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# Biodiversity Conservation and Sustainability of Initao- Libertad Protected Landscape and Seascape in Misamis Oriental, Philippines

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## ABSTRACT

Biodiversity is significantly contributed to food, shelter, medicine, water for domestic and commercial use, fuel/firewood, livelihood from by-products and ecotourism. Indeed, areas rich in biodiversity are proclaimed as protected area under NIPAS Act of 1992 (RA 7586).This study was conducted in Initao-Libertad Protected Landscape and Seascape, a protected area under NIPAS (National Integrated Protected Area System – RA 7586) which was proclaimed on September 16, 2002 by virtue of Presidential Proclamation no. 260, located in Tubigan, Initao, Misamis Oriental covering an area of 1,425 hectares. Based on the record of the DENR, a Resources Basic Inventory (RBI) and management effectiveness have not been undertaken in the park while the BMS has not been completed and updated, hence this study. The study used the Biodiversity Monitoring System as adopted by the Department of Environment and Natural

Resources (DENR). Part of the study used the policy as provided in Memorandum Order No. 10 series of 1991 to document the analysis and synthesis of relevant information on the ecological, geological, physical, social economic and historic environment of the protected area and its vicinity or the RBI. General findings of the study provided a research-based data on flora and fauna thriving in the park which are economically important, endemic, rare and endangered species which are urgently addressed for realistic conservation and management and for planning purposes and sustainability.

***Keywords:*** Protected landscape and seascape, Biodiversity richness and endemicity governance effectiveness

## INTRODUCTION

Biodiversity is important because it provides food, shelter, medicine, water for domestic and commercial use, fuel/firewood, and livelihood from by-products and ecotourism. As source of medicine, 40% of the medicines originated directly or indirectly from natural resources. About 25 thousand species of plants are destined for the production of medicines worldwide.

The Philippines is one of the eighteen countries identified as containing 60 to 70 % of the world's biodiversity, next to Brazil, Colombia and Indonesia. In 1999, the Philippines were identified as one of the 25 global hotspots country - 3rd for threatened birds and 8th for threatened mammals (Lim 2010). On a per unit area basis, the country is the top mega bio diverse country and hottest of the hotspots. It is important to conserve the biodiversity because it sustains life support system on earth that contributes to environmental stability and provides options for the present and future in terms of bio-resources. There are various threats to biodiversity. These are habitat destruction e.g. logging, fire, land conversion, siltation, over-exploitation, chemical or environmental pollution, and biological pollution.

Protected areas are the way forward in the struggle against biodiversity loss. Based on the records of the Protected Areas Wildlife Bureau, the recent extinction rate is 100 to 1,000 times greater than the natural rate of 1-10 species per year. In birds, 40 times greater than rate of one per 100 years. As a reaction to rapid forest depletion, there has been an equally dramatic increase in the global coverage of terrestrial protected areas. Establishment of protected areas is an IN-SITU approach to conservation of biodiversity.

The principles of establishing protected areas as provided in the law, the Republic Act 7586 of 1992, are for biodiversity conservation and sustainable development. The effectiveness of biodiversity conservation in the protected areas however, depends on a number of factors, such as adequate funding, political will, support of the Local Government Units, NGOs and local people inside and near the PA, functional PAMB and the availability of trained staff and in-placed monitoring and evaluation systems on all aspects and planning among others.

By virtue of Presidential Proclamation No. 260 dated September 16, 2002, Initao National Park was proclaimed as Initao–Libertad Protected Landscape and Seascape. This is located in Tubigan, Initao, Misams Oriental covering an area of 1,425 hectares, 57 hectares of which is landscape and 1,368 hectares is Seascape. The landscape portion is located at Sitio Bubotan, Barangay Tubigan, Municipality of Initao while the seascape portion extends from Lower Tubigan, Initao to Taboo Creek of Gimaylan, Libertad. These two municipalities are in the Province of Misamis Oriental.

It was in this juncture to conduct a comprehensive analysis on the performance of biodiversity conservation to the landscape and seascape ecosystem of Initao-Libertad Protected area using the guidelines for the conduct of Resources Basic Inventory (RBI).

## OBJECTIVES OF THE STUDY

The research's primary focus was the conduct of a Resource Basic Inventory (RIB) inside the Initao-Libertad Protected Landscape and Seascape. This was to give an understanding as to what maintenance and protection activities are suitable for a particular vegetative feature of the park. Another purpose of this study was to establish a Biodiversity Monitoring System and analyze the result as it is cost-effective and there is a standardized method in monitoring the trends in population of indicator and priority species and each uses in the protected area for reference of the Management. This research also aimed to provide database on floral and faunal assemblage of the park. Moreover, it sought to draw-out insights and recommendations in the management of Initao Protected Landscape and Seascape, the Protected Area Management Board (PAMB) members and Protected Area Office (PAO) to obtain information for appropriate management strategies and measures that lead to the conservation and protection of Initao-Libertad Protected Landscape and Seascape.

## MATERIALS AND METHODS

### Resources Basic Inventory

The conduct of this Resources Basic Inventory (RBI) was based on the DENR Memorandum Order No. 10, Series of 1991 entitled "Guidelines for the Conduct of RBI within Protected Areas".

In any attempt towards resource protection, management, development, and conservation, it is significant to know what resources are still present to protect, manage and conserve. In view of protected area compositions/vegetations, the availability of information of the present resource, floristic composition and association would give understanding as to what maintenance and protection activities are suitable for a particular vegetative feature. There is a need to conduct Resources Basic Inventory (RBI) of the existing resources for proper evaluation. This has not been undertaken in this park since its proclamation.

The level of biological stability of the ecosystem is likewise indicated by the presence of wild animals. Wild animals also play vital roles in vegetation regeneration, seed dispersal and pollination while their dropping contributes to the humus accumulation towards soil enrichment. In view of creating awareness on protected areas and wildlife resources, an RBI of its fauna is likewise necessary.

### Floral Resources

An intensive study of the vegetation was done following the conduct of RBI of the area to delineate its grassland and forest zones. For every study area, definite length of transect as well as number of stations were uniformly observed.

1. Line Intercept Method

A 900-meter transect line was laid out on the ground and subdivided into 9 stations/intervals (six (6) Strict Protection Zone and three (3) stations at the Recreational Zone). Intervals per sampling station was established at every 100m of the transect length. This was purposely established to cover the different vegetations, elevations and water systems within an area. The number of transect lines and stations was dependent on the shape of the study area, its vegetative cover, water system and its topography.

All floral and grass species including the seedlings, herbs, vines, rattans, saplings and other floral species of less than or equal to 3m tall that were physically intercepted by the transect/meter tape line or those species whose

perpendicular projection of the foliage were intercepted by the transect/meter line, were identified, counted and recorded.

For grass species, clump counts and intercept length measurements were noted and recorded. The intercepted length was important to estimate coverage. Whereas for the herbs, vines, rattans, seedlings and other woody plant, measurements intercepted length were confined to the perpendicular projection of the leaves physically overlapped/underlapped by the transect/meter tape line. Specimens of plant species not identified in the site were collected for future identification.

2. Point-Quarter Method.

This method was used to sample overstorey and understorey trees of less than 2 cm and greater than or equal to 20 cm diameter breast height (dbh) in each study site.

Using the same transect lines and stations established in the Line Intercept Method, area around each station was divided into four imaginary equal parts similar to that of a quadrant. The quadrant was oriented using the front and back transect line of the station as the base transect with another imaginary transect line cutting across the point quarter station to follow and represent the four cardinal directions NSEW. Two (2) sample trees located nearest to the station for every quadrant, one with dbh 20 cm and other with dbh less than 20 cm. representing the overstorey and understorey tree, respectively, for a total of 8 trees per station were taken as sample species. The dbh distances of the trees to the point quarter station and the tree species were recorded from each quarter. Records on individual species present nearest to the point, basal area/areal coverage and plant distance point were noted. The maximum tree distance for recording in this method is 50 meters. Trees appearing beyond this 50 meters distance were no longer be recorded.

3. Quadrant Method.

This method was used in assessing the area which contain significant number of small individuals so that confusion which led to omission or duplication in the counting and measuring was avoided. The quadrat method maybe systematic which involved the even spacing of plots throughout the sample or random which was described to have had the uneven spacing and was of advantage because it

provided valid statistical analysis.

Two (2) perpendicular quadrats of uniform sizes and shapes were laid down in to each of the stations established in the line intercept method. The quadrats were 5 meters apart on both sides on each of the identified station. Number of stations was the same as that of the point-quarter method and the line intercepts method and had standard size of 2m x 2m.

Wildlings species within the sampling quadrat were completely counted and identified on site whenever possible. Individual plant measurements like the basal area/areal coverage of the crown and diameter/circumference were taken and recorded. Unidentified specimens were collected for future identification. Surrounding overstorey tree species were counted and recorded.

Faunal / Wildlife Resources

The best time of the day to conduct inventory and data collection, particularly on avian species was early in the morning and late in the afternoon with an observation period of 3 days of 30 minutes on each inventory sites. Most of these species were found in forest edges, forest cleanings, along water embankments, in stands of edible fruit-bearing wild plants and along roads/ trail system. However, to have obtained an adequate representation of the wild animal population/community, sampling procedure covered the different habitat types, forest cover types altitudinal/elevation changes, and vegetative structures.

1. Establishment of Study Sites/sampling Areas

The observation areas were delineated and distributed within the protected areas. One observation area was located in each type of vegetation/habitat. All sightings/observations of any wildlife species were written, disregarding measurement of population densities, likewise, the respective habitat was described/noted for future reference in the restoration and stocking activities. Location for each sampling areas was determined by systematic methods or by standard random procedure. The figure below represents the whole picture of the landscape-seascape of the research area.

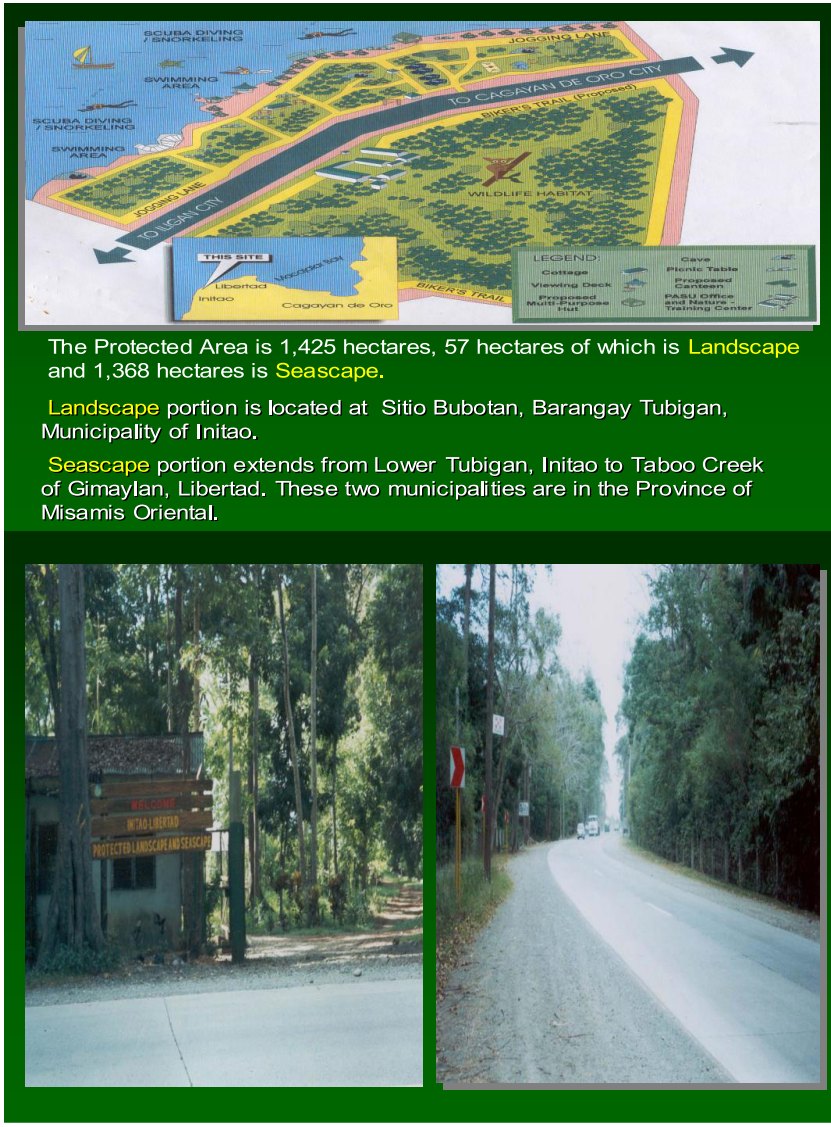


Plate 1. Aerial photo and research site of the study

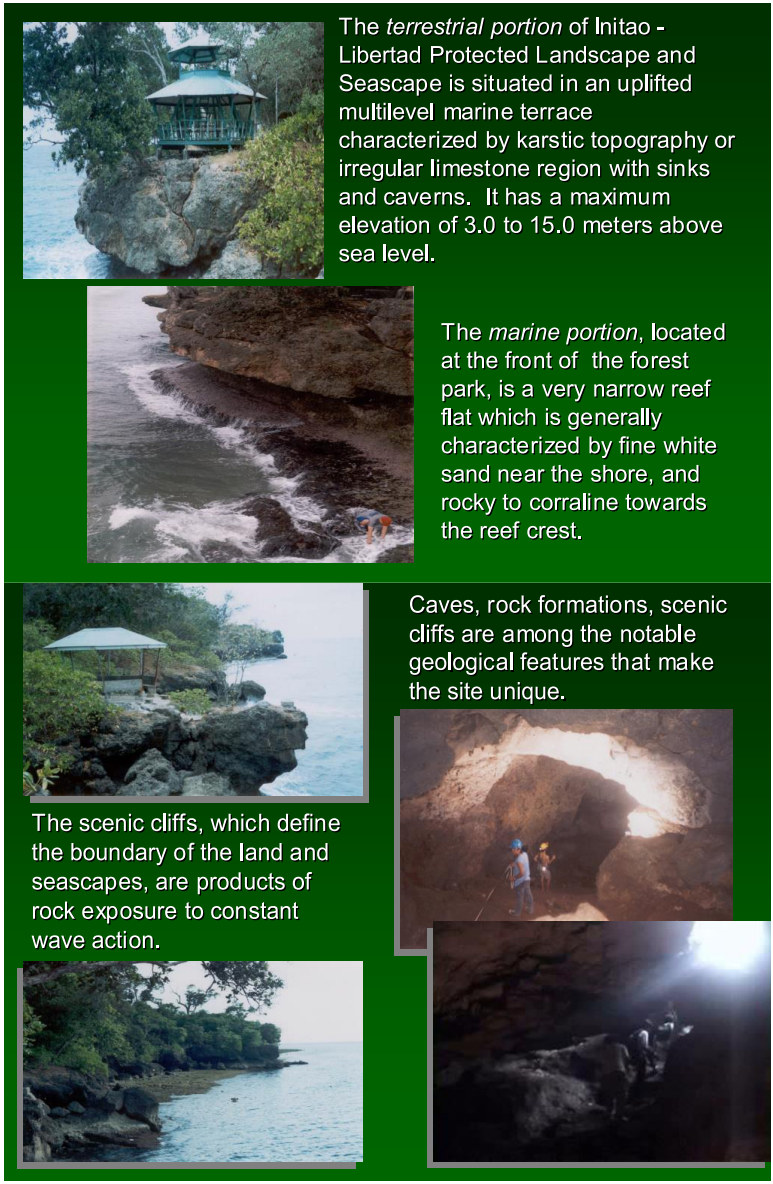


Plate 2. Landscape and Seascape biodiversity

2. Data Collection/Gathering

Data were collected using the following methods:

a) Time-Area Count Method

The observation walked around each established sampling areas for 30 minutes. All the animal species encountered during the period were identified, recorded and tallied. Only those actually observed by the naked eyes, seen through binoculars, telescope and those identified by vocalization, tracks, nests, burrows and feces were recorded. Each entry were on per study area and per session basis (morning or afternoon).

b) Line Transect Method

Involved walking along the line established through an area and recorded all the species observed from the line per unit distance travelled. The observer noted the right angle distance from each animal to the transect line or the straight line distance of the animal from him. The shortest the distance travelled before an animal sighted meant that numerous animals were present in the study area.

Sampling stations were established at every 100 meter of the transect length. The stations established in the conduct of Floral Resources Inventory were also used for this purpose. Some live-trapping techniques used were mist netting and snare trapping.

c) Other Methods

Additional methods that also helped in identifying the wildlife resources included Interview of residents and referral to past/secondary information, call counts, pellet counts, and roadside counts.

Underwater Resources of the Initao-Libertad Protected Landscape and Seascape

3. Coral Survey

The Line-Intercept Transect (LIT) method as described by English et.al was used to determine the cover of corals and other major benthic categories/ lifeforms in the area.

Only one (1) site was established, which is approximately 100 meters away from the shoreline of the Initao-Libertad Protected Landscape and Seascape. Three (3) 20-meters transects were laid randomly in depths ranging from 15 to 30 feet. The length of cover or intercept of each benthic categories and life forms were measured with a graduated transect tape in centimeters. Underwater measurement was done while moving slowly along the laid transects and was encoded based on coded indicators in slates.

The percent cover of each life forms/category was calculated using the formula:

$$\text{Percentage cover (\%)} = \frac{\text{Total length of Category} \times 100}{\text{Length of transect}}$$

**Fish Visual Census (FVC)**

The Fish Visual Census was conducted in conjunction with the LIT. Census started after a settling period of at least 10 minutes. This is to allow fish to resume normal behaviour after the transect line has been laid. The abundance of fish species found within 5 meters on both sides of the transect and above the observer were identified and listed.

BIODIVERSITY MONITORING SYSTEM (BMS)

The Biodiversity Monitoring System is a cost-effective and standardized method in monitoring the trends in population of indicator/priority species and land uses in the area adopted by the Department of Environment and Natural Resources (DENR). The BMS includes four (4) methods:

1. **Focus Group Discussion (FGD).** This method generates information regarding trends in use of resources. Trends in status of selected resources and trends in status of households benefiting from the use of resources. This information is mainly based on local communities own perception of trends. Data gathered continuously from a number of representative's community can provide valid pictures of general trends.

2. **Field Diaries** are used by protected area staff during regular patrols and other field activities. This method comprises standardized recording of

routine observations on resource use and wildlife in a simple pocketbook or data sheet. Information may be own observation or second hand information.

3. **Photo Documentation** is done at six permanent points by taking photos of the landscape from the same place every quarter. The new photos are compared with older ones to tract changes in the forest cover.

4. **Transect Walk** is somewhat similar to routine patrolling using field diary. However, transects are permanent demarcated routes where there are precise recommendations on where to walk (sail or swim). When to do it, and when to note. Transects are undertaken along 2 kilometers permanent routes every quarter.

## RESULTS AND DISCUSSION

### 1. Resources Basic Inventory of the Park (Species Richness and Conservation Status)

The park covered a limestone forest of about 57 hectares, which was where this resource assessment was conducted. The park had a marine portion covering 1,264 hectares. This assessment was conducted both at the Strict Protection Zone and Recreational Zone of the protected area.

The Line Intercept Method was a sampling method used to sample shrub layer of the vegetation. Roughly estimated, the dominant vegetation sampled was the dominant vegetation after seventy years this RBI was conducted.

At the Recreational Area, 45 species of assorted floral species were listed in Table 1. Margapali (*Dehassia triandra*) listed as with the highest number and Importance Value, followed by Duklap and Pait-paitan. Furthermore, a total of 36 species were listed in the Strict Protection Zone. Duklap topped in the list, followed by Pait-paitan and Margapali. It was noteworthy to emphasize that though the Recreational Area has a smaller area (14 has.), it listed more species (45 species) than the Strict Protection Zone, which had an area of 36 hectares and has only listed with 36 species. The presence of more species at the Recreational area was attributed to the presence of mangrove associate species along the bank of the cliff and introduction of ornamental plants.

Moreover, it was also noted that looking at the canopy of the park, Margapali and Talisay-gubat dominated the canopy. However, Talisay gubat was not among the dominant in the shrub layer in the sampling. The dominant species in the sample Duklap and Pait-paitan were only medium sized trees compared to overstorey dominating species in the area, the Margapali and Talisay-gubat.

In the Recreational Zone, Malabuaya, a medium sized tree dominated the sample in the less 20 cm diameter at breast height (dbh) group. In more than 20 dbh group, and was dominated by Margapali.

In the Strict Protection Zone, Alim dominated in the less than 20 dbh group while Talisay-gubat and Margapali were the dominant species in more than 20 cm dbh group.

It is again noteworthy to mention that Talisay Gubat, which was dominant in more than 20 cm dbh group in the Strict Protection Zone, was not listed in the understorey species in both zones. Roughly interpreted, these two species, Margapali and Talisay-gubat were no longer dominant in the next 50 years, if all the other growth factors remained constant.

The quadrat method listed the dominant species in the seedling layer of the samples. Margapali listed as dominant in the seedling layer in the sampled plots. It is followed by Pandadaging-gubat, Pait-paitan and Matang-hipon. Margapali is a large tree but the others are naturally medium sized trees. Talisay-gubat was in the list but not dominant. The seedling layer, which was represented by Margapali, roughly interpreted, was the dominant trees after 100 years or more.

Table 1.Summary of the Species Richness and there Conservation Status of Plants in Initao-Libertad

| Family | Scientific Name | Local Name | Conservation Status |
|---|---|---|---|
| Alangiaceae | *Alangium javanicum* Merr. | Putian | Depleted |
| Amaranthaceae | *Deeringia polysperma* (Roxb.) | Saloloy | |
| Apocynaceae | *Ervantia cronata* (Merr.) | Pandadaging gubat | |
| Araceae | *Aglaonema sp.* | Aglaonema sp. | |
| Bignoniaceae | *Oroxylum indicum* (L.) Kurz. | Pinka-pinkahan | Economically important |
| Boraginaceae | *Ehretia acuminate* R. Br. | Anonang | |
| Burseraceae | *Canarium hirsutum* Willd. | Bugo | Vulnerable |

| Family | Scientific Name | Local Name | Conservation Status |
|---|---|---|---|
| Caesalpinaceae | *Senna spectabilis* (DC.) Irwin and Barneby | Antsoan dilaw | Common |
| Combretaceae | *Pomentia pinnata* J.R. and G. Frost | Malugai | Depleted |
| Combretaceae | *Terminalia foetidissma* Griff | Talisay Gubat | |
| Combretaceae | *Terminalia catappa* L. | Talisay | |
| Combretaceae | *Terminalia calamansanai* (Blco.) | Sakat | |
| Ebenaceae | *Diospyros philosanthera* Blco. | Bolung-eta | Endangered |
| Ebenaceae | *Diospyros sp.* | Diospyrus sp. | |
| Euphorbiaceae | *Mallotus philippinensis* (L.) | Banato | Depleted |
| Euphorbiaceae | *Melanolepis multiglandulosa* (Reinw.) Reichb.f. and Zoll | Alim | Economically Important |
| Euphorbiaceae | *Codiaeum variegatum* (L.) Bl. | San Francisco | |
| Fabaceae | *Leucaena leucocephala* (Lam) de Witt. | Ipil-ipil | |
| Fabaceae | *Pongamia pinnata* (L.) Merr. | Balok-balok | |
| Guttiferae | *Calophylum sp.* | Calophylum sp. | |
| Lauracea | *Cinnamomum philippinense* | | Economically important |
| Loganiaceae | *Fagraea racemusa* Jack ex. Wall | Malabuaya | |
| Malvaceae | *Abutillon indicum* L. | Dalupang | |
| Meliaceae | *Swietenia macrophylla* Jacq. | Large leafed mahogany | Economically important |
| Moraceae | *Broussonetia luzonica* (Blco.) | Himbabao | |
| Moraceae | *Artocarpus blancoi* (Elmer) Merr. | Antipolo | Common species |
| Myrtaceae | *Syzygium sp.* | Syzygium sp. | |
| Myrtaceae | *Xanthostemon purpureus* Gug. | Malamancono | |
| Myrtaceae | *Syzygium costulatum* (C.B. Rob.) Merr. | Paitan | |
| Poaceae | *Cephalostachyum mindorense* Gamble | Bikal | |
| Poaceae | *Paspalumcon jugatum* | Carabao grass | |
| Rhamnaceae | *Ziziphus talanai* (Blco.) Merr. | Balakat | Other threatened species |
| Rhamnaceae | *Ziziphus trinervia* (Cav.) Poir | Duklap | |
| Rubiaceae | *Glochidion philippicum* (Cav.) C.b. Rob | Matang-hipon | |
| Rubiaceae | *Morinda citrifolia* L. | Bangkoro | |
| Rutaceae | *Murraya paniculata* (L.) Jack | Kamuning | |
| Sapindaceae | *Litchi chinenesis* Sonn. | Alupag | |
| Sapindaceae | *Dimocarpus longan* Lour. | Alupag-amo | Endangered |
| Sapotaceae | *Chrysophyllum caimito* L. | Caimito | |

| Family | Scientific Name | Local Name | Conservation Status |
|---|---|---|---|
| Sterculiaceae | *Pterocymbium tinctorium* (Blco.) Merr | Taluto | |
| Sterculiaceae | *Pterospermum elmerii* Merr. | Bayok | |
| Sterculiaceae | *Aglaia edulis* (Roxb.) Wall. | Malasaging | Vulnerable |
| Sterculiaceae | *Pterospermum diversifolium* Bl. | Balon | |
| Verbenaceae | *Gmelina arborea* Roxb. | Gmelina | Common |
| Zingiberaceae | *Zingiber sp.* | Zingeberaceae sp. | |

The rapid sampling listed 4 mammals, 16 avian species, 11 insect species, 4 reptiles, 1 gastropod and 1 amphibian. Interviews also revealed the presence of megapod or mound-building bird.

The Philippine macaque was already a common sighting in the area. The sighted 16 species of birds was already a good number for bird diversity in the area considering its smaller size.

## 2. **Underwater Assessment**

### 2.1 **Coral Survey**

As shown in Figure 1, the said site was in "good condition" having live coral cover of 51%. The abiotics covered 48% while sponges and other organisms covered .8% and .2 % respectively.

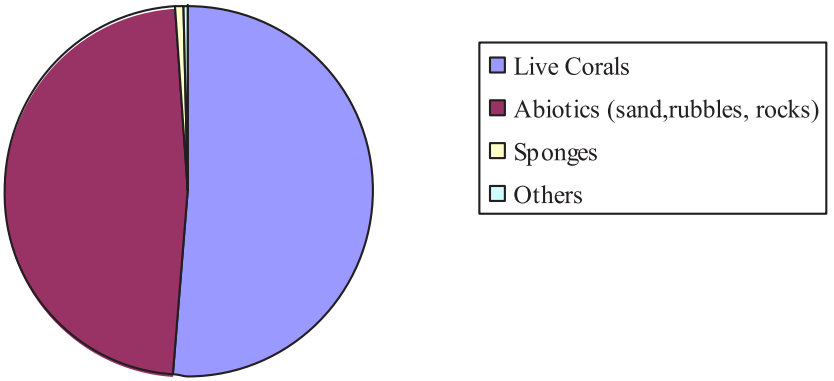


Figure 1. Percentage cover of the different benthic categories/lifeforms found within ILPLS

Seventeen (17) coral genera were found in the area, most of the which were massive, branching, foliose and encrusting in forms (Table 2).

Table 2. Coral Genera found within ILPLS

| | |
|---|---|
| 1. *Acropora* sp. | 10. *Lobophyllia* sp |
| 2. *Diploastrea* sp. | 11. *Merulina* sp. |
| 3. *Echinopora* sp. | 12. *Millepora* sp. |
| 4. *Euphyllia* sp. | 13. *Pavona* sp. |
| 5. *Favia* sp. | 14. *Pleroguya* sp. |
| 6. *Favites* sp. | 15. *Pocillopora* sp. |
| 7. *Fungia* sp. | 16. *Porites* sp. |
| 8. *Galaxea* sp. | 17. *Symphyllia* sp. |
| 9. *Heliofungia* sp. | |

Plate 3. Fish Visual Census (FVC)

A total of twenty-two species belonging to eighteen (18) Families of reef fish had been identified and recorded in the coral reef of ILPLS (Table 3). The Families of Butterflyfishes (Chaetodontidae), Angelfishes (Pomacanthidae) Damsels and Chromis (Pomacentridae) were considered indicators of a healthy reef and their presence suggested a highly productive coral reef environment

which had sustained a relatively low disturbance or stress from either natural occurrence or man-made activities.

Table 3. Checklist of Reef Fishes found within ILPLS

| Group/Family | Species |
|---|---|
| 1. Chaetodontidae | *Chaetodon aurega*<br>*Parachaetodon ocellatus* |
| 2. Pomacanthidae | *Centropyge bicolour* |
| 3. Pomacentridae | *Abudefduf sexfasciatus*<br>*Chromis sp.*<br>*Dascylus aruanus* |
| 4. Serranidae | *Pseudanthias hutchii* |
| 5. Mullidae | *Upeneus tragule* |
| 6. Nemipteriidae | *Nemipterus peroni* |
| 7. Lutjanidae | *Lutjanus dessucatus* |
| 8. Caesionidae | *Caesio cuning* |
| 9. Apogoniidae | *Apogon aureus* |
| 10. Balistidae | *Balistapus undulates* |
| 11. Centrisadae | *Aulisius strigatus* |
| 12. Cirrhitidae | *Cirrhitichthys falco* |
| 13. Labridae | *Thallasoma lunare* |
| 14. Gobiiidae | *Glossubius sp.* |
| 15. Amphiprionidae | *Amphiprion peridaeion*<br>A. *Ocellaris* |
| 16. Scaridae | *Scarus fasciatus* |
| 17. Scorparidae | *Pterois antennata* |
| 18. Plotosidae | *Plotusus lineatus* |

## CONCLUSIONS

Based on the findings of the research, we can conclude that the Park is the only identified habitat of Talisay-gubat in Northern Mindanao but it seems that the present standing species is the last of its generation. This species is becoming locally-threatened. Hence, there is a management implication to employ measures for its assisted regeneration. The management has to employ methods of Assisted

Natural Regeneration (ANR) with focus on those species. Tarsier is one species mentioned but were not noted by the inventory team. Hence, there is a need to conduct thorough observation to confirm presence of Philippine Tarsier in the park.

## RECOMMENDATIONS

The following recommendations are formulated after making the research:

There should be a limit on activities or development in the Strict Protection Zone. Activities or ecotourism should be confined in the Recreational Zone. Further studies shall be conducted specially regarding the important species in the park, both marine and terrestrial. Apart from that, there should be further avian species assessment, particularly at the coastal and marine portion to come up with list of possible migratory bird presence in the coastal zone. Another possible aspect of focus is the impact of climate change to the ecosystems of the park

Further studies should also look into identified gaps on program, projects and policy level and consider its discussion, resolution and actual action from among concerned DENR Officials, PAMB members and Protected Area Office headed by the PASU who is the executing officer in the protected area. For the PAMB and PAO, they should coordinate and effectively collaborate with the Local Government units concerned, having jurisdiction within the protected area, the municipality of Libertad with the barangay of Gimaylan and the municipality of Initao with barangay Tubigon to draw support in terms of human, financial and material support in managing the park. The PAMB and PAO should be transparent in all actions/decisions and accept responsibilities in their decisions and actions leading towards effective park management. The Local Government Unit should facilitate the lobbying of legislative action for ILPLS as permanent Protected Area with legal enactment.

Lastly, there should be a continuous orientation and education, sharing of lessons learned and exposure to model protected areas of PAMB members, PAO staff and important players to enhance their knowledge on park management and biodiversity conservation and strengthen planning, decision making and environmental governance skills as well as in-depth understanding and learning on climate change, its mitigating measures and adaptation process for application in ILPLS.

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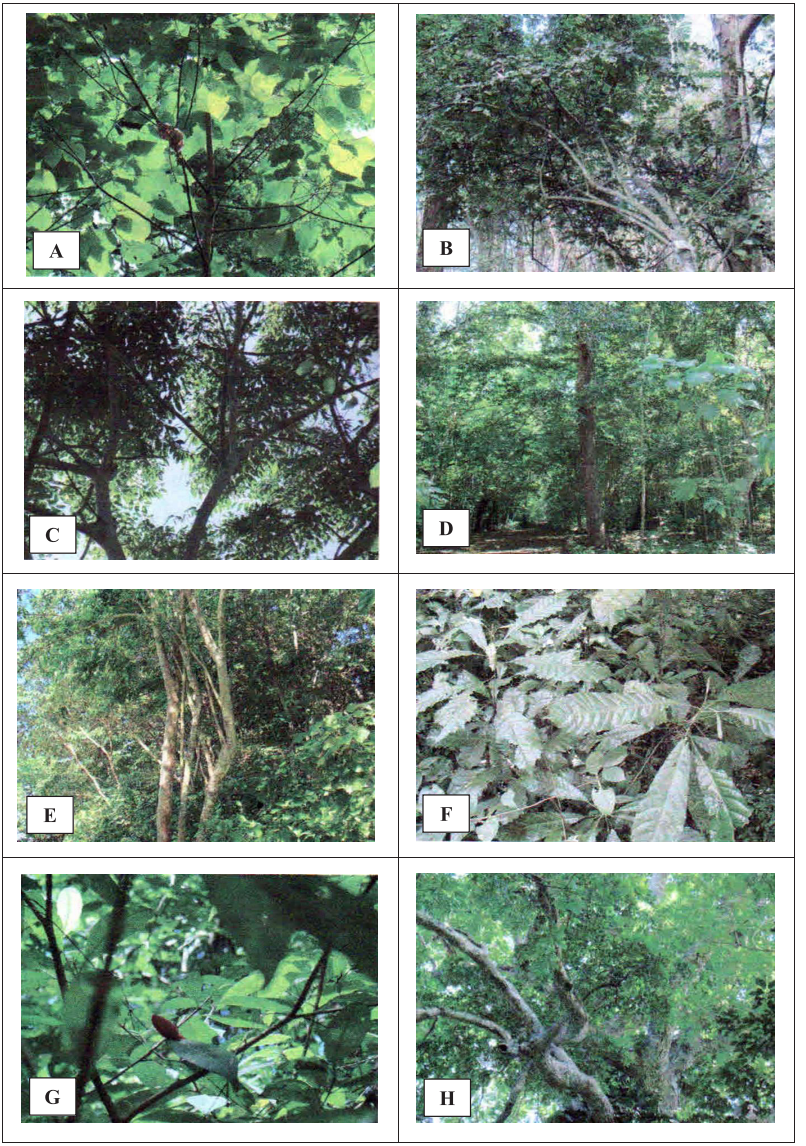


Plate 4. A. *Melanolepis multiglandulosa* (Reinw.) Reichb.f. and Zoll ; B. *Ziziphus trinervia* (Cav.) Poir; C. *Fagraea racemusa* Jack ex. Wall; D. *Dehassia triandra* E. *Glochidion philippicum* (Cav.) C.b. Rob; F. *Syzygium costulatum* (C.B. Rob.) Merr.; G. *Ervantia cronata* (Merr.); H. *Terminalia foetidissma* Griff