

A REPORT ON THE RAPID SITE ASSESSMENT OF CABUSAO WETLAND, CAMARINES SUR

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Abstract

*A total of 82 vertebrate species belonging to 64 genera and 34 families were recorded during a Rapid Site Assessment of the Cabusao wetlands in barangays Biong, Pandan and Barcelonita on 13-15 October, 2010. Of this total, eight are mammals, 74 are birds, two are reptiles, and three are amphibians. In terms of distribution, four are endemic, 37 are residents, 32 are migratory, four are both resident and migratory, three are introduced, and two have uncertain distribution status. Only one species of Anatidae was documented during the RSA. The Northern Shoveler (*Anas clypeata*) is a regular migrant to the Philippines. Although highly expected in wetland habitats, it is ironic that no members of family Rallidae were recorded. The scolopacid Asian Golden Plover (*Pluvialis fulva*) is the most numerous species with more than 600 individuals counted. The observation of the Javan Pond-Heron (*Ardeola speciosa*) may be a first for the species in southern Luzon. It is previously recorded only on Mindanao.*

Direct encounter, general observation and time-constrained searches are the methods used to collect data on the avifauna and other vertebrate fauna. Key informant interviews complemented the gathering of data. Prior to the RSA, a two-day reconnaissance and review of secondary data were undertaken to obtain a general picture of the wetland area and assist in the formulation of the design for the RSA.

Generally, the Cabusao wetland as a habitat is not yet heavily disturbed and degraded as shown by the relatively good condition of the mudflats and associated mangroves. Nevertheless, several problems and issues would need immediate response and action from the concerned authorities as these can undermine any effort to manage and protect the wetland area in the long term, such as pasturing of cattle, biological pollution, encroachment of communities into mangrove areas, gathering of driftwoods and bamboos, poaching of mangroves, low level of awareness and knowledge on conservation and wildlife laws, and weak management and law enforcement mechanisms. A set of recommendations has been proposed to address these problems.

INTRODUCTION

With an area of 300,000 km², the Philippines is a relatively tiny country (Figure 1). Comprising 7,109 islands and islets it is the second largest archipelago in Asia. Despite its small size, the Philippines is among the most biologically-diverse countries in the world, with probably the highest level of endemism both in absolute numbers and percentage on a per area basis than any country. The Philippines supports at least 14,000 species of plants (of which 50 percent is endemic), 201 species of mammals (56% endemic), close to 576 species of birds (34% endemic), 258 species of reptiles (66% endemic), and 101 species of amphibians (78% endemic). Unfortunately, the biodiversity of the Philippines is facing the highest degree of threats than any country in the world. Foremost of the threats is the loss of habitat, which impact on more than 90 percent of endemic faunal species. As a result, 725 vertebrate species have been included in the 2006 Red List of Threatened Animals and Plants prompting conservationists to regard the Philippines as the ‘hottest of the hotspots’ among the 25 global biodiversity hotspots and the most important country for biodiversity conservation in the world.



FIGURE 1. Map of the Philippines.

One factor that contributes to the richness of Philippine biodiversity is its tropical location, which allows it to receive high levels of precipitation and large amount of solar radiation. Speciation is very fast-paced in the tropics and the Philippines has evolved many species that are unique and are found nowhere else on earth. And the large amount of precipitation has given rise to at least 211 lakes, 421 major rivers, 22 marshes and swamps with a combined area of more than 230,000 hectares, and an average annual run-off of 260 billion cubic meters.

These freshwater resources subsequently helped form wetland habitats that sustained countless species of plants and animals, which in turn comprise the bulk of the country’s exceptional biological heritage. Philippine wetlands support at least 170 species of freshwater fish, at least 35 species of mangroves out of more than 60 species worldwide, at least 370 species of mangrove-dependent organisms, at least 385 species of estuarine and non-reef fish, more than 22,000 species of freshwater, terrestrial and marine mollusks, and at least 16 species of seagrasses upon which at least 480 species depend for survival.

The Ramsar Convention defines wetlands as “areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters”. It also stipulates that wetlands “may incorporate riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water deeper than six meters at low tide lying within the wetlands.” As ecosystems, wetlands are regarded as the most biologically diverse and among the most productive environments. Their vegetation is wide-ranging and includes mangroves, water hyacinths, cattails, sedges, grasses, and many others. The fauna include mammals, birds, reptiles, amphibians, crustaceans, annelids, insects, decapods, and many

others. Due to their rich biological components, wetlands are aptly called reservoirs of biodiversity and also are important storehouses of plant genetic material. Other important functions of wetlands include flood control, groundwater replenishment, water refinement, sediment and nutrient retention, shoreline stabilization and protection, recreation and ecotourism, cultural value, and climate change mitigation.

In southern Luzon, the province of Camarines Sur hosts numerous wetland environments that are both biologically and economically important in terms of the wildlife species they support and their contribution to the livelihoods of local people. The wetland situated in the municipality of Cabusao ($13^{\circ} 46' 0.53'' \text{ N } 123^{\circ} 3' 30.15'' \text{ E}$) (Figure 2), with an estimated area of 120 hectares, is fast gaining popularity as the Olango Island of the Bicol Region. It is a component of the Pulantuna watershed, a wide stretch of area encompassing eight towns in the province of Camarines Sur. Drained and fed by the Bicol River, it is one of the most fertile and biologically rich ecosystems in the province. As a result, the Cabusao wetland has become a popular wintering and staging area for migratory birds and as habitat of many resident birds and other wildlife species. The migratory birds, numbering in the thousands, used the area to feed and prepare for the long-haul flights during their annual southward and northward migrations between the months of August and March. The vast mudflats of Cabusao offer an ideal feeding ground for the migratory species because of the lower salinity, abundant supply of food, lesser threats, and plenty of space to establish individual niches. Nevertheless, the true potentials of the Cabusao wetland as a biological and an economic resource are unknown. And any planned development, without the support of well-researched data, can result to the degradation of this valuable ecosystem.



FIGURE 2. Map of Camarines Sur depicting the location of Cabusao.

Finally, the Cabusao wetland has a mangrove component that enhances its significance as wildlife habitat, contributes in the maintenance of ecological balance, and increases its capacity to provide ecosystem-based services. The mangroves perform four major functions as aquatic nurseries, wildlife habitat, shoreline stabilizers, and enhancers of water quality.

SURVEY SITE

Description of the Survey Site

The wetland in barangays Biong, Pandan and portion of Barcelonita in Cabusao, Camarines Sur, situated about 7-9 kilometers northeast of the town proper, is a wide stretch of marsh and mudflats facing San Miguel Bay (Figure 3). The terrain is generally flat, with the slopes not exceeding 10%. The only elevated areas are mostly found in barangay San Pedro and the western end of barangay Biong at the portion bordering with the municipality of Sipocot. Access to the survey area is through well-paved roads and an all weather dike. From here the mudflats is just ca. 150-250 meters on foot passing across a sparsely vegetated grassy marshland and mangrove forest.

The vegetative cover is a mix of second growth mangroves, grasses, shrubs, sedges, and vines. Canopy is open and low, not exceeding seven meters on the average. Most trees have heights ranging from three to nine meters and average diameters-at-breast-height (dbh) of between three and 10 centimeters. The large part of the understory is relatively sparse with grasses, wildlings of trees, herbaceous plants, and slender vines as the dominant vegetation.

The soil is chiefly clayey, which easily became muddy during the rainy season. Color ranged from dark gray, which predominated in the mudflat and marshy sections, and light brown, which is common in the inland portions.



FIGURE 3. A view of a portion of the vast wetland in Cabusao, Camarines Sur.

Weather condition during the RSA

The weather was fine with plenty of sunshine and only slight rain during the entire duration of the survey. The azure sky was clear of cloud cover for most of the time the observations were undertaken.

OBJECTIVES

The primary objectives of the RSA are to gather preliminary baseline information on the avifauna and other wildlife of the Cabusao wetland in barangays Biong, Pandan, and Barcelonita, municipality of Cabusao, province of Camarines Sur as well as to conduct an assessment of the biophysical and the socio-economic condition in the area.

The specific objectives are the following:

- generate a species list of the birds and other vertebrate fauna of the Cabusao wetland;
- evaluate the present condition of the different habitats within the Cabusao wetland;
- document the threats and sources of disturbance to the birds and other wildlife in the Cabusao wetland;
- provide well-analyzed information that can justify and support the declaration of the Cabusao wetland as Bird Sanctuary; and
- formulate recommendations for developing a well-defined management and protection plan for the Cabusao wetland.

METHODS, SCHEDULE AND DURATION

The Rapid Site Assessment is a technical procedure for generating primary data of a particular locality. It utilizes direct encounter, general observation and time-constrained searches to gather data on the avifauna and other vertebrate fauna. Although the methods strictly follow the standards for a scientific research they are modified to fit the shorter timeframe, the size of the

sampling area, and the physical limitations imposed by terrain and accessibility. The results are referred to existing secondary information from published literatures to obtain an objective assessment of the status of the avifauna and other wildlife. Interviews with local key informants complement the gathering of data.

In Cabusao, the RSA was carried out to gather data on topography and soil, vegetation, habitat types, faunal and floral composition, socio-economic status, resource use practices, accessibility, and conservation initiatives. The problems and issues perceived to have long-term damaging impacts on the ecological stability and abundance of species were likewise noted. The information generated from the RSA would be crucial inputs to the process leading to the declaration of the Canusao wetland as Bird Sanctuary, and in the development of a conservation and management plan for the area.

Schedule and Duration

The RSA was undertaken within a three-day period beginning on 13 October 2010 and ending on 15 October 2010. Observations were done twice daily from 05:30 until 09:30 in the morning and from 15:00 until 18:00 in the afternoon. The start, end and length of field observations were partly influenced by the sun's intensity, which limited the fieldwork until mid-morning and from mid-afternoon.

Methodology

A. Birds

The primary focus of RSA was the avifauna of the Cabusao wetland. Direct encounter and general observation were the main method applied to gather data on bird species in the survey area. All species were identified by sight and by ear. Birds were observed with the aid of 10x25 Nikon field binoculars. Each species was observed for at least 15 minutes to obtain a positive identification. Fieldwork put priority to generating the following information: identity of species, number of individuals, habitat type, actual and potential threats, and conservation and ecological considerations. Additional information was taken on mixed species feeding parties. Species identification, nomenclature, classification and information on conservation status followed Kennedy *et al.* (2000) and IUCN (2006).

B. Mammals

The RSA documented the presence of mammals in the survey area using the direct encounter and general observation methods. All species were identified by sight and, when present, from physical indications such as droppings, scats, claw and teeth marks, and foot and paw prints found within the survey area. Specific places inspected for presence of mammals included burrows, tangles of vegetation, passageways, holes in trees, and other places where mammals were expected to be found. Species identification and nomenclature followed Ingle and Heaney (1992) and Heaney *et al.* (1998). Classification of conservation status, endemism and habitat followed Heaney *et al.* (1998) and IUCN (2006).

C. Reptiles and Amphibians

The survey of the herpetofauna used the direct encounter, general observation, and opportunistic and time-constrained search methods. Amphibians were identified by sight and ear, and caught or observed if they were encountered; the same also was done with reptiles

although with caution. The specific habitats searched included isolated pools, creeks, burrows, and tangles of vegetation. Taxonomy and nomenclature of the herpetofauna followed Alcalá (1986) and Alcalá and Brown (1998).

D. Vegetation

The survey of plants applied direct *in-situ* identification with emphasis given on mangroves and non-grass species. Species were identified as they are encountered in the sites. No specimens were collected during the survey. Taxonomy and nomenclature for flora followed accepted standards and references.

E. Interview

To supplement the data-gathering interviews were conducted with local informants during the RSA. Questions emphasized on the local names of species, patterns of resource use, seasonality, breeding and nesting, foraging areas, threats and disturbance, protection and law enforcement, and species-related cultural practices.

RESULTS AND DISCUSSION

Fauna

A total of 82 vertebrate species belonging to 64 genera under 34 families were recorded during a Rapid Site Assessment of the wetland in barangays Biong, Pandan and Barcelonita in the municipality of Cabusao (Figure 4). Of this total, three are mammals, 74 are birds, two are reptiles, and three are amphibians. Four species are endemic, 37 are residents, 32 are migratory, four are both resident and migratory, three are introduced, and two have uncertain distribution status (Figure 5). The low rate of endemics is expected because the mangrove forests do not include fruit-bearing plant species attractive to the specialist terrestrial frugivores, such as those belonging to families Moraceae and Myrtaceae. In terms of relative abundance, 55 species are considered common, 17 species are uncommon, three species are locally common, and seven species are fairly common (Figure 6). Only one species of Anatidae, the Northern Shoveler *Anas clypeata*, has been documented when a pair was observed at the water edge near the boundary of barangays Biong and Pandan. However, the local guide claimed that the Philippine Duck *Anas luzonica* is abundant in the area particularly in November, when the migration season enters its peak period. The Philippine Duck has conservation significance being listed as Vulnerable by the International Union for the Conservation of Nature (IUCN). A Vulnerable species is one that has experienced a 20% reduction in numbers over a period of 10

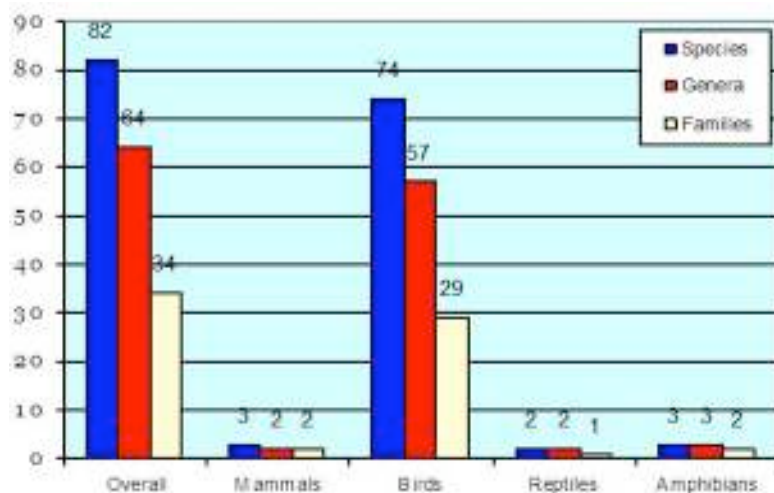


FIGURE 4. Chart summarizing the number of species, genera and families of vertebrate taxa recorded in the Cabusao wetland.

years, and only has a 10 percent chance of getting extinct in the wild in the next 100 years if no direct action is taken to protect it and its habitat.

Taxonomically, the family Scolopacidae, which comprises the curlews, godwits, sandpipers, and snipes, is the most diverse with 12 species recorded, all migratory. It is followed by family Ardeidae (bitterns, egrets, herons) with 11 species, of which four are migratory. Completing the top five are family Charadriidae (lapwings and plovers) with six species, families Columbidae (doves and pigeons) and Sylviidae (old world warblers) both with five species, and families Sternidae (terns and noddies) and Muscipidae (flycatchers) both with three species.

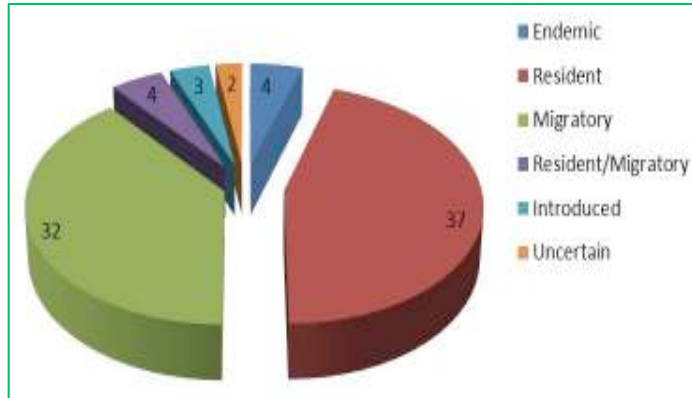


FIGURE 5. Graph showing the distribution status of bird species recorded in the Cabusao wetland.

Direct count showed the Asian Golden Plover (*Pluvialis fulva*) as the most numerous migratory species in the area with more than 600 individuals censused during the RSA. The egrets are next with an estimated 250-350 individuals counted. The overall total for all migratory species on the mudflats and adjacent freshwater marshes of the Cabusao wetland during the five-day RSA was between 2,500 and 3,000 individuals. It is interesting to note that in its census report, Wetlands International indicated a total of 10,555 individuals from 13 species were counted in the Cabusao wetland in 2008. On the basis of these figures, the Cabusao wetland should already be included among the most biologically important wetlands in the Philippines and cement its reputation as the Olango Island of the Bicol region.

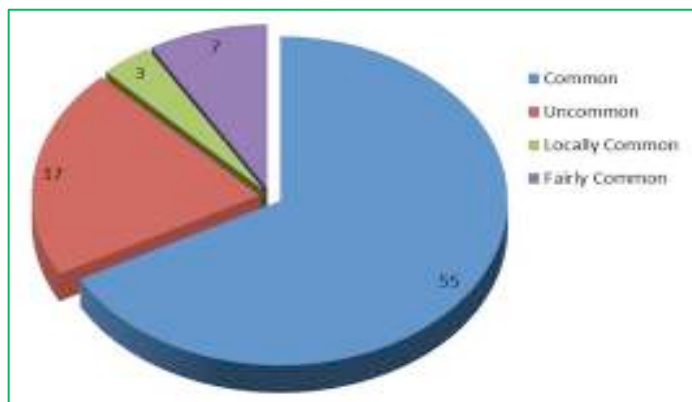


FIGURE 6. Graph showing the relative abundance of bird species recorded in the Cabusao wetland.

The abundance of birds in the wetland is a product of the massive deposition of silt carried by the Bicol River on the shores of Cabusao. As the muddy sediments accumulate, the resultant mudflats offer wider areas for foraging and refueling migratory shorebirds and waterbirds. The mixture of freshwater from the Bicol River and the saltwater in San Miguel Bay has resulted to a brackish water, which has lower salinity, lower temperature, and richer in nutrients. These environmental attributes are ideal ingredients for promoting the growth of many invertebrates which serve as the primary prey items of the migratory avifauna. This is a clear example of how an environmentally unfavorable phenomenon has produced a positive outcome.

One of the most significant findings of the RSA is the documentation of two individuals that fit the description of the Javan Pond Heron *Ardeola speciosa* (Figure 7), which may constitute a new distribution record of the species in southern Luzon. When observed, they foraged separately on the mud standing motionless most of the time to wait for prey. Occasionally, they

would probe the mud with their beaks to extract whatever invertebrates they could find. The Javan Pond-Heron is a recent migrant to the Philippines and is previously known only from Mindanao but has since been documented on Negros (Dumaguete) and Panay (Iloilo) in the Visayas, and in northern Luzon (Batanes) and central Luzon (Pampanga). The two birds were observed in barangay Barcelonita in the morning of 14 October 2010. From their appearance, it was easy to recognize that they are in breeding plumage. Both had chestnut belly that extends to the side below the shoulders, grayish black upper and lower back, and yellowish crown. The neck, breast and cheek are creamy white, the anterior half of the upper beak and lores are bluish, while the chin and throat are white. The change in plumage color, however, is presumed not complete and that eventually the neck, cheek and breast will turn coffee brown or chestnut when the birds attained full breeding condition.



FIGURE 7. The Javan Pond-Heron, a possible new record for southern Luzon.

In the highly disturbed habitats and built-up areas such as the coastal zones and barangay centers, the most commonly-encountered species are the Eurasian Tree Sparrow (*Passer montanus*), the Yellow-vented Bulbul (*Pycnonotus goiavier*), the Olive-backed Sunbird (*Nectarinia jugularis*), the Lowland White-eye (*Zosterops meyeri*), the Pied Fantail (*Rhipidura javanica*), the Black-naped Oriole (*Oriolus chinensis*), the Large-billed Crow (*Corvus macrorhynchus*), the Pacific Swallow (*Hirundo tahitica*), and the Asian Glossy Starling (*Aplonis panayensis*). These species have adapted themselves well to human presence and have developed the ability to co-exist with people within their ranges. The Eurasian Tree Sparrow in particular has long been associated with disturbance occurring widely in almost all places and even in highly populated areas, such as cities. The other most conspicuous species, the Zebra Dove (*Geopelia striata*), the Spotted Dove (*Streptopelia chinensis*), the Island Collared-Dove (*Streptopelia bitorquata*), the Red Turtle-Dove (*Streptopelia tranquebarica*), the Tawny Grassbird (*Megalurus timoriensis*), and the Glossy Swiftlet (*Collocalia esculenta*) preferred the open country and grassland habitats adjacent to the mangroves and mudflats. Their occurrence in these areas is an indication that the habitats are already disturbed and relatively degraded. In addition, the proximity of the Cabusao wetland to agricultural areas, residences, and commercial establishments makes it easy for introduced commensal mammal species such as the Oriental house rat *Rattus tanezumi* and the Polynesian rat *Rattus exulans* to colonize the area. The presence of these species was confirmed with the observation of a single individual of *R. exulans* scampering behind a tangle of vegetation near a ricefield in barangay Pandan and two individuals of *R. tanezumi* behind a house adjacent to the mangroves in barangay Barcelonita. These species have been classified as pests in all the areas they are present. Except for the doves, pigeons and ducks, most of the species recorded don't have specific socio-economic and cultural importance to the local people.

The RSA failed to record any species under the family Rallidae, which is highly unusual considering that the rails and crakes are most expected in wetlands and other habitats where water is perennially present. One plausible reason could be that the species are not breeding during at this time of the year. And when they are not breeding they don't perform courtship

displays, which include calling out to mates. Interestingly, the local informants shared that the birds are usually silent during the harvest season. Although this knowledge is prevalent among farmers they cannot think of any reason for this observed behavior in rails. But two members of this group, the Barred Rail (*Gallirallus torquatus*) and the White-breasted Swampphen (*Amaurornis phoenicurus*), are known to be noisy throughout the year, regardless if they are breeding, feeding or mating. Nevertheless, the absence of the rails and crakes does not indicate that they are already extirpated from the area. It is just that they were simply not active and visible at the time the RSA was undertaken.

Flora

Twenty-two species of plants belonging to 20 genera in 17 families were recorded during the RSA (Table 2). Of this total, 12 species are trees, two species are palms, three species are grasses, one species is sedge, two species are herbs, and two species are aquatic plants. The plant survey was undertaken as a parallel objective of the RSA. A forester and a UPLB-based botanist were consulted to identify the plant species from the photographs taken.

The RSA has shown that the most abundant tree species in the Cabusao wetland is the Milky Mangrove (a.k.a River Poison Tree) *Excoecaria agallocha* (Figure 8). Locally known as lipata, individuals of the species were documented throughout the whole stretch of the wetland from barangay Barcelonita to barangay Pandan. The species got its name from its milky sap, which can cause temporary blindness if it comes in contact with the eyes. The sap is also known to cause skin blisters and irritation. The species grows inland usually at the high water mark on both stony and muddy ground. It can tolerate dry and salty conditions and can grow quickly in both open areas and in the shade.



FIGURE 8. The appearance of the Milky Mangrove tree. Inset is the male flower.

E. agallocha has traditional medicinal uses as treatment of sores and stings from marine organisms. Smoke from the bark is used to treat leprosy. The plant is currently being tested for modern medical uses. Clinical trials show that the plant may have anti-HIV, anti-cancer, anti-bacterial and anti-viral properties.

The other tree species recorded are the Grey or White Mangrove *Avicennia marina*, Indian Mangrove *Avicennia officinalis*, Tropical Almond *Terminalia catappa*, Pongam Tree *Pongamia pinnata*, White Leadtree *Leucaena leucocephala*, Sea or Fish Poison Tree *Barringtonia asiatica*, Beach Hibiscus *Hibiscus tiliaceus*, Cannonball Mangrove *Xylocarpus granatum*, Tall-Stilt Mangrove *Rhizophora apiculata*, Red Mangrove *Rhizophora mucronata*, which is the species used in the mangrove reforestation in barangay Biong, and Indian Mulberry or Noni Fruit *Morinda citrifolia*.

The Shoreline Purslane *Sesuvium portulacastrum* (Figure 9), a sprawling perennial herb that grows in coastal areas throughout much of the world, is one of the most abundant ground vegetation in the Cabusao wetland, particularly in the mangrove area in barangay Biong. The

species is known to grow best in sandy clay, coastal limestone and sandstone, tidal flats and salt marshes. Another herb, the Sea Holly or Holly Mangrove *Acanthus ebracteatus*, a shrubby plant with large thorny leaves, was frequently encountered underneath the mangroves in barangay Biong and barangay Pandan.



FIGURE 9. The Shoreline Purslane, one of the most abundant ground vegetation in the Cabusao wetland.

Large quantities of the Common Water Hyacinth *Eichornia crassipes* had been observed decomposing adjacent the mangrove forest in barangay Biong. The plants were carried to the coastal wetland from inland freshwater sources by the Bicol River and then washed ashore. The Common Water Hyacinth is a free-floating perennial aquatic plant native to tropical and sub-tropical South America. It is a vigorous grower and is known to double its population in only two weeks possibly making it the worst aquatic weed species in the Cabusao wetland.

In a shallow pool behind the dike in barangay Biong, a dense cover of Water Cabbage or Water Lettuce *Pistia stratiotes* was noted. The species is distributed, either naturally or through introduction, in nearly all tropical and subtropical freshwater bodies of water and waterways. The Water Cabbage is often used in tropical aquariums to provide cover for fry and small fish. Its ecological significance in areas where it is distributed is in its ability to outcompete algae for nutrients in the water, thereby preventing massive algal blooms.

Status of mangrove forest

Majority of the mangroves in Cabusao is found in barangays Pandan, Biong and Barcelonita. All of the mangrove stands in these places are secondary growth and it is highly likely that no original stands remain in the municipality. There is a large degree of fragmentation but attempts had been made to reforest the area, particularly in barangay Biong where a wide portion had been planted with bakauan-babae (*Rhizophora mucronata*). The rehabilitation strategy must be well-planned, species well-chosen, and the mangrove areas well-protected to guarantee a high degree of success. Moreover, wide portions of mudflat should be left unplanted for use by migratory birds because majority of them prefer open areas to forage and interact with one another.

POBLEMS AND ISSUES

Generally, the Cabusao wetland as a habitat has not yet been heavily disturbed and degraded as shown by the relatively good condition of the mudflats and associated mangroves. However, the RSA noted several activities which have the potential to seriously undermine any effort to protect and manage the wetland



FIGURE 10. A herd of grazing cows poses a threat to the mangrove forest of the Cabusao wetland.

resource. If not immediately addressed, these problems could result to the further loss of mangroves along with the avian elements of the Cabusao wetland. Among the problems identified the following would need immediate response and action from the concerned authorities:

Pasturing of cattle

The RSA finds pasturing of cattle in the mangrove area and the vicinity of the mudflats as the most serious threat to the Cabusao wetland. More than 50 cows were observed grazing on shore at the edge of the mudflats (Figure 10). The activities of the cows affect the rehabilitation of the mangrove forest because they feed on the propagules and the newly planted seedlings. Their movement also causes the mud to become compact under their hooves making it hard for the migratory birds to probe with their delicate bills. When left unchecked, the cows will certainly cause large-scale damage to the mangrove forest and can drive migratory birds away from the mudflats.

Biological pollution

The accumulation of the Common Water Hyacinth *Eichhornia crassipes* will have long-term impact on the wetland ecosystem in Cabusao. This South American native is one of the worst aquatic weeds in the world. It is a very fast growing plant, with populations known to double in as little as 12 days. Infestations of this weed block waterways, limiting boat traffic and fishing and deprive migratory birds the full use of the mudflat by blanketing it. Water hyacinths also prevent sunlight and oxygen from reaching the water column and submerged plants. By shading and crowding native aquatic plants the Common Water Hyacinth dramatically reduces biological diversity in aquatic and wetland ecosystems. Even decaying plants (Figure 11) could pose a threat to the stability of the Cabusao wetland and aggravate climate change issues by releasing greenhouse gases to the atmosphere.



FIGURE 11. A portion of a large pile of decaying *Eichhornia crassipes* on a stretch of shore in barangay Biong.

Encroachment

Also requiring utmost attention is the increased encroachment of settlements into the mangrove areas. This problem was very evident in barangays Barcelonita and Biong, where houses were observed being built adjacent to the mangrove forest. Constructing structures within and near mangroves can result to their degradation limiting their capacity to perform the critical services needed to maintain the ecological balance in the Cabusao wetland.

Gathering of driftwoods and bamboos

People have been observed daily in the mangrove forests during the RSA. Their primary purpose of coming to the area is to gather driftwoods and bamboo poles that had been washed on shore. Although, the impact of their activities may be not so evident at this time the possibility of increased number of gatherers in the next couple of years will have a definite effect on the ecological stability of the mangrove habitat. Furthermore, their presence presents a constant source of disturbance that can drive ground-foraging species like the Common Emerald-Dove *Chalcophaps indica* away from the mangrove forest.

Poaching of mangroves

Cutting of mangroves is a visible activity in the area as shown by a couple of tree stumps observed during the RSA. The mangrove trees are collected for domestic use, primarily for firewood, charcoal, house repairs, and fences. Because of the subsistence nature of this activity, the present impact to the wetland ecosystem is very low. However, the planned development of the communities surrounding the wetland is expected to increase the demand for wood and lumber and exert heavy pressure on the mangrove forest.

Low level of awareness and knowledge on conservation and wildlife laws

Except for the Philippine Fisheries Code of 1998 (Republic Act No. 8550), those interviewed or conversed with have little or no awareness and knowledge on many conservation and wildlife laws. All admit not being aware of the existence of the Wildlife Resources Protection and Conservation Act (Republic Act No. 9147), Revised Forestry Code (Presidential Decree No. 705), the Philippine Environment Code (Presidential Decree No. 1152), the Clean Air Act (Republic Act No. 8749) or the Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention of 1971). These laws and policies are essential to the effective conservation and management of wetlands and should be fully understood not only at the level of the local government unit but also at the level of the barangay and the community.

Weak management and law enforcement mechanisms

At present, there is no well-defined mechanism to protect the Cabusao wetland. Although there are personnel from the LGU and provincial government assigned to watch over the mangroves, the RSA has learned that they seldom go to the area unless there are guests to accompany. But even if they do visit the area regularly it is difficult to see how law enforcement can be effective since these personnel lack the basic training and logistics to effectively perform the task. In addition, except for a resolution declaring the mangrove area as critical habitat, the municipality lacks specific legislations and policies on biodiversity, wildlife protection, wetland management, mangrove conservation, and environmental protection and management in general that provide the legal foundation for effective law enforcement.

Other threats

Aside from the problems elaborated above, the Cabusao wetland also faces other threats such as gleaning and shore-fishing, digging for crabs and crablets, and noise from people and motorized seacraft. The cumulative effect of these threats can lead to distress and stress, factors that motivate sensitive avian species to abandon the wetland as foraging and staging area.

RECOMMENDATIONS

The Cabusao wetland is a very important feeding and staging area for migratory birds in the province of Camarines Sur and the Bicol region. To preserve it and continue to benefit from the ecological services it is providing, the Cabusao wetland should be accorded the highest degree of protection. A well-defined conservation and management plan for the area should be formulated and it will benefit from the information generated by the RSA and subsequent studies as well. In this respect, the following are recommended:

On Research and Data Generation

- Year-round monitoring of the birds and other species in the wetland areas to establish the regular visitors and the peak period of migration;
- Investigation on the impact of human-induced disturbance on the behavior and abundance of migratory birds;
- Analysis of the substrate to determine its biological, physical and chemical composition;
- Creation of a database on the flora and fauna of the Cabusao wetland; and
- Research on the level of social and economic activities to determine their impacts on migratory birds and the long-term sustainability of the Cabusao wetland.
- Evaluate the detrimental effects of the Common Water Hyacinth on the long-term stability of the Cabusao wetland ecosystem and propose mechanisms in dealing with the issue of biological pollution.

On Management

- Banning or restricting the pasturing of cows in the mangrove forest and the vicinities of the mudflats;
- Take concrete action in addressing the encroachment of communities into the mangrove areas and the polluting effect of the Common Water Hyacinth on the wetland and migratory birds;
- Expand the area of mangrove by reforesting portions of the mudflat but must leave sufficiently wide swatch of open areas for the unhampered activities of migratory shorebirds and waterbirds;
- Minimize disturbance in the wetland areas by designating seacraft lanes near the mudflat;
- Schedule regular patrolling in the mangrove forest and the vicinities of the mudflats to discourage entry of gleaners and driftwood collectors outside of designated areas;
- Give orientation to the enforcement personnel regarding proper patrolling and enforcement of environmental and conservation laws;

- Capability-building, information dissemination and awareness-raising, and conservation education on the Cabusao wetland should be the responsibility of all stakeholders and must be integrated in the programs and plans of local government units, people's organizations, non-government organizations, cause-oriented and religious groups, academic institutions, and commercial establishments;
- Information and education campaign should target all stakeholders putting the focus on local communities that utilize wetland resources and visitors who would come near migratory birds and their foraging habitats;
- Preserve all extant stands of mangroves because of their established ecological functions, viewing any rehabilitation activities as only enhancing, expanding and strengthening the present mangrove forest;
- As restoration of habitat function of mangroves is not achieved through planting of trees alone, the appropriate species to be planted must be given utmost consideration;
- Explore the feasibility of a multi-sector body to be given responsibility in the management of the Cabusao wetland; and
- Consider zoning of the wetland area to reconcile the need for socio-economic development and natural resource conservation, in which the zones must define the mechanism for using resources without compromising conservation objectives.

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ANNEXES

Table 1. List of vertebrate species recorded during the Rapid Site Assessment of Cabusao wetland on 13-15 October 2010.

Taxon	English Name	Family	Distribution	Relative Abundance
BIRDS				
<i>Ardea purpurea</i>	Purple Heron	Ardeidae	Resident	Fairly Common
<i>Ardeola speciosa</i>	Javan Pond-Heron	Ardeidae	Resident?	Uncommon
<i>Butorides striatus</i>	Little Heron	Ardeidae	Resident/Migratory	Fairly Common
<i>Bubulcus ibis</i>	Cattle Egret	Ardeidae	Resident/ Migratory	Locally Common
<i>Egretta alba</i>	Great Egret	Ardeidae	Migratory	Uncommon
<i>Egretta intermedia</i>	Intermediate Egret	Ardeidae	Migratory	Locally Common
<i>Egretta garzetta</i>	Little Egret	Ardeidae	Migratory	Common
<i>Ixobrychus cinnamomeus</i>	Cinnamon Bittern	Ardeidae	Resident	Common
<i>Ixobrychus sinensis</i>	Yellow Bittern	Ardeidae	Resident	Common
<i>Nycticorax caledonicus</i>	Rufous Night-Heron	Ardeidae	Resident	Uncommon
<i>Nycticorax nycticorax</i>	Black-crowned Night-Heron	Ardeidae	Migratory	Uncommon
<i>Anas clypeata</i>	Northern Shoveler	Anatidae	Migratory	Uncommon
<i>Pandion haliaetus</i>	Osprey	Pandionidae	Migratory	Uncommon
<i>Circus melanoleucos</i>	Pied Harrier	Accipitridae	Resident/ Migratory	Uncommon
<i>Haliastur indus</i>	Brahminy Kite	Accipitridae	Resident	Common
<i>Charadrius alexandrinus</i>	Kentish Plover	Charadriidae	Migratory	Common
<i>Charadrius dubius</i>	Little Ringed-Plover	Charadriidae	Resident/ Migratory	Common
<i>Charadrius leschenaultii</i>	Greater Sand-Plover	Charadriidae	Migratory	Common
<i>Charadrius mongolus</i>	Lesser Sand-Plover	Charadriidae	Migratory	Common
<i>Pluvialis fulva</i>	Asian Golden-Plover	Charadriidae	Migratory	Common
<i>Pluvialis squatarola</i>	Grey Plover	Charadriidae	Migratory	Common
<i>Actitis hypoleucos</i>	Common Sandpiper	Scolopacidae	Migratory	Common
<i>Arenaria interpres</i>	Ruddy Turnstone	Scolopacidae	Migratory	Fairly Common
<i>Heteroscelus brevipes</i>	Grey-tailed Tattler	Scolopacidae	Migratory	Common
<i>Numenius arquata</i>	Eurasian Curlew	Scolopacidae	Migratory	Uncommon
<i>Numenius phaeopus</i>	Whimbrel	Scolopacidae	Migratory	Common
<i>Tringa nebularia</i>	Common Greenshank	Scolopacidae	Migratory	Common
<i>Tringa ochropus</i>	Green Sandpiper	Scolopacidae	Migratory	Uncommon
<i>Tringa stagnatilis</i>	Marsh Sandpiper	Scolopacidae	Migratory	Uncommon
<i>Tringa totanus</i>	Common Redshank	Scolopacidae	Migratory	Common
<i>Xenus cinereus</i>	Terek Sandpiper	Scolopacidae	Migratory	Fairly Common
<i>Calidris subminuta</i>	Long-toed Stint	Scolopacidae	Migratory	Common
<i>Gallinago megala</i>	Swinhoe's Snipe	Scolopacidae	Migratory	Common
<i>Himantopus himantopus</i>	Black-winged Stilt	Recurvirostridae	Migratory	Uncommon
<i>Chlidonias hybridus</i>	Whiskered Tern	Sternidae	Migratory	Common
<i>Chlidonias leucopterus</i>	White-winged Tern	Sternidae	Migratory	Fairly Common

<i>Sterna hirundo</i>	Common Tern	Sternidae	Migratory	Uncommon
<i>Chalcophaps indica</i>	Common Emerald-Dove	Columbidae	Resident	Common
<i>Geopelia striata</i>	Zebra Dove	Columbidae	Resident	Common
<i>Streptopelia bitorquata</i>	Island Collared-Dove	Columbidae	Resident	Uncommon
<i>Streptopelia chinensis</i>	Spotted Dove	Columbidae	Resident	Common
<i>Streptopelia tranquebarica</i>	Red Turtle-Dove	Columbidae	Resident	Fairly Common
<i>Cacomantis variolosus</i>	Brush Cuckoo	Cuculidae	Resident	Common
<i>Centropus viridis</i>	Philippine Coucal	Cuculidae	Endemic	Common
<i>Alcedo atthis</i>	Common Kingfisher	Alcedinidae	Migratory	Common
<i>Halcyon chloris</i>	White-collared Kingfisher	Alcedinidae	Resident	Common
<i>Merops philippinus</i>	Blue-tailed Bee-eater	Meropidae	Resident	Fairly Common
<i>Hirundo tahitica</i>	Pacific Swallow	Hirundinidae	Resident	Common
<i>Riparia paludicola</i>	Plain Martin	Hirundinidae	Resident	Uncommon
<i>Lalage nigra</i>	Pied Triller	Campephagidae	Resident	Common
<i>Pycnonotus goiavier</i>	Yellow-vented Bulbul	Pycnonotidae	Resident	Common
<i>Oriolus chinensis</i>	Black-naped Oriole	Oriolidae	Resident	Common
<i>Corvus macrorhynchus</i>	Large-billed Crow	Corvidae	Resident	Common
<i>Copsychus saularis</i>	Oriental Magpie-Robin	Turdidae	Resident	Uncommon
<i>Cisticola juncidis</i>	Zitting Cisticola	Sylviidae	Resident	Common
<i>Gerygone sulphurea</i>	Golden-bellied Flyeater	Sylviidae	Resident	Locally Common
<i>Megalurus palustris</i>	Striated Grassbird	Sylviidae	Resident	Common
<i>Orthotomus castaneiceps</i>	Philippine Tailorbird	Sylviidae	Endemic	Common
<i>Phylloscopus borealis</i>	Arctic Warbler	Sylviidae	Migratory	Common
<i>Cyornis rufigastra</i>	Mangrove Blue Flycatcher	Muscicapidae	Resident	Common
<i>Muscicapa griseisticta</i>	Grey-streaked Flycatcher	Muscicapidae	Migratory	Common
<i>Rhipidura javanica</i>	Pied Fantail	Muscicapidae	Resident	Common
<i>Anthus novaeseelandiae</i>	Richard's Pipit	Motacillidae	Resident/(Migratory?)	Common
<i>Motacilla flava</i>	Yellow Wagtail	Motacillidae	Migratory	Common
<i>Artamus leucorhynchus</i>	White-breasted Wood-swallow	Artamidae	Resident	Common
<i>Lanius cristatus</i>	Brown Shrike	Laniidae	Migratory	Common
<i>Aplonis panayensis</i>	Asian Glossy Starling	Sturnidae	Resident	Common
<i>Nectarinia jugularis</i>	Olive-backed Sunbird	Nectariniidae	Resident	Common
<i>Nectarinia sperata</i>	Purple-throated Sunbird	Nectariniidae	Resident	Common
<i>Dicaeum australe</i>	Red-keeled Flowerpecker	Dicaeidae	Endemic	Common
<i>Dicaeum trigonostigma</i>	Orange-bellied Flowerpecker	Dicaeidae	Resident	Common
<i>Zosterops meyeri</i>	Lowland White-eye	Zosteropidae	Endemic	Common
<i>Passer montanus</i>	Eurasian Tree Sparrow	Ploceidae	Resident	Common
<i>Lonchura malacca</i>	Chestnut Munia	Estrildidae	Resident	Common
MAMMALS				
<i>Cynopterus brachyotis</i>	Common short-nosed fruit bat	Pteropodidae	Resident	Common
<i>Rattus exulans</i>	Polynesian rat	Muridae	Introduced	Common

<i>Rattus tanezumi</i>	Oriental house rat	Muridae	Introduced	Common
REPTILES				
<i>Lamprolepis smaragdina</i>	Green Skink	Scincidae	Resident	Uncommon
<i>Mabuya multifasciata</i>	Common Mabouya	Scincidae	Resident	Uncommon
AMPHIBIANS				
<i>Occidozyga laevis</i>	Puddle Frog	Ranidae	Resident	Common
<i>Rana erythraea</i>	Common Green Frog	Ranidae	Resident	Common
<i>Bufo marinus</i>	Giant Marine Toad	Bufoidea	Introduced	Common

Table 2. List of plant species recorded during the Rapid Site Assessment of Cabusao wetland on 13-15 October 2010.

Taxon	English Name	Family	Local Name	Habit
<i>Avicennia marina</i>	Grey or White Mangrove	Avicenniaceae	Bungalon	Tree
<i>Avicennia officinalis</i>	Indian Mangrove	Avicenniaceae	Api-api	Tree
<i>Terminalia catappa</i>	Tropical Almond	Combretaceae	Talisai	Tree
<i>Excoecaria agallocha</i>	Milky Mangrove, River Poison Tree	Euphorbiaceae	Lipata, Buta-buta	Tree
<i>Pongamia pinnata</i>	Pongam Tree	Fabaceae	Bani	Tree
<i>Leucaena leucocephala</i>	White Leadtree	Fabaceae (Mimosaceae)	Ipil-ipil	Tree
<i>Barringtonia asiatica</i>	Sea or Fish Poison Tree	Lecythidaceae		Tree
<i>Hibiscus tiliaceus</i>	Beach Hibiscus	Malvaceae	Malubago	Tree
<i>Xylocarpus granatum</i>	Cannonball Mangrove	Meliaceae	Tabigi	Tree
<i>Rhizophora apiculata</i>	Tall-Stilt Mangrove	Rhizophoraceae	Bakawan-lalaki	Tree
<i>Rhizophora mucronata</i>	Red Mangrove	Rhizophoraceae	Bakawan-babae	Tree
<i>Morinda citrifolia</i>	Indian Mulberry, Noni Fruit	Rubiaceae	Apatot/Potat	Tree
<i>Nypa fruticans</i>	Mangrove Palm	Areaceae (Palmae)	Nipa	Palm
<i>Corypha elata</i>	Cabbage Palm	Palmae	Buri	Palm
<i>Cyperus iria</i>	Rice Flat Sedge	Cyperaceae	Dahat	Sedge
<i>Eleusine indica</i>	Wire Grass	Poaceae	Apidian	Grass
<i>Panicum maximum</i>	Guinea Grass	Poaceae		Grass
<i>Phragmites vulgaris</i>	Common Reed	Poaceae	Lupi	Grass
<i>Acanthus ebracteatus</i>	Sea Holly, Holly Mangrove	Acanthaceae		Herb
<i>Sesuvium portulacastrum</i>	Shoreline Purslane	Aizoaceae		Herb
<i>Pistia stratiotes</i>	Water Cabbage/Lettuce	Araceae		Aquatic plant
<i>Eichornia crassipes</i>	Common Water Hyacinth	Pontederiaceae		Aquatic plant