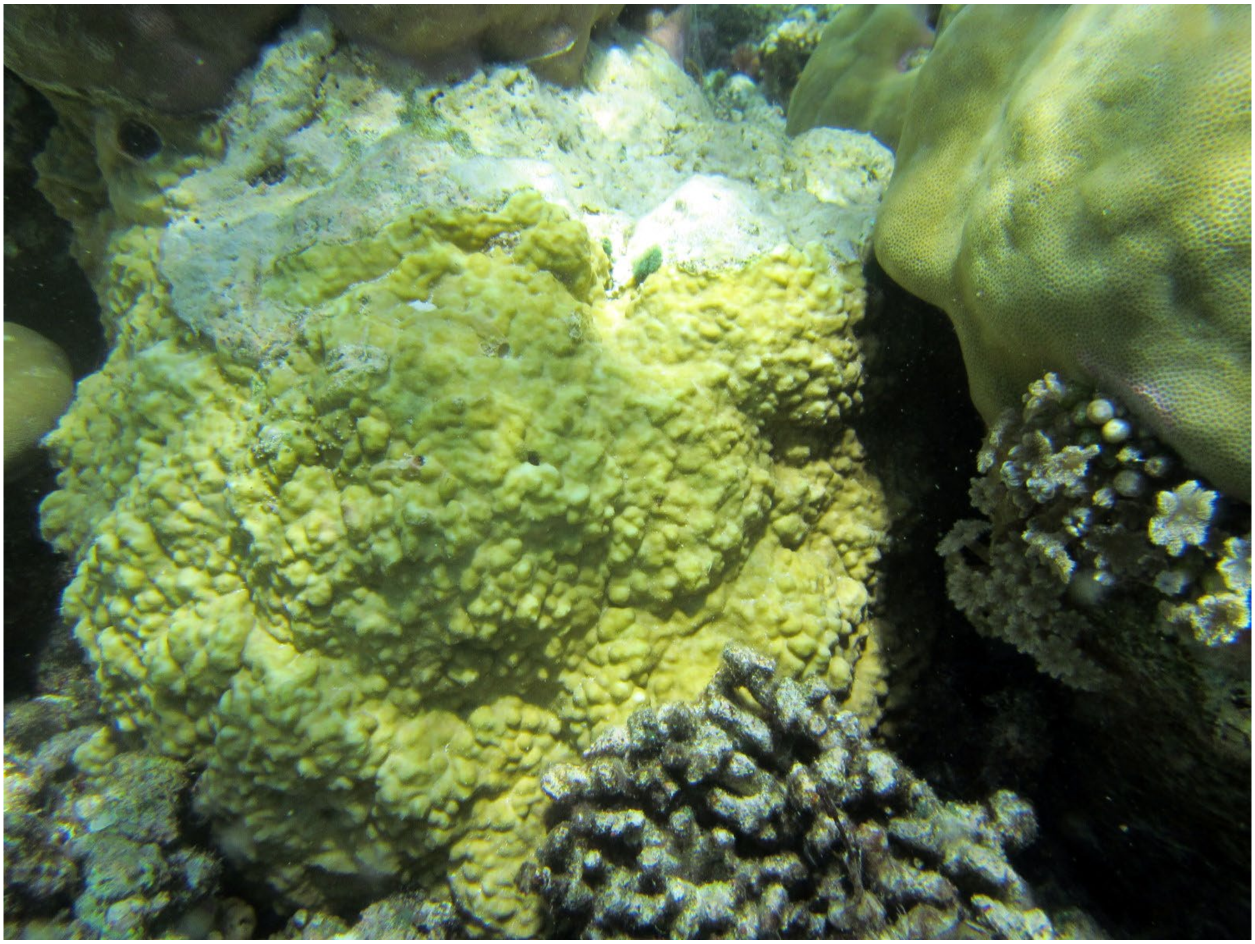
Millepora means "thousands" (= Mill) of pores. This is because it has many very tiny polyps and tiny holes or pores in the skeleton where the polyps are. Unless you look very closely with back lighting or use a magnifying glass, you won't see any corallites or pores. It is actually a hydrozoan, and reproduces 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. It is also one of the most sensitive to mass coral bleaching.

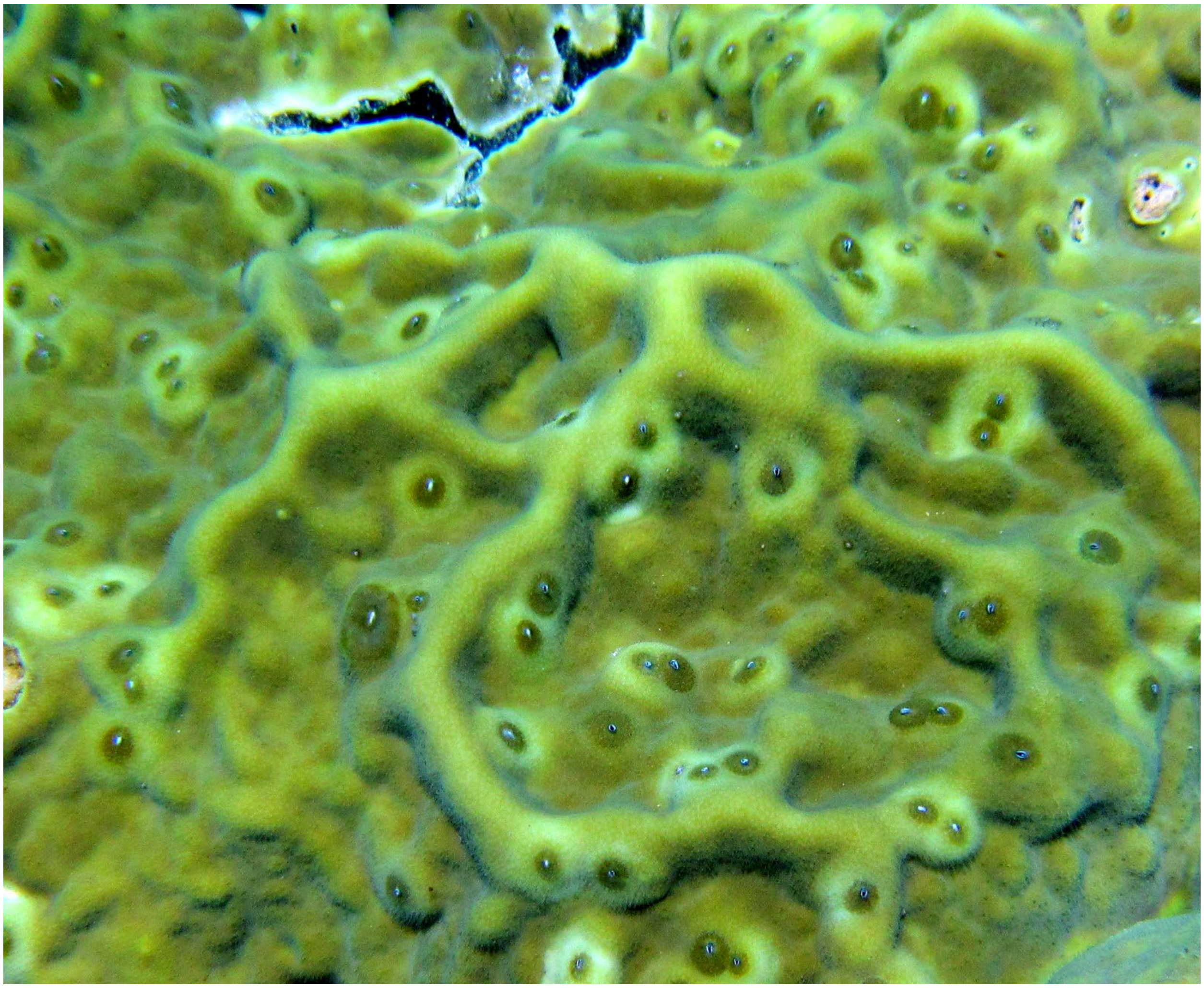
Millepora can be encrusting, encrusting base with vertical paddles, columns, or branching. Surfaces may be smooth or bumpy. Colony shapes are highly variable. It is most often yellow or brown, but can be light green, pink, or dark reddish-purple. They have zooxanthellae and are found in light. Touching it with anything but your finger tips will likely give a sting, and it is the only coral that can sting. The stings are not dangerous and usually go away fairly quickly. 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 platyphylla

Colonies can be encrusting only, but often form vertical plates, paddles, or columns. Colonies are often larger than *Millepora exaesa*, which does not have plates, paddles, or columns. *Millepora tenera* has short branches in rows wth flattened ends.



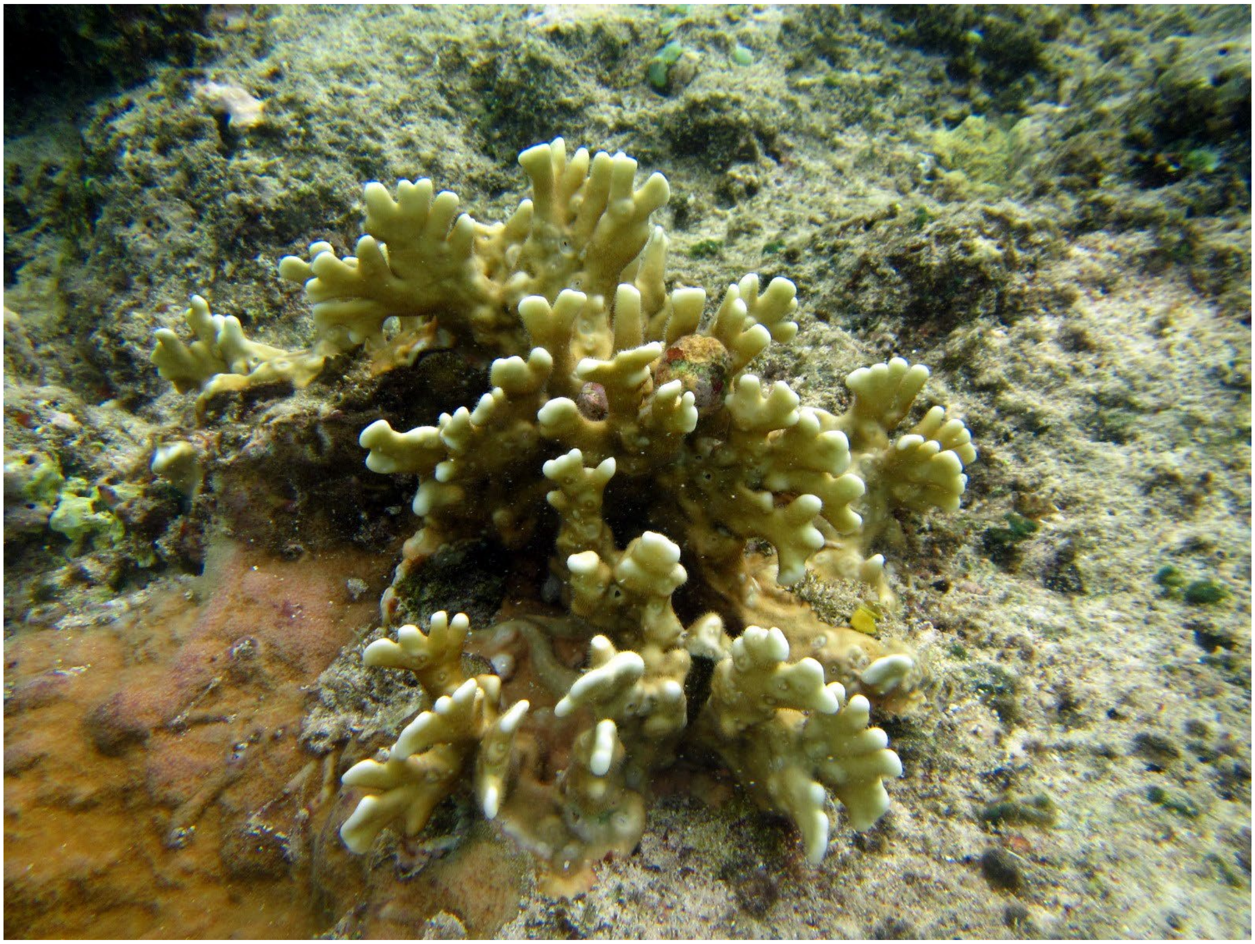
A bumpy encrusting colony of *Millepora platyphylla*.



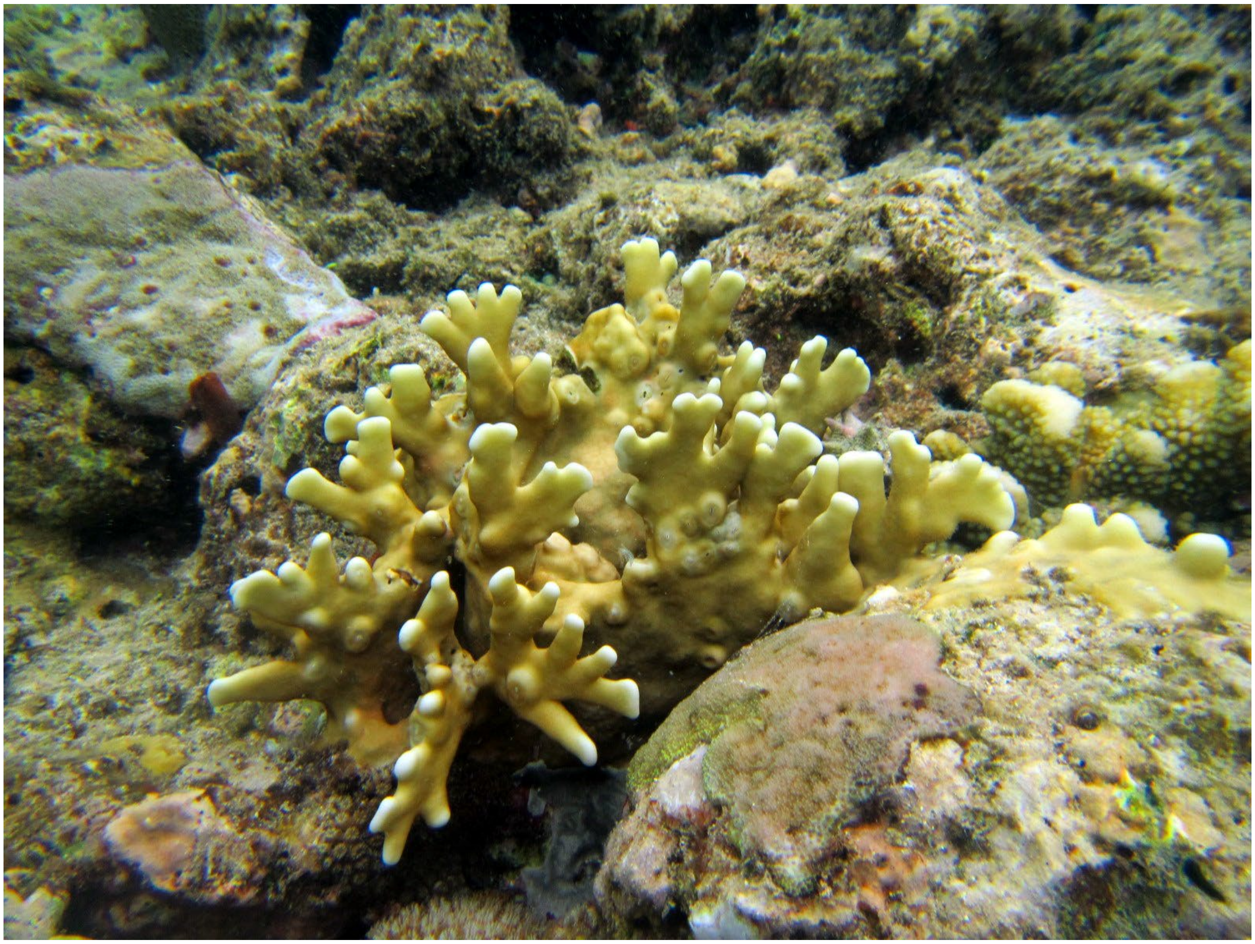
A close-up photo of *Millepora platyphylla*, showing rounded ridges and barnacles which are the dark spots with tiny white spots in the center.

Millepora tenera

Colonies have small encrusting bases with rows or fans of short vertical narrow paddles that may do some branching. Paddles are fairly uniform in height, about 3 cm tall. Colonies often have barnacles in them. Colonies were found about 2-3 m deep. This appears to be the first time this species has been shown in a field guide. The paddles are much smaller than on *Millepora platyphylla* and are in rows. The branches are thicker and shorter than on *Millepora dichotoma*.

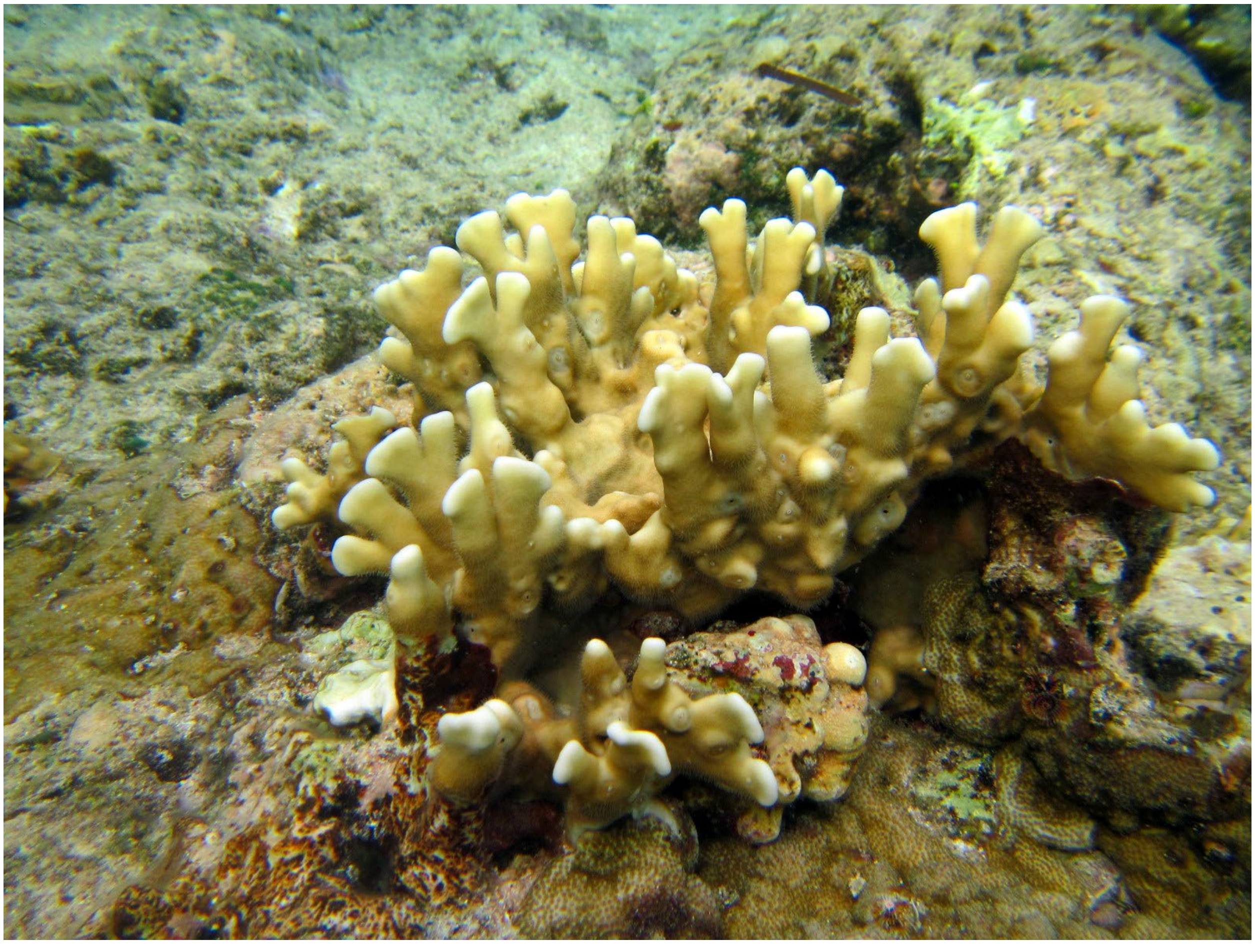


A photo of a colony of *Millepora tenera*.



A photo of a colony of *Millepora tenera*.

A photo of a colony of *Millepora tenera*.

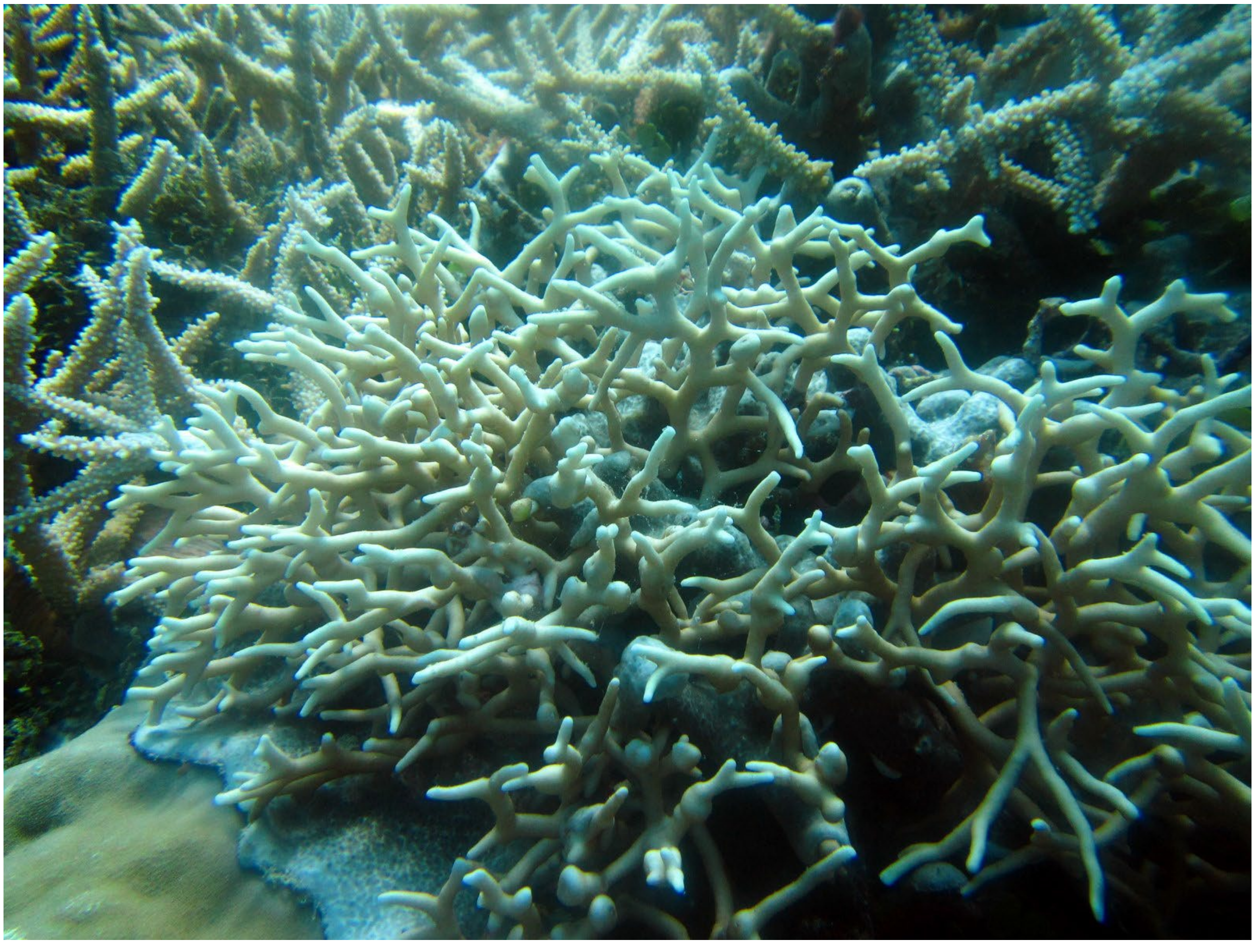


A photo of a colony of *Millepora tenera*.

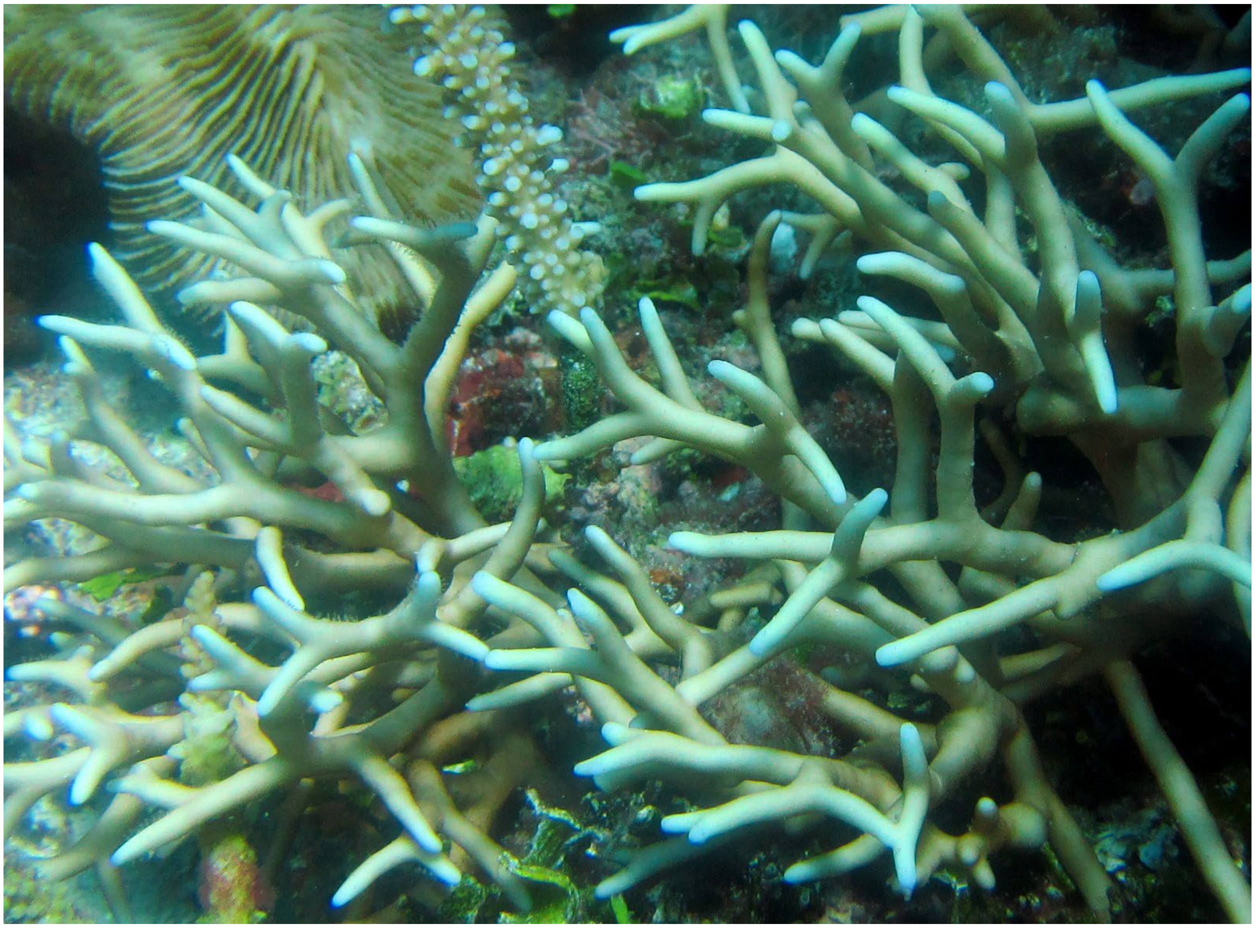
A photo of a colony of *Millepora tenera*.

Millepora intricata

Colonies are branching, with thin, smooth branches that go in many different directions. *Millepora dichotoma* has thicker branches that form two-dimensional fans with branches anastomosing.



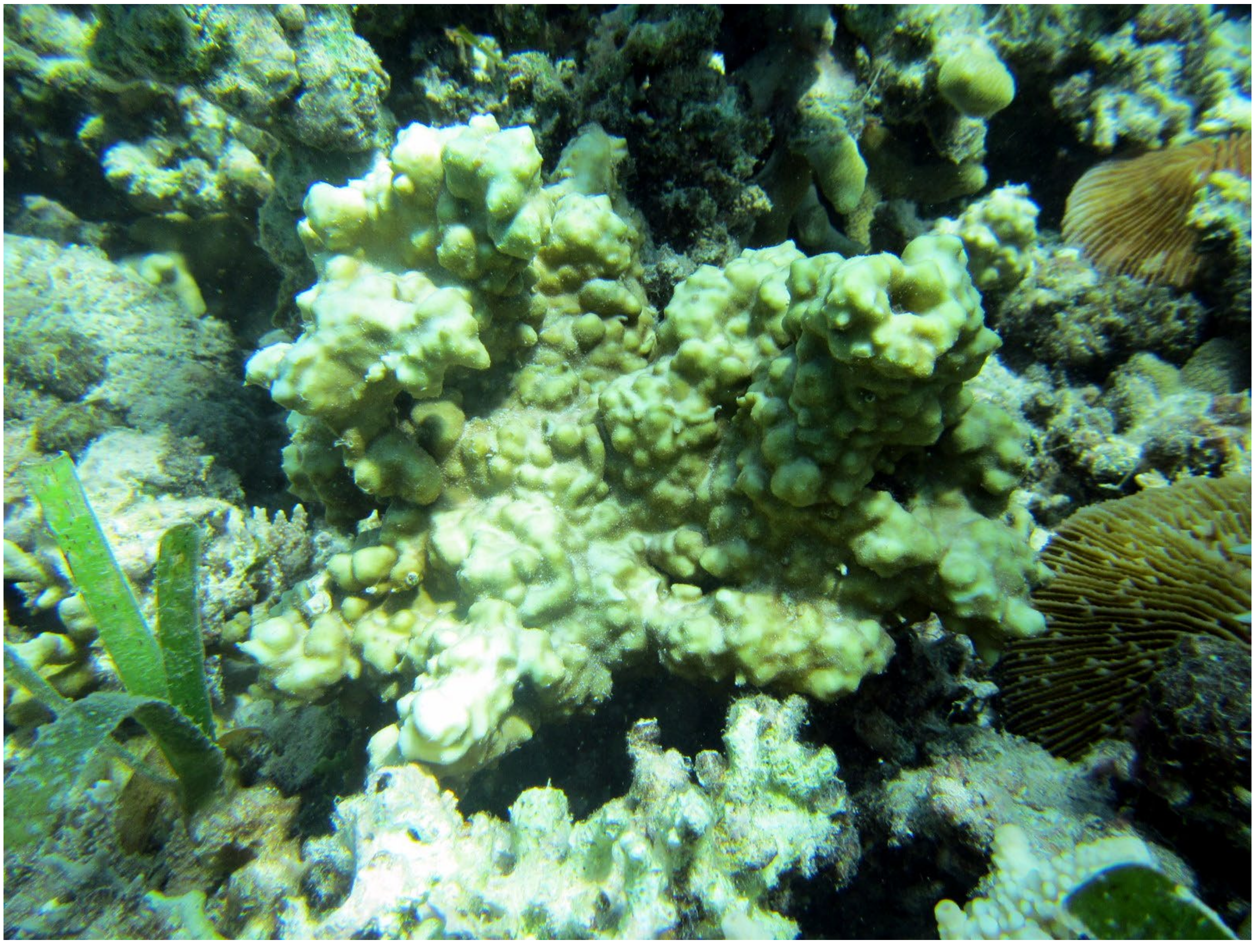
A colony of *Millepora intricata*.



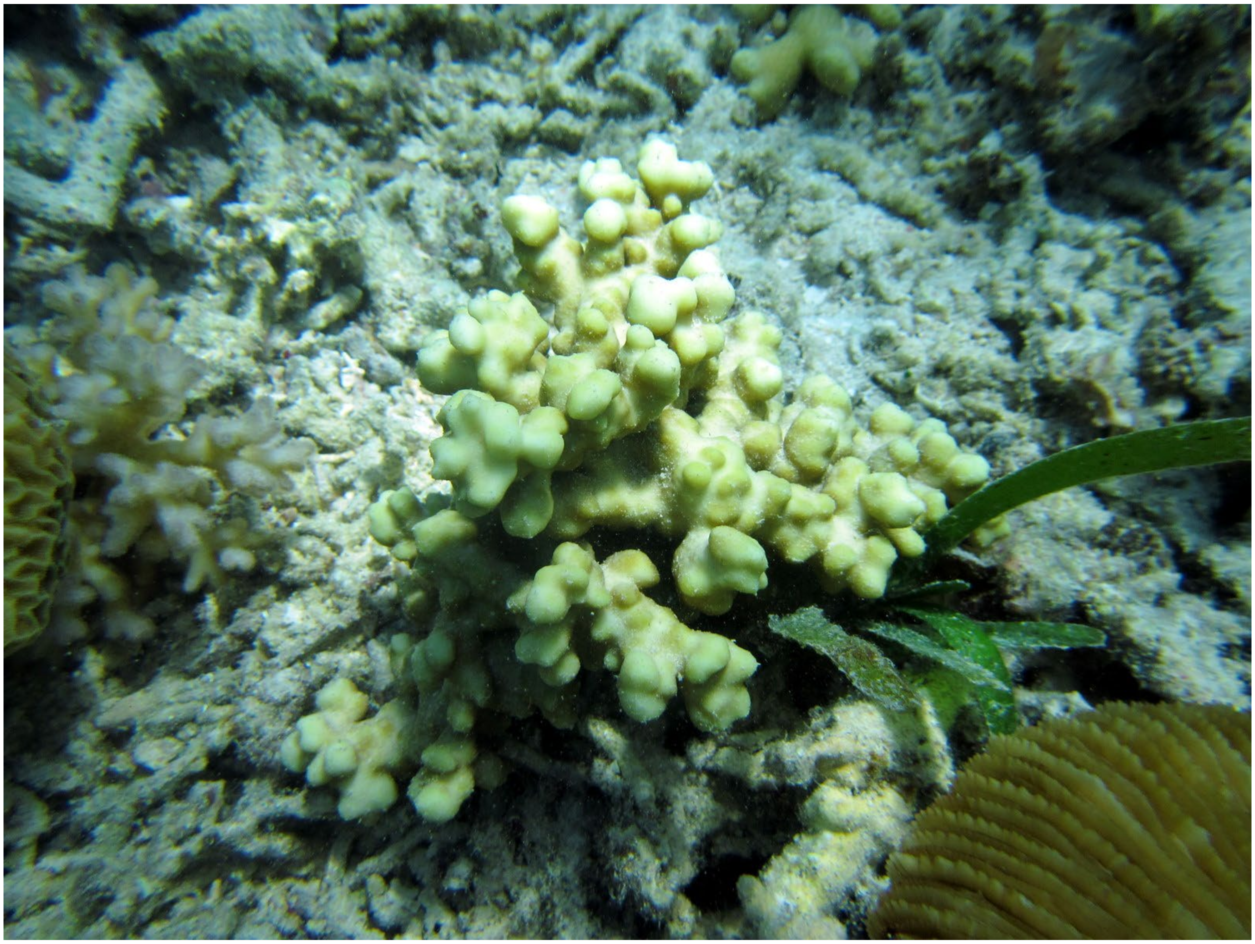
A close-up photo of *Millepora intricata*.

Millepora exaesa

Colonies are encrusting and nodular. They can encrust substrate or rubble. They never produce walls or paddles like *Millepora platyphylla*.



A colony of *Millepora exaesa*.



An unusually nodular colony of *Millepora exaesa*.

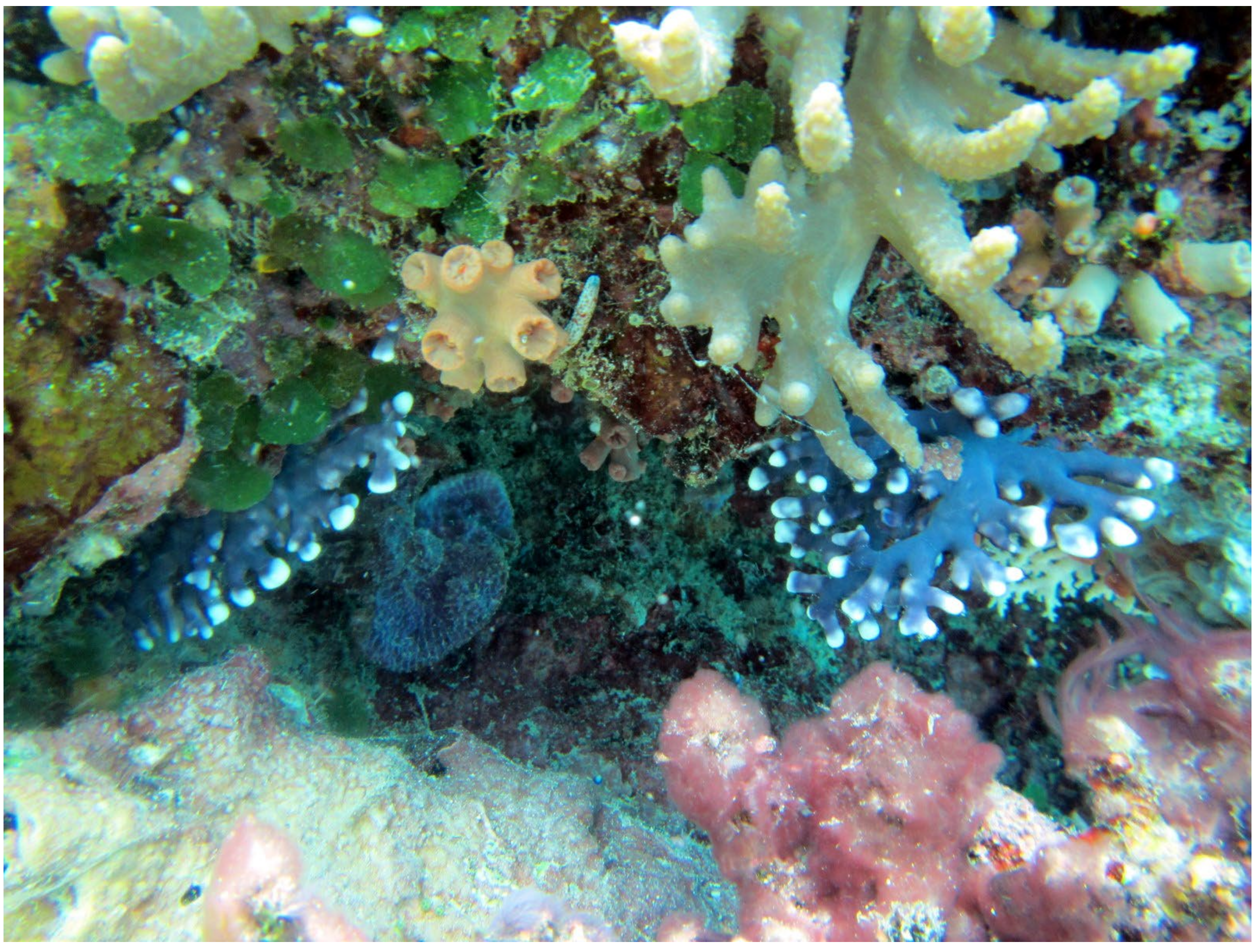
Family Stylasteridae has several genera in it, all of which are azooxanthellate, and only two of which have species on coral reefs.

Distichopora

Colonies are small fans of smooth flattened branches, usually in shaded locations. Colonies do not have zooxanthellae. They are usually intense colors like purple, yellow, or pink. The polyps are too tiny to see, and are located in short rows along the edges of the branches.

Distichopora violacea

Colonies are small blue or purple fans of flattened branches in shaded locations. The branch tips are commonly white. *Distichopora nitida* may have larger colonies, slightly different branch tip shapes, and colors other than blue or purple.

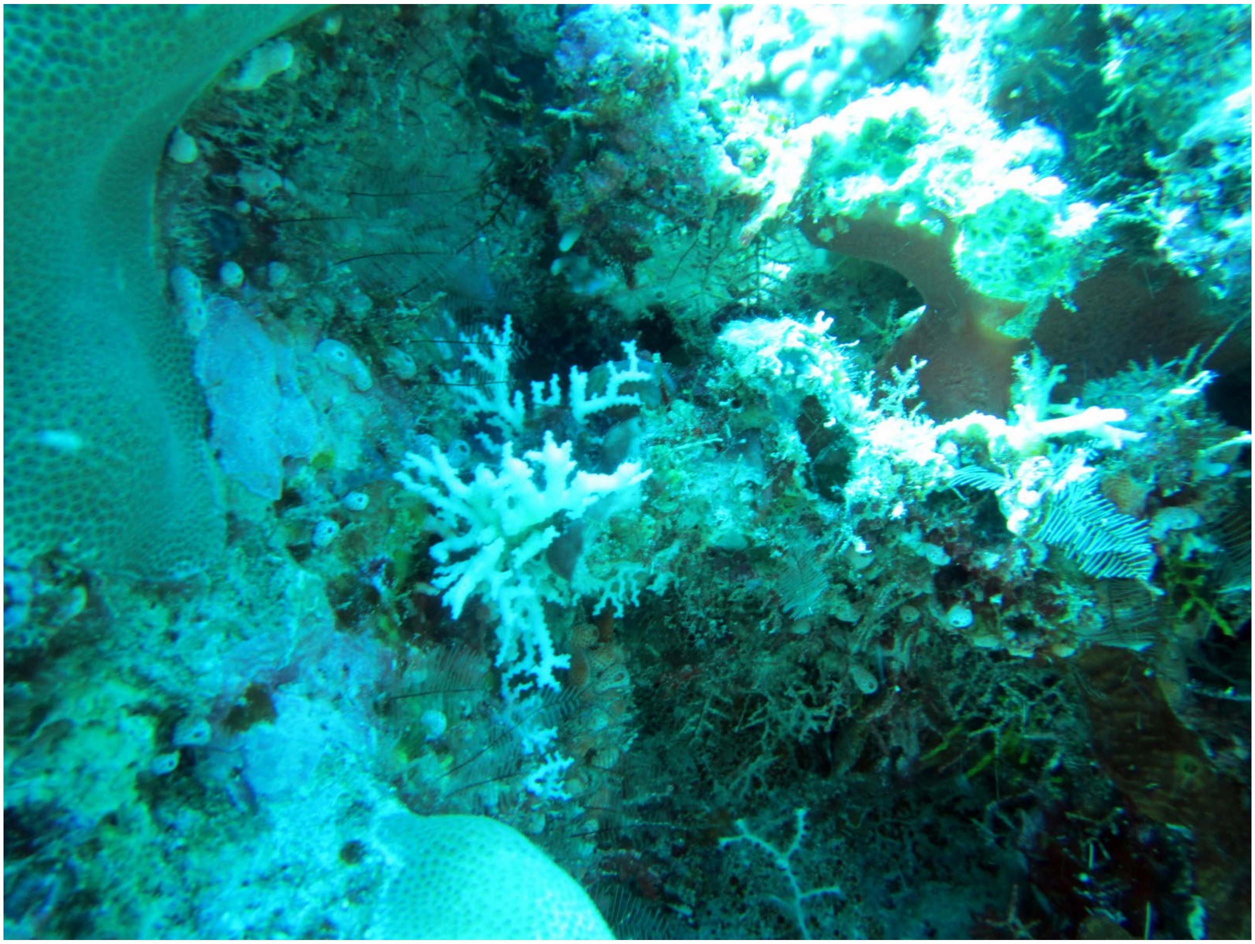


Two colonies of *Distichopora violacea*.

A close-up photo of *Distichopora violacea*.

Stylaster "lace corals"

Colonies form small, lacy fans in shaded locations. They do not have zooxanthellae. The polyps are too small to see under water. Often they are red, pink, orange, or white. The shallow-water Stylaster species of the Indo-Pacific are not sufficiently well worked out to identify these corals to species.



White colonies of *Stylaster* sp.

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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. Once graduated he attended the summer invertebrate zoology course at the Marine Biological Laboratory at Woods Hole, Massachusetts and then another summer was a course assistant for that course. 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 in 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 southern Italy in 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.