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OCCURRENCE AND DISTRIBUTIONAL RANGE OF MANGROVE VASCULAR FLORA OF CATANDUANES ISLAND, LUZON, PHILIPPINES

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ABSTRACT

Mangroves play very significant roles not only on the economic aspects but also on the ecological aspects as biobelting for tidal surges and tsunamis. The loss of human lives due to the deadly tsunamis in East Asia and the unabated destruction of coastal vegetation have resulted in a renewed focus on the mangrove resources. The purpose of this paper is to report the existing mangrove database of the typhoon-prone island province of Catanduanes in Luzon, Philippines which will be used as bases in determining the appropriate educational management initiatives of various sectors for mangrove rehabilitation and regeneration. A total of 37 species of mangrove vascular flora (13 species of major mangrove elements, 10 species of minor mangrove elements and 14 associated mangrove species) were identified in the island under study. Two species of the genus *Avicennia* (*A. marina* and *A. officinalis*) were noted in the island. The other genera (*Bruguiera*, *Ceriops*, *Sonneratia* and *Rhizophora*) are well distributed in the designated eco-zones. *Nypa fruticans* is the most important mangrove plant species and a member of the screwpine family (Pandanaceae), *Pandanus tectorius* which is an associated mangrove species is well-distributed all throughout the island.

Key words: Mangroves, vascular flora, Catanduanes, Philippines, occurrence and distribution.

INTRODUCTION

In recent years, there had been an increased interest on the status of mangrove environment and the degradation of mangrove ecosystems in the South East Asian (SEA) region. The rapid depletion of mangrove cover in the Philippines was due to the over-all exploitation by coastal dwellers and conversion to agriculture and aquaculture industries (Zamora 1989a, 1991b; Bennagen & Cabahug 1991; Primavera 2001). The coastal-dwelling communities of many countries of the region have been utilizing the mangrove resources in many different ways. They depend on wood and non-wood products as well as the economically important species of mangrove-

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associated fauna. On the utilization and conservation of mangroves, Masagca (2007) observed the general agreement of science teachers and coastal dwellers on their perceptions as to the ecological values such as protection from floods, erosion and other climatic factors.

Japar (1994) compiled the information on plant species associated with mangals in the country based on the papers of Gomez (1980), Zamora (1987), and Calumpong (1994). There are 31 to 34 exclusive mangroves species and 40 to 65 non-exclusive categories. These numbers vary slightly from country to country. Studies on mangroves in the Philippines are numerous, in Bukidnon for instance, Quimpang *et al*. (1987) described the mangrove forest structure in Gingoog City. The team of Vega *et al.* (1991) assessed the mangroves of San Miguel Bay in Camarines Sur using the transect plot method in their fieldwork as outlined by Dartnall & Jones (1986). De Leon (1992) in Negros Oriental noted that *Avicennia* dominates Talabong mangrove forest with 251-stems/10 sq m on the average. In Guimaras, Babaran & Ingles (1997) assessed the mangrove forests and nipa swamps. A total of 26 mangrove plant species were identified in the island.

This paper reports the mangrove-associated flora of Catanduanes Island, Luzon, Philippines. The said typhoon-prone island is located in the Bicol Peninsula wherein mangroves play very significant roles not only on the economic aspects but also on the ecological aspects as biobelting for tidal surges and tsunamis.

MATERIALS AND METHODS

Location of the Study

Catanduanes is an island province (total land area of 1,483 sq km) of the eastern part of the Philippine archipelago (13.5˚ to 14.1˚N Lat. and 124˚ to 125˚ E Long.). Highest elevation of the island is 803 m above sea level. The monsoonal climate of the province consists of two distinct dry season and wet season. Typical diurnal range of temperatures is 25˚ to 32˚C with minimal variations throughout the year. Relative humidity varies from 75 to 89%. The most likely current that affects the island is the North Equatorial Current moving westward across the Pacific.

Research Methods, Sources of Data and Sampling Procedures

Heywood (1995) propounded that characterizing biodiversity involves the observation and characterization of the main units of variation (e.g. Genus and species), as well as the quantification of variation within and between them (e.g. taxonomic relatedness). Ocular surveys in the present study cover mangrove areas in river mouths, creeks and buffer zones or marginal strips of the coastline found in the different study zones (see Table 1). The transect surveys were employed in gathering data and collection of voucher specimens for the mangrove floristic components of the mangroves in the island. Primary data were from direct systematic surveys or observation of the mangrove areas in the island. Laboratory observations were done to identify floral specimens not identified *in situ.*

The study sites cover the whole island, except for a landlocked town and a coastal town without a distinct mangrove area suited for scientific observation. There were 6 study zones established in the province for the purpose of showing the whole province as an ecological unit for analysis as shown in Table 1.

Table 1. Arbitrary ecological zones on Catanduanes island, Luzon

Zone	Zonal Location	Municipality*	Code
I	Northern	Pandan	PAN-06
II	Northwestern	Caramoran	CAR-04
III	Northeastern	Panganiban	PAG-07
		Viga	VIG-09
		Bagamanoc	BAG-01
	Southern	Virac	VRC-10
V	Southeastern	Bato	BAT-03
		Baras	BAR-O2
		Gigmoto	GIG-05

Also termed as town

Study stations for the transect surveys were selected based on the availability of mangrove forests stands suitable for the sampling method, i.e. PCQM (Point-Centered Quarter Method). Two to three transect lines were established from the forest margin at right angles to the edges of the mangrove forest. These were made landward to seaward direction with the use of magnetic compass.

Data Gathering Procedures

The predominant plants in the mangrove ecosystem are the trees or shrubs and these species were generally observed in the mangrove sites. Some plant specimens not identified in the site were collected from the mangrove sites and were plant pressed. Some samples of leaves, flowers and fruits were also obtained and photographed in the laboratory. Taxonomic diagnoses were noted following the reports of Ding Hou (1960), Tomlinson (1986) and Santisuk (1985). The works of Morton (1990) and Calumpong & Meñez (1997) were used as guides. Tomlinson (1986) who arbitrarily categorized mangrove flora into major, minor, associated and specialized mangal elements used fairly rigid criteria to distinguish the mangrove floral species. Since there is no standard way of categorizing the mangroves, Tomlinson's categories were employed in the present work. Taxonomic identification and counting of the different species of flora were accomplished using the aforementioned guides. Some specimens were dispatched to the Philippine National Museum (PNM) in Manila for confirmation of the identity. Herbal collections of PNM were also used as reference materials to identify the taxa of plant specimens.

RESULTS AND DISCUSSION

Tables 2, 3 and 4 present the checklist of the major, minor and associated mangrove flora, respectively found in Catanduanes Island.

A total of 13 species of major mangal elements (Table 2), 10 species of minor mangal elements (Table 3), and 14 associated mangrove species (Table 4). Three species of specialized mangrove plants were also identified as *Caesalpinia crista*, *Derris trifoliate* and *Asplenium s*p.

Table 2. List of major mangal elements recorded in Catanduanes Island, Luzon, Philippines

Family	Genus	Species	Code Used
Avicenniaceae	*Avicennia*	*Avicennia marina*	Am
		Avicennia officinalis	Ao
Combretaceae	*Lumnitzera*	*Lumnitzera racemosa*	Lr
		Lumnitzera littorea	Ll
Arecaceae	*Nypa*	*Nypa fruticans*	Nf
Rhizophoraceae	*Bruguiera*	*Bruguiera gymnorhiza*	Bg
		Bruguiera sexangula	Bs
	Ceriops	*Ceriops decandra*	Cd
		Ceriops tagal	Ct
	Rhizophora	*Rhizophora apiculata*	Ra
		Rhizophora mucronata	Rm
Sonneratiaceae	*Sonneratia*	*Sonneratia alba*	Sa
Total: 5 Families	**7 Genera**	**13 Species**	

Table 3. List of minor mangal elements recorded in Catanduanes Island, Luzon, Philippines

Family	Genus	Species	Code
Bombacaceae	*Camptostemon*	*Camptostemon philippinensis*	Cp
Euphorbiaceae	*Excoecaria*	*Excoecaria agallocha*	Er
Lythraceae	*Pemphis*	*Pemphis acidula*	Pa
Meliaceae	*Xylocarpus*	*Xylocarpus moluccensis*	Xm
		Xylocarpus granatum	Xg
Myrsinaceae	*Aegiceras*	*Aegiceras corniculatum*	Ac
		Aegiceras floridum	Af
Pteridaceae	*Acrostichum*	*Acrostichum aureum*	Aa
		Acrostichum speciosum	As
Sterculiaceae	*Heritiera*	*Heritiera littoralis*	Hl
Total: 7 families	**7 genera**	**10 species**	

Table 4. List of associated mangal elements recorded in Catanduanes Island, Luzon, Philippines

Family	Genus	Species	Code
Acanthaceae	*Acanthus*	*Acanthus ebracteatus*	Ae
		Acanthus illicifolius	Ai
Apogonaceae	*Cerbera*	*Cerbera manghas*	Cm
Bignoniaceae	*Dolichandrone*	*Dolichandrone spathacea*	Ds
Combretaceae	*Terminalia*	*Terminalia catappa*	Tc
Cyperaceae	*Cyperus*	*Cyperus malaccensis*	Cm
Lecythidaceae	*Barringtonia*	*Barringtonia racemosa*	Br

Table 4. Continued

Family	Genus	Species	Code
Leguminoceae	*Aganope*	*Aganope heptaphylla*	Ah
	Ipomoea	*Ipomea pes-caprae*	Ip
	Pongania	*Pongania pinnata*	Pp
Malvaceae	*Hibiscus*	*Hibiscus tiliaceus*	Ht
	Thespesia	*Thespesia populnea*	Tp
Palmae	*Corypha*	*Corypha elata*	Ce
Pandanaceae	*Pandanus*	*Pandanus tectorius*	Pt
Total: 10 families	**13 genera**	**14 species**	**90**

There are 94 species of vascular flora in mangals and associated coastal communities of the Philippines (Zamora 1995). Tomlinson (1986) noted that there are 18 species of major mangal elements, 12 species of minor elements, and 24 specialized mangal elements. The number of species obtained in Catanduanes is comparatively lower than the reports from other areas of the country, but slightly higher than the number of species obtained from Guimaras Island.

The categorization of mangrove flora by Tomlinson (1986) indicates that there are 34 species of major mangrove species worldwide; 20 species of minor element; and 46 mangal associates. Considering this available reference data, Catanduanes island shares 38% of the major elements (13 out of 34 species) and 72% (13 out of 18 from Zamora's list). For the minor elements, the province shares 50% (10 out of 20 species of Tomlinson's list) and 83 % (10 out of the 12 species from Zamora's list). Table 5 shows the comparison of the various listings.

Table 5. Category and number of mangrove floral species recorded in Catanduanes Island, Philippines compared to other reports/listings.

Group of Mangroves	Tomlinson (1986)	Zamora (1995)	This study
Elements	*World-wide*	*Philippines*	*Catanduanes Island*
Major	34	17	13
Minor	20	12	10
Associated	46	40	14
Total	**100**	**69**	**37**

Distributional Range of Mangroves in Catanduanes Island

Globally, mangrove ecosystems are thought to contain about 60 species of trees and shrubs and more than 20 additional species frequently associated with the mangrove flora but not necessarily restricted to it (Barth 1982; Hamilton & Snedaker 1984). Some 70 species of the mangrove plants are recognized from various regions of the world, with the highest concentrations of species being found in SEA and Australia (Spalding *et al.* 1997). According to Fortes (1989), the most diverse single stand of mangrove forest is found in Pagbilao, Quezon (Luzon, Philippines) with a total of 29 species. The report of Cadiz & de Leon (1994, cited by Calumpong & Meñez 1997) revealed that the mangrove forest of Misom in Baliangao, Misamis Occidental consisted of 21 species, while in Bais Bay in Negros Island (Visayas, Philippines) a total of 14 species were noted by Calumpong (1992). Babaran & Ingles (1997)

indicated that not all species of major as well as minor elements are simultaneously present in all municipalities of Guimaras, Philippines.

In the genus *Avicennia*, 2 species (*A. marina* and *A. officinalis*) are found in Catanduanes. The species, *A. eucalyptifolia* as reported by Zamora (1991) is not found in this province. The other genera, e.g. *Bruguiera*, *Ceriops*, *Sonneratia* and *Rhizophora* are also well distributed in this island. The most important major mangal species in the province is the palm, *Nypa fruticans*. A member of the screwpine family (Pandanaceae), *Pandanus tectorius* (an associated mangrove species) is distributed all throughout the province. However, this is not true in other places of the Philippines. In Guimaras, Babaran & Ingles (1997) made no report about its presence there. Likewise, Calumpong & Menes (1997) did not also mention *Pandanus* in their report. Among the members of family Pandanaceae, *P. tectorius* is the most well known species. This is the commonest and the most widespread (Gruezo & Zamora 2000; Stone 1976). Moreover, *Terminalia catappa* (locally known as "Tarisoy") was described by Calumpong and Meñez (1997), and earlier included by Dr. P. Zamora in his previous papers. This species of the Combretaceae family is well distributed in back mangals of the southern and western portions of island under study. Among the minor mangrove elements, the genus *Acanthus*, represented by the species, *Acanthus ebracteatus* and *A. illicifolius* are well distributed in the different zones of the Island from the northern to southern zones and eastern to western zones.

Of the major elements, *Sonneratia* and *Avicennia* are well distributed all throughout the island. Among the minor elements, *Excoecaria agallocha* and *Aegicera corniculatum* are distributed in almost all zones of the island.

CONCLUSIONS

A total of 37 species of mangrove vascular flora (13 species of major mangal elements, 10 species of minor mangal elements and 14 associated mangrove species) were identified in the island under study. Two species of the genus *Avicennia* (*A. marina* and *A. officinalis*) are present in the study sites. The other genera (*Bruguiera*, *Ceriops*, *Sonneratia* and *Rhizophora*) are well distributed in the designated eco-zones. The palm, *Nypa fruticans* is the most important mangrove plant species in the island under study and a member of the screwpine family Pandanaceae , *Pandanus tectorius* which is an associated mangrove species is well-distributed all throughout the island.

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REFERENCES

Babaran, R.P. and J.A. Ingles. 1997. Philippine marine coastal habitats at risk: a case study of Guimaras island. Institute of Marine Fisheries and Oceanology, University of the Philippines in the Visayas Institute of Integrative and Development Studies-Marine Affairs Program, UP Press.

Barth, H. 1982. The biogeography of mangroves. *In*: D.N. Sen and K.S. Rajpurohit (eds.). Tasks for Vegetation Science: Contributions to the Ecology of Halophytes. The Hague: Dr. W. Junk.

Bennagen, M.E.C. and D. Cabahug Jr. 1991. Natural resources accounting: mangroves. Technical Report No. 2. Natural Resources Accounting Project Final Workshop. National Institute of Geological Sciences, 15 Oct. 1991. University of the Philippines, Diliman, Quezon City.

Calumpong, H.P. 1992. Systematic studies on the red algal genus *Laurencia* (Ceremiales: Rhodomelaceae) in the Philippines. PhD Dissertation, University of California, Berkeley, California, USA.

Calumpong, H.P. 1994. Status of mangrove resources in the Philippines. *In*: C.R. Wilins, S. Sudara and C.L. Ming (eds.) Proceedings of the 3rd ASEAN-Australian Symposium on Living Coastal Resources, Chulalongkorn University, Thailand held on 16-20 May, 1994.

Calumpong, H.P. and E. G. Meñez. 1997. Field guide to the common mangroves, seagrasses and algae of the Philippines. Bookmark, Inc.: Makati City, Philippines.

Dartnall, A.J. and M. Jones (eds.). 1986. A manual of survey methods: living methods in coastal areas. ASEAN-Australia Cooperation Program on Marine Science handbook. Townsville, Australia: AIMS.

De Leon,R.O.D., J.A.U. Nuque and R.J. Raymundo.1992.Leaf litter production and tidal export of *Rhizophora apiculata*, *R.mucronata*, *Avicennia marina* and *Sonneratia alba* from Talabong mangrove forest in Bais, Negros Oriental. Philippine Council for Agriculture, Forestry and Development. Los Banos, Laguna. PCCARD Series No. 127, pp. 84-90.

Ding Hou, 1958. Rhizophoraceae. Flora Malesiana. Series 1, 5:429-493.

Fortes, M. 1989. Mangrove and seagrass study. Living Resources in Coastal Areas: Phase I Terminal Report. University of the Philippines, Quezon City, Philippines.

Gruezo, W.Sm. and P.M. Zamora. 2000. Conservation status of Philippine biota. 2. *Sararanga philippinensis* Merr., Family Pandanaceae. ASIA LIFE SCIENCES, The Asian International Journal of Life Sciences, 9(2):189=204.

Hamilton, L.S. and S.C. Snedaker (eds.). 1984. Handbook for mangrove area management. UNESCO and East West Center, Environment and Policy Institute, Hawaii.

Japar, S.B. 1994. Mangrove plant resources in the ASEAN region. *In*: C.R. Wilins, S. Sudara and C.L. Ming (eds.) Proceedings of the 3rd ASEAN-Australian Symposium on Living Coastal Resources, Chulalongkorn University, Thailand held on 16-20 May, 1994.

Masagca, J.T.2007. *Perceptiones de los maestros de ciencia y habitants costeros sobre conservacion de la biodiversidad de manglar* (Science teachers and coastal dwellers perceptions on mangrove biodiversity conservation). Revista de Educacion en Ciencias, Journal of Science Education, 7(1):24-29.

Morton, J. 1990. The shore ecology of the tropical Pacific. Jakarta: UNESCO ROTSEA.

Primavera, J. 2001. Mangroves. Haring Ibon, 3(2):16-21.

Quimpang, V.T., H.C. Porquiz, I. Gurea, L.A. Samaniego. 1987. The community structure of the mangrove forest in Pangasihan, Gingoog City. CMU Journal of Agriculture, Food and Nutrition, 9(1):84-102.

Tomlinson, P.B. 1986. The botany of mangroves. Cambridge University Press, Cambridge.

Santisuk , T.1985. Explanatory keys to terrestrial trees and shrubs recorded from the mangrove formations in Thailand. Proceedings of a Training Course in Life History of Selected Species of Flora and Fauna in Mangrove Ecosystems. Thailand, vol. 1.

Spalding, M.F., M.F Blasco and C. Field (eds.). 1997. World mangrove atlas. International Society for Mangrove Ecosystems. The World Monitoring Center and International Tropical Timber Organization.

Stone, B.C. 1976. Studies in Malesian Pandanaceae, XIV. Notes on Philippine taxa. Kalikasan, The Philippine Journal of Biology, 5(1):1936.

Vega, M.J.M., L.R. Garces, Q.P. Sia III and R.G.G. Ledesma. 1994. Assessment of mangrove resources in San Miguel Bay. *In*: G. Silvestre, C. Luna and J. Padilla (eds.) Multidisciplinary assessment of the fisheries in San Miguel Bay, Philippines (1992-1993). ICLARM Technical Report.

Zamora, P.M.1984. Philippine mangroves: assessment of status, environmental problems, conservation and management strategies. *In*: E. Soepadmo, A.N. Rao and D.J. Macintosh (eds.), pages 606-707. Asian Symposium on Mangrove Environment Research and Management. Unversity of Malaya, Kuala Lumpur, Malaysia.

Zamora, P.M. 1989. Mangroves of the Philippines. BIOTROP Special Publication (Bogor, Indonesia), 37:43-65.

Zamora, P.M. 1991. Managing the Philippine mangal for long-term human survival. Transactions of the National Academy of Science and Technology (NAST), 12:89-125.