SCLERACTINIA CORALS OF BAA ATOLL (MALDIVES): FIRST CHECKLIST AND OVERVIEW OF STONY CORALS COMMUNITY STRUCTURE

BY

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ABSTRACT

A survey of scleractinian corals for 21 stations in Baa Atoll (Republic of Maldives) was conducted in June 2009. The goal of the survey was to i) compile for the first time for this atoll a scleractinian coral check-list, ii) estimate the atoll total richness, iii) estimate intra-atoll richness variation and iv) describe preliminary patterns of community structure according to geomorphology and location criteria. The survey was stratified by the main reef geomorphological units. A total of 173 species of scleractinia belonging to 49 genera were recorded, including several species new to Maldives. Conversely, a number of species of genera quite common in the Indian Ocean were absent of the list of Pocilloporidae. Average richness per station was nearly 60 species. Richness ratio between slopes and flats/tops were between 3 and 1.3, with an average of 2.1, highlighting richer slopes than flats and tops. Differences of community composition between geomorphologic strata and between oceanic/lagoonal reefs were significant. Central lagoonal reefs provided highest richness, and highest coral cover as well. These findings are critical to plan for the conservation of Baa Atoll biodiversity.

INTRODUCTION

Historically, the Pillai and Scheer (1976) study provided the first Maldivian checklist of stony corals, from samples collected in 1957 and 1958 during the “Xarifa expedition” (Wallace and Zahir, 2007). The second significant contribution was the coral list proposed by Sheppard (1987) as a compilation of scleractinian species for various areas of Indian Ocean, including coral fauna of the Maldives. Finally, the most recent taxonomic census has been realized by Pichon and Benzoni (2007), based on 2002 /2003 field observations, after the 1998 regional bleaching event that seriously impacted coral communities of Maldives (Zahir et al. 2006; Lasagna et al. 2010, McClanahan, 2000). Pichon and Benzoni (2007) sampled 34 stations in Ari (Alifu), South Male (Kaafu),Vattaru and Felidhoo (Vaavu) Atolls. Additional data were added by numerous authors on limited number of sites (reviewed in Pichon and Benzoni, 2007). Despite this knowledge, taxonomic inventories of stony corals remain scarce for the entire

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archipelago, and are often limited to specific atolls. Furthermore, additional collections remain partly unprocessed due to the taxonomic revision of a specific group (*Acropora* collection by Wallace, 1999).

Specifically for Baa Atoll, the taxonomic composition of scleractinian coral communities remains poorly known. The Atoll Ecosystem Conservation Project (http://www.biodiversity.mv/aec/) has funded in 2008 a Baa-wide rapid assessment of coral communities (Le Berre et al., 2009), but manta tow surveys provided dominant growth forms and coral cover, not taxonomic lists. By providing a first qualitative description of hard coral communities and their main taxonomic dominance, across Baa Atoll coral habitats, this study fills a significant gap in Baa biodiversity knowledge.

MATERIAL AND METHODS

Scleractinian communities were described in June 2009 for 21 sites and 30 sampling stations across Baa Atoll (Fig. 1). The 21 sites included lagoon and oceanic sites (Fig. 1). The 30 sampling stations comprised four main coral reef habitats. Namely, these are reef slopes (5-20 meters), reef flats (0-2 meters), reef tops (the reef escarpment generally between 2 and 5 meters), and patch reefs (submerged isolated small reefs, below 10 meters of water). Thus, a site included 1 or 2 stations at most, since the upper part of a reef site was either a reef flat or a reef top.

For each site, scleractinia were sampled and/or recorded by SCUBA during a search time of 1 hour per station following a random path, going from the deeper areas to the shallowest. Slope, reef tops and reef flat station records were kept separate if done during the same dive. Forereef sampling was limited to the upper bio-constructed zones (approximately 5-20 meters). Generally, below 20 meters, sedimentary areas became dominant and corals scarce. Deep environments were mainly made of detritical coral reef habitats, sands and rubble.

The species were identified to the lowest tractable taxonomic level (species) excepted for the *Acropora* communities (species or genus level). Most species and all samples were photographed in situ. *Acropora* (21 samples) and Faviidae (5 samples) specimen have been collected for subsequent examination and deposited in Museum National in St Denis, La Reunion, and Muséum National Histoire Naturelle in Paris). Their taxonomic identification is in progress and results will be reported elsewhere.

Most dominant / abundant species have been recorded during the survey using a semi-quantitative scale (- scarse, singleton ; + average dominance ; ++ high dominance ; +++ very high dominance).

For each site and for each station (or habitat), a list of species was compiled. The coral species nomenclature used in this paper follows recent taxonomic revisions and monographs (Pichon and Benzoni, 2007). From the lists, univariate statistics provided richness indices per site and per station, (number of species and number of families) in order to assess trends in coral communities patterns per site (oceanic/lagoon) and per habitat (reef slope, reef top, reef flat, patch reef).

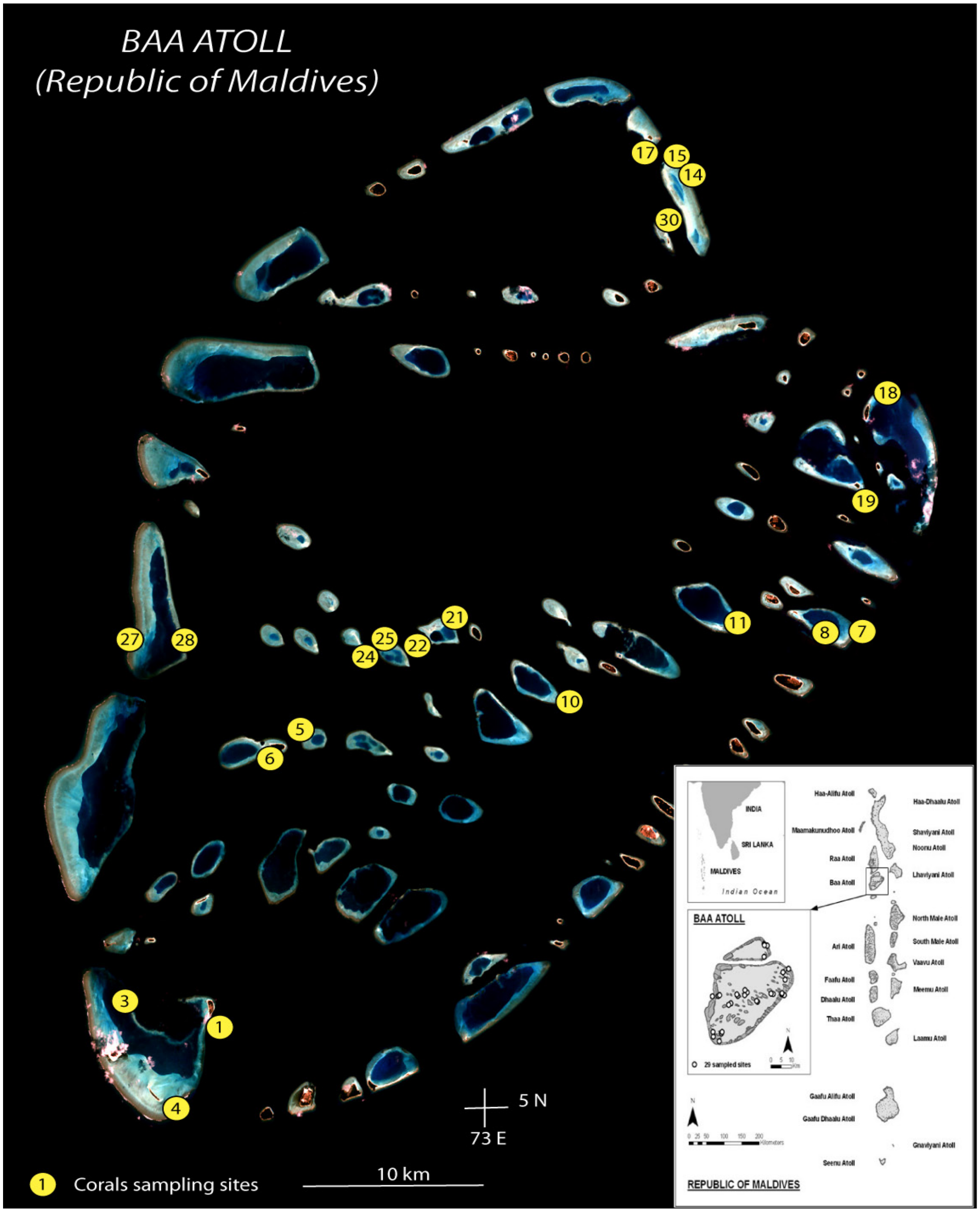

Figure 1. Map of Baa Atoll and position of the 21 coral reef sampling sites visited in June 2009.

Multivariate analysis (nMDS and ANOSIM) were performed on qualitative (presence & absence) data set only using the PRIMER 6 software (Clarke and Goorley, 2006). Bray-Curtis similarities were computed between each pair of stations. Non-metric multidimensional scaling (nMDS) displayed the different sources of variation in coral community structure, according to differences between sites (geography-exposure such as central lagoon and atoll rim periphery) and habitats. Results were tested using ANOSIM permutation tests (Clarke & Warwick, 2001).

RESULTS AND DISCUSSION

Overall Coral Species Richness

A total of 177 species of Scleractinia belonging to 49 genera were recorded in Baa Atoll. The list is presented in alphabetical order for the families, genera and species (appendix, Table 1). Acroporidae and Faviidae represented 55 and 46 species respectively (31% and 26 % of the coral community) (Fig. 2). Agaricidae and Fungiidae represented 14 % of the assemblage, other families were only represented by few species (1 to 4 %). Examples of specimen and facies are photographed in Plates 1 to 3.

Species richness reported here for Baa Atoll is consistent with scleractinian richness reported in other Maldives areas. For instance, Pichon and Benzoni (2007) reported 180 species from 4 atolls, identified on lagoon and oceanic reef slopes from the top down to 50 meters. The same authors reported a total of 258 species and 57 genera from a compilation of published sources.

By comparison with the list from Pichon and Benzoni (2007), we report that several species present in Baa Atoll were recorded for the first time in Maldives (*Montastrea magnistellata*, *Barabattoia cf. laddi*, *Turbinaria reniformis*, *Leptastrea pruinosa*). Previously, their presence could only be assumed according to distribution maps given by Veron (2000). Some of these newly recorded species were found relatively abundant in their preferred type of habitat (e.g., *Montastrea magnistellata*, L*eptastrea puinosa*, *Platygyra pini*, *Goniopora stutchburyi*) in agreement with similar observations made by Pichon and Benzoni (2007) for several species new to Maldives that they identified on their sampling sites.

For many sites located in the central part of Baa Atoll, *Acropora* communities were spectacular and charcacterized by tabular *Acropora* assemblages (*Acropora hyacinthus*, *A. cytherea*, *A. divaricata*), “bottlebrush” assemblages (*Acropora elseyi*, *A. longicyathus*), and branching or digitate assemblages (*Acropora muricata* “group”, *A. austera*, *A. samoensis*, *A. humilis*, *A digitifera*) (Wallace, 1999) (Appendix). Faviidae were also very common and often characterized by the presence of genera *Favia* and *Montastrea* (*M. annuligera*, *M. valenciennesi*, *M. magnistellata*). Agaricidae communities were dominated by *Leptoseris* (*Leptoseris scabra*, *L. hawaiensis*) and *Pavona* (*P. explanulata*, *P. venosa*, *P. varians*, *P. maldiviensis*).

Surprisingly, a number of species quite common in the Indian Ocean were absent from the list of Pocilloporidae (*Seriatopora histryx*, *S. caliendrum* or *Stylophora pistillata*). Similar observation was made for Milleporidae and other various species of hydrozoans during the same 2009 campaign (Gravier-Bonnet and Bourmaud, this issue).

As it stands now, the list published here is obviously conservative and incomplete. Indeed, *Acropora* samples need to be investigated to establish final conclusions on the alpha diversity of Baa Atoll. Furthermore, the major collection effort had taken place in the most dominant reef habitats of Baa Atoll. Many other habitats and niches still need to be sampled, including the deeper environments found in the lagoon, passes and oceanic fore reefs. Likely, the exploration of these habitats could yield additional species.

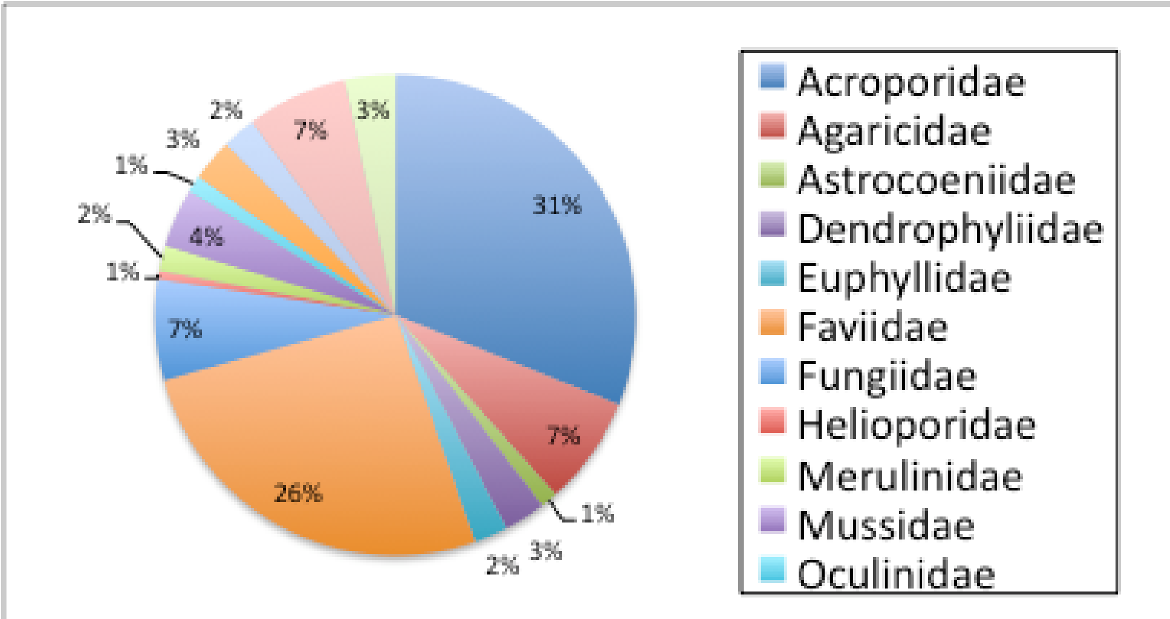

Figure 2. Proportion of coral reef families found in Baa Atoll (June 2009) considering all the sites.

Variations in Coral Community Structures

At the scale of the station, the average richness was just under 60 species, with a maximum at 74 and a minimum at 21. For the sites sampled both on reef slopes and reef flats/tops (n=8, ocean and lagoon sites), richness ratio between slopes and flats/tops were between 3 and 1.3, with an average of 2.1. Slopes were thus much richer than reef tops and flats. Richness on oceanic reef slopes (63.7 ± 6.9; n=8) were not significantly different than lagoon reef slopes (57.0 ± 9.5; n=4).

The highest coral richness recorded during this survey (often higher than 70 species) were also frequently associated with high coral cover (up to 80 %) (Le Berre et al., 2009). However, this is true only for lagoon stations. The health of these sites in terms of cover and richness are exceptional per Indian Ocean standards (plates 1, 2, 3) (Rajasuriya et al., 2002; Sheppard et al., 2008, Zahir et al, 2006).

The variations of facies observed in Baa is consistent with the categorisation of coral communities provided by Lasagna et al. (2010a). Based on the relative proportion of live coral and loose sediments and the three dimensional structure of the communities, they identified young, mature and regressive communities both on reef flats and slopes from Central Maldives atolls. Flats, especially in the central faro reefs where wave energy is low, appeared in Baa in young stage, whereas more exposed flats and slopes were of the mature and regressive forms. However, the classification by Lasagna et al; (2010a) would need to be tuned considering separately the communities dominated by *Acropora* (as in Lasagna et al., 2010b) and those dominated by massive *Porites*, which visually dominate the reefscape in the north eastern outer reefs of Baa (Le Berre et al., 2009).

The variation of richness per type of habitat sampled in Baa is presented for the 30 sampled stations in Figure 3. Baa sampling confirm the higher level of diversity founded in the central faro reefs slopes of Baa Atoll (stations 21, 22, 24, 25) and in central patch reefs (stations 11, 5).

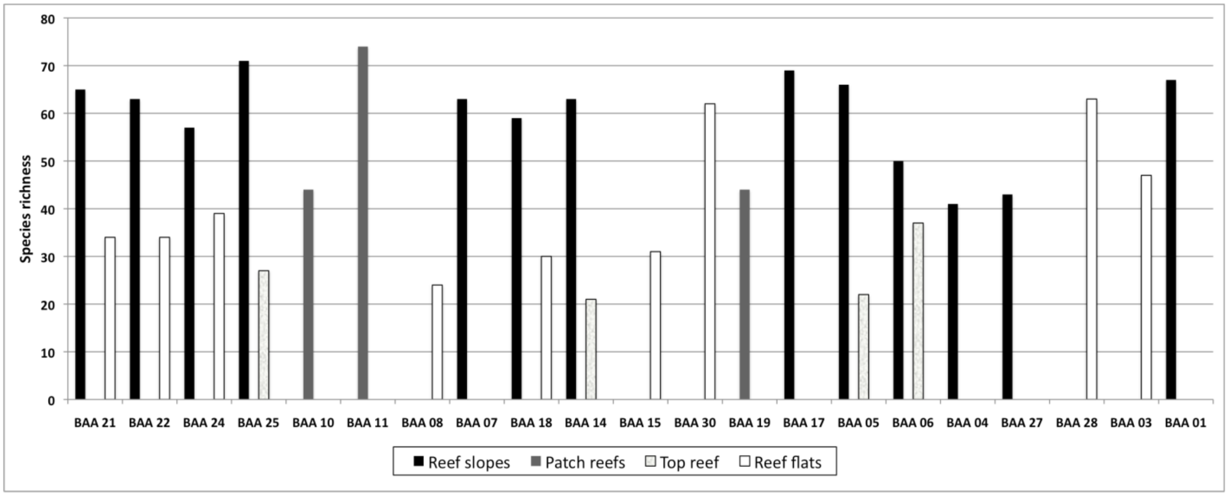

Figure 3. Coral species richness (S) recorded for the 21 sampled sites in Baa Atoll in June 2009 (Fig. **1).**

Three main families dominated coral communities: Acroporidae, Faviidae and Agaricidae. All together, they represented more than 70 % of the recorded species. The family composition of the different sites is presented in Figure 4.

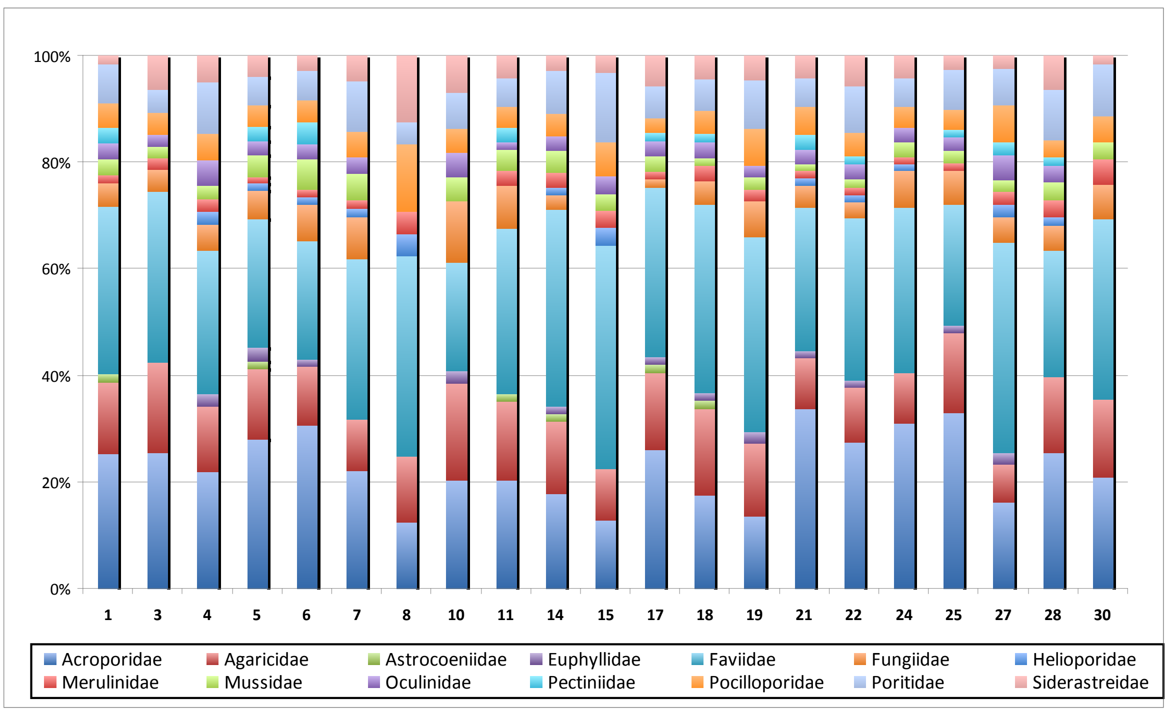

Figure 4. Distribution of coral families (in %) for the 21 sampling sites.

The richness composition of stations located in the central part of Baa Atoll (sites 5, 6, 21, 22, 24, 25) were dominated by *Acropora* communities (> 30 %) followed by Faviidae and Agaricidae. Stations located in the North /North East (sites 7, 8, 18, 19, 14, 15) and the west part of the atoll (sites 27, 28) were mostly dominated by Faviidae and Agaricidae. On each station, other coral families represented often less than 10 % of the total assemblage, but have an important contribution to the Baa Atoll coral diversity.

In terms of community composition, nMDS plots (stress values ranging 0.18, Clark, 1993) display the similarities between sites according to habitats (Fig. 5a) and oceanic vs lagoon location (Fig. 5b). The nMDS suggest grouping according to geomorphology. Indeed, differences among reef habitats were significant (R= 0,44, p < 0.001) with higher similarities between reef slopes and patches and between reef flats and top reefs (Fig. 5b). There are no evidences of grouping according to locations and exposure on the atoll (South, North, West, East) (not shown). However, differences between oceanic and lagoonal communities are evidenced in Figure 5b, although there is a clear overlap. Differences between the two groups were significant (R= 0,34, p < 0.001).

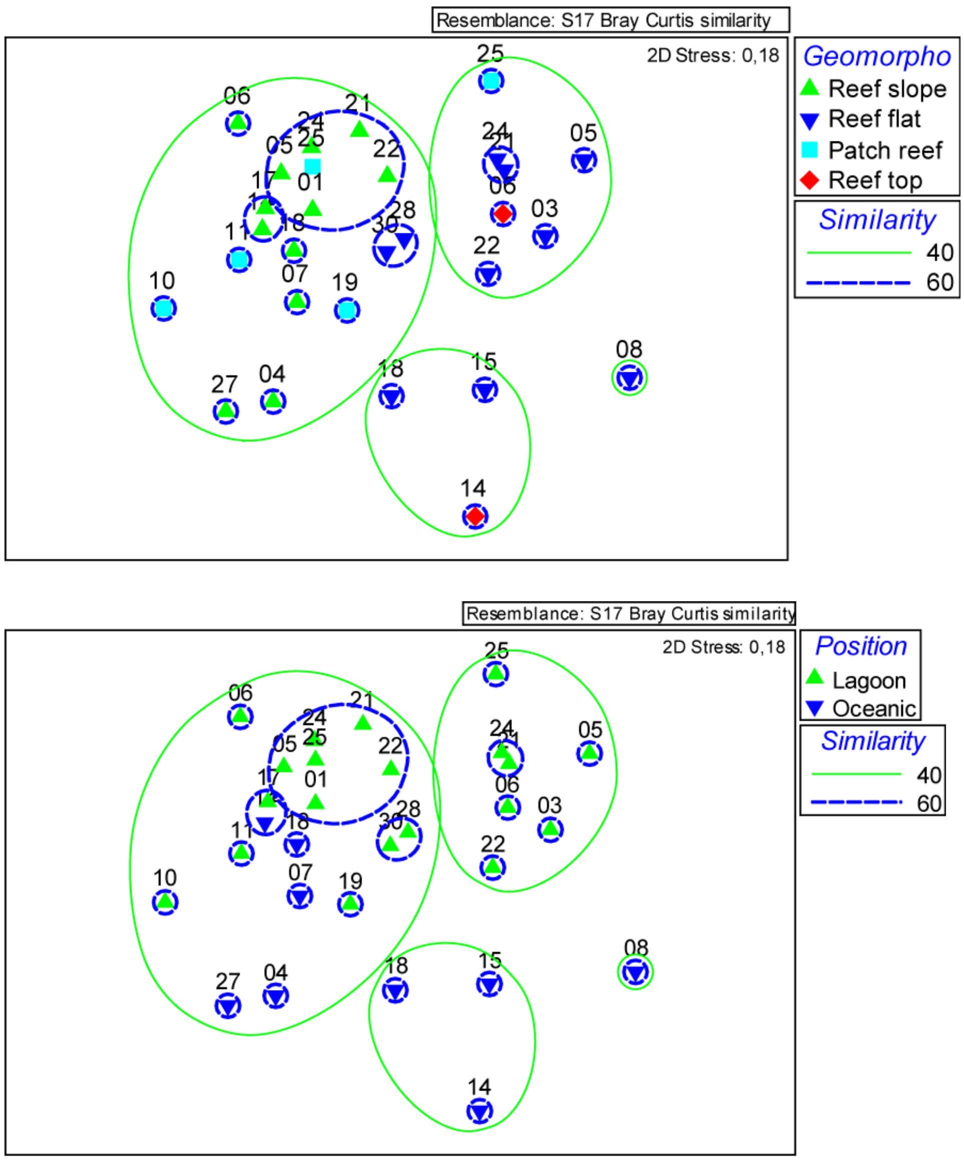

Figure 5 : Ordination by non-metric multidimensionnal scaling (nMDS) plot of Bray-Curtis similarities for presence / absence coral species data. 5a) Symbols refer the type of coral habitats and coloured lines denote the grouping of sites for a given similarity threshold. 5b) Symbols refer the location (lagoon and oceanic) and colored lines denote the grouping of sites for a given similarity threshold.

CONCLUSION

The Scleractinia of Baa Atoll were remarkably diverse, even in the present state of knowledge with 26 unidentified coral samples (Acroporidae and Favidae) and without investigations of the mesophotic deeper parts of the passes and lagoon. Additional surveys would certainly reveal the presence of other typical species adapted to these environments and which are known to have a broad geographical distribution range throughout the Indian Ocean. This point has been also highlighted by several authors for other atolls and confirmed that investigations on coral biodiversity in the Maldives should continue with a special emphasis on specific coral habitats or remote atolls not yet investigated.

Specifically for Baa, this study, stratified by the main reef geomorphological habitats, complete the previous rapid assessment by Le Berre et al. (2009) that estimated only cover and growth forms without detailed taxonomic assessment. Overall, for the reef sites sampled here, richness appear high to exceptional. Young communities (sensu Lasagna et al; 2010) present in reefs and faros in the center of the atoll appeared remarkable both in species richness and abundance. It is thus expected that this study will contribute to future decision making for conservation and zoning of Baa Atoll (Hamel and Andréfouët, this issue)

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APPENDIX

Table 1: List of Scleractinian recorded during this study, for each station (1=presence)

SITES		1	3	4	5	6	7	8	10	11	14	15	17	18	19	21	22	24	25	27	28	30
ACROPORIDAE - Verrill, 1902																						
Acropora austera	(Dana, 1846)	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	1	1	1	0	0	0
Acropora abrotanoides	(Lamarck, 1816)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	1
Acropora aculeus	(Dana, 1846)	1	0	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1
Acropora acuminata	(Verrill, 1864)	0	0	0	1	1	1	0	1	0	1	0	1	0	1	0	0	0	0	0	0	0
Acropora austera (ref 2)	(Dana, 1846)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Acropora cerealis	(Dana, 1846)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Acropora cf. grandis	(Brook, 1892)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1
Acropora cf. millepora	(Ehrenberg, 1834)	1	1	0	1	1	1	0	0	0	1	0	1	1	1	1	1	1	1	0	1	1
Acropora selago	(Studer, 1878)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Acropora verweyi	(Veron & Wallace, 1984)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
Acropora clathrata	(Brook, 1881)	0	0	1	1	1	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0
Acropora cytherea	(Dana, 1846)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	1	0	0	0
Acropora digitifera	(Dana, 1846)	0	1	1	1	1	1	1	0	1	1	0	1	0	1	1	0	1	1	0	1	1
Acropora divaricata	(Dana, 1846)	0	0	0	1	0	1	0	0	1	0	0	1	1	0	1	1	1	1	0	0	0
Acropora elseyi	(Brook, 1892)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	0
Acropora florida	(Dana, 1846)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0
Acropora gemmifera	(Brook, 1892)	0	1	1	0	1	1	1	0	1	0	1	0	0	0	1	1	1	1	1	0	0
Acropora granulosa	(Milne Edwards & Haime, 1860)	1	0	0	1	1	0	0	0	1	1	0	1	1	0	1	1	1	1	0	0	0
Acropora granulosa (ref. 2)		1	0	1	1	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0
Acropora humilis	(Dana, 1846)	1	1	0	1	1	1	0	1	1	1	1	0	1	1	1	1	1	1	0	1	1
Acropora hyacinthus	(Dana, 1846)	1	1	0	1	1	1	0	1	0	1	0	1	0	1	1	1	1	1	0	1	1
Acropora cf. longicyathus	(Milne Edwards & Haime, 1860)	1	0	0	1	1	0	0	0	0	1	0	1	0	0	1	0	1	1	0	0	0
Acropora muricata	(Linnaeus, 1758)	1	1	0	1	1	0	0	0	0	0	0	1	0	0	1	1	1	1	0	1	1
Acropora muricata (ref. 2)		0	0	0	1	0	0	0	1	1	0	0	0	0	0	1	0	1	0	0	0	0
Acropora muricata (ref. 3)		1	0	0	1	1	0	0	0	0	0	0	1	1	0	1	1	1	1	0	0	0
Acropora nasuta	(Dana, 1846)	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0
Acropora nasuta (ref. 2)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Acropora palifera	(Lamarck, 1816)	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Acropora paniculata	(Verrill, 1902)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Acropora robusta	(Dana, 1846)	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
Acropora rudis	(Rehberg, 1892)	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acropora samoensis	(Brook, 1891)	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acropora sp (ref. 10)		0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Acropora sp (ref.5)		0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acropora sp (ref. 7)		0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acropora sp (ref. 8)		0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Acropora sp (ref. 9)		0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Acropora sp (ref. 1)		1	0	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	0
Acropora tenuis	(Dana, 1846)	1	1	0	1	1	0	0	0	1	0	0	1	0	0	1	1	1	1	0	1	1
Astreopora myriophthalma	(Lamarck, 1816)	1	0	1	1	1	1	0	1	1	1	1	1	1	0	0	1	1	1	1	1	1
Astreopora cf. ocellata	(Bernard, 1896)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Montipora aequituberculat	(Bernard, 1897)	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0
Montipora floweri	(Wells, 1954)	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	1	0	1	0
Montipora sp (ref. 4)		0	0	0	0	1	0	0	0	1	1	0	1	1	0	0	0	0	1	1	0	0
Montipora sp (ref. 5)		1	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	1	0
Montipora sp (ref. 6)		0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Montipora sp (ref. 1)		1	0	1	0	1	0	0	0	0	0	0	0	1	0	0	0	1	1	1	0	0

Table 1 (Con'td)

SITES		1	3	4	5	6	7	8	10	11	14	15	17	18	19	21	22	24	25	27	28	30
Montipora sp (ref. 2)		0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0
Montipora sp (ref. 3)		0	0	0	0	0	1	0	1	0	0	0	1	0	0	0	1	1	0	0	0	0
Montipora undata	(Bernard, 1897)	1	1	1	1	1	1	0	0	1	0	0	1	1	0	0	1	0	1	0	0	0
Montipora venosa	(Ehrenberg, 1834)	0	0	0	1	0	0	1	0	1	0	0	0	0	0	1	1	0	0	0	1	0
Montipora venosa (ref. 2)		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Montipora verrucosa	(Lamarck, 1816)	0	0	0	1	1	1	0	0	0	0	0	0	1	0	0	1	1	1	0	0	1
AGARICIDAE - Gray, 1847																						
Gardineroseris explanulata	(Dana, 1846)	1	1	0	1	1	0	0	0	1	1	0	1	1	0	1	1	1	1	0	1	0
Leptoseris cf scabra	(Vaughan, 1918)	1	0	1	1	1	1	0	1	1	1	0	1	0	0	0	0	0	1	0	1	1
Leptoseris hawaiensis	(Vaughan, 1907)	1	0	0	1	1	0	0	0	0	1	0	0	1	0	1	0	0	1	0	0	0
Leptoseris mycetoceroides	(Wells, 1954)	0	0	0	1	0	0	0	0	0	1	0	1	0	0	0	1	1	1	0	0	1
Leptoseris sp		0	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Leptoseris yabei	(Pillai & Scheer, 1976)	0	1	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
Pachyseris speciosa	(Lamarck, 1846)	1	0	1	1	1	0	0	1	1	1	0	1	1	0	0	1	0	1	1	1	1
Pavona clavus	(Dana, 1846)	1	1	0	1	1	0	0	1	1	0	1	1	1	1	1	1	1	1	1	1	0
Pavona explanulata	(Lamarck, 1816)	1	0	1	1	1	1	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1
Pavona maldiviensis	(Gardiner, 1905)	1	0	0	1	0	1	0	1	1	0	0	0	1	0	0	0	1	1	0	1	1
Pavona minuta	(Wells, 1954)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Pavona varians	(Verrill, 1864)	1	1	0	0	1	1	1	1	0	1	1	0	1	1	1	1	1	1	0	1	1
Pavona venosa	(Ehrenberg, 1834)	1	1	0	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1	1
ASTROCOENIIDAE - Koby, 1890																						
Stylocoeniella guntheri	(Bassett-Smith, 1890)	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0
Stylocoeniella armata	(Ehrenberg, 1834)	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DENDROPHYLLIIDAE - Gray, 1847																						
Turbinaria mesenterina	(Lamarck, 1816)	0	1	1	1	0	0	1	0	1	1	0	0	1	0	0	0	0	0	0	1	0
Turbinaria stellulata	(Lamarck, 1816)	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Turbinaria peltata	(Esper, 1794)	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Tubastrea aurea	(Quoy & Gaimard, 1833)	0	0	0	0	0	0	0	0	1	0	0	1	1	1	0	0	0	1	0	0	1
Tubastrea micrantha	(Ehrenberg, 1834)	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	0	0	0	1
EUSMILIIDAE - Milne Edwards & Haime, 1857																						
Euphyllia glabrescens	(Chamisso & Eysenhardt, 1821)	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euphyllia ancora	(Veron & Pichon, 1979)	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Physogyra lichtenschteni	(Milne Edwards & Haime, 1851)	0	0	0	1	0	0	0	1	0	1	0	1	1	1	1	1	0	1	1	0	0
Plerogyra sinuosa	(Dana, 1846)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FAVIIDAE - Gregory, 1900																						
Barabattoia laddi	(Wells, 1954)	1	0	1	0	1	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0
Diploastrea heliopora	(Lamarck, 1816)	1	0	1	0	0	1	0	0	1	1	0	1	1	1	0	0	1	0	0	0	1
Echinopora gemmacea	(Lamarck, 1816)	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	1	0
Echinopora hirsutissima	(Milne Edwards & Haime, 1849)	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0
Echinopora lamellosa	(Esper, 1795)	1	1	0	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1	1
Echinopora horrida	(Dana, 1846)	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1
Favia favus	(Forskal, 1775)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	1	0
Favia helianthoides	(Wells, 1954)	0	0	0	1	1	0	0	0	0	1	0	0	1	0	0	0	1	0	0	0	0

Table 1 (Con'td)

	SITES	1	3	4	5	6	7	8	10	11	14	15	17	18	19	21	22	24	25	27	28	30
Favia matthai	(Vaughan, 1918)	0	1	0	0	0	1	0	1	1	1	1	0	1	1	1	1	1	1	1	0	1
Favia rotumana	(Gardiner, 1899)	0	1	0	0	0	0	1	1	0	0	0	0	1	1	0	0	0	0	1	1	1
Favia rotundata	(Veron & Pichon & Wijsman, 19	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0
Favia pallida	(Dana, 1846)	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1
Favia speciosa	(Dana, 1846)	1	0	1	1	1	1	1	0	0	1	0	1	1	1	1	1	1	1	0	0	1
Favia stelligira	(Dana, 1846)	1	0	0	1	0	1	0	0	1	1	0	1	1	0	1	1	1	1	0	1	1
Favia veroni	(Moll & Borel-Best, 1984)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Plesiastrea versipora	(Lamarck, 1816)	0	0	1	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	1	0	0
Favites pentagona	(Esper, 1794)	0	0	1	1	0	1	1	1	0	1	1	1	1	1	0	1	0	1	0	1	1
Favites abdita	(Ellis & Solander, 1786)	1	0	0	0	0	1	1	0	0	0	0	1	1	1	1	1	1	1	0	0	1
Favites halicora	(Ehrenberg, 1834)	1	1	0	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	0	1	1
Favites russeli	(Wells, 1954)	1	0	0	0	0	1	0	0	1	1	0	1	0	0	0	0	1	1	1	0	0
Favites cf. spinosa		0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Favites flexuosa	(Dana, 1846)	1	0	0	1	0	0	0	0	1	1	0	0	0	1	0	0	0	1	1	0	0
Favites peresi	(Faure & Pichon, 1978)	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Favites sp (ref 1)		0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Cyphastrea chalcidicum	(Forskal, 1775)	1	1	0	1	0	0	0	0	1	1	0	1	1	0	1	1	1	1	0	0	0
Cyphastrea seralia	(Forskal, 1775)	1	0	0	0	1	1	0	0	0	1	0	1	0	0	1	0	1	1	1	1	1
Cyphastrea microphthalma	(Lamarck, 1816)	0	1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Goniastrea pectinata	(Ehrenberg, 1834)	1	1	1	1	1	1	0	1	1	1	0	1	1	1	1	1	1	1	1	0	1
Goniastrea retiformis	(Lamarck, 1816)	1	1	1	1	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1
Goniastrea sp (ref. 2)		1	0	1	0	1	1	0	0	1	1	0	1	1	1	1	0	0	0	1	0	0
Goniastrea edwardsi	(Chevalier, 1971)	0	1	0	0	1	1	0	0	1	1	1	1	1	0	0	1	1	1	0	0	0
Leptastrea pruinosa	(Crossland, 1952)	1	0	0	1	1	1	0	0	1	0	0	1	1	1	1	0	0	0	1	1	1
Leptastrea transversa	(Klunzinger, 1879)	1	1	0	1	1	1	1	1	0	1	1	0	1	0	1	1	1	1	0	0	1
Leptastrea sp (ref. 1)		0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
Leptastrea sp (ref 2)		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Leptoria phrygia	(Ellis & Solander, 1786)	0	1	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0	0	1	1
Montastrea annuligera	(Milne Edwards & Haime, 1849)	0	1	0	1	0	1	0	0	0	0	0	1	1	0	0	1	0	0	1	0	1
Montastrea magnistellata	(Chevalier, 1971)	1	0	0	1	1	1	0	0	1	1	0	1	1	1	0	1	1	0	0	0	1
Montastrea valenciennesi	(Milne Edwards & Haime, 1849)	0	0	0	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0
Montastrea curta	(Dana, 1846)	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Oulophyllia crispa	(Lamarck, 1816)	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0
Platygyra daedalea	(Ellis & Solander, 1786)	0	0	0	0	1	0	1	0	0	1	1	1	0	0	1	1	1	0	1	0	0
Platygyra pini	(Chevalier, 1971)	0	0	0	1	1	1	0	1	1	1	1	0	1	0	1	1	1	1	0	0	1
Platygyra lamellina	(Ehrenberg, 1834)	1	0	1	1	0	1	0	1	1	0	0	1	0	1	0	1	1	1	1	1	0
Platygyra sinensis	(Milne Edwards & Haime, 1849)	1	1	0	1	1	0	0	0	0	0	1	0	1	0	0	0	0	0	1	1	1
FUNGIIDAE - Dana, 1846																						
Fungia fungites	(Linnaeus, 1758)	1	1	1	1	1	0	0	0	1	0	0	1	1	1	1	1	1	1	0	1	1
Fungia (cycloseris) sp		0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	1	0	0	0
Fungia sp (ref. 2)		0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0
Fungia scutaria	(Lamarck, 1801)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fungia klunzingeri	(Doderlein, 1901)	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
Fungia paumotensis	(Stuchbury, 1833)	0	1	1	1	0	1	0	1	1	1	0	0	0	1	0	0	1	0	1	1	1
Fungia horrida	(Dana, 1846)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Halomitra pileus	(Linnaeus, 1758)	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1	0	1	0	0	1	0
Herpolitha limax	(Esper, 1797)	0	0	0	1	1	0	0	0	1	0	0	0	1	0	1	1	1	1	1	0	1

Table 1 (Con'td)

	SITES	1	3	4	5	6	7	8	10	11	14	15	17	18	19	21	22	24	25	27	28	30
Sandalolitha dentata	(Quelch, 1884)	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	1
Cycloseris sp		0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
HELIOPORIDAE - Pallas, 1766																						
Heliopora coerulea	(Pallas, 1766)	0	0	1	1	1	1	1	0	0	1	1	0	0	0	1	1	1	0	1	1	0
MERULINIDAE - Verrill, 1866																						
Hydnophora microconos	(Lamarck, 1816)	0	1	0	0	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	1	1
Hydnophora exaesa	(Pallas, 1766)	0	0	1	1	0	1	0	0	0	1	0	1	1	1	1	0	0	1	1	1	1
Merulina ampliata	(Ellis & Solander, 1786)	1	0	0	0	0	0	0	0	1	1	0	0	1	0	0	1	1	0	0	0	1
MUSSIDAE - Ortmann, 1890																						
Acanthastrea echinata	(Dana, 1846)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
Lobophyllia corymbosa	(Forskal, 1775)	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0	1
Lobophyllia hemprichii	(Ehrenberg, 1834)	1	1	0	1	1	0	0	0	0	1	0	1	0	0	0	1	1	1	0	0	1
Cynarina lacrimalis	(Milne Edwards & Haime, 1849)	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
Symphyllia recta	(Dana, 1846)	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0
Symphyllia radians	(Milne Edwards & Haime, 1849)	0	0	0	1	1	1	0	0	1	1	1	1	1	1	0	0	0	0	0	1	0
Symphyllia agaricia	(Milne Edwards & Haime, 1849)	1	0	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
OCULINIDAE - Gray, 1847																						
Galaxea fascicularis	(Lamarck, 1816)	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0
Galaxea astreata	(Linnaeus, 1758)	1	0	1	1	1	1	0	1	0	1	0	1	1	0	1	1	1	1	1	1	0
PECTINIIDAE - Vaughan & Wells, 1943																						
Echinophyllia aspera	(Ellis & Solander, 1786)	1	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0
Mycedium elephantotus	(Pallas, 1766)	0	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Oxypora lacera	(Verrill, 1864)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Pectinia lactuca	(Pallas, 1766)	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	1	0	1	0	1	0
POCILLOPORIDAE - Gray, 1842																						
Pocillopora damicornis	(Linnaeus, 1758)	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Pocillopora verrucosa	(Ellis & Solander, 1786)	1	0	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1
Pocillopora meandrina	(Dana, 1846)	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1
Pocillopora eydouxi	(Milne Edwards & Haime, 1849)	1	0	0	1	1	1	0	1	1	1	0	1	1	1	1	1	1	1	1	0	0
PORITIDAE - Gray, 1842																						
Alvepora sp1		1	0	1	1	0	0	0	0	1	0	0	0	0	0	1	0	0	1	1	0	1
Goniopora stokesi	(Milne Edwards & Haime, 1851)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	0
Goniopora djiboutiensis	(Vaughan, 1907)	1	0	1	0	1	1	0	1	0	1	1	1	0	1	0	1	0	0	0	0	1
Goniopora columna	(Dana, 1846)	0	0	0	1	1	1	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0
Goniopora stutchburryi	(Wellsl, 1955)	0	0	0	0	0	1	0	0	0	1	0	1	0	0	0	0	1	1	0	0	0
Goniopora sp (ref. 3)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Porites lutea	(Milne Edwards & Haime, 1860)	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1
Porites synarea rus	(Forskal, 1775)	1	0	0	1	1	1	0	0	0	1	0	0	0	0	1	1	1	1	0	1	1
Porites lobata	(Dana, 1846)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	1	1
Porites cylindrica	(Dana, 1846)	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Porites solida	(Forskal, 1775)	1	0	1	0	0	1	0	0	1	1	1	1	1	1	1	1	0	0	0	1	0

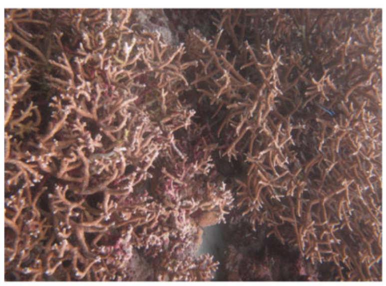
Table 1 (Con'td)

SITES		1	3	4	5	6	7	8	10	11	14	15	17	18	19	21	22	24	25	27	28	30
SIDERASTERIDAE - Vaughan & Wells, 1943																						
Coscinarea monile	(Forskal, 1775)	0	0	1	0	0	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0
Coscinarea sp (ref. 2)		0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Psammocora profundacell	(Gardiner, 1898)	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	0
Psammocora contigua	(Esper, 1797)	0	1	0	1	0	0	1	0	0	0	0	0	0	0	1	1	1	1	0	1	0
Psammocora digitata	(Milne Edwards & Haime, 1851)	0	1	0	1	1	1	1	0	0	0	0	1	0	0	1	1	1	0	0	1	1
Psammocora cf. haimenea	(Milne Edwards & Haime, 1851)	0	0	0	0	0	0	0	1	1	0	1	1	1	1	0	1	0	0	0	1	0

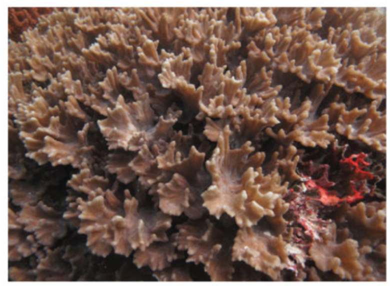
Plate 1

Psammocora digitata

Acropora muricata



Acropora cf. muricata

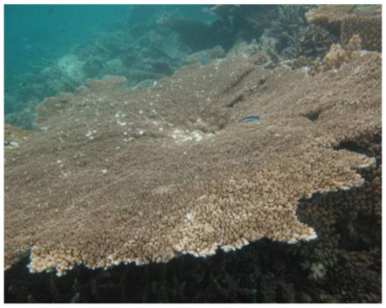


Pectinia paeonia

Echinopora horrida

Goniopora cf. columna

Plate 2



Acropora hyacinthus

Mycedium elephantotus

Acropora assemblage

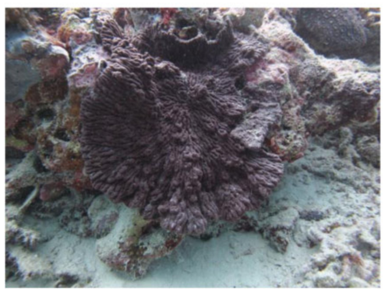
Acropora clathrata

Hydnophora microconos

Protopalythoa sp.

Plate 3

Acropora tenuis *Lobophyllia corymbosa*



Merulina ampliata *Acropora muricata assemblage*

Pocillopora verrucosa *Reef flat of central faro reef*

Photographs by*: Hani AMIR (MRC) et Lionel BIGOT (ECOMAR)*