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2012 report on

The Littoral and Coral Reef Mapping Project

Beau Vallon Bay, Mahé

Contents

None of the original data presented here have been published so far. Sophia Willmann compiled the list of fish species (pp. 30-32)

Summary of study goals

The project name relates to the main goal of the studies, i.e. detailed coral biotope mapping in order to trace developments both on long-term and short-term scales. The first detailed maps along transects of the reef near Beau Vallon-Mare Anglaise/Mahé have been first steps of a research program which shall help to understand natural dynamics of coral reefs and their alterations due to human interventions on short and long term levels.

In 2010 and in Mai-June, 2011, five transects were mapped in detail. The maps show the distribution and exact location of coral specimens. From two transects, 54 species were identified until August, 2011 (see our 2011 report). Additional species were to be expected from the remaining three transects. Another transect in the northern part of the study area was investigated for a census of echinoderms from near shore to the reef edge (transect E 1).

Understanding the coral communities and their dynamics require studies of the species composition. Tracing the fate of certain species in small areas may shed light on the background of changes, are they natural or caused by climate change or through more immediate human impact. As the coral species composition determines the occurrence of other organisms, the studies will be combined with research on (changing) species abundance and studies on various aspects of the biology of additional selected taxa (e.g. of echinoderms, fish, molluscs). A survey of the species occurring in nearby areas will help to understand biological dynamics and future changes in species associations in the study areas.

In 2011, a general biotope map of the study area along the coast of Mare Anglaise near Beau Vallon was also prepared. It shows the reef zonation from the shore to the reef edge (see our 2011 report). Small areas in the north and in the south are still not contained in the map and it will be completed in 2013/2014. Portions of the reef deeper than snorkelling depth were not mapped as our work is restricted to the upper (most vulnerable) reef zones.

Until now, no samples were taken and species identification has been done in a non-invasive manner (based on photographs). If removal of specimens was inevitable for identification (e.g. in echinoderms), the respective organism was put back to its original place immediately after examination. However, as the exact determination of certain coral species requires the examination of skeletal structures and/or molecular studies a few corals have not been identified down to species level.

Methods were described in the 2011 report and will be summarized here only briefly, see below.

All our data and results will be freely available on the internet.
Here, we report on the results of our investigations in the Beau Vallon-Mare Anglaise reef from August, 2011 to October, 2012.

- A sixth transect was mapped early in 2012
- In September and October 2012, we have begun re-mapping transect 2 in order to trace changes in the composition of the coral fauna and/or in single coral colonies.
- At the same time, we have begun a faunistic study on the fishes occurring in the study area.

Outlook
Tasks remaining for near future field work include comparison of the state of the coral fauna as it was in the first years of investigation with the state in subsequent years. A first such study has shown remarkable changes in the composition of the coral associations in a short period of time. - A comparative study at the south-eastern coast of Mahé was suggested in our first study application and our 2012 report (e.g. near Pointe au Sel) but upon recommendation of the National Parks Authority the preferred areas are now the fringing reef near Bel Ombre and the reef in Port Launay Bay.

In the future, the initial studies as outlined above should be extended by repeated detailed faunal surveys. It is especially important to re-study the areas both on a short term scale (e.g., after 3 years) and in long-term intervals (after ten, twenty etc. years). The high accuracy of the studies may make them models for biotope surveys in marine realms in general.

Mapping rock pools at a site north of Glacis, Mahé
An entirely different biologically interesting study is the examination of the fauna of a species-rich rock pool area in the north of Mahé’s west coast. This project has not been begun so far. For methods and study goals see the 2011 report.

Acknowledgements. Our thanks go to Juliane Schaub, who assisted in field work in October 2012. Christine Khan, Mike Bambochee and the team of Ocean Dream Divers have always and substantially contributed to our efforts in many ways. We want to thank Dr. Wolfgang and Karin Loch for assisting in the identification of coral species. Technical assistance in Goettingen was provided by Dr. Gert Tröster and the department’s artist Bernd Baumgart.

Field work from Mai, 2011 to October 2012 was conducted by Jessica Macken, Christiane Bock, Julia Frey, Sophia Willmann and the senior author.

Abbreviations

A	*Acropora* sp.
Abr	*Acropora brevis*
Ae	*Acanthastrea echinata*
aA	dead *Acropora*
Adi	*Acropora digitifera*
Adv	*Acropora divaricata*
Af	*Acropora formosa*
aG	dead *Goniastrea*
aG/P	dead *Porites or Goniastrea*
Al	*Alveopora* sp.
Ala	*Alveopora allingi*
Alo	*Acropora longicyathus*
aK	dead coral, not identified
aP	dead *Porites*
Am	*Astreopora myriophthalma*
aPo	dead *Pocillopora*
aPr	dead *Porites rus*
aS	dead *Stylophora*
At	*Acropora tenuis*
Cm	*Cyphastrea microphthalma*
Di 1	*Discosoma* sp.
Di 2	*Discosoma* sp.
Eh	*Echinopora hirsutissima*
El	*Echinopora lamellosa*
F	Faviidae
Fa	*Favia* sp.
Fa/c	*Favites abdita* or *F. complanata*
Fs	*Favia speciosa*
Fav	*Favites* sp.
Fsp	*Favites spinosa*
Fp	*Favites pentagona*
Fv	*Favites vasta*
Ga	*Galaxea astreata*
Ge	*Goniastrea edwardsi* oder *G. retiformis*
Gf	*Galaxea fasicularis*
Go	*Goniopora* sp.
Gom	*Goniopora minor*
Gop	*Goniopora planulata*
Gp	*Goniastrea pectinata*
He	*Hydnophora excesa*
Hm	*Hydnophora microconos*
Lep	*Leptoria phrygya*
Lo	*Lobophytum* sp.
Lp	*Leptastrea purpurea*
M	*Montipora* sp.
Md	*Metarhodactis* sp.
Me	*Montipora efflorescens*
Mg	*Montipora grisea*
Mi	*Montipora informis*
Mm	*Montipora monasteriata*
Mtu	*Montipora tuberculosa*

Mtur	*Montipora turgescens*
Mv	*Montipora venosa*
P	*Porites lutea* or *P. lobata*
Pd	*Pocillopora damicornis*
Pde	*Pavona decussata*
Pdu	*Pavona duerdeni*
Pe	*Pocillopora eydouxi*
Pex	*Pavona explanulata*
Pf	*Pavona frondifera*
Phl	*Physiogyra lichtensteini*
Pla	*Platygyra acuta*
Plc	*Platygyra carnosus*
Pm	*Pocillopora meandrina*
Po	*Psammocora obtusangula*
Pr	*Porites rus*
Pt	*Palythoa tuberculosa*
Pv	*Pocillopora verrucosa*
Pve	*Pavona venosa*
Sat	*Sarcophyton trocheliophorum*
Sp	*Stylophora pistillata*
Ti	*Turbinaria irregularis*
T1	transect 1
T2	transect 2
T5	transect 5
T6	transect 6

T6 66r — identification code of a quadrant:

T6	transect 6
66	distance from beginning point of T6 (in this case: 66 m)
r	position immediately right of the line (from 0 to 1 m left of the line)

T2 161.9l — identification code of a quadrant:

T2	transect 2
161	distance from fixed point on the shore (161 m)
9l	distance from line (9m) i.e. between the 9th and 11th quadrant
l	left hand side of the line

1 Introduction

Due to developments such as a natural improvement in coral species richness and the coral coverage of the seafloor after El Nino events in 1998 and shortly after the year 2000 on the one hand and human impacts because of increasing building activities or increasing tourism, the fates of the reefs along the coasts of the more populated islands of Seychelles are difficult to foresee. However, once they are well studied and remain well surveyed, they may provide good examples for developing nature conservation recommendations and conservation activities in general. In the granitic Seychelles, there are both coastal sections which are severely affected by man as well as others which have remained almost natural. Some of the latter may stay so if nature management allows. The importance of reefs have been considered in many publications and have become major political topics: Reefs protect the coasts, they are important for fishery, and their biological diversity attracts tourists. However, the reefs of the Inner Islands are threatened by coastal development, fisheries (Jennings et al., 2000), tourism and, one should add, recent 'modern' touristic activities such as the use of jet ski and boats, as well as climate change.

For comparative studies, the first and most important step to be taken is to gather what is there. While working out biotope maps has become a standard for terrestrial areas including urban areas, detailed maps of marine localities are scarce. They are, however, the basics for comparisons with the situation in the future, i.e. for the study of any development of the respective communities. This, in turn, allows for generalizations and general conclusions on reef endangering and reef management.

In the focus of our studies lies a reef belt along the northwestern coast of Mahé, the largest of the granitic islands (fringing reef along the coast of Mare Anglaise north of Beau Vallon). Study area is a fringing reef at the northern site of the bay (fig. 1.1). Further studies in the reef along the coast north of Bel Ombre shall follow from 2013 onwards.

A brief general introduction including aspects of the biology of important reef organisms, a review of earlier studies on Seychelles' fringing reefs along the inner granitic islands and of the study goals was given in the 2012 report and need not be repeated here.

Fig. 1: Mahé. Fringing reefs are shown in red. The study area is the Northern reef of the North-West Bay (Beau Vallon Bay) (Turner et al., 2000).

2 Biotope mapping methods

Line transects were laid out such that all zones of the fringing reef along Beau Vallon/Mare Anglaise (from the beach to the reef edge and occasionally upper parts of the reef front) were covered; compare fig 2.2. As the focus is on the coral species mapping was begun only after the first coral colony was met. For a brief description of the reef zones, see Taylor 1968, Pillai 1973 or our 2011 report. The examined reef sections lie in shallow water areas down to about 5 m water depth (snorkelling depth). We have not worked in greater depths, partly due to safety reasons but also because reef areas in shallow water are the most vulnerable ones.

In order to provide detailed maps, we have used blackened metal frames of 1 m² which were put down at the bottom of the sea along a line. The line was marked at intervals of 1 m in order to double check distances and positions. Six transects were investigated from 2010 to 2012. Transects 2, 3, 4 and 5 run from East to West, transect 1 deviates from T2 by an angle of 15°, while T6 runs almost from South to North near the southern reef edge. For localizing the starting points of these transects GPS was used, but GPS points are exact only with an uncertainty of 5 m and usually even more. During our work in the water, water proof compasses were used, but measurements with a compass may also have led to slight inaccuracies.

A number of photos of each quadrant was taken according to a standardized procedure (fig.2.1). The photographs include two overviews of each square meter (one from the East, one from the West) and nine photos showing details (for their arrangement, see the figure below). For determination of coral species, additional photos of a high magnification were taken. Thus, we have combined the photo line intercept transect method (PLIT) and the photo-quadrate method (PHOTS) (Nakajijma, 2010; Hill et al., 2004). Equipment was removed completely after field work.

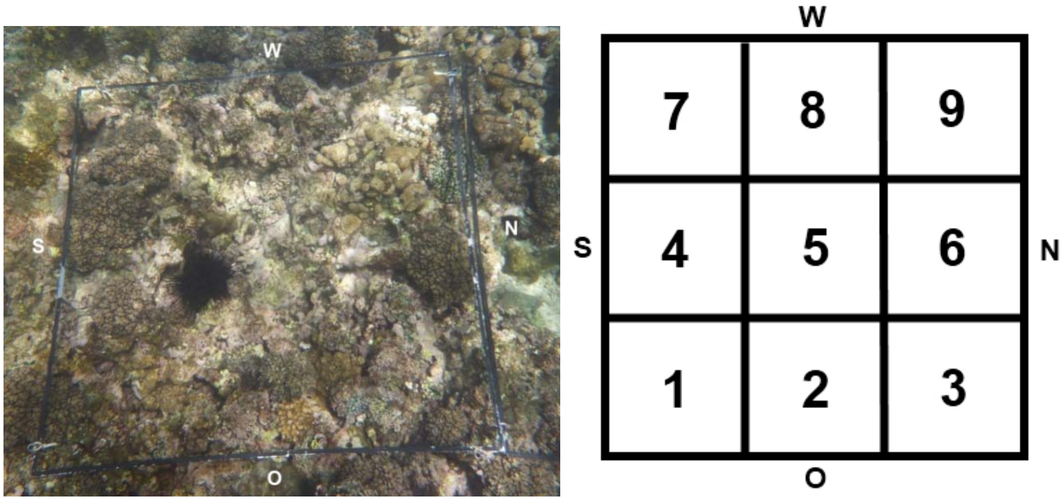

Fig. 2.1: left: overview photograph of a quadrant from transect 2. The identification code of the quadrant is: T2 162.2l. This means that the quadrant is from transect 2 (T2), that it lies at a distance of 162 m from the fixed point at the beach and 2 m left of the line (2l). Right: scheme of a quadrant (1 m²) showing the sequence of standard photographs.

In species-rich reef portions, large areas were mapped in detail.

In order to visualize the distribution and abundance of corals, four major methods were used: (1) photos; (2) silhouettes on the basis of photographs, (3) symbols for each species, indicating the position and number of corals per quadrant and (4) graphs summarizing the occurrence of species and the number of specimens per species from near-shore quadrants to the reef edge. Here again, symbols for the species were used. As different computer programs had to be used (Illustrator and Excel), the symbols used under (3) and (4) are slightly different. - Symbols as used under (3) do not reflect the size of colonies accurately. Examples are given below.

Until now, the data from four of six transects (T1-T6) have been studied in detail. An additional transect (E1) was studied with respect to the occurrence of echinoderms (see our 2011 report).

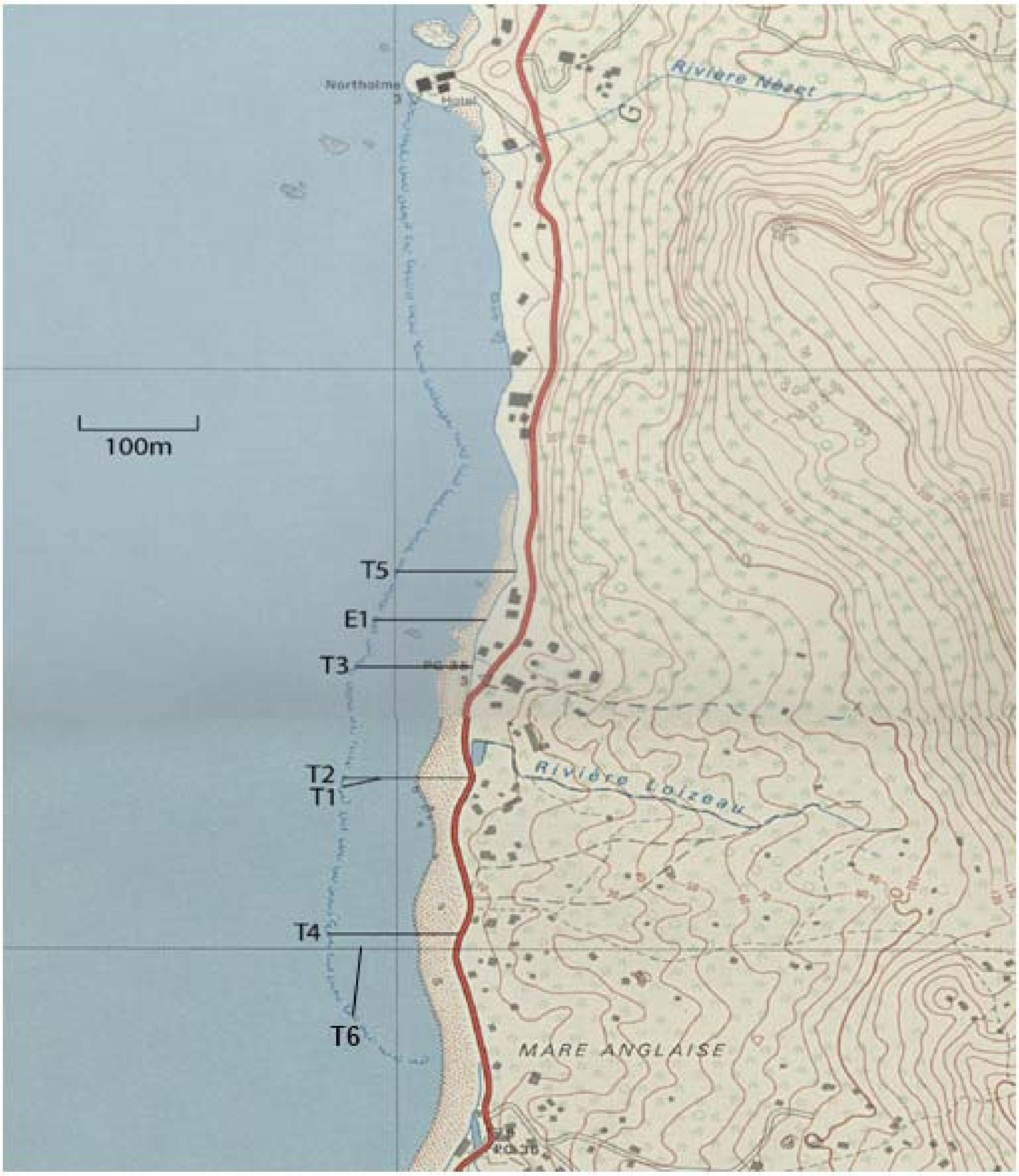

Fig. 2.2: The Beau Vallon/Mare Anglaise fringing reef at the northwest coast of Mahé and the position of transects T1-T6 and E (Echinoderms) 1.

3 Results

Four transects were studied in 2010 (964 m^2), another one in 2011 (T5), one early in 2012 (T6). Their fauna and flora was documented by more than 24.000 photographs. Due to the amount of material only part of the data has been investigated in detail until now, i.e. transects 1 and 2, 5 and 6. Transects 1 and 2 lie close to each other and cover an area of 479 m^2 (T1: 160 m^2,T2 319 m^2), T5 covers 187 m^2 and T6 covers 160 m^2. In this report only T5 and T6 will be explained in more detail (For T1, T2 and E1 see report 2011).

List of coral species

A total of 71 coral species have been identified from our transects until now. A few species have not been determined with certainty, and in a few cases, two similar species had to be grouped as one taxon as their exact determination using photographs was not possible (e. g. *Goniastrea edwardsi* or *G. retiformis*). Additional species are to be expected from outside the mapped areas.

Coral species in transects 1 and 2

From transects 1 and 2 60 species (35 genera) of corals have been identified. Eight of these species were newly identified in the last year during re-investigations of the photographic documentation.

Tab. 3.1: List of corals found in transects1 and 2.

Pocillopora damicornis	*Fungia* sp.
Pocillopora eydouxi	*Cycloseris vaughani* (new identification)
Pocillopora meandrina	*Galaxea astreata*
Pocillopora verrucosa	*Galaxea fasicularis*
Stylophora pistillata	*Acanthastrea brevis* (new identification)
Stylophora subseriata	*Acanthastrea echinata*
Montipora sp.	*Hydnophora microconos*
Montipora efflorescens	Faviidae gen. sp.
Montipora informis (new identification)	*Favia speciosa*
Montipora grisea (new identification)	*Favites abdita* or *F. complanata*
Montipora monasteriata (new identification)	*Favites pentagona*
Montipora tuberculosa (new identification)	*Favites spinosa* (new identification)
Montipora turgescens (new identification)	*Goniastrea edwardsi* or *G. retiformis*
Montipora venosa	*Goniastrea pectinata*
Acropora sp.	*Platygyra acuta*
Acropora digitifera	*Leptoria phrygia*
Acropora divaricata	*Montastrea valenciennesi*
Acropora formosa	*Leptastrea purpurea*
Acropora irregularis	*Leptastrea transversa*
Acropora nobilis	*Cyphastrea microphthalma*
Acropora pinguis	*Echinopora hirsutissima*
Porites lobata or *P. lutea*	*Physiogyra lichtensteini*
Goniopora minor	*Turbinaria irregularis* or *T. stellulata*

Goniopora cf. planulata	*Tubastrea* or *Dendrophyllia*
Alveopora sp.	*Zoanthus* sp.
Discosoma sp.	*Palythoa tuberculosa*
Psammocora obtusangula	*Protopalythoa* sp.
Pavona duerdeni	Gorgonaria gen. sp.
Pavona explanulata	*Sinularia* sp.
Pavona frondifera	*Lobophytum* sp.
Pavona varians	*Distichopora violacea*
Pavona venosa	

Coral species in transects 5 and 6

In transects 5 and 6, our northern- and southernmost study sites, another 14 coral species were found, the sum total of coral species in our transects now being 71 (36 genera). Of a few species one specimen only was found.

Tab. 3.2: List of coral species (T5) not previously identified in other transects.

Favites spinosa	*Montipora turgescens*
Favites vasta	*Sarcophyton trocheliophorum*
Montipora sp.	

Tab. 3.3: List of coral species (T6) not previously identified in other transects.

Acropora longicyathus	*Metarhodactis* sp.
Acropora tenuis	*Montipora tuberculosa*
Astreopora myriophthalma	*Montipora sp.*
Cycloseris vaughani	*Platygyra carnosus*
Echinopora lamellosa	*Porites rus*
Hydnophora exesa	

Transect T5, coral species abundance and distribution

Transect 5 runs exactly from west (near shore) to east (reef edge) and consists of a northern and a southern half. In the field, the two halves were separated by the marked rope that was laid out for exact measurement. In T5 39 species (29 genera) were identified, whereby 36 species (25 genera) were found at the northern side of the rope and 32 species (23 genera) at the southern side of the rope. This difference in the number of coral species might be the result of size differences of the mapped areas south ($84m^2$) and north ($103m^2$) of the rope. It also shows that accurate faunistic studies require the consideration of large areas, and that it is a matter of chance how many and which species are found in small areas.

Fig. 3.1 shows the five most dominant species in the northern part of T5. These species provide 68% of all identified coral colonies. *Goniastrea edwardsi* or *G. retiformis* is with 180 colonies the most common species in this mapped section, followed by the Zoanthidea *Palythoa tuberculosa* with 134 colonies and *Pocillopora damicornis* with 113 colonies. *Pavona explanulata* and *Montipora efflorescens* (50 and 52 colonies) provide, compared with *Goniastrea edwardsi* or *G retiformis*, less than one third of colonies.

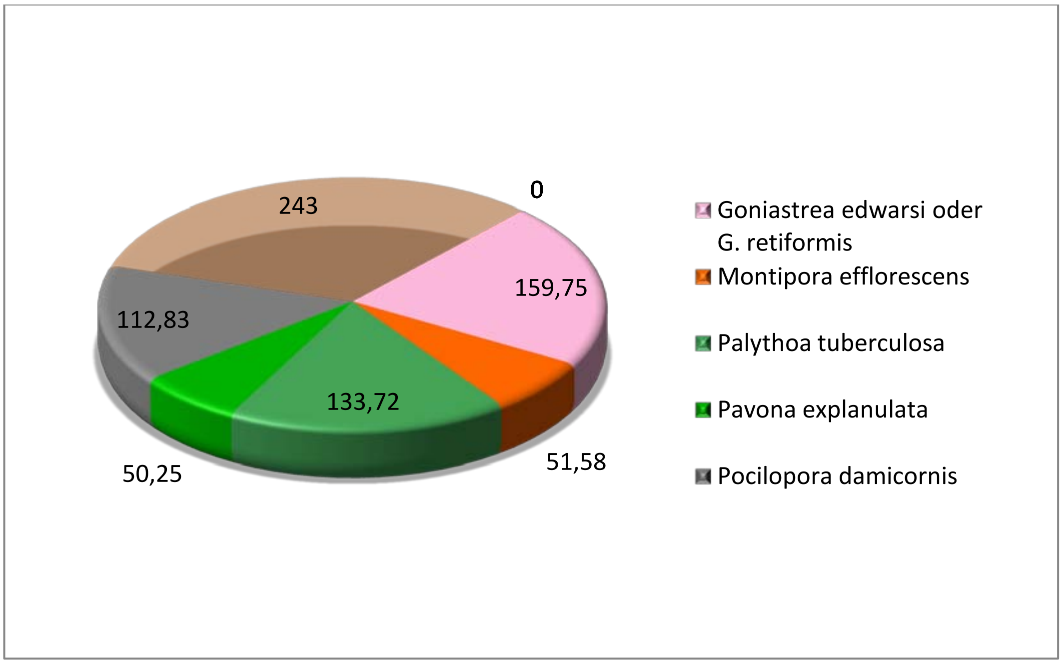

Fig. 3.1: Colonies of the most dominant coral species in Transect 5 (T5). Rest: Number of species, which occur with less than 50 colonies in T5.

In the northern part of T5 seven species were identified, which do not occur in the southern part: *Discosoma* sp., *Distichopora violacea*, *Echinopora hirsutissima*, *Gorgonaria*, *Pocillopora eydouxi* and *Sinularia* sp.. The southern part of the transect is, as in the northern side, dominated by *Palythoa tuberculosa*, *Pocillopora damicornis*, *Goniastrea edwardsi* or *G. retiformis*, *Pavona explanulata* and *Acropora*. The following species were only found in the southern part of T5, but not in the northern part: *Sarcophyton* sp., *Echinopora forskaliana*, *Favites vasta*, *Galaxea astreata* und *Leptastrea purpurea.*

From the beginning of the reef flat to the reef edge, numbers in coral species and individuals increase continuously (fig.: 3.2-3.4). This does not apply to species, which occur with one specimen only. The figures below visualize the increase for the identified coral species at the northern side of the rope in T5.

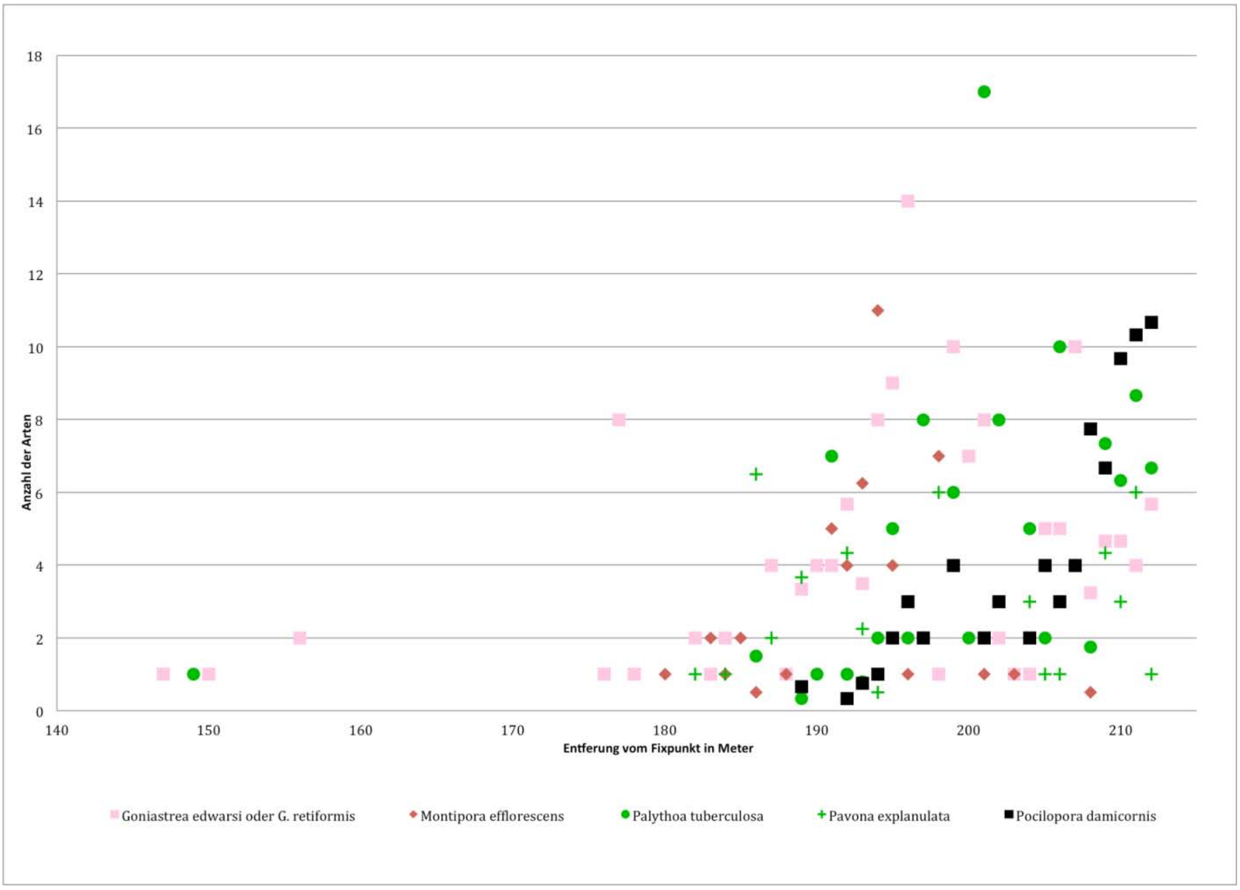

Fig. 3.2: Increasing abundance of the six dominant species (> 50 colonies) per square metre in T5; from east (reef flat) to west (reef edge). Vertical axis: number of coral species, horizontal axis: distance from shore.

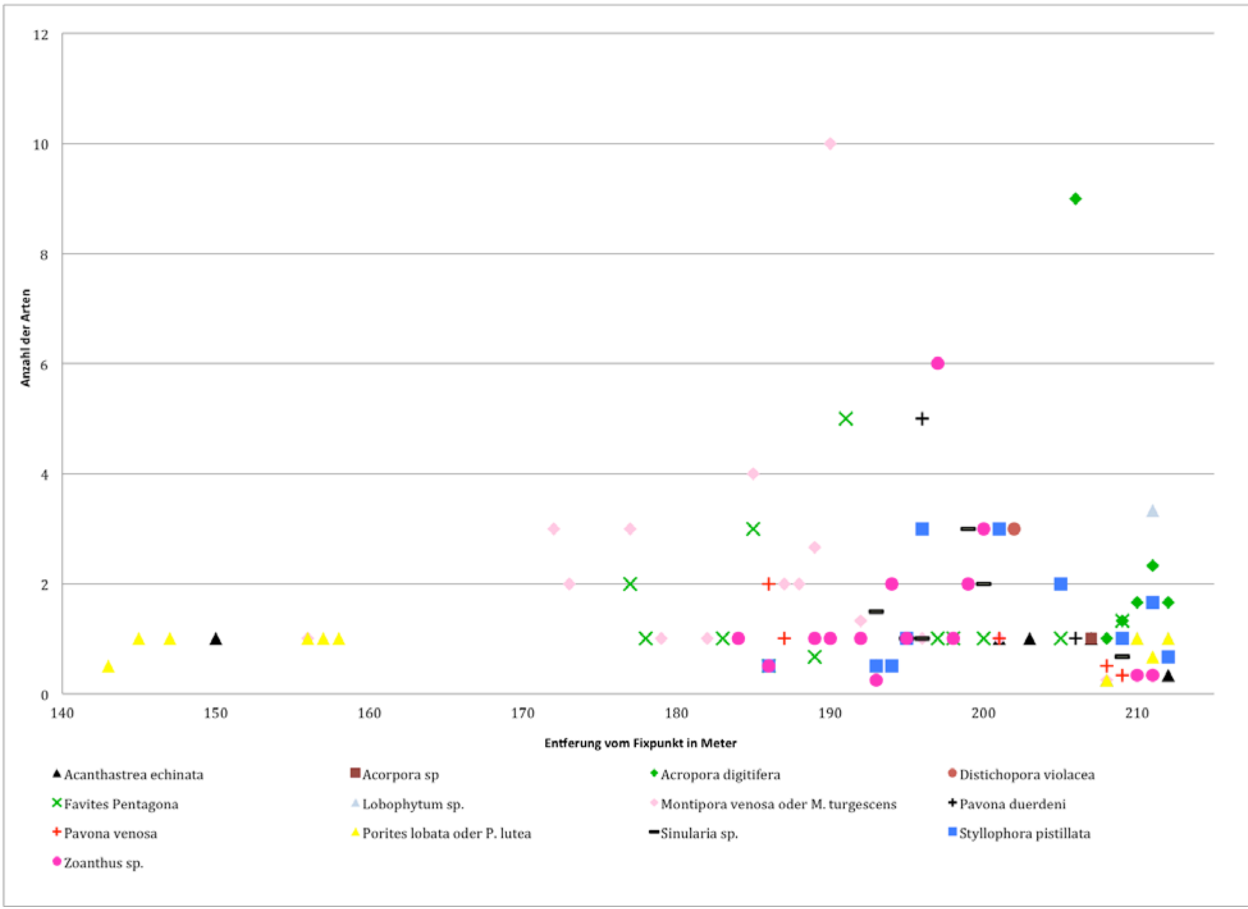

Fig. 3.3: Increasing abundance of less dominant species (5-50 colonies per square metre) in T5; from east (reef flat) to west (reef edge). Vertical axis: number of coral species, horizontal axis: distance from shore.

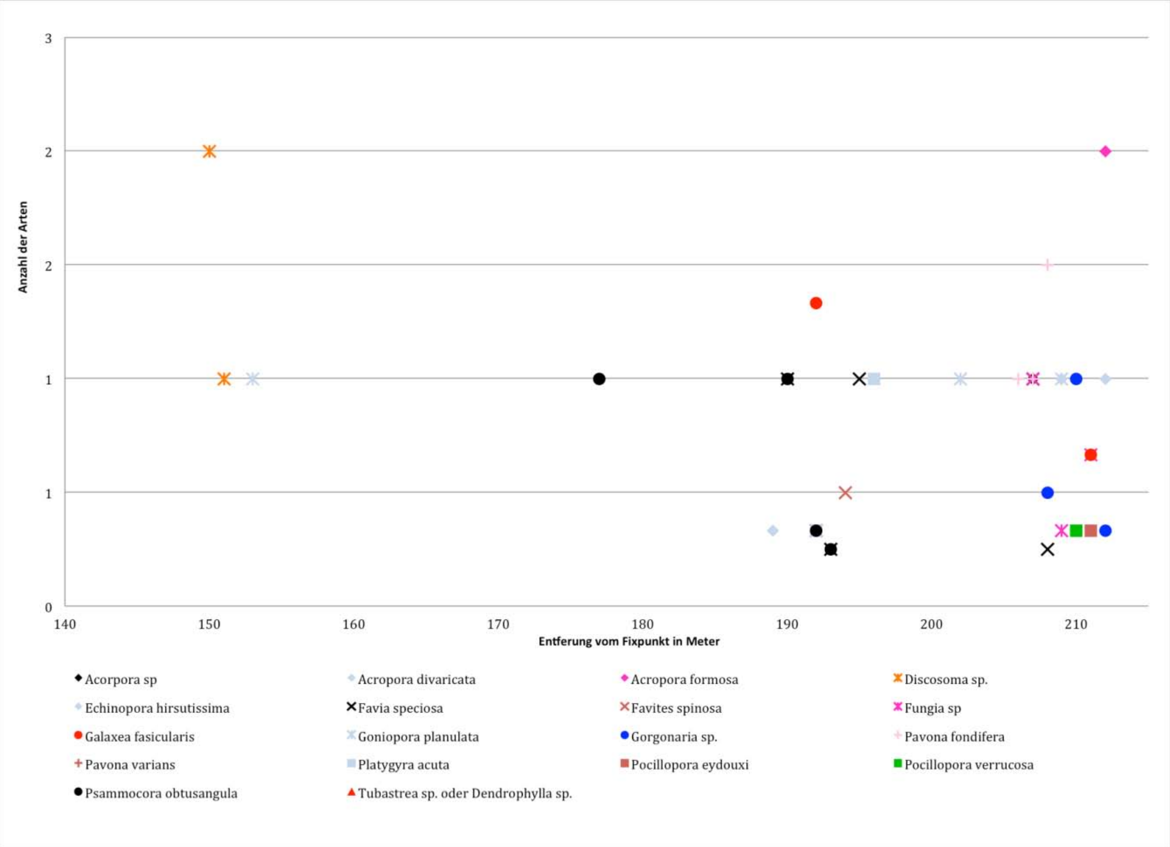

Fig. 3.4: Increasing abundance of rare species (<5colonies per square metre) in T5; from east (reef flat) to west (reef edge). Vertical axis: number of coral species, horizontal axis: distance from shore.

Transect 6, coral species abundance and coverage

Transect 6 runs from south to north and is located at the reef edge (fig. 2.2). With a length of 80m it covers an area of 160m², 80m² on each side of the rope. In T6 42 species (27 genera) were identified. At the eastern part of the rope 32 species (22 genera) were recorded, while at the western side of T6 42 species (27 genera) were found. At the western side all species from the eastern side including *Acropora tenuis, Astreopora myriophthalma, Favia speciosa, Cycloseris vaughani, Goniastrea pectinata, Goniopora* sp. *Hydnophora exesa, Leptoria phrygia, Lobophyllia* sp., *Montipora efflorescens, Montipora* sp., *M. venosa* and *Platygyra carnosus* were found. Coral diversity is greater in the western then in the eastern part. These differences may relate with the distance to the reef edge, because the western side is closer to the reef edge then the eastern part ($1m^2$). Coral diversity increases in direction to the reef edge (pointed out in T1, T2 and T5). Coral abundance and coral coverage (living coral and dead corals) in both parts of T6 seem to be very similar (fig. 3.7, 3.8 and 3.9, 3.10).

Fig. 3.6 shows the occurrence of coral species within T6. Coral species are unevenly distributed. This section of the reef is dominated by *Porites lutea* or *P. lobata*, *Palythoa tuberculosa, Porites rus, Goniastrea edwardsi* or *G. retiformis, as well as Acropora and Discosoma* (fig. 3.7 and 3.8). The middle of the transect (quadrants 42-53) is conspicuously dominated by dead *Acropora* topped with filamentous red and green algae (fig. 3.6). From time to time one can find massive dead *Porites*. In the middle of T6 and further north till quadrant 66 a lot of dead corals cover the reef top (fig. 3.9 and 3.10).

The differences in identified coral species in T5 and T6 indicate that it is very important to examine several transects in a study area as well as to map a larger area, because only a detailed biotope mapping of the benthos ensures an accurate knowledge of coral communities on a reef to reveal future changes and relate them to environmental factors. Otherwise a lot of species would not be recognized and their disappearance would not be noticed.

Fig. 3.5: Symbols as used in illustrations visualizing the occurrence of coral species within the transects T1, T2, T5 and T6

Fig. 3.6: Graphic representation of distribution of corals found in quadrants 1-80 of the left- and right-hand sides of the line in transect 6 (T6). Direction of reading (from South to North): bottom to top (bottom left to top, bottom middle to top, bottom right to top).

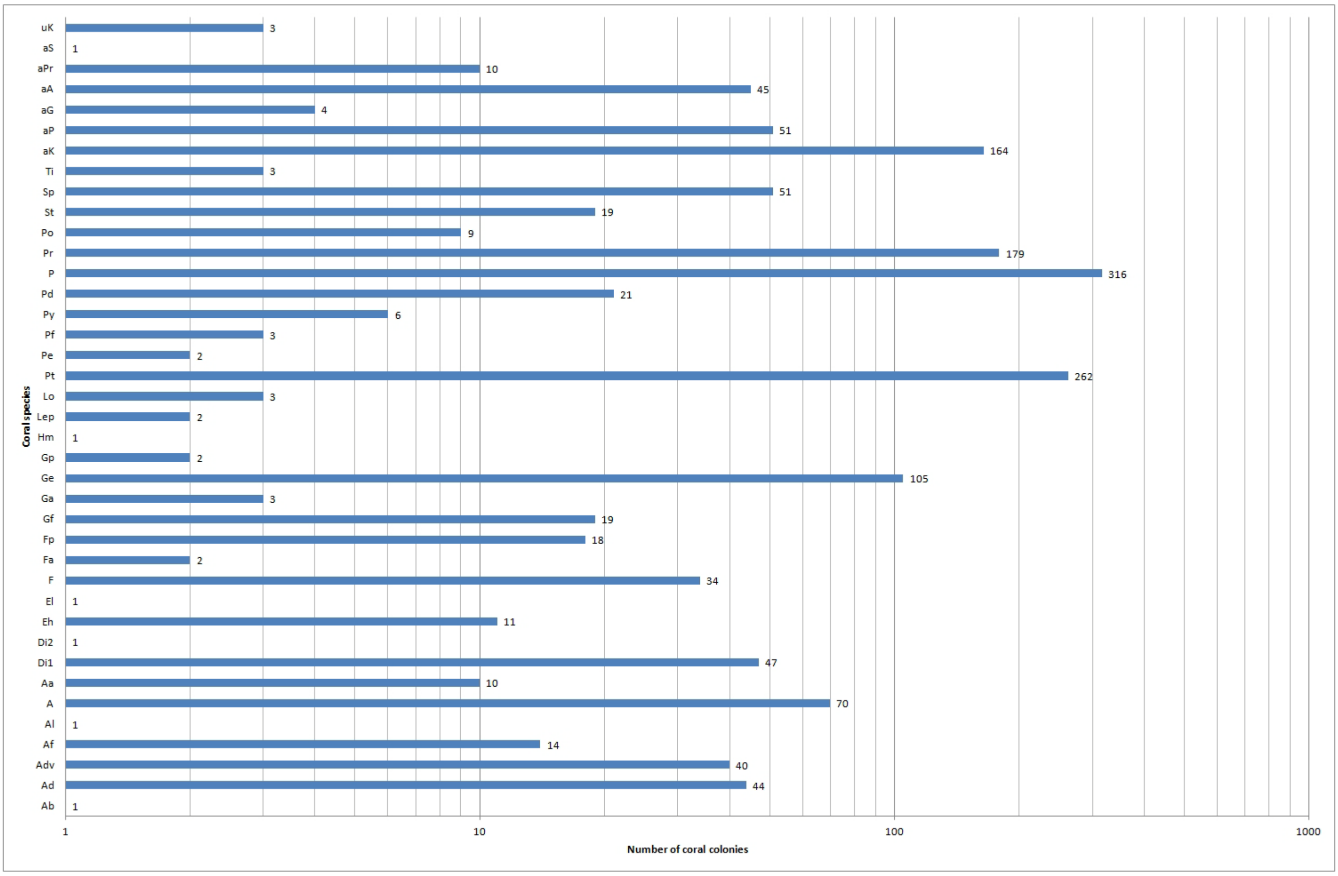

Fig. 3.7: Number of colonies per coral species in T6, eastern side of the transect line.

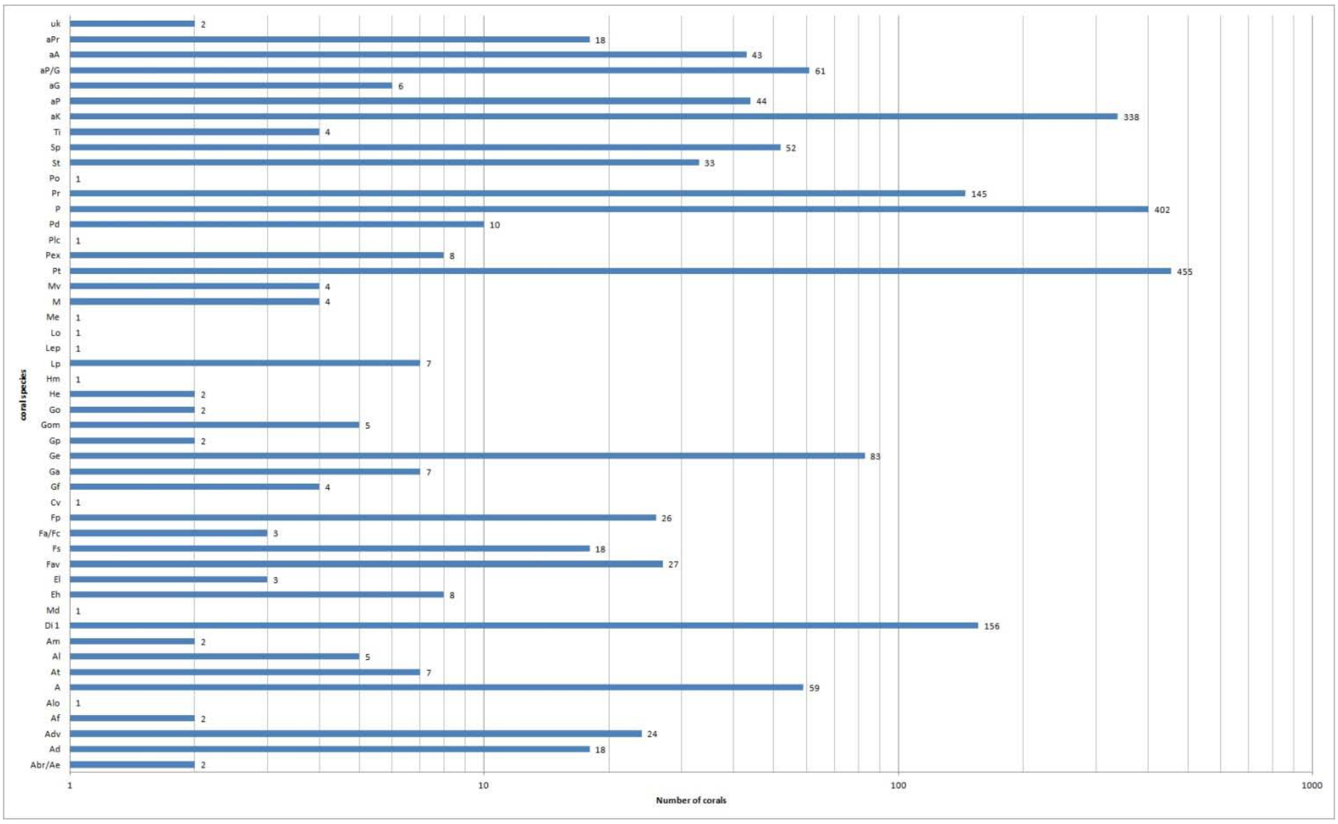

Fig. 3.8: Number of colonies per coral species in T6, western side of the transect line.

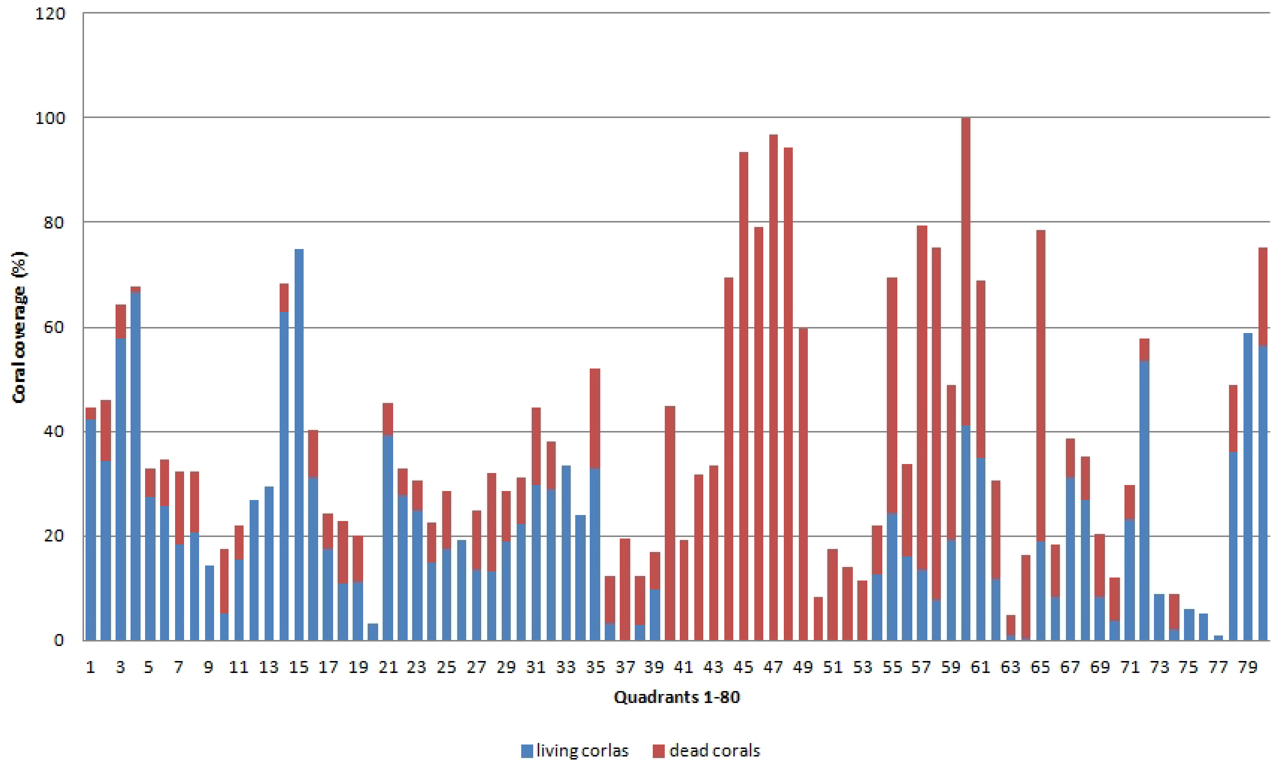

Fig. 3.9: T6, coral coverage (%) of quadrants 1-80 (eastern half).

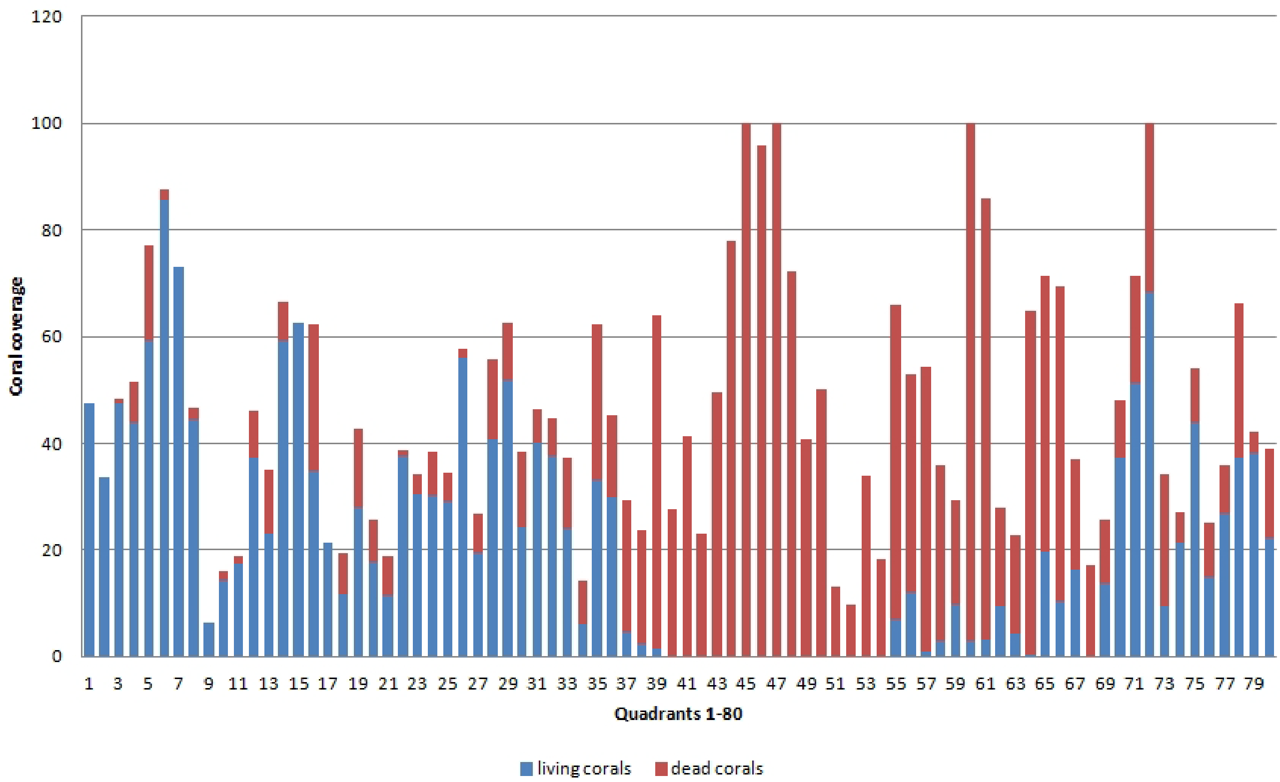

Fig. 3.10: T6, coral coverage (%) of quadrants 1-80 (western half).

Comparison of the transects

It is too early to discuss the differential faunal composition among the transects, as we have not yet analyzed the species differences, species numbers etc. in relation to sizes of the mapped areas etc. Two transects (T3, T4) have not been investigated in any detail, which means that the photographic documentation of the coral societies has not been transferred into drawings, species numbers have not been counted and the species have remained unidentified so far.

Developmental trends

As mentioned above, in October 2012 we have begun to remap portions of transects 2. Some coral colonies have disappeared entirely and/or were replaced by other species, others had grown to a remarkable extent.

4. Catalogue of corals found or identified after completion of our 2011 report

The following descriptions are essentially based on Veron (2005). For morphological structures and skeletal elements, see Veron; the major growth forms, referred to in the subsequent text, are also explained in our 2011 report.

Pocillopora meandrina (Dana, 1846) (Fig. 4.1) (corrected images)

Colonies are small upright bushes. All branches start growing from the initial point of growth. Colonies are either flattened or being curved. Verrucae are neat and uniform. Colonies are usually cream, green or pink. *P. meandrina* occurs in shallow water environments, especially on exposed reef fronts

Fig. 4.1: *Pocillopora meandrina*, T1 161.2l. Left: growth form of a colony, right: detail. Tentacles visible

Pocillopora verrucosa (Ellis and Solander, 1786) (Fig. 4.2) (corrected images)

Colonies are uniform upright branches. There is a clear distinction between branches and verrucae. Verrucae are irregular in size. Branches are thick and compact in unprotected habitats like the reef edge and becoming open and thinner in protected zones of the reef. Colonies are seldom 0.5 metres across. Colonies usually are cream, brown or pink. *P. verrucosa* occurs in most shallow water environments from exposed reef fronts to protected zones in the back of the reef.

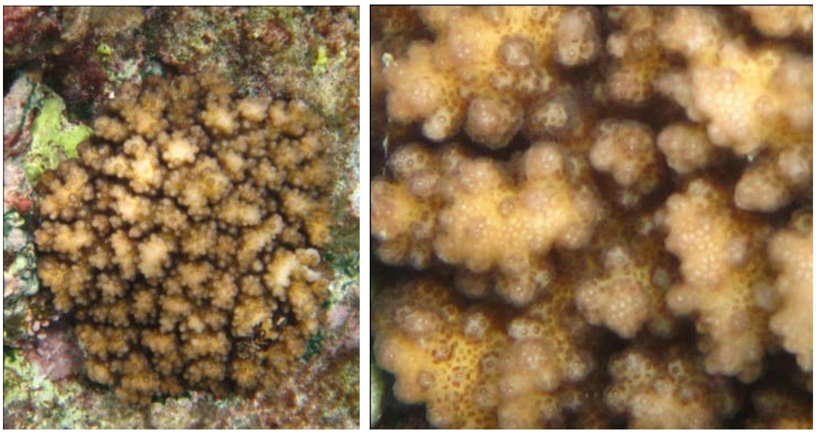

Fig. 4.2: *Pocillopora verrucosa*, T2 163.4l. Left: growth form of a colony, right: detail.

Montipora (Fig. 4.3)

Colonies are submassive, lmainar, encrusting or branched. Corallites are small. Tentacles are usually extended only at night. There are wide variations in growth-forms even within a single colony

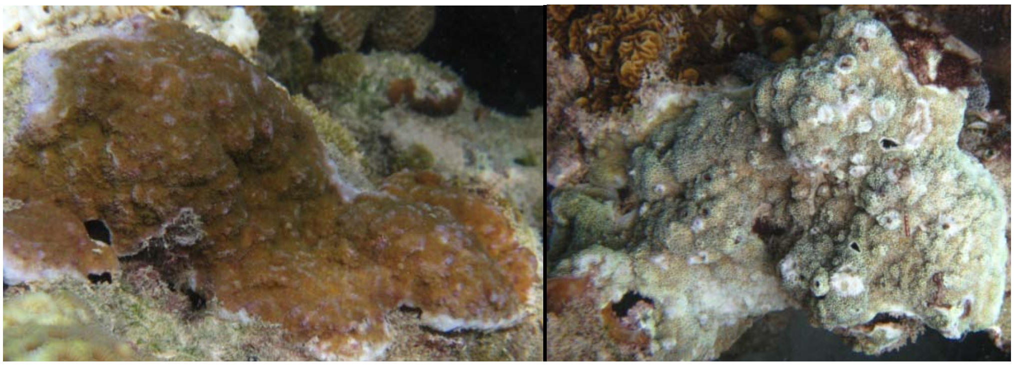

Fig. 4.3: *Montipora* sp. Left: T6 22l, right: T6 15l.

Montipora efflorescens (Bernard, 1897) (Fig. 4.4) (corrected images)

Colonies are massive or incrusting or form plates. The surface is flat or consisting of an irregular series of mounds or short columns. The coenosteum is covered with papillae which are usually elongate on mounds. Papillae are short on flat plates. The theca is covered with prominent papillae. These papillae are longer than coenosteum papilla, and may form a ring around corallite openings. Colonies are usually bright or dark green, sometimes cream, brown blue or pink. It’s a common species in upper reefslopes.

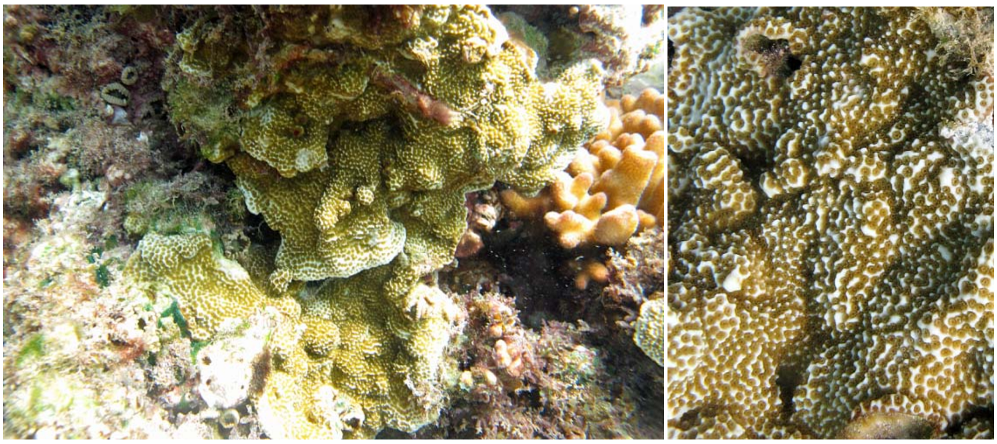

Fig. 4.4: *Montipora efflorescens,* T5.198r. Left: growth form of a colony, right: detail.

Montipora informis (Bernard, 1897) (Fig 4.5) (new identification)

Colonies are massive to encrusting. Corallites are evenly distributed and immersed. The reticulum is densely covered with elongate papillae of uniform length. The surface of this species appears smooth. Colour: brown or mottled brown and white. Papillae may have white or purple tips. White polyps may be extended during the day. *M. informis* is very common on reef slopes between 5 and 20 m depth.

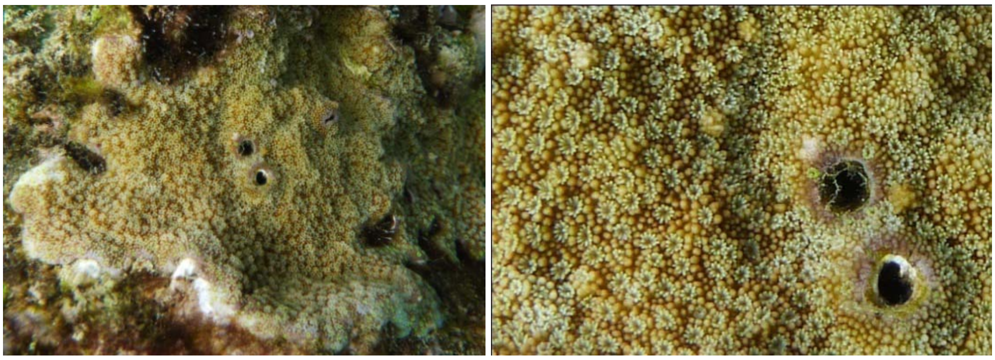

Fig. 4.5: *Montipora informis,* T2 164.4l. Left: growth form of a colony, right: detail.

Montipora grisea (Bernard, 1897) (Fig 4.6) (new identification)

Colonies are massive, encrusting, or are thick unifacial plates. Corallites are slightly exsert, surrounded by partly fused thecal papillae. Coenosteum papillae are also present. Colonies are dark brown or green but may be pale coloured or bright blue or pink. *M. grisea* is a common species and occurs on upper reef slopes.

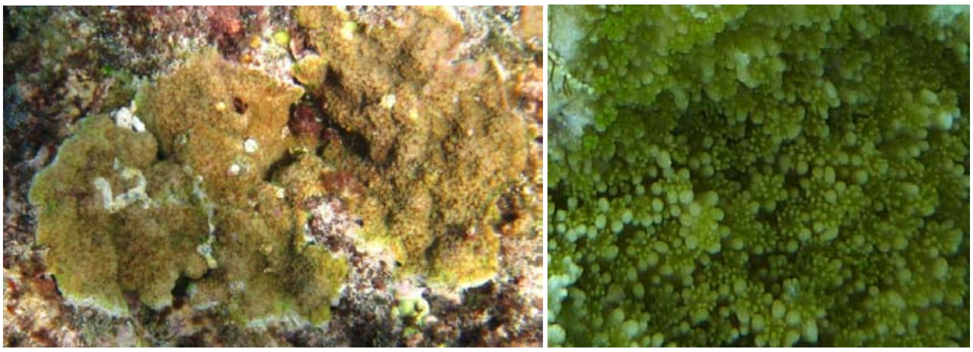

Fig. 4.6: *Montipora grisea.* Left: T2 161.9l, growth form of a colony. Right: T2 166.6r, detail.

Montipora monasteriata (Forskål, 1775) (Fig 4.7) (new identification)

Colonies are massive or are unifacial or bifacial thick plates or encrusting lumpy sheets. Corallites are mostly immersed. The coenosteum is covered with papillae and/or tuberculae. The tuberculae are prominent and small, but there is a fairly wide variation in tuberculae size. Colonies are pale brown or pink with pink or white margins. *M. monasteriata* is a common species and occurs mostly on upper reef slopes.

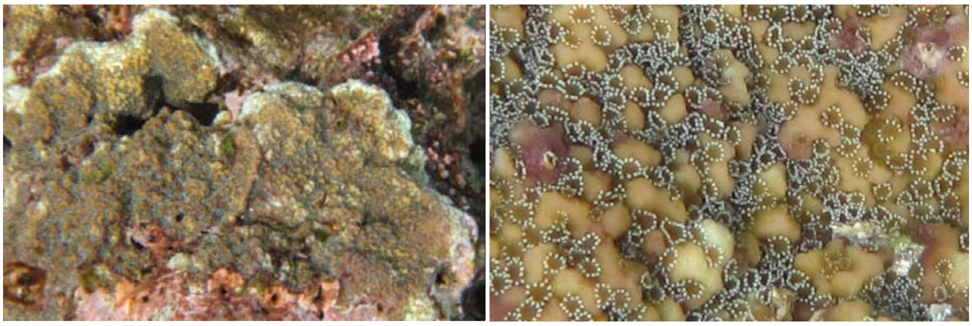

Fig. 4.7: *Montipora monasteriata,* T2 163.2r. Left: growth form of a colony, right: detail.

Montipora tuberculosa (Lamarck, 1816) (Fig 4.8) (new identification)

Colonies are submassive, encrusting, or plate-like. Corallites are small, some exsert, some immersed. Corallites are separated by papillae/tuberculae, which are numerous, and irregularly scattered. Colonies are usually dull brown or green, sometimes they are bright blue or purple. *M. tuberculosa* is a common species and occurs over a wide range of habitats.

Fig. 4.8: *Montipora tuberculosa*, T6 29l. Left: growth form of a colony, right: detail.

Montipora turgescens (Bernhard, 1897) (Fig 4.9) (new identification)

Colonies are massive, flat, hemispherical or columnar. The surface raised into mounds. Corralites are immersed. The reticulum is smooth. Colonies are brown, cream or purple. *M. turgescens* is a common species and occurs in most reef environments.

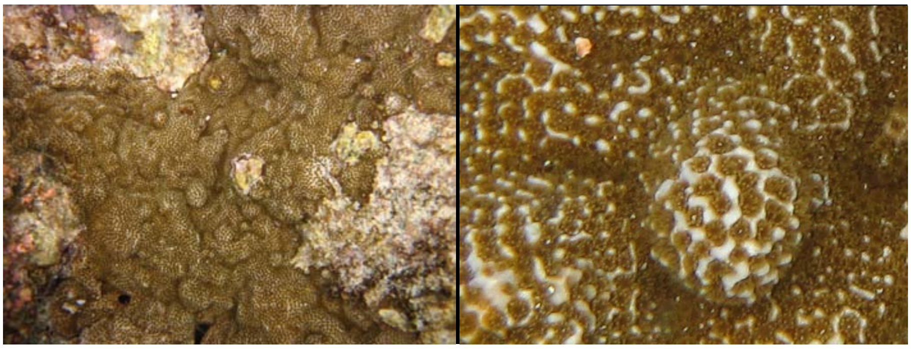

Fig. 4.9: *Montipora turgesces*,T2 139r. Left: growth form of a colony, right: detail.

Montipora venosa (Ehrenberg, 1834) (Fig. 4.10) (corrected images)

Colonies are massive. Corallites are either thrust out or funnel-shaped. Tuberculae and papillae are absent. Colonies are pale brown or blue, in photographs they may be purple. *M. venosa* is rare and occurs in most reef environments.

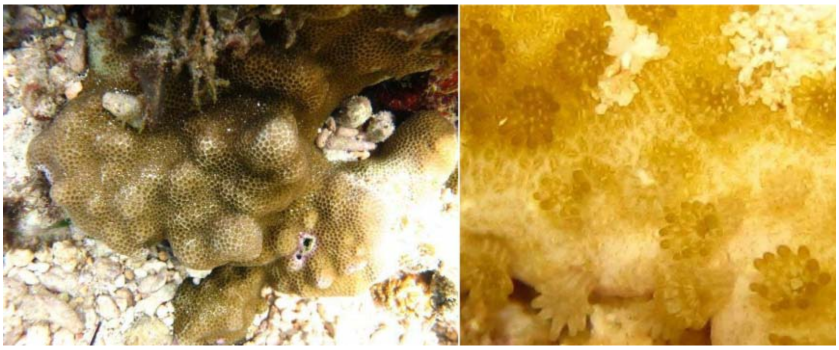

Fig. 4.10: *Montipora venosa*, T5.189r. Left: growth form of a colony, right: detail.

Acropora irregularis (Brook, 1892) (Fig. 4.11) (corrected images)

Colonies are large and staghorn-like. They have horizontal fused branches. Branches may be upturned. They have encrusting bases. Colonies may form table or plates over 3 m across. The central part of the colony is solid, while the periphery is openly branched. Corallites have different length and are tubular to rasp-like. Colonies are grey. *A. irregularis* occurs especially in shallow water with strong wave action.

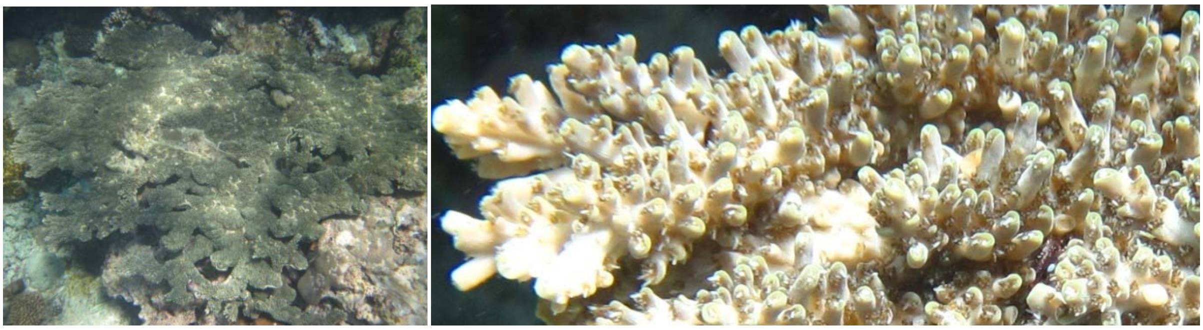

Fig. 4.11*: Acropora irregularis*. Next to T3 (found in T2 as well). Left: growth form of a colony, right: detail.

Acropora pinguis (Wells, 1950) (Fig. 4.12) (corrected images)

Colonies are large and staghorn-like. They have encrusting bases with short thick tapered branches. Colonies may form tables or plates over 2 m across. Central branches are conical, while periphal branches are irregularly prostrate. Radial corallites are small and rasp-like. Colonies are green, grey or brown. It is very difficult to separate small colonies of *A. pinguius, A. robusta* und *A. irregularis,* because of the incrusting base and similar growth-form. *A. pinguis* occurs on the reef flat exposed to strong wave action.

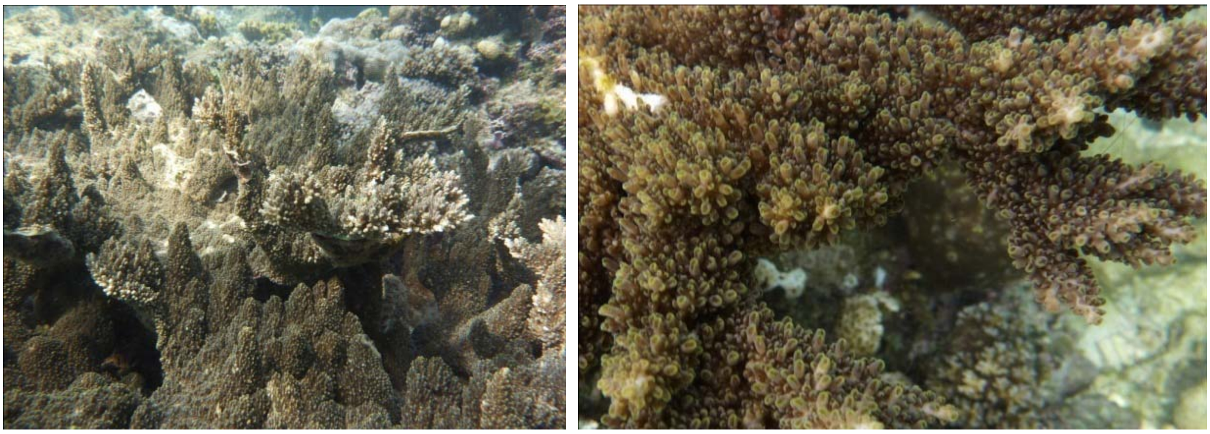

Fig. 4.12: *Acropora pinguis*, T2 164l. Left: growth form of a colony, right: detail.

Acropora longicyathus (Milne Edwards and Haime, 1860) (Fig. 4.13) (new identification)

Colonies are subarborescent and have bottlebrush branches. The branches are stocky at the base and grow thinner towards the tip. Upright main branches sometimes form clumps. Axial and initial axial corallites may be indistinguishable. Radial corallites are appressed. Corallites have thick walls with round openings. Colonies are pale to dark brown, sometimes blue. *A. longicyathus* occurs in calm waterzones of the reef. It is a common species, which may be dominant at loose substrates (Veron, 2000; Erhardt/Knop, 2005).

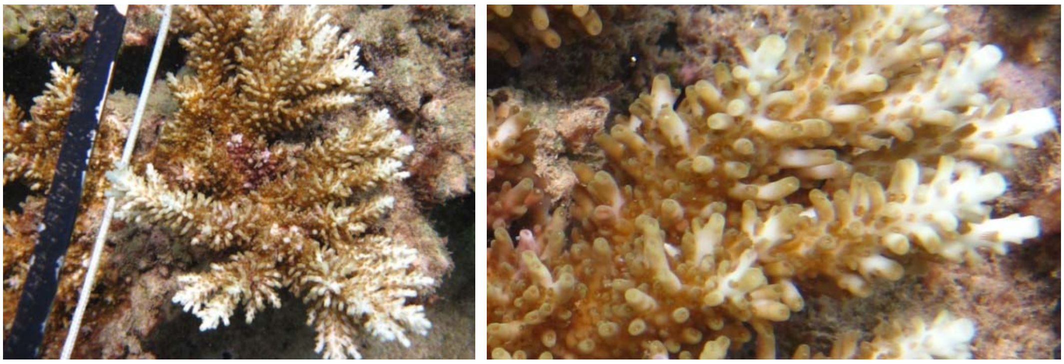

Fig. 4.13: *Acropora longicyathus*, T6 66r. Left: growth form of a colony, right: detail.

Porites rus (Forskål, 1775) (Fig 4.14) (new identification)

Colonies are submassive, laminar or contorted anastomosing branches and columns. Corallites are separated into groups by ridges which characteristically converge towards each other forming flame-shaped patterns. Colonies are pale cream, yellow or dark bluish-brown, often with pale branch tips. Sometimes they are brightly coloured in shallow water. *P. rus* is a common species and occurs in shallow reef environments.

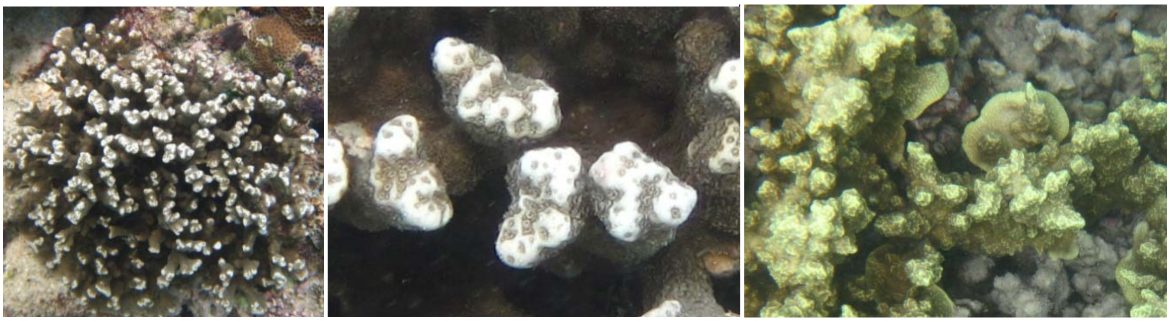

Fig. 4.14: *Porites rus*, T6 15l. Left: growth form of a colony, middle: detail, right: T6 35l, detail.

Metarhodactis sp. (Carlgren, 1943) (Fig 4.15) (new identification)

Little to none is known about *Metarhodactis.* It is difficult to differentiate species. *Metarhodactis* belongs to Corallimorpharia, which are closely related to stony corals. *Metarhodactis* is without a skeleton - like all anemones. Colonies have a broad thin oral disc with the mouth in the center. The disc is covered with branched tentacles, but no tentacles on the edge. The oral disc is crenated and change into a sack-like body with a horizontal base plate at the other end to fix on the substrate. Colonies are uniform colored, but coloration may be bright and strong. *Metarhodactis* occurs mostly in shallow reef environments. On damaged reefs it may be a dominant species and may cover a wide surface on the reef edge.

Fig. 4.15: *Metarhodactis* sp., T6 12r. Left: growth form of a colony, right: detail.

Galaxea astreata (Lamarck, 1816) (Fig. 4.16) (corrected images)

Colonies are often submassive, sometimes columnar or encrusting. Corallites may vary in size depending on where they occur on the colony. Usually they are 3-5 mm in diameter. Tentacles are seldom fully extended during the day. Colonies are bright, grey or brown. *G. astreata* occurs in protected zones of the reef.

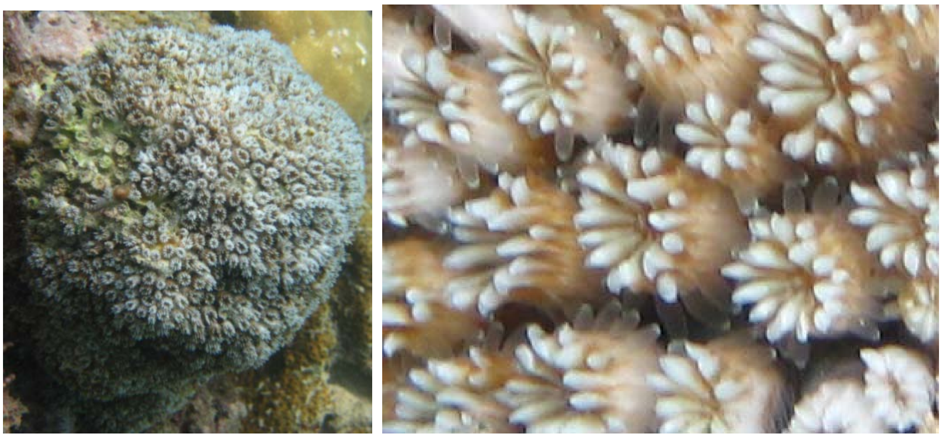

Fig. 4.16: *Galaxea astreata*. Left: T6 26l, growth form of a colony, right: detail.

Acanthastrea brevis (Milne Edwards and Haime, 1849) (Fig 4.17) (new identification)

Colonies are mostly submassive. Corallites are cerioid to subplocoid with thinner walls than *A. echinata*. Septa vary in length and are thin and widely spaced. Because of the longer septa with its very long upwardly projecting teeth colonies have a spiny appearance. Colonies are usually not fleshy like *A. echinata*. Colonies are mottled or uniform brown, yellow or green. *A. brevis* occurs in shallow water reef environments. It is an uncommon and vulnerable species. It is threatened by habitat loss and crown-of-thorns-starfish predation. *A brevis* and *A. echinata* may be difficult to differentiate unless they occur together.

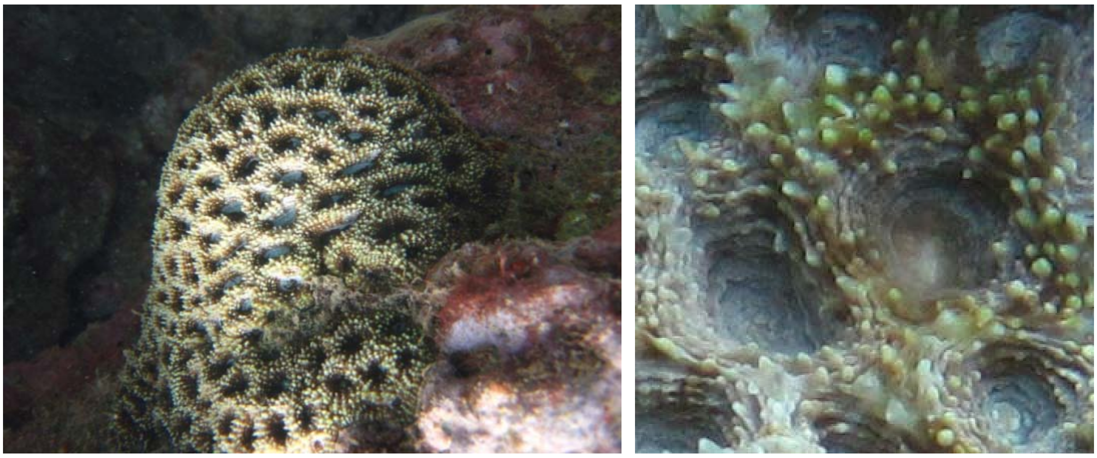

Fig. 4.17: *Acanthastrea brevis,* T6 38r. Left: growth form of a colony, right: detail.

Hydnophora exesa (Pallas, 1766) (Fig 4.18) (new identification)

Colonies are submassive, encrusting laminar or sub-arborescent. Many of these variations may occur in one colony but some colonies are composed only of plates. Often colonies grow encrusting with a tangle of short lumpy branches. The surface is covered with small hydnophores, small conical projections or pyramids. This species has large hydnophores, 3 to 5 mm tall and 5-8 mm in diameter or elongated, reaching 10 to 20 mm length. Its living tissue is fairly fleshy, with visible tentacles in daytime. Colonies are cream or dull green or pale creamy brown with green valleys. *H. exesa* is a common species and occurs in all reef environments, but especially in sheltered lagoons and on protected reef slopes

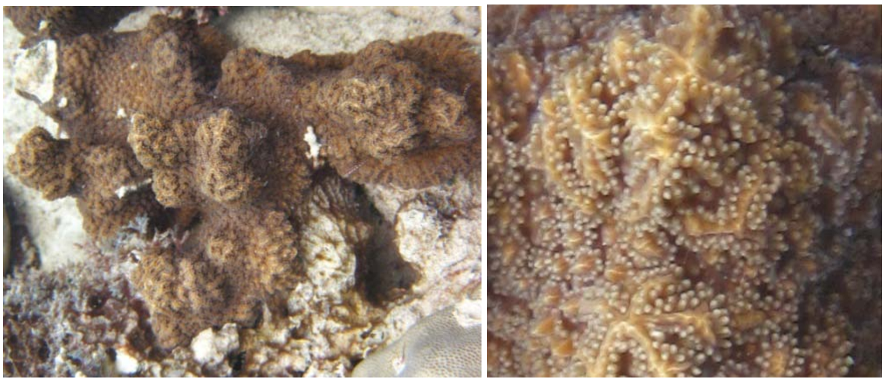

Fig. 4.18: *Hydnophora exesa*, T6 15l. Left: growth form of a colony, right: detail.

Favites spinosa (Klunzinger, 1879) (Fig 4.19) (new identification)

Colonies are small, massive and rounded. Corallites are deeply excavated, with angular walls. Septa are straight, widely spaced and are usually in two alternating orders. They have very prominent teeth, which have ragged margins. Paliform lobes are hardly developed. The columella is small and compact. Colonies have different colours, the walls are off-white, while the centres are dark. *F. spinosa* is an uncommon and vulnerable species. It occurs in a wide range of reef environments.

Fig. 4.19: *Favites spinosa*, T5 21l. Left: growth form of a colony, right: detail.

Favites vasta (Klunzinger, 1879) (Fig 4.20) (new identification)

Colonies are massive. Corallites are deep and angular with very thick walls. Septa are equal, uniform, not exsert and finely toothed. Paliform lobes are usually present. Walls are always uniform amber with cream or white oral discs. *F. vasta* is uncommon and occurs in most reef environments.

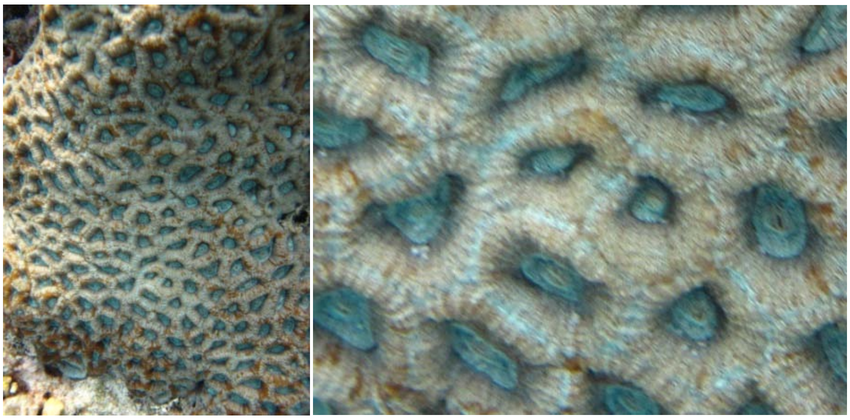

Fig. 4.20: *Favites vasta*, T5 222l. Left: growth form of a colony, right: detail.

Platygyra carnosus Veron, 2000 (Fig 4.21) (new identification)

Colonies are massive and cerioid to submeandroid. Walls are thin and acute. Valleys are irregular in length within the same colony. Septa are thin and highly granulated. They converge and may fuse except where valleys are straight. Columellae are well developed. Polyps are fleshy. Colonies are uniform brown or red, with pale tops to walls. On the figure below the valley floors are green. *P. carnosus* occurs in shallow reef environments. It is an uncommon species.

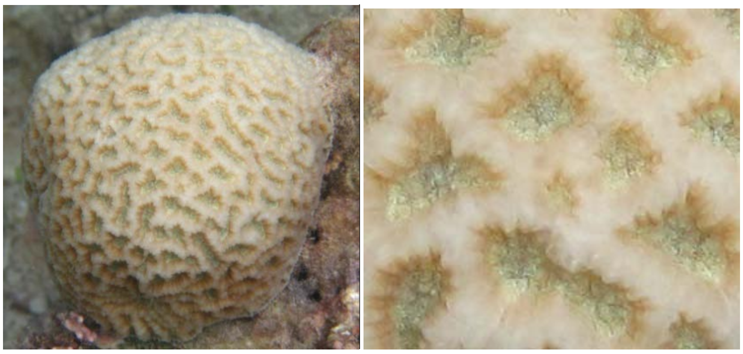

Fig. 4.21: *Platygyra carnosus*, T6 10l. Left: growth form of a colony, right: detail.

Echinopora lamellosa (Esper, 1795) (Fig 4.22) (new identification)

Colonies are thin laminae arranged in whorls or tiers or, rarely, forming tubes. Corallites have thin walls and are with 2.5-4 mm in diameter small. Columellae are small and compact. Paliform lobes are well developed. Colonies are amber, pale to dark brown or greenish, often with darker brown or green calices. *E. lamellosa* is a common species and may be a dominant species in shallow water habitats with flat substrates.

Fig. 4.22: *Echinopora lamellosa*. Left: growth form of a colony, right: detail.

*Sarcophyton trocheliophorum (*Marenzeller,1886) (Fig 4.23) (new identification)

Colonies have a thick smooth, single stalk with a flared, smooth mushroom-shaped top that can be folded or funnel-shaped. The "top" is called a capitulum and within that area are found long autozooid polyps for feeding and siphonozooid polyps for water movement. The capitulum is very convoluted (many deep folds), almost giving it a cauliflower look from a distance. Colonies are fleshy, firm and soft. The polyps can retract all the way, giving them a smooth look. They have sklerits for its stabilization. The extended polyps are shorter and finer than others in its genus, and can be brown or green. The flesh is yellow/tan, cream or tan. *S. trocherliophorum* is very tolerant towards biotic and abiotic influences.

Fig. 4.23: *Sarcophyton trocheliophorum*, T6 12l. Left: growth form of a colony, right: detail.

5. Fishes in the reef of Beau Vallon-Mare Anglaise

We have begun to prepare a catalogue of the diurnal reef associated fishes which occur in and near the mapped areas, i.e. from the shoreline to the reef edge. The reef-associated fish fauna in Seychelles consists in its entirety of about 400 species, but many appear to be restricted to the southern islands. It is largely unknown which species occur along certain coasts or data on the occurrences of particular fish species have only rarely been published so far (Jennings et al. 1995, 1996 a, b). It has been said that here are few, if any, endemics (Jennings et al. 2000), but closer taxonomic examination of reef fishes may well reveal endemics at the subspecies level.

Reef associated fishes were observed at snorkelling depth, as this is the main study depth for our investigation of coral communities. A few species have been added to the fish fauna observed on the reef flat based on short dives along the reef front. Following more recent authors working on Indian Ocean fish faunistics (e.g. Winterbottom & Anderson 1997 on the Chagos Islands) species have been documented by photographs, and no specimens were removed from the sea. In a few instances, this makes species identification difficult, the more so as juveniles and/or males/females may exhibit different colourations, and some species are sequential hermaphrodites and change from males to females or vice versa.

In order to cover the entire area, the reef was divided into 6 working sections, border lines being the coral transects T1/2-T5. A few simultaneous triple parallel video transects were taken showing the increase of fish abundance from the algal zone to the reef edge, and one video was taken along the entire reef edge from south to north.

Preliminary uncompleted list of fish species found from September, 23rd to October, 13th 2012 in the Beau Vallon/Mare Anglaise reef:

Chondrichthyes
Aetobatus narinari
Urogymnus asperrimus
Selachii gen. sp. (1 species)

Actinopterygii
Anguilliformes
Gymnothorax javanicus
Gymnothorax griseus
Gymnothorax pictus
Gymnothorax favagineus
Gymnomuraena zebra
Myrichthys colubrinus

other Actinopterygii
Caranx melampygus

Caranx sp.
Stethojulis albovittata female
Anampses caeruleopunctatus
Macropharyngodon bipartitus bipartitus
Pempheris cf. schwenkii
Lethrinus lentjan
Lutjanus cf ehrenbergii
Lutjanus gibbus
Lutjanus bohar juv.
Acanthurus lineatus
Acanthurus triostegus
Acanthurus leucosternon
Pomacanthus imperator
Pomacanthus semicirculatus
Chromis dimidiate
Chromis sp. 1-3
Fistularia commersonii
Aulostomus chinensis
Mullidae
Papureus cyclostomus
Parupeneus ciliatus
Parupeneus barberinus
Parupeneus macronemus
Trachyramphus bicoarctatus
Corythoichthys flavofasciatus
Scorpaenopsis vittapinna
Scorpaenopsis diabolus
Pterois miles
Labroides dimidiatus
Aeoliscus strigatus
Cheilodipterus macrodon
Gomphosus caeruleus
Hemigymnus fasciatus
Hemigymnus melapterus juv.
Synodus sp.
Monodactylus argenteus
Leptoscarus vaigiensis
Cheilio inermis
Naso elegans
Naso unicornis
Amphiprion fuscocaudatus
Novaculichthys taeniourus
Plagiotremus tapeinosoma
Trachinotus blochii
Rastrelliger kanagurta
Scarus scaber
Ptereleotris evides
Plotosus lineatus
Crenimugil crenilabis
Mulloidichthys flavolineatus
Epibulus insidiator
Pomacentrus sulfureus
Zebrasoma desjardinii
Hemigymnus fasciatus
Scomberoides tol or lysan
Plectorhinchus gibbosus
Bodianus axillaris
Caesio caerulaurea
Halichoeres hortulanus
Halichoeres cf. marginatus female
Halichoeres marginatus male
Oxymonacanthus longirostris

Zanclus cornutus
Chaetodon trifascialis
Chaetodon auriga
Chaetodon zanzibariensis
Chaetodon lunula
Chaetodon xanthocephalus
Chaetodon trifasciatus
Chaetodon kleinii
Chaetodon melannotus
Scolopsis frenatus
Platax orbicularis
Abudefduf sexfasciatus
Abudefduf sordidus
Abudefduf vaigiensis
Abudefduf notatus
Abudefduf septemfasciatus
Scuticaria tigrina
Rhinecanthus aculeatus
Rhinecanthus rectangulus
Balistoides viridescens
Labroides bicolor
Plectorhinchus vittatus
Cephalopholis argus
Epinephelus merra
Epinephelus fasciatus
Epinephelus spilotoceps
Epinephelus coeruleopunctatus
Epinephelus macrospilos
Plectropomus laevis
Grammistes sexlineatus
Bolbometopon muricatum
Thalassoma purpureum
Thalassoma lunare
Thalassoma hardwicke
Thalassoma hebraicum
Lethrinus harak
Canthigaster sp.
Canthigaster bennetti
Canthigaster solandri
Canthigaster valentini
Diodon hystrix
Diodon liturosus
Arothron nigropunctatus
Arothron stellatus
Arothron hispidus
Ostracion meleagris
Ostracion cubicus
Siganus corallinus
Siganus stellatus
Siganus argenteus
Sargocentron spiniferum
Sargocentron caudimaculatum
Beloniiformes gen. sp.

other Acanthuridae, Myriopristiformes and Scaridae, not yet identified, about 12 species.
Gobiiformes, about 10 species, not identified.
Rare visitors in the reef in the study period: about 30 species, not yet identified; photographic documentation in part not sufficient for identification.

A more detailed catalogue of the fishes will be included in the next research report.

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