NORTH WEST CAPE BARRIER REEFS

Resource description

The North West Cape reefs are the only example in Western Australia of barrier reefs with an associated fauna of corals, molluscs, echinoderms etc. typical of Indo-Pacific coral reefs.

The North West Cape reefs consist of a series of barrier reefs, 200 m to 2.5 km, in width with their outer margin up to 6 km from the shore and fringing reefs in some areas.

"Present-day reef growth takes place on a bedrock substratum of either Pleistocene marine or eolian sediments, or Tertiary Trealla Limestone. The southern margin of the reef is present at Gnarraloo where reef growth is centred on the seaward margin of a narrow intertidal rock platform, 200 m wide, consisting of Trealla Limestone. A prominent scarp, of Quaternary age, is abutted by the rock platform and several 'raised' coral reef structures are evident near the scarp base.

In the Warroora area, north of Gnarraloo, the Quaternary scarp is inconspicuous or absent and the narrow intertidal rock platform gives way northwards to a complex series of nearshore shoals, beach ridges, tidal channels, reef lagoons and an intermittently developed outer reef rim. All the present-day reef building activity north of Gnarraloo is taking place on a partly dissected platform of Pleistocene strata which is several kilometres wide north of Cardabia homestead."

Geological structure

"A marked parallel linearity between some parts of the western reef rim, particularly in the Cardabia and Warroora coastline areas, suggests faulting or some other form of geological structural control on the distribution and orientation of bedrock and outer reef margin. The development of raised reef structures on the southern Gnarraloo coast and western side of Cape Range shows that Quaternary uplift has occurred and tectonic factors may be responsible for the present orientation of strata on which the present reef growth has taken place." (I. Lavaring, Geol. Survey, 19.3.79).

Sandy beaches or intertidal shore platforms give way to a shallow lagoon, in places with beach rock isolates just off shore. The lagoon has a calcarenite base usually overlain by sand of varying thickness. Where the sand layer is thin sparse growths of brown algae are often attached. Staghorn Acropora corals in places form thickets in the lagoon, while Porites sp. sometimes forms massive isolates or "bommies" often partly colonized by other corals.

Some reefs have extensive sand covered back reef areas with coral patches while others drop several metres to the lagoon floor providing a vertical or undercut wall usually colonized by a diverse coral assemblage.

The reef crest, exposed at extreme low tide is, in some places, covered by a luxuriant growth of tabular and semi-tabular Acropora corals, in others by coralline alga covered dead coral with scattered living corals while others again are algal covered.

Dissected reefs and the edge of passages tend to have the most diverse coral communities.

The reef crest usually slopes gently seaward, in places dissected by weak groove and spur structures, before dropping to the bottom beyond the reef.

The continental shelf is very narrow, from 2-10 nautical miles wide, before the 200 metre contour is reached.

North of the barrier reefs, between Vlaming Head and North West Cape, a fringing reef borders the coast with some dissected reef offshore. These fringing reefs have discrete characteristics quite separate from the barrier reefs to the south and contain the most northerly habitat of the west coast fauna.

Bundegi reef, south of Cape Murat, is an example of a fringing and offshore reef in rather turbid, sheltered waters and thus has a rather different fauna from open coast reefs.

Marine fauna

The corals, with their symbiotic algae, are the core of the reef ecosystem being largely self nourishing and providing food and shelter for a host of assoicated fishes, molluscs, echinoderms and other invertebrates, while being broken down by other fishes, coral boring molluscs and sponges.

The reefs in many places support rich and diverse coral communities, typical of the tropical Indo-Pacific, which vary considerably from one area to another. Thirty eight genera and over 100 species of Scleractinian corals, including some Indo-Pacific species not yet recorded elsewhere in Western Australia, have been found on the reefs, together with hydrozoan corals (Millepora spp., the fire-corals) and Heliopora coerulea, the blue octocoral. Many of the coral species are abundant from one end of the reef to the other and also occur further to the south eg. at Shark Bay and the Abrolhos while a few are found as far south as Geographe Bay. However a number probably have their southern limit on the North West Cape reefs and some of the rarer species have, as yet, only been recorded as isolated examples although represented by large coralla eg. Pachyseris rugosa and Echinopora horrida (north west of Yardie Creek) and Physogyra sp. at Ningaloo. Some other species, although found over a wide area, reach their finest development in certain areas eg. Echinopora lamellosa, Merulina ampliata and Hydnophora rigida at Coral Bay.

The reefs support a rather limited echinoderm fauna (about 50 species have been recorded so far), most of them widespread Indo-Pacific coral reef species at or near the southern limit of their distribution. The most conspicuous and abundant starfish are the blue Linckia laevigata and a brown species, Nardoa galatheae. The large oreasterids (Protoreaster nodulosus and Protoreaster lincki) occur in the lagoon, the latter only known elsewhere from the Western Indian Ocean and Indonesia. The small population of this spectacular starfish on the Ningaloo reef could be wiped out by indiscriminate collecting.

Crinoids, ophiuroids and echinoids (except Echinometra mathaei in some areas) are not plentiful but some species of holothurians are abundant in several areas, for example the reefs off Mangrove Bay and Tantabiddi creek, and on the reef south west of Yardie Creek.

There is some evidence that the diversity of coral and echinoderm species diminishes from north to south along the barrier reefs but the reef south of Point Anderson has not yet been assessed.

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Ningaloo Reefs

The coast and reefs between North West Cape and Waroora have been the subject of W.A. Museum field work in 1968, 1977 and 1978.

In 1968 (August 22nd - September 12th) work was concentrated in the Ningaloo area where collections, principally of molluscs, echinoderms and a limited number of corals, were made by low tide collecting, snorkelling and dredging on the shore, lagoon and outer reef between Carbaddaman Passage and Point Cloates.

In 1977 (June 17th - July 4th) sampling of the reef, lagoon and shore fauna took place in four main areas: off Tantabiddi Creek, Mangrove Bay, Yardie creek and 25 km north of Ningaloo homestead. Again general collections were made with emphasis on echinoderms and molluscs but most attention was given to the corals, attempting to collect all the species encountered.

On the 1978 trip (August 12th - 22nd) the southern parts of the Ningaloo reefs were sampled along five transects between Frazer Island and Point Cloates and five between Point Maud and Point Anderson; logistic problems made it impossible to survey the area between Point Anderson and Cape Farquhar but some collecting was done off the headland near Waroora Station homestead.

The areas sampled are described briefly below in sequence from north to south and check lists of corals, echinoderms and molluscs are appended.

Tantabiddi creek

The barrier reef is comparatively narrow and dissected by tongues of sand from the back reef area. The reef crest consists of slabs of dead tabular Acropora, some loose, some cemented by lithothamnia. There are scattered clumps of Acropora spp and Faviids but the surface is partly algal covered. The outer reef flat slopes slightly seawards where round Platygyra sinensis heads are common.

The dissected back reef area drops about 2 metres to the sandy floor providing a habitat for lamellar species of coral which are poorly represented on the reef top (eg Echinophyllia) and a species of Pavona not found elsewhere. Large Galaxea clavus colonies (ca. 2-3 m diameter) are prominent in the back reef sandy areas together with Echinopora lamellosa, Hydnophora rigida, Lobophyllia spp, Acropora spp. and several genera of Faviidae.

A holothurian, Actinophyga mauritiana was common on the algal covered reef surface but other echinoderms were scarce; the asteroids Linckia laevigata, L. multifora and Nardoa galatheae were recorded and several species of crinoids occurred under ledges in the back reef area.

About 1 km to the south the sandy reef surface is almost completely algal covered predominantly with several species of the clorophyte Caulerpa. Holothurians (cf. Actinopyga echinites) were abundant on the algal covered reef(ca 1/sq m). Large specimens were observed on the Caulerpa beds, and smaller ones in the surf zone where the algal cover is sparser. Corals are almost absent from this area of reef, represented only by scattered small coralla on the occasional small boulder.

Mangrove Bay

The coastline is low with patches of Mangroves (Avicennia sp) near the shore of the southern part of the bay where extensive sand flats are exposed at low tide. The northern part of the bay has a broken intertidal algal covered rock platform with a very impoverished molluscan fauna.

The lagoon is shallow, ca 2-3 m, with patches of algae and coral. The reef top is striated with surge channels of bare coral rubble with few living corals. Between these striations there is a cover of 20-30% living coral with much dead coral particularly overturned tabular Acropora.

Tabular and bushy Acropora species form the main coral cover but a number of other genera are represented. Acanthastrea sp. and Pectinia were part of a diverse assemblage.

The reef crest, exposed at low tide, has small stacks with Saccostrea cucullata, barnacles and the molluscs Drupa spp. Beyond these the reef slopes seawards with Acropora spp., Alcyonarians and domes of Platygyra sinensis.

To the north of this area the reef top is slightly lower with algal covered rubble and scattered coral heads. Tridacna maxima and several species of holothurians Actinopyga mauritiana and ? A. echinites were abundant while Microthele nobilis occurred occasionally.

The back reef has a large population of Halodeima atra and ? Actinopyga cf. miliaris on sand amongst the coral. The back edge of the reef is sandy with scattered patches of tabular and staghorn Acropora. Porites sp forms large 'bommies' in the lagoon near the back edge of the reef.

West of Mt. Campbell

This section of barrier reef is about 3 km long and at a fairly high level, the surface striated with broad sandy rubble areas draining into the lagoon. The reef edge is subjected to heavier wave action than some of the adjacent reefs and strong surge flows across the reef.

Between the rather bare sand and rubble areas the reef surface has about 30% cover of living coral, predominantly small tabular Acropora with a moderately diverse assemblage of other coral genera including Pocillopora eydouxi, a species characteristic of areas with strong wave action. The back reef is dissected with sandy areas and drops about 4 metres to the sandy lagoon floor where several species not found elsewhere were seen: Echinopora horrida on the back reef edge; a large colony of Pachyseris rugosa rising from the lagoon floor and very large examples of a fungiid, Herpolitha limax, on the sand. The back reef, in the area sampled, has a rich and diverse coral fauna.

Yardie Creek

The lower part of the creek is a barred estuary with high cliffs giving way to muddy sand shores with mangroves (Avicennia marina, Rhizophora stylosa and Ceriops tagal) near the mouth.

At the time of sampling (June 1977) the bar was closed and oysters (? Crassostrea echinata), forming a conspicuous band on the lower part of the cliff, were dead although some still had the upper valve in place. Two gastropods, Planaxis and Nodilittorina, were living above the oyster band, the latter about one metre above the water level.

Along the shore south of Yardie Creek is a low emergent fossil coral reef with an eroded beach rock ramp sloping to an algal and sand covered shore platform with scattered boulders. The beach rock is populated by oysters, Saccostrea cucullata and a few ? Crassostrea echinata, and neritids.

The shore platform is rather barren with a few species of molluscs, echinoderms and some small coral colonies. One species each of holothurian, echinoid and ophiuroid were recorded.

Barrier reef west of Yardie Creek

North of the passage off Yardie Creek is a reef complex 5 km long and 2 km from the shore. At the southern end the inner reef crest has about 50% cover of living coral with sand patches between. In places Acropora spp predominated, a mixture of bushy and tabular forms with patches of several species of staghorn Acropora on the edge of sandy areas. In some places there is a diverse coral fauna with scattered micro-atolls of Porites sp. A massive species of the hydrozoan coral Millepora platyphylla edges many of the sandy areas in which two species of Fungia, F. (Pleuractis) scutaria and and F. (Fungia) fungites occur. From this area about 60 species of 20 genera of coral were collected including about ten species of Acropora and about six of Montipora. Other genera were represented by one or two species each.

The blue starfish (Linckia laevigata) and a brown species (Nardoa galatheae) are very common on the reef crest while the burrowing sea urchin, Echinometra mathaei is common in crevices.

About a kilometre north of the area described above the reef crest is at a lower level, sloping gently seawards with

a slight development of groove and spur structure on the outer edge. The reef surface has about 50% cover of living coral predominantly low growing semi tabular Acropora. Towards the reef edge there are many hemispherical heads of Platygyra cf. sinensis. A sandy channel about 3 m below the general reef surface dissects the reef and provides vertical and overhanging walls which are colonised by varied coral species. Galaxea clavus forms a turreted colony about 2 m across in the channel and there are large colonies of Lobophyllia cf. corymbosa and Acropora sp.

Species of Acropora, Astreopora, Hydnophora, Favites, Favia, Symphyllia, Merulina, Echinopora, Oxypora, Turbinaria and the blue coral Heliopora coerulea line the sides of the channel while Tubastrea spp. occur under overhanging ledges.

The general impression of this area is of a rich and diverse coral fauna.

South west of Yardie Creek

The barrier reef lying between Carbaddaman passage and the passage south west of Yardie Creek is about 7 km long and the outer edge 1.5 to 3 km from the shore. The reef itself is 1 to 1.5 km wide. The high broad reef crest at the northern end consists of dead coral cemented by lithothamnia with coral rubble and dead coral boulders and slabs covered by a short algal turf of Phaeophyta and Clorophyta. The back reef is sandy with patches of staghorn Acropora but low coral diversity. The starfish Linckia laevigata and Nardoa galatheae are common among the coral branches, as are the crinoids Stephanometra sp and Comanthus parvicirrus.

One kilometre south of this area the reef is similar to that described above with a back reef area of sand and staghorn Acropora.

About 2-3 kilometres further south the reef crest consists of areas of surf swept bare rock with scattered coral heads and areas of dead and living tabular Acropora with overlapping plates. A considerable part of the reef surface is algal covered with several species of holothurians of which Actinopyga cf. miliaris and A. mauritiana are fairly common. The asteroids Linckia laevigata and Nardoa galatheae were common in the open amongst corals.

About one kilometre further south the reef is similar to that described above.

Ningaloo

About 25 km north of Ningaloo homestead is a bay, marked at its northern end by a long sandy point with intertidal sand flats joining it to the outer reef. Sand dwelling species such as the asteroids Archaster angulatus, Astropecten sp. and a burrowing heart urchin Breynia australasiae were found here.

At the southern end the bay ends in a rocky headland with low cliffs of Pleistocene reef rock. At this point the outer edge of the reef is less than 1 km from the shore, separated from it by a very narrow channel.

The barrier reef in this area is rather broken and in places the reef crest is separated from an outer reef, on which the surf breaks, by a narrow channel. The inner reef, exposed at extreme low water spring tide has about 80% cover of living coral, predominantly low spreading clumps of Acropora.

Towards the protected outer edge there is a distinct zone of hemispherical heads 30-60 cm in diameter, of Platygyra sinensis. Many are only alive on the seaward side, the inner side dead and eroded. Among the reef top Acroporas are common species of Favia, Favites, Cyphastrea, Montipora, Stylophora, Seriatopora, Pocillopora, Astreopora; of infrequent occurrence are Pavona, Psammocora, Fungia, Hydnophora, Platygyra, Leptoria, Galaxea and Lobophyllia. Most colonies are small and stunted as may be expected in this situation. Between the living corals the reef surface is cemented with lithothamnia but other macroscopic algae are reduced to a fine film. The asteroids Linckia laevigata, Nardoa galatheae and Echinaster luzonicus are common on the reef surface, Fromia indica less common. The holothurian Actinopyga mauritiana is common on the reef top and a single example of Microthele nobilis was seen in the back reef area.

The back reef is a mixture of living and dead coral with many dead coral slabs. In addition to the corals mentioned above small colonies of Echinopora and Echinophyllia were found around pools in the back reef area.

North west of the sandy headland the reef is very broken with deep sandy pools and embayments on the outer and inner margins. The coral fauna is rich and diverse forming 'coral gardens'.

North West Cape reefs - May 1980

Corals and Echinoderms - L.M.Marsh

REEF COMM. 001

Transect 1 - West of Mangrove Bay.

The transect ran from the surf zone on the reef crest across the reef and lagoon to the rocky shore of the islet on the northern side of Mangrove Bay.

Corals from each site are tabulated.

Site 1 - Surf zone.

Site 2 - Reef crest.

About 50% of the substrate was dead coral, encrusted with lithothamnia and 50% was living coral, principally semi-tabular Acropora spp. with few other coral genera.

Site 3a - Coral zone.

The substrate was 90% living coral, principally a semi-tabular Acropora sp. About 5% of the coral cover was small round heads of Platygyra sinensis while other coral species were represented by few colonies of each species. A few colonies of Alcyonaria (Sarcophyton sp and Lobophytum sp) occurred amongst the hard corals. 17 species of coral were recorded.

Echinoderms were represented by Culcita schmideliana (2 specimens seen) and a few Stichopus chloronotus.

Site 3b

A zone of about 50% dead coral with small colonies of semi-tabular Acropora sp.

Echinoderms: a few Linckia laevigata, Nardoa galatheae was moderately common, as was the echinoid Echinometra mathaei and the black holothurian Holothuria atra.

Site 4 - Living coral zone.

The substrate was covered by about 80% of living coral, 10% of dead coral and 10% sand.

The corals were principally Acropora hyacinthus and the semi-tabular Acropora sp, a few A. robusta and a few other coral species.

Site 5 - Back reef.

A zone of dead coral, sand and rubble with < 1% of living coral represented by scattered small colonies (tabulated).

Echinoderms were represented by the two asteroids Linckia laevigata and a few Nardoa galatheae and three species of holothurians, Stichopus chloronotus (very common), Holothuria atra (common) and Microthele nobilis (3 specimens seen).

Site 6 - Tabular Acropora patch, back reef.

This area has about 90% cover of living coral with 5% dead coral and 5% sand.

The living coral is 90% Acropora hyacinthus with about 5% of other Acropora spp and 5% of other coral species. Twenty four species of coral were recorded from this area (tabulated).

On the adjacent sand were several species of staghorn Acropora.

Linckia laevigata and Nardoa galatheae were uncommon; only one species of holothurian, Stichopus chloronotus and one echinoid, Tripneustes gratilla were recorded in the coral patch but S. chloronotus was abundant on sand adjacent to the coral area and there were a few Holothuria atra.

Site 7 - Small coral patches in lagoon.

The substrate was sand and coral rubble with pavement rock exposed in places and isolated coral heads and small patches of dead coral partly colonized by a diverse assemblage of living corals. Coral cover was less than 5% but about 30 species were recorded including some species not found elsewhere eg Scapophyllia sp and ? Pavona spp.

The full list of corals is tabulated.

A single specimen of one species of asteroid, Nardoa galatheae was recorded with three species of echinoid (a few each of Echinometra mathaei, Diadema setosum and Tripneustes gratilla) and two species of holothurian (a few specimens of Holothuria atra and one of an undetermined species) a single specimen of ophiuroid (Macrophiothrix longipeda) was found.

Site 8 - The lagoon off Mangrove Bay.

The substrate was sand with basement rock exposed in places and coral rubble surrounding fish holes. A single small clump of Acropora sp was the only scleractinian coral found. A Xeniid Alcyonarian (Anthelia sp) occurred in small clumps on dead coral.

The ony echinoderms found were a brissid echinoid and dead tests of Peronella orbicularis.

Site 9 - Algal covered rock platform off the rocky islet on the north side of Mangrove Bay.

The platform has an uneven surface and sandy hollows with overhanging rock ledges.

Very few corals were recorded: very small colonies of Plesiastrea versipora, Favites sp, Cyphastrea serailia, Alveopora sp and an Alcyonarian (Anthelia).

The only echinoderms seen were Holothuria atra (common in sandy hollows), Tripneustes gratilla (under ledges), and few Echinometra mathaei and Macrophiothrix longipeda.

A finely branched green-brown sponge was common on the rocks.

Lagoon reefs.

Four areas were examined: north of Mangrove Bay (MB 10), MB 7, off Tantabiddi (T 2) and off Mandu Mandu (MM 4).

The three former had a very rich and diverse coral fauna including species not recorded elsewhere on the N.W. Cape reefs, while MM 4 was regenerating slightly from the effects of a catastrophe, possibly from flooding of Mandu Mandu creek in 197 ?.

Fifty two species were recorded from MB 10, 37 from T 2 and 38 from MB 7 but only 8 from the ? flood damaged site, MM 4.

MB 10 - North of Mangrove Bay.

This patch reef had a framework of dead Acropora spp and Porites sp overgrown by a diverse coral fauna giving 50-100% cover of living coral with 52 species of hard coral recorded.

Millepora platyphylla formed hemispherical colonies up to 1 metre diameter, composed of vertical plates; a branched species of Millepora was poorly represented at this site but abundant at another patch reef nearby; Galaxea clavus formed a large turreted colony on sand adjacent to the patch reef while Acropora formosa

and a foliose species of Montipora occurred in small patches on the lagoon floor nearby.

No asteroids were found, but two species of echinoid (Echinometra mathaei and Tripneustes gratilla) and four species of holothurian (Microthele nobilis, Holothuria edulis, Holothuria atra and Stichopus chloronotus) were recorded.

T.2 - Lagoon patch reef off Tantabiddi.

The area examined had huge Porites bommies with other coral species growing on and around them. The largest Porites colony was about 10 metres in diameter, others were 5-6 metres across with vertical sides, undercut at the base. Over 30 species of hard corals were recorded, including Symphyllia radians, rarely recorded on the N.W. Cape reefs.

Euphyllia glabrescens was here recorded for the first time from the N.W. Cape reefs.

Stichopus chloronotus was the only echinoderm recorded.

MM 4 - Lagoon patch reef off Mandu Mandu creek.

In contrast to the other two lagoon reefs examined this patc had a very impoverished coral fauna of small colonies which appeared to be regenerating after the reef had been killed possibl by fresh water flooding. The dead coral bommies were overgrown by crustose coralline algae with scattered small colonies of living coral. Nearby on the lagoon floor was an area of dead staghorn Acropora (possibly A.splendida). The coral was fragmented with some basal parts remaining, recolonized by small colonies of A. formosa.

Approximately 8 species of living corals were recorded.

Holothuria hilla was the only species of echinoderm recorded.

Reef front, seaward from reef crest.

Three reef front sites were examined, off Mandu Mandu, off Tantabiddi and outside the passage south of Mangrove Bay. The three areas had a very similar coral fauna with minor variations; it was dominated in each case by tabular and semi-tabular Acropora species with a moderately diverse fauna of other corals.

Reef front off Mandu Mandu (MM 1)

The groove and spur formation of the reef front is broken into isolated ridges separated by gutters and sandy holes. The top and sides of the ridges have 50-80% cover of living coral with 50-20% of dead coral or rock covered with lithothamnia and algae. The lower parts of the ridge sides are predominantly covered by lithothamnia with few corals. Sand in the gutters is mobile. The ridges are predominantly covered by semi-tabular Acropora colonies ca 30 cm in diameter with small colonies of A. hyacinthus and a moderately diverse fauna of other corals (tabulated).

A large encrusting colony of Pachyseris rugosa, rarely found on the N.W. Cape reefs was found on the seaward end of one of the spurs. On a vertical wall at the passage entrance (depth 15 m at the base) encrusting and foliose corals partly covered the lithothamnia covered wall. Several large encrusting and laminar colonies of Pachyseris speciosa occupied the 12-15m level with species of Pavona and Leptoseris not previously found in Western Australia.

Reef front off Tantabiddi

Site T 1 - North of Tantabiddi passage.

The reef front seawards of the groove and spur zone consists of isolated mounds of reef with mobile sand between. The sand is thrown into very large ripples and is stirred by swell at 10-12 m.

The reef mounds are predominantly covered by small colonies of Acropora hyacinthus and semi-tabular Acropora spp. (corals tabulated).

The Alcyonarian whip coral (Junceella fragilis) was common near the base of the reef mounds, attached to rock.

Four species of Turbinaria were recorded, growing near the base of the rock in the area subject to sand scour.

On the rock substrate a single specimen of Linckia laevigata and of Nardoa galatheae were recorded, a few Echinometra mathaei and Comanthus parvicirrus and one each of Echinostrephus molaris (a rock burrowing echinoid) and Actinopyga echinites. A few Microthele nobilis and Stichopus chloronotus occurred on the sand.

Outside the reef passage south of Mangrove Bay.

Site SMB 2

The reef on the north side of the passage has a modified groove and spur structure with deep clefts between the reef blocks some of which reach the surface.

The tops and upper part of the sides of the spurs had about 70% living coral cover and 30% lithothamnia and other algae.

The coral fauna is dominated by semi-tabular Acropora spp with a fair diversity of other corals - a full list was not made at this site. Several colonies of the blue coral (Heliopora coerulea) were growing on the top and sides of the reef, only the third locality on the N.W. Cape reefs that this species has been recorded, the others being off Yardie Creek and 25 km north of Ningaloo homestead.

Pachyseris speciosa was found on the reef wall adjacent to the passage but no species of Leptoseris or foliose species of Pavona.

Echinoids Echinothrix calamaris and Echinometra mathaei and a black crinoid were the only echinoderms recorded.

Site 11 - Reef crest north west of Mangrove Bay.

The reef crest has a moderately diverse coral fauna, mainly of Acropora spp and Montipora spp, about 20 species of coral were recorded with two species of Alcyonaria (Lobophytum sp and Sarcophyton sp), a zoanthid (Palythoa sp) also occurred in small clumps. The corals are tabulated. The ahermatypic species Tubastrea aurea and T. diaphana were found on the underside of coral rocks and in the open.

Inshore from the coral zone the reef ~~crest~~ flat consists of an algal covered rock platform with a few dead coral blocks, slabs and rubble. A large brown holothurian Actinopyga echinites was abundant in this area (approximately 1/m^2 over a large area), Microthele nobilis was moderately common. Other echinoderms recorded were Echinometra mathaei (common, burrowing in dead coral). Tripneustes gratilla, Diadema savignyi, Ophiocoma dentata, O. erinaceus, O. brevipes, and Ophiarachnella gorgonia. Dactylosaster cylindricus (an asteroid) was found for the first time on a mainland Western Australian reef.

Site 12 - Short algal turf zone, inshore from site 11.

The substrate is a rock flat with short algae and sand, very few coral colonies) (<<1% coral cover). Corals recorded were: Porites sp., Cyphastrea sp., very small Acropora clumps, Favites sp., Goniopora sp., Acropora formosa.

Dead coral rocks were burrowed by Echinometra mathaei; one species of holothurian was recorded and a single species of ophiuroid (Ophiocoma dentata).

Site 13 - long fucoid algal zone, inshore from site 12.

Tall fucoid algae are attached to the basement rock which is covered by a thin to thick sand layer. There are some loose, dead coral rocks and larger dead corals partly colonized by a few species of corals: Acropora spp, Cyphastrea sp., Favia spp and Favites spp.

Echinoderms recorded were: Echinothrix sp. (under a ledge), Ophiocoma dentata and Macrophiothrix sp under coral slabs. No holothurians, crinoids or asteroids were found.

Site MM3 - Mandu Mandu.

Inner side of reef crest.

The reef surface consists of dead tabular Acropora overgrown with lithothamnia. Recolonization by living corals covered 10-50% of the surface.

26 species of coral were recorded (tabulated)

Two species of encrusting sponge were common on the dead coral, in places overgrowing living corals as well.

Nardoa galatheae was the only asteroid recorded (few), Echinometra mathaei was moderately common, there were a few Stichopus chloronotus, Holothuria atra and Actinopyga mauritiana.

Reef off Lakeside camp.

A reef of moderate width lies seaward of a very shallow lagoon, less than 2 metres deep.

The reef top is predominantly covered by Acropora hyacinthus with few other corals. North of the tabular Acropora flats the reef narrows, there are striations of rubble across the reef and the coral fauna is more diverse.

The sample site (L 1) was near the northern end of the Acropora hyacinthus dominated area between the surf zone and the back reef. The coral cover varied from almost nil in the rubble areas to about 90%.

About 35 species of coral were recorded (tabulated).

Seaward from the sample site the coral fauna was dominated by semi-tabular Acropora sp and Playgyra sinensis which forms rounde heads in the surf zone.

Towards the back reef Acropora hyacinthus was the dominant species.

Two species of asteroid were common (Linckia laevigata and Nardoa galatheae), Echinometra mathaei was abundant and a single Echinothrix sp. was seen; Holothuria atra was common and Actinopyga mauritiana moderately common.

South of Mangrove Bay

Site SMB1

Reef crest with small channel heading seawards.

The reef surface was uneven, with sandy holes and rubble floored gutters leading to a small channel. A strong current flowed seawards.

Ridges, with a covering of lithothamnia and about 20% cover of living coral rose 1-2 metres from the gutters.

About 30 coral species were recorded (tabulated).

At this site the most abundant species of coral was a low growing branched Porites sp cf. P. andrewsi only found in the area previously off Yardie Creek and off Mangrove Bay.

Echinometra mathaei was the most common echinoderm; a black Echinothrix sp was recorded and Nardoa galatheae was moderately common; Actinopyga mauritiana was very common and one Microthele nobilis was recorded.

Between site SM 1 and the passage south of Mangrove Bay the reef top is dominated by Acropora hyacinthus and semi-tabular Acropora sp. Living coral covers about 60-70% of the substrate, 30-40% is dead coral with small sand patches.

Nearer the passage there is a higher proportion of dead coral with some staghorn Acropora along the lagoon edge of the reef.

The passage itself has a floor of rubble and sand with large Porites bommies and other corals (no dive).

Pilgramunna

No dives were made on the reef flat but observations from the boat with a waterglass showed the reef top south of the passage to have a dense cover of Acropora hyacinthus, covering about 90% of the substrate with a few rubble and sand striations across the reef.

Shorewards from the Acropora zone the coral thins out, with more rubble and sand giving way to rubble and sand with an algal film then to the sand floored lagoon. No fucoid zone was observed.

On the shoreward side of the narrow lagoon a rock platform extends out from the low rocky shoreline.

The inner platform is partly covered with a short algal turf and sand, the outer part with sand and small anemones. The sand layer had a rich fauna of molluscs and acorn worms (Ptychodera s

Corals recorded from the 'mottled zone' inshore from the reef included semi-tabular Acropora sp., Acropora sp. cf sarmentosa, Acropora (blue bushy), small heads of Porites sp. and patches of of Sarcophyton sp. and other soft corals and clumps of sponge with strap-like branches.

North of the Pilgramunna passage the reef has about 70% cover mainly of Acropora hyacinthus with 30% dead coral and sand. There was a low diversity of other corals - no coral list was made.

Turquoise Beach

Site TB 1

The area examined was a rather broken back-reef area just south of the reef passage, depth 2-3 metres to the sand and coral rubble bottom between reef pinnacles and a fairly low relief reef. A high proportion of the coral colonies were dead or partly dead, difficult to estimate percentage cover of living coral due to the variability of the substratum.

Despite the rather dead appearance of the area about 25 species of coral were recorded (tabulated).

The only echinoderms recorded were Echinometra mathaei (abundant) and Nardoa galatheae (one specimen).

North Mandu Mandu

The reef at this point is very narrow and the rock platform extends from shore to the outer reef at approximately the same level with no sandy channel.

NMM1

Off the rocky shoreline are several oyster covered rocky stacks undercut at their bases. North of these the rock platform has a ric coral community with 20-50% cover of living coral on the basement rock which carries an algal film. The basement rock and shoreline are a fossil coral reef with exposures of fossil corals on the shoreline and platform.

About 30 species of coral were recorded from this site (tabulated). The area was also richer in echinoderms than any other areas surveyed.

The following were recorded:

Echinoids -

Echinometra mathaei - very common
Echinothrix calamaris +
Echinostrephus molaris +

Asteroids -

Fromia indica +
Nardoa galatheae - very common
Echinaster luzonicus ++

Holothurians -

Holothuria atra - very common
Stichopus chloronotus - common.

NMM 2

Seawards of site NMM 1 the coral cover decreases and sponges increase. The rock platform here is algal covered with numerous sponges - grey with strap-like branches. The sponge zone extends southwards and comes close to shore replacing the coral community. Few corals were recorded in the sponge zone : Goniopora sp., Psammocora contigua, Montipora spp and clumps of Acropora sp.

Echinoderms were common:

Echinometra mathaei - common
Tripneustes gratilla +
Diadema sp +
Echinostrephus molaris +
Nardoa galatheae - very common
Linckia laevigata - common
Echinaster luzonicus +

South of the sponge and algae community coral is again predominant with abundant Holothuria atra and Nardoa galatheae.

The north Mandu Mandu area is unique among the sites so far examined on the N.W. Cape reefs in having a coral community adjacent to the rocky shore.

Coral distribution data, N.W. Cape reefs (May 1980)

The study sites are grouped by habitat in the following tables, except for the first one which is a transect from shore across the lagoon to the reef crest (Tables I to V).

The sites are abbreviated as follows:

Off Tantabiddi

- reef front - T 1
- lagoon reef - T 2

Off Mangrove Bay

- reef crest - MB 1, 2
- reef flat - MB 3-4, 11
- back reef - MB 5, 6, 12
- lagoon reefs - MB 7, 10
- fringing reefs - MB 9

South of Mangrove Bay

- reef flat - SMB 1
- reef front, outside passage - SMB 2

Off Lakeside Camp

- reef flat - L 1

Off Turquoise Bay

- back reef - TB 1

North Mandu Mandu

- back reef flat - NMM 1, 2

Off Mandu Mandu creek

- reef front - MM 1, 2
- reef flat - MM 3
- lagoon reef - MM 4

Coral Cover

At the head of each column is a subjective estimate of the percentage of the substrate occupied by living coral, dead coral or coral rock (often algal covered) and sand.

Coral abundance

Each species is graded 1-5 on a subjective estimate of the percentage of the total living coral cover occupied by a species

1 = 1-5% of the total coral cover.
2 = 6-10%
3 = 11-30%
4 = 31-80%
5 = 81-100%

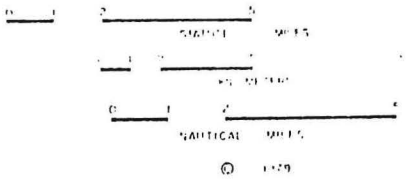
The species richness and percentage cover of living corals at the various sites are compared in Table VI.

It will be seen that the lagoon reefs are richest in coral species with up to 52 recorded at one site but only eight at Mandu Mandu where the lagoonal coral fauna is very depauperate probably following flooding by fresh water some years ago.

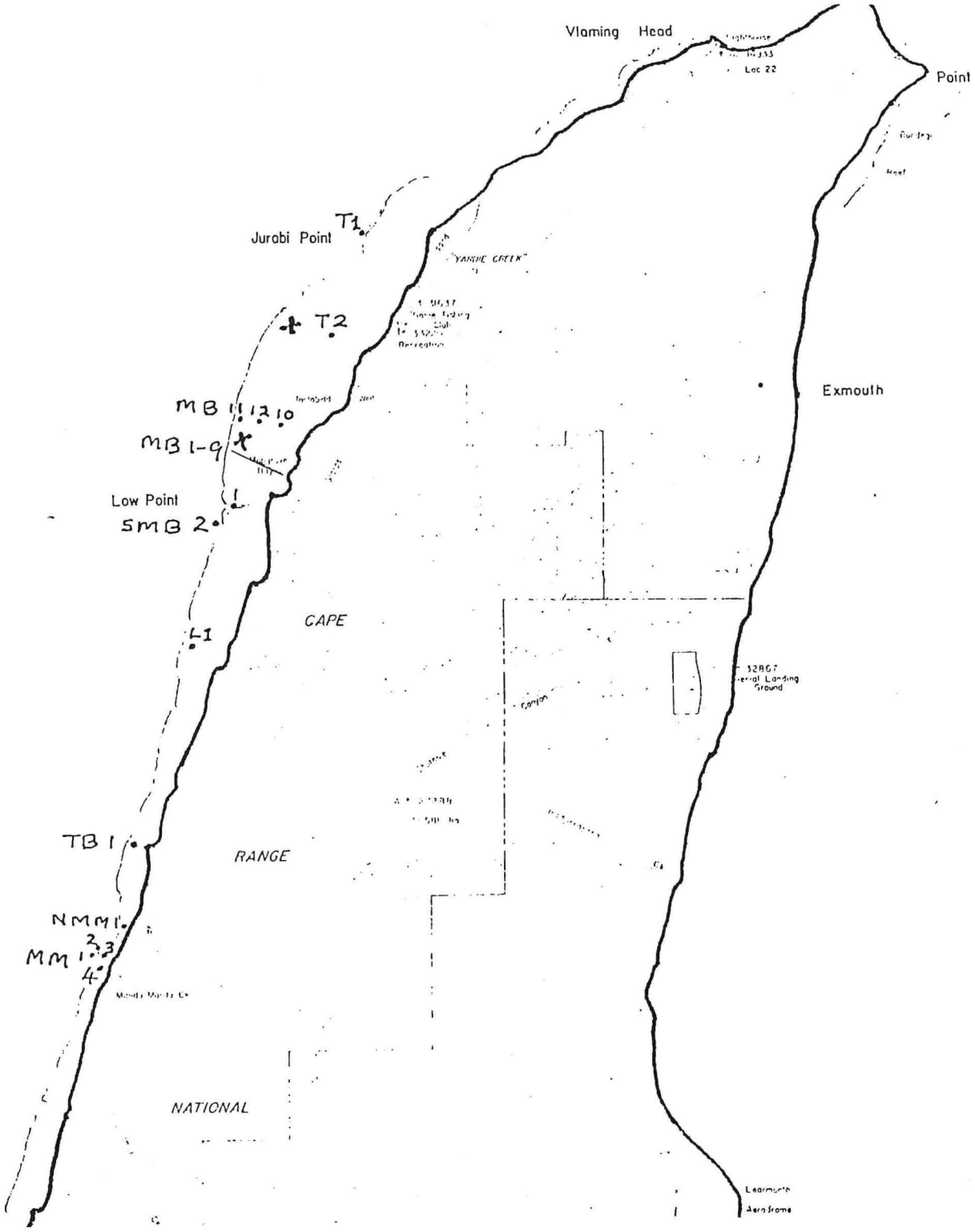
The coral fauna of similar habitats shows a wide range of variability between sites due probably to small scale habitat variations and patchiness of species distribution.

The percentage cover of living coral also shows a high degree of variability between sites in similar habitats. No trends are observable either in species richness or percentage cover.

CAPE RANGE BARRIER REEF



W.A.M. Sample sites, 1977 X
" " " 1980 •T1 etc.



Locality: off Mangrove Bay

Date: May 19th 1980

Transect no.: MB I

Site nos.

	Reef crest/ Reef flat					Back reef		Lagoon		Sp
	1	2	3a	3b	4	5	6	7	8	
% living coral	70	50	90	20	80	<1	90	5	0	<
% dead	20	50	10	50	10	} 99	5	5	0	8
% sand	10	0	0	30	10		5	90	100	:
Hydrozoa										
M. platyphylla										
Millepora sp. (branching)								1		
Anthozoa - Octocorallia										
Heliopora coerulea										
Anthozoa - Scleractinia										
Psammocora contigua										
P. digitata										
P. superficialis										
Stylocoeniella guentheri										
Pocillopora damicornis			1					1		
P. eydouxi						1		1		
P. verrucosa			1							
Seriatopora caliendrum										
Stylophora pistillata								1		
Acropora hyacinthus			1		4		5	1		
A. cf. millepora										
A. 3 semi-tabular (green)										
A. 4 clumps. cf. A. diversa			1			1	2	1	1	
A. 5 semi-tabular	5	5	5	3	4			1		
A. 6 blue bushy						1	1			
A. 7 cf. A. delicatula			1	1						
A. 8 cf. A. clathrata										
A. 9										
A. 10 cf. A. sarmentosa							1	1		
A. 11 cf. A. divaricata								1		
A. 12 A. robusta			1		1	1	1			
A. 13 cf. A. splendida							1			
A. 14										
15 cf. A. formosa						1	1			
A. 16 Thin staghorn							1			
Astreopora myriophthalma + A. cf. ocellata							1	1+1		
Montipora cf. erythraea								1		
M. cf. informis										
M. ~~ramosa~~ encrusting spp (3)			1			1	1	1		
M. 4 branching						1	1	1		
M. 5 sp.								1		
M. 6 sp.						1				
M. 7										
M. 8										
Pavona decussata			1							
P. ~~minuta~~ cf. venosa								1		
P. ~~varians~~ encrusting sp.								1		
Coscinaraea sp.										
Pachyseris rugosa										
P. speciosa										
Fungia (F.) fungites					1		1			
F. (Pleuractis) scutaria							1			
F. (Verrillofungia) concinna										
Herpolitha cf. limax										

other spp. not recorded.

other spp not recorded.

N. W. Cape

Locality:

Date: 19. V. 80

Transect no.: MBI

Site nos.

	1	2	3a	3b	4	5	6	7	8	9
Polyphyllia talpina										
Podabacia crustacea										
Alveopora cf. daedalea										
Alveopora 1.										1
Alveopora 2.										
Goniopora cf. pedunculata										
G. cf. tenuidens										
G. 1. sp.								1		
G. 2.										
Pc tes (Porites) cf. australensis			1			1		1		
Porites cf. P. andrewsi										
P. cf. cylindrica										
P. sp. 1.								1		
P. sp. 2.										
Caulastrea tumida										
Cyphastrea chalcidicum										
C. microphthalma								1		
C. ~~serailia~~ sp.							1	1		1
Diploastrea heliopora										
Echinopora lamellosa							1	1		
E. horrida										
E. hirsutissima								1		
Favia amicorum							1			
F. favus										
F. matthai								1		
F. maxima										
F. pallida							1			
F. stelligera										
Favia 1.							1			
Favia 2.										
Favites abdita			1				1	1		
F. cf. chinensis										
F. cf. flexuosa										
F. pentagona										
Favites ~~spp.~~							1			1
Favites 2.										
Goniastrea aspera										
G. ~~australensis~~ cf. G. favulus								1		
G. edwardsi			1				1	1		
G. pectinata								1		
G. retiformis			1							
Hydnophora exesa										
H. microconos										
H. rigida								1		
Leptastrea cf. pruinosa										
L. ~~cf. transversa~~ sp.								1		
Leptoria phrygia			1				1	1		
Montastrea curta			1					1		
M. valenciennesi										
Montastrea sp. 1.										
Moseleya latistellata										
	1 spp. recorded	2 spp. recorded								

N. W. Cape -

Locality: _____ Date: 19. V. 80

Transect no.: M B I Site nos.

	1	2	3a	3b	4	5	6	7	8	9
Platygyra daedalea			1				1	1		
P. sinensis			2			1	1	1		
P. lamellina										
P. cf. pini							1	1		
Plesiastrea versipora										1
Trachyphyllia geoffroyi										
Galaxea clavus							1			
G. fascicularis							1	1		
Merulina ampliata							1			
Sc[illegible]phyllia sp.								1		
Acanthastrea sp.			1					1		
Blastomussa merleti										
Lobophyllia corymbosa								1		
Lobophyllia sp. 1.										
Lobophyllia 2.										
Lobophyllia hemprichii										
Symphyllia radians										
Echinophyllia aspera							1			
Oxypora lacera										
Mycedium elephantotus										
M. tenuicostatum										
M. cf. tubifex										
Mycedium sp. 1.										
Pectinia lactuca										
P. paeonia										
Cataphyllia jardinei										
Euphyllia glabrescens										
Eup[illegible]llia fimbriata (T)										
E. [illegible]mbriata										
Plerogyra sp.										
Physogyra sp.										
Dendrophyllia sp. 1.										
Dendrophyllia sp. 2.										
Duncanopsammia axifuga										
Tubastrea aurea										
T. diaphana										
Turbinaria bifrons										
T. cf. frondens										
T. mesenterina										
T. peltata										
T. reniformis										
T. sp. 1.										
T. sp. 2.										
No. of species of hard corals			18	2	4	10	29	40	1	4
Alcyonacea										
Sarcophyton sp.			1							
Lobophytum sp.			1							
[illegible]r spp. not recorded										
[illegible]her spp. not recorded.										

Locality: Tantabiddi, reef front (T 1) Date: May, 1980

Passage south of Mangrove Bay, reef front (SMB 2)

Mandu Mandu, reef front (MM 1,2)

	T 1	SMB 2	MM 1,2				
Hydrozoa	% living 50-80 % dead 20-50 % sand	70 30 sand at base of reefs	50-80 20-50				
M. platyphylla			1				
Millepora sp.							
Anthozoa - Octocorallia							
Heliopora coerulea		1					
Anthozoa - Scleractinia							
Psammocora contigua							
P. digitata			1				
P. superficialis							
Stylocoeniella guentheri							
Pocillopora damicornis			1				
P. eydouxi	1	1	1				
P. verrucosa		1					
Seriatopora caliendrum	1						
Stylophora pistillata							
Acropora hyacinthus	4	2	2				
A. cf. millepora							
A. 3 semi-tabular (green)							
A. 4 clumps - cf. A. diversa							
A. 5 semi-tabular	2	4	4				
A. 6 blue bushy							
A. 7 cf A. delicatula							
A. 8 cf A. clathrata			1				
A. 9							
A. 10 cf. A. sarmentosa							
A. 11 cf A. divaricata							
A. 12 A. robusta							
A. 13 cf. A. splendida							
A. 14							
A. 15 cf A. formosa							
A. 16 cf A. roseria							
Astreopora myriophthalma	1		1				
Montipora cf. erythraea							
M. cf. informis							
M. ramosa							
M. 4 encrusting spp.	1	1	1				
M. 5 bracket spp		1	1				
M. 6							
M. 7							
M. 8							
Pavona cf. explanulata			1				
P. minuta	1		1				
P. sp. (encrusting)	1						
Pavona sp (very fine)			1				
Pachyseris rugosa	1		1				
P. speciosa		1	1				
Fungia (F.) fungites							
F. (Pleuractis) scutaria							
F. (Verrillofungia) concinna							
Herpolitha cf. limax							
Leptoseris mycetoseroides			2				
L. hawaiiensis			1				
L. aff. hawaiiensis			1				
L. cf. scabra			1				

N.W. Cape

Locality: Reef front

Date: May, 1980

Transect no.:

Site nos.

		T 1	SMB 2	MM 1, 2					
Polyphyllia talpina									
Podabacia crustacea									
Alveopora cf. daedalea									
Alveopora 1.				1					
Alveopora 2.									
Goniopora cf. pedunculata									
G. cf. tenuidens									
G. 1.		1							
G. 2.									
Pc tes (Porites) australensis									
Porites cf. P. andrewsi				1					
P. cf. cylindrica									
P. sp. 1.		1		1					
P. sp. 2.									
Caulastrea tumida									
Cyphastrea chalcidicum									
C. microphthalma									
C. spp.		1	1	1					
Diploastrea heliopora									
Echinopora lamellosa									
E. horrida									
E. hirsutissima									
Favia amicorum									
F. favus									
F. matthai				1					
F. maxima									
F. pallida									
F. stelligera				1					
Favia spp.		1	1	1					
Favia 2.									
Favites abdita									
F. cf. chinensis									
F. cf. flexuosa									
F. pentagona									
Favites spp.		1	1	1					
Favites 2.									
Goniastrea									
G. australensis				1					
G. edwardsi		1		1					
G. pectinata		1		1					
G. retiformis									
Hydnophora exesa				1					
H. microconos		1							
H. rigida									
Leptastrea cf. pruinosa				1					
L. cf. transversa									
Leptoria phrygia		1		1					
Montastrea curta				1					
M. valenciennesi									
Montastrea sp. 1.									
Moseleya latistellata									
Oulophyllia crispa		1							

N.W. Cape

Locality: Reef front

Date: May 1980

Transect no.:

Site nos.

		T 1	SMB 2	MM 1,2					
Platygyra daedalea		1		1					
P. sinensis									
P. lamellina									
P. cf. pini									
Plesiastrea versipora									
Trachyphyllia geoffroyi									
Galaxea clavus									
G. fascicularis		1	1	1					
Merulina ampliata				1					
Scolymia sp.									
Acanthastrea sp.									
Blastomussa merleti									
Lobophyllia corymbosa				1					
Lobophyllia sp. 1.									
Lobophyllia 2.									
Lobophyllia hemprichii									
Symphyllia radians									
Echinophyllia aspera									
Oxypora lacera									
Mycedium elephantotus									
M. tenuicostatum									
M. cf. tubifex									
Mycedium sp. 1.									
Pectinia lactuca									
P. paeonia									
Catalaphyllia jardinei									
Euphyllia glabrescens									
Euphyllia fimbriata (T)									
E fimbriata									
Plerogyra sp.									
Physogyra sp.									
Dendrophyllia sp. 1.									
Dendrophyllia sp. 2.									
Duncanopsammia axifuga									
Tubastrea aurea									
T. diaphana				1					
Turbinaria bifrons		1							
T. cf. frondens									
T. mesenterina		1							
T. peltata		1							
T. reniformis		1							
T. cf. stellulata		1		1					
T. sp. 2.									
Number of species, hard corals		26	12	41					
Alcyonacea									
Sarcophyton sp.		1							
Gorgonacea									
Junceella fragilis		2	incomplete sampling						

Locality: N.W. of Mangrove Bay, reef flat (MB 11) Date: May, 1980

South of Mangrove Bay, reef flat (SMB 1)

Off Lakeside camp, reef flat (L 1)

Mandu Mandu (MM3)

	MB 11	SMB 1	L 1	MM 3				
% living		20						
% dead		60						
% sand		20						
Hydrozoa								
M. platyphylla	1	1						
Millepora sp.								
Anthozoa - Octocorallia								
Heliopora coerulea								
Anthozoa - Scleractinia								
Psammocora contigua	1		1					
P. digitata				1				
P. superficialis profundacella	1							
Stylocoeniella guentheri								
Pocillopora damicornis		3	1	1				
P. eydouxi	1		1	1				
P. verrucosa	1	3	1	1				
Seriatopora caliendrum		1						
Stylophora pistillata		3	1	1				
Acropora hyacinthus	1		3-4	1				
A. cf. millepora			1					
A. 3 semi-tabular (green)	1	1	1					
A. 4 clumps. cf. A. diversa		1	1	1				
A. 5 semi-tabular	1	2	3					
A. 6 blue bushy		1	1					
A. 7 cf. A. delicatula			1					
A. 8 cf. A. clathrata			1					
A. 9								
A. 10 cf. A. sarmentosa	1		1					
A. 11 cf A. divaricata		1						
A. 12 A. robusta	1		1	1				
A. 13 cf. A. splendida			1					
A. 14								
15 cf. A. formosa								
A. 16 cf. A. rosaria								
Astreopora myriophthalma								
Montipora cf. erythraea		1		1				
M. cf. informis								
M. encrusting spp.	1	1	1	1				
M. 4 bushy		1	1					
M. 5								
M. 6								
M. 7 cf. M. multiformis		1	1					
M. 8								
Pavona decussata								
P. minuta		1	1					
P. varians								
Coscinaraea sp.								
Pachyseris rugosa								
P. speciosa								
Fungia (F.) fungites								
F. (Pleuractis) scutaria		1						
F. (Verrillofungia) concinna								
Herpolitha cf. limax								

N.W. Cape

Locality: Reef flat

Date: May, 1980

Transect no.:

Site nos.

	MB 11	SMB 1	L 1	MH 3				
Polyphyllia talpina								
Podabacia crustacea								
Alveopora cf. daedalea								
Alveopora 1.								
Alveopora 2.								
Goniopora cf. pedunculata								
G. cf. tenuidens								
G. 1.								
G. 2.								
Porites (Porites) australensis								
Porites cf. P. andrewsi		4						
P. cf. cylindrica								
P. spp.	1		1	1				
P. sp. 2.								
Caulastrea tumida								
Cyphastrea chalcidicum								
C. microphthalma		1		1				
C. serailia			1	1				
Diploastrea heliopora								
Echinopora lamellosa		1						
E. horrida								
E. hirsutissima		1						
Favia amicorum								
F. favus								
F. matthai			1					
F. maxima								
F. pallida								
F. speciosa		1		1				
Favia spp.	1	1	1					
Favia 2.								
Favites abdita		1	1	1				
F. cf. chinensis								
F. cf. flexuosa								
F. pentagona								
Favites spp.	1		1					
Favites 2.								
Goniastrea aspera			1					
G. australensis								
G. edwardsi		1	1	1				
G. pectinata			1	1				
G. retiformis			1					
Hydnophora exesa				1				
H. microconos	1		1					
H. rigida		1		1				
Leptastrea cf. pruinosa								
L. cf. transversa			1					
Leptoria phrygia		1	1	1				
Montastrea curta			1					
M. valenciennesi								
Montastrea sp. 1.								
Moseleya latistellata								

N.W. Cape

Locality: Reef flat

Date: May, 1980

Transect no.:

Site nos.

		MB 11	SMB 1	L 1	MM 3				
Platygyra daedalea			1	1	1				
P. sinensis				2	2				
P. lamellina		1	1	1	1				
P. cf. pini									
Plesiastrea versipora									
Trachyphyllia geoffroyi									
Galaxea clavus									
G. fascicularis			1	1	1				
Merulina ampliata									
Scolophyllia sp.									
Acanthastrea sp.					1				
Blastomussa merleti									
Lobophyllia corymbosa					1				
Lobophyllia sp. 1.									
Lobophyllia 2.									
Lobophyllia hemprichii									
Symphyllia radians									
Echinophyllia aspera									
Oxypora lacera									
Mycedium elephantotus									
M. tenuicostatum									
M. cf. tubifex									
Mycedium sp. 1.									
Pectinia lactuca									
P. paeonia									
Cataphyllia jardinei									
Euphyllia glabrescens									
Euphyllia fimbriata (T)									
E. imbriata									
Plerogyra sp.									
Physogyra sp.									
Dendrophyllia sp. 1.									
Dendrophyllia sp. 2.									
Duncanopsammia axifuga									
Tubastrea aurea		1							
T. diaphana		1							
Turbinaria bifrons									
T. cf. frondens									
T. mesenterina									
T. peltata									
T. reniformis									
T. sp. 1.									
T. sp. 2.									
Number of species		18	29	38	26				
Alcyonacea									
Sarcophyton sp.		1							
Lobophytum sp.		1							
Zoanthidea									
Palythoa sp.		1			1				

N.W. Cape IV

Locality: off Turquoise beach, back reef (TBI) Date: May, 1980

North Maudu Maudu, inner reef flat Site nos.

drozoa	TB 1	NMM 1
% living	20	20-50
% dead	30	50-80
% sand	50	0
M. platyphylla	2	
Millepora sp.		
thozoa - Octocorallia		
Heliopora coerulea		
thozoa - Scleractinia		
Psammocora contigua		1
P. digitata	1	1
P. superficialis		
St coeniella guentheri		
Pocillopora damicornis		
P. eydouxi		1
P. verrucosa		1
Seriatopora caliendrum		
Stylophora pistillata	1	
Acropora hyacinthus		3
A. cf. millepora		
A. 3 semi-tabular (green)		
A. 4 clumps cf. A. diversa		2
A. 5 semi-tabular	3	
A. 6 blue bushy		1
A. 7 cf. A. delicatula		
A. 8 cf. A. clathrata		
A. 9		
A. 10 cf. A. sarmentosa	1	1
A. 11 cf. A. divaricata		1
A. 12 A. robusta	1	1
A. 13 cf. A. splendida		
A. 14		
A. 15 cf. A. formosa		
A. 16 Astreopora cf. ocellata		1
Astreopora myriophthalma		1
Montipora cf. erythraea	1	
M. cf. informis		
M. ramosa		
M. 4 encrusting spp. (3)	1	1
M. 5		
M. 6		
M. 7 cf. M. multiformis		1
M. 8		
Pavona decussata		1
P. minuta		
P. varians		
Coscinaraea sp.		
Pachyseris rugosa		
P. speciosa		
Fungia (F.) fungites		
F. (Pleuractis) scutaria		
F. (Verrillofungia) concinna		
Herpolitha cf. limax	1	

N.W. Cape

Locality: Back reef

Date: May, 1980

Transect no.:

Site nos.

		TB 1	NMM 1						
olyphyllia talpina									
odabacia crustacea									
lveopora cf. daedalea									
lveopora 1.									
lveopora 2.									
oniopora cf. pedunculata									
. cf. tenuidens									
. sp			1						
. 2.									
o: es (Porites) australensis									
or.ces cf. P. andrewsi									
. cf. cylindrica									
. sp.			1						
. sp. 2.									
aulastrea tumida									
yphastrea chalcidicum									
.microphthalma									
. spp.		1	1						
iploastrea heliopora									
chinopora lamellosa		1							
. horrida									
. hirsutissima		1							
avia amicorum									
. favus									
. matthai			1						
. maxima									
. pallida									
. stelligera		1	1						
a . spp.		1	1						
avia 2.									
avites abdita			1						
. cf. chinensis									
. cf. flexuosa									
. pentagona									
avites spp.		1	1						
avites 2.									
oniastrea aspera			1						
. australensis									
. edwardsi									
. pectinata		1							
. sp.			1						
ydnophora exesa									
. microconos									
. rigida		1							
eptastrea cf. pruinosa									
. cf. transversa									
eptoria phrygia		1	1						
ontastrea curta			1						
. valenciennesi									
ontastrea sp. 1.									
oseleya latistellata									

N. W. Cape

Locality: Back reef

Date: May, 1980

Transect no.:

Site nos.

		TB 1	NMM 1					
Platygyra daedalea								
P. sinensis		1						
P. lamellina		1	1					
P. cf. pini								
Plesiastrea versipora								
Trachyphyllia geoffroyi								
Galaxea clavus		1	1					
G. fascicularis		1						
Merulina ampliata		1						
Sc ophyllia sp.								
Acanthastrea sp.			1					
Blastomussa merleti								
Lobophyllia corymbosa		1						
Lobophyllia sp. 1.								
Lobophyllia 2.								
Lobophyllia hemprichii								
Symphyllia radians								
Echinophyllia aspera								
Oxypora lacera								
Mycedium elephantotus								
M. tenuicostatum								
M. cf. tubifex								
Mycedium sp. 1.								
Pectinia lactuca								
P. paeonia								
Catalaphyllia jardinei								
Euphyllia glabrescens								
Euphyllia fimbriata (T)								
E. imbriata								
Plerogyra sp.								
Physogyra sp.								
Dendrophyllia sp. 1.								
Dendrophyllia sp. 2.								
Duncanopsammia axifuga								
Tubastrea aurea								
T. diaphana								
Turbinaria bifrons								
T. cf. frondens								
T. mesenterina								
T. peltata								
T. reniformis								
T. sp. 1.								
T. sp. 2.								
Number of species		24	30					

N.W. Cape V

Locality: Tantabiddi, lagoon reef (T2) Date: May, 1980

off Mangrove Bay, lagoon reef (MB10) site nos.
Mandu Mandu, lagoon bommies (MM4)

	T 2	MB 10	MM 4					
ydrozoa	% living % dead % sand	sand	50-100 0-50 around reefs	1-2 98				
M. platyphylla		2	2					
Millepora sp.		1	1					
nthozoa - Octocorallia								
Heliopora coerulea								
nthozoa - Scleractinia								
Psammocora contigua								
P. digitata		1						
P. sp.			1					
S ocoeniella guentheri								
Pocillopora damicornis		1	1	1				
P. eydouxi								
P. verrucosa			1					
Seriatopora caliendrum		3	3					
Stylophora pistillata		3	3					
Acropora hyacinthus			1	1				
A. cf. millepora								
A. 3 semi-tabular (green)				1				
A. 4 clumps - cf. A. diversa		1	1					
A. 5 semi-tabular		1	1	1				
A. 6 bushy		1						
A. 7 cf A. delicatula								
A. 8 cf. A. claturata								
A. 9								
A. 10 cf. A. sarmentosa		1	1					
A. 11 cf. A. divaricata			1					
A. 12 A. robusta			1					
A. 13 cf A. splendida			1					
A. 14								
A. 15 cf. A. formosa			2	1				
A. 16 cf. A. rosaria			1					
Astreopora myriophthalma								
Montipora cf. erythraea		1	1	1				
M. cf. informis								
M. ramosa								
M. 4 encrusting spp.		1	1					
M. 5 bracket spp.								
M. 6 spp. (3)			1					
M. 7								
M. 8								
Pavona decussata			1					
P. minuta			1					
P. sp. (massive)			1					
Coscinaraea sp.			1					
Pachyseris rugosa								
P. speciosa								
Fungia (F.) fungites								
F. (Pleuractis) scutaria			1					
F. (Verrillofungia) concinna								
Herpolitha cf. limax		1						

N. W. Cape

Locality: Lagoon reefs

Date: May, 1980

Transect no.:

Site nos.

		T 2	MB 10	MM 4					
Polyphyllia talpina			1						
Podabacia crustacea			1						
Alveopora cf. daedalea									
Alveopora 1.									
Alveopora 2.									
Goniopora cf. pedunculata									
G. cf. tenuidens									
G. 1.			1						
G. 2.									
Pc tes (Porites) australensis		4.	3						
Porites cf. P. andrewsi									
P. cf. cylindrica									
P. sp. 1.									
P. sp. 2.									
Caulastrea tumida									
Cyphastrea chalcidicum									
C. microphthalma		1	1						
C. sp.			1						
Diploastrea heliopora									
Echinopora lamellosa		1	1						
E. horrida									
E. hirsutissima		1							
Favia amicorum									
F. favus									
F. matthai		1	1						
F. maxima									
F. pallida									
F. stelligera			1						
Fa a 1.			1						
Favia 2.									
Favites abdita									
F. cf. chinensis									
F. cf. flexuosa									
F. pentagona			1						
Favites spp.		1	1	1					
Favites 2.									
Goniastrea aspera		1							
G. sp.			1	1					
G. edwardsi		1	1						
G. pectinata		1	1						
G. retiformis			1						
Hydnophora exesa		1							
H. microconos			1						
H. rigida		1							
Leptastrea cf. sp.		1							
L. cf. transversa									
Leptoria phrygia		1	1						
Montastrea curta		1							
M. valenciennesi									
Montastrea sp. 1.									
Moseleya latistellata									
Oulophyllia crispa			1						

N.W. Cape

Locality: lagoon reefs

Date: May, 1980

Transect no.:

Site nos.

		T 2	MB 10	MM 4					
Platygyra daedalea			1						
P. sinensis									
P. lamellina			1						
P. cf. pini			1						
Plesiastrea versipora									
Trachyphyllia geoffroyi									
Galaxea clavus		1	1						
G. fascicularis		1	1						
Merulina ampliata		1							
S[illegible]ophyllia sp.									
Acanthastrea sp.									
Blastomussa merleti									
Lobophyllia corymbosa		1	1						
Lobophyllia sp. 1.									
Lobophyllia 2.									
Lobophyllia hemprichii									
Symphyllia radians		1							
Echinophyllia aspera		1							
Oxypora lacera									
Mycedium elephantotus									
M. tenuicostatum									
M. cf. tubifex									
Mycedium sp. 1.									
Pectinia lactuca		1							
P. paeonia			1						
Catalaphyllia jardinei									
Euphyllia glabrescens		1							
Euphyllia fimbriata (T)									
E. [illegible]mbriata									
Plerogyra sp.									
Physogyra sp.									
Dendrophyllia sp. 1.									
Dendrophyllia sp. 2.									
Duncanopsammia axifuga									
Tubastrea aurea									
T. diaphana									
Turbinaria bifrons									
T. cf. frondens									
T. mesenterina									
T. peltata									
T. reniformis		1							
T. cf T. stellulata		1							
T. sp. 2.									
Number of species		37	52	8					

Table vI

Comparison of species richness of corals and percentage cover of living corals at the sites sampled, May 1980.

Sites	No. of species	% cover of living coral
Shore platform		
MB 9	4	<1
Lagoon reef		
MB 7	40	5
MB 10	52	50 - 100
T 2	37	50 - 100
MM 4	8	1 - 2
Back reef		
MB 5	10	<1
MB 6	29	90
TB 1	24	20
NMM 1	30	20 - 50
Reef flat		
MB 3a	18	90
MB 3b	2	20
MB 4	4	80
MB 11	18	-
SMB 1	29	20
L 1	38	-
MM 3	26	-
Reef crest		
MB 1	-	70
MB 2	-	50
Reef front		
T 1	26	50 - 80
SMB 2	12	70
MM 1,2	41	50 - 80

The coral fauna of the North West Cape reefs

The species of hard corals (Hydrozoa, Octocorallia and Scleractinia) collected and observed during museum surveys of the North West Cape reefs in 1968, 1977, 1978 and 1980 have been tabulated (Table VII) and their presence recorded in five areas, from Tantabiddi in the north to Point Anderson in the south.

The areas are coded as follows:

Jurabi Pt. to Low Pt. (Mangrove Bay area)	MB
Turquoise Bay to Mandu Mandu	MM
Yardie creek (and 8 km north and south)	Y
Carbaddaman Passage to Pt. Cloates (Ningaloo area)	N
Point Maud to Pt. Anderson (Coral Bay area)	CB

Sight records are designated by S and collected specimens by X in the columns.

Because of difficulties in identifying species in some genera and the need for revisions before the taxonomy is stabilized, some of the determinations in the list are made only to genus. Where species have a characteristic growth form this is used to separate them but in the genera Acropora, Montipora, Goniopora and Porites several species are included in a single growth form in several cases.

Each of the five areas covers a range of habitats including fringing reefs, lagoon patches, back reef and reef flat areas with limited observations on the reef crest and reef front. The latter was sampled at only three locations: off Tantabiddi, off Low Point and off Mandu Mandu. Collecting effort has otherwise been similar in all the areas studied.

A comparison of the species richness of the five areas indicates a close similarity between the four more southerly areas, from each of which ca 67-70 species have been recorded while from the northernmost area, between Jurabi Point and Low Point, ca 99 species are listed. While some of the additional records can be attributed to the rich coral fauna of the lagoon patches in this area there is also an overall richer fauna which may be due to a geographical difference between the areas.

A comparison of the coral fauna of the North West Cape barrier reefs with that of the Houtman Abrolhos and the Dampier area is tabulated below:

Hard corals	Dampier		North West Cape		Abrolhos	
	Gen.	Spp.	Gen.	Spp.	Gen.	Spp.
Hermatypic	48	ca 94	44	ca 124	37	ca 64
Ahermatypic	2	3	2	3	8	9
Non-Scleractinian	1	3	2	3	0	0
Total	51	ca 100	48	ca 130	45	ca 73

Of the non-scleractinian corals Millepora spp. are common on the Dampier reefs, occur sporadically on the North West Cape reefs and are absent from the Abrolhos. While the blue Octocoral (Heliopora coerulea) has not been found in the Dampier area, only occurs at a few sites on the N.W. Cape reefs and is also absent from the Abrolhos.

Differences in generic and species composition of the coral fauna on the three areas can be attirbuted to several factors. The Abrolhos, although having a fairly rich coral fauna is situated at the southern limit for many genera and species and has fewer species representing many of the genera found further north. On the other hand it has a greater diversity of habitats than the other two areas, including lagoon slopes to a depth of over 30 metres, providing a habitat for foliose species either not found or poorly represented in the other two areas.

The North West Cape reefs are subjected to high energy oceanic water on their seaward face causing strong tidal currents to flow across the reefs. Thus the reef flat is colonized by species resistant to strong surge and foliose coral species are very poorly represented, even in the lagoon. However small lagoonal reef patches carry a more varied coral fauna than the reef flats.

The coral fauna of the Dampier Archipelago and Burrup peninsula is richer in genera than the N.W. Cape reefs but fewer species have been recorded. The inshore areas are subjected to a high level of turbidity and marked seasonal temperature variations but nevertheless have a rich although specialized coral fauna including a number of genera either not found or poorly represented in the North West Cape area eg. Caulastrea, Duncanopsammia, Dendrophyllia, Diploastrea, Moseleya, Euphyllia, Catalaphyllia and Trachyphyllia.

On the other hand the genus Acropora is represented by many more species on the N.W. Cape reefs than in the Dampier area.

Species characteristic of deeper water eg. Leptoseris spp have not been found in the Dampier area due to the lack of suitable habitat. The genus is represented by 2 species in the Abrolhos and six on the N.W. Cape reefs, all from one site off Mandu Mandu, on the outer face of a reef at 12-15 metres depth.

Further sampling of the deeper parts of the reef front and passages may reveal additional genera and species not yet recorded from these reefs but the number of genera approaches that of the Dampier area and the number of species is already higher.

Summary

1. The reef between the passage south of Low Point and the passage off Tantabiddi creek consists of a broad ?Pleistocene rock platform with a dissected reef front sloping steeply to a sand and rock bottom at 30-50 ft and a gently sloping sandy back reef separated by a shallow lagoon from inshore fringing rock platforms.

2. The reef front (where examined) has a 50-80% cover of living coral, predominantly semi-tabular Acropora spp with a moderately rich fauna of other corals.

3. The outer reef crest has proved to be inaccessible but the inner crest, where examined, has a 50-70% cover of living coral, predominantly semi-tabular Acropora spp and heads of a brain coral, Platygyra sinensis. It is reasonable to assume that the coral cover of the outer reef crest is similar to and continuous with that of the reef front. Coral covered reef crests are exposed to air at the lowest spring tides but in some areas the crest is higher, more frequently exposed, almost devoid of coral and extensively burrowed by echinoids (Echinometra mathaei). Dead coral boulders and residual stacks are colonized by oysters (Saccostrea cucullata) and barnacles.

4. The outer reef flat has a variably developed coral zone with 20-90% cover of living coral of low to moderate species richness in places dominated by a tabular Acropora (A. hyacinthus). Where scour lines cross the reef coral growth is almost absent.

In the coral zone the holothurian Actinopyga mauritiana (the surf red fish) is common but where the outer reef flat has a sparse coral cover and is predominantly covered by a short algal turf and sand there is a large population of Actinopyga echinites (approximately $1/m^2$, over a large area) and smaller numbers of Microthele nobilis (black teat fish).

The algal zone with a high population of holothurians was observed on the outer reef flat continuously from near the northern end of the reef to northwest of Mangrove Bay, where coral is again more abundant.

5. The back reef at the northern and southern ends of the reef has rich coral growth except where crossed by scour lines (1 to 90% cover of living coral). In places Acropora hyacinthus is dominant, to the exclusion of most other corals, elsewhere there is a rich assemblage of species. Staghorn Acropora species occur in some places on the inner edge of the back reef, but do not cover extensive areas.

The middle section of the back reef is partially sand covered with patches of long fucoid algae.

6. The lagoon is sand floored (overlying a rock pavement) with in many places a superficial algal film. A number of patch reefs and Porites bommies, particularly near Tantabiddi and north of Mangrove Bay have the richest assemblage of corals recorded at any site on the N.W. Cape reefs.

7. The North West Cape reefs are very variable, over short distances, in coral cover and species richness within similar habitats but it is believed that the above summary description of the reef between Jurabi Point and Low Point may be representative of other reefs, in the barrier reef system, that have a similar configuration.

TABLE VII

	MB	MM	Y	N	CB
HYDROZOA					
Millepora platyphylla	S	X	X		X
Millepora spp (ramose)	X		X	X	
Cl. ANTHOZOA					
S. cl. OCTOCORALLIA					
Heliopora coerulea	X		X	S	
S. cl. ZOANTHARIA					
Or. SCLERACTINIA					
Fam. THAMNASTERIIDAE					
Psammocora contigua	X	X	X	X	X
P. digitata	X	X	X	X	X
P. profundacella	X				
P. superficialis					X
Psammocora sp.	X				
Fam. POCILLOPORIDAE					
Pocillopora damicornis	X	X	X	X	S
P. eydouxi	X	X	X	X	
P. verrucosa	S	X	X	X	S
Seriatopora cf. hystrix	S		X	X	S
Stylophora pistillata	S	S	X	X	S
Fam. ACROPORIDAE					
Acropora hyacinthus	S	X	X	X	S
A. sp. cf. millepora			X	X	
A. sp. (semi-tab., green)	S	S	X	X	S
A. sp. cf. diversa	X	X	X		S
A. sp. (semi-tabular)	X	X	X	X	S
A. sp. (open clumps)	X				
A. sp. (blue bushy)	S	S		S	X
A. sp. cf. delicatula	X				X
A. sp. (elk-horn)			X		
A. sp. cf. clathrata		X	X		
A. sp. (encr. with knobbly branches)	X		X		S
A. sp. cf. sarmentosa	X	X	X	S	S
A. sp. (wide, flat branches)				X	
A. sp. cf. divaricata	X	X			
A. robusta	X	S	X	S	S