IUCN Conservation Outlook Assessment 2017 **(archived)**
Finalised on 09 November 2017

Please note: this is an archived Conservation Outlook Assessment for Tubbataha Reefs Natural Park. To access the most up-to-date Conservation Outlook Assessment for this site, please visit https://www.worldheritageoutlook.iucn.org.

Tubbataha Reefs Natural Park

SITE INFORMATION

Country:
Philippines
Inscribed in: 1993
Criteria:
(vii) (ix) (x)

Site description:
The Tubbataha Reef Marine Park covers 130,028 ha, including the North and South Reefs. It is a unique example of an atoll reef with a very high density of marine species; the North Islet serving as a nesting site for birds and marine turtles. The site is an excellent example of a pristine coral reef with a spectacular 100-m perpendicular wall, extensive lagoons and two coral islands. © UNESCO

SUMMARY

2017 Conservation Outlook

Good with some concerns

The conservation outlook for Tubbataha Reefs Natural Park, a no-take reserve that comprises 78% of the no-take area of the Philippines, is positive in relation to present management and current threats which, for the most part, are being addressed and mitigated. The values of the Park are being maintained and enhanced due to effective management. The site has very effective planning, outreach, enforcement and implementation capabilities. Recent successful efforts to secure the area as a Particularly Sensitive Sea Area (PSSA) to mitigate against shipping impacts is illustrative of these efforts. However, additional efforts are required to address some of the remaining issues, including further development of the sustainable financing plan and design and implementation of a dive management plan. Potential future threats raise concerns because of their unknown nature. Marine debris is always increasing from sources far from the Park. The potential of sea surface temperature increases due to climate change could have a severe negative impact on the coral reef ecosystem in the future.

Current state and trend of VALUES

Good
Trend: Stable

The biophysical and environmental resources of coral reefs and their associated high diversity of marine life as well as their high reproduction values and atoll reef formation are being well maintained in the Park and are in excellent condition based on current management and improvements from the past conditions prior to the implementation of protection for the Tubbataha Reefs. The associated reef habitats of seagrass beds, reef slopes, small islets with nesting seabird populations are equally well maintained and improving in ecological integrity. Coral disease prevalence in the monitoring sites in TRNP is fairly low compared to other surveyed sites in the Philippines (TMO 2015b). Water pollution impacts are low and the overall system serves as a laboratory for study,

education and research as well as a control for the high biomass of marine life no longer typical in this part of the world.

Overall THREATS

Low Threat

Almost all current threats are low to very low but vigilance is needed to maintain these threats at a low level. Potential threats, mainly related to climate change, are mostly beyond the control of Park managers and the Philippines but are considered to be high if they occur.

Overall PROTECTION and MANAGEMENT

Highly Effective

Overall, the protection and management of Tubbataha is excellent. Overseen by a joint, stakeholder- inclusive management board and with an active outreach program promotes a high degree of compliance. This is further encouraged by an active enforcement presence. There is a current general management plan (review 2018) and several sub-plans (such as enforcement and interpretation). These plans are being implemented and, in addition, consideration should be given to:
1. Further development of the sustainable financing plan
2. Design and implementation of a dive management plan.
3. Incorporating a finer-scale zoning plan into general management plan that explicitly recognises and expands no-access zones.
4. Continued development and implementation of the interpretation and outreach plan
5. Design and implementation of a regular and effective monitoring program.
6. Implementing the plan to construct a new ranger station with enhanced monitoring and enforcement capability as well as visitor interpretation facilities and improved living quarters for rangers.

FULL ASSESSMENT

Description of values

Values

World Heritage values

- **Pristine coral reefs with a large diversity of associated marine life**
  Criterion:(vii)

  Tubbataha Reefs Natural Park contains excellent examples of pristine reefs with a high diversity of marine life. The property includes extensive reef flats, reef lagoons and perpendicular walls reaching over 100m depth, as well as large areas of deep sea. The remote and undisturbed character of the property and the continued presence of large marine fauna such as tiger sharks, manta rays, cetaceans and turtles, and big schools of pelagic fishes such as barracuda and trevallies add to the aesthetic qualities of the property (SoOUV, 2009). The coral reef atoll formation which includes all common reef-associated habitats, is a remote area that is largely undisturbed and with a wide variety of reef topographies, slopes and reef flats within seas of clear water with visibility ranging from 15 to 30 m. (Ledesma et al 2005)

- **High reproduction among large diversity of reef associated marine life**
  Criterion:(ix)

  Tubbataha Reefs Natural Park lies in a unique position in the middle of the Sulu Sea and is one of the Philippines’ oldest ecosystems. It plays a key role in the process of reproduction, dispersal and colonization by marine organisms in the whole Sulu Sea system, and helps support fisheries outside its boundaries (Campos et al, 2006). The relatively pristine nature of the

coral reef and its high diversity of marine life allows high level reproduction among its marine life which populates the surrounding waters with larvae and repopulates the reef. The rapid re-colonisation of corals destroyed by ship groundings in 2013, as reported by TRNP (TMO 2015a) is testament to the abundance of coral spawn and optimal conditions at TRNP

▶ Laboratory for study of ecological and biological processes in pristine condition

Criterion:(ix)

The area serves as a natural laboratory for the study of ecological and biological processes, displaying the ongoing process of coral reef formation and supporting a large number of marine species dependent on reef ecosystems. The increasing shark populations indicate ecological balance and the area offers a control site for the study of the responses of a protected reef system to the impacts of climate change (TMO 2015a). Unlike other sites in the country, research in 2015 showed that increase in sea surface temperature had little significant impact on coral in Tubbataha (TMO 2015a,b).

▶ High diversity of common and threatened marine species including seabirds

Criterion:(x)

Tubbataha supports 360 species of corals (almost 90% of all coral species in the Philippines and 72% of the corals worldwide), 7 species of seagrass and 66 species of algae. The property also supports 13 species of cetaceans, 23 species of rays and sharks, and an estimated 600 species of fish, including healthy and growing populations of species, such as the Napoleon wrasse (Cheilinus undulatus) and bump-head parrotfish (Bolbometopon muricatum) that are threatened elsewhere. Of the 18 species of sea cucumber, some of which are larger than reported anywhere else, 3 are endangered (Dolorosa 2015). There are seven species of giant clams, all protected under CITES (Dolorosa et al 2015). Pelagic species such as jacks, tuna, barracuda and whale sharks (Rhincodon typus) are common. Tubbataha has an increasing population of endangered green (Chelonia mydas) (see Rey et al 2017) and critically endangered hawksbill (Eretmochelys imbricata)sea turtles that feed, rest and nest in the area. The park is the only site in the Philippines of global

importance for the conservation of seabirds and there are healthy populations of 6 seabird species. The critically endangered Christmas Island Frigate (Fregata andrewsi) is a regular visitor to the property and North Islet is the breeding ground of an endemic subspecies of black noddy (Anous minutus). The park contains 181 threatened and near-threatened species of marine life (SoOUV, 2009; White et al 2012; Jensen 2010, TMO, 2012, 2015a,b).

▶ **High biomass of reef fish, invertebrates and associated organisms in the Coral Triangle region**
Criterion:(x)

Over 25 years of no fishing has allowed the biomass of reef organisms to increase so that Tubbataha has a higher biomass per unit area of reef compared to any reef in the Philippines and comparable with the best reefs in Southeast Asia and globally (TMO 2015a). The site also has among the highest population densities of white tip (Triaenodon obesus) and grey (Carcharhinus amblyrhynchos) reef sharks (Murray et al 2016a, 2017a), sea cucumbers (Dolorosa 2015) and topshells (Tectus niloticus) (Jontila et al 2014) reported in the scientific literature.

Assessment information

Threats

Current Threats

Low Threat

Current threats mostly pertain to either present uses of the site area through tourism and some potential illegal fishing and those restricted to areas outside the site related to shipping and the accumulation of debris in the Sulu Sea from various sources outside the site. The overall level of current threats is low based on recent history, recent designation as a Particularly Sensitive Sea Area and high management capability.

► Solid Waste

High Threat
Inside site, scattered(5-15%)

A growing concern is the increase in floating debris in and around the Park that affects marine life (IUCN Consultation, 2016). However this is a generic and widespread problem and not worse in Tubbataha than anywhere else.

► Fishing / Harvesting Aquatic Resources

Low Threat
Inside site, scattered(5-15%)

Fishing is not allowed inside the Park and rarely occurs (last reported in 2011) but vigilance is needed. Fishing outside the Park could encroach into the Park on the outer boundaries where surveillance is difficult . Information, Education and communication (IEC) campaigns (TMO 2014b) implemented in the local communities, where most apprehended illegal fishers are based, have greatly contributed to enhancing compliance with the ‘no-take’ status of the property, as evidenced by the low and declining number of illegal fishing related arrests made . Illegal fishing from international vessels is potentially more serious than from local fishers. Regular patrols are conducted. The no-fishing zone now extends to the boundaries of the Buffer Zone (IUCN Consultation, 2017). Threat is rated as "low" due to effective patrolling and outreach strategies

► Shipping Lanes

Low Threat
Inside site, localised(<5%)

Ships pass close to the Park on a regular basis and present a threat for either grounding or pollution. Rangers report ship numbers passing through and close to the Buffer Zone increased from 3358 in 2010 to 5,546 in 2013 (TMO 2014a). In 2013 Heij et al (2013)undertook a risk analysis and detected increasing risk for the park from shipping traffic. In that same year the USS Guardian grounded on South Atoll causing damage to 2,346 sqm of coral and a Chinese fishing vessel also ran aground damaging 3,902 sqm of coral (TMO 2013). A resolution recognizing the TRNP as a Particularly Sensitive Sea Area was adopted in July 2017. Designation as an Area To Be Avoided (ATBA),

adopted at the 98th Session of the Maritime Safety Committee (MSC 98) held on 7-16 June 2017, will take effect on 1 January 2018 after completion of the notification period in the Safety of Navigation circular. The ATBA extends to the boundaries of the TRNP Buffer Zone. New charts identifying TRNP as a PSSA and ATBA will be prepared by the National Mapping and Resource Information Authority, and Notice to Mariners prepared by the Philippine Coast Guard (IUCN Consultation, 2017, TMO 2017). These measures should serve to significantly reduce the level of threat from shipping.

► Hyper-Abundant Species

Low Threat
Inside site, localised(<5%)

The proliferation of red-footed boobies (Sula sula) in TRNP results in intense fertilization from droppings and the denudation and death of trees which are the habitat of other tree- breeding seabirds (TMO 2011). The threat is very localised.

► Tourism/ visitors/ recreation

Low Threat
Inside site, localised(<5%)

Dive tour boats are well managed (IUCN Consultation, 2016) but in excess could detract from the visitor satisfaction and have impacts on the reef ecosystem. Although a tourism plan has been completed (TMO 2013) it does not adequately address dive tourism, the dominant use of the reef. Potentially serious cumulative effects if not monitored.

Potential Threats

High Threat

Potential threats are mostly related to climate change that could cause repeated episodes of sea surface temperature increases causing coral bleaching that are already being experienced and the likely impacts of ocean acidification in the future.

► Oil/ Gas exploration/development

Low Threat
Inside site, localised(<5%)

Outside site

There is interest in the Philippines to explore for oil/gas in the Sulu Sea. However exploration is forbidden within the park and buffer zone. May be some impacts from outside.

► Ocean acidification

High Threat
Inside site, throughout(>50%)

Ocean acidification will affect the reef when it occurs, but timeframes are highly uncertain.

► Temperature extremes

High Threat
Inside site, throughout(>50%)
Outside site

Sea surface temperature changes caused a major bleaching in Tubbataha in 1998 but recent studies (TMO 2015b) suggest relatively high resilience of reefs.

► Earthquakes/ Tsunamis

Very Low Threat
Inside site

Earthquakes have damaged the reef in the past and could in the future while a tsunami will likely have only a minor impact

Protection and management

Assessing Protection and Management

► Relationships with local people

Highly Effective

One of the main founding principles for park management is stakeholder involvement and there is extensive local stakeholder representation on the Management Board. The park undertakes extensive outreach activities in

local communities involving target groups ranging from fishers to school children. Ten percent of park entrance fees go to local communities for various projects. Management planning engages local stakeholder groups.

► Legal framework

Highly Effective

The legal framework is comprehensive and effective, extends to the buffer zone and now includes international frameworks as evidenced by recent designation as a PSSA.

► Enforcement

Highly Effective

A Compliance and Enforcement Plan was completed in 2012 that outlines the main procedures, parties and activities related to enforcement (TMO 2012b). There is an active interception and enforcement program by the combined navy, coastguard and park personnel stationed on site. Early violations were related to illegal fishing (eg see Dygico et al 2013) but since 2013, violations mostly related to ship grounding and tourism including coral damage (ship grounding), non-payment of conservation fees and late application of permit to operate. Most tourism-related violations were settled right away, through payment of fines. Warnings were given to dive operators for violation of protocol and standards. Since 2012, the fines for violations of the Tubbataha Reefs Natural Park Act of 2009 or RA 10067 amounted to a total of Php 58,934,730.00 (IUCN Consultation, 2017).

► Integration into regional and national planning systems

Highly Effective

Tubbataha Park is protected by national law and is part of the National Integrated Protected Areas System (NIPAS) in the Philippines and also a flagship site within the Coral Triangle MPA System (TRNP Act of 2009)

► Management system

Highly Effective

The management regime is focused on strict protection, and delivered through a management consortium consisting of the Philippine central,

provincial and municipal level of government, NGOs and some private sector donors. The management operations are carried out by the Tubbataha Management Office (TMO) based in Puerto Princesa.

▶ Management effectiveness

Highly Effective

The management systems work and are practical, resulting in one of the best protected coral reef systems in the world. TRNP employs three management effectiveness assessment tools. These include two external assessments led by the Department of Environment and Natural Resources (DENR) and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) - MPA Management Effectiveness Assessment Tool (MPA MEAT) and Management Effectiveness Tracking Tool (METT); and an assessment led by the Tubbataha Protected Area Management Board (TPAMB) following the MEE framework of the Great Barrier Reef Marine Protected Area.

MPA MEAT has been used in TRNP in 2011, 2014 and 2016. During the first two assessments, TRNP was able obtain the highest score for all parameters except the parameter on 'financially self-sustaining in the last seven consecutive years'. In 2016, the assessors came up with a consensus that this parameter is already achieved because the MPA has been successfully operating in the last two decades.

METT evaluates the management based on the IUCN management effectiveness framework with the following indicators: context, planning, input, process, output and outcome. This tool has been used in TRNP twice, in 2014 and 2016. TRNP scored the lowest in the inputs which mainly pertains to the security of budget. The conservation fees from divers cover approximately 50% of the annual operational costs for managing the park. This mainly funds enforcement activities, equipment, staff benefits and compensation and other administrative operating expenses. Other activities such as research, IEC and capacity building are funded by external grants.

MEE following the tool used by the GBRMPA also employs the IUCN indicators, but with focus on the management topics identified by the TPAMB. The TPAMB has identified nine priority management topics categorized under values (biodiversity, community benefits), impacts (water quality, shipping,

illegal fishing, marine pollution, climate change and extreme weather) and uses (research and tourism). The results show that TRNP is effective in managing tourism and the threats of fishing, but is only partially effective in managing shipping activities. Hopefully this will improve with the recent PSSA designation. The remaining management topics were scored as mostly effective.

► Implementation of Committee decisions and recommendations

Highly Effective

In 2009 when the World Heritage Committee approved the extension of the property, it also requested that the State Party put in place a program of ecological monitoring and develop a sustainable tourism strategy. In its Decision 35COM 7B.17 the World Heritage Committee commended the State Party for the progress achieved in implementing the recommendations, but also urged the State Party to expedite designation of the Sulu Sea as a Particularly Sensitive Sea Area. (World Heritage Committee, 2011). This was achieved in July 2017.

► Boundaries

Mostly Effective

Boundaries, including the buffer zone, are established by national law and publicized for all mariners and stakeholders (TRNP Act of 2009). The boundaries are adequate and effectiveness should improve given recent PSSA designation.

► Sustainable finance

Some Concern

The Park has revenue from tourism, national and provincial government allocations and from small grants. Dive tourism provides about half of yearly budget (IUCN Consultation, 2017) putting constant pressure to increase tourism but with no detailed dive tourism management plan in place.

► Staff training and development

Mostly Effective

Staff are generally well trained and highly motivated and perform their tasks

well (IUCN Consultation, 2016). On-site operations are heavily reliant on the personnel and logistic support from the Navy and Coastguard (see Songco 2017) and continual upgrading of staff in terms of skills and equipment is necessary to maintain effectiveness. Staff are employed on a contractual basis (TMO 2015a) which reduces the incentive for long term investment by staff in the Park.

► Sustainable use

Mostly Effective

The Park is only used directly for tourism and some monitoring and research. These should be relatively low-impact activities although effective monitoring systems need to be implemented to ensure that this is the case. The latest management plan (TMO 2015a) identifies providing support to other MPAs in the municipality in terms of sustainable use as an outreach effort that will benefit marine conservation throughout the Sulu Sea, including Tubbataha. This is a very forward looking strategy if TRNP has the resources to engage in such a way. In addition 10% of the revenues from TRNP are allocated to the municipality to support conservation-friendly livelihood initiatives by local people, another very forward looking management strategy.

► Education and interpretation programs

Highly Effective

The Park has offered interpretation and educational programs since 1997 and has a comprehensive information, education and communication plan for 2015-2020 in place (TMO 2014b). The plan identifies target audiences, key messages and activities. Activities are under two main groupings, public outreach and production of information materials. Full details of activities are provided in the plan and demonstrate focus (eg diver briefings before departure), innovation (community “caravans”) and partnership building in both design and delivery. The new ranger station will also contain some interpretive presentations and volunteers/researchers have added useful materials on the TRNP website and elsewhere. TMO personnel undertake outreach programs to communities all around Palawan to raise awareness of the importance of TRNP (see http://tubbatahareef.org/wp/education_outreach). Field guides have also been produced both by the TMO and also in co-operation with research

institutes such as LAMAVE (eg TMO and LAMAVE nd Guide to Sharks and Rays). An evaluation of the IEC program was undertaken in 2013 and a follow-up review now that the new plan is in place would be timely.

► Tourism and visitation management

Mostly Effective

Lack of tourism impact monitoring on the property's Outstanding Universal Value (OUV) represents a management gap (TMO, 2011; IUCN Consultation, 2017). There is need for a dive management plan based upon Limits of Acceptable Change methods and zoning (eg see Roman et al 2006, Dearden et al 2010, Augustine et al 2016) that will optimise visitor numbers while ensuring resource protection. A diver exit survey was undertaken in 2015 (TMO 2015c) giving important insights into diver profiles, motivations, satisfactions and willingness to pay among other factors.

► Monitoring

Mostly Effective

Monitoring is done annually by Park staff, some outside researchers and one volunteer scientific group which visits the Park for monitoring every 4 years. The latest management plan states the need to entrench regular monitoring to inform timely and judicious decision-making and specifically mentions the need for diver impact monitoring (TMO 2015a)

► Research

Highly Effective

Most research is related to monitoring of Park resources over time to determine cause effect relationships for changes in the coral reef and fish. The management plan identifies the need for more targeted research on topics of management interest, such as diver impacts. The site has recently become more used on an ongoing basis by researchers as a "natural laboratory" using innovative methods such as Baited Remote Underwater Videos (BRUVs) looking at shark and other species populations and distributions, and conservation needs (eg Murray et al 2016a,b; Roberts et al 2017). The TMO has helped sponsor innovative research methods such as the use of citizen science for recording elasmobranch species numbers and distributions (see Murray et al 2016c). The park is very welcoming to outside

researchers and provides support wherever possible (IUCN Consultation, 2016).

Overall assessment of protection and management

Highly Effective

Overall, the protection and management of Tubbataha is excellent. Overseen by a joint, stakeholder- inclusive management board and with an active outreach program promotes a high degree of compliance. This is further encouraged by an active enforcement presence. There is a current general management plan (review 2018) and several sub-plans (such as enforcement and interpretation). These plans are being implemented and, in addition, consideration should be given to:
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2. Design and implementation of a dive management plan.
3. Incorporating a finer-scale zoning plan into general management plan that explicitly recognises and expands no-access zones.
4. Continued development and implementation of the interpretation and outreach plan
5. Design and implementation of a regular and effective monitoring program.
6. Implementing the plan to construct a new ranger station with enhanced monitoring and enforcement capability as well as visitor interpretation facilities and improved living quarters for rangers.

► Assessment of the effectiveness of protection and management in addressing threats outside the site

Highly Effective

All reasonable measures have been taken by the Park to protect OUV through measures such as the buffer zone and PSSA establishment. Remaining outside threats, such as pollution and the impacts of global climate change are largely beyond the abilities of the park to address

► Best practice examples

Tubbataha Reef represents 78% of the no-take area of MPAs in the Philippines in the heart of the Coral Triangle, the richest marine ecosystem in the world. It is a critically important MPA and management has taken many

innovative steps for enhanced protection providing a best practice example of a truly no-take reserve in this highly human-influenced region.

State and trend of values

Assessing the current state and trend of values

World Heritage values

▶ **Pristine coral reefs with a large diversity of associated marine life**
Low Concern
Trend:Stable

Stable and improving based on monitoring results (TMO 2015b). Monitoring suggests that both hard and soft coral cover are stable (Dygico et al 2013). The deep sites are in ‘good’ condition while the shallow sites have ‘excellent’ coral cover. In 2015 twenty locations were monitored for water quality. Out of the 15 parameters, TRNP passed the standards for the highest class for tourism and marine park waters for pH, dissolved oxygen, salinity and biological oxygen demand. The normal levels for the following parameters are still being established for TRNP: temperature, total suspended solids, color, nitrates and phosphates. Oil and grease concentration decreased from last year but most sites inside the lagoon exceeded 1mg/L maximum for Class SA. Some sites failed in the total coliform levels for Class SA. However, all sites passed standards for Class SB (recreational/fisheries waters) (TMO 2015b)

▶ **High reproduction among large diversity of reef associated marine life**
Good
Trend:Improving

Evidence of increased population of vulnerable species such as Napoleon wrasse, (Cheilinus undulatus), groupers, small pelagic fish that were less abundant in the past, sharks, and a few others (Ledesma et al., 2005; White et al 2012, TMO 2015b, Roberts et al 2017, Murray et al 2017a)

▶

Laboratory for study of ecological and biological processes in pristine condition

Good
Trend:Improving

Stable and improved based on monitoring results (TMO 2015b). Used as natural laboratory for shark studies (eg Murray et al 2016b) and baseline for climate change impacts (TMO 2015b). Dolorosa (2015) suggests that TRNP provides ideal site for sea cucumber research due to diversity and size of cucumbers and lack of exploitation

► High diversity of common and threatened marine species including seabirds

Good
Trend:Improving

Stable and improved for most species based on monitoring results (Ledesma et al., 2005; White et al., 2012; Jensen 2005, TMO 2015b).

► High biomass of reef fish, invertebrates and associated organisms in the Coral Triangle region

Good
Trend:Improving

Since 1997, yearly monitoring has been conducted to assess reef health and to understand how the reef responds to disturbances. Five sites are assessed in Tubbataha annually to monitor the condition of the fish populations and benthic community. The latest report available (TMO 2015b) estimated average fish biomass for the whole Tubbataha at 444.8 metric tons/km2 . Healthy reef ecosystems in the Philippines are projected to produce 21 to 40 mt/km2 of fish (Nañola et al. 2006). All monitoring sites showed improvement in both biomass and density values compared to the previous monitoring year The combined biomass and density of families belonging to commercially important fish such as Acanthuridae, Labridae, Lutjanidae, Scaridae, Siganidae and Serranidae from 1998 to 2011 show an increasing trend (Dygico et al 2013) suggesting an absence of fishing activity. The combined total population of all breeding seabirds in 2015 was 187% higher than the first inventory conducted in 1981 (TMO 2015b).

Summary of the Values

► Assessment of the current state and trend of World Heritage values

Good

Trend: Stable

The biophysical and environmental resources of coral reefs and their associated high diversity of marine life as well as their high reproduction values and atoll reef formation are being well maintained in the Park and are in excellent condition based on current management and improvements from the past conditions prior to the implementation of protection for the Tubbataha Reefs. The associated reef habitats of seagrass beds, reef slopes, small islets with nesting seabird populations are equally well maintained and improving in ecological integrity. Coral disease prevalence in the monitoring sites in TRNP is fairly low compared to other surveyed sites in the Philippines (TMO 2015b). Water pollution impacts are low and the overall system serves as a laboratory for study, education and research as well as a control for the high biomass of marine life no longer typical in this part of the world.

Additional information

Benefits

Understanding Benefits

► Outdoor recreation and tourism

Tubbataha is a major (world class) diving destination for both Filipinos and international tourists. It provides tourism revenues to Park management as well as indirect economic benefits to tourism related enterprises in Palawan Island and in Cagayancillo Municipality. It also provides education to Filipinos and international visitors.

► Importance for research, Contribution to education

Tubbataha, being a no extraction marine reserve, located in a remote area without much pollution and under good management, means that it can serve as a control for how coral reef ecosystems function in a natural setting, and how it will change over time in relation to climate change. Recent acoustic research on grey reef sharks (Murray et al 2017a) illustrates laboratory function and authors particularly highlight value of having large no-take MPAs available for studies of this nature.

► Fishing areas and conservation of fish stocks

Oceanographic models show that Tubbataha is a major source and sink of coral and fish larvae that are continuously broadcast throughout neighboring fishing grounds and reefs in the Sulu Sea and beyond(TMO 2015a)

Summary of benefits

The benefits of Tubbataha extend to the regional and global. The income brought by divers is a valuable addition to the regional economy, although no firm estimate of this value exists. In addition Tubbataha is a healthy coral reef ecosystem that provides ongoing export of organisms to other sites in the Sulu Sea. Some of these organisms become a direct enhancement of the human food chain. In the wider sense, as a well-managed, no-take marine reserve of considerable size located in the midst of the most diverse global marine ecosystems, Tubbataha provides ongoing global benefits as an outdoor laboratory for research and education.

Projects

Compilation of active conservation projects

№	Organization/individuals	Project duration	Brief description of Active Projects

1	Coastal Conservation and Education Foundation, Inc.		Conducts monitoring of Tubbataha Reefs every 4 years and compiles a complete report of the reef status. This monitoring uses volunteer divers who cover the cost of the trip so trained divers who want to contribute are always encouraged to join the expedition.
2	Tubbataha Management Office (TMO)		The TMO manages the Tubbataha Park in its entirety and coordinates all activities within the Park and assists to source resources for Park management
3	World Wildlife Fund Philippines		WWF Philippines provides monitoring support to the TMO and use of their boat to travel to Tubbataha for routine operations. WWF also provides support for some personnel assisting with Park management.
4	Large Marine Vertebrates Research Institute (LAMAVE)	From: 2015 To: 2020	LAMAVE has initiated an energetic and innovative program of research at Tubbataha ranging from elasmobranch assessments through to the development of citizen science and outreach projects (eg see Murray et al 2017a,b, Roberts et al 2017). Co-operating with a wide range of international partners and deploying long term researchers to work in partnership with the TMO has resulted in a wide range of exposure for the Park, plus capacity enhancement for the staff. LAMAVE is the largest independent, non-stock, non-government organization dedicated to the conservation of marine megafauna and the marine environment in the Philippines.

Compilation of potential site needs

№	Site need title	Brief description of potential site needs	Support needed for following years
1	Dive management Plan	Needs to develop and implement a dive management site plan to ensure that cumulative impacts from diving do not become a detriment to the site	From: 2018 To: 2020

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