Nature and Management of Some Marine Ecosystems in Vietnam: A Case Study at The Hon Mun Island at Nha Trang

Sarfo Isaac*1, Afure Whyte1 and Terney Kumara Pradeep2
1Marine Ecosystem Mgt and Climate Change, Nha Trang University, Vietnam
2Department of Oceanography and Marine Geology, University of Ruhuna, Sri Lanka

Abstract

Nha Trang is a city in Vietnam endowed with several sceneries which has attracted several tourists around the world over the past few decades. The city is highly characterized by coastal features as well as beautiful landscapes. Among these features are: beaches, caves with swift-let birds, resort centers, islands, traditional temples, forts and so on. The act of enhancing economic activities, coupled with some natural factors like; climate change as well as the increasing number of tourists’ over the years has led to the alteration of some of these ecosystems, that gives the city its value, hence, sense of attracting numerous tourists from all walks of life. The Hon Mun Islands are located to the south of Nha Trang Bay. Hon Mun MPA is situated in central - South Vietnam, offshore from the coastal resort city of Nha Trang, Khanh Hoa Province. The name “Hon Mun” (means Black Island) comes from the high and rugged cliffs forming up caves, particularly black rock here as ebony, very rarely seen elsewhere. Due to the island’s location adjacent to the hot sea-currents from the equator, suitable to the development conditions of corals and various types of tropical sea creatures, the sea bed of Hon Mun is home to an abundant and diverse group of marine species, an interesting and useful place for researchers, oceanographers and tourists to observe and explore more of the sea creatures’ life [1]. It is for these reasons why this study was conducted to delve into the nature, management and threats posed on the ecosystems at the Hon Mun Island at Nha Trang in Vietnam.

Keywords: Hon Mun; Biodiversity; Management; Transect; Coral reef; Island

Lifeform Codes: STN: Stone; SND: Sand; R: Rubble; ODC: Old Dead Coral; FAV: Favia species; MON: Montipora species; GAL: Galaxea species; ACR: Acrpora species; FUN: Fungia species; POR: Porites species; POD: Podabacia species; TUB: Tubastrea species; POC: Pocillopora species

Introduction

The International Union for Conservation of Nature (IUCN) defines a marine protected area as: “a clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values”. This study conducted to undertake line transect measurement in two different sites at the Hon Mun Island, to make some observations on some bottom features, coral reef types and their habitats, zonation, the nature and management of ecosystems at the Hon Mun Island at Nha Trang.

In recent years, with increasing economic development, the marine environment adjacent to Nha Trang City, especially around the Hon Mun Islands, has faced increased exploitation. Coral reefs have been destroyed by many, mainly human-induced, factors. Shipping, dynamite-fishing, coral harvesting and marine tourism have led to a decrease in marine biodiversity and the loss of precious genetic resources, such as those of the Hawksbill turtle, false killer whales and leatherback turtles, from the South China Sea. Destructive activities obviously diminish the benefits reaped from tourism in the islands [2]. It is for these reasons why this study was conducted to explore more the nature, management and threats posed on the ecosystems at the Hon Mun Island at Nha Trang in Vietnam.

Objectives

The main objectives of this study were to:

1. Give an overview of the current status of biodiversity at the Hon Mun Island and its marine environment
2. To briefly analyze data using Line transect measurement of some diversity in the area
3. To give a general view on how the island is being managed
4. Identify key problems affecting biodiversity at the Hon Mun Islands
5. Propose measures to mitigate these problems

Study Area

The Hon Mun Islands are located to the south of Nha Trang Bay. The total area of the complex is about 160 km², in which 122 km² is sea and 38 km² is an island area. Since 1975, the National Marine Programme of Vietnam, which was implemented by National Centre for Natural Science and Technology, has run at Hon Mun to analyze and preserve marine creatures here. Currently, Hon Mun is a famous attraction in Nha Trang for Vietnamese and tourists [1]. The islands have a variety of habitats and ecosystems, including fringing coral reefs, mangrove forests and sea grass beds with an adjacent deep-water upwelling, which supports the local fishing industry. Hon Mun MPA is situated in central - South Vietnam, offshore from the coastal resort city of Nha Trang, Khanh Hoa Province. The MPA encompasses nine islands (Hon Tre, Hon Noc, Hon Mun, Hon Rom, Hon Vung, Hon Cau, Hon Mot, Hon Tam and Hon Mieu) and their surrounding waters, some 160 km² in total [3]. The nine islands, located from 1 km to 15 km offshore, provide...
the topographic basis for a wide range of coastal and marine habitat types, developed in relation to prevailing oceanographic conditions and gradients in mainland - oceanic influences (Figure 1). The diverse array of tropical habitats includes coral reefs, soft bottom communities, sea grass beds, mangroves, sandy beaches and rocky shores.

Materials and Methods

Materials for data collection

Use of cellular phones, measuring tape for transects measurement, ruler, slate, pencil, thread and snorkeling masks.

Methods for data analysis

Personal and direct observations were made at the study area. Informal interviews were conducted with some personnel at the area to get more insight about the area. Secondary data from the internet and other literature were used to give detailed information on biodiversity of species and management of the ecosystem at the Hon Mun Island. Use of Microsoft office tools like; Microsoft word and excel worksheet as well as Shannon Weiner’s index to calculate for the diversity of species in the area in quantitative analysis and formulation of charts.

Research strategy

The strategy used for this research was both qualitative and quantitative approach. Some quantitative tools were used in the collection and analyzing of data. No laboratory test or analyses were made to establish a logical base except quantitative tools outlined in section 6.2.

Research design

The research design adapted for this study is a case study design. A single case study was adapted to explore more world about the nature and management of ecosystems at the Hon Mun Islands, taking into consideration some areas that were measured for this study. Since, this study is a single case study, results or findings cannot be generalized for the entire islands in Vietnam or other islands at Nha Trang.

Limitation of the study

Limited funds did not enable us to visit the place more often to engage the most of the local people who are mainly farmers and fishermen, thus, participatory/action based research to delve more and broaden the objectives of this study. This limitation does not limit the validity and credibility of this study since, engagement of the people is not a main objective although it would have helped establish and give us more information. Language barrier also hindered our ability to engage most of the indigenous or local inhabitants although the primarily mode of data collection was through primary data as well as use of secondary data on the internet and from the site as well as engaging some few staff at the site.

Results

Percentage Cover (%) = \frac{\text{Area Covered by Life-form} \times 100}{\text{Total Distance}}

(Tables 1-6) In calculating for the variables in the tables above; Difference in transitional Life-form Code in the area measured by the Life-form at that given area up to the next area or zone being measured. Hence, zones with the same life-form have their distance summed up (i.e., Sand (SND) covered in two or three areas are summed up; L1i+L1ii….L1n). Using Shannon Weiner’s mode of calculating for diversity of species in a given area;

| Description                  | Hon Mun Island |
|------------------------------|----------------|
| Corals reefs cover           | √√√            |
| Coral reefs structure        | √√√            |
| Recreational activities      | √√√            |
| Organisms                    | √√√            |
| Rocks                        | √              |
| Sand beaches                 | √              |
| Jelly Fish                   | x              |
| Sea urchins                  | √              |
| Swiftlet birds               | x              |
| Sea star                     | √              |
| Rubbles                      | √              |
| Boats                        | √√√            |
| Snorkeling                   | √√√            |
| Tourism                      | √√√            |
| Sea cucumber                 | x              |
| Diving                       | √              |
| Water Clarity                | √              |
| Fishing activities           | x              |
| Sea turtles                  | x              |
| Crabs                        | √              |
| Shore Constructions          | √              |
| Limpets                      | √              |
| Tropical Periwinkles (Ligia sp.) | √√√             |

Source: Field Survey

Table 1: Visual observation for the two islands (√√√ = Good, √√ = Fair, √ = Poor and x = none).

| No. of known species |
|----------------------|
| Coral                | 193                |
| Fish                 | 176                |
| Crustaceans          | 112                |
| Echinoderm           | 27                 |
| Molluscs             | 112                |
| Algae                | 104                |
| Others               |                    |

Source: IUCN Hon Mun Island Pilot field report, 2005

Table 2: Biodiversity of species at the Hon Mun Island at Nha Trang.
Management of ecosystem at the Mun Island

In an interview with a tourist guide at the Hon Mun Island, we were meant to understand that the site is being managed by the Government of Vietnam with sole responsibility given to the Ministry of Fisheries as the responsible agency. Khan Hoa PPC and the committees in some allocated communities or villages around the Hon Mun Island.

There are some forms of international support for management of Hon Mun Island from the World Conservation Union supporting the Marine Protected Area, funded by Global Environmental Facility (GEF) through the World Bank as well as the Royal Danish Government through DANIDA [4].

Objectives of Hon Mun marine protected area

- To conserve a representative example of internationally significant and threatened marine biodiversity.
Coral reefs at the Mun Island

There were wide ranges of coral reef forms ranging from encrusting, columnar, plate-like, mushroom (Fungia sp.), free living, massive, semi-massive and branching corals. These coral forms had several polyp growth forms like; plocoids, phaceloid, ceroid, meandering and flabelloid growth forms embedded around them when observed from above (Figure 2).

Coral reefs as a base for protection and habitat for some fishes, echinoderms, crustaceans and molluscs

Per direct observation, some dead corals, broken (fragmented) corals in a state of bleach with some still growing as well as a coral with half of its section being dead and half being alive in the images below (Figures 3 and 4).

Threats/Problems the Hon Mun Island is faced with:

- **Over-harvesting of resources**: Overfishing may cause algae bloom since some of these fishes feed on algae and when harvested excessively may increase the accumulation of algae. In addition is harvesting corals for making jewelries and other ornaments.
- **Illegal fishing**
- **Tourism and other recreational activities** like; diving, snorkeling and trampling, touching or walking on coral reefs by some tourist as well as anchor damage from boats especially during low tide zones (Figure 5).
- **Pollution**: Some forms of solid waste like; clothes, baskets, old fishing nets and polythene bags were found beneath the ocean where there are coral reef platforms from direct observation. This goes a long way to breed algae and compete for space with corals (Figure 6).
- **Inputs from land like; nutrients and sediment run off** from agricultural lands around the island or from mountainous farmlands. This causes smothering and growth of algae competing with the corals (Figure 7).
- **Invasion of some species thereby causing some corals to die off or bleach**: e.g. Crown-of-thorn on some corals with some images captured from field study (Figure 8).

Table 7: Biotic and abiotic features at these two sites.

| Living biotic features | Substrata | Others         |
|------------------------|-----------|----------------|
| Lively hard corals     | Sand      | Geomorphology |
| Soft corals            | Bedrock   | Visibility    |
| Macro algae            | Rubble    | Depth         |
| Sponge                 | Dead coral|                |
| Some fish species      |           |                |
| Echinoderms like; sea  |           |                |
| urchins, star fish and |           |                |
| so on                  |           |                |

Source: Field Survey

---

Figure 2: Coral reefs at the Mun Island (Source: Field Data/Survey).
Recommendations

These are some measures which when effectively taken into consideration, can ensure sustainable use of resources at the Hon Mun Island:

1. Participatory planning and management by relevant stakeholders.
2. Development of alternative income generating activities to draw people away from activities associated with excessive resource use.
3. Capacity building through management training and public education. A tourist who visits this site are being sensitized, fishermen, local people in the area are being educated about the need to conserve the resource and how their actions can significantly impact upon the resources in the area.
4. Monitoring and evaluation of how effective policies, plans and
programs which have been implemented are meant to conserve or keep the resources in its pristine nature.

5. Support community involvement through; Collection of user fees of which a percentage is returned to local communities. Local people are involved in monitoring the change in biodiversity. Local people are rewarded for improvements in the local marine environment.

Conclusion

In nut-shell, participatory or action based approach as well as conservation, are two main approaches, which can be adhered to ensure sustainable use of resources if the right policy framework and monitoring mechanisms are properly structured through institutional capacity [7]. The factors spelt above delves into biodiversity of species at the Hon Mun Island, who manages the site, support, threats which degrade the site's pristine ecosystem and proposed measures which can be adapted to ensure sustainability of resources in that marine environment.

Acknowledgement

We would like to express our profound gratitude to God Almighty for giving us strength to embark on this study thereby making this study fruitful. We would also like to thank the management at the Hon Mun Island for their time and information they gave to us as well as Norhed and management of Nha Trang University for the resources they provided in making this study a success.

References

1. National Environmental Agency (NEA) and Ministry of Science, Technology and Environment (MOSTE) (2001) Scientific Rationales for Marine Protected Area System Planning. Ministry of Science, Technology and Environment, Hanoi, Vietnam.

2. Nam PK, Son TVH (2002) Recreational value of the corals surrounding the Hon Mun Islands in Vietnam: A travel cost and contingency valuation study. Economy and Environmental Program for Southeast Asia, World Fish Centre, Vietnam.

3. Tuan V, Long NV, Tuyen HT, Hoa NX, Hoang PK (2002) Coral reefs on the Hon Mun MPA, species composition, community structure, status and management recommendations. Hon Mun Marine Protected Area Pilot Project, Vietnam. pp: 9-11.

4. Rambaldi G, Bugna S, Gieger M (2015) Review of the protected area system of Vietnam. WWF Indochina, IUCN, Vietnam.

5. (2002) Hon Mun Marine Protected Area (MPA). Khu Bao Ton Bien, Nha Trang.

6. International Union for Conservation of Nature (IUCN) (2005) Hon Mun Island Project Plot report.

7. www.nhatrangbaympa.vnn.vn/newsletter/English/News1.pdf

Figure 7: Observation of inputs from land like; nutrients and sediment run off (Source: Field Data/Survey).

Figure 8: Invasion of some species thereby causing some corals to die off or bleach.