

Reef corals of the Padre Burgos area, southern Leyte, Philippines

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Executive Summary

- A list of corals was compiled for 4 sites near Padre Burgos, southern Leyte, Philippines. The survey involved about 9 hours of scuba diving by D. Fenner to a maximum depth of 17.6 meters.
- The reefs near Padre Burgos have a highly diverse coral fauna. A total of 251 species in 65 genera of hard corals (239 species and 59 genera of zooxanthellate Scleractinia) were observed during the present survey. This is higher than the number reported in similar studies by the author for Danjungan (236 species), Cagdanao (234 species), Tubbataha Reef (243 species) and the Cagancillio island group (244 species) but less than that reported for the Malitbog area of Leyte (275 species). However, there were only 5 hours of diving in Cagdanao and there were 13 hours in Malitbog, and in Danjungan the author was learning identification.
- The number of species found after 10 hours of diving and snorkeling was 251, which is more than the number found after the same number of hours of diving in Sierra Madre (108), Tubbataha (205), Cagancillio (220), Calamianes (202), Malitbog (227), Cagdanao (245), and Apo Island (229), and only slightly less than that in Anilao (253).
- This brief study found 54% of the (461) species of zooxanthellate Scleractinia reported so far from all of the Philippines. Additional study would find many more. This high diversity supports the value of efforts to use these reefs sustainably.
- Species numbers at visually sampled sites ranged from 83 to 141, with an average of 108.8 per site. Sites in Sierra Madre had 72 species per site, Tubbataha 86, Cagancillio had 75 per site, Calamianes 92, Negros Oriental 137, Malitbog 101, Cagdanao 82, Apo Island 123, and Anilao 120. Previous surveys with the same method and author have produced an average of 93.6 species per site in extensive diving in 12 locations within the “Coral Triangle” area of highest diversity. Thus, these reefs had more coral species than most Philippine reefs.
- *Acropora*, *Montipora*, *Porites*, *Fungia*, *Platygyra*, *Pavona*, *Lobophyllia*, *Turbinaria*, *Favia*, *Echinopora*, *Pectinia*, *Goniastrea* were dominant genera on these reefs, with 35, 17, 10, 9, 9, 8, 8, 7, 7, 7, 6, and 6 species. The proportion of the total fauna in the most diverse genera was fairly typical of rich Indo-Pacific reefs.

- The overwhelming majority (95%) of corals on these reefs are zooxanthellate Scleractinia, with only a few non-scleractinian and azooxanthellate species, as is typical of Indo-Pacific reefs.
- 10 rare species were found.
- A total of 7 species that have not been reported from the Philippines in published reports were found, one of which represents an extension of the known range for that species.
- Three species were found that could only be identified to genus, and may possibly be new species. Much more study will be required to determine if they are new species, and several are likely to previously be named but not be well known.
- The coral disease “White Syndrome” was fairly common on the table coral, *Acropora millepora*, and one tumor was seen on the same species.
- These reefs support a very high coral diversity, typical of the best reef sites within the “Coral Triangle” area of highest reef diversity, and should be used sustainably.

Introduction

The following is a report of the reef coral fauna of 4 dive sites along the coastline near Padre Burgos in southern Leyte, based on results of the author’s observations during a visit to the CCC base at Ampo in December, 2005.

The principle aim of the coral survey was to provide an inventory of the coral species growing on reefs and associated habitats and compare the coral fauna on different sites. This includes species growing on sand or other soft sediments within and around reefs. The primary group of corals is the zooxanthellate scleractinian corals, that is, those that contain single-cell algae and which contribute to building the reef. Also included are a small number of zooxanthellate non-scleractinian corals which also produce large skeletons which contribute to the reef (e.g., *Millepora*, *Heliopora*, *Tubipora*, *Distichopora*: fire coral, blue coral, organ-pipe coral, and thick lace coral, respectively), and a small number of azooxanthellate scleractinian corals (*Tubastrea* and *Rhizopsammia*). All produce calcium carbonate skeletons that contribute to reef building to some degree.

The results of this survey facilitate a comparison of the faunal richness of these southern Leyte reefs with other reefs in the central Philippines reefs such as Tubbataha and Cagancillio area reefs, with other Philippine reefs, and with other parts of Southeast Asia and adjoining regions. However, the list of corals presented below is incomplete, due to the limited number of dives in the survey (about 9 hours of diving and snorkeling), the highly patchy distribution of corals and the difficulty in identifying some species in the water. Corals are sufficiently difficult to identify that there are significant differences between leading experts on some identifications.

Methods

Corals were surveyed in about 9 hours of diving in 10 scuba dives and one snorkel by D. Fenner to a maximum depth of 17.6 m. A list of coral species was recorded at 4 sites. Multiple dives at the Ampo site were each carried out at slightly different locations, to the left or right of the buoy. The basic method consisted of underwater observations. For a few dives, corals were recorded in 40 minutes, and then an additional 20 minutes was spent at less than 5 m depth. The name of each species identified was marked on a plastic sheet on which species names were printed. A direct descent was made in most cases to the maximum depth of the dive (usually 17 m) or of the reef, whichever was less. The bulk of the dive consisted of a slow ascent along the reef in a zigzag path to about 5 meters depth. After ascent to the surface, re-descent to less than 5 m was made for an additional 20 minutes on some dives. Sample areas of all habitats encountered were surveyed. Many corals can be identified to species with certainty in the water and a few must be identified alive since they cannot be identified without living tissues. Also, there are some that are easier to identify alive than from skeletons. Field guides assisted identification (Veron and Stafford-Smith, 2002; Veron, 2000; Wallace, 1999ab). Limited collecting of small fragments for examination to confirm species were collected during other projects in other areas of the Philippines (and most fragments returned to the water). Additional references supporting identification are listed in references (Best & Suharsono, 1991; Boschma, 1959; Cairns & Zibrowius, 1997; Claereboudt, M. 1990; Dai, 1989; Dai & Lin 1992; Dineson, 1980; Fenner, in preparation; Hodgson, 1985; Hodgson & Ross, 1981; Hoeksema, 1989; Hoeksema & Best, 1991; Hoeksema & Best 1992; Moll & Best, 1984; Nemenzo 1986; Nishihira, 1986; Ogawa & Takamashi, 1993, 1995; Randall & Cheng, 1984; Sheppard & Sheppard, 1991; Suharsono, 1996; Veron, 1985, 1986, 1990, 2000; Veron & Nishihira, 1995; Veron & Pichon 1976, 1980, 1982; Veron, Pichon & Wijman-Best, 1977; Wallace 1994, 1997a, Wallace & Wolstenholme 1998).

Dive sites are listed in Table 3.

Results

A total of 251 species in 72 genera of stony corals (239 species and 59 genera of zooxanthellate Scleractinia) were found in the survey of these reefs, (Appendix A). All of these species are illustrated in Veron (2000) and Veron and Stafford-Smith (2002). The total of 251 species is more than that found by the author Danjugan in 1997 (236 species), Cagdanao in 2001 (234 species), on Tubbataha Reef (243 species) and the Cagancillio island group (244 species), but less than found by the same observer in the “Coral Triangle” area of highest diversity using the same methodology: 303 species in the Calamaian Is., Philippines, 315 sp. in Sulawesi, Indonesia, 318 in Milne Bay, PNG, and 331 in Irian Jia, Indonesia. However, many more dives were made in these other surveys, and additional dives increase the number of species found.

General faunal composition

The coral fauna consists mainly of Scleractinia. The genera with the largest numbers of species found were *Acropora*, *Montipora*, *Porites*, *Fungia*, *Pavona*, and

Lobophyllia, *Favia*, *Echinopora*, *Pectinia*, and *Goniastrea*. These 12 genera account for about 51% of the total observed species (Table 1). (Families are less stable and useful in corals than genera, and thus were not used.)

Table 1

Genera with the greatest number of species

Rank	Genus	No. species
1	<i>Acropora</i>	35
2	<i>Montipora</i>	17
3	<i>Porites</i>	10
4	<i>Fungia</i>	9
5	<i>Platygyra</i>	9
6	<i>Pavona</i>	8
7	<i>Lobophyllia</i>	8
8	<i>Turbinaria</i>	7
9	<i>Favia</i>	7
10	<i>Echinopora</i>	7
11	<i>Pectinia</i>	6
12	<i>Goniastrea</i>	6

Acropora, *Montipora*, and *Porites* are usually the three most species-rich genera on rich Indo-Pacific reefs, in that order. The farther down the list one moves, the more variable the order becomes, with both the number of species and the differences between genera decreasing.

Most of the corals were zooxanthellate (algae-containing, reef-building) Scleractinian corals, with 95% of the corals in this group. There were 2 species that are azooxanthellate (lacking algae) Scleractinia for 0.8% of the total, and there were 10 corals that were not Scleractinia, for 4% of the total.

Zoogeographic affinities of the coral fauna

The reef corals of southern Leyte reefs belong to the overall Indo-west Pacific faunal province. A few species span the entire range of the province, but most do not. The area of highest biodiversity in corals appears to be an area enclosing the Philippines, central and eastern Indonesia, and northern (Hoeksema, 1992) and eastern Papua New Guinea. Areas of somewhat lower diversity include Eastern Australia's Great Barrier Reef, Southern New Guinea, and the Ryukyu Islands of Southern Japan. Some evidence (Best et al 1989) indicates western Indonesia may not be included in the area of highest diversity. Although it is usually assumed that the northern Philippines are included in the area of highest biodiversity, until now there have been no good data to indicate whether it is included in the area of highest diversity.

The biodiversity of corals falls off from the Coral Triangle in all directions, reaching 80 species at an island near Tokyo, 65 species at Lord Howe Island southeast of Australia, about 45 species in Hawaii, and about 20 species at Pacific Panama. Species fall-off is significantly less to the west in the Indian Ocean and Red Sea. About 300 species may currently be known in the Red Sea, though this area, like many others, is insufficiently studied to provide accurate figures.

Most coral species found in this area have fairly wide distributions within the Indo-Pacific. A majority of corals have a pelagic larval stage, with a minimum of a few days pelagic development for broadcast spawners (a majority of species), and larval settling competency lasting for at least a few weeks. A minority of species release brooded larvae that may be capable of anything from immediate settlement to a long pelagic dispersal period. Most of the corals found in these reefs have ranges that extend both east and west of the Philippines, many ranging from the Red Sea to Tahiti. A small minority of species have ranges that extend in only one or two directions from the Philippines (such as north and east but not west), and a very small number have ranges that only extend to the Coral Triangle (and thus can also be found in Indonesia and/or New Guinea). None are endemic to just the Philippines.

Diversity at individual sites

The number of species for each dive is presented in Table 3.

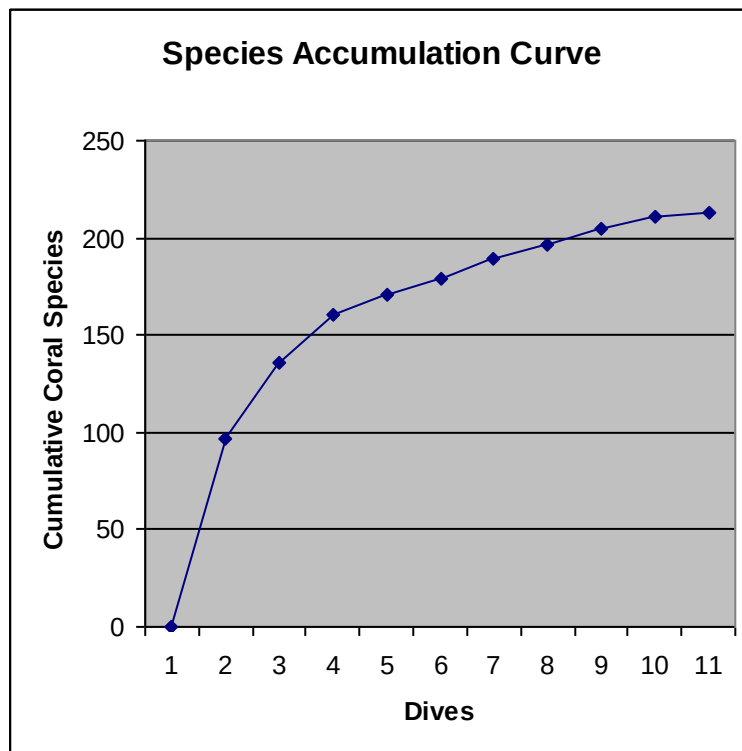
Table 3

Number of coral species for each dive

Dive	Site	Number of species	Duration
1.	Ampo	97	43 min
2.	Ampo	119	60 min
3.	Ampo	127	60 min
4.	Ampo	119	60 min
5.	Mack's Climax	85	43 min
6.	Ampo	141	53 min
7.	Heaven's Gate	115	42 min
8.	Heaven's Gate	99	43 min
9.	Napantau	83	42 min
10.	Heaven's Gate	103	42 min

Species were added to the list rapidly at first and then at a slower rate near the end of the survey (Figure 1), though the curve was still rising and additional sites would increase the number of species found.

Figure 1



Habitats and Reefs

Corals are habitat-builders and appear to have less niche-specialization than some other groups. Some zonation occurs by depth and exposure to waves or currents. Thus, there are a few corals that are restricted to zones such as very shallow areas, protected areas, deep water, shaded niches, soft bottoms, or exposed areas. However, many corals can be found over a relatively wide range of exposure and light intensity. Corals are primarily autotrophic, relying on the products of the photosynthesis of their symbiotic algae, supplemented by plankton caught by filter-feeding and suspension feeding. Most require hard substrate for attachment, but a few grow well on soft substrates.

The coral reefs studied were all within a short distance on the southwestern point of Leyte, except for Napantau. They are exposed to similar currents, similar turbidity and sedimentation, and similar bottom topography. The highest cover and diversity of coral is where the slope is steepest, about 5 to 15 or 20 m deep. The best community for hard corals is the Ampo house reef. On the slope, nearly everything is hard coral, with impressive diversity, though not a huge variety of *Acropora*. Still, it is one of the most attractive reefs the author has observed anywhere, for hard corals. One of the dives at Ampo produced 141 coral species, about the 4th highest single dive count the author has ever found. Other sites had more patchy coral, and many more corallimorphs. Napantan had the most corallimorphs the author has ever seen, of several different species. The shallows at Ampo are presently covered with brown algae. This may have been caused by overfishing of herbivorous fish and/or nutrient

runoff. Casual observation indicates that large and medium size fish are missing. Herbivorous fish like surgeons and parrotfish were not obviously abundant.

Dominant Species

At the top of the steeper slope, *Porites cylindrica* (finger coral) was dominant, with abundant *Echinopora lamellosa* (plates). At some deeper spots, *Seriatopora hystrix* was most common. The steeper part of the slope has a diverse community, with no obviously dominant species.

Unusual Community

An unusual community was found at Napantau, at around 12-18 m. This community was dominated by *Cyphastrea decadia*, with abundant *Anacropora matthai*. Both are thin branching forms that form small bushes, and were on sand.

Species of special interest

A total of 10 species were found that are uncommon to rare, which are listed in Table 4.

Table 4

Rare Corals

1. *Acropora donei*
2. *Astreopora ocellata*
3. *Cycloseris erosa*
4. *Favia vietnamensis*
5. *Lobophyllia dentatus*
6. *Montipora mactanensis*
7. *Pectinia aylini*
8. *Pectinia maxima*
9. *Pocillopora danae*
10. *Seriatopora aculeata*

A total of seven species were found which have not previously been reported from the Philippines in the published literature (Veron & Hodgson, 1989; Veron & Fenner, 2000, Veron 2000). These species are listed in Table 5.

Table 5

Coral species not previously reported for the Philippines in published literature (Veron and Hodgson, 1989; Veron and Fenner, 2000; Fenner, 2000)

1. *Favia truncatus*^{*}
2. *Favia vietnamensis*

3. *Goniopora albiconus*^{^+}
4. *Lobophyllia dentatus*
5. *Lobophyllia flabelliformis*^{^*#}
6. *Pocillopora danae*
7. *Seriatopora aculeata* range extension

[^]Also found by the author at Malitbot, Leyte

^{*}Also found by the author also in Tubbataha and Cagancillio.

⁺Also found by the author in Sierra Madre

[#]Also found by the author at Anilao

There are also three coral species that were identified only to genus, and which may be new species. These species are listed in Table 6. Samples would have to be collected and several years of study will be required to determine if they are actually new species, and some are likely to be found to already have names but not be well known.

Table 6

Possible new species

1. *Echinopora* “large corallites”
2. *Platygyra* “green”
3. *Pavona* “ridges”

Coral Disease and Predation

White Syndrome disease was fairly common at Ampo, but was present only in shallow water on the table coral, *Acropora millepora*. One neoplasm (tumor) was observed, also on *Acropora millepora*. Several clusters of the snail, *Drupella*, were seen eating coral, and at least one patch where Crown-of Thorns starfish had eaten the tissue off of corals.

Overview of the coral fauna

The coral fauna of these southern Leyte Pacific coast reefs is very rich indeed. The average number of species found in one dive, and the number of species found in 10 dives, was higher than on most other Philippine reefs, and one dive produced one of the highest counts the author has made anywhere.

The total number of species found in this study, 251, is not particularly large for reefs in the Coral Triangle area of highest reef diversity. However, this was the result of a very limited number of dives, and is greater than the number found at most other Coral Triangle sites after a similar number of dives. As with all such reef studies, the total number of species found increases with additional effort in searching for species. Further study is certain to reveal many more species of coral. The average number of species in one dive, and the number in 10 dives are much more comparable measures of diversity, since they are based on equal effort. Also, it should be kept in mind that no reef in the Philippines has been found to have all 461 species that have been reported from the Philippines as a whole (Veron and Fenner, 2000). Many species

have spotty distributions based in large on chance factors, and corals not found on one reef are likely to be found on another nearby reef. The fact that 54% as many zooxanthellate scleractinian corals have been found on Padre Burgos reefs (251) as have been reported from the entire country (461: Veron and Fenner, 2000) after such a short study is indeed remarkable. Padre Burgos reefs are remarkably rich and deserve every effort to be used sustainably.

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