

# FIJI

By: **Batiri Thaman, Aliti Vunisea, Alifereti Naikatini and Timoci Gaunavinaka**

## **Background on Fiji's Mangrove Resources**

### Mangrove Area and Distribution

In the late 1980s the area extent of mangrove forests was calculated to be 38,543 hectares (of the original 41,000 hectares) (Watling 1985). Just over 90% of the mangroves are on Viti Levu and Vanua Levu, with the largest stands located in the deltaic areas of the Rewa, Ba, and Nadi Rivers on Viti Levu and the Labasa River on Vanua Levu (Ellison In Press a). The Ba, Labasa, and Rewa deltas combined support 28% of the national resource, however, they are lightly affected by development pressure (Gray 1993). The Suva-Navua mangroves and the Nadi Bay mangroves are, on the other hand, considered the most threatened because of their location (Watling 1985).

The mangroves of the Rewa delta are the most diverse and have been identified for urgent consideration in terms of sites important for biodiversity conservation. Those that need urgent conservation in terms of hydrological function are the mangroves of the Ba and Labasa Deltas (Singh 1996).

### Mangrove Flora and Fauna

Fiji's mangrove flora is floristically simple consisting of four exclusively mangrove species, a unique mangrove hybrid, and four predominantly mangrove species. It is dominated by three 'true mangroves' from the family Rhizophoraceae: *Bruguiera gymnorrhiza* (**dogo** in Fijian), *Rhizophora stylosa* and *Rhizophora samoensis* (both **tiri**). The fourth true mangrove is *Lumnitzera littorea* (**sagale**). The sterile hybrid *R.x selala* (**selala**) is a cross between *Rhizophora stylosa* and *R.samoensis*. The predominantly mangrove species include *Xylocarpus granatum* and *Xylocarpus moluccensis* (both **dabi**), *Excoecaria agallocha* (**sinu**), and *Heritiera littoralis* (**kedra ivi na yalewa kalou**) (Pillai 1990, Watling 1985, and Smith 1981). The mangrove fern *Acrostichum auruem* (**borete**) is also widespread. In addition, there are many non-exclusive mangrove tracheophytes (Pillai 1990). The hybrid *Rhizophora x selala* is of some scientific interest because it is only found in Fiji, Tonga, and New Caledonia with Fiji having the greatest area of the hybrid (Watling 1985).

The mangrove fauna include a wide range of different marine organisms including crabs, prawns, a mangrove lobster, shellfish, fish, sharks, rays, eels, and other invertebrates, plus a smaller range of terrestrial animals that live in the forest, for example birds, flying foxes, mammals, and insects. Raj *et al.* (1984) provides a preliminary list of mangrove associated fauna, and Lal (1983) provides a list of the mangrove fish fauna.

### Jurisdiction Over Mangrove Resources

Because mangroves are on the land-water interface, jurisdiction over them and their management is complex. Although terrestrial land may be owned by groups of indigenous Fijians, by government, or by others in the case of Freehold land, all intertidal and submerged land is owned by the state thus the state technically owns most mangrove areas (Department of Forestry 2001). However, Fijians have customary rights of use to

the living resources in these intertidal areas but not to the living resources on the land adjacent to it, if it is not owned by them. This has implications for mangrove utilisation by Fijians, as some species (e.g. land crabs) live within mangrove areas above the mean high water mark (Baines 1984).

### Management of Mangrove Resources

Despite the considerable importance of mangroves to Fijian society, their sustainable management has only recently been given the attention it deserves, and currently faces many constraints. The present management system for mangroves was developed by Watling in 1985 and 1987, and includes legislation and zoning of mangrove areas. The mangrove zoning scheme comprises:

A. Mangrove Reserves: Primary Designation	<ol style="list-style-type: none"> <li>1. Resource Reserves - allocated in areas of high species diversity and areas important to capture fisheries.</li> <li>2. National Reserves - areas of major scientific, educational, and recreational interest.</li> </ol>
B. Managed Resource Areas: Secondary Designation	<ol style="list-style-type: none"> <li>1. Traditional Use Zone - areas required for the subsistence of Fijian communities, especially in rural areas.</li> <li>2. Wood Production Zone - areas of potential for timber and firewood. Needs to be managed.</li> <li>3. Shoreline Protection - required to protect roads, seawalls and agricultural land from the ocean, and coral reefs from pollution and sediment.</li> </ol>
C. Development Zone: Tertiary Designation	<ol style="list-style-type: none"> <li>1. Sewage Processing - areas used for the treatment of sewage. Research needs to be carried out on these areas as well as continual monitoring.</li> <li>2. Aquaculture</li> <li>3. Urban Development - Environmental Impact Assessment should be carried out prior to development</li> <li>4. Tourism</li> <li>5. Agriculture</li> </ol>

This management plan has not been officially adopted (Lal 1991) and the current management of individual zones is probably inadequate. A Mangrove Management Committee, established in 1983, also exists and advises the Lands and Surveys Ministry on all matters concerning mangroves (Swarp 1992). Moreover, because the mangrove resource is poorly understood, most decisions on its utilisation appear to be made on an *ad hoc* basis and rely on inadequate information (Pillai 1985).

### Research

The mangrove flora and fauna of Fiji have been fairly well researched. Various studies have been conducted on the mangrove flora of Fiji, mangrove-associated algae, and mangrove-associated fauna such as the fishes, mud crabs, penaeid prawns, the mangrove lobster, and the mangrove oyster. Few ecological studies have been carried out on Vanua Levu and almost none on the outer islands (Gray 1993). Investigations into the impact of pollution on mangroves are also lacking.

### **Current Awareness Activities**

A number of workshops have been conducted recently related to mangrove conservation and use. In addition, there are a number of projects being carried out related to mangrove management, conservation, and monitoring.

### Workshops

- USP has conducted workshops in Namatakula and Navutulevu on mangroves
- Wetlands International in January 2001 held a workshop in Suva on Field Survey Techniques for studying wetland biota
- WWF/MAFF recently conducted a workshop on Vanua Levu on Kuta and Wetlands
- Women in Fisheries Network conducted workshops and mangrove replanting in Tikina Namena
- GTZ
- FSP have conducted workshops in Nadroga
- National Trust

### Projects

- USP- In Verata, one community conducts monitoring of mud lobsters in mangroves that they have set aside as part of their marine resource management plan. USP has also commenced a similar project at Votua, Ba. A mangrove area has been set aside as a tabu area by these communities and the plan is to monitor mangrove crabs within this mangrove area.
- OISCA has conducted extensive mangrove replanting projects in a number of communities along the coral coast.
- WWF has a Masi project in Tikina Wai on the Coral Coast. This project examines the use of mangrove bark as dye for tapa (bark cloth)
- USP/Govt./NGOs are seeking to establish the Muanikau mangroves and Children's Park as a Mangrove Conservation Area
- National Trust was involved in the set up of the Oceania part of the GLOMIS mangrove database. This database includes references on mangroves as well as personnel involved in mangrove research and management. National Trust also has developed a mangrove poster.
- FSP
- JICA

## **Recent Institutional Developments**

### Institutions Established

- A wetland working group was established in 2000 to deal with wetland conservation issues as well as the selection of a Ramsar Site.
- A Mangrove Management Committee established in 1983 still exists to advise the Lands and Survey Department on all matters concerning mangroves in Fiji.

### Training Programs and Materials Developed

- A community training booklet on mangroves and other coastal ecosystems is being developed by the Women in Fisheries Network. This is in the process of publication for community level education throughout the region.
- Incorporation of awareness of mangroves into the school curriculum – classes 7 & 8 has been completed.

## **Present Monitoring Systems**

### Community-Based

- Verata: Communities are conducting their own biological monitoring of mud-lobster (USP supported)
- Tikina Wai, Nadroga: Community is monitoring the use of the mangrove (**dogo**) for dye for masi (WWF supported)

### Government-Based

- Department of Forestry regulates “commercial logging” of mangroves (for poles and firewood)
- Department of Fisheries monitors the size of “mangrove crabs” sold at local markets

### **Involvement of Other Sectors**

#### NGO's

- WWF – World Wide Fund for Nature
- Women in Fisheries Network
- OISCA
- JICA
- FSP –Foundation for Peoples of the South Pacific
- GTZ

#### Community Groups

- Verata District (Tailevu)
- Namena District (Tailevu)
- Wai District (Nadroga/Navosa)
- Votua (Ba)
- Nasoata Island (Rewa)
- Coral Coast communities

#### Academia

- USP – University of the South Pacific

#### Business Sector

- None specifically targeting mangrove conservation

### **Mangrove Legislation and Policy**

In Fiji there is no single body of legislation or institution that deals specifically with mangroves. The Lands and Survey Department, however, has been the custodian of all mangrove resources of the country. Legislation depends on the departments that deal with the land, water, and the resources in or on mangrove areas (Lal 1983c). For example, although the Forestry Department is responsible for issuing and regulating licenses for the commercial felling of mangroves for firewood or timber via the Forestry Act, there is no legal framework covering illegal felling or overexploitation of timber for subsistence use (Watling 1985). The Fisheries Department is responsible for issuing licenses to fish in coastal waters via the Fisheries Act, while the Lands and Survey Department is responsible for foreshore land and reclamation of mangroves (Lal 1990). In addition, legislation dealing with pollution and reclamation of mangrove areas are haphazardly enforced.

An area of concern is that subsistence uses, unlike commercial uses, of mangrove areas have never been regulated by government or indigenous populations. This could be of importance since subsistence utilisation of mangrove-associated fisheries and wood is more widespread than commercial utilisation (Lal 1991).

In 1992, a National Policy concerning mangroves was under consideration by the Fiji government. It stated that:

Mangroves are an important national asset: Primarily as a resource base for capture fisheries, secondarily as a renewable source of products which contribute to the quality of life of associated coastal communities.

Recognizing this: The natural processes of the ecosystem should be preserved wherever possible thereby allowing the sustained harvesting of its renewable products and the preservation for future development options. Conversion activities should be minimised and permitted only in the national interest and after detailed socio-economic comparison with the expected loss to capture fisheries and other renewable uses (Swarp 1992).

However, at present there is a lack of a policy on wetland protection (Singh 1996).

### **Current Utilisation Patterns**

Mangrove ecosystems in Fiji, in addition to their ecological and environmental roles, play a major role in the historical, cultural, and economic life of the Fijian people that live near the coast.

Fijian communities on the coast utilise mangrove forests as a source of food, for cash income, fuelwood, construction materials, tools, fishing equipment, medicines, and dyes amongst other things. In a recent study by Thaman (1998), it was found that these products are still being used, however, their importance is diminishing due to the use of alternative modern products, less time available to collect because of other commitments, and the loss of traditional knowledge in the preparation and use of these products.

Mangrove wood is commercially exploited for firewood and mangrove poles. Commercial exploitation is concentrated in the Rewa Delta, producing around 95% of the national total of commercial production. The estimated total area of mangrove actively managed for firewood production is estimated to be less than 50 ha and production has now declined to around 1,000 to 2,000 cubic meters per year. Currently there are 7 annual licenses in operation, 5 in the Rewa Delta and 2 in Navua (Department of Forestry 2001).

Mangrove ecosystems also support coastal subsistence, commercial, and recreational fisheries in Fiji. Mangrove fisheries are a critical source of subsistence protein, and a significant source of cash income for coastal communities, especially in rural areas, with a range of mangrove-related species commonly sold at local markets. Molluscs, crustaceans (crabs, mangrove lobsters, and prawns), and around 70 species of finfish are found or caught in mangrove waters (Lal *et al.* 1983, Lal 1991). Urban communities also utilise mangrove areas for subsistence and commercial purposes but not to the same extent as rural communities.

Mangrove areas are also extremely important to Fiji's sewage treatment program. Almost all of Fiji's municipal sewage plants are associated with mangroves, which are used as oxidation ponds, areas where solids are trapped and where effluent is discharged (Watling 1985). Rubbish dumps are also often situated near or in mangrove areas. However, these

two uses need to be more carefully planned and managed as they could result in serious community health problems (Baines 1984).

A further use of mangrove areas is for the location of settlements. All the major settlements of the Suva Peninsula are located around Suva's rivers or mangrove swamps, or where these once were. The location of Suva's poorer residents in these areas is explained by the low commercial value of the mangrove land, and a preference to locate near a river or mangrove area that could supplement them with food and cash earnings, and provide access to the ocean and reefs for those with boats.

Mangrove areas are also seen as valuable land for reclamation for agriculture, industry, residential areas, tourist hotels, and urban development. Applications for reclamation for residential, industrial, and other urban development have increased dramatically, especially in urban areas.

Additional values of mangroves are for use in scientific studies, recreation, tourism, and education.

### **Present Threats to Mangroves in Fiji**

Although threats to the mangrove ecosystem in Fiji are currently limited, the resource is much smaller than in Asian countries and thus more vulnerable. Mangrove areas in urban and peri-urban areas are the most susceptible to threats which arise due to increasing urbanization and development activities. These threats include the expansion of squatter settlements within and bordering mangroves, high population densities that consequently lead to overexploitation of mangrove products, reclamation of mangroves because of commercial, industrial and residential demands for land, drainage activities, sand mining, pollution, and estuarine dredging for flood mitigation (Watling 1985; Pillai 1985; Singh 1996).

Over-exploitation for subsistence firewood use is present and visible but highly localised and limited in extent. It is most serious in the urban and periurban areas and in the drier western mangroves where the ability to withstand coppicing appears to be poor (Swarp 1992).

Although poorly executed large-scale reclamations, which had the greatest impact on mangroves in the past, have reportedly been stopped as official government policy, continuing small-scale reclamations are resulting in the same loss of valuable mangrove resources (Lal 1983). It has been estimated that more than 80% of the mangroves of the Suva Peninsula are thought to have already been reclaimed for urban development (Hamilton and Snedaker 1984), and 6% of the total area has been converted to other uses (Pillai 1988). In addition, extensive government-approved reclamations of mangroves associated with the Denarau Island and Vulani Island tourism developments in Western Viti Levu have been carried out.

No detailed monitoring of pollution in Fiji mangroves has been carried out although Lal (1984) reported observations of abnormalities in the mangroves adjacent to an electricity generating plant, which could have been near the mangroves of Kinoya village. Bryant (1994) reported that in the Suva area, 95% of the mangrove oysters collected from 8 sites exceeded World Health Organisation limits for faecal coliform levels probably originating from sewage effluent. In the urban areas, litter is often thrown into mangroves (Chape and Watling 1992).

Threats that affect mangrove areas, in general, include increasing populations near the coast, commercialization of mangrove products, lack of enforcement of regulations prohibiting unlicensed mangrove felling for commercial purposes, illegal cutting and fishing, hurricanes, and probable sea level rise.

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