Tubbataha Reef National Marine Park in Palawan

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1.1 BIOPHYSICAL SETTING

The Tubbataha Reefs National Marine Park (Figure 1) covers some 33,200 hectares and lies in the middle of the Sulu Sea, about 150 kilometers away from Puerto Princesa, the capital city of Palawan. The reef structure consists of both fringing and atoll reefs and harbors a diversity of marine life equal to or greater than any other such area in the world In 1983, 46 coral genera, 300 coral species and at least 40 families and 379 species of fish were recorded. In 2000, 448 species from 57 families of fish were recorded.

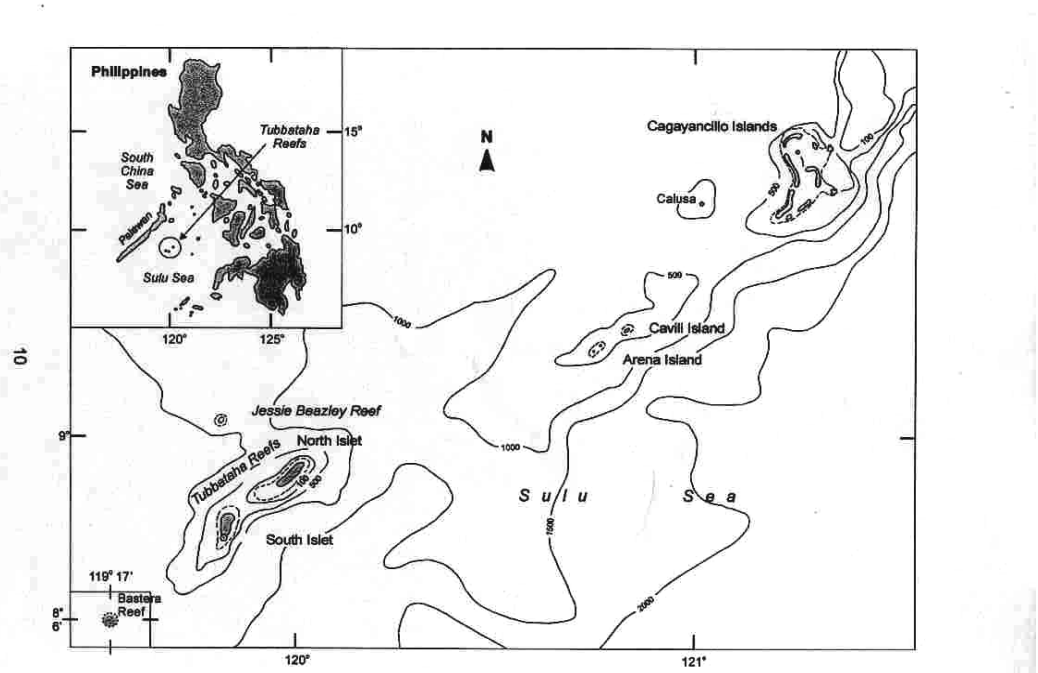

Figure 1. Location of Tubbataha Reefs in the Sulu Sea

In the late 1980's the condition of the once pristine reefs of Tubbataha deteriorated due to the destructive fishing methods used by fishermen. These destructive fishing methods were carried out not only by local fishermen but also by migrant fishermen from the South and Central Philippines and from Taiwan and China. Though these fishing activities were limited due to monsoon winds, the cover of living coral on the outer reef flats were surveyed to have decreased by 24% within 5 years. The introduction of seaweed farming in 1989 also threatened the reef but fortunately this was stopped in 1991.

1.2 SOCIOECONOMIC SETTING

The closest human settlement is the Municipality of Cagayancillo. It is distinct from other cultures in the Philippines and the inhabitants live independently from the mainstream of the country. It is mostly self sufficient and is physically separated from modern existence. Cagayancillo is a 6th class municipality and most of its inhabitants are self employed. Until about 1986 fishing was the primary source of income whilst farming was a secondary source. Seaweed culture became widespread after this time replacing fishing as the main source of cash income. In 1989 63% of the population was involved in seaweed farming while 67% relied on fishing. 35% of the population depended on agricultural farming and 2% were government employees. Though fishing and farming still provided income their purpose became relegated to subsistence and home consumption.

1.3 MANAGEMENT

A timeline of management events up to the present, follows:

- 1988 Park declared by Presidential Decree
- 1989 First draft of park management plan based on limited information
- 1990 Sporadic patrols started to stop illegal and destructive fishing
- 1991 Illegal seaweed farm removed from the Park
- 1992 Several research expeditions collected baseline data on the coral reef
- 1993 Park management plan re-drafted; illegal activities increase
- 1994 World Heritage status declared
- 1995 Presidential Task Force set up to implement management and provide funds; Philippine Navy assigned to guard park
- 1996 Coastal Resource Management Project (CRMP) refines management plan together with Japan International Cooperation Agency (JICA) support, Department of Environment and Natural Resources (DENR), Palawan Council for Sustainable Development (PCSD), World Wide Fund for Nature (WWF) and stakeholders in Palawan and Cagayancillo
- 1997 CRMP initiates study of legal basis for Protected Area Management Board (PAMB) to become functional together with DENR, PCSD and WWF; JICA sponsors planning and supports educational tour for media together with CRMP
- 1998 PAMB formed based on DENR/CRMP recommendations; management plans endorsed in a workshop with all stakeholders with support from PCSD, DENR, WWF, CRMP; coral bleaching event kills more than 20% of living coral cover
- 1999 PAMB becomes operational with a park manager appointed and supported by WWF based on management plan as designed by CRMP technical guidance; Global Environment Facility (GEF) 5-year funding approved for park management based on management plan; Marine Parks Center of Japan engaged CRMP and the Sulu Fund to facilitate the construction of a Park ranger station
- 2000 Management plan fully endorsed by the PAMB for implementation and fee structure designed based on willingness-to-pay study of CRMP and WWF; revenue of between US$50,000 and 100,000 to be collected; CRMP and the Sulu Fund jointly implement reef monitoring funded by volunteer divers

1.4 ISSUES AND THREATS

Destructive fishing methods such as the use of explosives, sodium cyanide and large scale extraction of sea turtles, precious and common shell, and giant clams have had a detrimental effect on the ecosystem as a whole in years past. Fish trawling, long lining for tuna and boat anchor damage have also affected the reef ecosystem and the abundance of fish but is now being recovered. The primary threats currently concern the ability of Park managers to maintain constant surveillance in Tubbataha to deter the threat of illegal entry of fishermen from the Philippines and other Asian countries. Also, the need to maintain good anchoring facilities is crucial for the increasing number of dive vessels entering the Park.

1.5 MONITORING, EVALUATION AND FEEDBACK

Methods for data collection

Substrate Cover. Snorkeling surveys covering 1 to 1.5 km of reef crest or reef flat at even depths (usually 2-4 meters) parallel to the beach and the drop-off were conducted at each site. The snorkeler stopped at 50-meter intervals to estimate the bottom cover parameters for one square meter of bottom area. Each snorkel observer attempted to make 15 stations on one snorkel survey.

Scuba surveys were conducted using 50-meter transect lines laid parallel to the reef drop-off at a depth ranging from 6 to 8 meters. The living and dead substrate immediately under the transect line was recorded by category under each 25-centimeter segment of the line. Each substrate type was listed on a slate board and checked according to incidence under the transect line. The number of each substrate type was translated into percent of substrate cover for each parameter listed on the data forms. Invertebrate indicators were counted within a two-meter wide strip along each transect line.

Indicator Species. During both snorkeling and scuba surveys at a study site, the research team recorded all species of butterflyfish seen and any rare or large marine life.

Fish Species Richness and Density. These data was collected by recording the diversity and abundance of 19 families of fish in a 500-meter square area estimated by using a 50-meter transect line as the upper boundary normally laid at about 7 meters depth. The observers swam 10 meters along the line, then down the slope and 10 meters parallel to the line and then back to the line and so on in this pattern until reaching the transect end. This procedure was repeated in the opposite pattern back to the beginning of the transect line. The number of species per family and number of individuals per species were noted using logarithmic categories for those species with large numbers of individuals.

Daily Log of Human Activities. Each day some volunteers recorded observations on human use of the site being surveyed. These observations included fishing, boats, dropping of anchors, divers, shoreline development and any other activities with potential impacts.

All survey methods used were consistent with Uychiaoco, et al., 2001 with those used by the Reef Check Foundation.

SUMMARY OF TRENDS AND FINDINGS

Table 1 shows summaries of the mean percent of reef substrate from the 7 sites surveyed from 1984 to 2000. Scuba transect data collected at 5-7 meters showed an increase in coral cover up to 1996 and then a decline in 2000 due to coral bleaching. There is no evidence of large-scale physical damage from either dynamite fishing or the use of sodium cyanide. The big natural impact of concern is the major bleaching incident of late 1998 during which coral all over the southern Philippines were affected. Improvements in living coral cover up to 1996 can be attributed to improved management and protection.

Table 1. Mean percent of living and dead substrate cover for the Tubbataha Park area in Palawan , 1984 to 2000, at deep (1.5-15 m) and shallow (1-7 m) reef areas

	Deep					Shallow				
	1984	**1992**	**1996**	**2000**		**1984**	**1989**	**1992**	**1996**	**2000**
BENTHOS										
Hard Coral	39.6	34.1	47.2	27.1		48.2	25.1	33.2	46.8	24.6
Soft Coral	7.4	20.6	16.9	5.1		7.6	13.4	7.2	3.2	1.8
Abiotic	49.0	41.6	33.4	51.8		40.2	52.6	55.8	38.1	65.8
White Dead Standing Coral	4.0	3.8	2.5	1.4		4.0	8.8	3.8	11.9	2.1
Dead Coral With Algae	~	~	~	14.7		~	~	~	~	5.6
GRAND TOTAL	**100.0**	**100.0**	**100.0**	**100.0**		**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Other Relevant Information										
Depth Range (m)	1-15	2-15	5-10	5-7		2-7	2-7	1-7	1-3	2-3
Sample Size (50m-transects/1m²stations)	3	15	29	120		4	10	30	9	79

Table 2 shows the mean fish abundance in the Tubbataha Reef Marine Park. Six of the seven coral reef areas surveyed are legally protected from fishing. Only Bastera reef is outside the park. The fish abundance survey reflects the relative success of Tubbataha Park management since the abundance of fish per unit area (density) is 26% higher on average than in 1996. Increases in the density of fish (abundance per unit area), are statistically significant in some cases. Significant increases in certain target families of fish such as grouper, emperor breams, jacks and several others in particular sites can be attributed to the lack of fishing pressure over the last 10 years.

Table 2. Mean fish abundance (density/500 m2) for the Tubbataha Reef area, 1992 to 2000.

FISH FAMILY	1992 n=5	1996 n=11	2000 n=36
Surgeonfish (*Acanthurids*)*	213.20	120.8	178.39
Rabbitfish (*Siganids*)*	1.20	4.4	2.67
Groupers (*Serranids*)*	9.80	9.0	17.07
Snapper (*Lutjanids*)*	29.00	15.8	10.94
Sweetlips (*Haemulids*)*	3.00	1.9	4.56
Emperors (*Lethrinids*)*	1.80	3.6	8.04
Jacks (*Carangids*)*	7.20	2.1	9.84
Fusiliers (*Caesionids*)*	148.80	76.5	57.99
Spinecheeks (*Nemipterids*)*	0.60	24.7	7.71
Goatfish (*Mullids*)*	53.40	44.3	18.99
Parrotfish (*Scarids*)*	90.60	56.4	64.09
Rudderfish (*Kyphosids*)*	0.00	1.7	8.26
Triggerfish (*Balistids*)	139.20	51.9	289.07
Butterflyfish (*Chaetodonids*)	55.00	44.6	43.93
Angelfish (*Pomacanthids*)	28.80	7.9	32.10
Wrasses (*Labrids*)	160.80	94.4	115.34
Damselfish (*Pomacentrids*)	1012.20	1653.2	1837.02
Fairy Basslets (*Anthids*)	955.80	787.7	924.12
Moorish Idols (*Zanclus cornutus*)	17.40	20.2	9.27
Total (all reef species)	2927.80	3020.6	3639.40
Total (Target reef species)	558.60	360.8	388.51

Note:
* Target species sought by fishermen
1992- 5 sites
1996- 5 sites
2000- 7 sites

1.6 FUTURE DIRECTIONS AND RECOMMENDATIONS

The management issues in Tubbataha National Marine Park have evolved substantially from 10 years ago. This is a welcome turn of events because Tubbataha is being managed and protected and the management plan endorsed in 1999 is being implemented. This is a change from 1989 when the reefs were at their lowest point and illegal fishing was rampant. Now with our increased knowledge of the area, there are still many things to do to improve the protection of Tubbataha so that it is long lasting and effective. Specific needs to improve conservation of Tubbataha from observations of 2000, 1996, 1992 and 1989 are:

1. Active patrols are the single most important deterrent to prevent illegal fishermen and boats from entering the park.
2. The Park Navy personnel can take a more active role in park management.

3. More and better anchor buoys are needed to moor visiting boats.
4. Improved management of tourism in general to Tubbataha is essential.
5. More diver and boat operator education is needed
6. Raising awareness about waste disposal is needed
7. User fees, once collected, need to be managed credibly and made transparent and allocated for park management.
8. Monitoring and evaluation information needs to be shared among all stakeholders.

In conclusion, the only mitigating measure for the expected increasing intensity and frequency of elevated sea surface temperatures related to the "El Niño" phenomena that occurred in 1998 is improved management of coral reefs. Tubbataha Reefs lost more than 20% living hard coral cover in 1998 due to warm water bleaching. The Reefs can regain this loss if they are protected from human caused damage.

1.7 REFERENCES

Arquiza, Yasmin D. and White, Alan T. 1999. Tales from Tubbataha, Natural History, Resource use and Conservation of the Tubbataha Reefs, Palawan, Philippines. Bookmark, Philippines. 190 pp

Uychiaoco, AJ., S.J. Green, M.T. dela Cruz, P.A. Gaite, H.O. Arceo, P.M. Aliño and A. White. 2001. Coral Reef Monitoring for Management. University of the Philippines, Marine Science Institute, United Nations Development Programme Global Environment Facility-Small Grants Program, Guiuan Development Foundation, Inc., Voluntary Service Overseas, University of the Philippines Center for Integrative and Development Studies, Coastal Resource Management Project and Fisheries Resource Management Project. 110 p.

White, A.T., Courtney, C.A., Meyer, M.C., Alvarado, A, White, E., Apurado, J., Christie, P.C..2000. Summary Field Report 'Saving Philippine Reefs' Coral Reef Monitoring Expedition to Tubbataha Reef National Marine Park, Sulu Sea, Philippines May 21-30, 2000 Coastal Resource Management Project and the Sulu Fund for Marine Conservation Foundation, Inc.

White, A.T. 1984. Marine parks and reserves: management for Philippine, Indonesian and Malaysian coastal reef environments. Department of Geography, University of Hawaii, Phd Dissertation, unpublished, 275 pp

White, A.T., Calumpong, H. 1993. 'Saving Tubbataha Reefs', Eathwatch Expedition to the Philippines '92 Siliman Journal, 36(2): 77-105