Bookshelf

Corals of Australia and the Indo-Pacific
J.E.N. Veron
University of Hawaii Press (1993)

Everything you ever wanted to know about corals and more! The first part of this 644-page tome deals with general coral information. Most of the book is an identification guide lavishly illustrated with well-captioned colour photos, maps and diagrams. Each genus is introduced with a brief informative overview. A short geological history and biogeography completes this comprehensive volume.

Scleratinia of Eastern Australia
J.E.N. Veron, et al.
AIMS Monograph series (1976-84)
For the coral expert. These five volumes have enough detail to completely confuse any amateur!

Many of the corals included in the following books are found on the GBR.

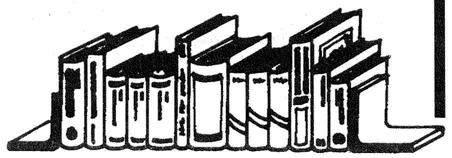
Indo-Pacific Coral Reef Field Guide
Dr Gerald R. Allen and Roger Steene
Tropical Reef Research (1994)

Tropical Pacific Invertebrates
Patrick L. Colin and Charles Arneson
Coral Reef Press (USA) (1995)

Coral Reef Animals of the Indo-Pacific
Terence M. Gosliner, David W. Behrens, Gary C. Williams
Sea Challenges (1996)

Video: Silent Sentinels
Available from ABC TV Programme Sales, Sydney. Ph: (02) 9950 3173; Fax: (02) 9950 3169. Cost: $100

This one-hour video, first shown on ABC TV earlier this year, looks at the severe coral bleaching events of 1998. Taking a worldwide perspective, with reference to the GBR and work done by Australian researchers, it studies the causes and effects, links with climate change, El Nino frequencies and future prospects. A chilling and sobering alarm call.



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The Marine Animal Hotline number is **1300 360898**
Please call **urgently** to report injured, stranded or dead dugongs as well as dolphins, whales and marine turtles.

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Tropical Topics

An interpretive newsletter for the tourism industry

Identifying corals

No. 58 November 1999

Notes from the Editor

At this time of year we become more conscious of corals as they engage in mass spawning. The focus of this *Tropical Topics* is coral identification and it features a concise guide to the main families and genera, courtesy coral artist Geoff Kelly. The pages are designed to be copied on to both sides of a sheet of waterproof paper for taking diving. Good luck with identification!

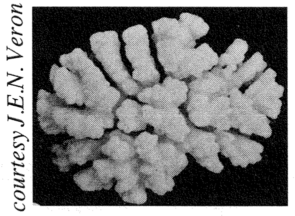
It is common practice among coral scientists to collect samples of coral, bleach them and study them with hand lenses or microscopes. However, since the corals of the GBR are protected, and collection is done only under permit, this is not possible for the amateur. The guide on pages 4 and 5 therefore, is designed to describe the distinguishing characteristics of skeletons which can be seen in the living colony.

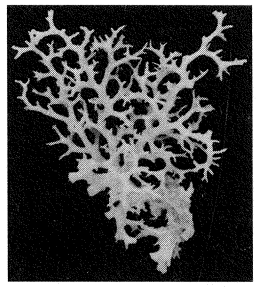
Thank you
I would particularly like to thank Geoff Kelly for kindly allowing his coral indentification guide on pages 4 and 5 plus other material on pages 2 and 7 to be reproduced.

Slippery species

"The corals constitute a chaotic collection of individuals, and the uncertainty as to what may be considered a species is the first problem that must confront anyone who happens to study corals from his own resources on an isolated coral reef."
Fredric Wood-Jones ***On Growth Forms and Supposed Species in Corals*****, 1907.**

Corals are morphs, changing their shapes to suit themselves. For this reason they have been compared with the Greek god Proteus, the prophetic old man of the sea who had an annoying habit of disappearing, by changing form, without answering the questions he was asked.





Photos courtesy J.E.N. Veron

Both these pictures show the same species of coral, *Pocillopora damicornis*, growing in different places. The colony on the left came from the top of the reef flat where there is strong wave action. As a result, it has developed a solid, stunted, robust form. The delicate, branching colony was living in much calmer water.

The open branching form of *Pocillopora damicornis* is also found in muddy water so lack of light also determines the growth form it adopts. This is not unusual. Certain species which grow in a flat plate form in deep water are known to adopt a more convoluted foliose form (see diagram, page 2) in shallower, lighter conditions. Indeed, when moved, experimentally, from one situation to another they have changed their style of growth accordingly. Since less light penetrates to deeper colonies they presumably need to be as flat as possible to maximise the amount of light captured for the food-producing algal cells (zooxanthellae) in their tissues.

As a result, the growth forms of corals are of little use as a guide to their identity. Coral experts depend instead on the shape of the corallites — the little limestone cups in which the polyps sit. However, even these can vary. Large corallites at the tips of staghorn branches, which are responsible for budding new polyps, are quite different to those on the sides. Even on the rounded surface of a porites boulder, corallites just a few centimetres apart can vary in character according to their position on the colony. This may be determined by factors such as space availability, age, predation or micro-environment.

All this flexibility creates headaches for students of corals. If one species of bird was able to look like a robin, a monarch and a fantail depending on environmental circumstances, there would be a lot fewer bird watchers and the field guides would be a great deal heavier — it is estimated that as many as fifty different photographs of each species would be needed for a coral field guide. However, while distinguishing different species is for the expert, happily it is not too hard to identify many corals at family and genera level — which is the aim of the guide on pages 4 and 5.

For notes on families and genera see page 6.

Marine Parks

Great Barrier Reef Marine Park Authority

Environmental Protection Agency

Life in the suburbs — getting a handle on the jargon

When referring to the coral diagrams on pages 4 and 5, you will need to be familiar with some teminology.

The holes or valleys where the polyps live are called **corallites**. These are the individual polyps' houses.

Each corallite is surrounded by a **wall** which separates it from the surrounding skeleton.

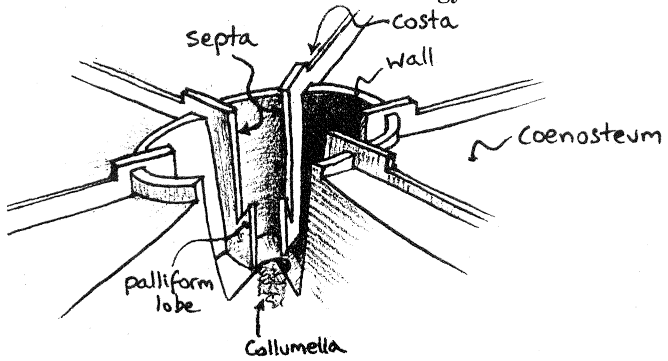
This surrounding skeleton — think of it as the backyard — is called the **coenosteum**. The size of the backyard depends on the type of suburb — see diagrams below.

The wall around the corallite has numerous ridges in it. On the inside of the corallite they are called **septa**. Like partitions, they divide the inside of the 'house' into cubicles. Ornamentation on these internal dividers varies — some are plain smooth vertical blades while others are elaborately decorated with teeth and rows of spines.

Sometimes the septa continue outside the wall of the corallite, into the backyard, where they are called **costae** (singular, costa). Like radiating fences, they may cross the coenosteum, sometimes connecting up with those of the neighbours.

Some corals have elaborate interior decoration. Pillars on the inner margin of the septa, called **palliform lobes**, often form a neat circle within the corallite.

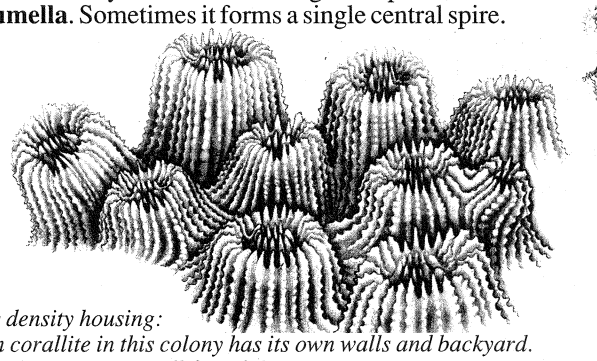
Right in the middle of the corallite, the septa join at floor level, beneath the mouth of the polyp. Instead of forming a solid floor they often create a tangle of spines, called the **columella**. Sometimes it forms a single central spire.



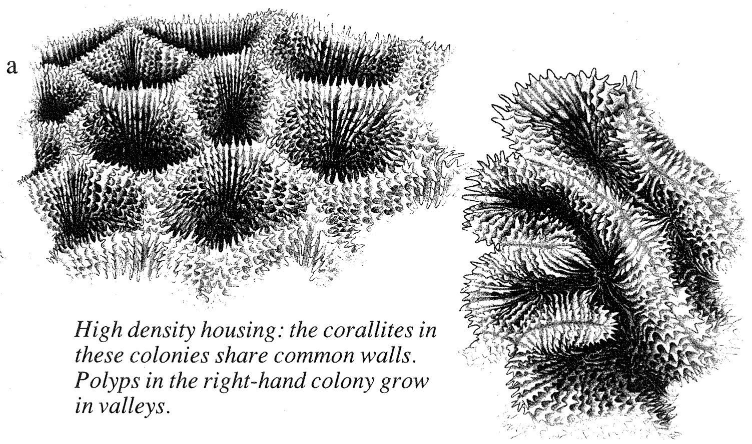
The living layer

The coral polyp's tissue covers its skeleton. The lower layer of this 'skin' secretes limestone to build up the skeleton while the upper layer has the stinging cells which capture food and others which produce mucus.

Individual polyps in the colony are in close contact. The body cavities of neighbours are interconnected so nerve messages are transmitted throughout the colony. This is why all polyps may withdraw in response to disturbance to only one part of the colony. Nutrients are also shared, so there is no competition between the polyps.



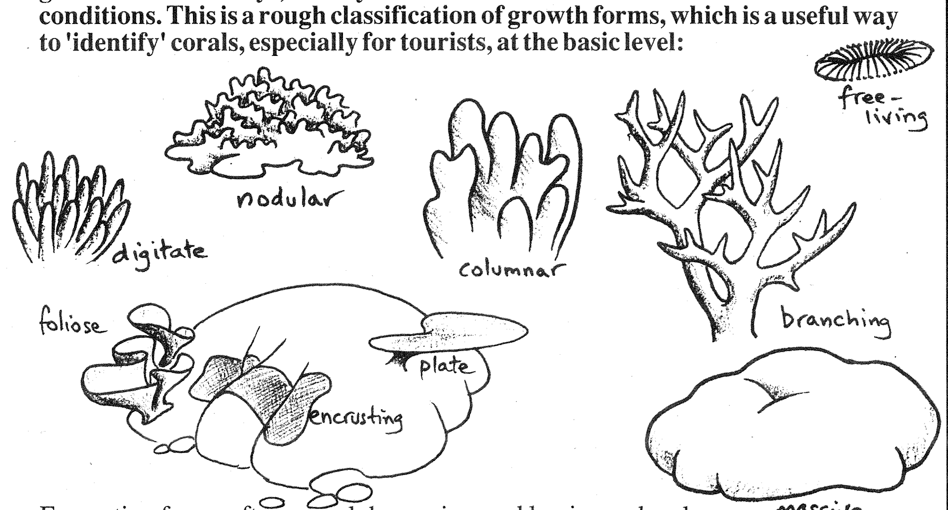
Low density housing: each corallite in this colony has its own walls and backyard. Note the prominent palliform lobes



High density housing: the corallites in these colonies share common walls. Polyps in the right-hand colony grow in valleys.

Colony shapes

Colonies of some corals are always of a particular shape, whereas others can grow into widely different shapes depending on the local conditions (particularly water movement and light intensity). Even different parts of the same colony can grow in different ways, usually because of variations in environmental conditions. This is a rough classification of growth forms, which is a useful way to 'identify' corals, especially for tourists, at the basic level:



Encrusting forms often grow lobes, spires and laminae when larger.

The advantage of colonial architecture

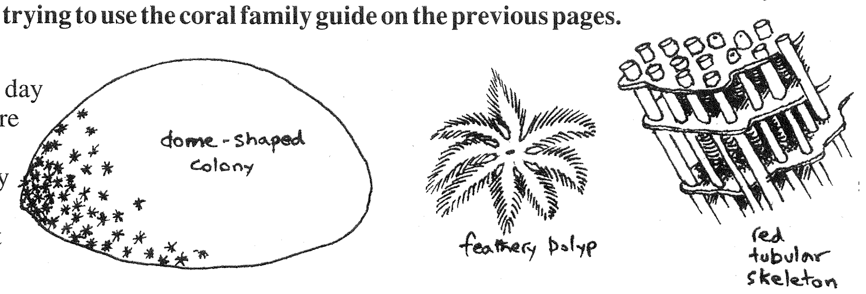
Although a few corals, like the mushroom corals, go it alone, forming one structure belonging to one single animal, most stony corals form colonies consisting of large numbers of individual polyps. There are a number of advantages to this strategy. Working together, the polyps can build huge structures which may maximise exposure to light for all the members, allow competition with neighbours and, within reason, keep pace with rising sea levels.

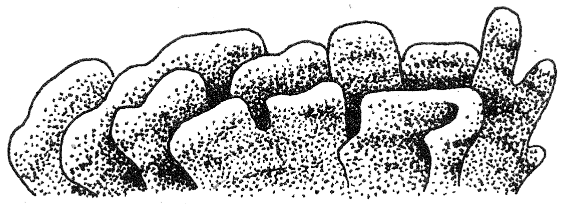
The growth form of the colony depends on the construction efforts of individuals. It seems that the polyps of many coral species are genetically programmed with a wide range of options which allow them the flexibility to adapt their growth patterns to environmental circumstances.

Confusing 'corals'

In general, corals can be divided into hard (scleractinian) and soft (alcyonarian) corals. Soft coral polyps have eight tentacles while those of hard corals have six, or multiples of six. However, some soft corals are hard and, since they are very common, can be confusing for anyone trying to use the coral family guide on the previous pages.

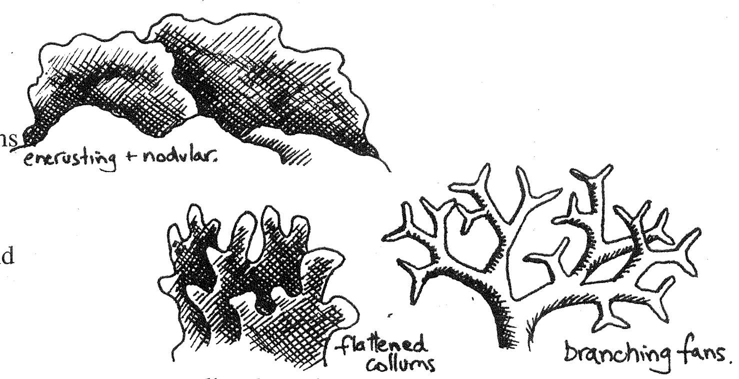
Organ pipe coral (*Tubipora musica*) (right) always has its feathery tentacles displayed, day and night. Grey-green in colour, they obscure the bright red of the skeleton which is composed of a cluster of red tubes joined by flat plates. Although hard in texture, this skeleton is composed of fused spicules, not hard solid limestone as in true hard corals.





Blue coral (*Heliopora coerulea*) can form huge colonies (left) with flattened vertical branches which are brown with white upper edges. The blue colour, which is visible only in broken and dead pieces, is due to iron salts. The polyps are very small — barely visible — and give the colony a smooth appearance.

Fire coral (*Millepora* species) is not a coral at all but belongs to the closely related class, Hydrozoa. Nonetheless, these animals are important reef builders, their yellow-brown structures taking many different forms (right). The name *Millepora* means thousands of pores because the skeleton is covered with tiny holes from which fine hairs protrude. Some of the invisibly tiny polyps are feeders while others specialise in stinging and can cause a rash on sensitive human skin — hence its common name.



POMS

Nothing to do with English people, POMs stands for Plans of Management. The Plans for the Cairns and Whitsundays areas of the GBR were released in June 1998 to provide new strategies for protecting World Heritage values. Minor amendments were made in response to submissions from users of the Areas and the amended Plans ratified by the Executive Council of the Commonwealth Government on 20 October 1999.

A number of new rules governing whale watching, sea bird nesting sites, aircraft, cruise ships, tourism and so on have been introduced. For example a new long range roving operation permit has been developed which allows up to 100 days' access a year to both the Cairns Area and Whitsundays without a booking. Specific permit conditions apply — for details please obtain copies of the amended Plans.

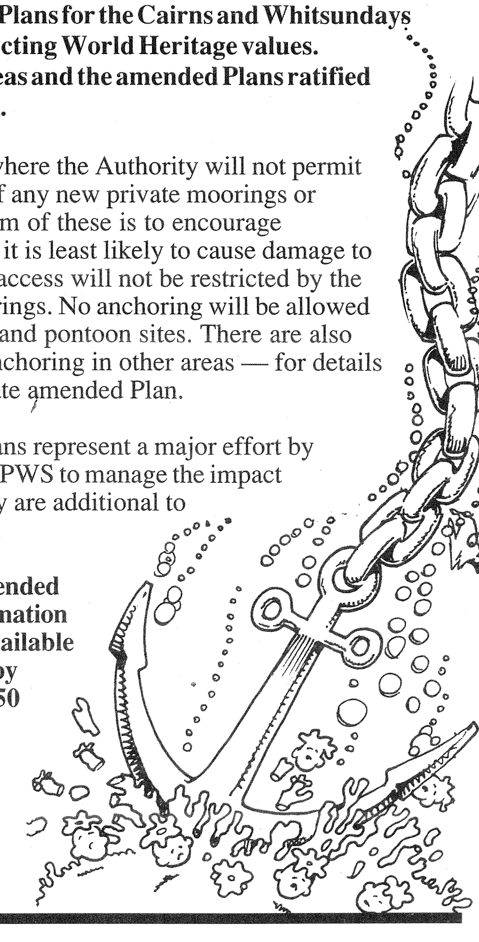
An important focus of the amended Plans is to limit coral damage from **anchoring**. This is designed to protect coral cover and diversity as coral reefs are vulnerable to damage by careless anchoring and vessel groundings; it is an offence to intentionally, recklessly or negligently damage coral. This applies to tour operators and to private users.

In the Whitsundays, reef protection markers have been placed in popular bays where anchoring in the past has damaged coral. Anchoring is prohibited inshore of the line of marker buoys. Public moorings have been installed at a number of sites to provide access to popular bays while protecting the reefs. For conditions of use, please see the appropriate amended Plan.

In the Cairns Area, a number of places have been designated as Reef Anchorages. These are preferred anchoring sites where the Authority will not permit the installation of any new private moorings or pontoons. The aim of these is to encourage anchoring where it is least likely to cause damage to coral and where access will not be restricted by the presence of moorings. No anchoring will be allowed around mooring and pontoon sites. There are also restrictions on anchoring in other areas — for details see the appropriate amended Plan.

The amended Plans represent a major effort by GBRMPA and QPWS to manage the impact of Reef use. They are additional to the zoning plans.

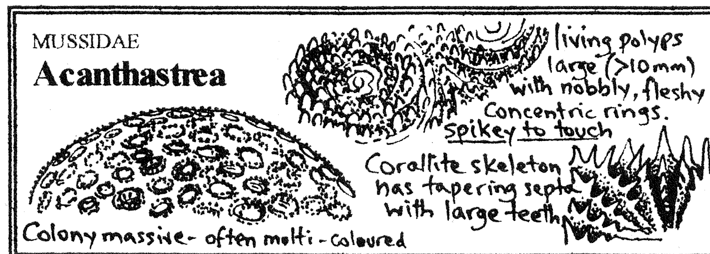
Copies of the amended POMs and information brochures are available from GBRMPA by phoning (07) 4750 0700 and from QPWS offices.



Pinning the name on the colony

Colour and soft tissue are of very little use when identifying corals. It is more important to look at the structure of the polyp cup or 'corallite' and, to some extent, the colony shape (but see page 1). For an explanation of the terminology see page 2. Family names are in capitals and genera names in bold.

MUSSIDAE
Acanthastrea



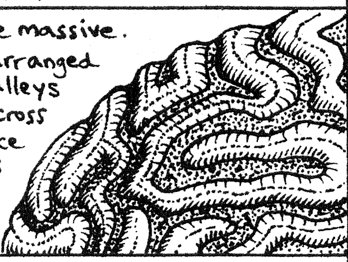
living polyps large (>10mm) with nobbly, fleshy concentric rings. Spikey to touch

Corallite skeleton has tapering septa with large teeth.

Colony massive - often multi-coloured

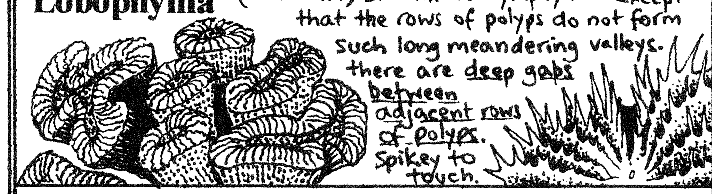
MUSSIDAE
Symphyllia

Colonies are massive. Polyps are arranged in large valleys which are at least 12mm across and meander over the surface of the colony. Fleshy polyps conceal large toothed septa which make the colony spikey to touch.



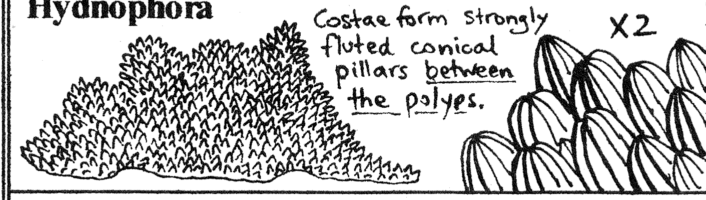
MUSSIDAE
Lobophyllia

Colonies are massive with very large polyps (>50mm) Similar to Symphyllia except that the rows of polyps do not form such long meandering valleys. there are deep gaps between adjacent rows of polyps. Spikey to touch.



MERULINIDAE
Hydnophora

Colonies are massive or encrusting. Costae form strongly fluted conical pillars between the polyps. X2



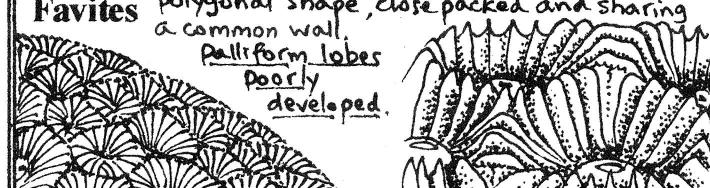
FAVIIDAE
Favia

Colonies massive. Corallites 3-20mm, roundish with raised walls and well separated from each other. Palliform lobes present. polyps bud by splitting evenly

x2

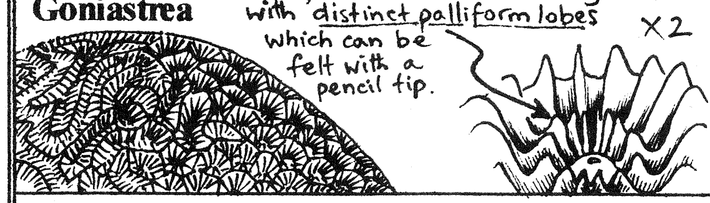
FAVIIDAE
Favites

Colonies are massive, corallites 6-20mm polygonal shape, close packed and sharing a common wall. palliform lobes poorly developed.



FAVIIDAE
Goniastrea

Colonies massive, corallites like Favites but neater, sometimes meandering and with distinct palliform lobes which can be felt with a pencil tip. X2



FAVIIDAE
Platygyra

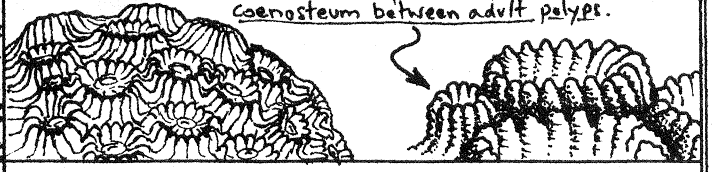
Colonies are massive, corallites are in meandering rows and have no palliform lobes X2

FAVIIDAE
Leptoria

Colonies massive, corallites in very long, meandering, narrow (≈ 4mm) valleys with even septa and no palliform lobes much finer than Platygyra. Columella is a row of vertical flat plates. Colony surface looks like a maze of wiggly zippers

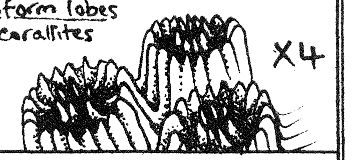
FAVIIDAE
Montastrea

Colonies massive. Corallites 2.5-15mm. Palliform lobes present or absent. Like Favia except new polyps bud from coenosteum between adult polyps.



FAVIIDAE
Plesiastrea

Colonies are encrusting, usually in shade. Corallites are like montastrea except that they are small (2-3mm), cylindrical and have a distinct inner circle of palliform lobes. costa are continuous between corallites on a smooth coenosteum.



X4

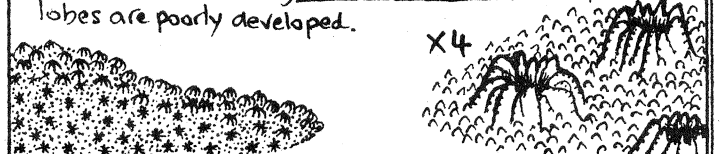
FAVIIDAE
Diploastrea

Colonies massive, often very large. Genus has single species: D. heliopora. Polyps are tightly packed, ridged domes (≈12mm). grey-green to green brown. Septa taper toward centre.

x1

FAVIIDAE
Cyphastrea

Colonies massive or encrusting. Corallites small (<3mm) like strongly fluted domes on a granulated coenosteum. palliform lobes are poorly developed.

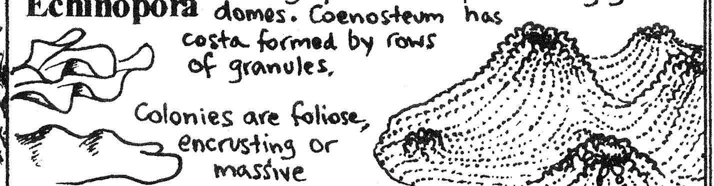


X4

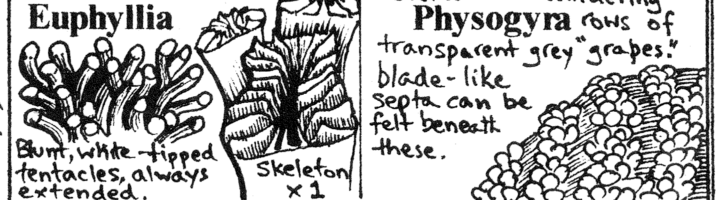
FAVIIDAE
Echinopora

Corallites like Cyphastrea except larger (3-4mm) with roughly toothed septa forming granular domes. Coenosteum has costa formed by rows of granules.

Colonies are foliose, encrusting or massive



CARYOPHYLLIIDAE
Euphyllia



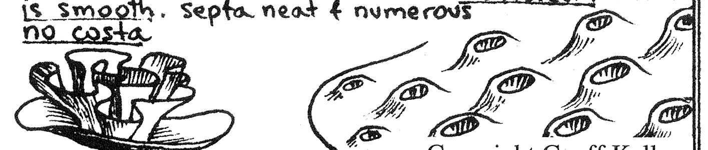
Blunt, white-tipped tentacles, always extended.

Skeleton x1

Colonies are massive and covered in meandering **Physogyra** rows of transparent grey "grapes." blade-like septa can be felt beneath these.

DENDROPHYLLIIDAE
Turbinaria

Colonies are foliose, encrusting or plates. Corallites are 1-5mm, simple turrets or holes in coenosteum which is smooth. no costa. septa neat & numerous

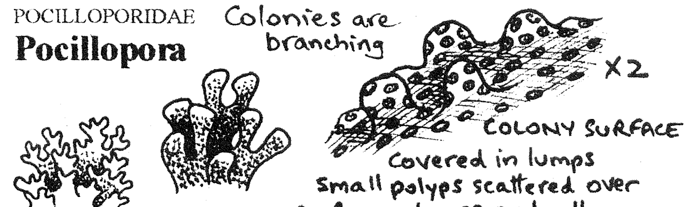


Copyright Geoff Kelly

 Beware: Some other organisms pose as 'hard' corals and can cause confusion. See page 7.

POCILLOPORIDAE
Pocillopora

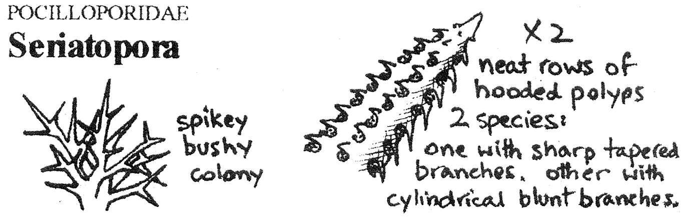
Colonies are branching



X2

COLONY SURFACE covered in lumps. Small polyps scattered over surface - lumps and all.

POCILLOPORIDAE
Seriatopora



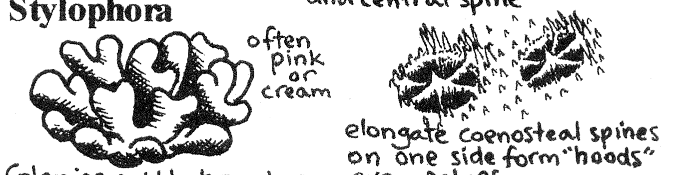
spikey bushy colony

X2 neat rows of hooded polyps. 2 species: one with sharp tapered branches. other with cylindrical blunt branches.

POCILLOPORIDAE
Stylophora

Polyps with six septa and central spine X6

often pink or cream

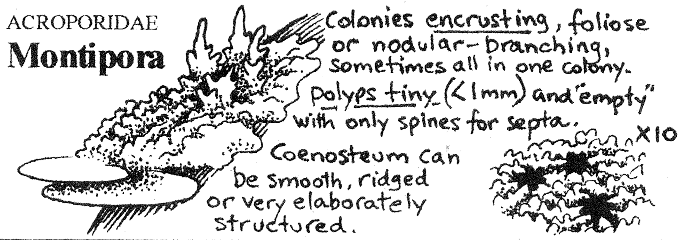


elongate coenosteal spines on one side form "hoods" over polyps.

Colonies nobbly branches

ACROPORIDAE
Montipora

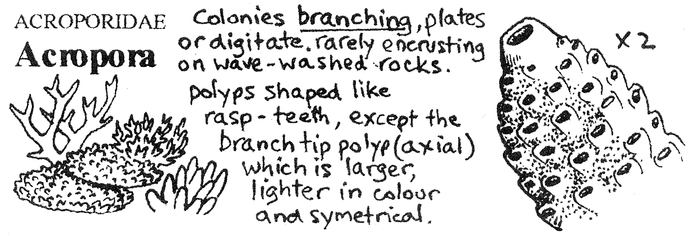
Colonies encrusting, foliose or nodular-branching, sometimes all in one colony. Polyps tiny (<1mm) and 'empty' with only spines for septa. X10



Coenosteum can be smooth, ridged or very elaborately structured.

ACROPORIDAE
Acropora

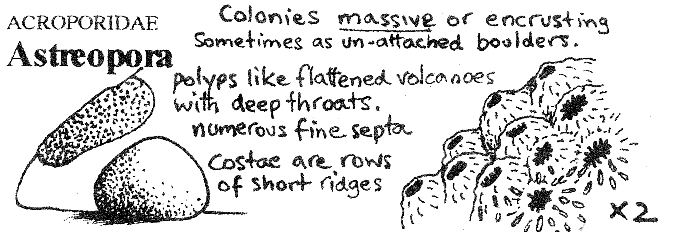
Colonies branching, plates or digitate, rarely encrusting on wave-washed rocks. Polyps shaped like rasp-teeth, except the branch tip polyp (axial) which is larger, lighter in colour and symetrical.



X2

ACROPORIDAE
Astreopora

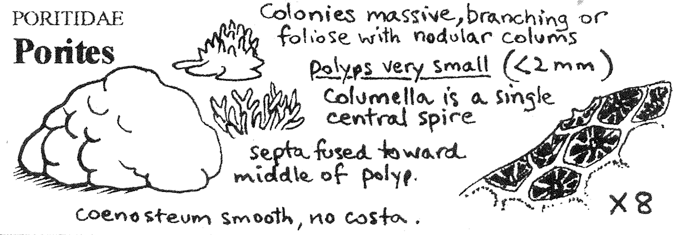
Colonies massive or encrusting. Sometimes as un-attached boulders. Polyps like flattened volcanoes with deep throats. numerous fine septa. Costae are rows of short ridges



X2

PORITIDAE
Porites

Colonies massive, branching or foliose with nodular colums. Polyps very small (<2mm). Columella is a single central spire. septa fused toward middle of polyp.

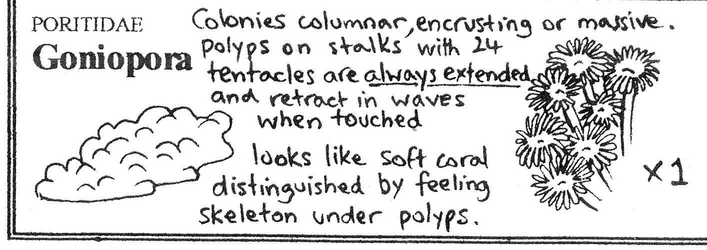


X8

coenosteum smooth, no costa.

PORITIDAE
Goniopora

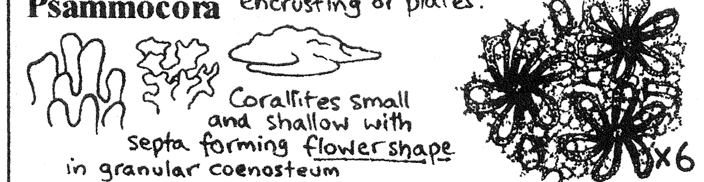
Colonies columnar, encrusting or massive. Polyps on stalks with 24 tentacles are always extended and retract in waves when touched. looks like soft coral distinguished by feeling skeleton under polyps.



X1

SIDERASTREIDAE
Psammocora

Colonies are columnar, branching, encrusting or plates.



Corallites small and shallow with septa forming flowershape in granular coenosteum

X6

AGARICIIDAE
Pavona

Colonies are encrusting, columnar, or "leafy" foliose. Septo-costae form continuous meandering lines between adjacent corallites.

X10

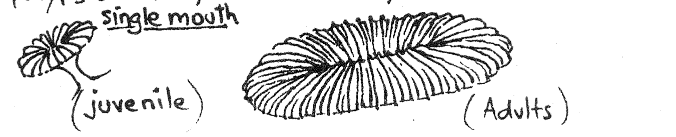
AGARICIIDAE
Pachyseris

Colonies are foliose to compressed-branching. fine, even septo-costa form ridges parallel to colony edges.

X5

FUNGIIDAE
Fungia

Solitary free-living polyp up to 400mm across. Circular or elongate. Polyps start life attached by a stalk. single mouth

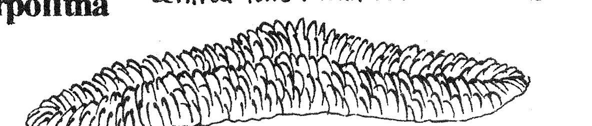


(juvenile)

(Adults)

FUNGIIDAE
Herpolitha

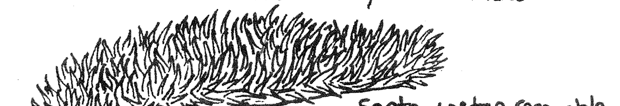
Elongate free-living colony central furrow with several mouths



Septa smooth or serrate. Septa do not extend to colony edge from mouth

FUNGIIDAE
Polyphyllia

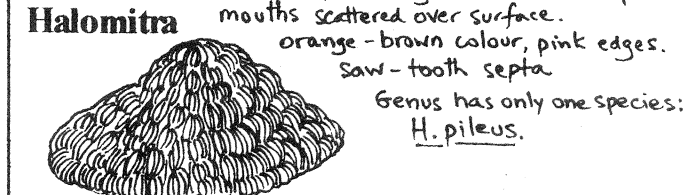
Elongate free-living colony mouths all over surface tentacles allways extended



Septo-costae resemble a smooth version of Psammocora.

FUNGIIDAE
Halomitra

Colony is free living dome or bell shape mouths scattered over surface. orange-brown colour, pink edges. Saw-tooth septa. Genus has only one species: H. pileus.



OCULINIDAE
Galaxea

Colonies are encrusting, massive or columnar. X2

Corallites are cylinders with a ring of sharp pointed septa like a rosette of knife blades. transparent white tentacles may extend below septa.

You are welcome to copy these pages on to underwater paper for use when diving.

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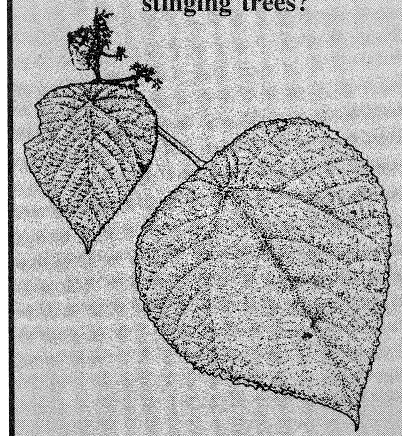
Questions & Answers

Q What insects eat the leaves of stinging trees?



A The caterpillars of white nymph butterflies as well as several stick insects, a weevil and a chrisomelid beetle (in the ladybird family) eat the leaves of the common stinging tree (*Dendrocnide moroides*) — the bush with heart-shaped serrated leaves which it is a good idea to avoid. (It is often the well-eaten leaves which sting us, since they are a lot less obvious than the whole ones.)

Green possums eat the leaves of the shiny-leafed stinging tree (*Dendrocnide photinophylla*).

Q What has happened to the EMC monies?

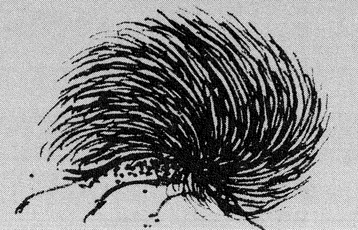
A When the EMC (Environmental Management Charge) monies were collected at the rate of $1 a head, they had agreed destinations. Of the $1.5 million per year, 70 percent went to the CRC Reef Research Centre, 20 percent to industry-based education and training programs and 10 percent to administrative costs.

When the Government decided to increase the EMC, this changed. As before, all EMC monies go into Consolidated Revenue and the exact same amount is appropriated back to the Authority. It then goes into the general Authority budget and is not targeted for specific projects. The Authority still has an agreement with the CRC — it paid it $975,000 for the 98/99 fiscal year, and $1,020,000 for the 99/00 fiscal year. However, this is not specifically EMC monies.

Q I have recently noticed the turtle weed around the Keppel Islands becoming bleached in some areas. Why is this so? I presume it's a regular thing everywhere.

A It is probably reproducing — like so many other things on the reef at the moment. The algae release gametes (the sexual bits) into the water and then die back. Whether there is recovery from the same plants, like grass after a dry spell, is uncertain.

Calcareous algae — *Halimeda* species — definitely does die completely, leaving a hard white skeleton which breaks down to become an important component of sand on the reef. Turtle weed, however, seems to recover.



Facts and stats

on corals

About 500 species of hard corals are known from the Indo-Pacific. About 70 percent of these are found in Australian waters.

Zooxanthellae, the algal cells which live inside the coral polyp's tissue, providing a substantial amount of food through the process of photosynthesis, are approximately 0.008-0.012mm in diameter. Normally a coral has about 5 million zooxanthellae in each square centimetre of tissue but when the coral is bleached this generally drops to about half a million.

The tissue at the tips of staghorn branches is usually paler than the rest of the colony because the zooxanthellae have not had time to colonise the newly formed, rapidly growing tissue.

Three species of coral (Montiporas) have been observed spawning twice a year at Magnetic Island (near Townsville) — in autumn as well as in spring. Not all colonies spawned in autumn and it was not as intense as the spring event. It seems to vary from year to year. Corals in Western Australian waters have their main spawning in autumn.

Tourist talk

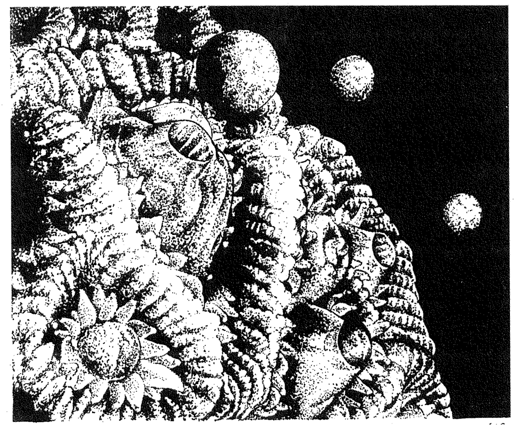
ENGLISH	GERMAN	JAPANESE	
species	Arten	shu	種
family	Familie	ka	科
genera	Gattungen	zoku	属
skeleton	Korallenskelett	kokkaku	骨格
shape (form)	Form	katachi	形
to change	verändern	henka suru	変化する
colony	Kolonie	colony	コロニー
plate	Platte, Teller	ita	板
massive	riesig, massiv	tairyo no	大量の
branching	verzweigt	edajo no	枝状の

What are families and genera?

A hierarchical system is used for categorising plants and animals. The broadest category is the phylum which includes all animals or plants which are thought to have a common evolutionary origin. For example all vertebrates (those animals with backbones) are in the phylum Chordata. Corals, along with anemones and jellyfish are in the phylum Cnidaria. The phylum is then subdivided into various classes (eg. Mammalia). Further subdivisions are orders, families, genera and finally species.

Think of John Smith. He can be categorised as follows: **Order**: Human; **Family**: Caucasian; **Genera**: Smith; **Species**: John. His common name might be Jack. The coral identification on pages 4 and 5 deal with families and genera.

Out and about



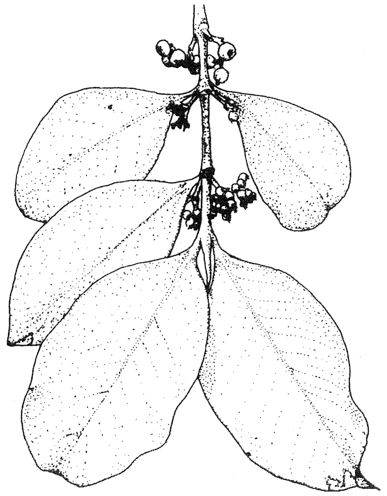
A Goniastrea *coral colony releasing egg and sperm bundles from the polyp mouths.*

It's **coral spawning** time again. In theory, most of the Reef is expected to perform from about 26 to 30 November — although, as always, this is only a prediction of a natural event which has a habit of confounding the experts.

The corals around Magnetic Island usually spawn a month before the rest of the Reef due to the warmer water temperatures. However, this year, despite ideal conditions, not all the corals spawned. Examination showed that many corals contained eggs but that they were pale and immature, so these colonies are expected to spawn in November. It is thought that this is due to continued stress from the severe coral bleaching event of early 1998. Last year only 40 percent of the corals around Magnetic Island reproduced. This year there is an 80 percent fecundity level, which is obviously better, but the effects of the 1998 event still seem to be affecting the corals (there was very little bleaching this year). Those corals which survived the bleaching have probably been putting their energies into recovery rather than egg production, which starts in about June.

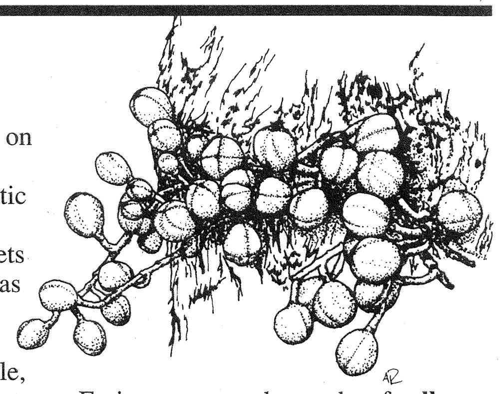
This is the first time a split spawning has been observed at Magnetic Island at this time of year (when the October full moon has been late in the month). Therefore, it is thought that corals elsewhere on the GBR may follow this pattern, some spawning in November while others may wait until December (26-30). It would be interesting to hear of any observations of spawning. If you feel like sharing your experiences, please write to the editor — postal and e-mail addresses on page 8.

Two Cairns-based DPI marine biologists have been working on **an underwater alarm system**. Known as pingers, the acoustic alarms are intended to warn marine mammals away from nets — they have been described as the equivalent of 'wet paint' signs. The alarms are audible to any marine mammal — whale, dolphin and dugong — but not to sharks and other fish. The intention is not to frighten or chase away the mammals from their habitat, just to warn them that there is something to avoid. A major study to examine the effectiveness of the pingers in Queensland waters has yet to begin, but preliminary results suggest that some of the devices are working well, especially with humpback whales.

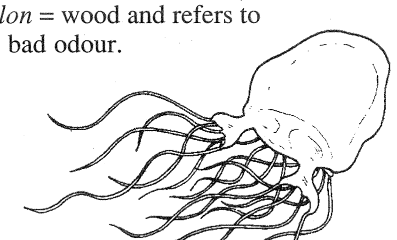


Fruit-eating birds are attracted to **corky bark** (*Carallia brachiata*) trees at this time of year, as the orange fruit begin to ripen. This tree is a member of the Rhizophoraceae family of mangroves but is one which has adapted to rainforest habitats. A bushy tree, with glossy leaves, it makes a good addition to the garden or resort. It also attracts the attractive black, white and yellow day-flying four-o'clock moths, whose caterpillars feed on the foliage.

Correction:
In *Tropical Topics* 57 it was incorrectly stated that Mueller's stag beetle is 'one of only a handful of Australian insects to be protected by law.' It is not protected.



Fruits appear on the trunks of **yellow mahogany** (*Dysoxylum schiffneri*) trees in November and December. This is one of many species of rainforest trees which produce flowers and fruits on the trunk — a habit known as cauliflory. It is thought that in a dense rainforest, this makes them more accessible for pollinating and dispersing animals. The white blossoms have four petals and only a few stamens set in a tube around the stigma. The brown fruit capsules split open to reveal quite large seeds with a fleshy covering which is attractive to birds. Incidentally, the word *Dysoxylum* comes from *dys* = bad and *xylon* = wood and refers to its bad odour.



Look out for **box jellyfish** as the sea warms and the rains flush the new generation of these potential killers out of the creeks where they have been developing over winter. Box jellies do have eyes — eight, in fact, grouped in pairs on the sides of their cube-like bells — and may try to avoid us. Experiments with specimens in tanks have shown that they always avoid black shapes (but ignore white ones). Although it does not have a brain or central nervous system, the jellyfish has a nerve net in its tissue which acts as a simple feedback loop — a reflex action. When a shadow goes across the eye, the muscles start contracting and cause the animal to turn. It is thought that this helps them to escape from predators such as turtles and fish and to navigate around obstructions which might tear their delicate tissues. In fact, they probably try to avoid humans in the water, if given the chance; stings usually occur when people blunder into them.