# Conservation Of Aquatic Biodiversity And Environmental Sustainability

## Introduction

Conservation of aquatic biodiversity has been one of the major concerns with respect to maintaining environmental sustainability, food stock production and regulation, recreational and commercial water activities. Humans have been dependent on aquatic resources for food, medicines, tourism, recreational and commercial needs since the early settlement of man and the commencement of industrialization.

Marine biodiversity is the variability of aquatic life in all forms, levels and combinations and the ecosystem within which it sustains and thrives. It can be classified into a three-tiered structure and the functioning of the dynamic processes links one tier to the other hence maintaining the integral structure within(Australia, 2003). The tiers can be classified into:

- Genetic diversity – variety and rate of occurrence of the genes within each species.
- Species diversity – variety and frequency of the different species.
- Ecosystem diversity – variety and frequency of the different habitats and ecosystems shaping them into one.

Often the implication and importance of these processes are appreciated or concerned about only after they have been damaged or lost in the process of satisfying human needs.

Marine protected area is a boundary within the oceanic spread dedicated to the protection and maintenance of biodiversity and of other natural and cultural resources associated to that zone and managed through legal and other effective means (Australia, 2003). MPAs include marine parks, natural reserves and locally managed marine areas that protect the designated area's reefs, seagrass beds, archaeological sites, salt marshes, mangroves, and wildlife within their assigned areas (Marine Biodiversity: Patterns and Processes, Assessment, Threats, Management and Conservation, 2006).

The marine parks have proved to be successful in conserving most of the resources and habitats within its vicinity, but there still seems to be a slow progress when it comes to regulating the count of water species due to the constant factor of external stress affecting the progress or the working of a marine park.

## Marine Parks

Marine parks have the opportunity to showcase their unique and distinctive sea life and iconic natural features along with exceptional opportunities for students, educators, and scientists to study the marine biodiversity exclusive for that relatively untouched state. (dpi.nsw.gov.au, 2019) The number of native settlers lies within 500 occupants and the number of visitors allowed per visit are restricted to no more than a few hundreds. There are currently six marine parks that cover around on-third of NSW's marine estate, namely (dpi.nsw.gov.au, 2019) :

- Cape Byron Marine Park
- Solitary Islands Marine Park
- Port Stephens Great Lakes Marine Park
- Lord Howe Island Marine Park
- Jervis Bay Marine Park
- Batemans Marine Park

## A. Current management strategies

There are existing policies and rules specific for each park's functioning based on their functions and threats and the intensity of the threats that threaten the sustenance of the biodiversity in that park. The management involves the local communities to give importance to the economic, social and environmental values. (dpi.nsw.gov.au, 2019)

Restricted access zones, the maximum number of visitors per visit per year, strict permits to adhere to for commercial activities help manage the operational plans effectively.

Currently, each marine park is categorized into four zones within its coverage:

## 1. Sanctuary zones (dpi.nsw.gov.au, 2019)

- a. This zone provides the highest level of protection to the biodiversity, natural and cultural features respecting the connection and values that aboriginals or original settlers have with specific places.
- b. Only recreational activities that do not hinder with the regular flow of the habitats working or harm the species inhabiting within this zone.

## 2. Habitat protection zones (dpi.nsw.gov.au, 2019)

- a. The physical and biological habitats are protected.
- b. High impact activities like anchoring, mooring, discharge of ballast water from the ship, commercial collection for the aquarium trade, etcetera is kept to a bare minimum.
- c. Restricted recreational activities, educational and research-based activities

## 3. General use zone (dpi.nsw.gov.au, 2019)

- a. High impact activities are carried out but in a more environmentally sustainable way that doesn't affect the surrounding habitat or sea life.
- b. Recreational and commercial activities are carried out in this part of the park.

## 4. Special purpose zones (dpi.nsw.gov.au, 2019)

- a. Aboriginal and other cultural features are safeguarded within this zone.
- b. It also houses the marine research facilities, marinas, aquaculture and it is meant for traditional aboriginal use only. The access is highly restricted.

The marine parks can be accessed through ships, yachts, and planes and individual or private access requires a granted permit prior to arrival. Each of the activities are separated based on

the assigned zones and some require special permits for activities in and around the parkland and waters. (dpi.nsw.gov.au, 2019)

Recreational activities include:

- Boating
- Educational activities
- Recreational fishing
- SCUBA diving and snorkelling

Commercial activities include:

- Commercial fishing
- Charter fishing
- Aquaculture
- Export of palm seeds
- Group event organizations, etcetera under special permits.

## B. Threats and challenges

## Management stressors

These marine parks in NSW are home to a number of endangered species, and some are special only to the Australian waters. Some of the protected species include black rock cod, whale shark, great white shark, turtles, dolphins, sea lions, seals, sea birds, Ballina angelfish, bluefish, various sympathies and so on. In recent times tourism has increased and the government of New South Wales has been increasingly involved with issues of conservation (dpi.nsw.gov.au, 2019)

One of the most iconic and last of its kind is the true southerly coral reefs that can be found within the protected environment on the western side of the island. (dpi.nsw.gov.au, 2019) Although more than 50% of the natural habitat is conserved in its natural form and the number of visitors' are restricted, the presence of any external stressor during the breeding season or the juvenile growth season would highly affect the ability of the species to cope and sustain itself.

The common threat among all these marine parks is that they seem to be susceptible to invasive species through the continuous entry and exit of ships that carry large amounts of ballast water increasing the chances of invasive species.(dpi.nsw.gov.au, 2019)

Easy accessibility to the island makes it a hot spot for the tourists to visit it more often and over time could pose as a serious issue when the demand to visit the island increases, thus compromising on environmental sustainability over social and economic sustainability. Despite having recycling units and treatment plants within the parks to reduce waste thrown into the ocean or be carried away in containers, the energy produced by these units have an impact on the environment.

## Environmental stressors

Apart from the internal or management policy issues, coral bleaching has been one of the most talked about and worrying issue that has recently lead researchers to work on heat resistant corals. Lord Howe Island Marine Park is the only one that houses the internationally significant and the world's only southmost coral reef which are now subjected to bleaching, also contains species found nowhere else in the world. Sustained heat stress has seen 90% of some reefs bleached and some have barely escaped with minimum damage (theconversation.com, 2019).

The survey conducted across the Lord Howe Island Marine Park by Tess Moriarty and Steinberg showed that 95% of the corals on the inshore lagoon reefs were showing extensive bleaching. The corals on the outer and deeper reef sites have survived healthily through the summer heat. Coral bleaching is one of the greatest threats to the sustainability of coral reefs and indicates our greatest challenges with effects of global warming on the environment and biodiversity (theconversation.com, 2019)

Artificial reefs and fish attracting devices (FADs) are widely used to increase and redistribute fish stocks in and from the surrounding areas. The effectiveness of these increasing production remains uncertain but significant differences have been observed depending on the reef design, material, structure, placement, porosity and relationship to ocean currents. Although they are particularly designed to increase the fish stock and diversify the varieties of species, it also poses a threat of over fishing due to increased fishers at the site and availability of variety at lower costs (environment, 2015).

Artificial reefs are expensive to install and remove, they have an operational life span and the material used can cause certain amount of pollution over a time of usage. Despite using it for increasing the aggregate of fish at a particular site, it is a lesser known fact that there is no proper research on the sea floor sediment habitats and thus leading to lesser-known conservation values (environment, 2015).

The statewide TARA outcomes in 2017 draw broadly similar conclusions to the results of the Community Survey in 2014: "that pollution, habitat disturbance and climate change are key threats to the NSW marine estate. Similarly, pollution, antisocial behavior, climate change and information gaps have been identified as key threats to the social, cultural and economic benefits derived from the marine estate."

## C. Recommendations and conclusions

Relating threats to benefits, with time as a factor affecting its productivity will help understand the core issues that need to be treated. Zoning of the park can be used to understand and prioritize areas that need the most and least attention, which in turn will help in conserving environmental values, manage conflicting uses and policies and enhance the range of values and benefits the community derives from the marine park. Characterizing the risk under rare, unlikely, possible, likely and almost certain will give a depth into the consequence level of the threats being acted upon (government, 2015)

In-situ reservoirs of important habitat features and species, it acts as a network that provides assurance that biodiversity will remain intact, regardless of the catastrophic events that may occur in the area. Allocation of no-take zones. No-take zones with restrictions on recreational and commercial fishing, and no human access. Developing and adapting to sustainable fishing

practice, also setting catch levels to minimize impacts of over fishing (Australia, 2003). Reduction in fishing from year to a few months and establishing reserves in the no-take zones will contribute to the increase in species count over a set period of time. (A similar target was achieved in Egypt wherein 1995 government's collaboration with the local fishermen in establishing and maintaining five no-take reserves showed a significant increase in the number of species that were protected) (Australia, 2003)

Improving public knowledge and involving the native communities in the initiatives dealing with marine and biodiversity conservation. Educational awareness programs through education centers and trained education staff around in Marine parks have an important role in making the listening audience understand the complexities of the ecosystem around them. Marine parks or MPAs with educational facilities would be a key step taken towards involving the tourists in the awareness program by providing training, support and information for local people involved in the tourist industry (industries, 2009). Educating visitors about the significance of the historic sites and the importance of the relationship between people and marine environments could be a part of the entire tour package.

One of the major drawbacks is the lack of defined data of empirical observations on larger and mobile marine organisms' that live deeper than 10 meters. Use of sophisticated new ocean technologies and sustainable tools/ methods for observing and measuring the physical, chemical and biological characteristics of the ocean. Use of high resolution and multi-spectral satellites measure ocean wave heights, phytoplankton productivity; video techniques for improved census of fish population in continental shelf waters (Australia, 2003).

Turning the marine parks into bio reserves with minimum human interaction for about 5-8 years with the help of local communities and fishermen would help prevent the loss of biodiversity at the rate in which it is progressing now (Marine Biodiversity: Patterns and Processes, Assessment, Threats, Management and Conservation, 2006). Continuous monitoring and patrols for signs of any environmental stress or trigger caused by human interaction can help regulate the actions between them.

If the current decline in the marine ecosystem is not reversed in the coming 10 -20 years, production and supply of high-quality protein cannot be maintained, and the value of every biodiversity hot spot would eventually degrade to yet another commercialized zone. Marine protected areas are an important tool to manage the oceans and supply the ever-growing human population quantitatively and with qualitative commodities.

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