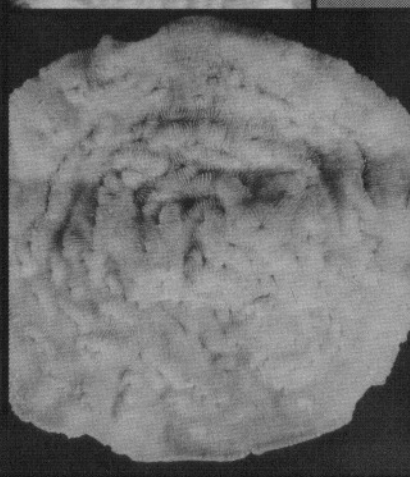
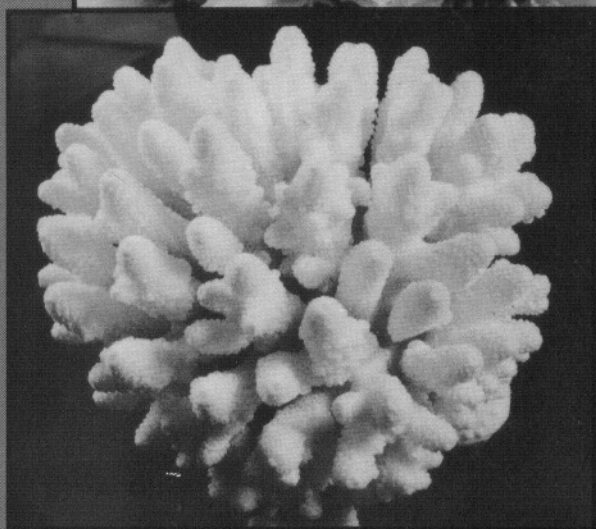
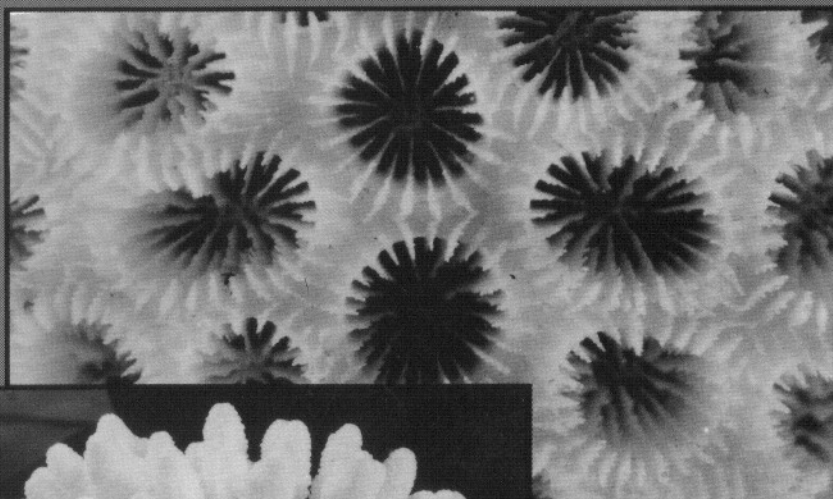


GENERIC GUIDE TO SELECTED CORALS OF MALDIVES

By Hussein Zahir and Ibrahim Naeem



**Marine Research Section
Ministry of Fisheries and Agriculture**

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**Marine Research Section
Ministry of Fisheries and Agriculture**

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INTRODUCTION

The Maldives is a country built by corals. It is made up exclusively of coral atolls and associated coral structures. Coral reefs are the foundation and source of material for every island in the country. They also form a natural line of sea defence for these islands. Coral reefs provide a habitat and refuge for reef fish and other reef associated organisms. These in turn support valuable fisheries and are of prime importance as attractions for the tourism industry.

Without corals there would be no Maldives. However, corals and coral reefs are under increasing pressure in the Maldives from numerous sources including coral mining, dredging and localized pollution. These in turn are a reflection of the growing Maldivian population, the growing number of tourist arrivals, and the growing affluence of both groups. Events beyond the control of the Maldives, notably global warming, are also likely to have a negative impact on Maldivian corals and coral reefs. Without healthy coral reefs, islands will be eroded and reef fish resources adversely affected. Island communities, and the two major industries, fisheries and tourism, would suffer. It is therefore imperative that efforts are made from an early stage to understand the processes affecting coral reefs, and to take mitigating action wherever possible. This requires a sound understanding of coral taxonomy.

Early studies of the reefs and corals of the Maldives were made by the famous naturalist Charles Darwin (1842), and also by John Stanley Gardiner (1903, 1906) and Alexander Agassiz (1903). The "Xarifa" expedition of 1957-58 led by Hans Hass was the first diving expedition to the Maldives. A major collection of corals was made and deposited at the Hessian State Museum, Germany. Publications on corals include Scheer (1972, 1974 & 1978) and Pillai and Scheer (1976). The Cambridge University expedition of 1964 led by David Stoddart also made significant contributions to the understanding of Maldivian reefs and stony corals. Publications include Stoddart (1966), Wells and Davies (1966) and Davies, Stoddart and Sigee (1971).

Recent studies on corals include those undertaken by foreign scientists visiting the Maldives as tourists (Ciarapica and Passeri, 1993; Morri, Bianchi and Aliani, 1995) and those under the auspices of the Marine Research Section (MRS). MRS was formed within the then Ministry of Fisheries in 1984, and a summary of the work undertaken up to 1994 is provided in MRS (1995). Coral reef research has been given priority and efforts have been made to understand the dynamics of coral reef ecosystems. In particular, attempts have been made to identify the major threats to coral reefs, and much work has been done on the effects of coral mining. One constraint faced by MRS staff in this work has been the difficulty in identifying corals.

Pillai and Scheer (1976) provided a major review of Maldivian stony corals. They described 147 species from their collections, and cited literature records of a further 94 species, making a total of 241 species. Sheppard (1987) synonymized this list, and suggested that the total number of valid species known from the Maldives was 166. Within MRS a coral collection programme was initiated with the objective of establishing a national a coral reference collection. Over 150 corals specimens have been collected and identified. Clark (1995) reviewed these recent collections of corals. She suggested that the total number of hermatypic corals recorded from the Maldives to date is about 200 species, representing over 60 genera (Appendix 1). Non-scleractinian cnidarians have been poorly studied.

The objectives of this book are twofold: first to provide descriptions and guidance for identification of common coral genera so far collected and recorded at the Marine Research Section in the Maldives. Secondly, the book also seeks to further the readers' knowledge of corals and coral reefs in the Maldives by providing available local names of corals, and information on their biology and utilization.

The Marine Research Section continues to collect and identify corals and hopes to publish a more comprehensive guide to corals of Maldives in the future. It is our hope that this first publication on Maldivian corals will help the reader to appreciate the variety and abundance of corals and to increase our knowledge of coral reefs.

CORAL MINING IN MALDIVES

Within the Maldives corals are the only indigenous source of building stone. They are also the only source of aggregate and sand. Not surprisingly therefore corals are a major source of building materials in the Maldives. Coral mining is a major source of revenue for many people, but it is also the major cause of damage to coral reefs.

The demand for coral has increased at an enormous rate during the last two decades. Recent studies suggest that coral mining is no longer a sustainable activity. In the 1980s, the demand for coral aggregate for the construction industry in Malé Atoll was estimated at 0.5 million cubic feet/year. Although no recent estimates have been made, it is thought that current demand is probably at the limit of supply. Furthermore, with current methods of mining it is thought that the supply of coral building materials in North Malé Atoll will be exhausted within a maximum of 20 years.

In addition to the difficulties of maintaining a steady supply of building materials in the face of dwindling coral stocks, there are many other problems associated with the current mining practices. Biological surveys of mined sites indicate that the coral and fish diversity and abundance have been dramatically reduced. Sea defence capabilities of reefs are also reduced by mining. In addition, little recovery is seen at sites intensively mined over 20 years ago.

Coral mining clearly has long lasting impacts on the reef environment. The successful management of coral mining activities requires a strong legal foundation, which defines the environmental standards related to coral mining. The Government of Maldives is concerned with environmental implications of coral mining and is determined to control mining with legislation. An alternative source of building material need to be identified in order that coral mining be completely banned.

Historical development of coral mining

Coral mining has a long history in the Maldives. The predominant sources of building material in earlier days were coconut palms and other local timbers. Coral rock was only used for more important constructions, such as tomb stones, wells and mosques. In most cases large massive coral heads (*Porites*) were collected for such works. Apart from their use as building bricks, corals and coral aggregate were also used to make lime (*uva*) by burning.

Development of the fishing and tourism industries since the early 1970's has brought more money to the island communities. As a result, construction of coral houses became a priority for people in many islands. In addition, public buildings such as schools,

offices and mosques were considered important components in island development and their construction rate increased. In consequence, the quantity of coral being mined increased, and coral mining became more widespread throughout the archipelago.

However, the greatest development of coral mining activities has been in the central Maldives. With the introduction of tourism and with increased development in Malé, the construction industry grew at a tremendous rate and demand for construction materials increased exponentially. Easily accessible reefs were soon exhausted, and other suitable reefs have become increasingly scarce and the government had imposed tentative regulations for coral mining activities in the country.

Uses of Corals

Corals are mined in the Maldives mainly for the construction of houses and other buildings. The main types of corals mined are massive varieties such as Poritids and Faviids. Large corals are broken up manually into smaller pieces and used to build walls. Groynes, solid jetties, breakwaters and sea walls are also constructed from massive corals, although in these cases they are not broken up into smaller pieces. Corals are also used in the construction of causeways in some parts of the country.

Another major use of corals is in the making of lime or *uva*. For many local communities it is cheaper to produce lime locally than to buy imported cement. Naturally occurring coral aggregate (*akiri*) is burned in a pit in the ground using locally available firewood. The coral rock (calcium carbonate) is converted to lime (calcium oxide) by the heat.

Coral Mining Areas

Until quite recently, corals were usually mined from the reef flats of island house reefs. In many islands the reef is close to the island, so collection is very easy. However, in many cases this led to erosion of island beaches. Current regulations do not allow coral mining from island house reefs. Professional coral miners tend to choose accessible shallow ring reefs (*faros*) to mine corals; mining tends to be carried out on the inner rims. In atolls with few ring reefs mining activity is concentrated on the lagoon side of outer atoll rim reefs.

Methods of Coral Mining

Coral mining methods are manual and labour intensive. Having chosen a suitable reef, the miners travel to the site by boat. Corals are broken up with iron bars to manageable sizes. Some massive corals may be small enough to be mined without breaking. The

corals are lifted by hand on to the boat. When enough has been collected it is transported to the island, where the coral lumps are left to be dried and cleaned by the sun and rain.

Coral mining is not carried out on a large-scale commercial basis throughout the country. In most atolls mining is carried out on a minor scale. Large scale commercial mining is normally only carried out by miners from Ari Atoll. In this atoll two islands, *Fenfushi* and *Maamingilli*, are famous for coral mining. Miners work under contract for construction companies in Malé, tourist resort islands, and in many other atolls country-wide. Recent harbour improvement projects in many atolls had led to an increase in the demand of corals for harbour wall constructions.

Coral mining forms an important source of income for at least some island communities. The Government is aware of the financial loss of income to these miners that may arise as a result of its attempts to seek alternatives for coral mining, but at the same time is deeply concerned about the current level of coral mining.

Environmental Impacts of Current Coral Mining Activities

Coral mining is believed to be the most serious threat to reefs in the Maldives. Population growth, combined with increased wealth from tourism and the fishery industries, has created a steadily increasing demand for building materials from coral reefs. This in turn has led to increased reef damage.

The biological and physical impacts of coral mining on reefs in Malé Atoll have been relatively well studied. Live coral cover on reefs subject to coral mining is very low compared to unmined reefs (Brown and Dunne, 1988). Abundance of reef fish is significantly lower on mined reefs compared to non-mined reefs (Brown et al., 1990; Shepherd et al., 1992). In addition, little recovery is seen at some mined sites over a 20 year period.

Physical impact of coral mining depends on the type of reefs in question. No immediate effect may be observed with coral mining at an isolated ring reef. However if house reefs of islands are subject to mining activities there may be adverse effects. Island house reefs act as physical barriers, protecting the coral islands against wave action, by dissipating most of the energy in the incoming waves before they reach the beach line. Mining corals from the reef flats effectively remove this physical barrier and leaves the islands exposed to increased wave action, swells and storm surges and consequently beach erosion. The sediment dynamics of coral islands may be also altered as a result of altered flow regimes.

Regulations regarding coral mining

The Government of Maldives is concerned about the environmental implications of coral mining. In 1992 preliminary regulations were introduced to control mining activities. The following controls are now in effect in the country.

1. Mining cannot be carried out on island house reefs.
2. Mining cannot be carried out on atoll rim reefs or common bait fishing reefs.
3. Permission is required from the atoll office to mine coral. Each applicant must apply through the island office to the atoll office. The island office is required to estimate the quantity of corals needed for the job in hand, and hence should ensure that only the required amount is granted.
4. Every island is required to keep a log book of the amount of corals mined.
5. The export of corals is banned.

The Ministry of Fisheries and Agriculture is the responsible authority for the formulation of regulations regarding coral mining. The Ministry has been formulating comprehensive coral mining regulations, and more stringent controls are expected in 1997. Under the new regulations coral mining will be restricted to specific areas and monitored very closely.

FORMATION OF THE MALDIVES

Ancient history

The Maldives is a linear atoll chain stretching north-south from approximately 7° N to 0.5° S along 73° E in the central Indian Ocean. The Maldivian atolls form the central and largest part of the Chagos-Laccadives Ridge. This Ridge is part of a still larger feature that stretches from the late Cretaceous early Tertiary (66-68 million years old) Deccan Traps of India (centred at about 20°N) to the volcanically active island of Réunion in 21°S (Morgan, 1981; Duncan and Hargreaves, 1990). The Maldives themselves comprise an early to mid-Tertiary (50-60 million years old) volcanic basement overlain with approximately 2000m of shallow-water carbonate (Purdy, 1981; Duncan and Hargreaves, 1990; Purdy and Bertram, 1993, see also Glennie, 1936).

The Chagos-Laccadives Ridge lies on an ocean plate that was formed during the last 100 million years or so, as India drifted away from Africa and travelled north to crash into the rest of Asia. As it did so it passed over a stationary hotspot underlying the position of present day Réunion. This resulted in the volcanic outpourings of the hotspot being drawn out in a long line, from the Deccan Traps in the north, through the Laccadives, Maldives and Chagos, to Mauritius and Réunion in the south. Thus the atolls of the Maldives are oldest in the north and youngest in the south.

In the region of the Laccadives, Maldives and Chagos the volcanic ridge must have reached to at least the sea surface in many places, where its margins would have been colonized by corals. As the volcanic ridge subsided there would have been a classic Darwinian progression from fringing to barrier to atoll reefs. Continued subsidence has resulted in the accumulation of over 2000m of carbonates of shallow water origin on top of the now much reduced volcanic ridge.

More recent history

The crest of the Maldivian carbonate ridge must have been exposed and subject to subaerial (i.e. rain and wind) erosion during periods of low sea level, notably during ice-ages. The most recent sea level minimum was reached at the glacial maximum, perhaps 20,000 years ago. Although there are considerable regional and other variations, the depth to which sea level dropped is often taken as 120m. At that time the Maldivian atolls must have stood out from the sea as giant steep-sided, plateau-topped islands. The surfaces of these plateaus would have been worn down by erosion. As a result, when sea level rose again the atolls would have been completely submerged. The eroded surfaces of the reefs may have been at about 15-30m below the current sea level.

At the end of the last glaciation the sea rose rapidly, reaching something near its present level about 6,000 years ago. Reef growth was slower, and the reefs did not 'catch-up' with sea level until about 3,000 years ago (Woodroffe, 1993). Therefore the present Maldivian islands cannot be much more than about 3,000 years old, even though the Maldivian atoll chain has been in existence for some 50-60 million years.

The Maldivian atolls show two peculiar features that are not easily explained within the conventional Darwinian framework. One is the double line of atolls in the central Maldives. The other is the presence of numerous ring-shaped reefs or *faros*.

Double atoll chain

In the centre of the Maldives the atolls form a double chain, separated by an 'inner sea' with an depth of about 250-400m, known locally as the *Alihuras Kandu*. How this unusual feature was formed is not known, but the most convincing scenario to date is provided by Purdy and Bertram (1993). They suggest that the original extrusion of hot spot basalt was unusually broad (in an east-west sense) in this area. Associated with this extrusion was a modest amount of crustal stretching, indicated in seismic records by a fault and subsidence system in the centre of the extrusion. Later as the basalts cooled, the thickest central portion would have contracted more than the edges, resulting in the formation of a 'sag basin' by the mid-Oligocene, about 30 million years ago. This simple picture is complicated by periodic changes in sea level that have occurred in the past. Nevertheless, coral reef growth on either side of this basin since then has tended to be towards the centre of the inner sea. To date this has resulted in the formation of the double row of atolls. Eventually (i.e. in several million years time) it may result in the coalescing of the atolls to form a single massive coral platform.

Ring reefs

Maldivian atolls, particularly the northern and central ones, contain ring shaped reefs known as *faros*. Although common in the Maldives, faros are relatively rare elsewhere. There are two main types of explanation for the formation of faros: those relating their structure to the nature of their growth, and those relating them to the nature of their foundations.

Charles Darwin was the first to speculate on the origin of faros. He noted that they were common in the north and central Maldives where there are many gaps in the outer atoll rims, but rare in the south where atoll rims are more continuous. He suggested that the

numerous channels in the north and centre allowed more 'fresh' ocean water into the atolls, therefore allowing corals inside the atolls to flourish. This concept was later developed to take account of the seasonally alternating monsoons. As these bring currents and waves onto alternating sides of the reefs it is reasonable to suppose that the reefs will grow outwards in two directions, in ring-like shapes. The scarcity of faros in southern Maldives is explained by the more complete atoll rims and lesser strength of the monsoons there compared to the north and centre.

An alternative hypothesis is that faros are ring-shaped because they have grown from ring-shaped foundations. During the last ice age when the tops of the Maldivian atolls were exposed, the limestone would have been subject to erosion. Limestone eroded by rain water tends to become sculpted into saucer-like shapes, each with a raised rim around a central depression. When sea level rose again after the ice age, these saucer-shaped foundations would have tended to support the growth of ring-shaped reefs. This hypothesis appears to work well for atoll rim faros (Purdy and Bertram, 1993) but is less convincing for atoll lagoon faros.

Corals do not get all their nutrients from the plankton that they catch. Microscopic algae known as zooxanthellae live symbiotically within the polyp tissues. These unicellular algae use sunlight to make organic carbon through photosynthesis. This explains why most luxuriant coral growths are found in well lit shallow areas. Indeed the depths to which reef building corals can grow is limited. Hermatypic corals (those which possess zooxanthellae in their tissues) are provided with some of the organic carbon produced by the zooxanthellae as a result of photosynthesis of the calcium carbonate skeleton occurs at a much faster rate in corals that have zooxanthellae in their tissue than in ahermatypic corals (those without zooxanthellae).



CORAL STRUCTURE AND BIOLOGY

The Polyp

Coral is a general term used to describe a variety of related forms of animals belonging to the phylum *Cnidaria*. The living part of the coral is very simple, resembling an anemone, and is known as the **polyp**. The polyp mouth is surrounded by soft tentacles which can be retracted or extended for feeding or to other stimulus. Some species have tentacles which have special stinging cells called **nematocysts**, which release toxic chemicals upon contact. These cells help to capture planktonic prey and act as a defensive mechanism in competition for space with other species of corals.

Zooxanthellae

Corals do not get all their nutrients from the plankton that they catch. Microscopic algae known as **zooxanthellae** live symbiotically within the polyp tissues. These unicellular algae use sunlight to make organic carbon through **photosynthesis**. This explains why most luxurious coral growths are found in well lit shallow areas. Indeed the depths to which reef building corals can grow is limited. **Hermatypic** corals (those which possess zooxanthellae in their tissues) are provided with some of the organic carbon produced by the zooxanthellae. As a result deposition of the calcium carbonate skeleton occurs at a much faster rate in corals that have zooxanthellae in their tissue than in **ahermatypic** corals (those without zooxanthellae).

Reproduction

All corals devote a substantial part of their energy to **sexual** reproduction. This may be via either internal fertilisation (swimming mobile sperm), or external fertilisation (the release of sperms and eggs into the water). In all cases the end result of sexual reproduction is the development of small mobile **planula larvae**. These larvae are a means of long distance dispersal. Additionally most coral species also engage in **asexual** reproduction. Asexual reproduction takes in the form of **budding**. Daughter polyps may arise from the dividing of an existing polyp (**intratentacular** budding) or from the side of an existing polyp (**extratentacular** budding). It is in this way that coral colonies are formed.

Structure and Classification of Corals

The corallite

The skeletal parts secreted by an individual polyp is called the **corallite**. The polyp sits in the cup like corallite. Within the corallite are series of vertical radiating **septa**, which divide the corallite radially into 6 or more divisions. The skeleton between the corallites are known as **coenosteum**. When the septa pass over the coenosteum they are referred to as **costae**. In some cases the distinction between septa and costae is indistinct and they are termed **septo-costae**. Vertical tooth-like structures known as **paliform lobes** may be formed at the inner end of some septa. An axial structure known as **columella** is usually developed at the centre of each corallite. This may be of different shapes. The entire coral skeleton is known as the **corallum**. Specific arrangements and characteristics of the septa, costae, columella, corallites and corallum are all important features with regard to identification.

The method of budding used by the polyps is also often an important aid to identification, with the skeletal arrangement reflecting the budding patterns of the polyps. In intratentacular budding the corallite divides from the middle. In extratentacular budding a new corallite appears from the outside of the parent corallite.

Coral Growth Forms

Corals that form colonies do so by asexual reproduction in the form of budding. If the corallites of a colony have their own walls they are called **plocoid** or **phaceloid** and depends on the length of the corallite. If the colonies share common walls they are called **cerioid** or **meandroid** depending whether they form valleys or not.

The most common types of growth forms are **massive** (similar in all sides), **columnar** (forming columns), **encrusting** (adhering to the substrate), **branching** (tree like or finger like), **foliaceous** (leaf-like) and **laminar** (plate like).

Considerable growth form variation may occur within one species depending on where it grows. These variations can be easily seen on a reef slope. Corals on the upper slope exposed to pounding waves tend to be solid and robustly structured. Further down the slope where the wave action is less coral colonies become large and delicate and the structure may be reduced to thin plates. Such variation in growth form needs to be taken into account when identifying coral species.

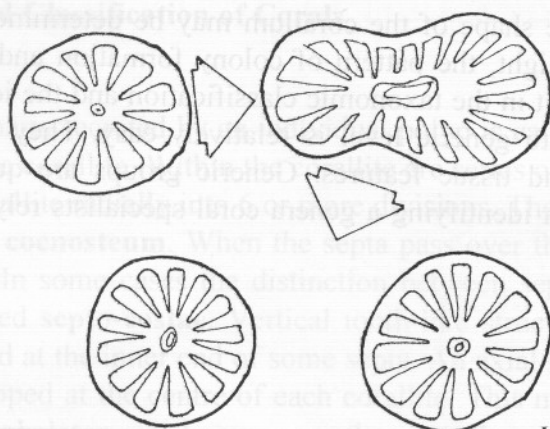
Classification

The appearance of living coral under water, its growth form, shape and colour of its polyp are all important features in identification of corals. Corallum shapes and growth

forms vary markedly. While the shape of the corallum may be determined by depth, wave action and availability of light, the pattern of colony formation and the growth form of the colonies are important in the taxonomic classification and the identification corals. Identification of corals to generic level is relatively easy. They are grouped according to general skeletal and tissue features. Generic groups are quite distinct. However where there is doubt in identifying a genera coral specialists rely entirely on the details of skeletal structure.

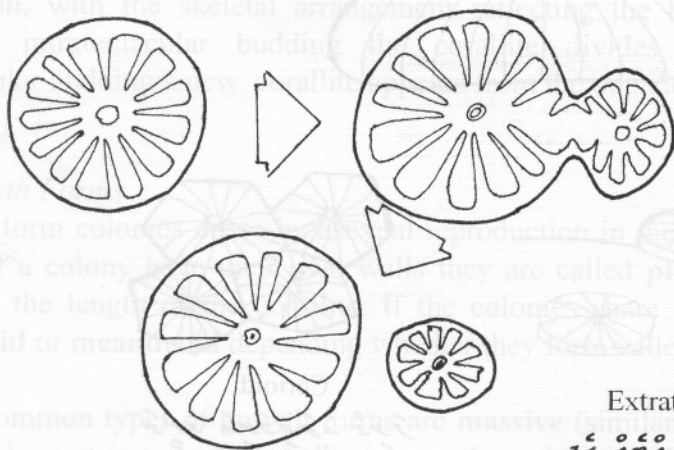


Structural diversity of corals
 ساختہ کی تنوع



Intratentacular

مادر و فرزند در یک تنتاکل

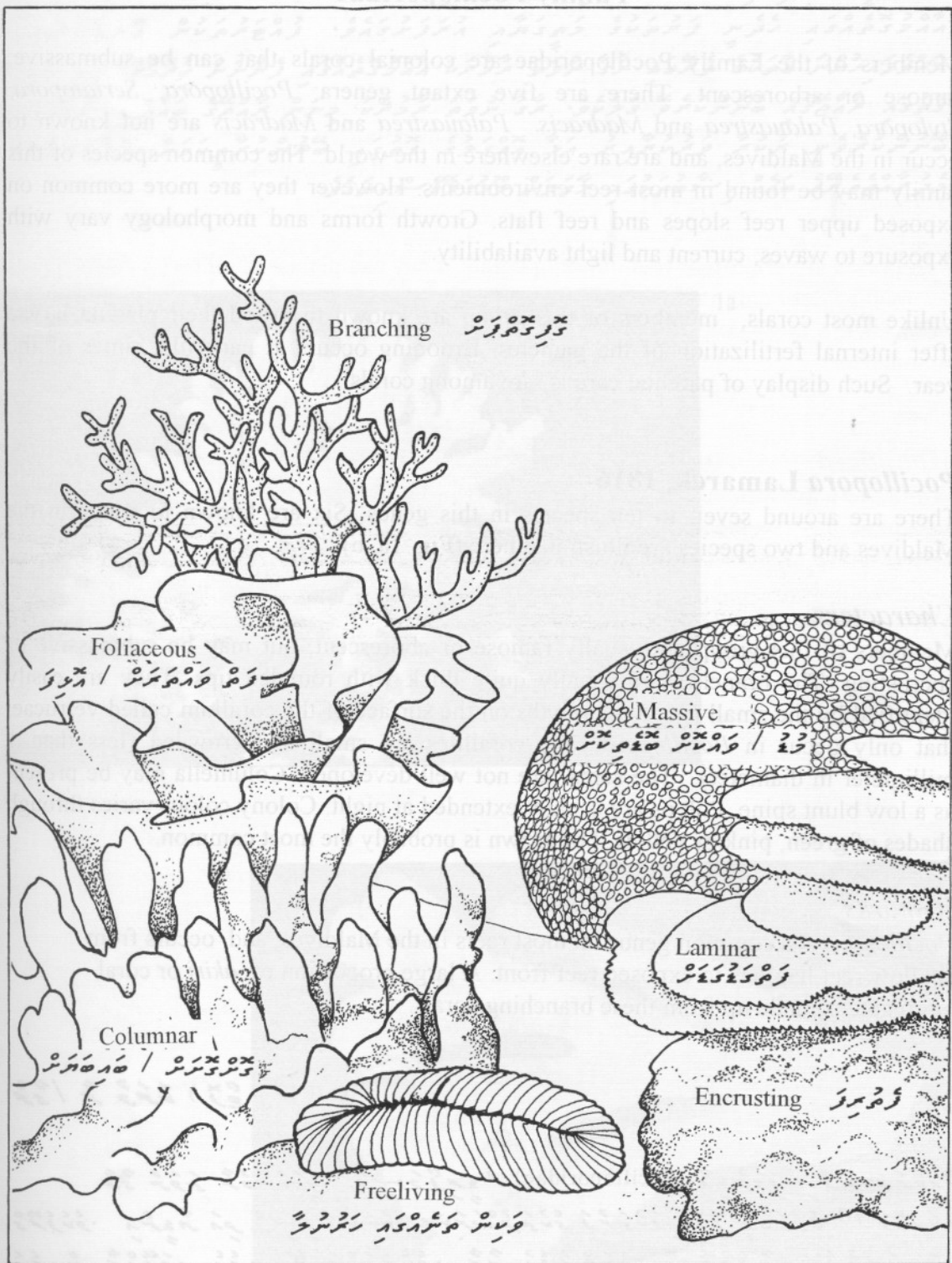


Extratentacular

مادر و فرزند در دو تنتاکل

The two main types of asexual reproduction in corals

دو نوع اصلی تکثیر بی‌جنسی در مرجانها



Growth forms of corals

نمط نمو الشعاب المرجانية

Members of the Family Pocilloporidae are colonial corals that can be submassive, ramose or arborescent. There are five extant genera: *Pocillopora*, *Seriatopora*, *Stylopora*, *Palauastrea* and *Madracis*. *Palauastrea* and *Madracis* are not known to occur in the Maldives, and are rare elsewhere in the world. The common species of this family may be found in most reef environments. However they are more common on exposed upper reef slopes and reef flats. Growth forms and morphology vary with exposure to waves, current and light availability.

Pocillopora Lamarck, 1816

Characters

Remarks

(1a, b $\frac{1}{2}$) $\frac{1}{2}$ / $\frac{1}{2}$

16

Family Acroporidae

exposed upper reef slopes and reef flats. Growth forms and morphology vary with

abundance.

Montipora Blainville, 1830

While there are around 200 nominal species in this genus, the numbers of true species are unknown. Twelve species are known to occur in the Maldives and one is illustrated here (Fig. 2).

Characters

Members of this group may be submassive, foliaceous, ramose or encrusting. They possess very small corallites (less than 1mm in diameter) and may sometimes be confused with the genus *Porites*. *Montipora* appears to be lacking in any skeletal structures within the corallites. Septa are usually short and project inwards making them difficult to see with the naked eye. The skeleton joining the corallites together (coenosteum) largely differs between species and is used in identification. Quite often there are ornamentations and depending on their size they are referred to as papillae or tuberculae (small or large respectively). There is a wide variation in colour. Living colonies may be brown, yellow, green or purple. Polyps are small, with minute white tentacles that may be extended during the day but usually at night.

Remarks

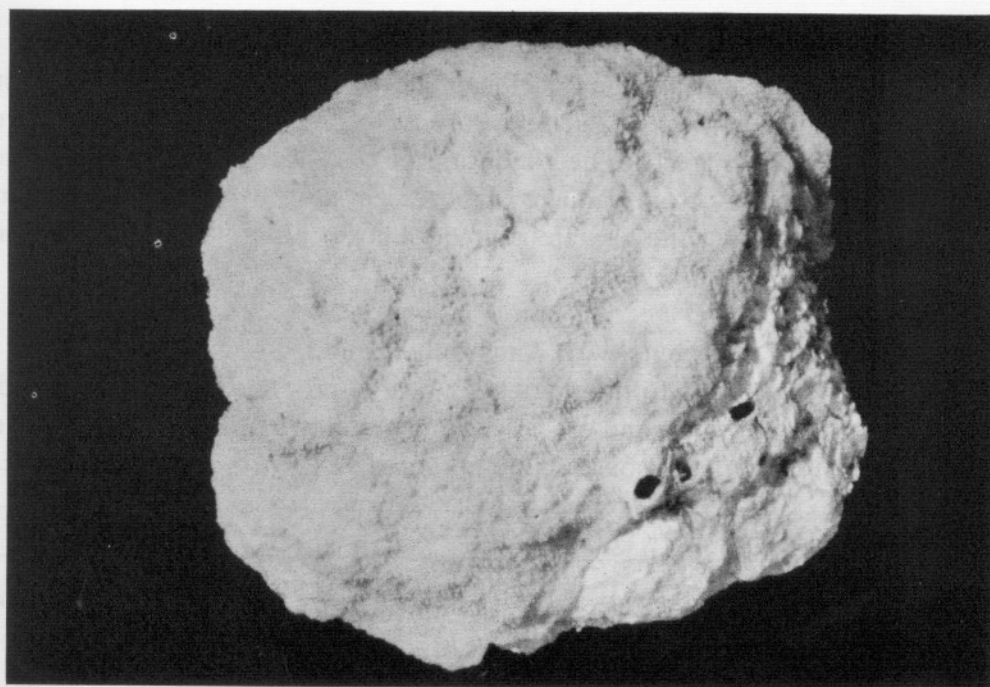
Montipora is a common genus occurring in most reef habitats, and appear to be widespread throughout the Maldives. These corals are not exploited by coral miners, probably due to their loosely porous structure and growth forms.

تَرْجُومَةُ وَجْهٍ (٢٠)

[illegible]

[illegible]

دھوقہ کی کھنڈ میں قوم نے اس کو سزا دے کر مار ڈالا۔
سورائنہ وینسنٹ "فریمر جیکب" میں سے تھی اور اس کا



Acropora Oken, 1815

There are around 350 nominal species of *Acropora*, the number of true species being approximately 150. This is the largest genus of all extant scleractinia. It is an important group being the most abundant on most Maldivian reefs. Around 50 species are known to occur in the Maldives, of which seven are illustrated here (Fig. 3a-g). Recognition of the genus is easy. However identification of species is made difficult by the large number of colonies, with huge array of shapes and colours that may be present on any given reef. The common names for many of these species are 'elkhorn' or 'staghorn' corals due to the resemblance.

Characters

Acropora colonies display many growth forms, the main ones being: aborescent; tabulate or plate-like; corymbose; digitate and caespitose. Coralites are of two types, axial and radial. Almost all species of *Acropora* possess axial corallites that are usually at the tip of each branch or branchlet. Septa are poorly developed. There is no columella. Coralite wall and the coenosteum are porous. *Acropora* are amongst the most brightly coloured corals on the reef. They are often creamy, yellow, blue, green, purple, red or brownish in colour with different coloured branch tips. Polyps are usually extended only at night.

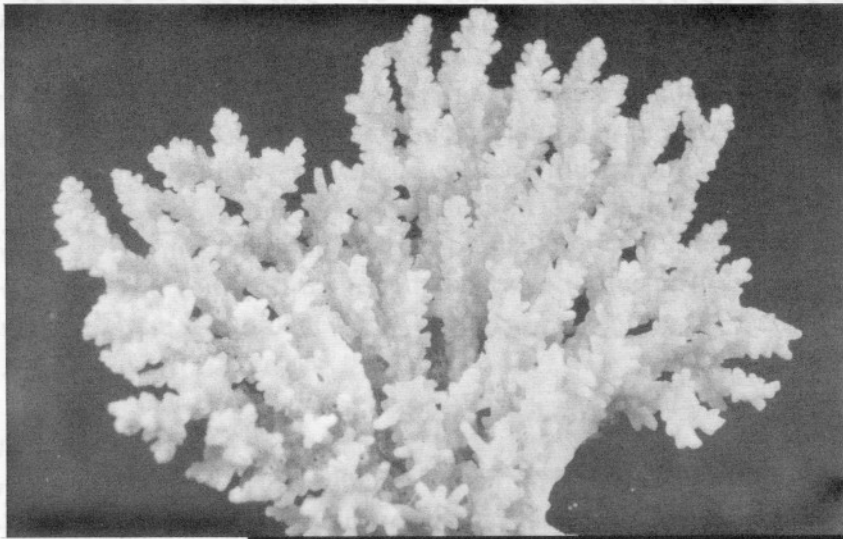
Remarks

Acropora are able to dominate in all reef habitats, and are particularly common on upper reef slopes and reef flats. The light porous skeleton and the branched growth allow them overgrow and overtake neighbouring colonies. These colonies tend to re-establish themselves readily from damage. Arborescent and plate-like colonies tend to flourish in sheltered areas, while digitate and corymbose colonies are able to persist in more exposed environments.

Branching members of this genus are commonly exploited for making *uva* as their porous skeletal structure turns to lime quickly. A large proportion of *akiri* is made up from broken pieces of *Acropora* and other branching coral fragments and is collected as coral aggregate for building and construction purposes.

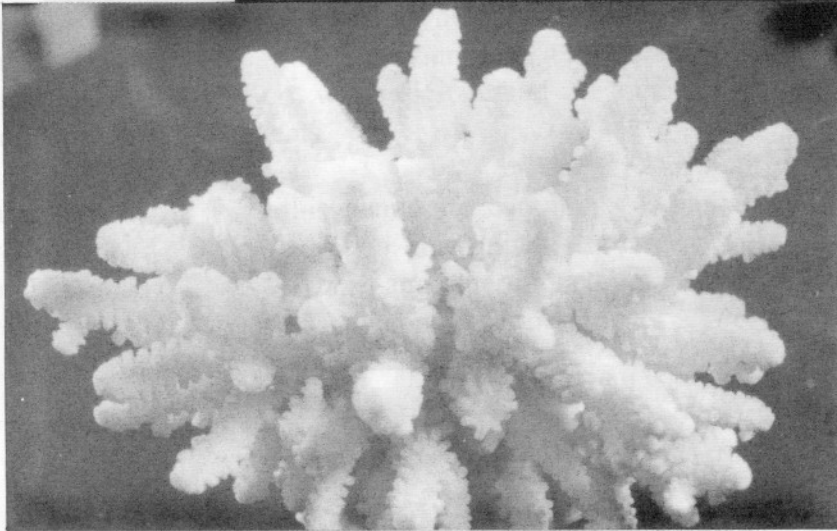
(3a - g)

150

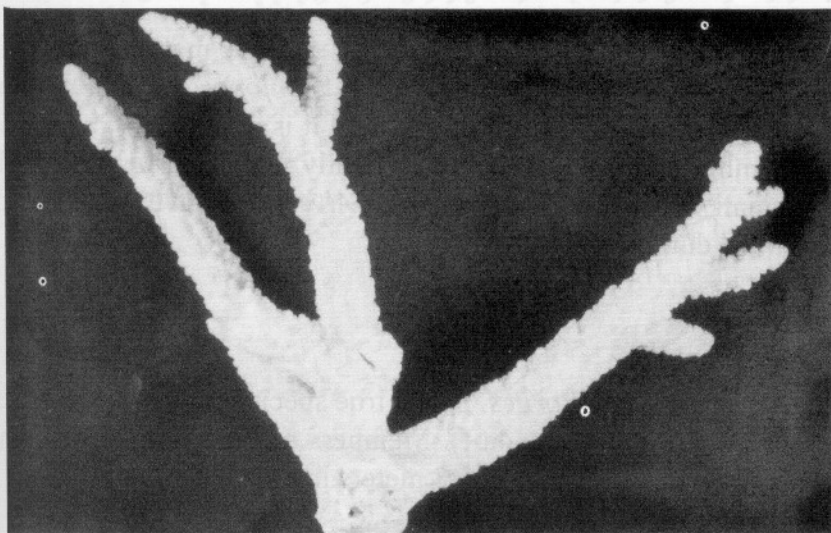


3b

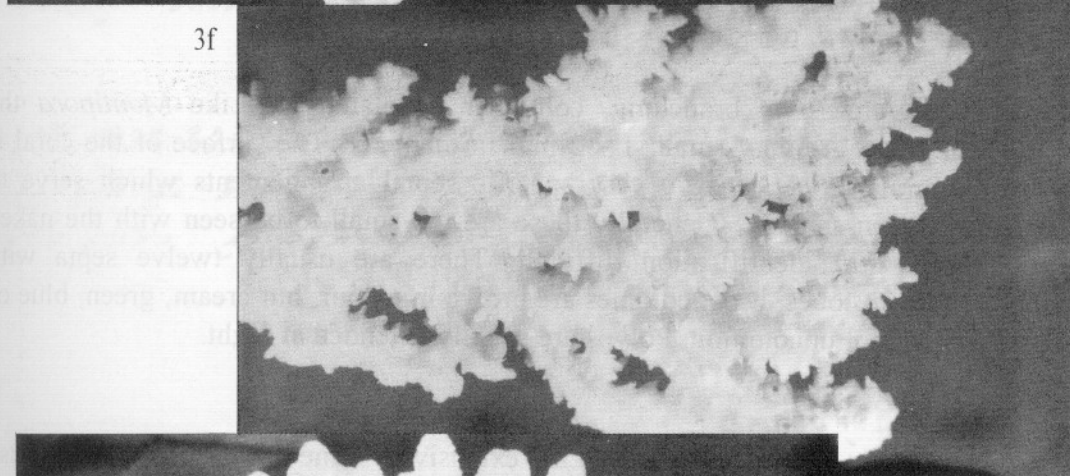
3c



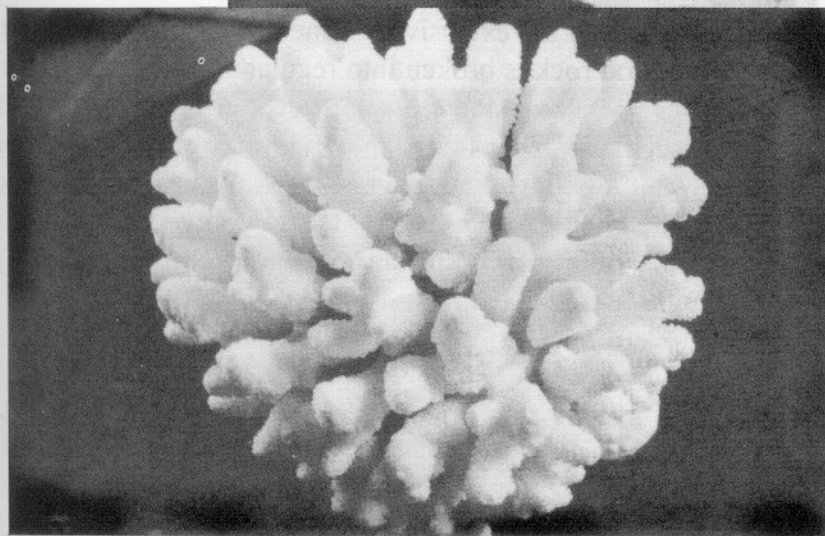
3d



3e



3f



3g

Family Poritidae

Members of the Family Poritidae are colonial corals that can be massive, laminar, ramose or encrusting. There are four extant genera: *Porites*, *Goniopora*, *Alveopora* and *Stylaraea*. *Stylaraea* has only one relatively rare species and it is not known to occur in the Maldives. The three common genera are morphologically distinct. *Porites* usually appears massive and has small corallites, *Goniopora* and *Alveopora* have large polyps which are commonly extended during the day.

Porites Link, 1807

There are around 120 nominal species of *Porites*. Seven true species are known to occur in the Maldives. Six are illustrated here (Fig. 4a-f). Members of this genus form some of the largest of all coral colonies, some measuring 8 meters in diameter!

Characters

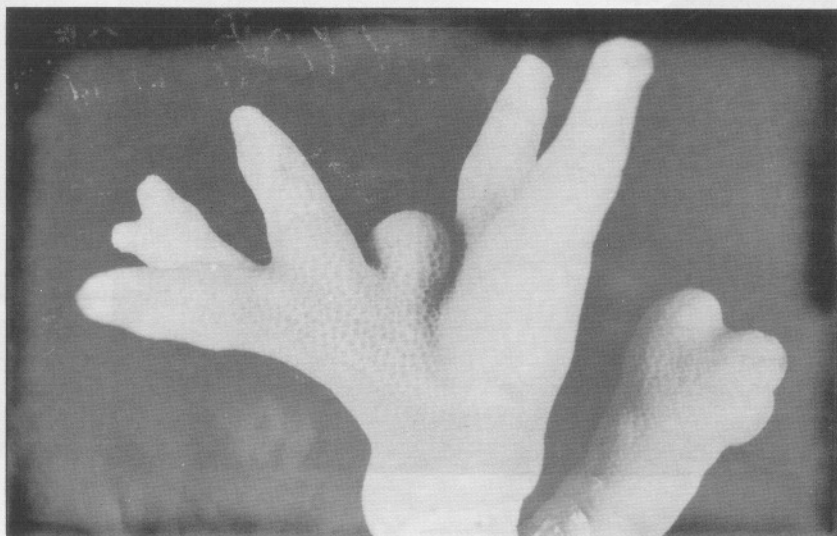
Colonies can be massive, branching, columnar or plate-like. Like *Montipora* the corallites of *Porites* are very small, 1 - 2 mm in diameter. The surface of the coral is smooth or granular. *Porites* have very specific septal arrangements which serve to distinguish between species. Generally these are too small to be seen with the naked eye, making *in situ* identification difficult. There are usually twelve septa with prominent paliform lobes. Most colonies are brown in colour, but cream, green, blue or pink colonies are not uncommon. Polyps are usually extended at night.

Remarks

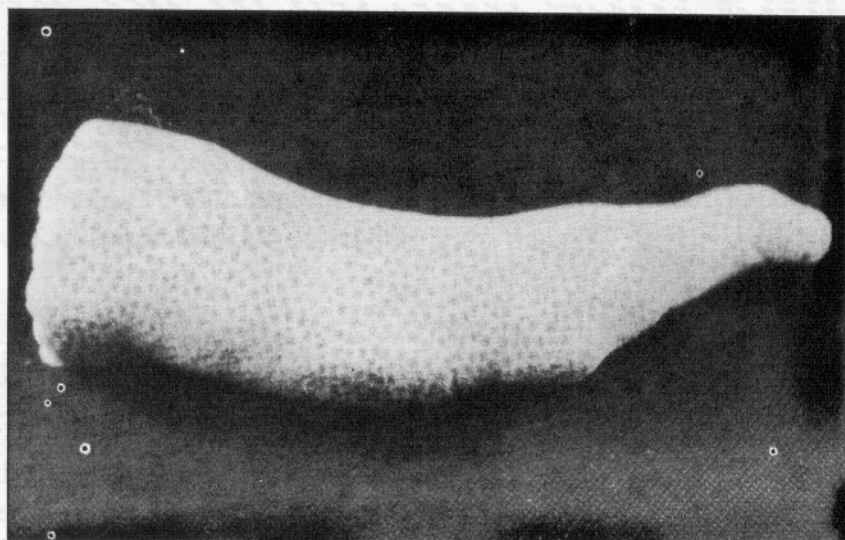
The massive species of *Porites* (*Hirigaa*) are extensively mined in the Maldives for use in the construction industry. The coral rock is broken into regular shaped bricks for use in building. Tomb stone curvings are also made from large colonies of *Porites*. The massive forms are common to reef flats, upper reef slopes, and may dominate in some areas. *Porites* commonly form what are known as 'micro-atolls'. Sediments deposition and exposure, kills large area in the middle of the colony, leaving only the perimeter of live coral. Large boulders provide refuge for fish and vantage points for growth of invertebrate organisms (e.g. fanworms and clams).

(4a - f)

7 (Poritidae) " " 30

[illegible][illegible][illegible]

4a



4b

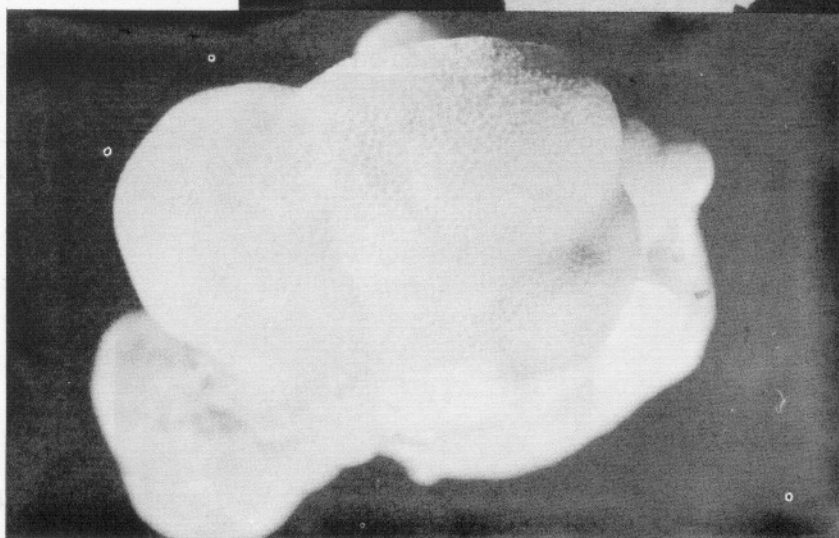
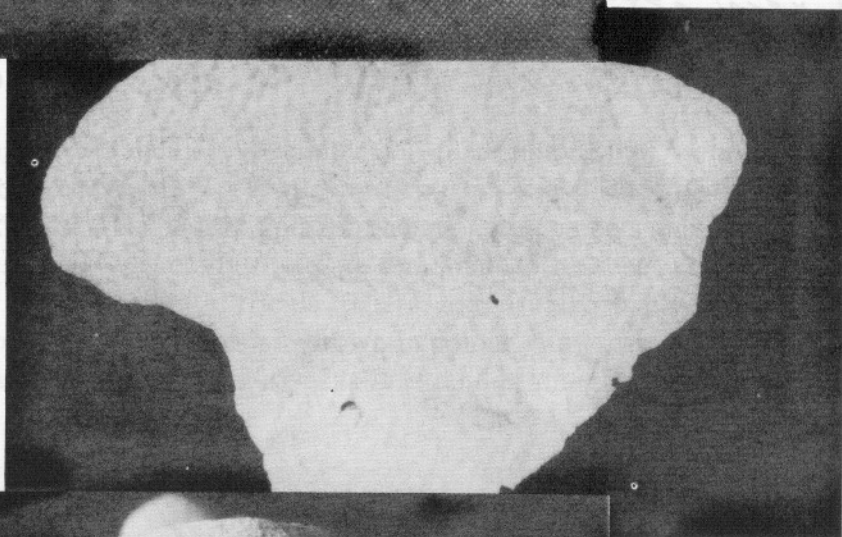
Characters

Colonies can be in corallites of 2-3 mm, smooth or slightly depressed, green eye, radius of 10-15 mm, prominent plates in pink colonies are not

Remarks

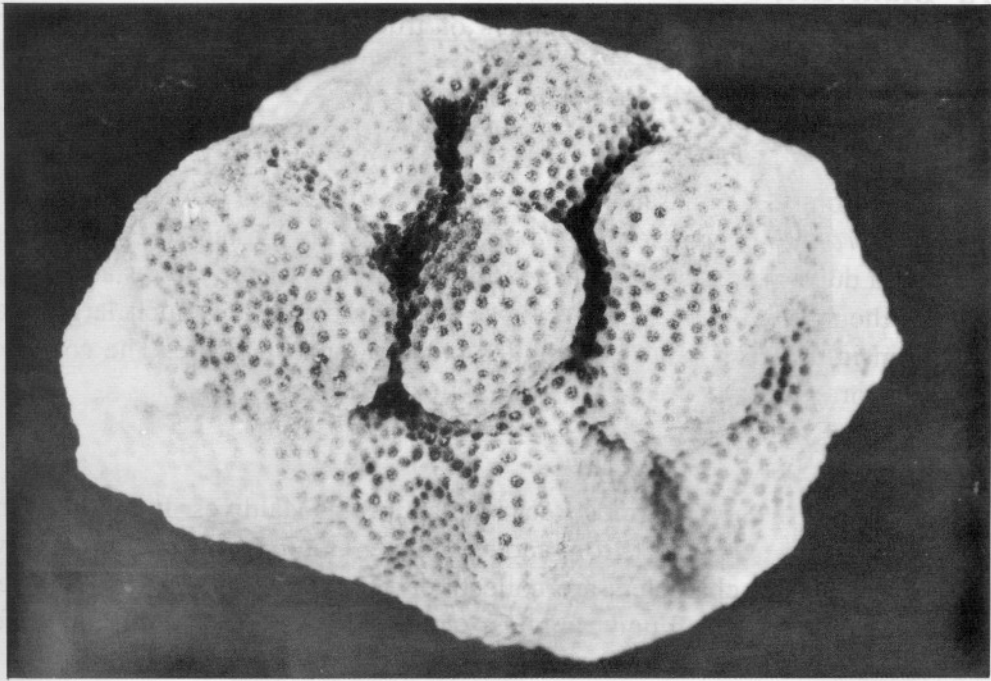
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4c



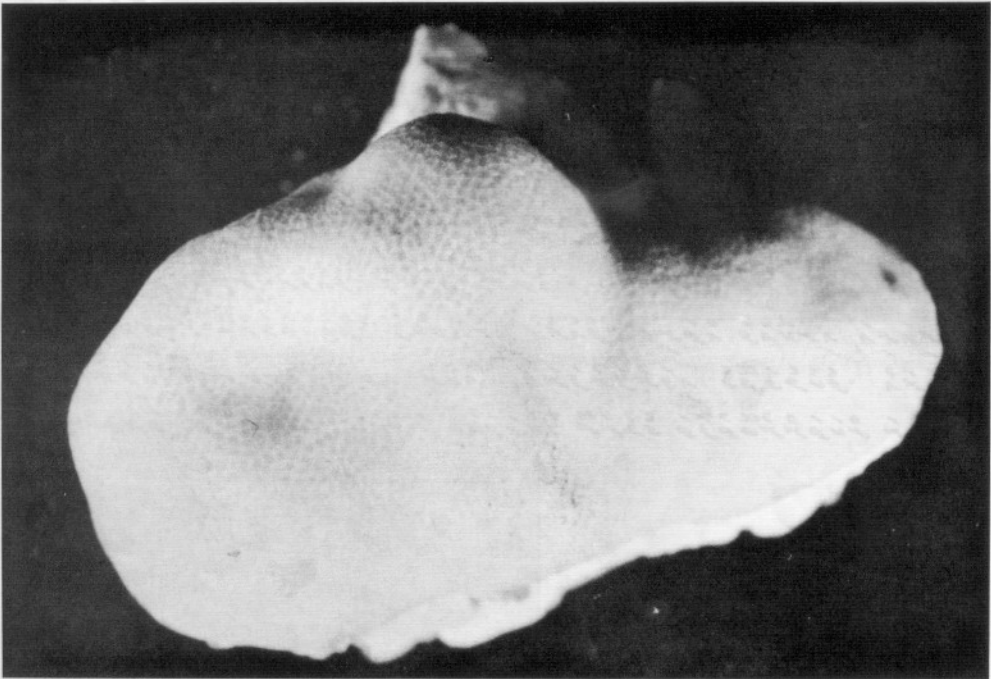
4d

rites. The to in some deposition number of growth of



4e

4f



Goniopora Blainville, 1830

There are 39 nominal species, but the numbers of true species are unknown. Seven species of this genus are known to occur in Maldives. Two are illustrated (Fig.5a, b).

Characters

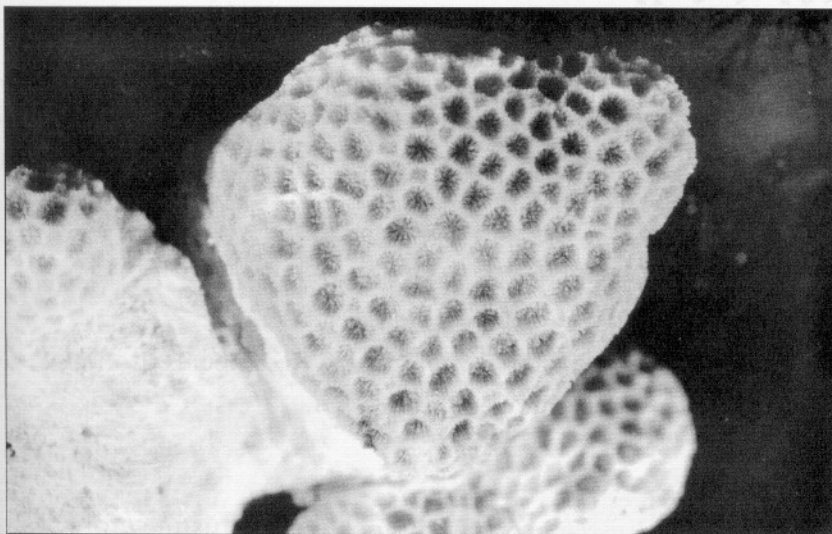
Most *Goniopora* colonies are massive or columnar, but may also be encrusting. The polyps of *Goniopora* are long, fleshy and are armed with 24 tentacles which are generally extended during the day. The shapes and the colours of the polyps are used in identification of the species underwater. Calices of these corals are much larger than *Porites* (3 - 5mm in diameter) and are rounded or hexagonal in shape. The colour of the polyp and the corallum may be brown, gray, blue or green.

Remarks

Goniopora is a common genera in most reef habitats in the Maldives. It can be found in shallow water areas along the reef front and reef slope. *Goniopora* and other massive corals with similar skeletal characters are collectively termed as *onuhiri* in Maldives. *Goniopora* is not commonly found amongst coral boulders that are mined for construction purposes.

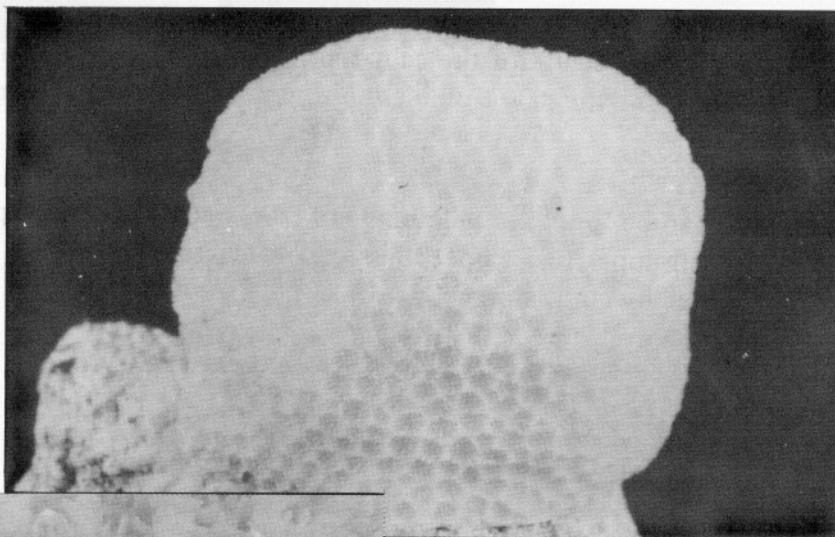
(5a, b $\begin{matrix} \textcircled{x} \\ \textcircled{\beta} \end{matrix}$) $\begin{matrix} \text{---} & \text{---} \\ \text{---} & \text{---} \end{matrix}$

[illegible]

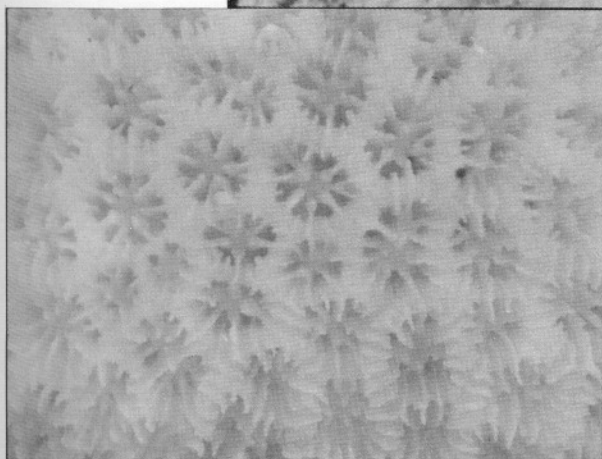


5a

5b(i)



5b(ii)



Family Siderastreidae

Members of the Family Siderastreidae are colonial corals. Colonies may be columnar, foliaceous or encrusting. There are six extant genera: *Pseudosiderastrea*, *Siderastrea*, *Anomastrea*, *Horastrea*, *Psammocora* and *Coscinarae*. Only *Psammocora* and *Coscinarae* are known to occur in the Maldives.

Psammocora Dana, 1846

There are approximately 27 nominal species of *Psammocora*. Six species are known to occur in the Maldives. Three are illustrated here (Fig. 6a-c).

Characters

This genus shows a great variety of growth forms: branching, encrusting, foliaceous, massive or columnar. The calices are tiny and closely packed, falling between the few millimeters high collines. Coralite walls are indistinct. Septa are numerous and converge toward the centre of the calice in a flower-type arrangement. Polyps may be seen extended during the day. Colonies are usually brown or green in colour.

Remarks

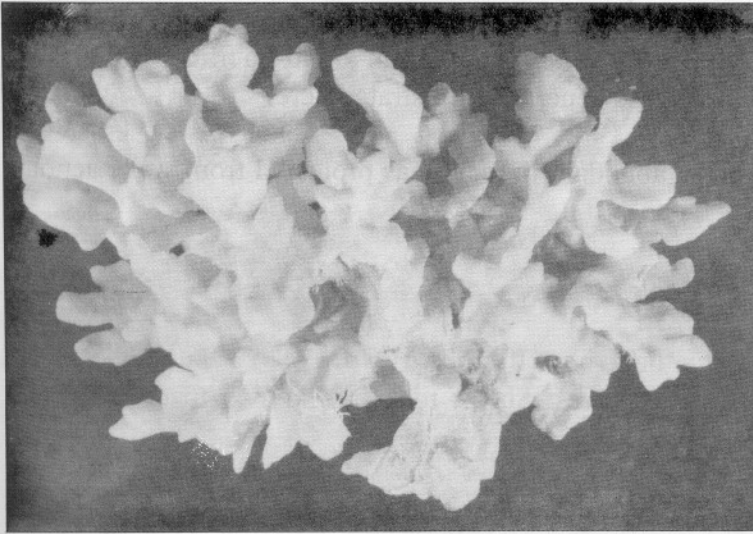
Psammocora can be found in wide range of reef habitats and is especially common on the reef flat and upper reef slope. Massive and encrusting growth forms of this genus may be exploited by coral miners.

(6a - c)

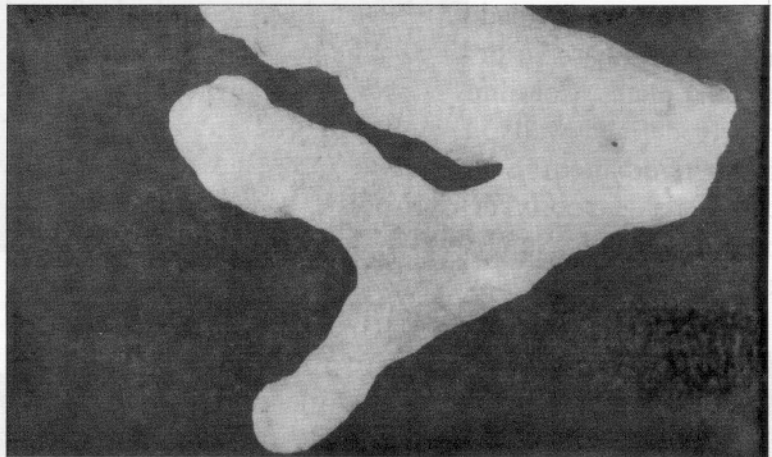
މި ފާމިލީ "ސައިދަރެސްޓްރީޔާ" (Siderastreidae) ގެ ދަށުން ވަރަށް ގިނަ ވައްތަރުގެ ސައިދަރެސްޓްރީޔާ ވަނީ ފާހަގަ ކުރެވިފައެވެ. ނަމަވެސް ދިވެހިރާއްޖޭގައި ވަނީ ތިރީ ބަޔާންކުރެވިފައިވާ ތިން ވައްތަރުގެ ސައިދަރެސްޓްރީޔާ ފާހަގަ ކުރެވިފައެވެ. ފާހަގަ ކުރެވިފައިވާ ތިން ވައްތަރުގެ ސައިދަރެސްޓްރީޔާ ތަކުގެ ގޮތުން ވަރަށް ގިނަ ވައްތަރުގެ ސައިދަރެސްޓްރީޔާ ވަނީ ފާހަގަ ކުރެވިފައެވެ. ފާހަގަ ކުރެވިފައިވާ ތިން ވައްތަރުގެ ސައިދަރެސްޓްރީޔާ ތަކުގެ ގޮތުން ވަރަށް ގިނަ ވައްތަރުގެ ސައިދަރެސްޓްރީޔާ ވަނީ ފާހަގަ ކުރެވިފައެވެ. ފާހަގަ ކުރެވިފައިވާ ތިން ވައްތަރުގެ ސައިދަރެސްޓްރީޔާ ތަކުގެ ގޮތުން ވަރަށް ގިނަ ވައްތަރުގެ ސައިދަރެސްޓްރީޔާ ވަނީ ފާހަގަ ކުރެވިފައެވެ.

މި ފާމިލީ ގެ ދަށުން ވަރަށް ގިނަ ވައްތަރުގެ ސައިދަރެސްޓްރީޔާ ވަނީ ފާހަގަ ކުރެވިފައެވެ. ނަމަވެސް ދިވެހިރާއްޖޭގައި ވަނީ ތިރީ ބަޔާންކުރެވިފައިވާ ތިން ވައްތަރުގެ ސައިދަރެސްޓްރީޔާ ފާހަގަ ކުރެވިފައެވެ.

دھوکہ دے کر کہتا ہے کہ "میں نے تم کو سزا دے دی ہے" اور کہتا ہے کہ "میں نے تم کو سزا دے دی ہے"۔
 "میں نے تم کو سزا دے دی ہے"۔



6a



6b



6c

Family Agariciidae

Members of the Family Agariciidae are colonial corals which can be massive, laminar or foliaceous. Many species of this Family are known to occur in the Maldives but are generally not common in any reef habitat. There are six extant genera: *Pavona*; *Leptoseris*; *Gardineroseris*; *Coeloseris*; *Pachyseris* from Indo-Pacific region and *Agaracia* from West-Indies. Four of these genera are illustrated here.

The members of this family are most abundant in reef areas protected from wave action, currents and sunlight.

Pavona Lamarck, 1801

In the past, many species of *Pavona* have been described. However recent studies have indicated that there are only 12 true species. Six of these are known to occur in the Maldives and four are illustrated here (Fig. 7a-d).

Characters

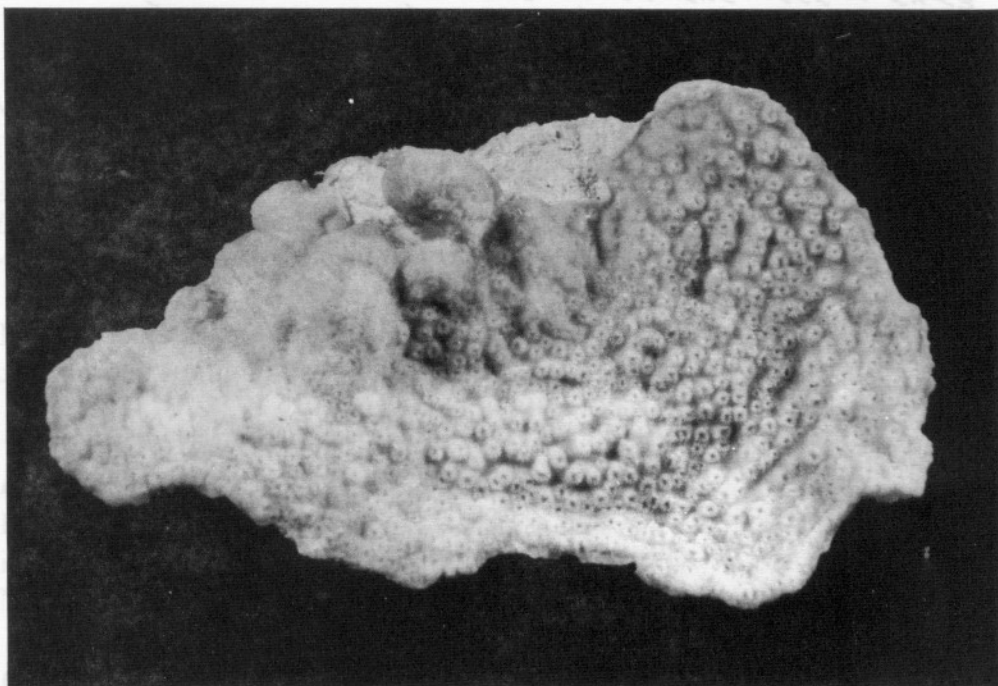
Pavona can be divided into two main groups: the leafy and non-leafy forms. The latter are usually massive or encrusting, while the former have variable shaped fronds and bifacial plates. Corallites are round or polygonal in shape, slightly depressed with very poorly defined walls. The septo-costae arrangement joining corallites creates a very distinctive pattern. Septa are in cycles and only some reach columella. In some cases columella is poorly developed and lies deep within the fossa. Colonies are mostly brown in colour. Some shows shades of purple, green, or yellow. Tiny tentacles may be extended during the day.

Remarks

Members of this genus are mostly found in shallow water habitats, such as lagoons, reef flats and upper reef slopes. They may attain huge sizes rivaled only by *Porites*, and serve as sheltered habitats for large reef fish.

(7a - d ²) ² ₅ ₁ ₂ ₃ ₄ ₅ ₆ ₇ ₈ ₉ ₁₀ ₁₁ ₁₂ ₁₃ ₁₄ ₁₅ ₁₆ ₁₇ ₁₈ ₁₉ ₂₀ ₂₁ ₂₂ ₂₃ ₂₄ ₂₅ ₂₆ ₂₇ ₂₈ ₂₉ ₃₀ ₃₁ ₃₂ ₃₃ ₃₄ ₃₅ ₃₆ ₃₇ ₃₈ ₃₉ ₄₀ ₄₁ ₄₂ ₄₃ ₄₄ ₄₅ ₄₆ ₄₇ ₄₈ ₄₉ ₅₀ ₅₁ ₅₂ ₅₃ ₅₄ ₅₅ ₅₆ ₅₇ ₅₈ ₅₉ ₆₀ ₆₁ ₆₂ ₆₃ ₆₄ ₆₅ ₆₆ ₆₇ ₆₈ ₆₉ ₇₀ ₇₁ ₇₂ ₇₃ ₇₄ ₇₅ ₇₆ ₇₇ ₇₈ ₇₉ ₈₀ ₈₁ ₈₂ ₈₃ ₈₄ ₈₅ ₈₆ ₈₇ ₈₈ ₈₉ ₉₀ ₉₁ ₉₂ ₉₃ ₉₄ ₉₅ ₉₆ ₉₇ ₉₈ ₉₉ ₁₀₀ ₁₀₁ ₁₀₂ ₁₀₃ ₁₀₄ ₁₀₅ ₁₀₆ ₁₀₇ ₁₀₈ ₁₀₉ ₁₁₀ ₁₁₁ ₁₁₂ ₁₁₃ ₁₁₄ ₁₁₅ ₁₁₆ ₁₁₇ ₁₁₈ ₁₁₉ ₁₂₀ ₁₂₁ ₁₂₂ ₁₂₃ ₁₂₄ ₁₂₅ ₁₂₆ ₁₂₇ ₁₂₈ ₁₂₉ ₁₃₀ ₁₃₁ ₁₃₂ ₁₃₃ ₁₃₄ ₁₃₅ ₁₃₆ ₁₃₇ ₁₃₈ ₁₃₉ ₁₄₀ ₁₄₁ ₁₄₂ ₁₄₃ ₁₄₄ ₁₄₅ ₁₄₆ ₁₄₇ ₁₄₈ ₁₄₉ ₁₅₀ ₁₅₁ ₁₅₂ ₁₅₃ ₁₅₄ ₁₅₅ ₁₅₆ ₁₅₇ ₁₅₈ ₁₅₉ ₁₆₀ ₁₆₁ ₁₆₂ ₁₆₃ ₁₆₄ ₁₆₅ ₁₆₆ ₁₆₇ ₁₆₈ ₁₆₉ ₁₇₀ ₁₇₁ ₁₇₂ ₁₇₃ ₁₇₄ ₁₇₅ ₁₇₆ ₁₇₇ ₁₇₈ ₁₇₉ ₁₈₀ ₁₈₁ ₁₈₂ ₁₈₃ ₁₈₄ ₁₈₅ ₁₈₆ ₁₈₇ ₁₈₈ ₁₈₉ ₁₉₀ ₁₉₁ ₁₉₂ ₁₉₃ ₁₉₄ ₁₉₅ ₁₉₆ ₁₉₇ ₁₉₈ ₁₉₉ ₂₀₀ ₂₀₁ ₂₀₂ ₂₀₃ ₂₀₄ ₂₀₅ ₂₀₆ ₂₀₇ ₂₀₈ ₂₀₉ ₂₁₀ ₂₁₁ ₂₁₂ ₂₁₃ ₂₁₄ ₂₁₅ ₂₁₆ ₂₁₇ ₂₁₈ ₂₁₉ ₂₂₀ ₂₂₁ ₂₂₂ ₂₂₃ ₂₂₄ ₂₂₅ ₂₂₆ ₂₂₇ ₂₂₈ ₂₂₉ ₂₃₀ ₂₃₁ ₂₃₂ ₂₃₃ ₂₃₄ ₂₃₅ ₂₃₆ ₂₃₇ ₂₃₈ ₂₃₉ ₂₄₀ ₂₄₁ ₂₄₂ ₂₄₃ ₂₄₄ ₂₄₅ ₂₄₆ ₂₄₇ ₂₄₈ ₂₄₉ ₂₅₀ ₂₅₁ ₂₅₂ ₂₅₃ ₂₅₄ ₂₅₅ ₂₅₆ ₂₅₇ ₂₅₈ ₂₅₉ ₂₆₀ ₂₆₁ ₂₆₂ ₂₆₃ ₂₆₄ ₂₆₅ ₂₆₆ ₂₆₇ ₂₆₈ ₂₆₉ ₂₇₀ ₂₇₁ ₂₇₂ ₂₇₃ ₂₇₄ ₂₇₅ ₂₇₆ ₂₇₇ ₂₇₈ ₂₇₉ ₂₈₀ ₂₈₁ ₂₈₂ ₂₈₃ ₂₈₄ ₂₈₅ ₂₈₆ ₂₈₇ ₂₈₈ ₂₈₉ ₂₉₀ ₂₉₁ ₂₉₂ ₂₉₃ ₂₉₄ ₂₉₅ ₂₉₆ ₂₉₇ ₂₉₈ ₂₉₉ ₃₀₀ ₃₀₁ ₃₀₂ ₃₀₃ ₃₀₄ ₃₀₅ ₃₀₆ ₃₀₇ ₃₀₈ ₃₀₉ ₃₁₀ ₃₁₁ ₃₁₂ ₃₁₃ ₃₁₄ ₃₁₅ ₃₁₆ ₃₁₇ ₃₁₈ ₃₁₉ ₃₂₀ ₃₂₁ ₃₂₂ ₃₂₃ ₃₂₄ ₃₂₅ ₃₂₆ ₃₂₇ ₃₂₈ ₃₂₉ ₃₃₀ ₃₃₁ ₃₃₂ ₃₃₃ ₃₃₄ ₃₃₅ ₃₃₆ ₃₃₇ ₃₃₈ ₃₃₉ ₃₄₀ ₃₄₁ ₃₄₂ ₃₄₃ ₃₄₄ ₃₄₅ ₃₄₆ ₃₄₇ ₃₄₈ ₃₄₉ ₃₅₀ ₃₅₁ ₃₅₂ ₃₅₃ ₃₅₄ ₃₅₅ ₃₅₆ ₃₅₇ ₃₅₈ ₃₅₉ ₃₆₀ ₃₆₁ ₃₆₂ ₃₆₃ ₃₆₄ ₃₆₅ ₃₆₆ ₃₆₇ ₃₆₈ ₃₆₉ ₃₇₀ ₃₇₁ ₃₇₂ ₃₇₃ ₃₇₄ ₃₇₅ ₃₇₆ ₃₇₇ ₃₇₈ ₃₇₉ ₃₈₀ ₃₈₁ ₃₈₂ ₃₈₃ ₃₈₄ ₃₈₅ ₃₈₆ ₃₈₇ ₃₈₈ ₃₈₉ ₃₉₀ ₃₉₁ ₃₉₂ ₃₉₃ ₃₉₄ ₃₉₅ ₃₉₆ ₃₉₇ ₃₉₈ ₃₉₉ ₄₀₀ ₄₀₁ ₄₀₂ ₄₀₃ ₄₀₄ ₄₀₅ ₄₀₆ ₄₀₇ ₄₀₈ ₄₀₉ ₄₁₀ ₄₁₁ ₄₁₂ ₄₁₃ ₄₁₄ ₄₁₅ ₄₁₆ ₄₁₇ ₄₁₈ ₄₁₉ ₄₂₀ ₄₂₁ ₄₂₂ ₄₂₃ ₄₂₄ ₄₂₅ ₄₂₆ ₄₂₇ ₄₂₈ ₄₂₉ ₄₃₀ ₄₃₁ ₄₃₂ ₄₃₃ ₄₃₄ ₄₃₅ ₄₃₆ ₄₃₇ ₄₃₈ ₄₃₉ ₄₄₀ ₄₄₁ ₄₄₂ ₄₄₃ ₄₄₄ ₄₄₅ ₄₄₆ ₄₄₇ ₄₄₈ ₄₄₉ ₄₅₀ ₄₅₁ ₄₅₂ ₄₅₃ ₄₅₄ ₄₅₅ ₄₅₆ ₄₅₇ ₄₅₈ ₄₅₉ ₄₆₀ ₄₆₁ ₄₆₂ ₄₆₃ ₄₆₄

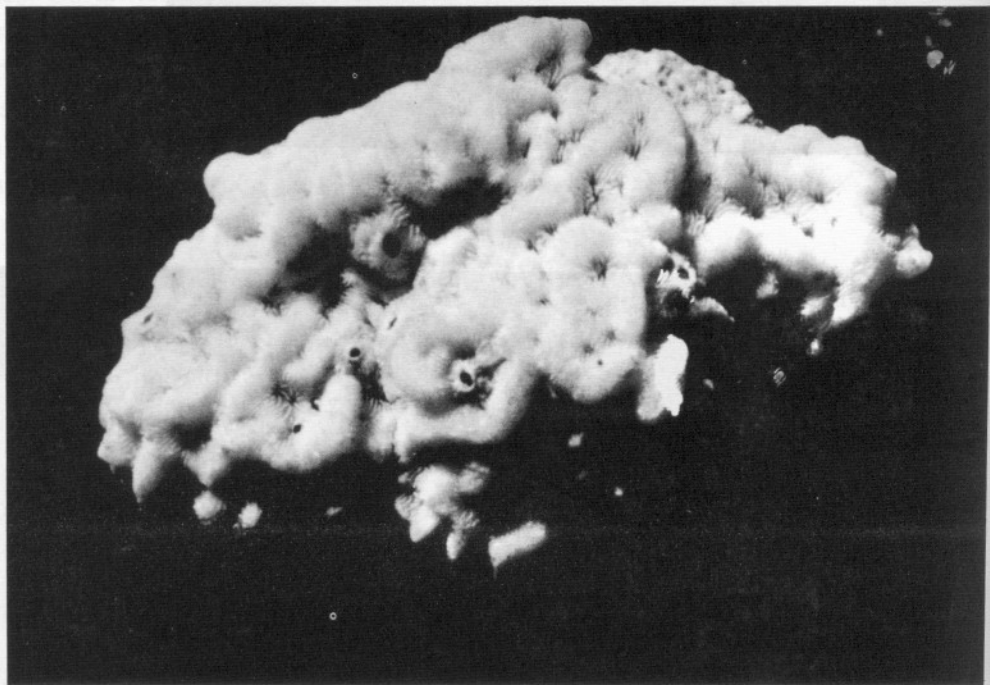
[illegible]



- 7c

Pavora can be divided into two groups. The first group are usually massive or bifacial plates. Coralline poorly developed. Distinctive columella brown in color. Extended

7d



Leptoseris Milne-Edwards & Haime, 1849

There are 14 true species of this genus. Six are known to occur in the Maldives. Four are illustrated here (Fig. 8a-d).

Characters

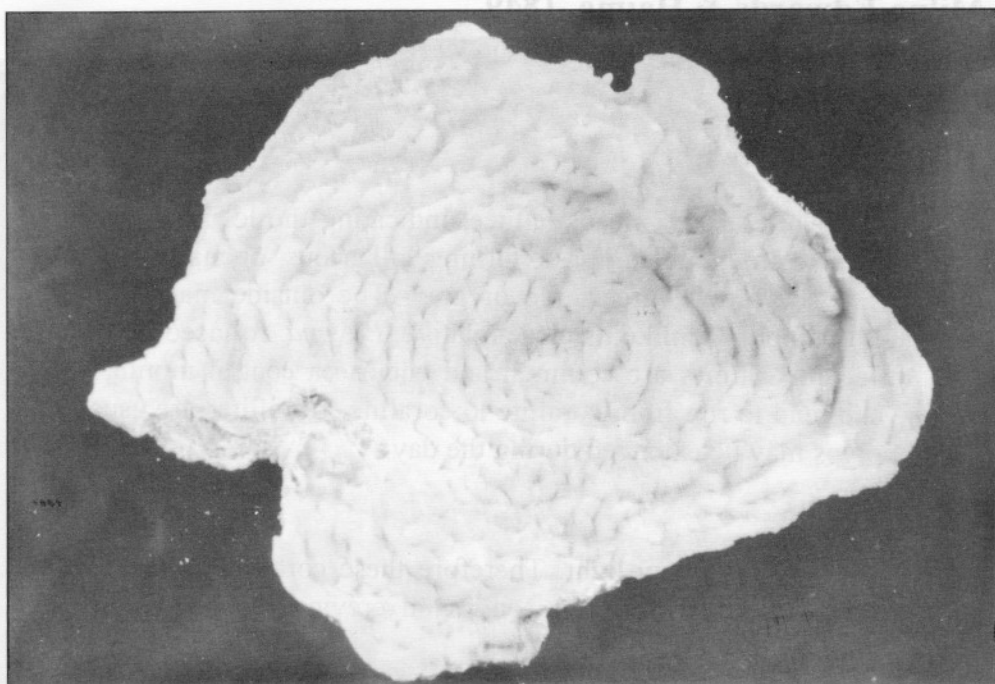
'*Lepto*' refers to slender while '*seris*' means lettuce, indicating the leafy form of this genus. *Leptoseris* may have an encrusting base, turning foliaceous, or may be entirely encrusting. Colonies may be brown, green, red or gray. The outside margins of the corallum may be paler in colour. Unlike its close relative, *Pavona*, foliaceous colonies of *Leptoseris* are unifacial. Collines are common and enclose a central mouth, while septo-costae are fine and tend to run from corallite to corallite. Corallites are usually 2 - 5mm in diameter. Polyps may be extended during the day.

Remarks

Leptoseris tends to prefer areas of low light. Therefore these corals occurs in deeper water on lower reef slopes, and also in overhangs and crevices. These are usually uncommon and found only by scuba divers.

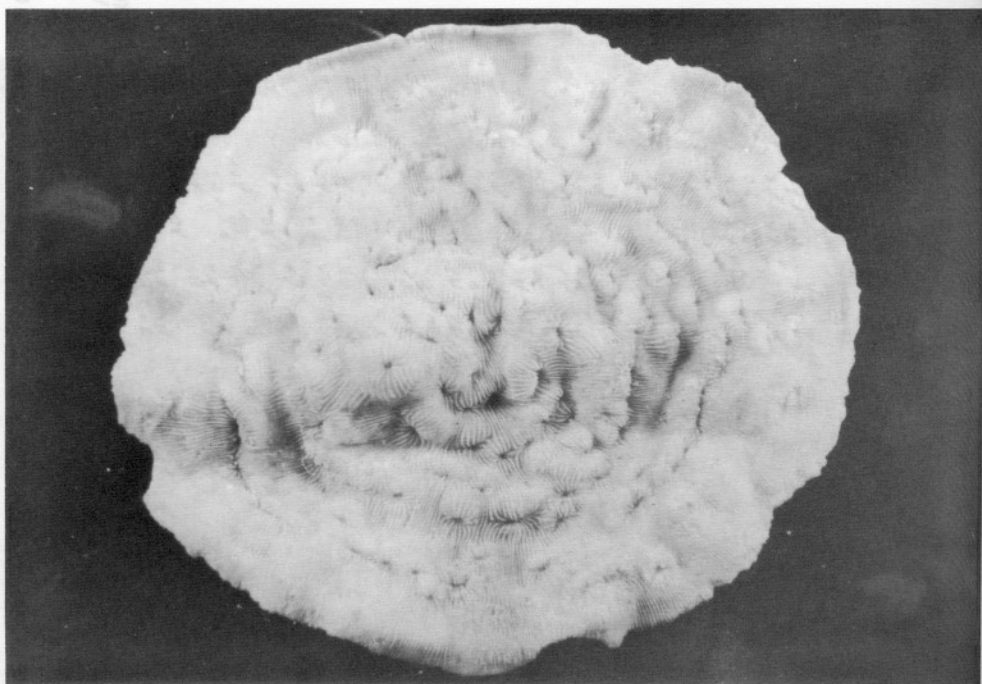
(8a - d \mathcal{E}^x) \approx $\mathcal{E}^x_{\text{H}} + \mathcal{E}^x_{\text{H}} + \mathcal{E}^x_{\text{H}} + \mathcal{E}^x_{\text{H}}$

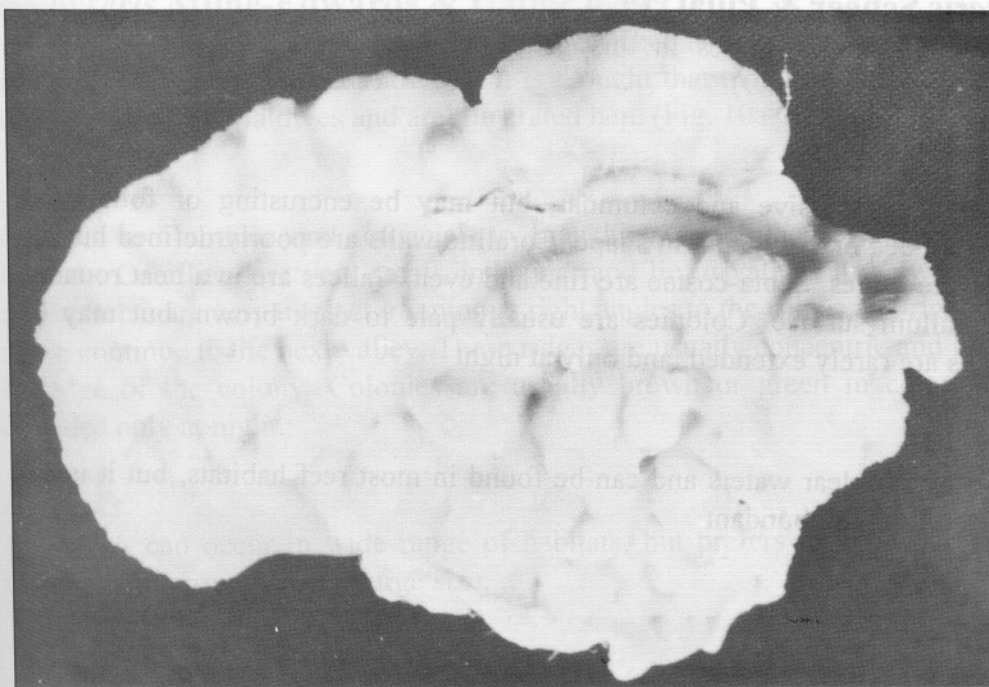
[illegible][illegible][illegible]



8a

8b

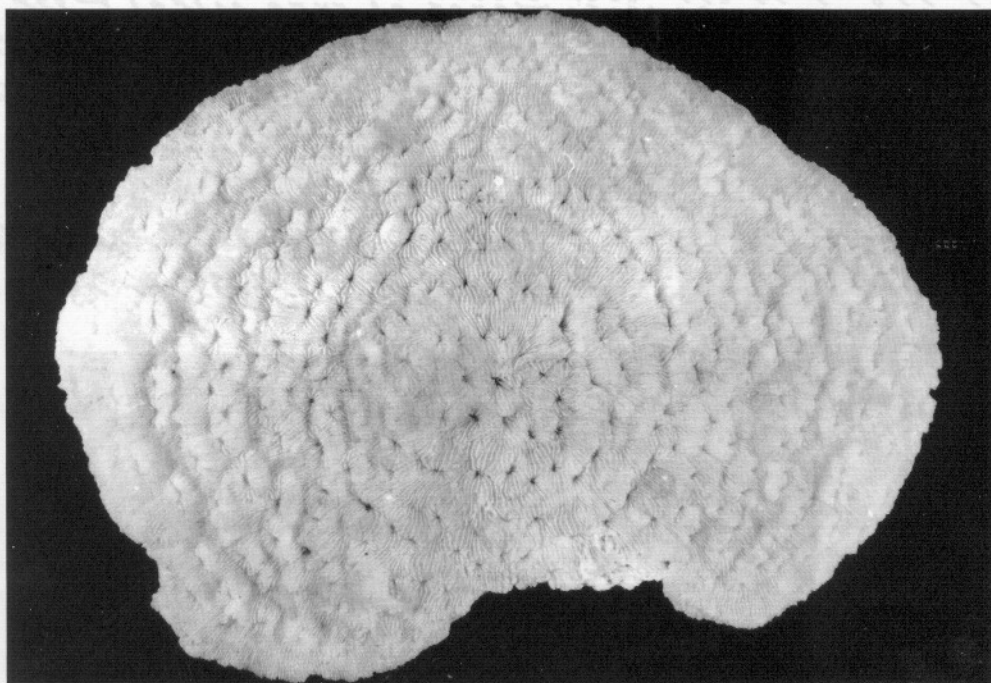




8c

Gardineria
There is one
common in
Character
Colonies are
Colonies are
separated by
cup on the
of the
purple to
the apical
Remarks
G. plumosa
particularly

8d



Gardineroseris Scheer & Pillai, 1974

There is only one named species in this genus, *G. planulata*, which is relatively common in the Maldives (Fig. 9).

Characters

Colonies are usually massive and columnar, but may be encrusting or foliaceous. Corallites are rounded or polygonal in shape. Corallite walls are poorly defined but are separated by acute ridges. Septa-costae are fine and even. Calices are in a neat rounded cup on the corallum surface. Colonies are usually pale to dark brown, but may be purplish. Polyps are rarely extended, and only at night

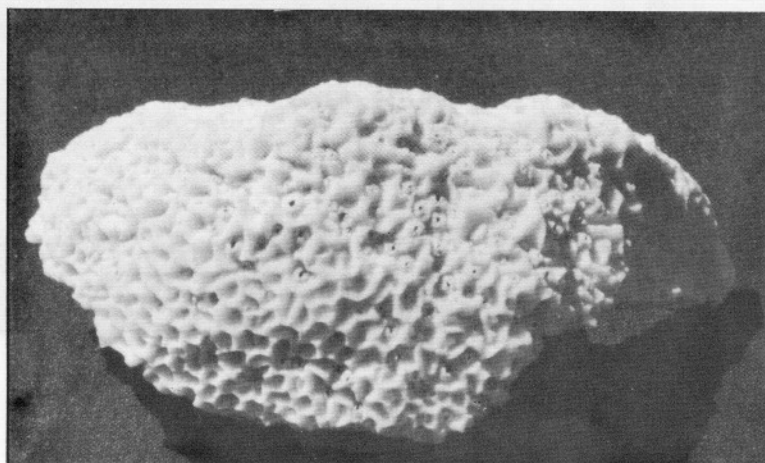
Remarks

G. planulata requires clear waters and can be found in most reef habitats, but it is not particularly common or abundant.

(9)

... ..

... ..
 ""



9

***Pachyseris* Milne-Edwards & Haime, 1849**

'*Pachy*' means thick, therefore the genus is described as 'thick lettuce'. Twelve nominal species have been described, however it is thought that there are only two true species. Both are found in Maldives and are illustrated here (Fig. 10a, b).

Characters

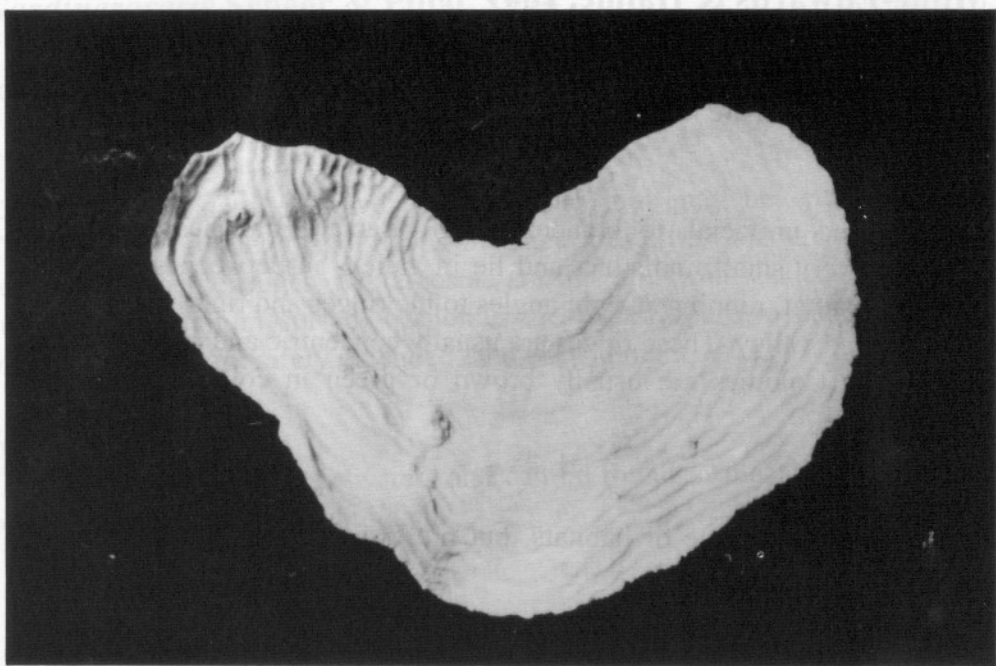
Colonies are laminar and unifacial, to branching and bifacial. Branches are highly twisted. Corallites are very small, indistinct and lie in valleys in-between steep-sided ridges. Septa are very distinct, running at right angles to the ridges and right over the top which continue to the next valley. These ridges are usually concentric and run parallel to the edge of the colony. Colonies are usually brown or green in colour. Polyps are extended only at night.

Remarks

Pachyseris can occur in wide range of habitats, but prefers shallow sheltered waters. Colonies can grow to a very large size.

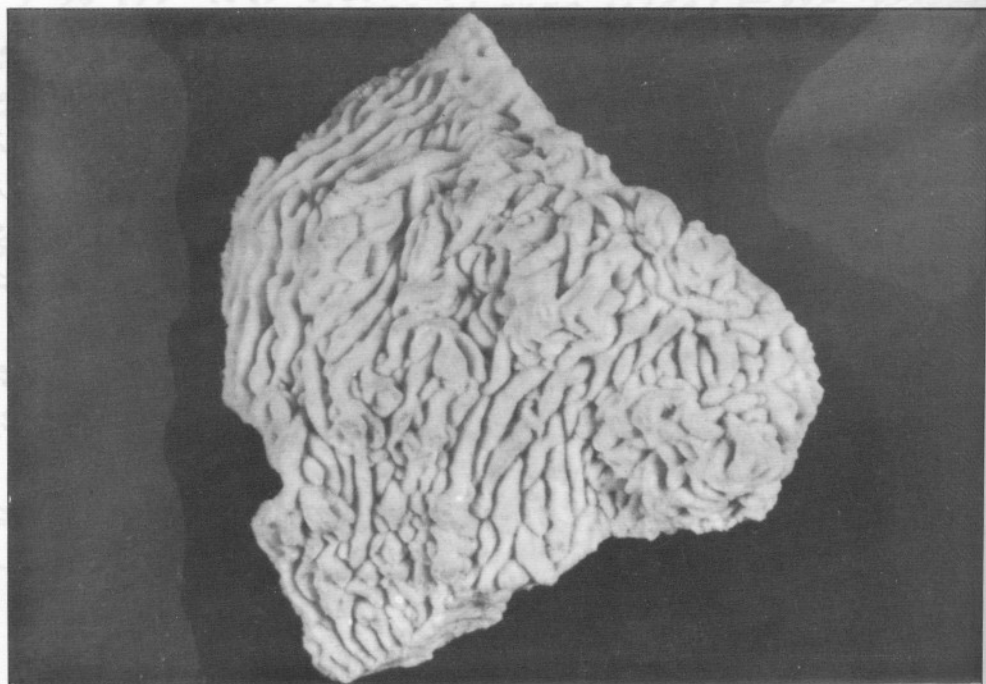
(10a, b)

1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100. 101. 102. 103. 104. 105. 106. 107. 108. 109. 110. 111. 112. 113. 114. 115. 116. 117. 118. 119. 120. 121. 122. 123. 124. 125. 126. 127. 128. 129. 130. 131. 132. 133. 134. 135. 136. 137. 138. 139. 140. 141. 142. 143. 144. 145. 146. 147. 148. 149. 150. 151. 152. 153. 154. 155. 156. 157. 158. 159. 160. 161. 162. 163. 164. 165. 166. 167. 168. 169. 170. 171. 172. 173. 174. 175. 176. 177. 178. 179. 180. 181. 182. 183. 184. 185. 186. 187. 188. 189. 190. 191. 192. 193. 194. 195. 196. 197. 198. 199. 200. 201. 202. 203. 204. 205. 206. 207. 208. 209. 210. 211. 212. 213. 214. 215. 216. 217. 218. 219. 220. 221. 222. 223. 224. 225. 226. 227. 228. 229. 230. 231. 232. 233. 234. 235. 236. 237. 238. 239. 240. 241. 242. 243. 244. 245. 246. 247. 248. 249. 250. 251. 252. 253. 254. 255. 256. 257. 258. 259. 260. 261. 262. 263. 264. 265. 266. 267. 268. 269. 270. 271. 272. 273. 274. 275. 276. 277. 278. 279. 280. 281. 282. 283. 284. 285. 286. 287. 288. 289. 290. 291. 292. 293. 294. 295. 296. 297. 298. 299. 300. 301. 302. 303. 304. 305. 306. 307. 308. 309. 310. 311. 312. 313. 314. 315. 316. 317. 318. 319. 320. 321. 322. 323. 324. 325. 326. 327. 328. 329. 330. 331. 332. 333. 334. 335. 336. 337. 338. 339. 340. 341. 342. 343. 344. 345. 346. 347. 348. 349. 350. 351. 352. 353. 354. 355. 356. 357. 358. 359. 360. 361. 362. 363. 364. 365. 366. 367. 368. 369. 370. 371. 372. 373. 374. 375. 376. 377. 378. 379. 380. 381. 382. 383. 384. 385. 386. 387. 388. 389. 390. 391. 392. 393. 394. 395. 396. 397. 398. 399. 400. 401. 402. 403. 404. 405. 406. 407. 408. 409. 410. 411. 412. 413. 414. 415. 416. 417. 418. 419. 420. 421. 422. 423. 424. 425. 426. 427. 428. 429. 430. 431. 432. 433. 434. 435. 436. 437. 438. 439. 440. 441. 442. 443. 444. 445. 446. 447. 448. 449. 450. 451. 452. 453. 454. 455. 456. 457. 458. 459. 460. 461. 462. 463. 464. 465. 466. 467. 468. 469. 470. 471. 472. 473. 474. 475. 476. 477. 478. 479. 480. 481. 482. 483. 484. 485. 486. 487. 488. 489. 490. 491. 492. 493. 494. 495. 496. 497. 498. 499. 500. 501. 502. 503. 504. 505. 506. 507. 508. 509. 510. 511. 512. 513. 514. 515. 516. 517. 518. 519. 520. 521. 522. 523. 524. 525. 526. 527. 528. 529. 530. 531. 532. 533. 534. 535. 536. 537. 538. 539. 540. 541. 542. 543. 544. 545. 546. 547. 548. 549. 550. 551. 552. 553. 554. 555. 556. 557. 558. 559. 560. 561. 562. 563. 564. 565. 566. 567. 568. 569. 570. 571. 572. 573. 574. 575. 576. 577. 578. 579. 580. 581. 582. 583. 584. 585. 586. 587. 588. 589. 590. 591. 592. 593. 594. 595. 596. 597. 598. 599. 600. 601. 602. 603. 604. 605. 606. 607. 608. 609. 610. 611. 612. 613. 614. 615. 616. 617. 618. 619. 620. 621. 622. 623. 624. 625. 626. 627. 628. 629. 630. 631. 632. 633. 634. 635. 636. 637. 638. 639. 640. 641. 642. 643. 644. 645. 646. 647. 648. 649. 650. 651. 652. 653. 654. 655. 656. 657. 658. 659. 660. 661. 662. 663. 664. 665. 666. 667. 668. 669. 670. 671. 672. 673. 674. 675. 676. 677. 678. 679. 680. 681. 682. 683. 684. 685. 686. 687. 688. 689. 690. 691. 692. 693. 694. 695. 696. 697. 698. 699. 700. 701. 702. 703. 704. 705. 706. 707. 708. 709. 710. 711. 712. 713. 714. 715. 716. 717. 718. 719. 720. 721. 722. 723. 724. 725. 726. 727. 728. 729. 730. 731. 732. 733. 734. 735. 736. 737. 738. 739. 740. 741. 742. 743. 744. 745. 746. 747. 748. 749. 750. 751. 752. 753. 754. 755. 756. 757. 758. 759. 760. 761. 762. 763. 764. 765. 766. 767. 768. 769. 770. 771. 772. 773. 774. 775. 776. 777. 778. 779. 780. 781. 782. 783. 784. 785. 786. 787. 788. 789. 790. 791. 792. 793. 794. 795. 796. 797. 798. 799. 800. 801. 802. 803. 804. 805. 806. 807. 808. 809. 810. 811. 812. 813. 814. 815. 816. 817. 818. 819. 820. 821. 822. 823. 824. 825. 826. 827. 828. 829. 830. 831. 832. 833. 834. 835. 836. 837. 838. 839. 840. 841. 842. 843. 844. 845. 846. 847. 848. 849. 850. 851. 852. 853. 854. 855. 856. 857. 858. 859. 860. 861. 862. 863. 864. 865. 866. 867. 868. 869. 870. 871. 872. 873. 874. 875. 876. 877. 878. 879. 880. 881. 882. 883. 884. 885. 886. 887. 888. 889. 890. 891. 892. 893. 894. 895. 896. 897. 898. 899. 900. 901. 902. 903. 904. 905. 906. 907. 908. 909. 910. 911. 912. 913. 914. 915. 916. 917. 918. 919. 920. 921. 922. 923. 924. 925. 926. 927. 928. 929. 930. 931. 932. 933. 934. 935. 936. 937. 938. 939. 940. 941. 942. 943. 944. 945. 946. 947. 948. 949. 950. 951. 952. 953. 954. 955. 956. 957. 958. 959. 960. 961. 962. 963. 964. 965. 966. 967. 968. 969. 970. 971. 972. 973. 974. 975. 976. 977. 978. 979. 980. 981. 982. 983. 984. 985. 986. 987. 988. 989. 990. 991. 992. 993. 994. 995. 996. 997. 998. 999. 1000.



10a

10b



Family Fungiidae

Members of the Family Fungiidae may be free-living or attached, colonial or solitary. There are eleven extant genera, with numerous sub-genera which makes the classification and identification of this group complex.

The polyps of this group are among the largest of all known corals. The distinction between 'solitary' and 'colonial' may be difficult with some corals. However it is usually the number of mouths that is used as the guide rather than the number of polyps. There is a long fossil history of the Fungiidae and it is thought that colonial species probably evolved from solitary group. Members of this family have proved to be mobile and able to extract themselves, from beneath the sand or rubble.

Fungia Lamarck, 1801



There are around 25 species in the *Fungia* group. Six species are known to occur in the Maldives (Fig. 11a-f).

Characters

Members of this group are solitary corals which become unattached when juveniles, maintaining a free-living status. They may be rounded or elongated, flat or dome-shaped. The mouth is located in the centre of the corallum. Septa are numerous and their edges are armed with teeth. Septa radiate outwards from the central mouth. Costae have prominent spines on their margins. The coralite wall is perforated. Corallum is usually brown in colour. Polyps are usually extended only at night and have short widely spaced tentacles.

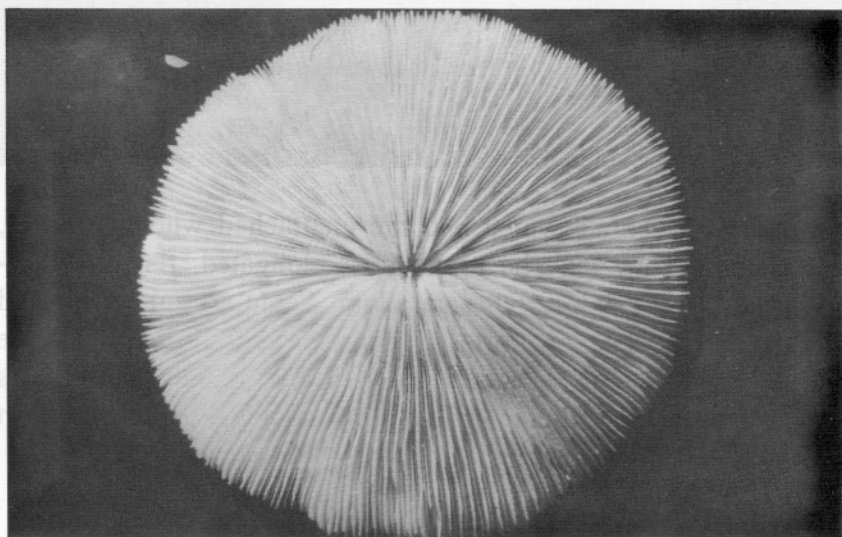
Remarks

Fungia are usually very common, and can persist in all reef habitats, including wave-washed upper reef slopes, protected lagoons, lower reef slopes. These are common on sandy reef flats.

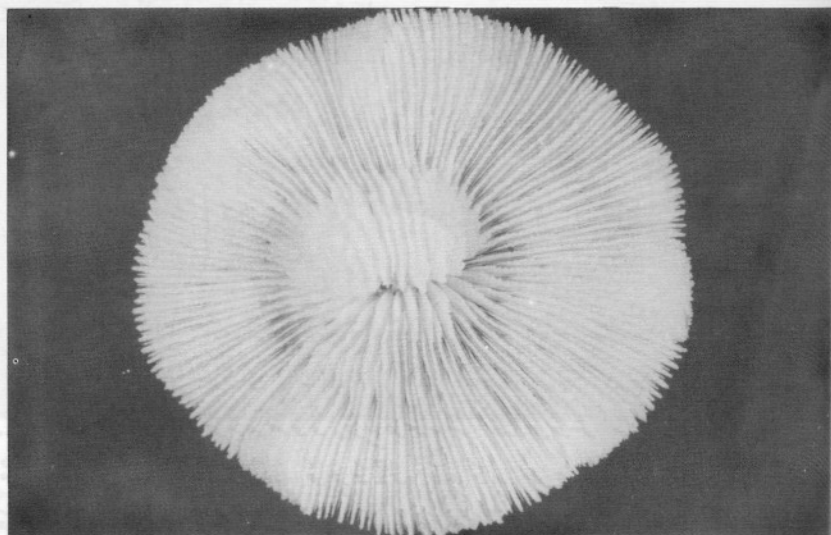
(11a - f ) 

[illegible]

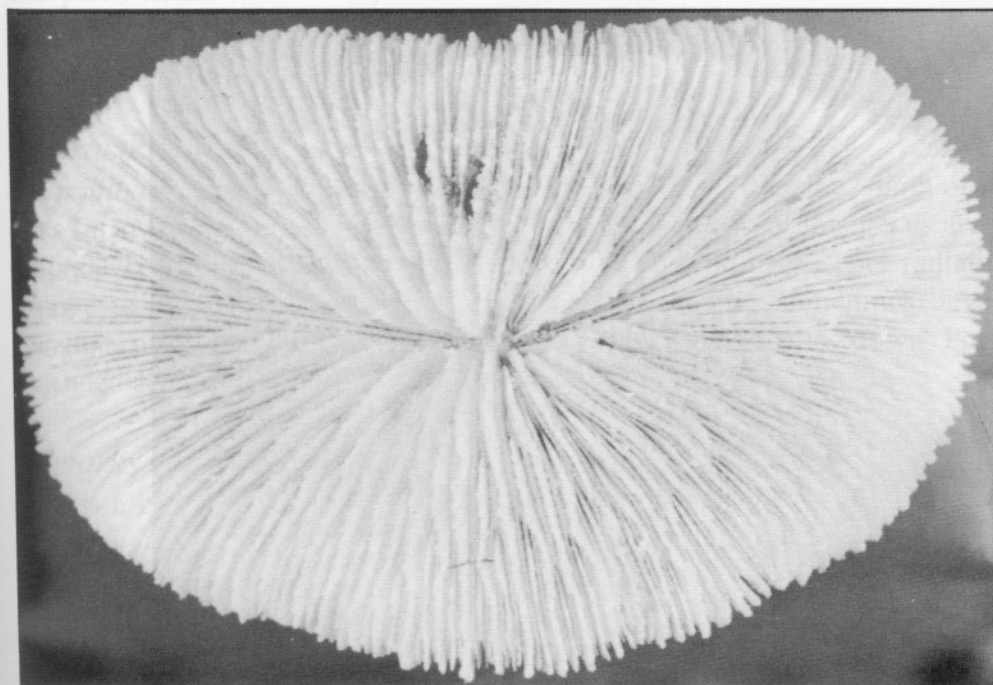
جَوْدِ مَحْمُودِ یَحْسَنُ مَهْ قَوِیْ زَیْنُ سُرُورِ عَمْرِو سَمْعِیْ سُرُورِ قَرِیْ سُرُورِ زَیْنُ
 سُرُورِ زَیْنُ رِیْ سَمْعِیْ سُرُورِ مَوْسِیْ "سُرُورِ زَیْنُ" مَهْ سُرُورِ قَرِیْ سُرُورِ



11b

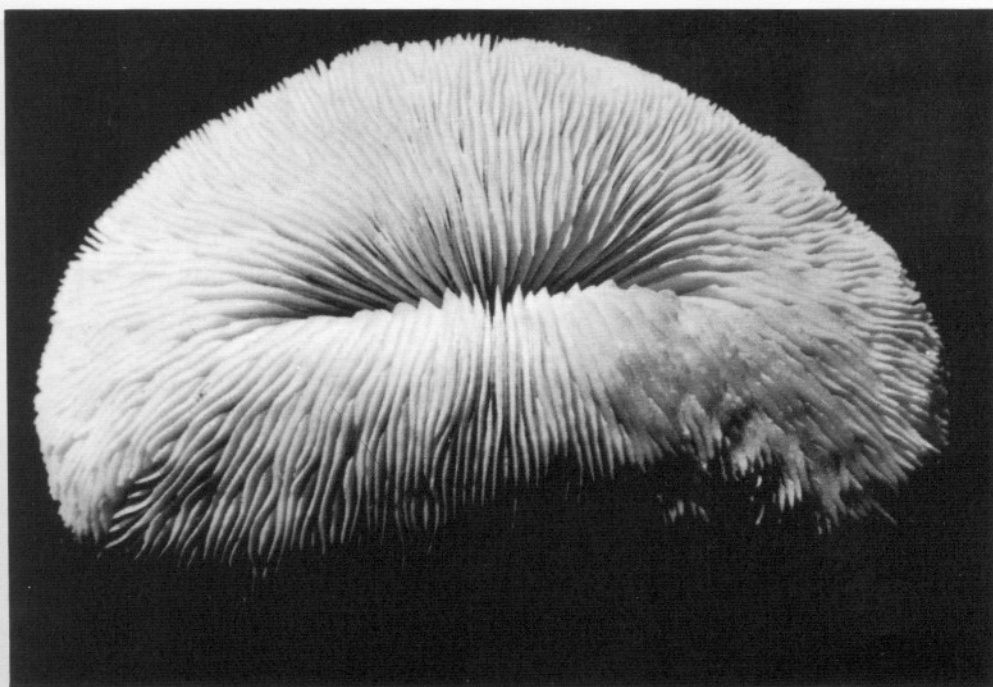


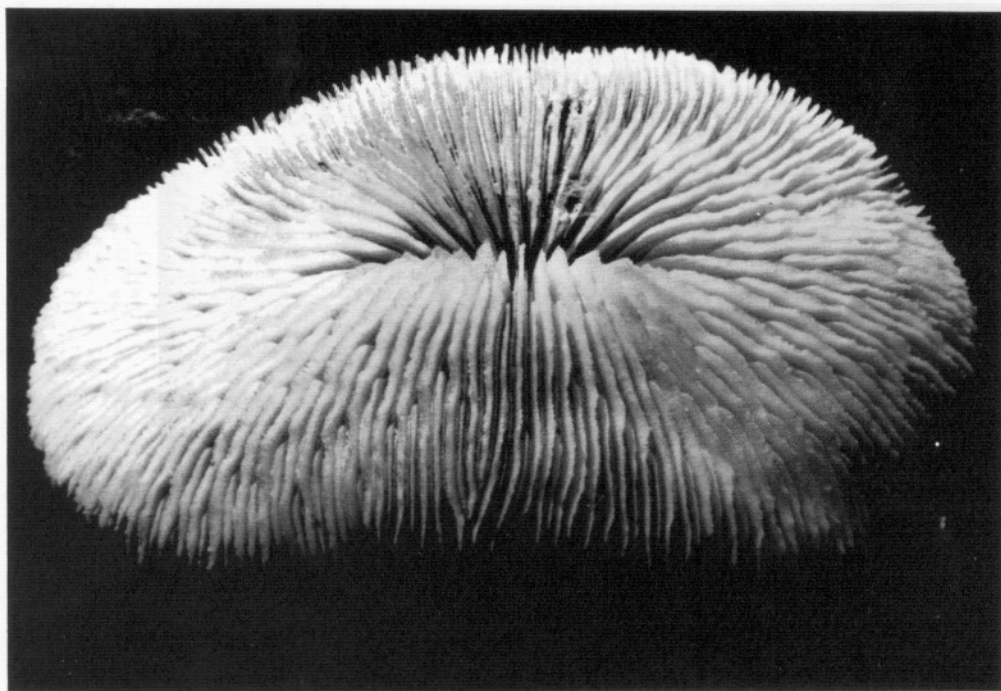
Herpolitha Eschscholtz, 1825



11c

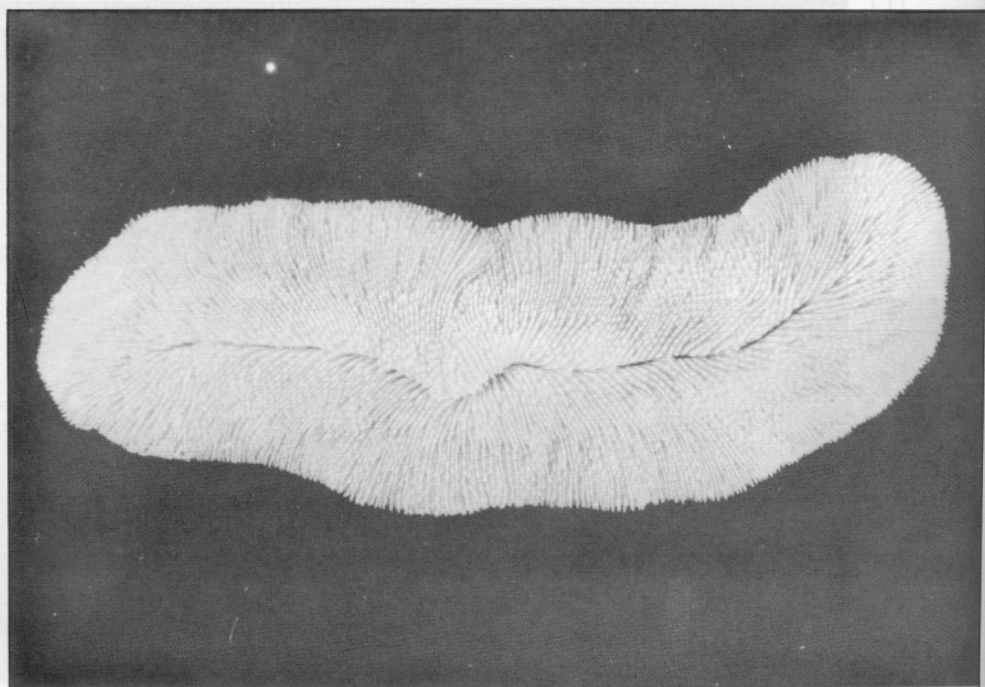
11d





11e

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Herpolitha Eschscholtz, 1825

Only two true species are thought to occur in this genus. Both are known to occur in the Maldives and are illustrated here (Fig. 12a, b).

Characters

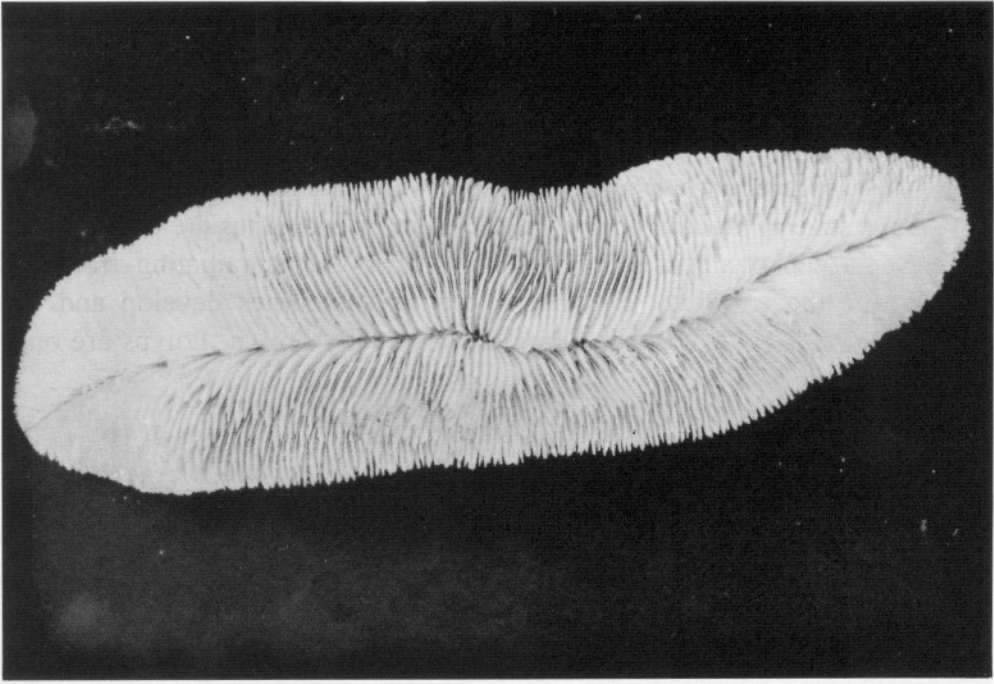
Herpolitha is usually elongate, with an axial furrow that runs the length of the corallum. This furrow may have several mouths, therefore members of this genus are described as colonial corals. Septa can come in three lengths, primary septa radiating from the groove to the edge of the corallum. Secondary centres sometimes develop and the corallum may become Y, T or X shaped. Colonies are usually brown. Polyps are only extended at night.

Remarks

This is a common genus, generally occurring in protected areas on reef slopes and in lagoons.

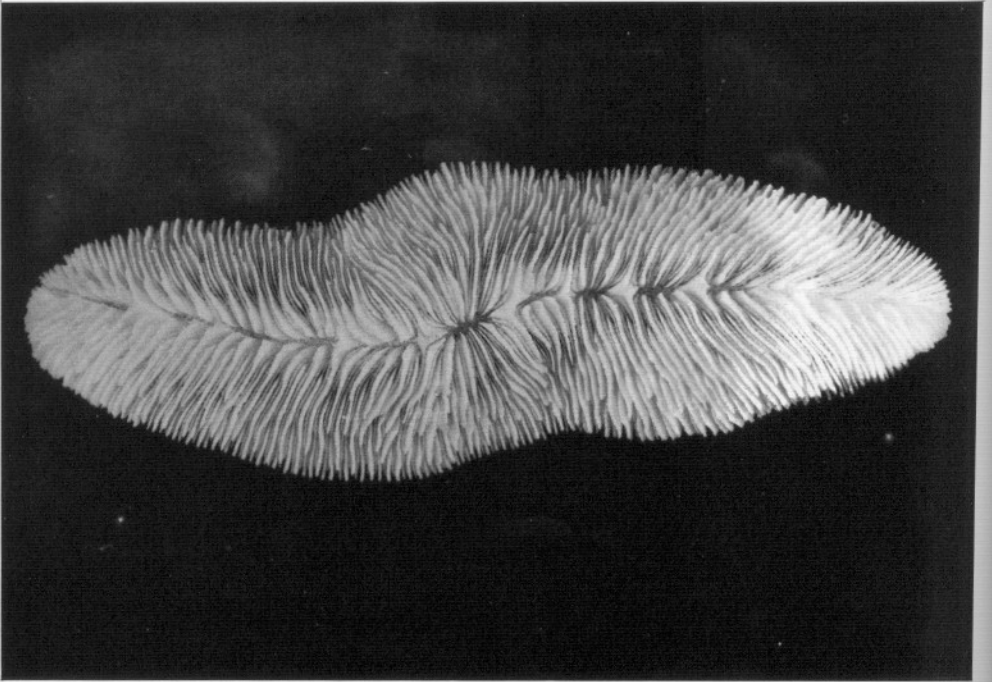
(12a, b)

Herpolitha is a genus of colonial corals. It is usually elongate, with an axial furrow that runs the length of the corallum. This furrow may have several mouths, therefore members of this genus are described as colonial corals. Septa can come in three lengths, primary septa radiating from the groove to the edge of the corallum. Secondary centres sometimes develop and the corallum may become Y, T or X shaped. Colonies are usually brown. Polyps are only extended at night.



12a

12b



Polyphyllia Quoy & Gaimard, 1833

There are three species in this genus, one of which is known to occur in the Maldives and is illustrated here (Fig. 13).

Characters

Like *Herpolitha*, *Polyphyllia* is considered a colonial coral due to the presence of many mouths on the upper surface of the corallum. Colonies are free living. The corallum is elongate in shape, and may be flat, arched, or crescent shaped. The colony is covered with long tentacles which are usually extended during the day making this genus very easy to distinguish. Colonies are usually brown.

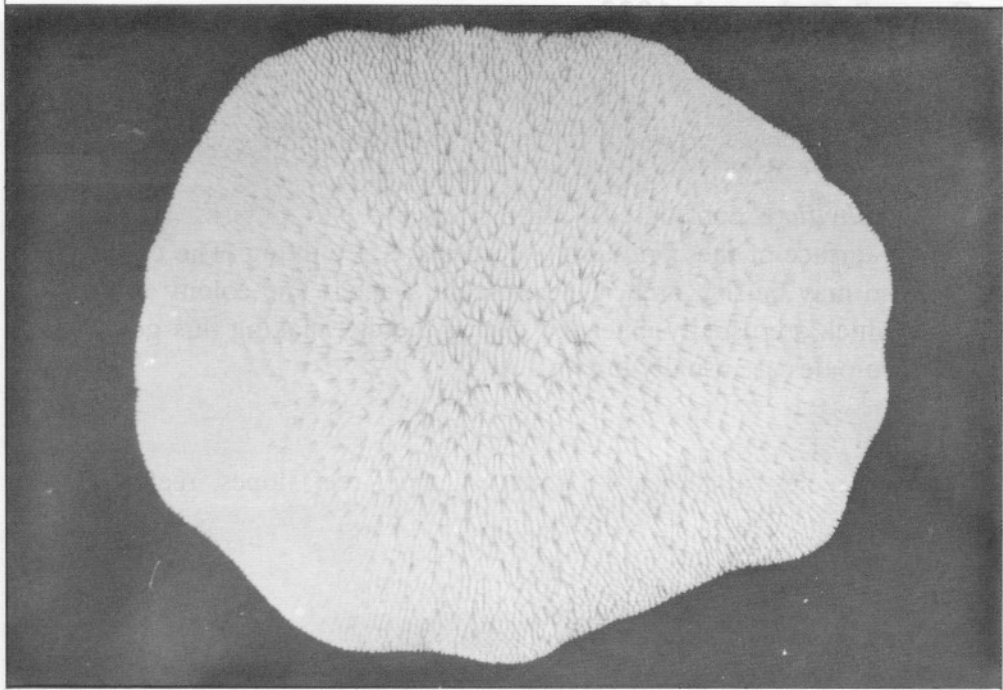
Remarks

Found in a variety of reef habitats; sandy bottoms, upper reef slopes, reef flats and lagoons.

(13)

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Halomitra Dana, 1846

Although six species have been described it is thought that only one is a true species. *Halomitra pileus* occurs in the Maldives and is illustrated here (Fig. 14).

Characters

Halomitra are free-living rounded colonies. They are usually dome or umbrella shaped consisting of a thin skeleton. There may be a central coralite that is larger than the secondary ones. The mouths are scattered widely over the upper surface of the corallum. The septa are covered in spines making it rough to touch. The corallum is brownish in colour. Polyps are extended only at night.

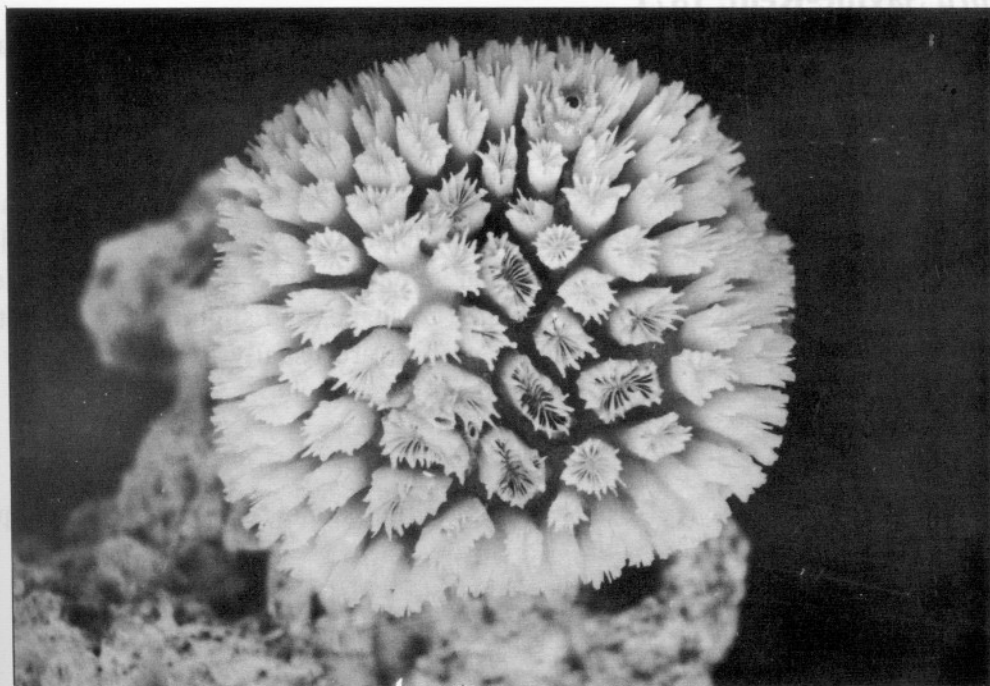
Remarks

Halomitra is uncommon and prefers protected lower areas of the reef slope or lagoons with a sandy substrate.

(14)

Figure 14 shows a colony of *Halomitra pileus*. The colony is dome-shaped and consists of a thin skeleton. The mouths are scattered widely over the upper surface of the corallum. The septa are covered in spines making it rough to touch. The corallum is brownish in colour. Polyps are extended only at night.

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Family Pectiniidae

Members of the Family Pectiniidae are colonial corals which possess large thick and fleshy tentacles which may be a variety of colours. These polyps are only extended at night. This group only consists of hermatypic corals which are generally laminar consisting of thin plates, but may be encrusting or foliaceous.

There are approximately 30 species in this family. There are five extant genera: *Physophyllia*, *Echinophyllia*, *Oxypora*, *Mycedium* and *Pectinia*. Only the latter four are known to occur in the Maldives (Fig. 16).

Oxypora Saville-Kent, 1871

There are two true species of *Oxypora*, one of which occurs in the Maldives and is illustrated here.

Characters

Oxypora forms encrusting, submassive or laminar colonies with foliaceous perimeters. The skeletal plate may be thin, becoming thickened in some areas, especially in submassive colonies. Most corallites are separate and distinct, but may be crowded on the corallum in some areas. They are rounded in shape, and slightly raised. Septa are few and columella are poorly developed. Colonies are usually brown in colour with pink, grey or green centres. Polyps are extended only at night.

Remarks

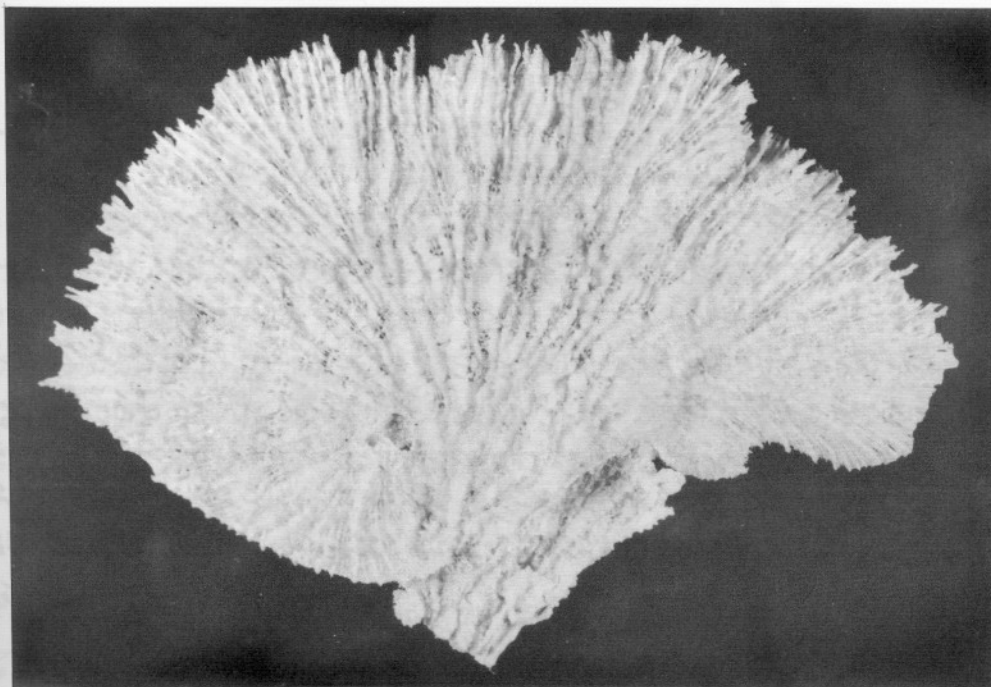
May be common in shallow reef fronts and upper reef slopes, colonies reaching up to a meter in diameter.

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Mycedium Oken, 1815

There are two true species of *Mycedium*. One is known to occur in the Maldives and is illustrated here (Fig. 17).

Characters

Mycedium usually form flat or contorted foliaceous colonies, that are known to display a lot of growth variation. Corallites are usually separate but may crowd together in places on the corallum. They are inclined at an angle to the corallum surface with the calice opening facing towards the outside of the colony. Most colonies are brown, pink or greenish often with brightly coloured red or green oral discs. Polyps are extended only at night.

Remarks

Common in a wide range of habitats, where the skeleton tending to become thinner and more delicate in deep, protected areas.

Characters

Polyps

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17 (17)

1. The colony is a flat, fan-shaped, foliaceous structure, often with a central point of attachment and radiating branches. The surface is covered with numerous small, rounded corallites, each with a central opening (calice) facing outwards. The color of the colony is typically brown, pink, or greenish, with bright red or green oral discs visible at night.

2. The corallites are usually separate but may crowd together in places on the corallum. They are inclined at an angle to the corallum surface with the calice opening facing towards the outside of the colony. Most colonies are brown, pink or greenish often with brightly coloured red or green oral discs. Polyps are extended only at night.

3. The colony is a flat, fan-shaped, foliaceous structure, often with a central point of attachment and radiating branches. The surface is covered with numerous small, rounded corallites, each with a central opening (calice) facing outwards. The color of the colony is typically brown, pink, or greenish, with bright red or green oral discs visible at night.

Echinophyllia Kulunzinger, 1879

There are five nominal species and four true species. Three species have been recorded from Maldives and only one species is illustrated here (Fig. 18).

Characters

Colonies are encrusting, laminar or foliaceous. Often the central part of the corallum is attached and solid, the margin free and thinner. Calices are round and oval in shape, not strongly inclined to the corallum surface. There are numerous septa and columella are well developed. Septal margin is unevenly serrated. The overall colour of the colonies are brown with green or pink oral discs. Polyps are extended only at night.

Remarks

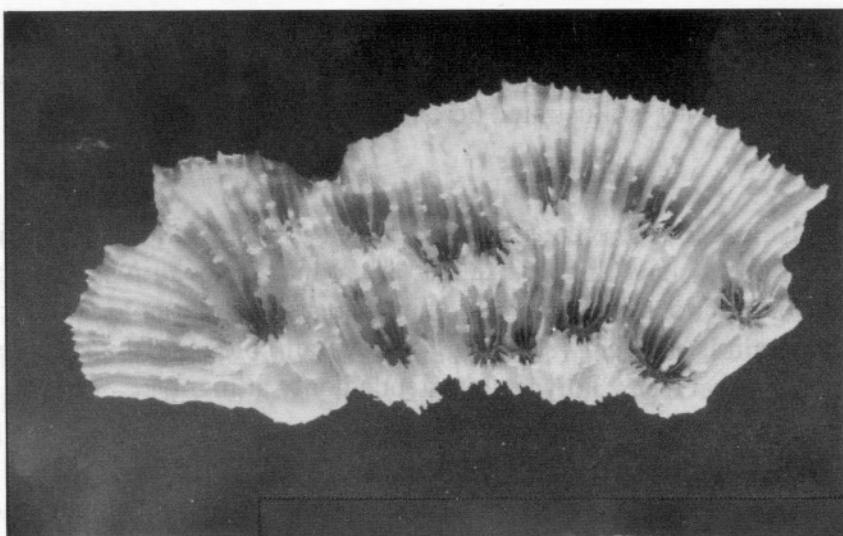
This genus is common in wide range of habitats, especially lower reef slopes and lagoons. Colonies may reach a meter or two in diameter.

(18)

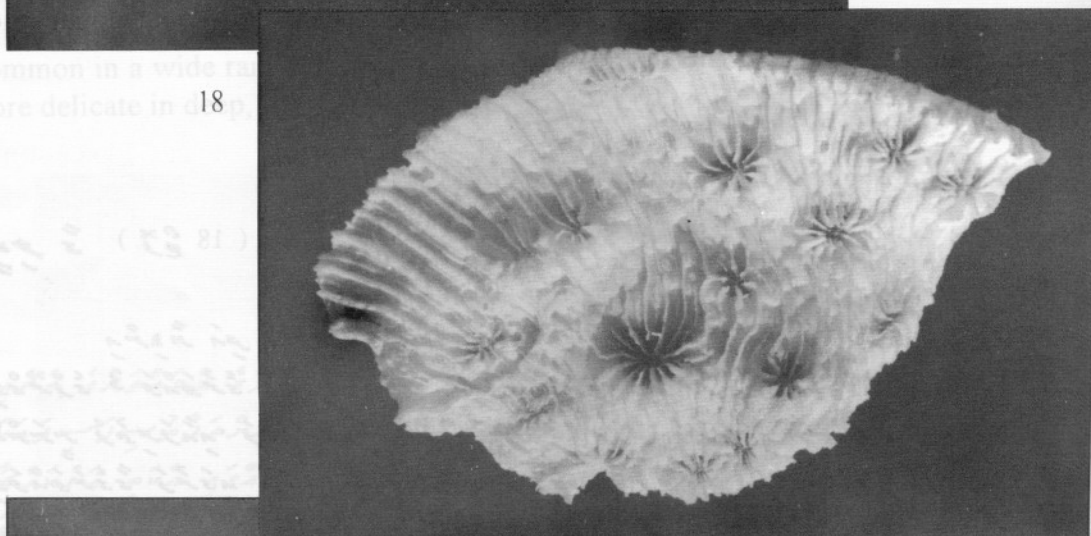
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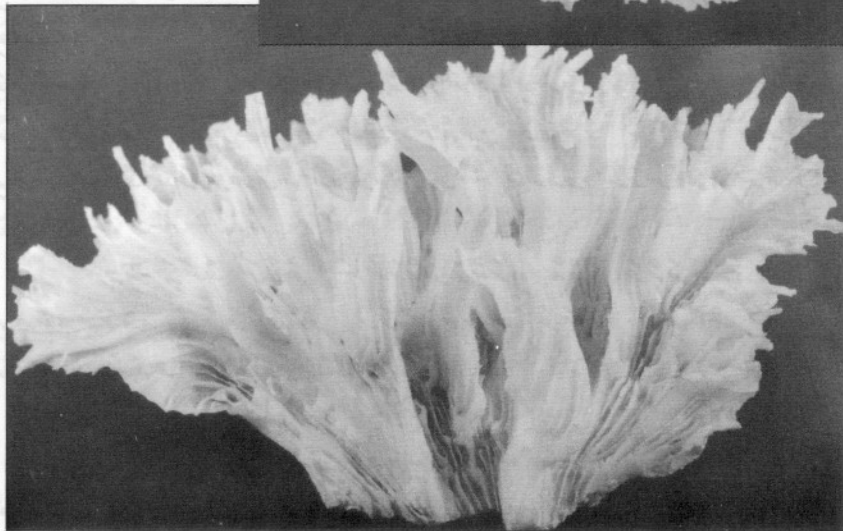
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Pectinia Oken, 1815

There 14 nominal species, but only seven true species. Three species have been recorded from the Maldives. Only one species is illustrated here (Fig. 19).

Characters

Colonies are laminar and branching with thin irregular walls arranged as short valleys. The walls may form tall spires, becoming sub-arborescent. A large coralite centre may be in any position in the corallum. The walls commonly have smaller secondary centres half way up the coral. Septo-costae are often spiny. The living coral is often brown or greyish in colour. Polyps are extended only at night.

Remarks

Occurs in most reef habitats, both in shallow and deep areas. Common in lower reef slopes and in turbid waters. These corals may have been exploited for making lime which have been used as a substitute for cement for construction purposes.

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Family Mussidae

Members of the Family Mussidae are hermatypic and may be colonial or solitary corals. The skeletons of this group are heavy and have large sharp spines on the septa. The polyps are thick and fleshy and may have a range of colours.

Mussidae has twelve genera of which seven are known to occur in the Indo-Pacific region. Only five of these genera are known to occur in the Maldives: *Scolymia*, *Cynarina*, *Acanthastrea*, *Lobophyllia* and *Symphyllia*. However two genera are described here.

Lobophyllia Blainville, 1830

There are five true species of *Lobophyllia*. Three have been recorded from the Maldives. Two are illustrated here (Fig. 20a, b).

Characters

Lobophyllia forms massive, convex or rounded colonies. Colonies are phaceloid to meanderoid. Coralites and valleys are large. Septa are large with very long teeth. Columella are compact. A fleshy mantle is often present on the surface of the coral, hiding much of the detail of the corallum. The living tissue of the corallum is usually green or brown, sometimes red or pinkish with different coloured mouth. Polyps are only extended at night. Tentacles usually have white tips.

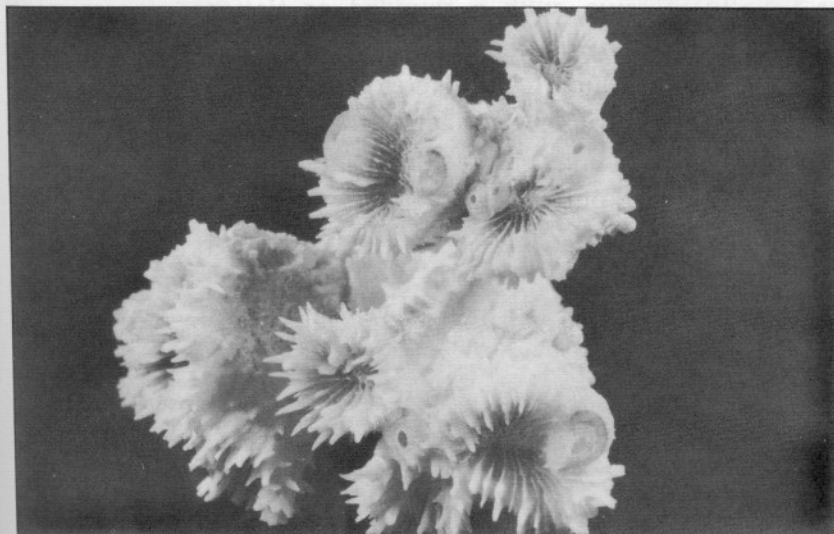
Remarks

Lobophyllia colonies are common along the reef flats and upper reef slopes. Colonies may reach two meters in diameter. These coral are not exploited by coral miners.

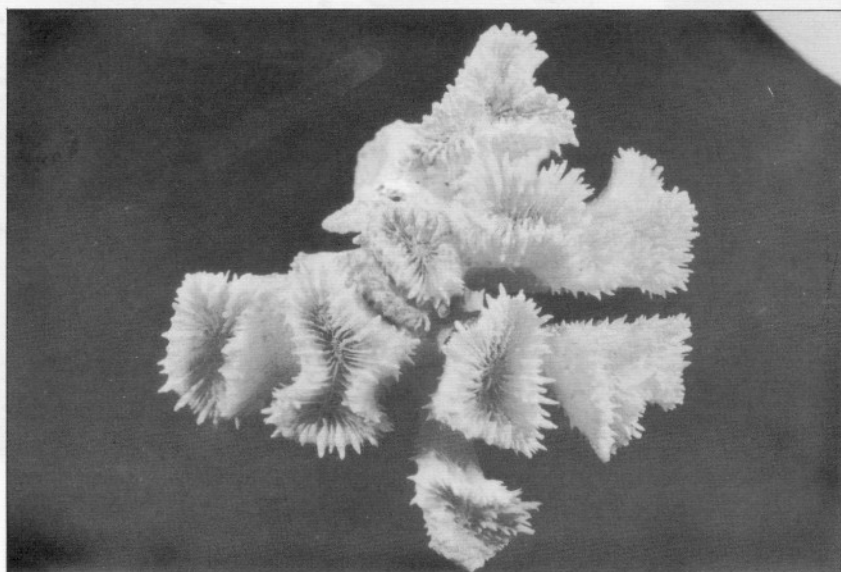
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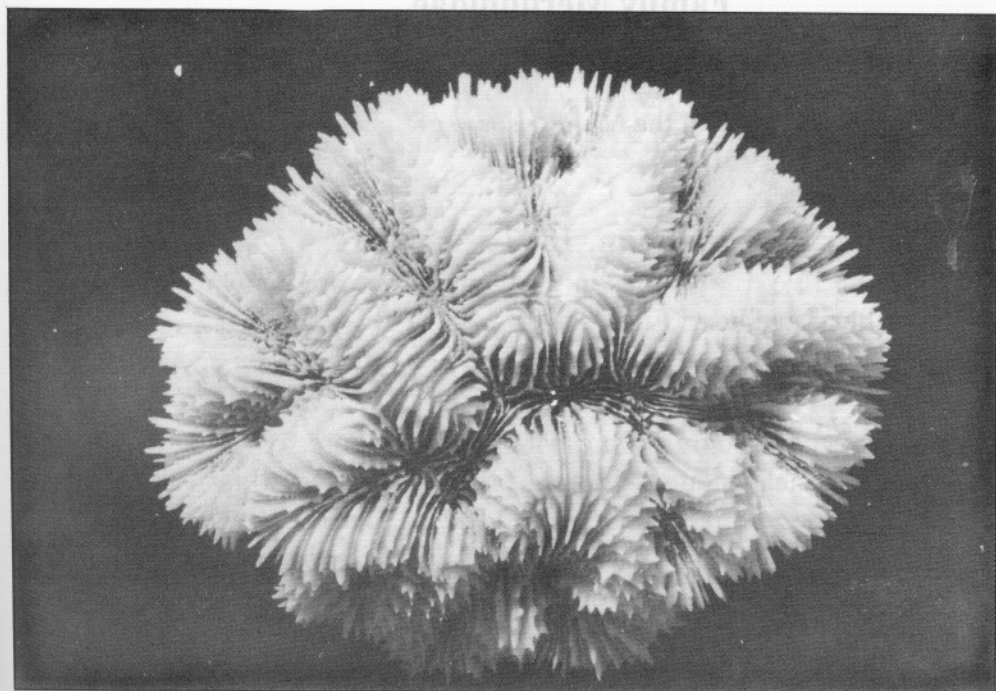
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20a

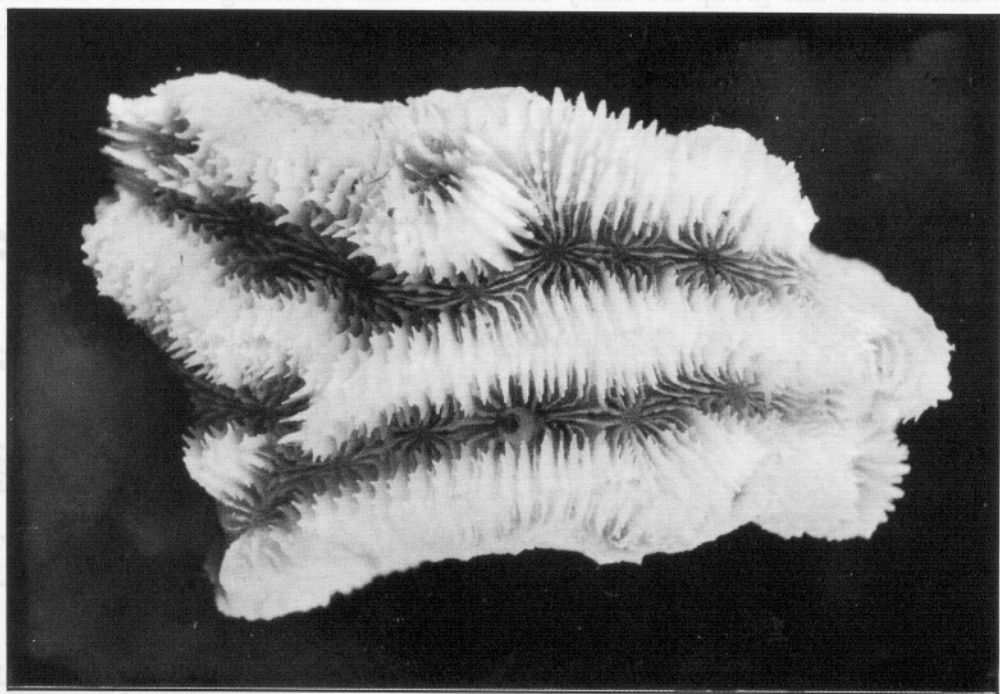


20b





21a



21b

Family Merulinidae

All members of this family are hermatypic and colonial corals. There are five genera, two of which are known to occur in the Maldives and are illustrated here.

Hydnophora Fischer de Waldheim, 1807

There are thought to be five true species in this genus, two are known to occur in the Maldives. Two are illustrated here (Fig. 22a, b).

Characters

Hydnophora is easily recognised by the presence of hydnoophores covering the corallum surface. These small conical mounds protrude from shared corallite walls, and may come in a variety of shapes, which can serve to identify species. *Hydnophora* may be branched massive or encrusting, or combinations of these growth forms. The corallites are joined in series, and ridges are not prominent. Colonies are usually brown or cream in colour. Polyps may be extended during the day.

Remarks

Members of this group are fairly common corals occurring in most reef habitats. Tend to prefer calm lagoons and sheltered reef slopes. Massive forms may be exploited by coral miners.

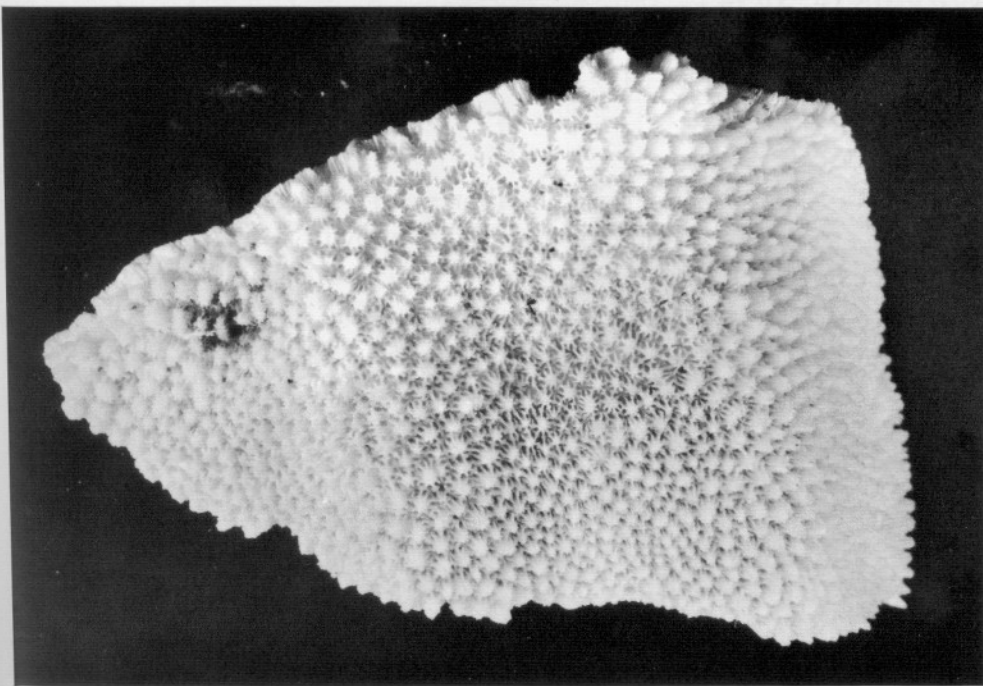
(22a, b)

(Merulinidae) " "
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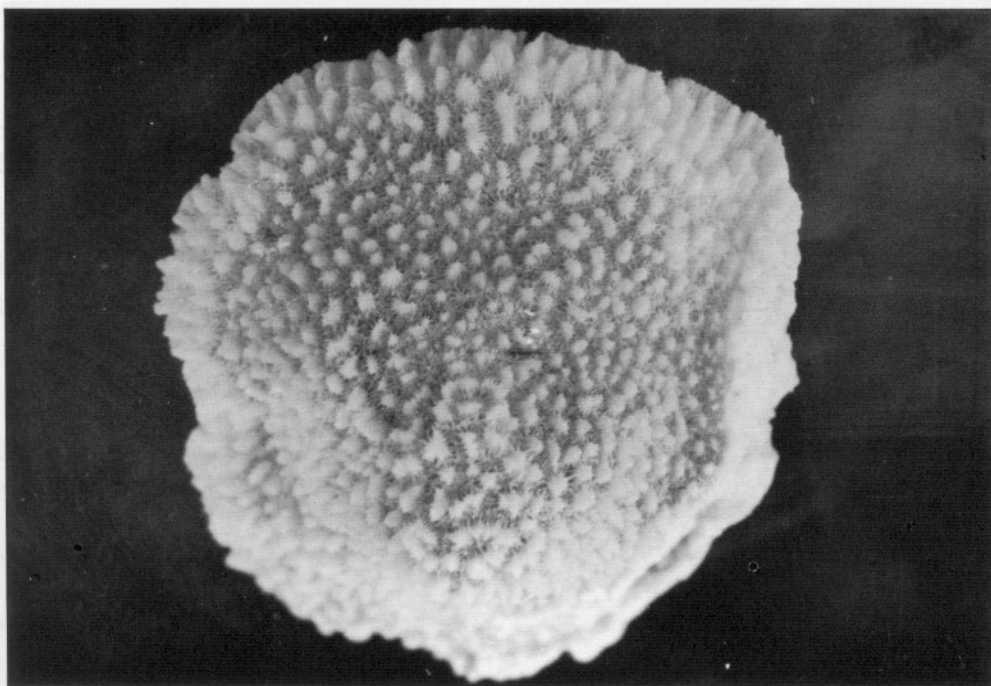
22a, b

22a, b

22a



22b



Merulina Ehrenberg, 1834

There are two true species of *Merulina*, one of which is known to occur in the Maldives and is illustrated here (Fig. 23).

Characters

Merulina is usually foliaceous, laminar or sub-arborescent with partly encrusting base. A colony may display a combination of the above growth forms. *Merulina* is a meandroid coral with small calices arranged in rows which are separated by collines or hills. The valleys and rows of calices usually radiate from the colony centre. Flat surfaces have concentric growth lines. Colonies may have variety of pale colours, usually pink or brown. Polyps are usually extended only at night.

Remarks

Merulina is not common in the Maldives, but may occur in protected lagoons and reef slopes.

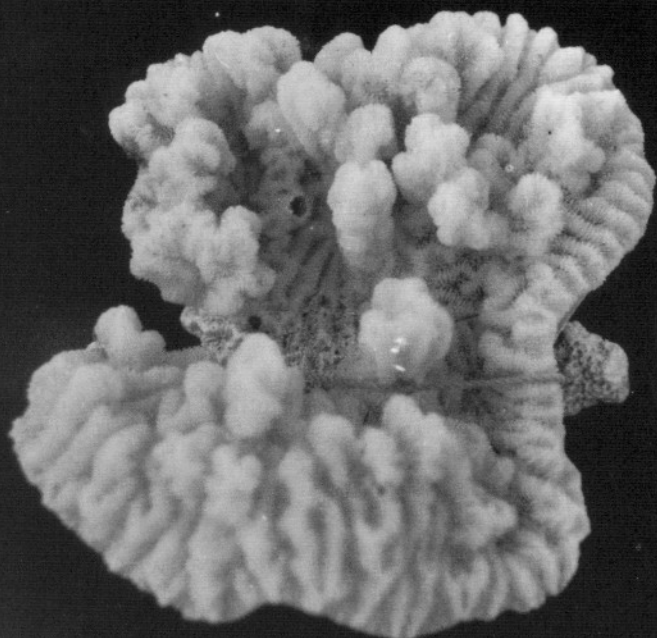
Remarks

Members of this group are fairly common corals occurring in (23)

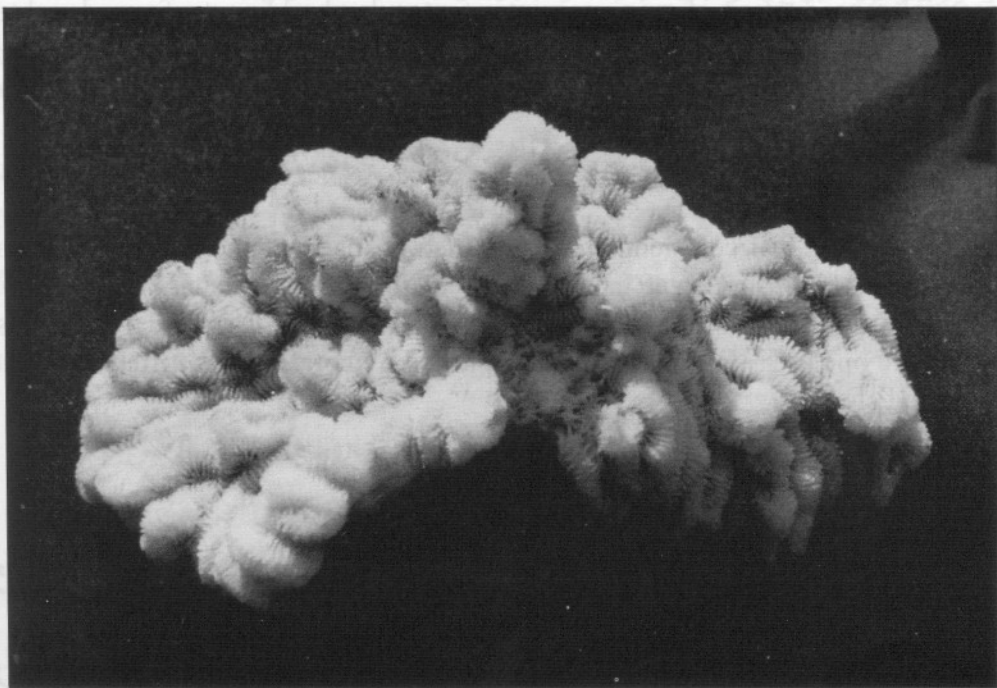
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23(i)



23(ii)



Family Faviidae

Members of the Family Faviidae, are among the most important groups of colonial corals. This group displays the largest number of genera in scleractinian corals.

Morphology within this group is variable. Faviidae displays a great array of colony structural variations. The more common corallite structures are: *phaceloid*; *plocoid*; *cerioid*; and *meandroid*. Two types of asexual reproduction; intra-tentaculur or extra-tentacular budding can be important in identification. There are over 200 species in the family which are divided into 27 extant genera. Thirteen genera will be described here.

Favia Oken, 1815

Eleven true species are known to occur in the Indo-Pacific region. Six species are known to occur in the Maldives. Four are illustrated here (Fig. 24a-d).

Characters

Favia usually form massive rounded or dome shaped colonies, with some encrusting forms. Corallites are monocentric and plocoid. Corallites are roughly the same size and shape, and are slightly projected above the corallum surface. The numerous septa are clearly visible and together with the adjoining costae are rough to touch. This genus is very similar to *Monastrea* and one way to separate them is by looking at the mode of asexual reproduction. *Favia* uses intra-tentacular budding to form daughter corallites whereas in *Montastrea* new coralites are formed by extra-tentacular budding. Colonies are usually brown, green or yellow with contrasting coloured corallite mouths. Polyps are extended only at night.

Remarks

This is often a difficult genus to distinguish as many of the characteristics are variable with depth, light, and reef habitat. The distinction between *Favia* and *Favites* is not very contrasting. *Favia* are common on shallow reef flats and reef fronts, and may dominate one area. *Favia* is heavily exploited by coral miners, often collected from reef flats and slopes.

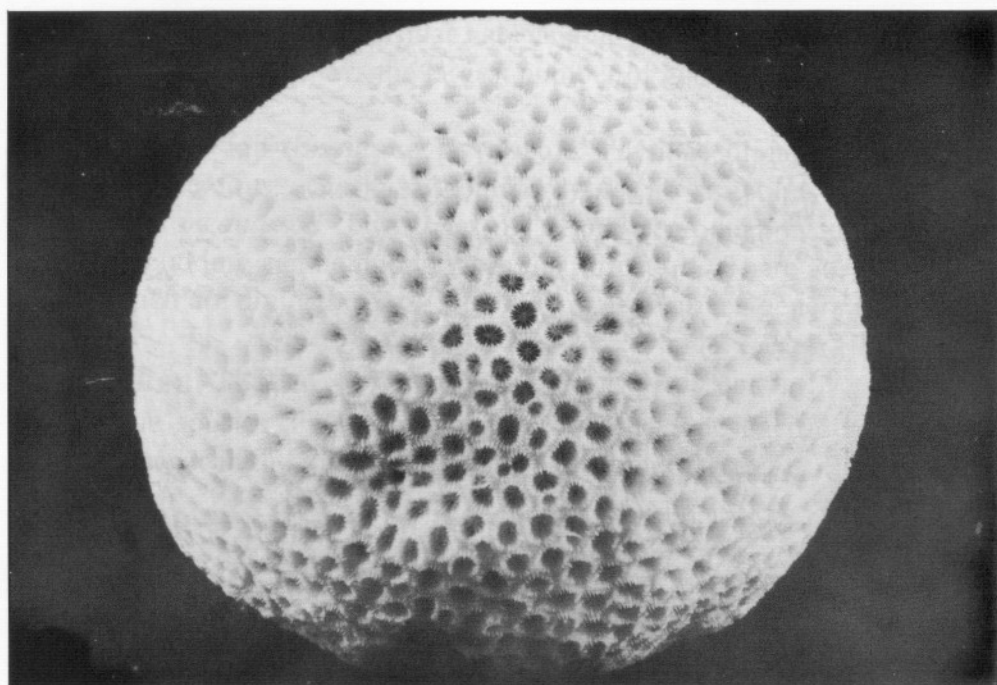
(24a-d ) 

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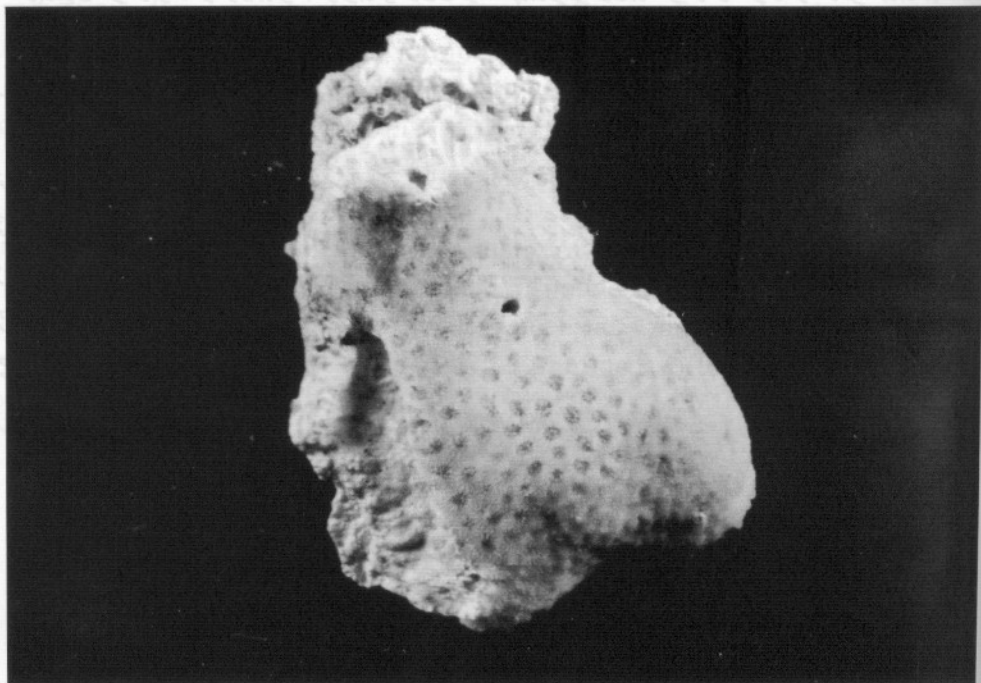
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Family Faviidae

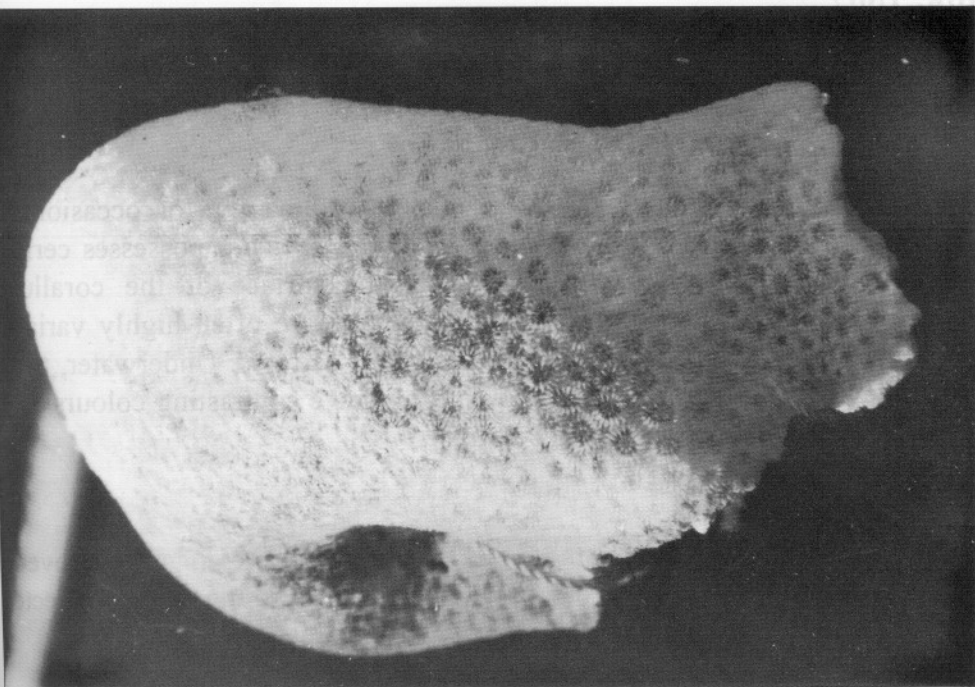
24a



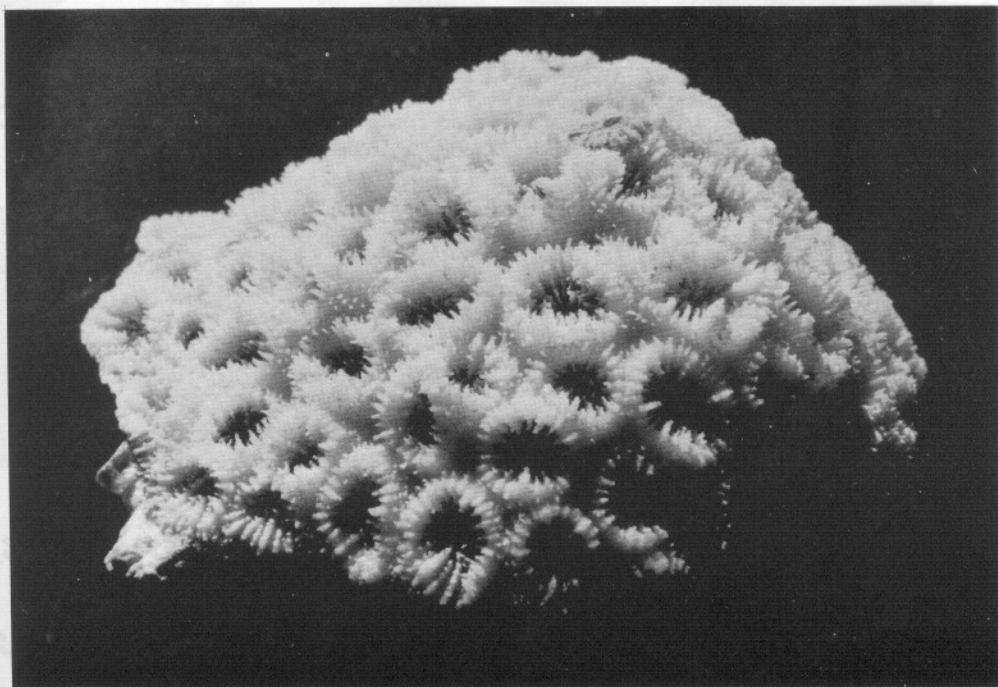
24b



24c



24d



Favites Link, 1807

All of the seven true species of this genus are known to occur in the Maldives. Only three are illustrated here (Fig. 25a-c).

Characters

Favites forms massive rounded colonies. They may be submassive or occasionally encrusting. Like *Favia* corallites are monocentric. However *Favites* possesses cerioid corallites with shared walls which is raised above the surface of the corallum. Corallites may be rounded, oval or polygonal in shape and are often highly variable even within the one colony. Septa are prominent and finely serrated. Underwater, these species appear quite colourful and the inner mouth often have contrasting colours with respect to the walls. Polyps are extended only at night.

Remarks

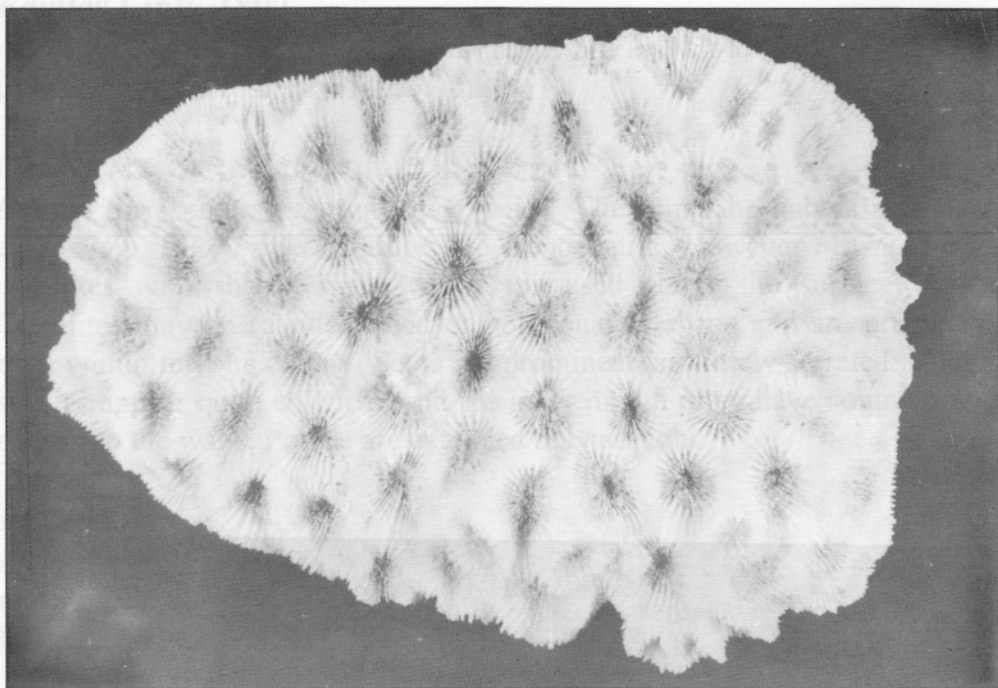
Favites is a common genus and found in most reef habitats. Colonies may grow over a meter or two in diameter. Like *Favia* the massive forms of these coral are also collected by coral miners and used for construction purposes.

(25a - c) ޖަދުވަލު 25

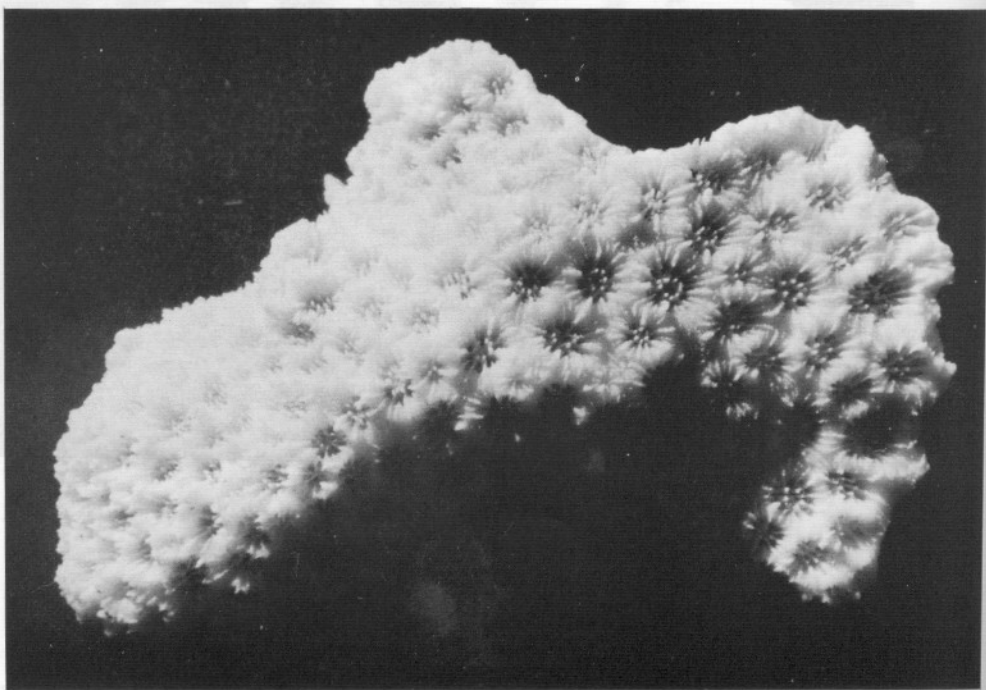
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ފެންނަނިވި ސަރަޙައްދުތަކުގެ ފެންނަނިވި ސަރަޙައްދުތަކުގެ ފެންނަނިވި ސަރަޙައްދުތަކުގެ ފެންނަނިވި ސަރަޙައްދުތަކުގެ

ފަވައިތަކުގެ ފެންނަނިވި ސަރަޙައްދުތަކުގެ ފެންނަނިވި ސަރަޙައްދުތަކުގެ ފެންނަނިވި ސަރަޙައްދުތަކުގެ ފެންނަނިވި ސަރަޙައްދުތަކުގެ



25c



Goniastrea Edwards & Haime, 1848



There are seven true species of *Goniastrea*. Two species are known to occur in the Maldives, and both are illustrated here (Fig. 26a, b).

Characters

Goniastrea forms massive rounded, convex or lobed colonies that may be occasionally encrusting. Corallites may be rounded or polygonal and tend to be crowded. Corallites are cerioid, and may form short meanders on the corallum surface. Septa are visible and smooth to touch. Budding is intra-tentacular. There is a well formed paliform lobe at the inner margin of the septa. Columella is well defined. Colonies are brown, green or greyish. Polyps are extended only at night.

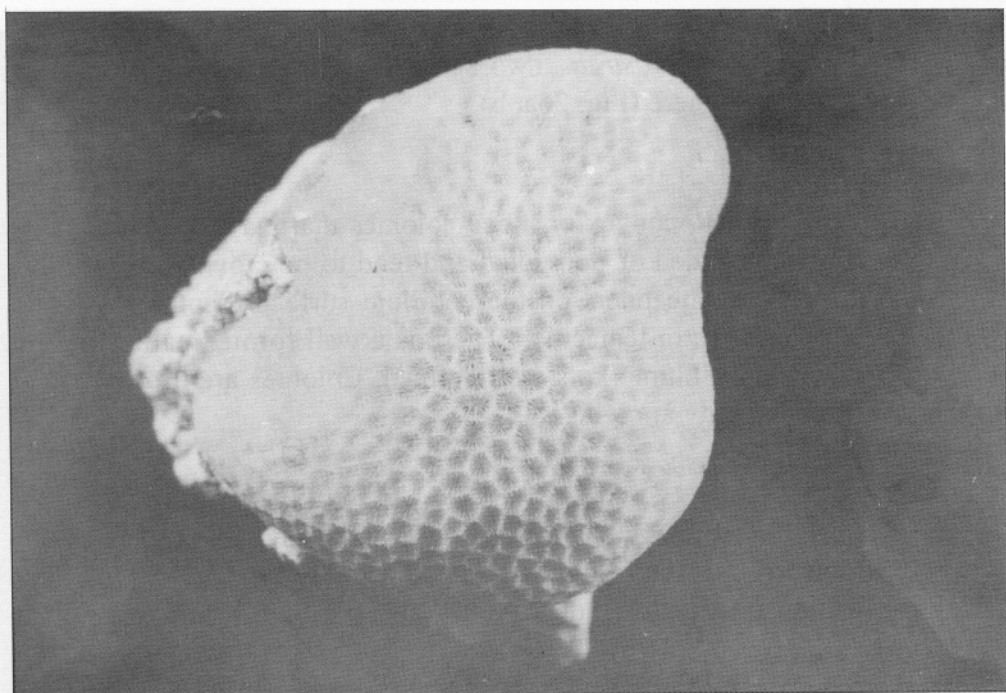
Remarks

This is a common genus, that prefers shallow waters, and can persist even when exposed at low tide. Some species may dominate in reef fronts and reef flats, where they are mined for use in the construction industry.

(26a, b ) 

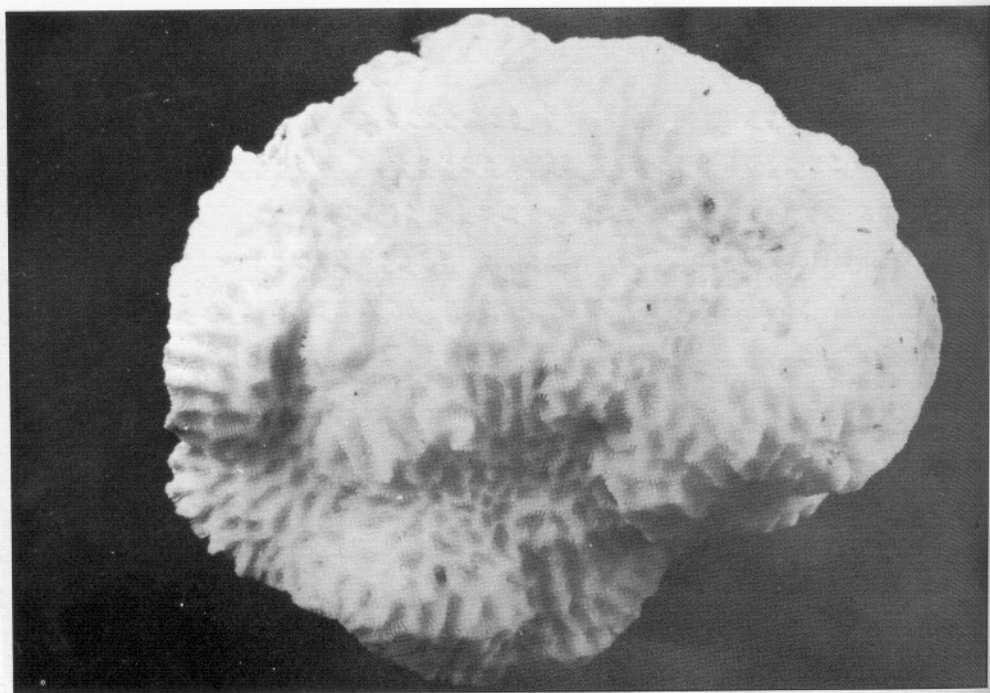
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26a

26b



Platygyra Ehrenberg, 1834

There are thought to be around eight species of *Platygyra*. Three species are known to occur in the Maldives, and one is illustrated here (Fig. 27).

Characters

Platygyra forms massive, flat or dome shaped colonies. Corallites are joined in series to form long meanders with mouths arranged in rows in the centre of the valleys. Septa are armed with teeth and run freely over the ridge and into calices. Colonies may be green, brown or white or a combination of these colours. Polyps are extended only at night.

Remarks

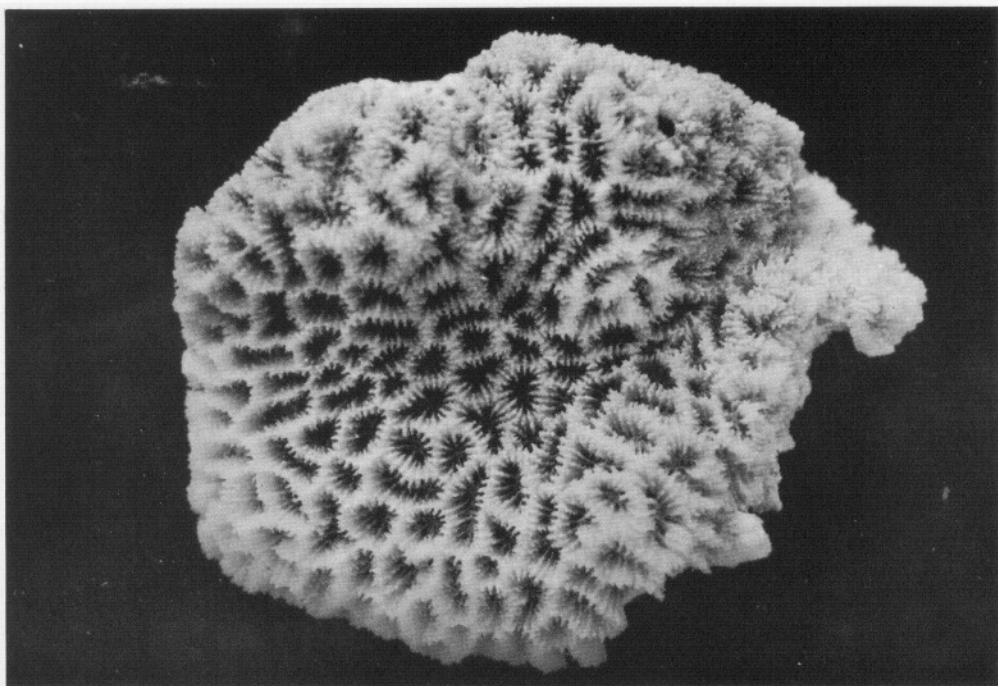
Platygyra are commonly called 'brain corals' due to the meanders on the corallum surface. *Platygyra* is a common genus and can occupy a great number of reef habitats. Large boulders are exploited by coral miners.

(27 9x) 5 5 5 5 5

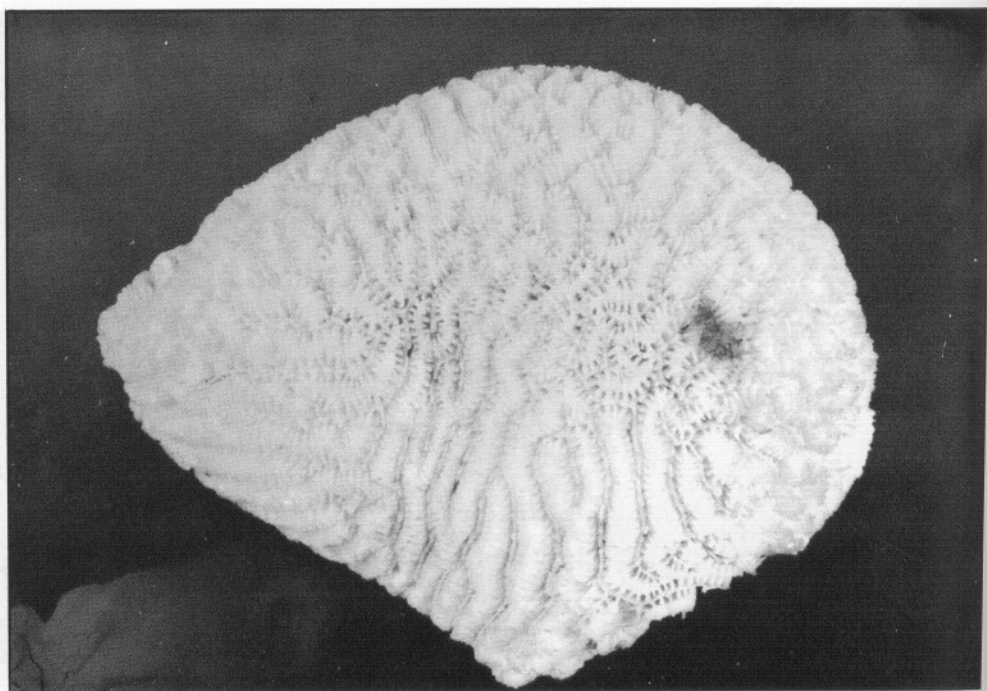
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27



28



Leptoria Edwards & Haime, 1848

There is thought to be only one true species in this genus that also occurs in the Maldives, and is illustrated here (Fig. 28).

Characters

Colonies are massive, but hillocky rather than rounded. Calices are joined in series to form long meanders over the corallum surface. The valleys are of uniform width and depth, making *Leptoria* quite a 'neat' species. Septa are distinct and run parallel to each other, not quite meeting in the centre of the corallite. *Leptoria* is often confused with *Platygyra*, but can be distinguished by the plate-like columella, which appears spongy in *Platygyra*. Colonies are brown or creamy in colour. Polyps are usually extended at night.

Remarks

Leptoria occurs in most reef habitats. It tends to prefer shallow waters dominating areas along the reef front and upper reef slope. These corals are also exploited by coral miners.

(28 ق)

[illegible][illegible]

دیکھو! یہاں تو "موت" کی بجائے "حیات" ہے۔

Oulophyllia Edwards & Haime, 1848

There are three true species of *Oulophyllia*, one of which occurs in the Maldives and is illustrated here (Fig 29).

Characters

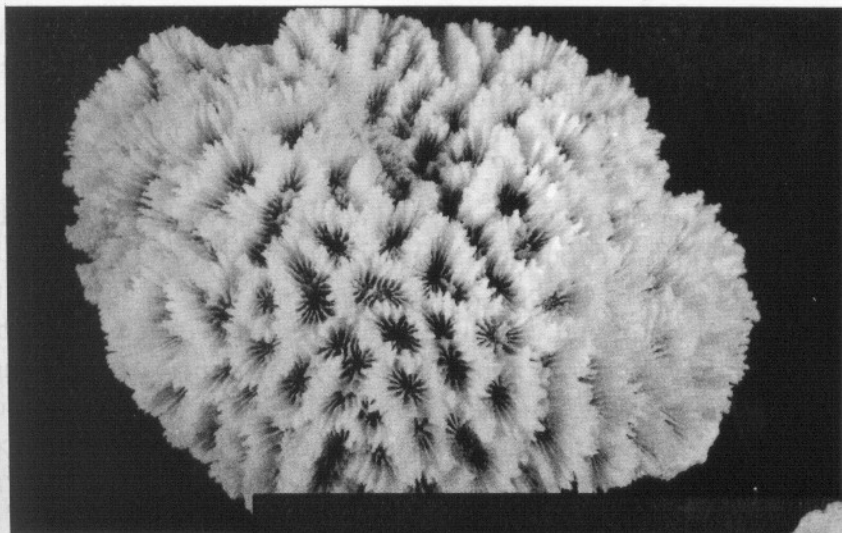
Oulophyllia forms massive colonies that may be round or convex in shape. Calices are joined in series to form relatively short discontinuous valleys. Valleys are usually broad (up to 20mm) and the septa appear irregular. Septa are not evenly spaced as in *Leptoria*. Paliform lobes are usually present. Colonies may have brown or green walls with pink or creamy valleys. Polyps are usually extended at night.

Remarks

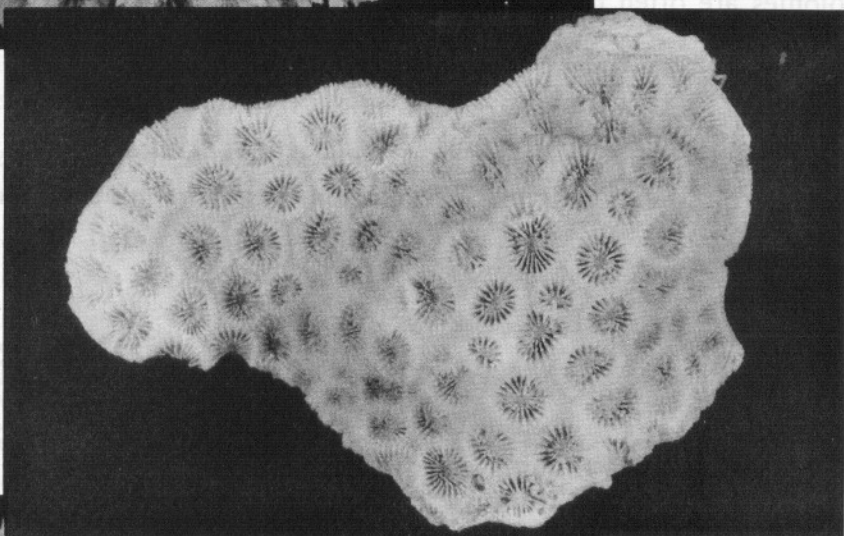
Although known to occur in most reef habitats, *Oulophyllia* is a relatively uncommon species. It may be found in shallow protected environments such as lagoons.

(29)

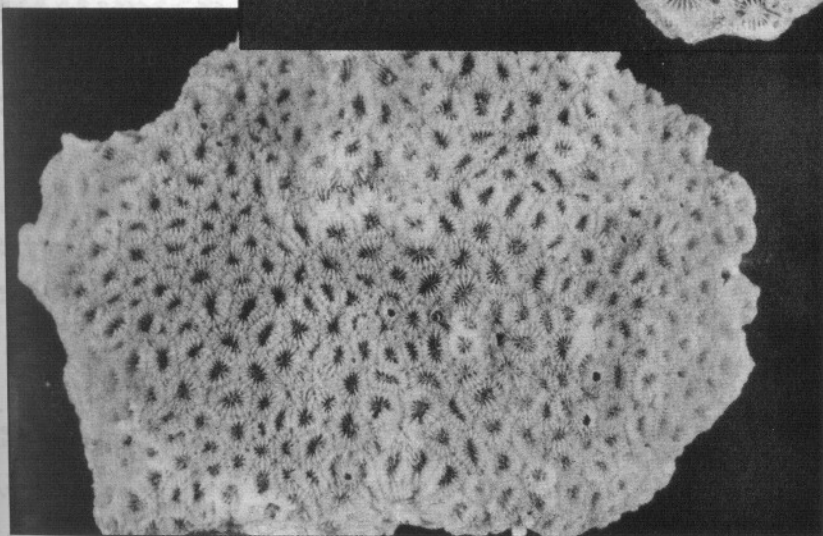
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30a



30b



Montastrea de Blainville, 1830



There are around five or six species from the Indo-Pacific area, three of which are known to occur in the Maldives. Two of these are illustrated here (Fig. 30a,b).

Characters

Monastrea form rounded, flattened or massive colonies. Some colonies may be encrusting. The monocentric, plocoid corallites are generally rounded and are slightly elevated from the corallum surface. Members of this genus are often confused with *Favia* due to the similar growth form and corallite arrangement. *Favia* reproduces by intra-tentacular budding, while *Monastrea* reproduces by extra-tentacular budding. Septa are finely toothed bearing a paliform lobe. The smaller daughter corallites of *Montastrea* can often be seen between the larger mature ones on the colony surface. Colonies are often brown, yellow or greenish in colour. Polyps are extended only at night.

Remarks

While *Monastrea* may occur in a wide variety of reef habitats. However it is not common on Maldivian reefs. Large colonies may be mined, if they are found on reef flats.

(30a, b ) 

[illegible][illegible]

دَیْخَنَ مَیْ قَیْ نَیْ سَیْ سَیْ قَیْ سَیْ مَیْ سَیْ دَیْخَنَ مَیْ قَیْ نَیْ سَیْ
 سَیْ سَیْ "وَهْیْ سَیْ" مَیْ سَیْ قَیْ سَیْ

Plesiastrea Edwards & Haime, 1848

There are two true species described for this genus. One is known to occur in the Maldives and is illustrated here (Fig. 31).

Characters

Plesiastrea forms massive colonies which may be rounded or flattened. Corallites are monocentric and plocoid, that may be crowded and slightly raised. Daughter corallites are produced by extra-tentacular budding. Paliform lobes are distinct and form a circle around the columella. Colonies may be pale green or brown. Polyps are commonly extended only at night.

Remarks

Although it is known to occur in a wide variety of reef habitats, *Plesiastrea* is not a common coral. It tends to prefer sheltered areas away from wave-action, such as deeper waters and overhangs in the reef.

(31)

[illegible]

وَمِنْهُمْ مَّنْ يَّهْدِي وَبَعْضُهُمْ يَضِلُّ ۚ وَاللَّهُ بِمَا تَعْمَلُونَ خَبِيرٌ ۝١٢٠

[illegible]

Diploastrea Matthai, 1914

There is only one member of this genus: *Diploastrea heliopora*, and it is one of the most easily recognised corals. This species is known from the Maldives and is illustrated here (Fig. 32).

Characters

Diploastrea forms massive colonies that may be rounded or slightly flattened. The corallites are plocoid and regular in appearance (cone shape), 2 - 3mm raised above the corallum surface. Budding is extra-tentacular and daughter corallites can often be seen between the larger mature ones. Septal arrangement is distinct with a thicker outside edge that becomes thinner as it reaches the centre of the corallite. Colonies are pale brown or green in colour. Polyps are extended only at night.

Remarks

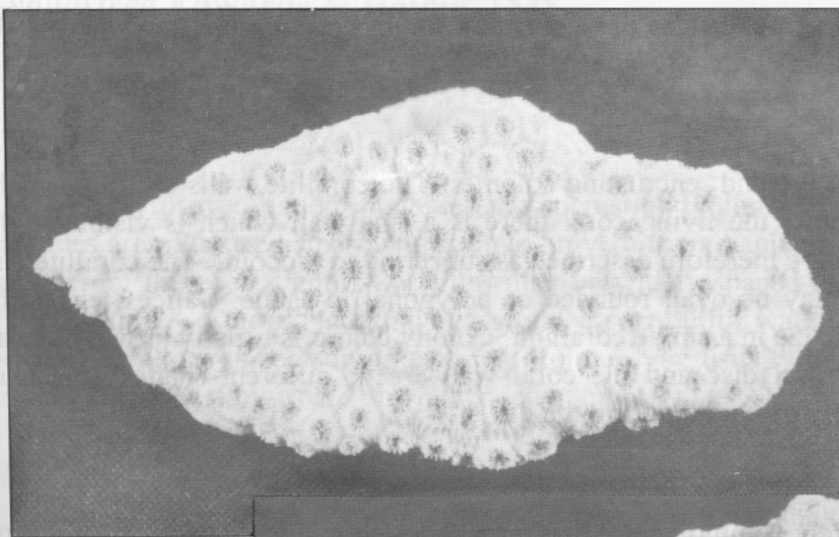
While *D. heliopora* is known from most reef environments, it is not a common coral. It seems to prefer areas of strong current movement such as reef fronts, flats and upper reef slopes. Colonies in these areas can attain large sizes. Larger colonies may be mined if found in shallow reef flats.

(32 0x) 7x x 70 0

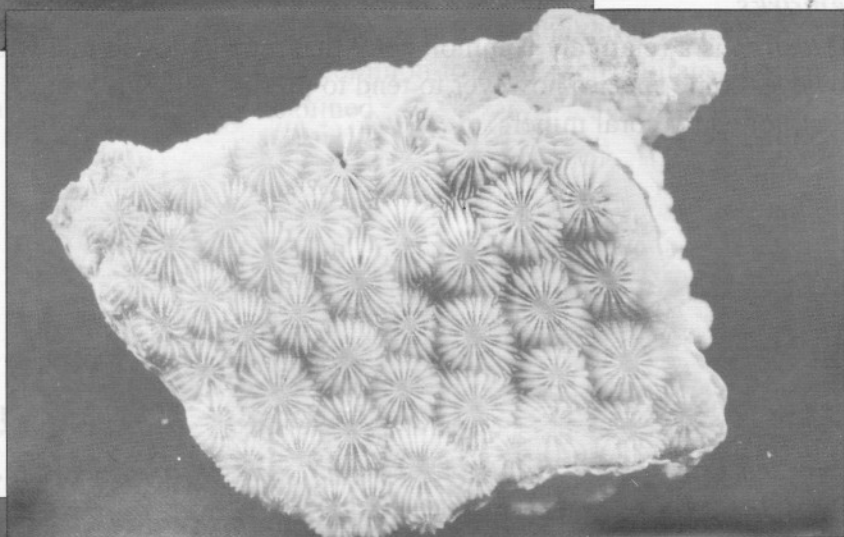
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جَدِّكَ مِنْ مَتِّهِ فَوَيْلٌ لَكَ مِنَ النَّارِ سَبْعُونَ مِائَةً أَلْفَ نَفْسٍ تَنْزِيلُ
سَبْعِينَ مِائَةً أَلْفًا وَسِتُّونَ وَفِي السَّادَةِ ثَمَانُونَ مِائَةً أَلْفًا

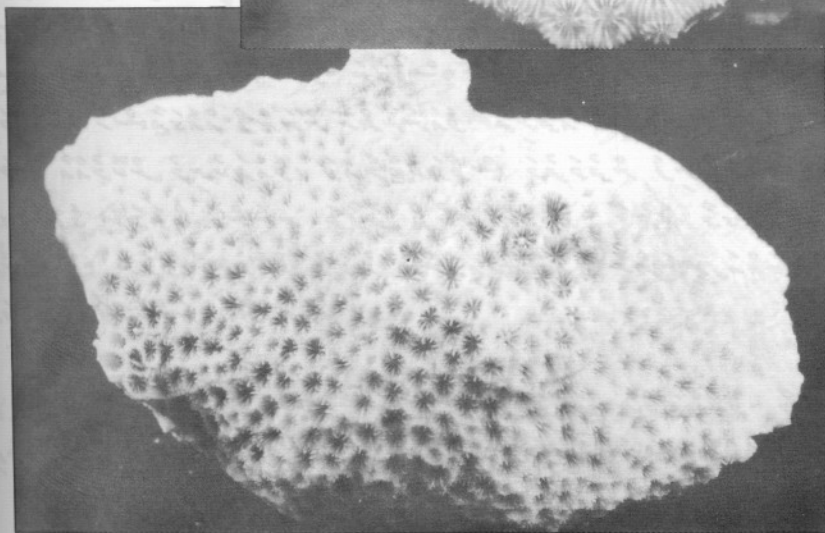
31



32



33



Leptastrea Edwards & Haime, 1848

There are around seven true species of *Leptastrea*, three of which are known from the Maldives. One is illustrated here (Fig. 33).

Characters

Leptastrea forms massive and encrusting colonies. The corallite walls are fused at the base however just below the living coral there is a fine wall which is visible to the naked eye. Corallites are therefore described as subseriod to plocoid. The corallites are closely packed, and may be oval, rounded or polygonal in shape. Calices tend to be irregular in shape and size in a single corallum. Colony colour is usually brown but may be purple. Often the oral disc and the coral wall are of different shades of colour. Polyps may be partially extended during the day.

Remarks

Leptastrea is a relatively common coral that may be found in a wide variety of habitats. However some species however to tend to prefer shallower waters. Larger colonies may be exploited by coral miners.

(33 $\frac{2x}{2}$) $\frac{2x}{2}$ $\frac{2x}{2}$ $\frac{2x}{2}$

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Cyphastrea Edwards & Haime, 1848

There are around seven true species in the genera *Cyphastrea*. Three are known to occur in the Maldives and are illustrated here (Fig. 34a-c).

Characters

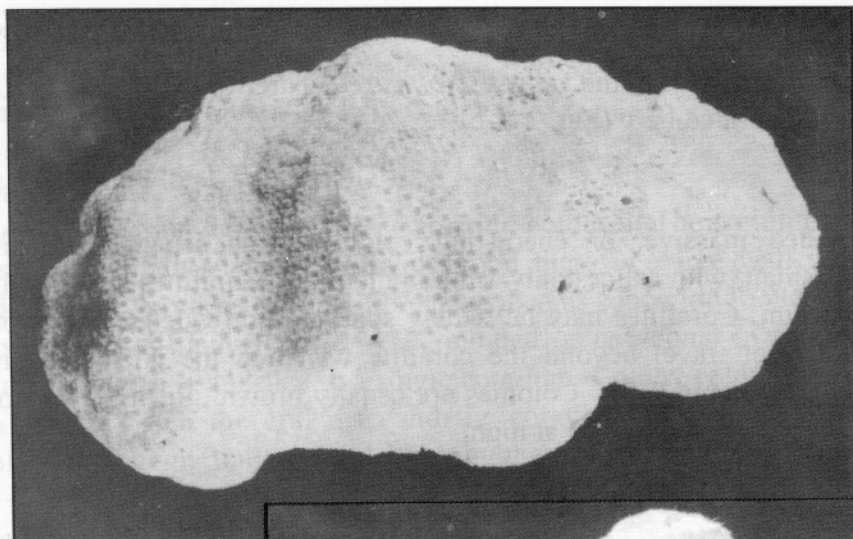
Cyphastrea form rounded massive, or encrusting colonies. The separate plocoid corallites are round and small, with calices only 1mm in diameter. Corallites are slightly raised from the coenosteum. Corallites may be widely spaced or crowded in areas on the corallum. Costae do not travel beyond the corallite wall and the coenosteum in between corallites is coarsely granulated. Colonies are usually brown, green, yellow or creamy in colour. Polyps are only extended at night.

Remarks

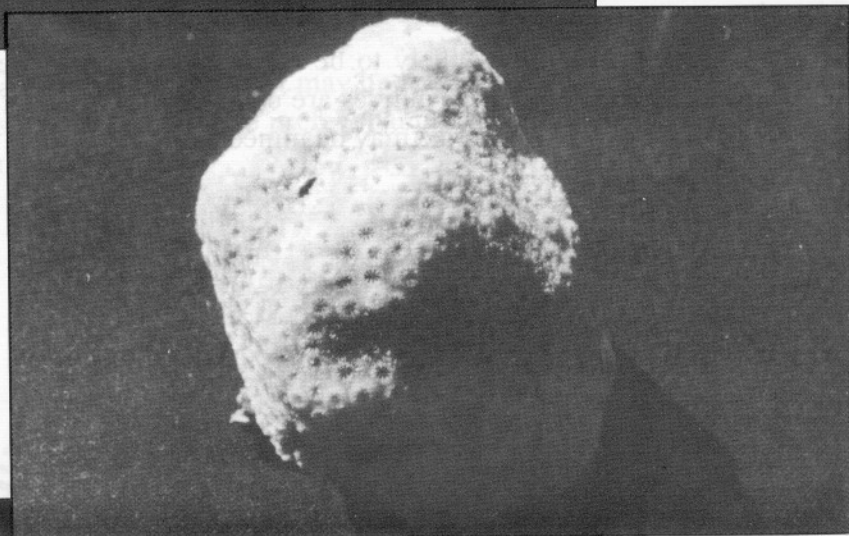
Encrusting colonies are more likely to be found in deeper, sheltered reef slopes. The three species known from the Maldives are common to most reef habitats. If found in shallow reef flat areas, these corals may be mined.

(34a - c)

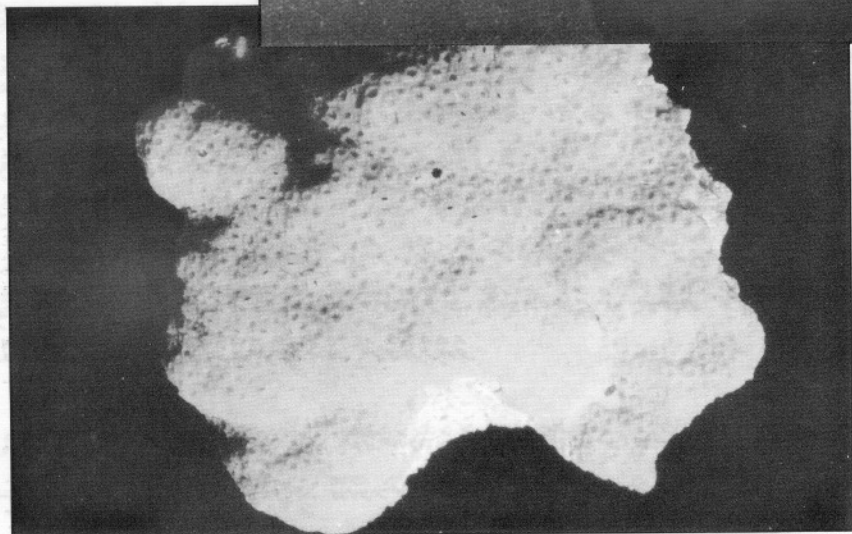
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34a



34b



34c

Echinopora Lamarck, 1816



There are approximately six species of *Echinopora*. Three are known to occur in the Maldives, and are illustrated here (Fig. 35a-c).

Characters

Echinopora frequently forms a variety of foliaceous colonies. However, massive, encrusting and arborescent colonies are not uncommon. Encrusting forms tend to have free foliaceous perimeters of new growth. Corallites are plocoid. Septa protrude from the corallum surface and costae are confined to the corallite wall. Colony colour is usually brown or green with yellow or pinkish tinges. Polyps are extended only at night.

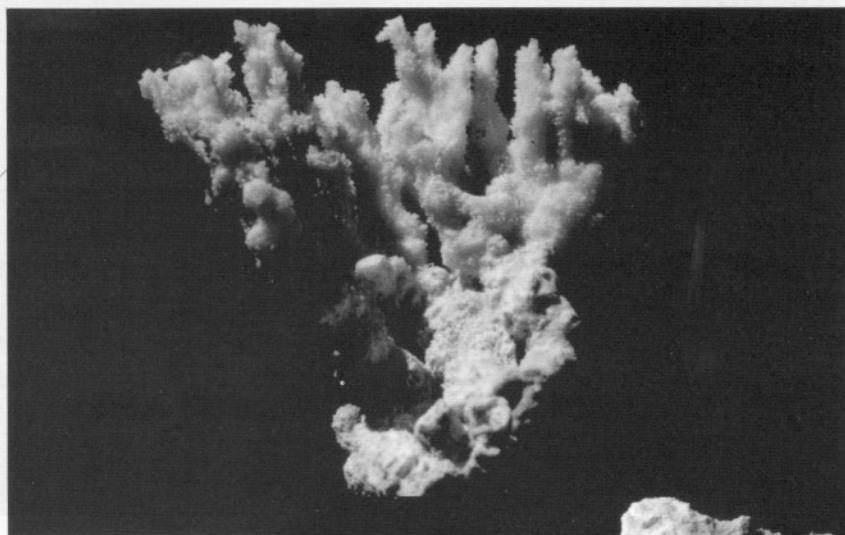
Remarks

Foliaceous forms of *Echinopora* are common on Maldivian reefs, and occurs in shallower areas on reef flats.

(35a - c ) 

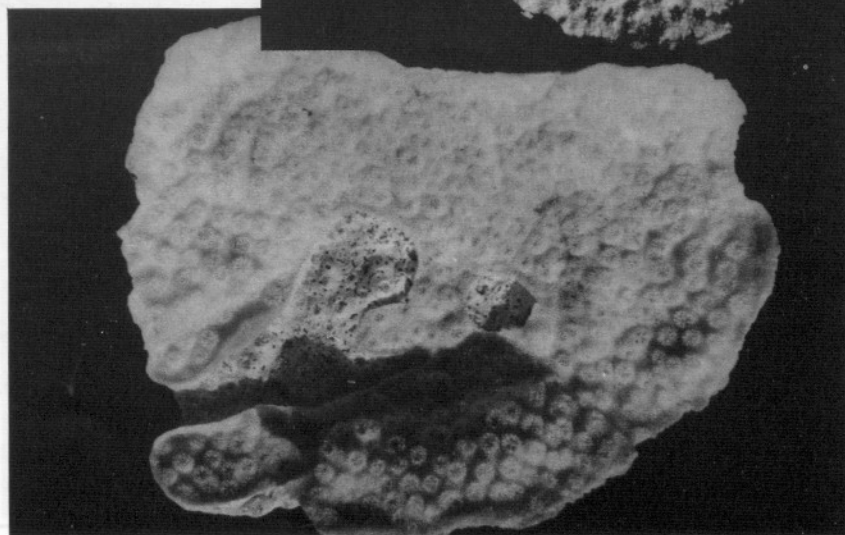
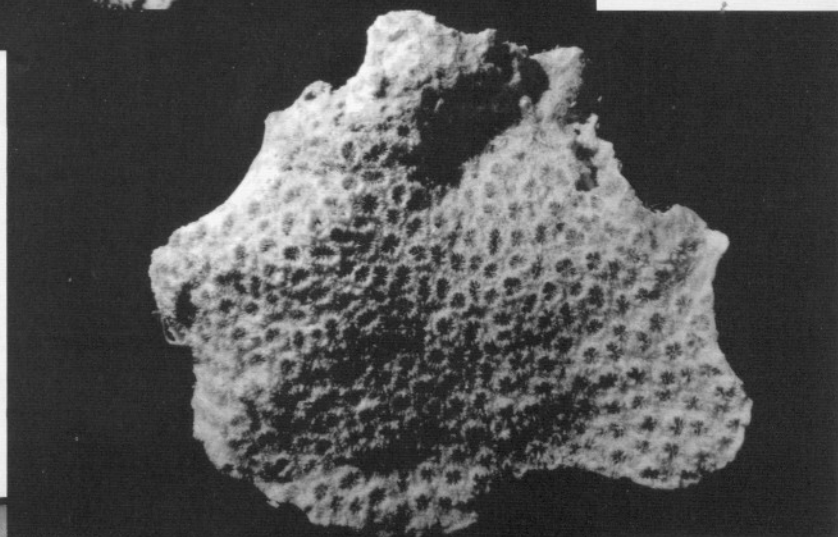
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35a

35b



35c

Family Caryophylliidae

Family Caryophylliidae is a large family that has been divided into six subfamilies. Only one of these is hermatypic. Members from the hermatypic group have phaceloid or meandroid colonies, while the ahermatypic members of the group may be solitary with one large polyp and a single mouth. There are eight extant genera within the hermatypic subfamily, five of which are known from the Maldives. Only one genus is illustrated here.

Physogyra Quelch, 1884

There are three true species of *Physogyra*. Only one is known to occur in the Maldives and is illustrated here (Fig. 36).

Characters

Colonies are usually rounded and massive. Calices are joined in series, to form meanders over the corallum surface. During the day there are small air-bubble type vesicles that are extended and retract when disturbed. The skeleton of *Physogyra* consists of many thin plates making the skeleton very light. Septa and costae are broad and leafy, protruding from the corallites as they pass over the corallite walls. Colonies are pale grey and sometimes dull green. Polyps are only extended at night.

Remarks

Physogyra is common only in protected habitats on the reef. It may be found under overhangs and in underwater caves.

(36)

Figure 36 (Caryophyllidae) "Physogyra" 3
The illustration shows a colony of Physogyra, characterized by its rounded, massive structure and the series of joined calices forming meanders over the corallum surface. The skeleton is composed of many thin plates, making it very light. The septa and costae are broad and leafy, protruding from the corallites. The colonies are pale grey and sometimes dull green. Polyps are only extended at night.

Appendix 1. A Checklist of Hermatypic coral species known to occur in the Maldives.
Prepared for the Marine Research Section by Dr. Susan Clark (1995)
in Recommendations for Establishing a Coral Collection within the
Marine Research Section.

| Family | Genera | Species |
|----------------|----------------|---|
| Astrocoeniidae | Stylocoeniella | armata
gueutheri |
| Pocilloporidae | Stylophora | mordax
pistillata
subseriata |
| Pocilloporidae | Seriatorpora | caliendrum |
| Pocilloporidae | Crossinopora | hystrix |
| Pocilloporidae | Pocillopora | acuta
damicornis
eyedouxii
meandrina
molokensis
verrucosa |
| Acroporidae | Acropora | abrotanoides
aspera
austera
cerealis
clathrata
concinna
corymbosa
cytherea
danac
digitifera
divaricata
echinata
eibli n.sp
elseyi
eurystoma
florida
forskali
formosa
gemmifera
granulosa
haimeii
hemprichi
horrida
humilis
hyacinthus
latistella
loripes
microphthalma |

| | | | |
|-------------|------------|------------------|--|
| Acroporidae | Acropora | millepora | |
| | | monticulosa | |
| | | nasuta | |
| | | nobilis | |
| | | palifera | |
| | | pharaonis | |
| | | quelchi | |
| | | pulchra | |
| | | robusta | |
| | | rotumana | |
| | | selago | |
| | | surculosa | |
| | | squarrosa | |
| | | stoddarti n.sp | |
| | | tenuis | |
| | | valenciennesi | |
| | | valida | |
| | | variabilis | |
| | | vaughani | |
| Acroporidae | Montipora | floweri | |
| | | foliosa | |
| | | hispida | |
| | | informis | |
| | | maldivensis n.sp | |
| | | monasteriata | |
| | | prolifera | |
| | | sinensis | |
| | | sinuosa n.sp | |
| | | suvadivae n.sp | |
| | | verrucosa | |
| | | venosa | |
| Acroporidae | Astreopora | gracilis | |
| | | listeri | |
| | | myriophthalma | |
| | | ocellata | |
| Poritidae | Porites | andrewsi | |
| | | convexa | |
| | | cylindrica | |
| | | lichen | |
| | | lobata | |
| | | lutea | |
| | | mayeri | |
| | | murrayensis | |
| | | vaughani | |
| | | nigrescens | |
| Poritidae | Synaraca | rus | |
| | | solida | |
| Poritidae | Goniopora | columna | |
| | | djiboutiensis | |

| | | | | | |
|-----------------|----------------|--------------------|--|--|--|
| | | granulosa n.sp | | | |
| | | minor | | | |
| Favidae | Cyphastrea | stokesi | | | |
| | | tenella | | | |
| | | tenuidens | | | |
| Poritidae | Alveopora | allingi | | | |
| | | superficialis n.sp | | | |
| | | verilliana | | | |
| | | viridis | | | |
| Siderastreidae | Psammocora | haimeana | | | |
| Caryophylliidae | Euphyllia | contigua | | | |
| | | digitata | | | |
| Caryophylliidae | Fimbriaphyllia | explanulata | | | |
| Caryophylliidae | Plerogygia | nierstazi | | | |
| Caryophylliidae | Plumosea | profundacella | | | |
| Siderastreidae | Coscinaraea | monile | | | |
| Agariciidae | Pavona | cactus | | | |
| | | clavus | | | |
| | | explanulata | | | |
| | | maldivensis | | | |
| Agariciidae | Pavona | minuta | | | |
| | | varians | | | |
| | | venosa | | | |
| Agariciidae | Gardineroseris | planulata | | | |
| Agariciidae | Pachyseris | rugosa | | | |
| | | speciosa | | | |
| Agariciidae | Leptoseris | explanata | | | |
| | | fragilis | | | |
| | | gardineri | | | |
| | | hawaiiensis | | | |
| | | mycetoseroides | | | |
| | | scabra | | | |
| | | solida | | | |
| | | yabei | | | |
| Fungiidae | Ctenactis | echinata | | | |
| | | simplex | | | |
| Fungiidae | Danafungia | danai | | | |
| | Fungia | fungites | | | |
| | | paumotensis | | | |
| | Verrillofungia | repanda | | | |
| | Pleuractis | scutaria | | | |
| Fungiidae | Herpolitha | limax | | | |
| | | weberi | | | |
| Fungiidae | Halomitra | pilcus | | | |
| Fungiidae | Polyphyllia | talpina | | | |
| Fungiidae | Podabacia | crustacea | | | |
| Fungiidae | Sandalolitha | dentata | | | |
| Fungiidae | Zoopilus | echinatus | | | |
| Oculinidae | Galaxea | astreata | | | |
| | | fascicularis | | | |

| | | |
|-------------|---------------|---------------|
| Pectiniidae | Echinophyllia | lamareki |
| Pectiniidae | Oxypora | aspera |
| Pectiniidae | Mycedium | lacera |
| Pectiniidae | Pectinia | elephantotus |
| | | alcicornis |
| | | lactuca |
| | | paconia |
| Pectiniidae | Physophyllia | ayleni |
| Mussidae | Acanthastrea | echinata |
| Mussidae | Symphyllia | radians |
| | | recta |
| | | valenciennesi |
| Mussidae | Lobophyllia | corymbosa |
| | | costata |
| | | hemprichii |
| Mussidae | Cynarina | lacrymalis |
| Mussidae | Scolymia | vitiensis |
| Merulinidae | Merulina | ampliata |
| Merulinidae | Hydnophora | exesa |
| | | microconos |
| Faviidae | Caulastrea | furcata |
| | | tumida |
| Faviidae | Favia | favus |
| | | mattahai |
| | | pallida |
| | | rotumana |
| | | speciosa |
| Faviidae | Favia | stelligera |
| Faviidae | Favites | abdit |
| | | amicorum |
| | | bennettiae |
| | | chinensis |
| | | complanata |
| | | flexuosa |
| | | halicora |
| | | melicerum |
| | | pentagona |
| Faviidae | Goniastrea | pectinata |
| | | retiformis |
| Faviidae | Platygyra | daedalea |
| | | lamellina |
| | | sinensis |
| Faviidae | Leptoria | phrygia |
| Faviidae | Oulophyllia | crispa |
| Faviidae | Montastrea | annuligera |
| | | curta |
| | | valenciennesi |
| Faviidae | Plesiastrea | versipora |
| Faviidae | Diploastrea | heliopora |
| Faviidae | Leptastrea | bottae |

| | | |
|------------------|----------------|---|
| Faviidae | Cyphastrea | purpurea
transversa
chalcidium
microphthalma
serailia |
| Faviidae | Echinopora | hirsutissima
horrida
gemmacea
lamellosa |
| Trachyphylliidae | Trachyphyllia | geoffroyi |
| Caryophylliidae | Euphyllia | cristata
glabrescens |
| Caryophylliidae | Fimbriaphyllia | fimbriata |
| Caryophylliidae | Plerogyra | sinuosa |
| Caryophylliidae | Physogyra | lichtensteini |
| Caryophylliidae | Catalaphyllia | jardinei |
| Dendrophylliidae | Turbinaria | mesenterina
stellulata |
| Dendrophylliidae | Heteropsammia | miclini |

n = 15 n = 62 n = 209

Glossary

Ahermatypic: corals without zooxanthellae

Arborescent: branching colony where branches are longer and 'tree-like'.

Attached: coral is attached to the substrate.

Axial corallites: corallites which have a special function of budding (eg. *Acropora*).

Axial furrow: the groove occurring in Fungidae corals, running the length of the corallum.

Bifacial: colony that has two vertical sides (such as foliaceous colonies) possessing corallites.

Budding: asexual reproduction where daughter corallites arise from already mature corallites.

Caespitose: colonies are small and bushy with branches that refuse (eg. *Acropora*).

Calyx (calices): the openings on the surface of the corallum, the openings of the corallites, the polyp cup.

Ceriod: adjacent corallites share walls.

Coenosteum: skeletal structure in-between corallites on the corallum.

Collines: small protrusions (hillocks) on the corallum surface (eg. *Psammocora*).

Colony: a group of polyps forming an individual coral specimen, ie. colonial corals.

Columella: skeletal structure at the centre of the corallite.

Columnar: colony shape where corallum divides into columns that rise vertically from substrate.

Corallites: individual skeletal parts secreted by a single polyp.

Corallum: entire skeleton of a colony

Corymbose: plate-like colony where horizontal branches fuse, and there are small vertical branches (eg. *Acropora*).

Costae: an extension of the septa radiating from the outside of the corallite.

Daughter corallites: corallites that have budded off from an existing mature corallite.

Digitate: colony branches are small, vertical and consist of finger-like projections.

Encrusting: coral colony where the coral grows in a thin layer over the surface of the substrate.

Extratentacular budding: form of asexual reproduction where daughter polyps form on the edge of an existing colony.

Foliaceous: coral colonies are composed of thin leaf-like sheets.

Free-living: unattached, mobile coral.

Gametes: male sperm and female ova.

Hermatypic: Corals that have zooxanthellae in their tissue.

Intratentacular budding: form of asexual reproduction where the parent polyp divides into two or more polyps.

Laminar (plate-like): colonies form flattened horizontal plates.

Mantle: living flesh of coral that sometimes covers the corallum.

- Massive:** colonies are the same size in all dimensions (eg. spherical).
- Meandroid:** calices are joined in series so corallites are separated by valleys rather than walls.
- Monospecific:** 'one type', monospecific growth in large areas of one species of coral.
- Nominal:** different species by name. In the past the same species has been described with a different name, making it a nominal species.
- Paliform lobes:** large teeth-like structures occurring on the inner surface of the septa, within the corallite.
- Papillae:** small ornamentations on the corallum (e.g. *Montipora* colonies).
- Phaceloid:** individual corallites are projected from the corallum, distinctly separated.
- Plocoid:** corallites are conical in shape, possess individual walls and protrude from the corallum.
- Radial corallites:** corallites at the sides of branches, which are commonly derived from the axial corallite (eg. *Acropora*).
- Ramose:** branching colonies.
- Septa:** vertical plate like skeletal structures that occur within the corallite and radiate inwards.
- Solitary:** description used for corals possessing only one mouth.
- Septo-costae:** septa united with costae from one corallite to other corallite (eg. *Oxypora*).
- Submassive:** coral shape is approximately spherical with a flat base.
- True species:** true separated species cf. nominal species.
- Tuberculae:** large ornamentations on the coenosteum of *Montipora* colonies.
- Turbid:** water that has suspended materials in it making it unclear and less light passes through it.
- Unifacial:** corallites only occur on one side of vertical foliaceous colonies (eg. *Leptoseris*).
- Verrucae:** small rounded growths on the corallum of *Pocillopora*.
- Zooxanthellae:** symbiotic algae that lives in the tissues of coral.

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کھڑکی و سترز ماری

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Wallace C.C. (1978) The coral genus *Acropora* (Scleractinia: Astrocoenina: Acroporidae) in the central and southern Great Barrier Reef province, Australia. *Records of the Queensland Museum* 18(2): 273-319.

Wells J.W. and Davies P.S. (1966) Preliminary list of stony corals from Addu Atoll.
Atoll Research Bulletin 116: 43-55.

[illegible][illegible]

کے لئے ضروری ہے۔

[illegible][illegible]

[illegible][illegible]

معاد سرخس (جی سرخس کی قبر سردار نو دفری)

[illegible]

دُرُودِ سُبْحَانِ سُبْحَانِ

[illegible]

מִי־לֵבִי וְיִשְׁמְרֵנִי מִכָּל־חַטֹּאתַי וְיִשְׁמְרֵנִי מִכָּל־חַטֹּאתַי וְיִשְׁמְרֵנִי מִכָּל־חַטֹּאתַי.

1- מִי־לֵבִי וְיִשְׁמְרֵנִי מִכָּל־חַטֹּאתַי וְיִשְׁמְרֵנִי מִכָּל־חַטֹּאתַי.

2- אֲשֶׁר־לֵבִי וְיִשְׁמְרֵנִי מִכָּל־חַטֹּאתַי וְיִשְׁמְרֵנִי מִכָּל־חַטֹּאתַי וְיִשְׁמְרֵנִי מִכָּל־חַטֹּאתַי.

3- אֲשֶׁר־לֵבִי וְיִשְׁמְרֵנִי מִכָּל־חַטֹּאתַי וְיִשְׁמְרֵנִי מִכָּל־חַטֹּאתַי וְיִשְׁמְרֵנִי מִכָּל־חַטֹּאתַי.

4- אֲשֶׁר־לֵבִי וְיִשְׁמְרֵנִי מִכָּל־חַטֹּאתַי וְיִשְׁמְרֵנִי מִכָּל־חַטֹּאתַי וְיִשְׁמְרֵנִי מִכָּל־חַטֹּאתַי.

5- מִי־לֵבִי וְיִשְׁמְרֵנִי מִכָּל־חַטֹּאתַי וְיִשְׁמְרֵנִי מִכָּל־חַטֹּאתַי וְיִשְׁמְרֵנִי מִכָּל־חַטֹּאתַי.

מגזינים ופזמונים

המגזין "המגזין" נחשב לאחד מהמגזינים המובילים בישראל. המגזין מפרסם כתבות, פזמונים, וציורים. המגזין נוסד בשנת 1990. המגזין מופיע פעם בשבוע. המגזין מפיץ 100,000 עותקים. המגזין מפיץ 100,000 עותקים.

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مَدْرَسَةُ

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وَمَنْ يَكُنْ فِي قَوْمٍ مُّؤْمِنًا وَكُنْ فَتُحَادِدِ قَوْمًا فَفُتِنُوا مِنْهُمْ فَلْيُحَدِّثْ إِلَىٰ يَوْمِ الْوَعْدِ أَتَىٰ عِلْمَهُمْ لَوْلَا بِرُحْمَتِكُمْ لَفَسَدَتِ السَّمَاوَاتُ وَالْأَرْضُ وَالَّذِينَ فِي قُلُوبِهِمْ مَّرَضٌ يُضَاعَفْ لَهُمْ ضَرَرُهُمْ وَلَهُمْ عَذَابٌ عَظِيمٌ

فَوَيْلٌ لِلْمُصَلِّينَ إِذَا دُخِرَ صَافًى هُمْ يُصَلُّونَ إِذْ يُخَفِّفُونَ الثَّيْلَ

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ارخو قورس

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مومو قورس

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ماخو

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801 مومو قورس

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101 ارخو قورس

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102 ارخو قورس

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103 قورس ارخو

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98 مومو قورس

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98 ارخو قورس

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28 ارخو قورس

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48 مومو قورس

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52 مومو قورس

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18 مومو قورس

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80 مومو قورس

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12 قورس مومو قورس

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22 مومو قورس

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42 قورس

18

02 قورس مومو قورس

16

88 مومو قورس / مومو قورس

فَرْسِ سَمَوِ

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| 108 | زَیْنُ سَمَوِ |
| 107 | مَوِ سَمَوِ |
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