THREAT TO MANGROVES - AUSTRALIA VS SRI LANKA A REVIEW

Mangrove forests are important ecosystems found in the intertidal areas on sheltered shorelines and in the saline reaches of rivers and streams. They are characterized by having specialized root structures, salt tolerance adaptations, viviparity and dispersal for increased chance of survival etc.

Australia has 39 mangrove species which is around 52% of those found in the world whereas in sri lanka there are 20 identified mangrove species. Important genera in Australia and Sri Lanka include Avicennia, Rhizophora, Aegiceras, Brugüiera, Lumnitzera, Excoecaria and Ceriops. Although these seven genera are common in Australia and Sri Lanka, Rhizophora and Ceriops vary in the species level.

Mangrove ecosystems is one of the important and productive coastal ecosystems. The Mangrove vegetation protects the riverbanks from erosion and serves as essential and nursery areas for fish. Small fish use the tangled roots of the mangrove forest as a protection from predators. The incredible richness of the food chains in mangroves supports a large number of commercial fish species for at least apart of their life cycles.

The boundaries of mangrove areas are naturally dynamic in response to changes in patterns of sediment deposition and other factors. However,anthropogenic processes such as habitat modification and destruction are now having a substantial impact. In many tropical areas in South East Asia, mangrove habitats have been seriously depleted through clearance for aquaculture and firewood. Clearance for aquaculture has occurred to the same extent in Australia, although they are used for oyster farming (which can involve habitat modification) as well as commercial and recreational crab trapping and recreational oyster collection. In some parts of Australia, damages in mangroves have been due to clearing or reclamation and changes in water flow attributed to adjacent developments (e.g. urban development, agriculture, port and marina development etc).

(http;//www. Amonline.net.au/invertebrate/matine_overview/chap5bm.html)

Some of the wetlands adjacent to the Fisherman Islands facility (in Australia) have contained dead mangroves for some time. WBM Oceanics undertook a survey of mangroves of the Fisherman Islands area and studied the distribution of mangrove communities and current health status. Surveys of the study area (wetlands adjacent to Fisherman's Islands) Were undertaken in November 1999 to January 2000. The site was surveyed alone transects to record mangrove species, canopy height, community structure, mangrove health, macro algae and macro fauna abundance. Results of the mangrove health assessment indicated that a large proportion of mangroves within the Fisherman Island area was of poor health and recovery or regrowth in those areas was limited (Environmental reports 2000).

Three impacting processes (which may interact and exacerbate impacts) were suggested (i) Land reclamation practices undertaken in the 1980s resulted in direct loss of mangroves and large scale changes to drainage patterns. This has resulted in the ponding of waters around mangroves which prevents the reestablishment of mangroves and provides an on-going impacting process in adjoining areas.(ii) There was excessive algal growth, possibly related to elevated nutrients in adjacent waters, including the lower reaches of Brisbane River, from sewerage discharges (wynnum and to a lesser extent luggage Point treatment plants), and inputs from the Brisbane River catchments. The macro algae may directly affect mangroves by smothering mangrove root systems, reducing their efficiency, or reducing the recruitment of seedlings. Furthermore, the growths of macro algae may from small bunds leading to ponding waters and resulting in mangrove stress or death. (iii) Development of sand bunds was related to increased wave energy at some sections of frontal mangroves. Dredging activities have removed seaward shallow areas which previously dissipated wave energy. Some areas contain sand bunds at the crest of the seaward fringe that has the effect of either directly smothering mangroves and or blocking flow paths and ponding waters within mangrove areas. This process is most evident along the Boat Passage.

Other adjacent areas (e.g. Whyte Island and Luggage point) are also suffering similar mangrove losses suggesting a regional issue. Studies on Mangrove Die back at Luggage point showed that this was most significant in ***Avicennia marina*** (dominant mangrove species in Moreton Bay) probably due to a herbicide (Diuron) flow through a channel into the mangrove vegetation (Figure 1,2)

Another survey was done at Luggage point in 2003 where the experimental sites were selected near the channel and far away from the channel. The health of mangroves was studied by measuring the height of the tree, girth of the tree, and for seedling, height of the seedling, numbers of healthy leaves, number of unhealthy leaves, number of shoots, girth of the seedling etc. A square area (16mx16m) in the die back area was selected and the number of dead and healthy trees, number of new seedlings was counted. Then another area of same size was selected far away from the channel and the same parameters were measured.

The results showed that the number of new seedlings is higher in the area which is away from the channel. The number of dead trees was very high in the site near the channel.

The chlorophyll distribution studies in different mangrove trees did not show significant difference. Thus it was suggested that chlorophy 11 was not a good indicator of potential diuron uptake. Pneumatophore density was higher in areas far away from the channel.

The root biomass of healthy and unhealthy trees showed significant difference. So the root biomass results would provide for future studies.

The surface sediment was collected to analyze the diuron distribution in the above mentioned

sites. Further studies should be done in the soil layers below surface to measure the amount of diuron leached in to the soil from the sediment. Also, further studies have to be done in order to see why ***Avicennia marina*** is more susceptible to diuron.

The ***Avicennia*** trees found at Luggage Point (healthy area) were very much bigger than those at West End alone the border of the river (Figure 3).

As most Queenslanders live close to the sea, the life style affects the biodiversity on which they depend. Clearing mangroves and wetlands for canal estates, air ports and harbor development has redused Queensland's wetlands cover. The discharge of storm water from gutters and of sewage (usually treated but still rich in nutrients) has affected wetlands.

Moreton Bay is located in one of Australia's fastest growing regions. Almost two-thirds of Queensland's populations live in the south-east corner so the bay is subjected to many pressures.

A hail storm swept through Southern Moreton Bay in September 1997 resulting in complete defoliation of the mangrove forests in its direct path (Figure 4) Either side of the swathe, threes experienced some level of defoliation and damage. ***Avicennia marina*** recovered through lateral sprouting. Howewer, this region is dominated by other species, like Rhizophora and Ceriops which were unable to resprout (Figure 5,6).

Therefore, little recovery of the canopy occurred over the following years. The research group which studied the hail damage in Southern Moreton Bay used a rapid transect method to quantify the changes in mangrove vegetation after hail damage. The hail damage was observed in Cobby Cobby Islands in October, 2003.

Mangroves which provide natural protection to coastlines and act as important fish nurseries are also among the planet's most endangered ecosystems. I the last century alone, one half of the earth's mangrove forests were destroyed much of the loss resulting from conversion to shrimp farming.

Crabs influence the forest structure and species composition by preferentially consuming fruits of some species while leaving others (Figure 7). In some areas the pneumatophores are covered by algae which prevent the respiration in mangroves.

This was seen in Myura Springs (North Stradbroke Island) (Figure 8).

The extent to mangroves in Sri Lanka is steadily dwindling owing to natural process of physical coastal erosion but more to anthropogenic reasons (URL:http://www.tamilnet.com).

Over the past decade many of the lagoons and estuaries in Sri Lanka have been subjected to rapid destruction of its mangrove vegetation for commercial aquaculture. This powerful industrial group is composed of top level bureaucrats and businessmen, Who have shown their lack of interest in mangrove conservation.

As a consequence of this unsustainable activity, lagoons are silted, estuaries are eroded and mangrove ecosystems are deteriorated. In Puttalam district, for e.g. where the most extensive and rare mangrove species occur, more than 3000 hectares of mangrove lands were converted to industrial shrimp farms under the government's patronage (Figure 9) (http:www.wrm.org.uy/bulletin/20/Sri Lanka.html). Where the commercial shrimp farms are nowadays located, 28000 lagoon fishers are engaged in fishing till 1994, after the construction of commercial shrimp farms two thirds of them lost their jobs and were obliged to migrate to the city in order to earn their living. Before the wide spread of shrimp farming the average fish catch per unit effort was 4 Kg and by 1997, this had declined to 1.5 Kg.

Three mangrove species *(Lumnitzera littorea, Pemphis acidula* and *Scyphiphora hydrophyllacea)* one mangrove associate ***(Cynometra iripa)*** and one species of beach vegetation communities ***(Xylocarpus rumphii)*** were found to be very rare. In addition to these rare species, another three species of true mangroves ***(Bruguiera cylindrical, Excoecaria indica and Sonneratia alba)*** were found to be rare (Table 1). At present, all these species are at serious risk as no systemic attempt has been made to conserve them, nor to educate the local people about their significance or to draw attention to their value. For instance, the conversion of mangrove forests for aquaculture and pollution of mangrove ecosystems continue unchecked. Therefore there is a need for urgent and concerted efforts to conserve Sri Lankan mangrove ecosystems.

In North East many of the utilizable trees including mangroves have been heavily subject to felling by local people because of open access although, in a legal sense, these areas belong to the state. The total absence neither of participation nor of any kid of common understanding with local people for sustainable conservation and management of coastal resources whether for fisheries or forest products, has compounded the problem.

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3. Jayatissa LP, Dahdouh-Gueba F, Koedam N. 2002. A review of the floral composition and distribution in Sri Lanka. Botanical Journal of the Linnean Society 138:29-43.

Figure 1. Complete Die back of Avicennia at Luggage Point(i)

Figure 2. Complete Die back of Avicennia at Luggage Point(ii)

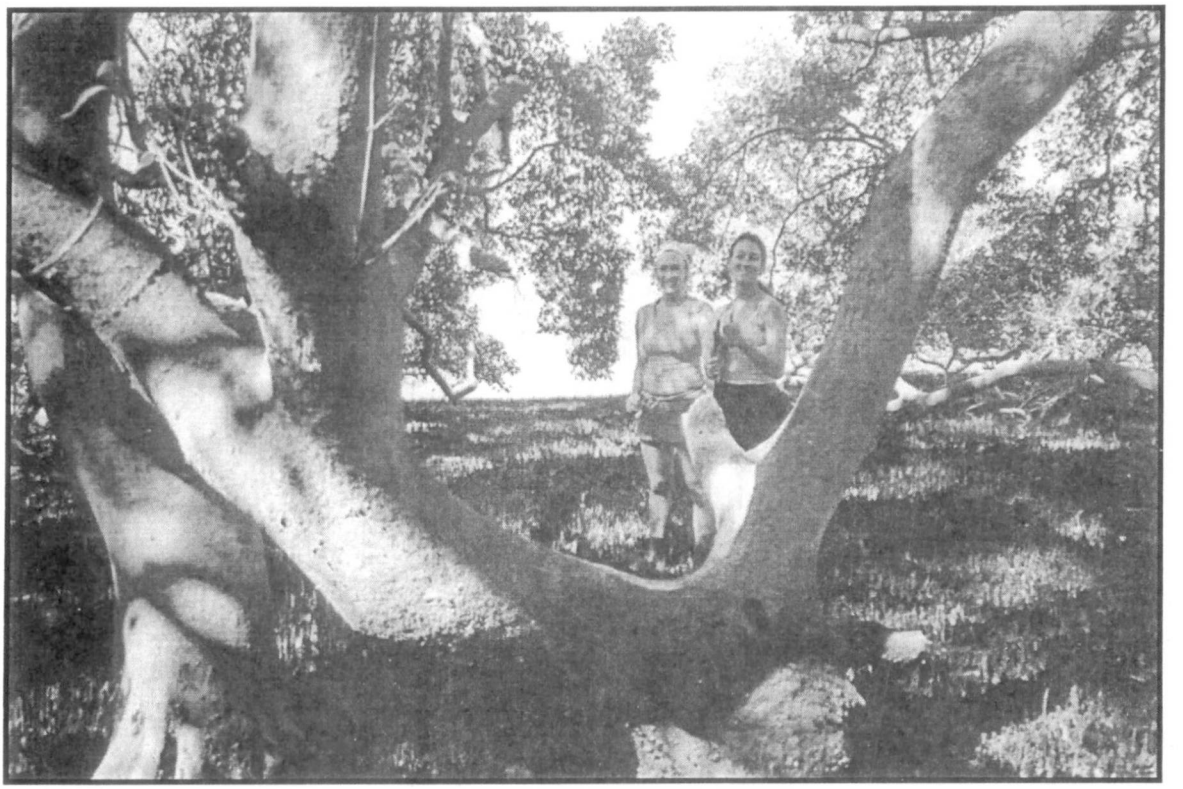

Figure 3. Big Avivennia trees at Luggage Point

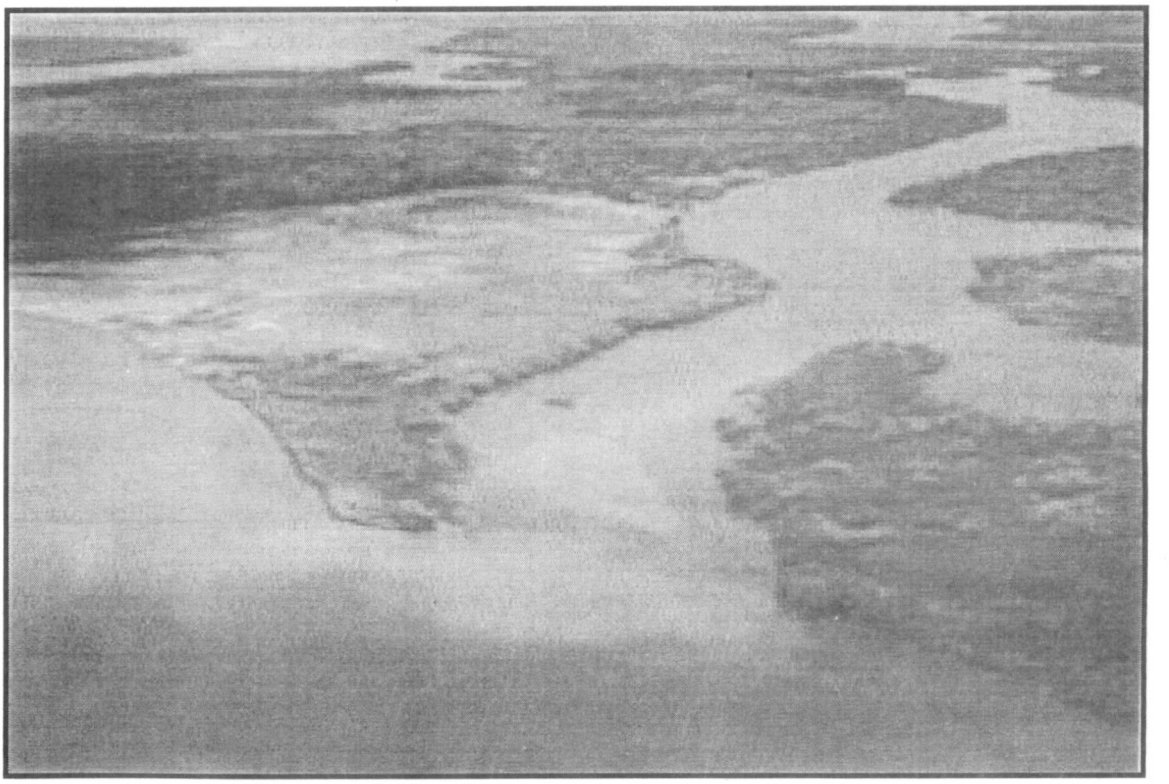

Figure 4. Hail Damage in Moreton bay (1997)

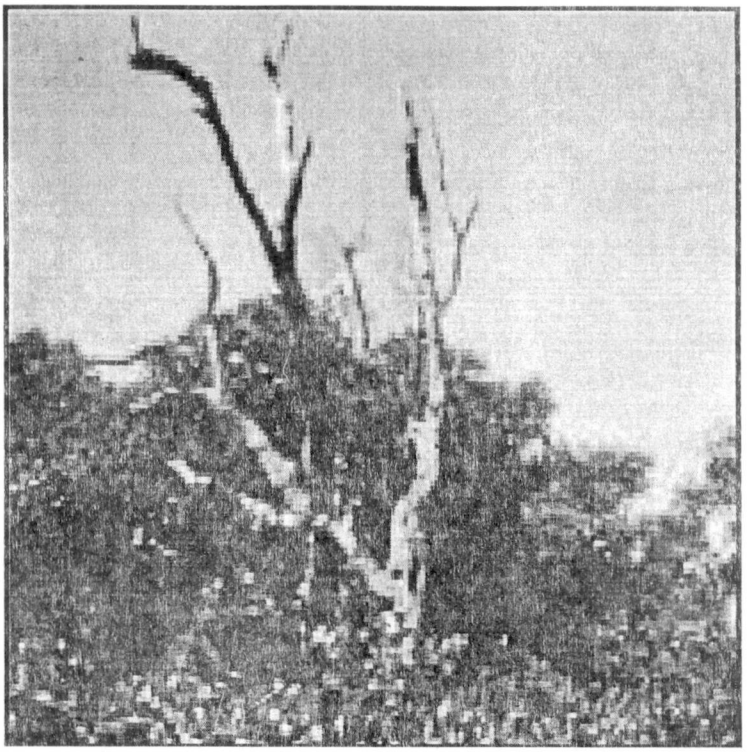

Figure 5. Mangrove Tree Affected by Hail Storm In Moreton Bay

Figure 6. Severe hail damage killed Rhizophora while Avicennia sprouted new growth.

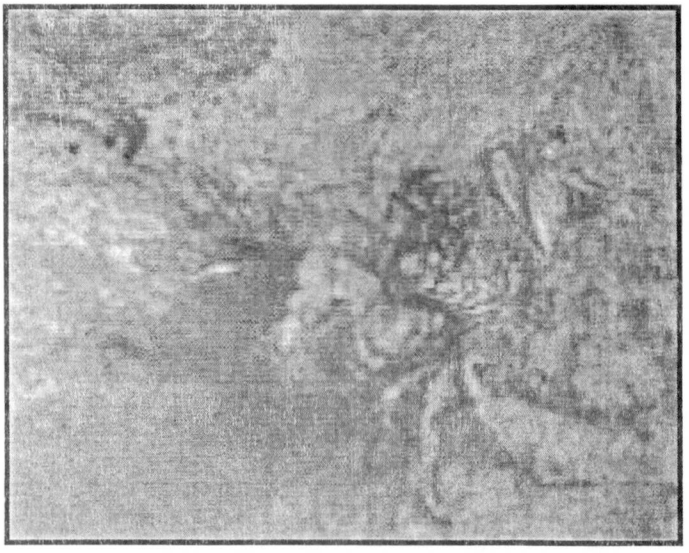

Figure 7. Crab Damage.

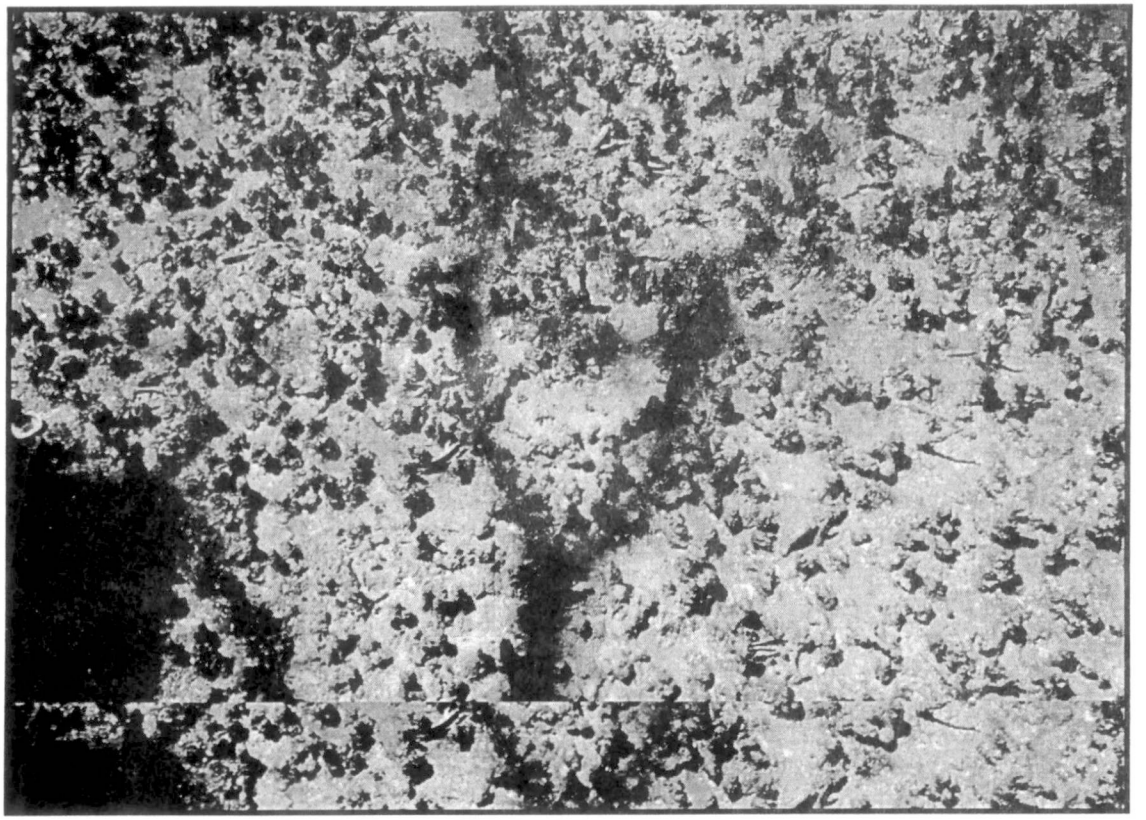

Figure 8. Pneumatophores are covered by Algage at Myura Springs
(North Stradbroke Island)

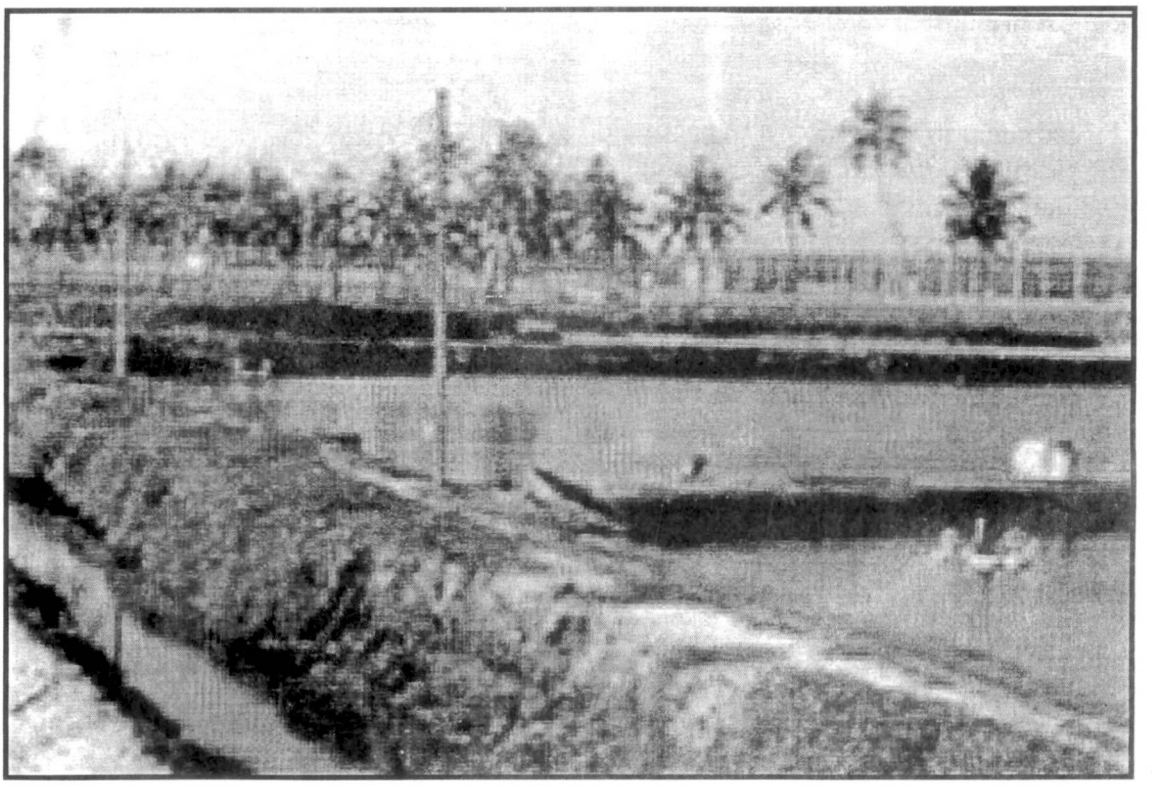

Figure 9. Shrimp farms constructed in puttalam district

Table 1. Distribution of mangrove species (according to Tomlinson, 1986) and mangrove associates in five representative mangrove forests covering all the climatic zones of Sri Lanka, •denotes occurrence. The abundance scale includes all 43 mangrove communities (++=very common; -=rare; --= very rare)

	Wet zone		Intermediate zone		Dry zone	
Lagoon :	Galle	Balapitiya	Rekawa	Pambala	Puttalam	Abundance
	Unawatuna			Chilaw		
MANGROVE SPECIES						
Aegiceras corniculatum	•		•	•	•	+
Avicennia marina	•		•	•	•	++
Avicennia officinalis			•	•		++
Bruguiera cylindrica				•	•	-
Bruguiera gymnorhiza	•	•	•	•		+
Bruguiera sexangula	•	•	•	•		+
Ceriops talal			•	•	•	+
Excoecaria agallocha	•	•	•	•	•	++
Excoecaria indica				•		-
Heritiera littoralis	•	•	•	•	•	+
Lumnitzera littorea		•				--
Lumnitzera racemosa	•	•	•	•	•	++
Nypa fruticans		•	•			+
Pemphis acidula	•				•	--
Rhizophora annamalayana				?		
Rhizophora apiculata	•	•		•		+
Rhizophora mucronata			•	•	•	+
Scyphiphora hydrophyllacea					•	--
Sonneratia alba				•	•	-
Sonneratia caseolaris	•			•		+
Xylocarpus granatum				•		+
Total number of mangrove species	10	8	11	16	11	

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