

# MANGROVE FLORAL COMPOSITION AND ZONATION IN WESTERN LEYTE

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## ABSTRACT

Sebidos, R.F. and M.I. Galinato. 1996. Mangrove floral composition and zonation in Western Leyte. *Ann. Trop. Res.* 18: 35-48.

Mangroves are a community of trees or shrubs thriving along tidal flats and coastlines extending inland along rivers, streams and their tributaries with brackish waters. A floral composition survey identified 14 species of true mangrove trees belonging to 8 families, and 11 associated species in 10 families, present in 12 different towns of W. Leyte. Mangrove communities within and between sites markedly differ in their zoning pattern. In the northern part *Sonneratia* dominated the seaward edges while *Avicennia* in the landward fringes. However, in the southern part *Rhizophora* is found in the seaward edge while a mixture of *Sonneratia*, *Ceriops* and *Avicennia* occupied the landward zone.

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**KEY WORDS:** Brackish water. Mangrove. Tributaries. Zonation.

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## INTRODUCTION

Mangroves are a type of forest located on tidal flats and coastlines. People see them as a strange biological entity because of their ability to survive in such adverse habitats. They thrive on places hardly tolerated by other higher plants, characterized by waterlogging, poor soil aeration, salinity, high humidity and strong winds.

Mangrove swamps have long since offered a variety of uses; they serve as pollution sink, wind breaks, source of firewood, habitat for some wildlife species, and spawning ground for fishes, among others. Because of the varied uses of mangroves, thousands of hectares have been damaged. Serrano and Fortes (1987) reported that in 1967, Philippine mangrove areas totalled 418,900 ha. Fifteen years after, mangrove areas were reduced to 239,387 ha only. Average annual mangrove area destroyed within the 15-yr period was



pegged at 12,829 ha. Varying statistical figures on the number of species in the mangal community have been reported as well, based on research studies conducted. Salvosa (1936) bared 22 species; Arroyo (1977) presented 41 and Pancho and Fernando (1978) enumerated 35 species and 3 varieties.

These differences in figures could be due to the lack of comprehensive regional surveys on the extent of mangrove resources. This study was then conducted as an initial survey of the mangrove species existing in W. Leyte. The floral composition and the distribution (zonation) of the mangal community in each town were noted. Zonation describes the pattern of occurrence of the different species and communities in a particular site. The survey aimed to characterize the different species and their occurrence within and between sites.

## **MATERIALS AND METHODS**

A reconnaissance survey of the mangrove community in 12 towns of W. Leyte, five to the north of Baybay (Merida, Isabel, Palompon, Villaba and Babatngon), and seven to the south (Baybay, Inopacan, Hindang, Hilongos, Matalom, Bato and Maasin) (Figure 1), was done in 1989 and 1990, with a follow-up survey in 1993. The follow-up was conducted to check if there were changes in the floral composition of the sites. The zonal distribution of each species per site was also recorded.

Species were collected and prepared as herbarium specimens. Photographs were also taken to document the existence of these species (Figures 2a-i).

## **RESULTS AND DISCUSSION**

### **Floral composition**

The mangrove ecosystem is considered as one of the richest ecosystems in the world teeming with flora and fauna. In W. Leyte alone, there are 25 known mangrove species representing 18 families observed and documented.

The elements of the mangrove macroflora are categorized into two: (1) true mangrove trees, represented by members of Rhizophoraceae, Avicenniaceae, Sonneratiaceae, Arecaceae, Aegiceraceae, Euphorbiaceae,



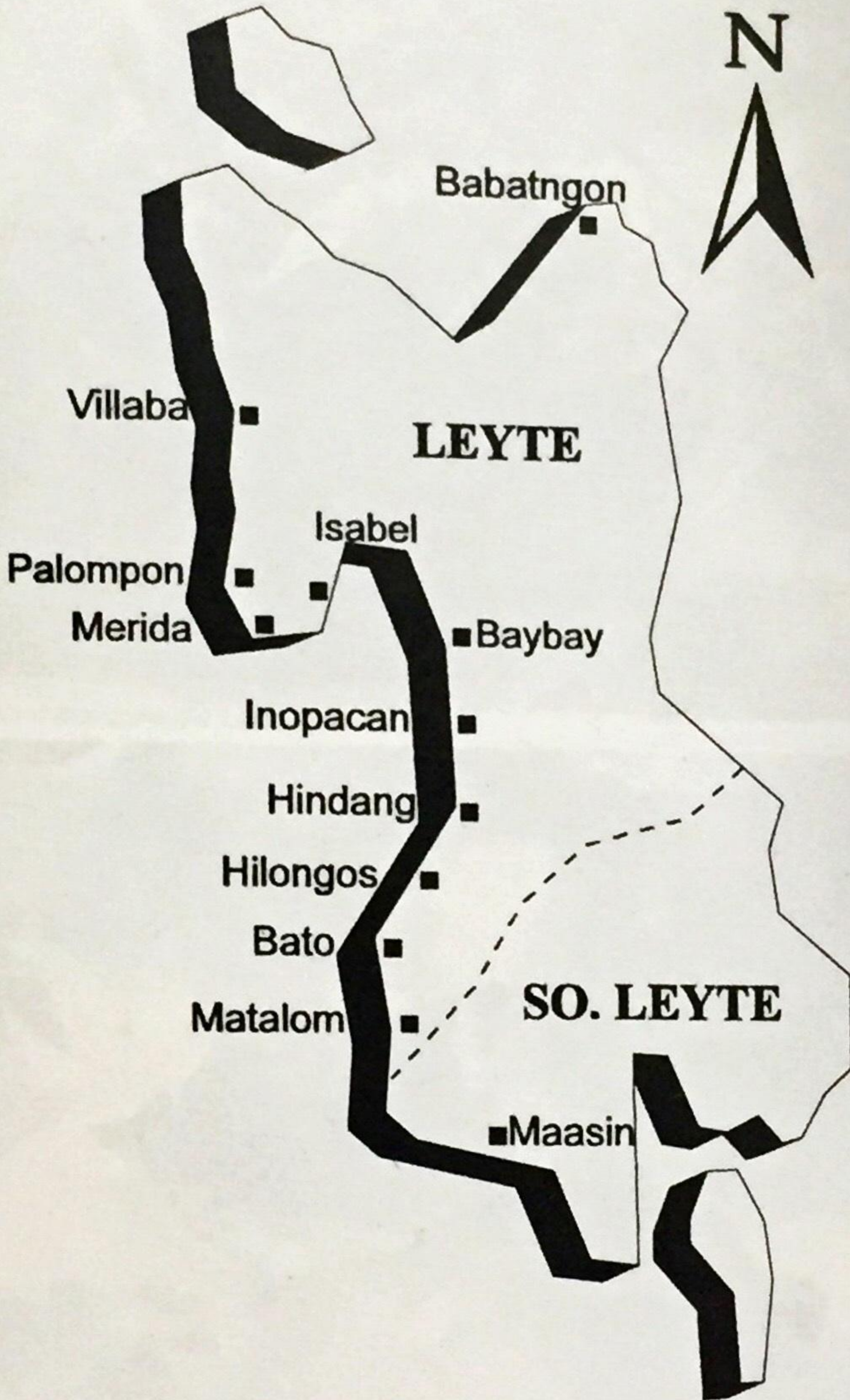


Figure 1. Map of Leyte showing survey sites.





**a**

*Sonneratia alba* Sm.



**b**

*Sonneratia caseolaris* (L.) Engl.

Figure 2a-i. Mangrove species in Leyte





**c**

*Rhizophora mucronata* Lam.



**d**

*Rhizophora apiculata* Blume



**e**

*Excoecaria agallocha* L.

**f**

*Aegiceras corniculatum* (L.) Blanco





*Avicennia* sp.



*Bruquiera sexangula* (Lour.) Poir.





**i**

*Nypa fruticans* van Wurmb.



Table 1. True mangrove species and families in mangrove communities in W. Leyte during 1989, 1990 and 1993 surveys.

Family/Species	Local name
<b>Aegiceraceae</b>	
<i>Aegiceras corniculatum</i> (L) Blanco	Saging-saging
<b>Avicenniaceae</b>	
<i>Avicennia officinalis</i> L.	Api-api
<i>Avicennia alba</i> L.	Api-api
<i>Avicennia</i> sp.	Api-api
<b>Combretaceae</b>	
<i>Lumnitzera racemosa</i> Willd.	Solasi
<b>Euphorbiaceae</b>	
<i>Excoecaria agallocha</i> L.	Lipata
<b>Malvaceae</b>	
<i>Hibiscus tiliaceus</i> L.	Balibago
<b>Palmae</b>	
<i>Nypa fruticans</i> van Wurmb.	Nipa
<b>Rhizophoraceae</b>	
<i>Rhizophora mucronata</i> Lam.	Bakauan-babae
<i>Rhizophora apiculata</i> Blume.	Bakauan-lalaki
<i>Bruquiera sexangula</i> (Lour.) Poir.	Bakauan
<i>Ceriops tagal</i> (Perr.) C.B. Rob.	Tungog-tungog
<b>Sonneratiaceae</b>	
<i>Sonneratia alba</i> Sm.	Pedada
<i>Sonneratia caseolaris</i> L. Engl.	Pagatpat

Combretaceae and Malvaceae (Table 1); and (2) mangrove associates, represented by members of Acanthaceae, Aizoaceae, Cyperaceae, Convolvulaceae, Fabaceae, Pandanaceae, Polypodiaceae, Pteridaceae, Rubiaceae and Verbenaceae (Table 2).

The principal tree species in a primary mangrove forest are from the families Rhizophoraceae and Avicenniaceae. Other species found to be of commercial value belong to the family Sonneratiaceae.

The pteridophytic life form is composed of large aquatic species *Acrostichum aureum* and one epiphyte, *Drynaria quercifolia*. Some blue-green



Table 2. Mangrove associate species and families in mangrove communities in W. Leyte during 1989, 1990 and 1993 surveys.

Family/Species	Local name
<b><i>Acanthaceae</i></b>	
<i>Acanthus ilicifolius</i> L.	Dampalit
<b><i>Aizoaceae</i></b>	
<i>Sesuvium portulacastrum</i> L.	Lambayong
<b><i>Convolvulaceae</i></b>	
<i>Ipomoea pes-caprae</i> L.	Lambayong
<b><i>Cyperaceae</i></b>	
<i>Cyperus ferax</i> L.	Payung-payong
<i>Fimbristylis dichotoma</i> L.	Ubod-ubod
<b><i>Fabaceae</i></b>	
<i>Derris trifoliata</i> Lour.	—
<b><i>Pandanaceae</i></b>	
<i>Pandanus tectorius</i> Sol.	Pandan
<b><i>Polypodiaceae</i></b>	
<i>Drynaria quercifolia</i> (L.) Bory	Pako
<b><i>Pteridaceae</i></b>	
<i>Acrostichum aureum</i> L.	Lagolo
<b><i>Rubiaceae</i></b>	
<i>Morinda citrifolia</i> L.	Lino
<b><i>Verbenaceae</i></b>	
<i>Premna integrifolia</i> L.	Alagao

and green algae (unidentified) were also observed clinging to the trunks, stems, and stilt roots of the mangrove species.

In other related studies, Fortes and Trono (1979) have documented 9 species of blue-green algae, 5 species of green algae, and 10 species of red algae found in the mangrove areas of Puerto Galera, Oriental Mindoro. Cordero (1978) reported 48 species of mangrove-associated algae from five collecting points in Aklan. One species of ascomycete fungus, 12 of basidiomycetes, and 3 of lichens were likewise recorded associated with the arborescent group in the mangroves of Likot Cove and Mahabang Parang Cove (Banaag, 1972).



## Zonation

Zonation refers to the arrangement or distribution in zones of mangrove species in a given mangrove area.

A clearly defined zonation of the mangrove trees was observed in the northern part of W. Leyte. A community of *Sonneratiaceae* was seen bordering the seaward edges, while the landward fringes, with *Avicenniaceae* (Figure 3). Typical of muddy, water-logged portions were a few stands of *Rhizophoraceae* and abundant *Arecaceae*. In the southern part, at the mouth of the river (estuary), *Rhizophoraceae* was observed bordering the seaward

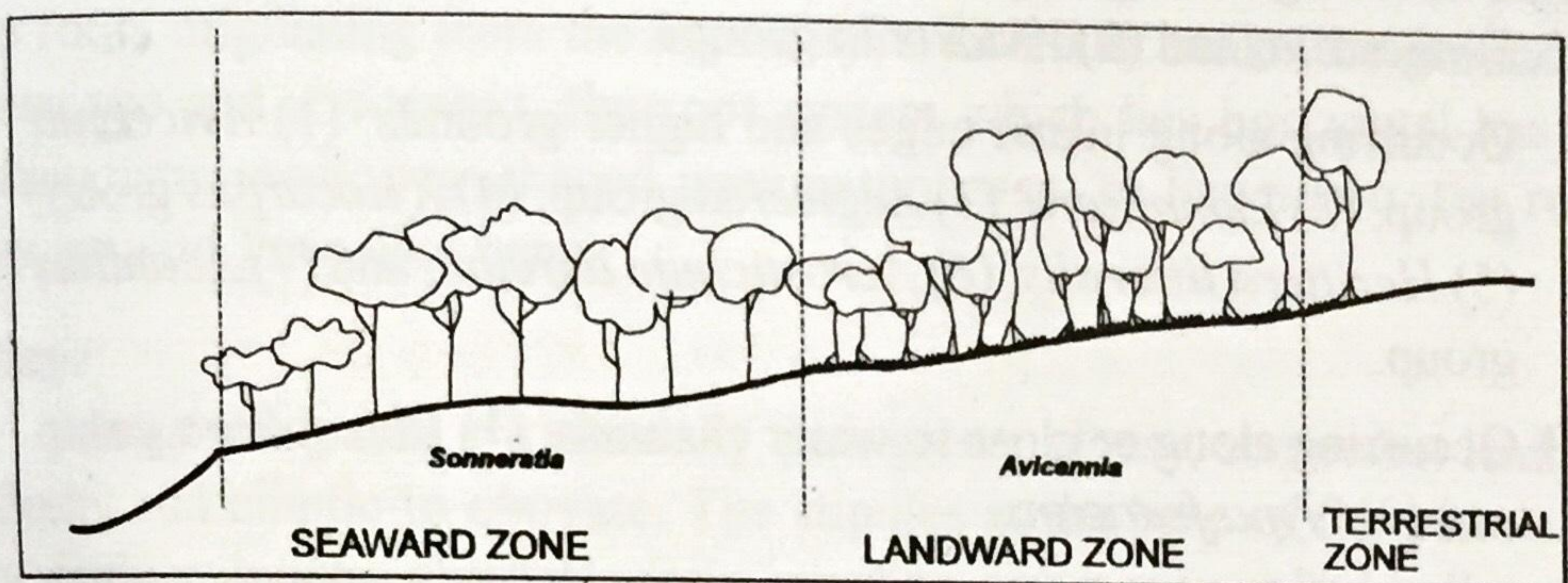


Figure 3. A schematic and generalized profile of tidal flat in the northern part of W. Leyte showing mangrove distribution at low tide.

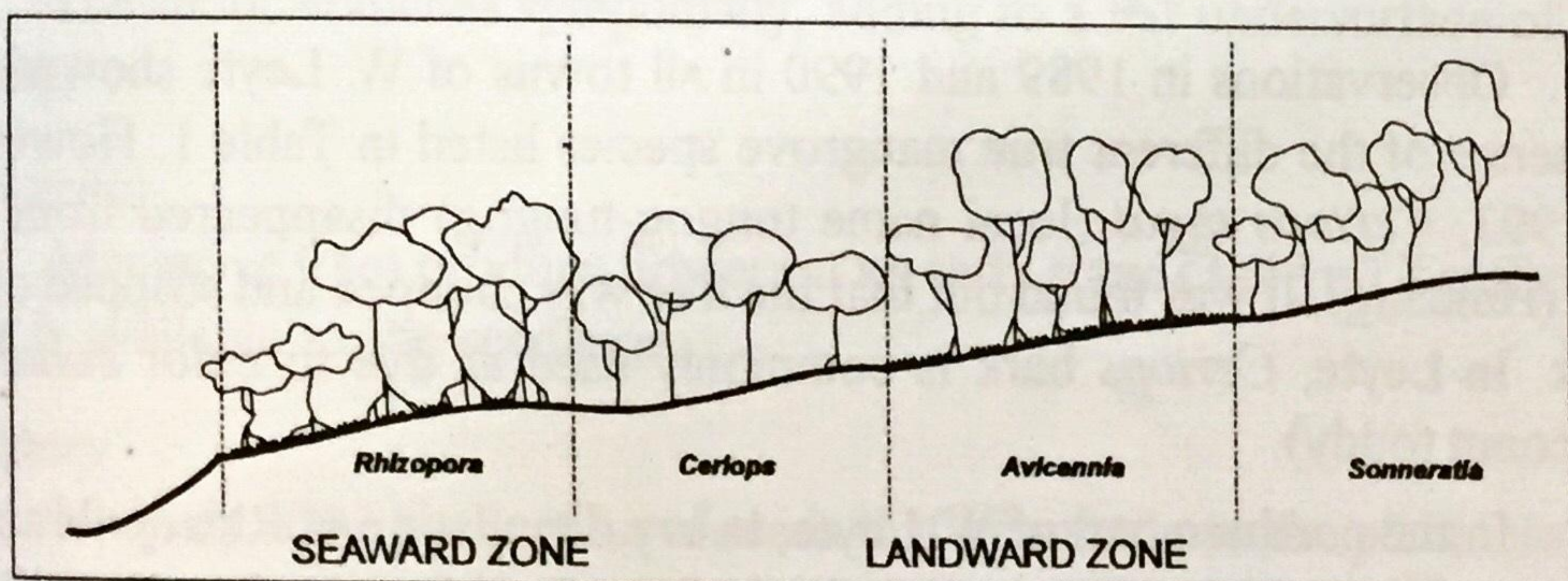


Figure 4. A schematic and generalized profile of tidal flat in the southern part of W. Leyte showing mangrove distribution at low tide.

edge. Growths of *Ceriops tagal*, *Avicennia* sp., and *Sonneratia caseolaris* were observed on the landward zone back of the *Rhizophora* stand (Figure 4).



*Aegiceras corniculatum* was largely confined near the riverbank, where fresh water inflow was apparently greatest.

The epiphytic fern and herbaceous vines were found occupying the central section. *Drynaria quercifolia* may be seen on the trunks or branches of other trees. *Derris trifoliata*, a vine, hang on to other trees. *Acanthus ilicifolius* occurred in the upper stretches of tidal streams together with *Nypa fruticans* although the latter is also found along riverbanks and tidal streams.

Brown and Fischer (1920), as cited by Arroyo (1977), described the zonation pattern of Philippine mangrove as follows:

- I. Occurring along exposed coral reefs: (1) *Rhizophora*, (2) *Sonneratia*, and (3) *Avicennia* groups.
- II. Occurring along inland edges and higher grounds: (1) *Avicennia* group, (2) *Lumnitzera*, (3) *Aegiceras* group, (4) *Xylocarpus* group, (5) *Heritiera littoralis*, (6) *Acrostichum aureum*, and (7) *Acanthus* group.
- III. Occurring along or close to water channels: (1) *Rhizophora* group and (2) *Nypa fruticans*.
- IV. Occurring in open bays: (1) *Sonneratia* and (2) *Avicennia* groups.

### **Additional observations in the mangal community**

Observations in 1989 and 1990 in all towns of W. Leyte showed the presence of the different true mangrove species listed in Table 1. However, in 1993, *Ceriops tagal* (local name tungog-tungog) disappeared from the site (Hindang). It was found out that the tree was chopped and stripped of its bark. In Leyte, *Ceriops* bark is commonly used as dye to color *bahalina* (coconut toddy).

In the northern part of W. Leyte, heavy denudation of Rhizophoraceae was observed. *Rhizophora*, particularly, was found planted as frontliners occupying the first 10 m of land from the sea. Behind the *Rhizophora* stand, fishponds and rice fields were observed. The tree stand was also chopped and gathered as firewood and sold in markets.

In the southern part, the same practice was observed done to *Rhizophora* stands. In addition, *Nypa* leaves were gathered and used for roofing, walling



and handicrafts while the juice is fermented into a beverage called *tuba*. The denuded *Rhizophora* stand was replaced by *Avicennia* which became the dominant species in the mangal community. Species of *Sonneratiaceae* were ranked next in terms of density.

Further observations in the mangrove areas also showed that the species exhibit a number of remarkable features in their root system, foliage, branching habit, flowering and seed development.

#### *Root system*

In general, the taproot in mangrove is absent or barely developed. In *Rhizophora* the root system consists mainly of lateral adventitious stilt or prop roots originating from the hypocotyl which later strike the ground. In *Sonneratia* and *Avicennia*, the root system which lies horizontal has the characteristic erect, peg-shaped pneumatophores. In *Bruquiera*, the roots show upward knee-like bends.

#### *Foliage*

Mangrove leaves are generally dark green, glossy, somewhat leathery to fleshy and elliptic to obovate. The stipules at the base of the petiole are very distinct, having glandular resin-exuding emergence called colleters.

#### *Branching*

The shoot branches sympodially, adding to a flat undersurface of the crown.

#### *Flowering*

Mangrove trees produce flowers at an early stage (3–4 yrs) if sufficient light is available to the seedlings.

#### *Vivipary*

Vivipary is the production of seeds that germinate on the plant. Not all mangrove species are viviparous. Some like *Aegiceras*, *Avicennia*, *Bruquiera* and *Rhizophora* were found to have seeds germinating while still on the mother plant. This phenomenon is thought to be a special adaptation to the environment (Ding Hou, 1958).



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