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PROJECT REPORT

Project Title	:	**Verification Survey and Mapping of the New Identified Mangrove Species in Maribojoc Bay Community-Managed Mangrove Forest in Maribojoc Bay**
Proponent	:	PROCESS-Bohol, Inc.
Project No.	:	RE16-203V-CO-S
Start-up Date	:	April 11, 2016
Completion Date	:	October 11, 2016
Project Partners	:	San Vicente Mangrove Association (SAVIMA) Dipatlong Mangrove Planters Association (DIMAPA) Abatan Lincod Mangroves Growers Organization (ALIMANGO) Upper dela Paz Biodiversity Conservation Association (UBCA) And Dr. Hilconida P. Calumpong, PhD Director, Institute of Environmental and Marine Sciences Silliman University, Dumaguete City
Funded By	:	Foundation for the Philippine Environment (FPE)

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I. IDENTIFYING INFORMATION

The Participatory Research, Organization of Communities and Education towards Struggle for Self-reliance (PROCESS)-Bohol, Inc. forged another PARTNERSHIP AGREEMENT with Foundation for the Philippine Environment (FPE) for a small grant project entitled: Verification Survey and Mapping of the New Identified Mangrove Species in Maribojoc Bay Community-Managed Mangrove Forest in Maribojoc Bay". The total project cost is PhP269,200.00.

The proposed project is a 6-month research initiative designed to revalidate the survey result of the re-assessment of the bio-physical resources of CBFMA designated areas abutting the Maribojoc Bay.. The results of which could be used as basis for stronger legislation support as well as more concrete action to address the worsening condition of the mangrove forest ecosystem.

Based on the latest study conducted, these three barangays had a combined total of 32 different mangrove species belonging to 14 families comparatively higher compared to the study conducted last 1997. Findings also revealed that the mangrove areas still have high regeneration capacities and are abundant in saplings and seedlings which are major feature of a fast growing forest. This current condition also indicates that the place is favorable environment for mangrove (Lepiten, 1997).

The project will be implemented in the four (4) coastal barangays in the Maribojoc Bay namely; Upper dela Paz of Cortes, and Lincod, San Vicente and Dipatlong of Maribojoc, Bohol. The four barangays has a combined total land area of approximately 645.33 hectares of which 42% or 272.6 hectares were mangrove forest. The covered barangays also have a combined total household of 1,055 consisting of 4,642 individuals with an average growth rate of 2.37% per annum. Basically, residents are dependent on the coastal resources for their livelihood activities. Majority are fishermen, gleaners, nipa growers and nipa weavers.

Currently, some of the mangrove areas in the three barangays are being awarded to the accredited people's organization through the community-based forest management agreement (CBFMA), namely: Upper dela Paz Biodiversity Conservation Association (UBCA), Dipatlong Mangrove Planter's Association (DIMAPA) and San Vicente Mangrove Association (SAVIMA) in the municipalities of Cortes and Maribojoc respectively.

All these POs were organized by PROCESS-Bohol, Inc. and duly registered with the Department of Labor and Employment (DOLE). Likewise, all of them were direct partner-beneficiaries of various projects on community-based resource management in collaboration with different government agencies like Department of Environment and Natural Resources (DENR), Bureau of Fisheries and Aquatic Resources (BFAR) and local government units of Cortes and Maribojoc. These organizations are also recipients of different program and projects of DENR under the National Greening Program and CBFMA assistance; DOLE for their livelihood; BFAR also for livelihood and their respective Local Government Units for livelihood and infra support.

II. EXECUTIVE SUMMARY

Prior to the conduct of the revalidation survey, an on-the job training was done on Mangrove Taxonomy and Assessment last May 12-15, 2016 at the Abatan Main Village Center, Cortes, Bohol facilitated by Dr. Hilconida P. Calumpong, PhD, with her team. A total of 16 participants attended who are members of the POs of Cortes and Maribojoc. The list of trainees and their PO affiliation is found in Annex 1. The first day was a lecture discussion as their basic fundamental knowledge regarding Mangrove Taxonomy while the remaining three (3) days were focused on the application of their learning and knowledge as para-taxonomists.

The training module consisted of the following topics: 1) What are mangroves and what are the services and goods that they provide? 2) How do we identify mangrove species? 3) How do we assess mangroves? 4) How do we do mangrove mapping?

After the four-day training, all the participants served as para-taxonomists and were part of the Team who conducted the re-validation survey. The participants were divided into 4 teams. The survey were done in the two municipalities of Cortes and Maribojoc particularly in the six (6) barangays of Lower de la Paz, Salvador, Upper de la Paz in Cortes, and Lincod, San Vicente, Anislag, Poblacion, Dipatlong in Maribojoc were surveyed.

As a result, it was found out that a total of **35 mangroves in 15 families**, including one hybrid, and **20 associated species in 17 families** (excluding unidentified ones) were identified in the area (Table 1 of the survey report). Three new records in three families are added to the list; Heritiera littoralis Dryand. (Malvaceae), Scyphiphora hydrophyllacea Gaerten. f. (Rubiaceae), and Xylocarpus rumphii (Kostel) Mabb (Meliaceae).

Four species are in the IUCN (2015) threatened species list: Aegiceras floridum Roem. and Schult.–Near Threatened ver. 3.1, Avicennia lanata Ridley– Vulnerable B1+2c ver 2.3, Camptostemon philippinensis (S.Vidal) Becc.– Endangered C1 ver. 3.1 and, Ceriops decandra (Griff.) Ding Hou– Near Threatened ver. 3.1.

All sites had increased number of species over the 2013 survey, except Upper de la Paz with six less species seen in 2016. Dipatlong had the most dramatic increase, from 7 species in 2013 to to 26 species in this current survey.

Based on local knowledge, the unidentified mangrove in 1997 locally called “maudo” was identified as Lumnitzera littorea (Jack) Voigtand the unidentified fern, Acrostichum speciosum Willd. “Tungki” is not a mangrove species but the local name for the propagules of Rhizophora. Based on studies conducted at SU-IEMS (unpub.), Acanthus ebracteatus Vahl. and A. ilicifolius L. can change leaf morphology depending on exposure to sunlight and can take the form of A. volubilis Wall. We have retained Acanthus ebracteatus in this listing.

One hydrid was identified: Rhizophora x lamarckii Montr. (R. stylosa x R. apiculata).

III. PROJECT DESCRIPTION

Generally, the project aims to establish tangible data basis for stronger legislation support as well as more concrete action to address the worsening condition of the mangrove forest ecosystem.

Specifically, the project aims to:

1. conduct verification study of the seven new records of mangrove species;
2. map the location of the species;
3. determine their tree sizes (diameter at breast height) and abundance (in terms of tree counts per species);
4. train local community researchers basic mangrove para-taxonomy.

Strategies

The verification study was conducted by the Silliman University Research team led by Dr. Hilconida Calumpong, PhD, currently the Director of Silliman University Graduate Studies. Dr. Calumpong is a mangrove expert and was involved in several research activities in the Bohol Marine Triangle Project in 2002 and many other researches. She is also a member of the FPE's Expert Advisory Pool (EAP).

The strategies was in a form of an on the job training. This means that local community researchers participated in a one-day lecture workshop on mangrove taxonomy and methods of assessment, after which the trainees conducted the assessment of their assigned barangay under the supervision of an SU researcher. Trainees were given mangrove photo guides to help them in the identification. Each species encountered will be photographed, geo-referenced, measured and voucher specimens brought to the field base, If needed for further verification by the expert. Two hours per day were allocated for participants to input the gps data, map the location of the species, compute for their dbh and density. When the survey was completed, the whole group validated the results. The results in the form of a species map could be used in aid of legislation and for information dissemination and education campaigns (eg diorama). Short write-ups on the importance of the verification and Research and Mapping were done as the main Strategy. Also, community researcher were trained with Basic Mangrove Para-Taxonomy

Methods

Pre mapping were done by SU researchers prior to the survey based on the 1997 and 2013 surveys. The area was divided into four grids, each grid equivalent to one barangay, with one SU researcher per grid and at least 4 trainees/local researchers/para-taxonomists. Each team will have a GPS device, camera, tape measure, slate board and pencil. The transect –plot method of English et al. (1997) will be used to determine density per species and diameter at breast height.

Expected Outputs

1. Verification list of new species, species location (GPS way points), average dbh/species, density/species/ barangay
2. Geo-referenced map per species for the whole Maribojoc Bay
3. At least 4 mangrove para-taxonomist per barangay or 16 trained mangrove para-taxonomist.

IV. ACCOMPLISHMENT

a. A narrative report of the accomplishments ie. vis-a-vis approved activity plans, ways forward

Capacity Building

A total of sixteen (16) members of four (4) peoples' organizations attended and completed the Training on Mangrove Taxonomy and Assessment. The list of trainees and their PO affiliation is found in Annex 1.

Lectures and practice were conducted on Day 1 (May 12, 2016) at the Abatan Main Village (Tourist) Center in Cortes (see Annex 2-3). The training module consisted of the following topics: 1) What are mangroves and what are the services and goods that they provide? 2) How do we identify mangrove species? 3) How do we assess mangroves?; 4) How do we do mangrove mapping?

Survey Sites.

Six barangays (De la Paz, Upper de la Paz in Cortes, Lincod, Cabawan, San Vicente and Dipatlong in Maribojoc) in two municipalities (Cortes, Maribojoc) were surveyed (Fig. 1 of the Survey Report). The survey tracks and plots are shown in Figure 2 of Survey Report.

However, to make the survey more comprehensive and inclusive, the survey sites were expanded to adjacent barangays of Anislag and Poblacion of Maribojoc. These barangays are adjacent to San Vicente and Dipatlong respectively.

Three sites were assessed in 1997: De la Paz, Lincod and San Vicente; de la Paz was not was reassessed in 2013 but Dipatlong, and Upper de la Paz were added while a new site (Cabawan), was added in 2016 but only the site along the Abatan River was surveyed.

Actual Survey

During the first sampling, the actual field surveys and mapping were done on Days 2 and 3 (see Annex 5) while validation of data and closing ceremonies were completed on Day 4 (see Annex 5). The participants were then divided into 4 teams led by the Silliman Researchers as the group's team leader and mentor.

However, another revalidation survey was done last October 13, 2016 to revalidate the mangroves identified that were not found during the first validation.

Significant Findings

Species Composition

A total of 35 mangroves in 15 families, including one hybrid, and 20 associated species in 17 families (excluding unidentified ones) were identified in the area (Table 1 of the survey result). Three new records in three families are added to the list; Heritiera littoralis Dryand. (Malvaceae), Scyphiphora hydrophyllacea Gaerten. f. (Rubiaceae), and Xylocarpus rumphii (Kostel) Mabb (Meliaceae). The first one was found only in Cabawan while the last two were found only in San Vicente. Photos of all species, including the associates are found in Plate 1. Mangrove classification follows the scheme found in Massó et al. (2010). It should be noted that under this scheme, 4 species originally put in the true mangrove list are transferred to the mangrove associates category. These are Barringtonia asiatica (L.) Kurz, Derris trifoliata Lour., Dolichandrone spathacea (L.) K. Schum., Pongamia pinnata (L.) Pierre. Also, three families are merged, Aviceniaceae with Acanthaceae, Myrsinaceae with Primulaceae and Lythraceae with Sonneratiaceae.

Four species are in the IUCN (2015) threatened species list: Aegiceras floridum Roem. and Schult.–Near Threatened ver. 3.1, Avicennia lanata Ridley– Vulnerable B1+2c ver 2.3, Camptostemon philippinensis (S.Vidal) Becc.– Endangered C1 ver. 3.1 and, Ceriops decandra (Griff.) Ding Hou– Near Threatened ver. 3.1.

All sites had increased number of species over the 2013 survey, except Upper de la Paz with six less species seen in 2016. Dipatlong had the most dramatic increase, from 7 species in 2013 to to 26 species in this current survey. This could be due to the more systematic search conducted.

Three species were found only in San Vicente: Xylocarpus rumphii (Kostel) Mabb. (Meliaceae), Scyphiphora hydrophyllacea C.F.Gaertn. (Myrtaceae) and Aegiceras floridum Roem.& Schultes (Myrsinaceae), although the latter was recorded in Upper de la Paz in 2013 but not found there during this survey.

The endangered Camptostemon philippinensis was not seen in the areas surveyed in San Vicente but was found in Lincod. This may be because the stations surveyed in 2013 were not the same as the one in the current survey as no specific locations of survey stations were given in the 2013 report. Three species were not seen in this current survey and were put on the watch list: Acanthus ilicifolius, Sonneratia caseolaris (L.) Engler., and S. ovata Backer. This is because we rely on the flowers/fruits for the species confirmation and it was not their flowering/fruiting period. Eight species in 5 families were found in all sites, Avicennia marina (Forsk.) Vierh. (Acanthaceae), Excoecaria agallocha L. (Euphorbiaceae), Nypa fruticans (Thun.) Wurmb (Arecaceae), 4 species in the Rhizophoraceae-Ceriops decandra (Griff.) Ding Hou, Rhizophora apiculate Blume, R. mucronata Lamk., R. stylosa Griffith, and Sonneratia alba J. Smith (Lythraceae).

Based on local knowledge, the unidentified mangrove in 1997 locally called “maudo” was identified as Lumnitzera littorea (Jack) Voigtand the unidentified fern, Acrostichum speciosum Willd. “Tungki” is not a mangrove species but the local name for the propagules of Rhizophora. Based on studies conducted at SU-IEMS (unpub.), Acanthus ebracteatus Vahl. and A. ilicifolius L. can change leaf morphology depending on exposure to sunlight and can take the form of A. volubilis Wall. We have retained Acanthus ebracteatus in this listing.

One hydrid was identified: Rhizophora x lamarckii Montr. (R. stylosa x R. apiculata).

Additional significant findings:

1. Community Structure. The mangrove forest of Maribojoc Bay is a combination of natural and reforested areas. Reforested areas are generally planted to Rhizophora stylosa and these are found in the seaward portion of the forest. The river banks are fringed with Nypa fruticans with its associated fern species (Acrostichum). Landward is where most of mangrove associates are found. Large areas, are still protected, e.g., in San Vicente but in Lincod, only a small portion is left as most of it has been converted to fishponds.

2. Density. The most common species is Sonneratia alba as shown in Fig. 3 of the survey report with mean density of 318 + 317 stems ha-1. This is followed by Rhizophora apiculata and R. stylosa with mean densities of 229 + 228 and 2221 + 378 stems ha-1, respectively. Avicennia marina ranked fourth with a mean density of 137 + 113 stems ha-1.

3. Regeneration potential. Of the more than 30 species of mangroves, seedlings/saplings of 19 species and 1 associated species were seen. (see Fig. 4 of the survey report). This gives a regeneration potential of about 50%.

   Bruguiera parviflora had the highest number of seedlings (2605 + 5414 seedlings ha-1) but almost no saplings were found (1 + 2 saplings ha- 1) while Ceriops decandra had the most number of saplings (902 + 1057 saplings ha- 1) but no seedlings were seen.

4. Lincod is one of the two most diverse sites with 21 mangrove species but also the most threatened with fishponds occupying what used to be mangrove forest.

   The endangered Camptostemon philippinensis was also found here. The most abundant species were Sonneratia alba, Avicennia marina and Rhizophora mucronata. There were also monospecific patches of Xylocarpus moluccensis, Lumnitzera littorea, and Excoecaria agallocha.

5. San Vicente is the other most diverse site with 21 species of mangroves and the most well protected forest in the whole Bay. Most abundant species is Rhizophora apiculata.

6. Among all sites, Dipatlong showed highest increase in the number of species, from 7 in 2013 to 19 in the current survey. This may be due to a more systematic sampling and more areas covered.

7. In De la Paz, twenty (20) species were seen, an increase of 6 species over the previous survey. Based on relative density Rhizophora apiculata was the most abundant in the seaward portion while Avicennia officinalis was the most abundant in the landward portion of the forest. Biggest trees were Avicennia lanata, found in the seaward portion with maximum diameter at breast height (DBH) of 41.4 cm and average basal area (BA) of 1114.9 cm2.

8. In Upper de la Paz, thirteen species were seen. A decrease of seven species over the previous survey. Noteworthy was Bruguiera sexangula which was not seen in this survey but was seen up River in Cabawan area.

9. Abatan River was monospecific with large trees of Bruguiera parviflora. This is the only site where large trees of Lumnitzera littorea were found but were also threatened by girdling.

Threats

Several threats to the mangrove forest of Maribojoc Bay were seen. The primary threats are the continuing expansion of fishponds and settlements, leading to dredging and garbage. Minor threats are cutting and girdling, pests and diseases.

b. Challenges, lessons learned and succeeding course of action that the Partner will take to sustain the outputs of the Project

Indeed, Maribojoc Bay is one of the most diverse mangrove ecosystem in the country. A total of 35 mangroves in 15 families, including one hybrid, and 20 associated species in 17 families (excluding unidentified ones) were identified in the area.

However, this goes with ith some challenges. *First*, there are four (4) species that are found in the IUCN (2015) threatened species list. These are the following: a) Aegiceras floridum Roem. and Schult.–Near Threatened ver. 3.1; b) Avicennia lanata Ridley– Vulnerable B1+2c ver 2.3; c) Camptostemon philippinensis (S.Vidal) Becc.– Endangered C1 ver. 3.1; and, d) Ceriops decandra (Griff.) Ding Hou– Near Threatened ver. 3.1.

Aside from the threatened species, several threats to the mangrove forest of Maribojoc Bay were seen. The primary threats are the continuing expansion of fishponds and settlements, leading to dredging and garbage. Minor threats are cutting and girdling, pests and diseases.

Hence, more vigilance is needed particularly those sectors that are directly affected such as the coastal communities through their respective POs with support from the local government units of Cortes and Maribojoc as well as the provincial LGU.

Conclusions

The Maribojoc mangrove forest is one of the most diverse, if not the most diverse mangrove forest in the Philippines with 35 species in 15 families, including one hybrid and excluding mangrove associates.

Four of the species four families are in the IUCN (2015) threatened species list: En - Camptostemon philippinensis (S.Vidal) Becc., NT- Aegiceras floridum Roem. and Schult., and, Ceriops decandra (Griff.) Ding Hou and V- Avicennia lanata Ridley.

The most common species is Sonneratia alba with mean density of 385 + 37 stems ha-1 while those with only one stem found in the surveyed plots were Aegiceras floridum, Bruguiera gymnorrhiza and Xylocarpus rumphii. Among the herbaceous and shrubby species, Nypa fruticans was the most abundant with a mean cover of 42.0 + 36.3%. Among the sites, Lincod and San Vicente are the most diverse with 21 species of mangroves, excluding associates but while San Vicente is the best protected, Lincod is the most threatened due to fishpond development. It is also the site where three of the threatened species are found. Overall, the forest has a moderate regeneration potential of about 50% with seedlings and saplings of 19 species out of 35 found during the sampling period. No seedlings were seen for 4 species with saplings and no saplings were seen for 5 species with seedlings. Bruguiera parviflora had the highest number of seedlings.

Ways Forward

1. A comprehensive management and conservation plan for the Maribojoc Bay mangrove forest is urgently needed.
2. In the meanwhile, activities that could be done at the barangay level include: a. Enhancement planting of disappearing species and threatened species (marked with asterisk). The list below shows priority species and their seed/seedling source:

Species	Local Name	Seed/Seedling Source
*Aegiceras floridum Roem. and Schultes**	Tinduk-tindukan/	San Vicente
*Avicennia lanata Ridley**		Lincod
Bruguiera cylindrica (L.) Blume	Pototan-lalake	Dipatlong
Bruguiera gymorhiza (L.) Lamk	Busain	San Vicente
Bruguiera parviflora Wight & Arnold ex Griffith		Upper de la Paz Cabawan
Bruguiera sexangula (Lour.) Poir.	Pototan	Cabawan
*Camptostemon philippinensis (S.Vidal) Becc.**	Gapas-gapas	Lincod
*Ceriops decandra (Griff.) Ding Hou**	Lapis-lapis	All sites
Lumnitzera littorea (Jack) Voigt	Tabao/Maudo	Upper de la Paz
Scyphiphora hydrophyllacea Gaerten. f.	Nilad	San Vicente
Xylocarpus rumphii (Kostel) Mabb.	Tabigi/Piagau	San Vicente

3. Regular inventory of existing species and monitoring of threats. Mangrove species that were not found in this survey and are put on the watch list for monitoring are:

   a) Acanthus ilicifolius L.,
   b) Sonneratia caseolaris (L.) Engler
   c) Sonneratia ovata Backer

4. Awareness campaign on the importance of mangroves and their role in livelihood provision.

5. Initiation of new (bird watching) and strengthening of existing ecotourism (e.g., firefly tour) and other livelihood activities dependent on mangroves.

6. Establishment of mangrove nursery.

c. Financial Report

Please see separate report.

V. OVERALL PROJECT IMPACT

The result of the "Verification Survey and Mapping of the New Identified Mangrove Species in Maribojoc Bay Community-Managed Mangrove Forest in Maribojoc Bay" Project has made a huge impact not only on the community but on the local government units as well which covers from the barangay up to the municipal and provincial levels in terms of policy support.

First, we were able to establish tangible data as basis for stronger legislation support as well as more concrete action to address the worsening condition of the mangrove forest ecosystem. .

Second, we can indeed claim that Maribojoc mangrove forest is one of the most diverse, if not the most diverse mangrove forest in the Philippines with 35 species in 15 families, including one hybrid and 20 associated species in 17 families (excluding unidentified ones).

Third, four (4) mangrove species were identified as included in the IUCN (2015) threatened species list: Aegiceras floridum Roem. and Schult.– Near Threatened ver. 3.1, Avicennia lanata Ridley– Vulnerable B1+2c ver 2.3, Camptostemon philippinense (S.Vidal) Becc.– Endangered C1 ver. 3.1 and, Ceriops decandra (Griff.) Ding Hou – Near Threatened ver. 3.1.

Fourth, the study also identified threatened species including "disappearing" species or near extinction that should be given focus in terms of enhancement planting.

Fifth, a total of sixteen (16) members of four (4) peoples' organizations were trained on Mangrove Taxonomy and Assessment. In so doing, these local researchers as para-taxonomist are now applying their knowledge in the identification of mangroves while serving as local tour guides in Abatan River Community Life Tours.

And most importantly, there are 400 eco-museums established in the world but none in the Philippines. It has been a long term goal of Abatan River Development Management Council (ARDMC) with the initiative of the provincial Governor of Bohol, Gov. Edgar M. Chatto, to establish Abatan River and its estuary facing Maribojoc Bay as an eco-museum in the country. If this could be done, we will be the 401st eco-museum in the world.

In fact, we are now coordinating with the Department of Environment and Natural Resources (DENR) and later with the Department of Tourism on this initiative. Most especially that Abatan Watershed is one of the 29 watersheds piloted by DENR for sustainable integrated area development (SIAD) strategy using the *ridge to reef* approach. Currently, formulation of Ordinance for the purpose is on-going spearheaded by a volunteer staff with environment management background from Portland, Oregon, USA.

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