

## State of the Mangroves in **ORIENTAL MINDORO**

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### **I. INTRODUCTION**

Oriental Mindoro is located 120 km south of Metro Manila and 45 km south of Batangas. It comprises 16% of Region IV-B (or MIMAROPA Region) with a land area of 588,350 ha. It is bounded by Verde Island Passage in the north, Maestro del Campo Island and Tablas Strait in the east, Semirara Island in the south, and Occidental Mindoro in the west. It has a total land area of 436,472 ha, comprising 1.5% of the country's total landmass.

It is divided into two congressional districts i.e., District I and District II, with Calapan City as its capital. It is comprised of 14 municipalities and 426 barangays. Naujan is the biggest municipality, covering an area of 52,800 ha and accounting for 12% of the province's land area. The smallest is the municipality of Roxas comprising only 1.99% with an area of 8,710 ha. Naujan has the most number of barangays while San Teodoro has the least number with 70 and 8 barangays, respectively. Twelve municipalities and one city are located along the coast of Oriental Mindoro, namely: Puerto Galera, San Teodoro, Naujan, Pola, Socorro, Pinamalayan, Gloria, Bansud, Bongabong, Roxas, Mansalay, Bulalacao, and Calapan City. **Appendix E** shows the list of coastal barangays in the 13 coastal municipalities.

The total coastline length of the province is about 342.45 km. The coastal population is approximately 237,023 with 12,523 fishing families as of 2015. The total area of the municipal waters of Oriental Mindoro is about 320,789 ha. There are 33 marine protected areas with a total area of ca. 6,000 ha that were established and being managed by the community. The coastal and marine waters in the province of Oriental Mindoro are used for transportation, navigation, fish culture, recreation, and tourism.

The northern portion of the shores of the province is situated along the Verde Island Passage that is recognized as the "center of the center of marine shorefish biodiversity." This area is part of the Coral Triangle and is considered a rich spawning ground of diverse fish species.

The fisherfolk in the province have an average age of 40 years old, and age range of 16–80 years. Ninety-three percent (93%) are married with an average of four children per household. Daily household expenses are less than Php 200 for food, water, electricity and other expenses such as daily allowances of school kids. Generally, fishers in Oriental Mindoro have very low educational attainment. Only about 4% have reached college level and only 1% would graduate. About 68% did not finish high school, 59% did not reach high school, while 10% did not attend school at all. The number of fishers with no formal education was highest in Mansalay (29%), followed by Pinamalayan (21%), Baco (17%), San Teodoro (15%), and Puerto Galera (11%). In Calapan, all residents had at least elementary level education (Romero, et al 2015).

The main sources of income for Oriental Mindoro are agriculture and fishing, except for Puerto Galera, which relies on tourism. Rice farming is highest in Naujan followed by Calapan, with irrigated areas covering 11,348 ha and 7,043 ha, respectively. Mansalay has the highest number of families (1,200) engaged in fishing. However, in terms of total number of registered fisherfolk, Bulalacao is highest with 2,100, followed by Pola, Calapan City, and Mansalay.

Among the main socio-economic problems of coastal residents in the province are low income and limited alternative livelihood. Like most coastal communities, the coastal residents heavily depend on fishing for their income, have little or no savings, and lack access to capital.

**Table 10.** Mangrove areas in the municipalities of Oriental Mindoro, 2010

| Municipality  | Exact image date (circa 1990) | Exact image date (circa 2010) | No. of years | CA. 1990 Areas (ha) |          | CA. 2010 Areas (ha) |          |
|---------------|-------------------------------|-------------------------------|--------------|---------------------|----------|---------------------|----------|
|               |                               |                               |              | Mangrove            | Fishpond | Mangrove            | Fishpond |
| Puerto Galera | 18-Jun-1989                   | 17-Sep-2009                   | 20           | 5.4                 | 2.25     | 5.55                | 2.17     |
| San Teodoro   | 18-Jun-1989                   | 17-Sep-2009                   | 20           | 154.03              | 10.98    | 174.95              | 13.88    |
| Baco          | 18-Jun-1989                   | 17-Sep-2009 and 18-Apr-2010   | 20           | 185.1               | 30.57    | 210.29              | 53.39    |
| Calapan City  | 18-Jun-1989 and 18-Mar-1993   | 18-Apr-2010                   | 17           | 522.69              | 557.31   | 618.13              | 622.32   |
| Naujan        | 18-Jun-1989 and 18-Mar-1993   | 18-Apr-2010                   | 17           | 405.98              | 204.84   | 298.36              | 179.15   |
| Pola          | 18-Mar-1993                   | 18-Apr-2010                   | 17           | 291.33              | 158.58   | 405.28              | 279.09   |
| Pinamalayan   | 18-Mar-1993                   | 18-Apr-2010                   | 17           | 31.19               | 49.2     | 38.12               | 61.7     |
| Gloria        | 18-Mar-1993                   | 18-Apr-2010                   | 17           | 14.47               | 3.36     | 20.72               | 5.92     |
| Bansud        | 18-Mar-1993                   | 18-Apr-2010                   | 17           | 31.44               | 0        | 67.83               | 0.15     |
| Bongabong     | 18-Mar-1993                   | 18-Apr-2010                   | 17           | 286.14              | 498.21   | 344.67              | 461.9    |
| Roxas         | 18-Mar-1993                   | 18-Apr-2010                   | 17           | 52.86               | 232.41   | 33.76               | 232.06   |
| Mansalay      | 18-Mar-1993                   | 18-Apr-2010                   | 17           | 52.2                | 186.57   | 20.34               | 238.09   |
| Bulalacao     | 18-Mar-1993                   | 18-Apr-2010                   | 17           | 178.11              | 182.97   | 153.7               | 269.71   |

### Importance of Mangroves

The most important role of mangroves in the province is in protecting vulnerable coastlines from wave action. Mangroves shield inland areas during storms, minimizing its damage, and regularly break down pollutants, filter sediments, and protect the ocean from siltation. Ecologically, mangrove forests provide habitats for aquatic species, especially as nursery areas and safe havens for juvenile fish, shrimp and crab. Mangroves also contribute significantly to the fishing industry and fisheries resources of coastal residents. Some fishers earn additional income from mangroves through charcoal-making and aquaculture activities.

## II. STATUS OF MANGROVES IN ORIENTAL MINDORO

Mangrove area in the province covers approximately 2,392 ha. These are mostly located in the coastal municipalities of Puerto Galera, San Teodoro, Baco, Calapan City, Naujan, Pola, Pinamalayan, Gloria, Bansud, Bongabong, Roxas, Mansalay, and Bulalacao (Table 10; CI-Philippines 2010; ). Table 11 provides a summary of the old growth, secondary growth and mangrove plantations in the province.

Cayabyab (2014) assessed the mangrove areas in Oriental Mindoro. Forty (40) plots were surveyed in 11 out of 13 coastal municipalities and in the city of Oriental Mindoro. From

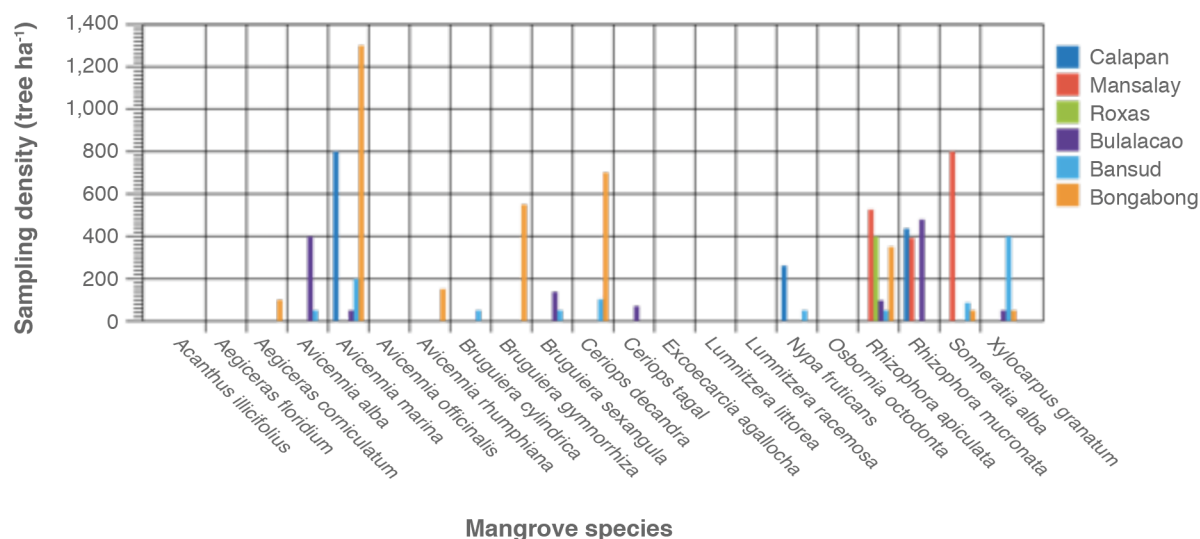
these plots, 26 mangrove species were identified along its coasts. Mangrove areas in Silonay in Calapan City, Tambong, Proper Bansud in Bansud, and Crutinda II, Masaguisi in Bongabong had the highest species richness while Tuhod, Naujan and Budburan, Mansalay had the lowest species richness. The rest of the surveyed municipalities have 6 to 12 mangrove species. The genera *Rhizophora* and *Sonneratia* are widely distributed in the province.

“Regeneration” is a measure of the capacity of the mangrove forest to replenish itself. This is estimated from the number of saplings that measure 5 cm DBH and 2 m in height, and seedlings whose height is lower than 2 m. In Roxas, planted saplings of *Rhizophora apiculata* and seedlings of *Avicennia* spp. contributed significantly to the regeneration of the area. In Mansalay, seedlings of *Avicennia marina* (in the landward side) and saplings of *Sonneratia alba* (in the seaward side) also contributed to the regeneration. In Bulalacao, regeneration was relatively high because of the presence of *Rhizophora mucronata* seedlings at the seafront. Regeneration ranged from 200 (Tuhod, Naujan) to ~8000 ha<sup>-1</sup> (Silonay, Calapan City) as shown by the number of seedling and saplings/ha (Figs. 8 and 9). The species *Avicennia marina*, *Avicennia rumphiana* and *Sonneratia alba* have high basal area (Fig. 10).

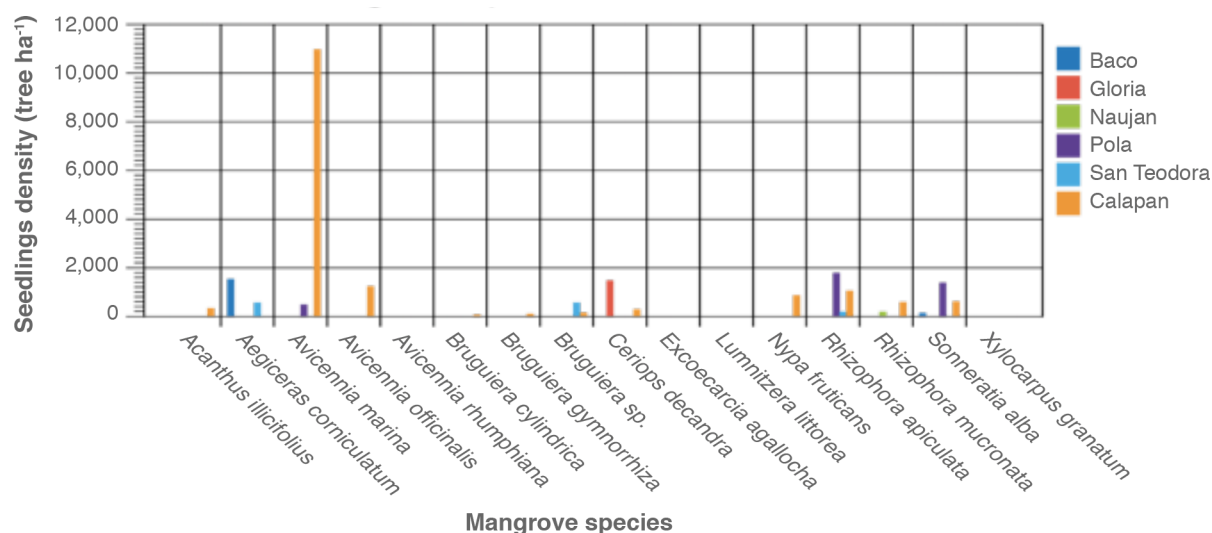
The canopy is the upper layer or habitat zone formed by mature tree crowns including other organisms. This refers to the extent of the outer layer of leaves of an individual tree or a group of trees. San Teodoro has the highest canopy cover with *Sonneratia alba* as the dominant species followed by Pola which is dominated by *Rhizophora apiculata* (Fig. 11). The next municipality with high canopy cover is Pola but it is primarily composed of *Avicennia* spp.

**Table 11.** Estimated areal extent of mangroves in Mindoro Oriental (ha).

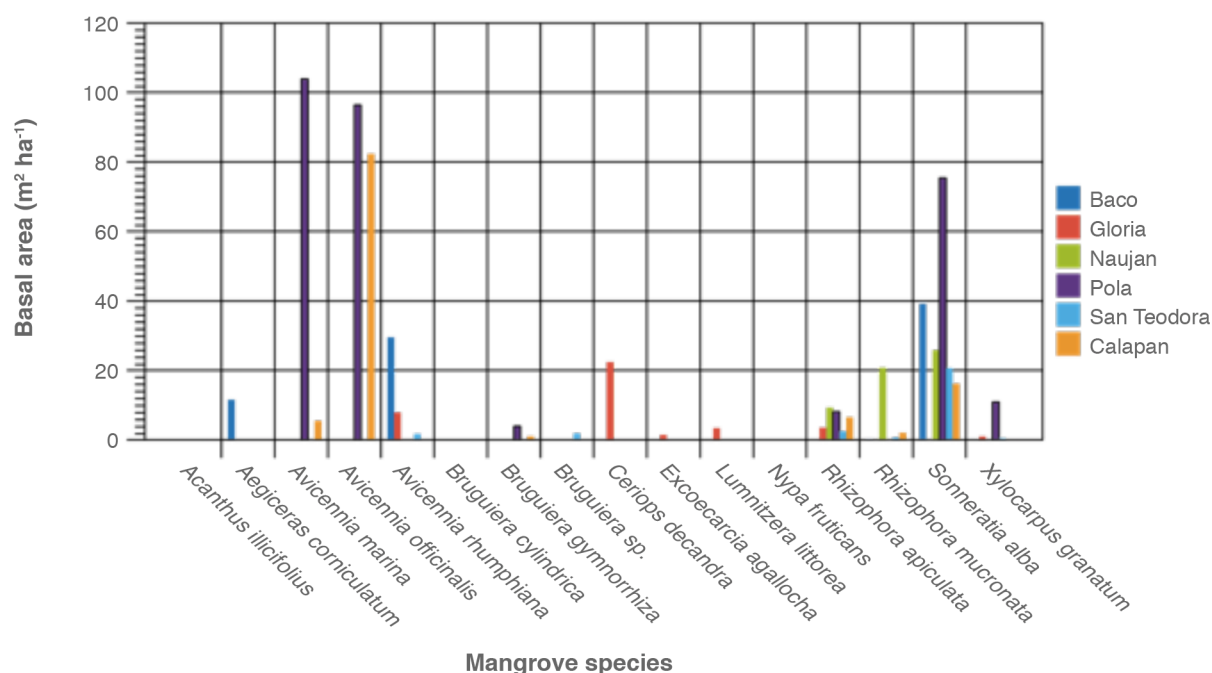
| Old stand | Secondary growth | Plantation |
|-----------|------------------|------------|
| 2,210.95  | 0                | 181.05     |



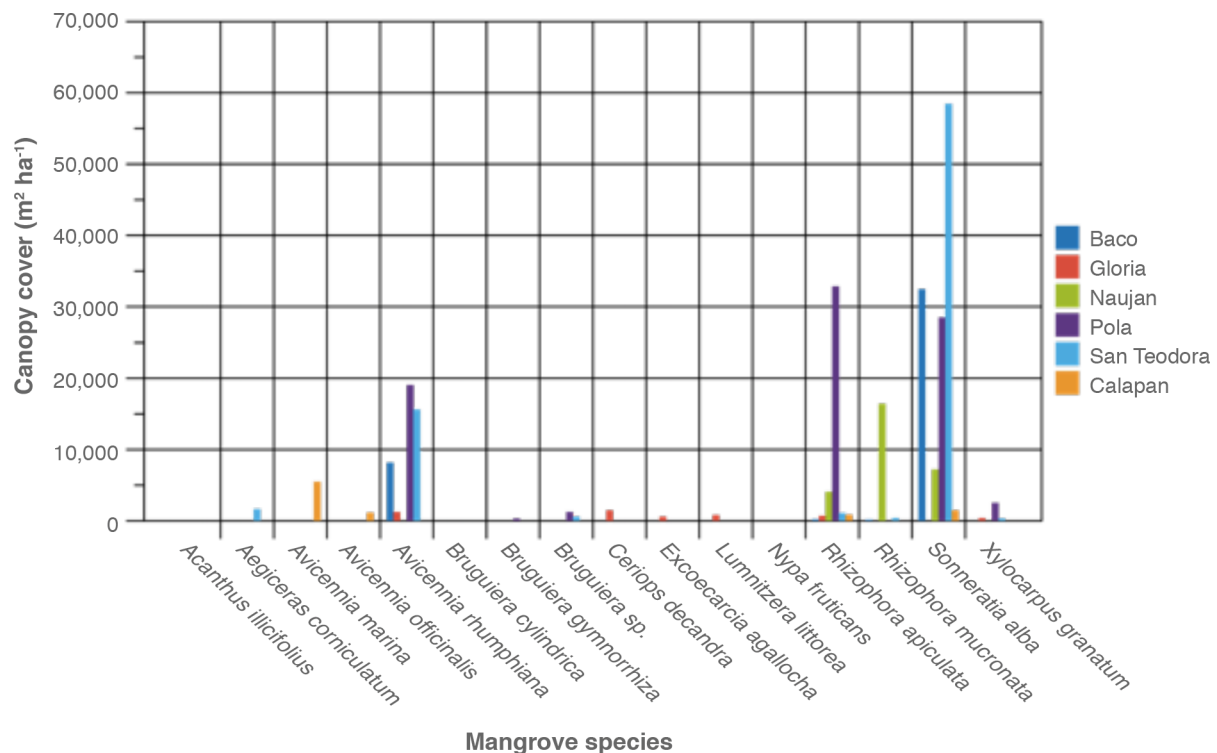
**Figure 8.** Sapling density in six coastal municipalities of Oriental Mindoro.



**Figure 9.** Seedling density of mangrove species in six sites in Oriental Mindoro.



**Figure 10.** Basal area of mangrove species in six sites in Oriental Mindoro.



**Figure 11.** Canopy cover of six municipalities in Oriental Mindoro in 2014.

The overall condition of mangrove areas in Oriental Mindoro is classified as 40% fair, 30% good, 20% poor, and 10% excellent. Most of these mangrove areas are of the riverine and fringing types dominated by species from the genera *Rhizophora* and *Avicennia*. The dominant substrates are sandy, clay loam, and muddy. In Calapan City, the forest cover is 332 ha, Naujan with 165 ha, Baco with 134 ha, and Pola with 147 ha. However, most of these mangrove areas are near coastal communities and are being affected by anthropogenic activities such as conversion to fishponds, resort and port establishment, and illegal cutting.

#### *Degradation of Mangrove Forests*

Generally, mangrove stands in the province is increasing. This could be due to the mangrove rehabilitation programs being implemented in the province by various groups like national government agencies (DENR and BFAR), NGOs, academic institutions, people's organizations (POs) and other civil groups. The decline in mangrove stands in some areas is attributed to cutting, conversion into residential areas, and influx of coastal residents from other municipalities or provinces. These issues are being addressed through the effective implementation of the

Coastal Resource Management Program (CRMP). The CRMP aims to conserve and protect marine ecosystems such as mangrove, seagrass and coral reef. One of the major projects in CRMP is the establishment of marine protected areas (MPAs).

#### *Threats to Mangrove Forests*

Many coastal residents still cut mangrove trees for house construction and charcoal-making. There are few alternative sources of livelihood available to them. While there are mangrove rehabilitation activities, the technology on mangrove reforestation is not properly observed. In many cases, planting of the wrong species in wrong substrate areas like the planting of *Rhizophora* spp. in seagrass beds have been practiced. There are so many abandoned fishponds which used to be mangrove forests, but since these are still covered by Fishpond Lease Agreements (FLA) and they remain abandoned because leaseholders lack the capital to rehabilitate the ponds or to reforest these. Updating of FLA status is a national agency concern. This should be prioritized by BFAR to validate non-productive areas and convert these into mangrove forests.

### III. MANGROVE PROTECTION AND MANAGEMENT

The major activity under the Integrated Coastal Area Management Programs (ICAMP) is the establishment of Marine Protected Areas. Mangrove forest is among the ecosystems being protected under local ordinance. The following are the locally managed MPAs in the province:

- Silonay Mangrove Conservation Area and Eco Park with a total area of 42 ha;
- Baco Marine Protected Area located at Barangays Pulang Tubig and San Andres with total area of 120 ha (mangroves, seagrass, and coral reef); and
- Puerto Galera Mangrove and Ecotourism Area located at Barangays Tabinay and Dulangan with a total area of 18 ha (mangroves, seagrass, and coral reef).

Mangrove rehabilitation is part of the ICAMP. Mangrove seedlings are being planted along the different sections of coastlines and rivers. Another program is the mapping of mangroves using GIS tools in conjunction with the establishment of a monitoring and reporting process.

On the policy and regulatory side, mangrove protection is now considered in the Municipal Fishery Ordinance and other ordinances related to conservation and protection of natural resources formulated by the Local Government Unit that are adopted at the legislative level.

#### *Monitoring and Evaluation*

The Provincial Agriculture Office (PAO) established the Oriental Mindoro Resource Monitoring Team, composed of trained technical personnel who are capable of conducting a baseline assessment and monitoring surveys and writing reports. The team does resource assessment on a yearly basis, particularly in protected areas. The data gathered are analyzed to determine the impact of protecting and conserving marine habitat. A monitoring and evaluation system is freely available in the state of the Coasts of the Oriental Mindoro guidebook; a chapter was dedicated to emphasize its importance.

### IV. SUMMARY AND RECOMMENDATIONS

Mangrove rehabilitation and reforestation of patches where mangroves used to grow is the most recommended action. This can be done through massive planting of appropriate species along the coastal zone and the planting of different species to maintain the integrity and ecological services that mangroves provide. The indicator for this would be a 50% increase in mangrove areas by 2020. Towards this end, the establishment of ten operational mangrove nurseries for various mangrove species and beach forest nurseries within the province must be the target in the next five years. At least 50% of the Fish Pond Lease Agreement should be reverted and converted into mangrove rehabilitation sites.

As a management measure, mangrove MPAs should be established per municipality and four mangrove protected areas and ecotourism and conservation areas shall be established by 2020. These should be properly gazetted and maintained. Regular mangrove clean-up shall be sustained and a solid waste management program shall be functional so that garbage-free mangrove areas may be attained. In lieu of fishponds, five mangrove aquasilviculture projects shall be implemented as an alternative livelihood for communities dependent on mangrove resources with support from BFAR. Municipal ordinances shall likewise be reviewed to include management and conservation of mangrove forests with stiffer penalties for violations.

### V. REFERENCES

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