

SHRIMP CULTURE AND MANGROVES: BRUNEI DARUSSALAM

Sheikh Haji Al-Idrus bin Sheikh Haji Nekman

Department of Fisheries

Ministry of Fisheries and Primary Resources

Bandar Seri Begawan, Brunei Darussalam

INTRODUCTION

Brunei Darussalam is a coastal state located in the north-western portion of Borneo island within latitudes 5° 05' N and 4° 00' N and longitudes 114° 04' E and 115° 22' E. The country has a land area of 5765 km² (576,400 ha.) divided administratively into four districts, i.e. Brunei-Muara, Tutong, Belait and Temburong. The coastline of the country is roughly 130 km long, fronting the South China Sea and shares a common border with the east Malaysian State of Sarawak. The main population centers are in the coastal zone, accounting for over 85% of the population (305,100 in 1996). It is a Malay Islamic Monarchy and has a stable economy largely dependent on the exploitation of petroleum hydrocarbons.

SHRIMP CULTURE

Since 1965, the Government of Brunei Darussalam has implemented a series of National Development Plans to diversify its economy away from traditional oil and gas industry to other industries. Aquaculture has been identified as one of the priority areas for development because of the availability of potential sites for the development of this industry and the high demand for quality fish products for the local as well as the export markets.

The Department of Fisheries (DOF) of the Ministry of Fisheries and Primary Resources has identified 928 ha of coastal areas for brackish water ponds mainly for commercial shrimp culture (DOF - MIPR 1992). Among these are 90 ha in Kampung Keramat and Telisai in Tutong District; 100 ha in Pengkalan Sibabau and 628 ha in Tutong District; and approximately 200 ha in Kuala Belait District. Most of these areas are sparsely vegetated with some fringes of mangroves, except Pengkalan Sibabau, which is entirely covered with mangrove forests.

Shrimp farming in Brunei Darussalam is quite recent compared to its neighboring countries. In 1997, the total area of shrimp farm was 33 ha producing 52.2 mt of shrimps. Stocking density was 15-30 PL/m² with an average production of 1.5–4.0 mt/ha/year. However, recently with the introduction of *Litopenaeus stylirostris* coined as “udang rostris” by DOF, most of the farms are now stocking at 40-60 PL/m². In 2002, the total area developed for shrimp farming was 210 ha. The production of shrimps from 2000 until May 2003 is shown in Figure 1.

The DOF is now implementing programs such as the incorporation of siltation and bio-ponds to all shrimp farms to safeguard the environment from the polluting effects of shrimp farms discharge. Moreover, environment friendly shrimp culture system is also aggressively verified by DOF and will be promoted to make the shrimp production of Brunei Darussalam sustainable and environment-friendly.

At the moment there is only one shrimp hatchery supplying “udang rostris” to the shrimp farms. This hatchery is producing fry from fully domesticated breeders. Domestication of tiger shrimp is still being worked out by DOF and in the meantime farmers wishing to culture tiger shrimp are allowed to import tiger shrimp fry from accredited hatcheries. About 10% of the shrimp fry requirements (tiger shrimp) are still being imported from the neighboring countries of Brunei Darussalam.

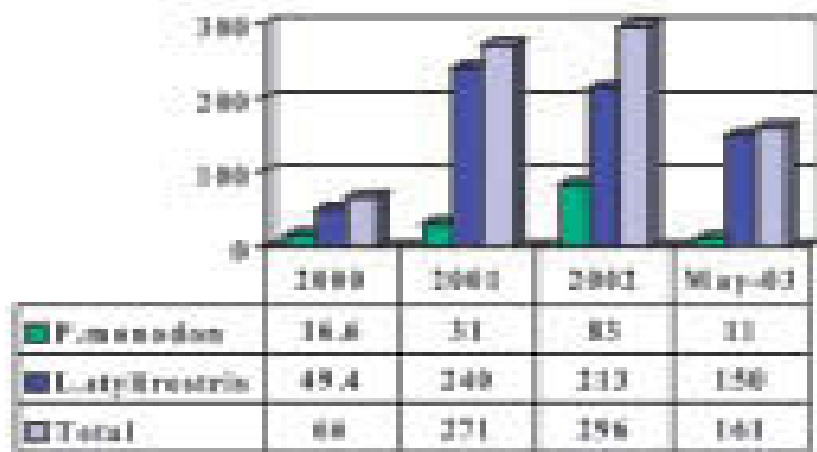


Fig. 1. Production of *P. monodon* and *L. stylirostris* in Brunei Darussalam

MANGROVE FORESTS

The mangrove forests in Brunei Darussalam have an aerial extent of 18,418 ha representing 3.2% of the country's total land area. These occur in saline soils subjected to tidal inundation, largely in northern Temburong, along the lower reaches of Belait, Tutong and Brunei rivers and around Muara (Fig.2). Mangrove forests in Brunei Darussalam are among the best preserved in the region, rich with different types of flora and fauna. Zamora (1987) listed 81 species of vascular plants in the country's mangrove swamps. These consist of 47 flowering plants, one gymnosperm and 33 ferns and fern allies.

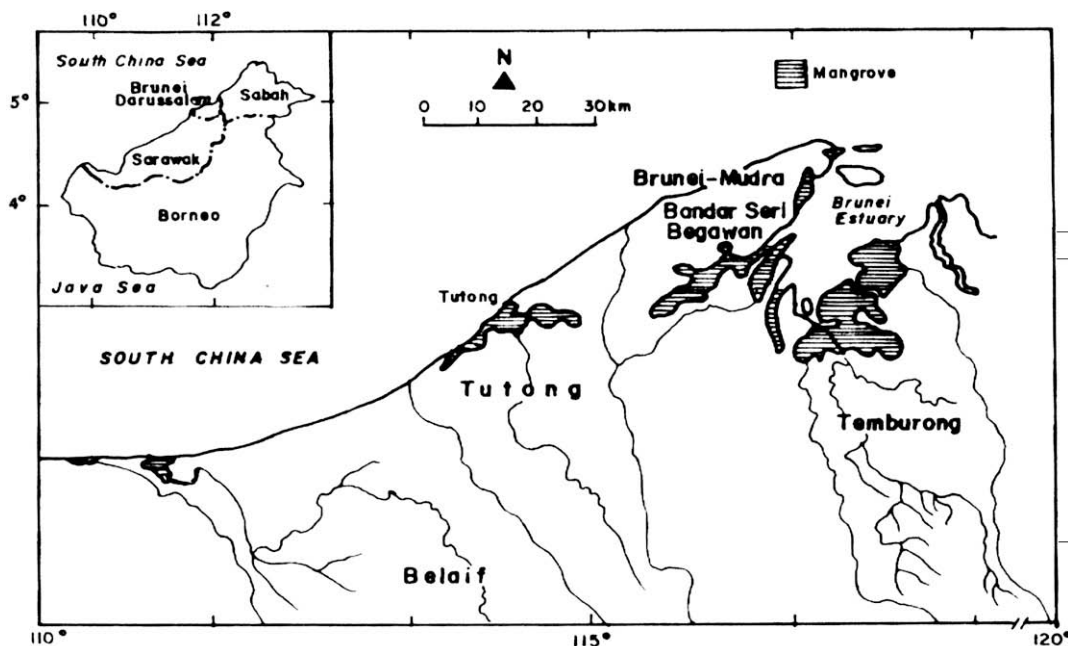


Fig. 2. Distribution of mangrove forests in Brunei Darussalam

The most dominant species are the *Rhizophora apiculata* (bakau minyak) and *Nypa fruticans* (nipha) while *Kandelia candel* (aleh-aleh), *Bruguiera cylindrica* (berus ngayong), *B. parviflora* (berus linggadai) and *B. sexanguila* (berus pulut) are the rare species. The country's mangroves are home to several unique and endangered wild fauna including the proboscis monkey (*Narsalis larvatus*), crab eating macaque (*Macaca fascicularis*), silver leaf monkey (*Presbytis cristata*) and large fruit bats (*Pteropus vampyrus*). Mangroves and the associated mud flats are also used by migratory birds as wintering habitats. The mangrove areas relative to the total land area in the country's four administrative districts are given in (Table.1).

Table 1. Mangrove areas relative to total land area in the four administrative districts of Brunei Darussalam

District	Total land area (ha)	Mangrove area (ha)	% of total area
Temburong	116,600	12,164	66.0
Brunei-Muara	57,000	3,937	21.4
Tutong	130,300	1,784	9.7
Belait	272,500	533	2.9
Total	576,400	18,418	100.0

From an ecological standpoint, mangroves are known to:

- export detritus and nutrients into nearby systems which form the food base of a complex of marine organisms, which in turn support valuable estuarine and nearshore fisheries;
- act as nursery and breeding grounds for many economically important fishes and crustaceans;
- reduce surges and strong winds associated with storms;
- help prevent erosion of riverbanks which in turn protect adjacent properties; and
- harbor unusual wildlife, which provides valuable opportunities for education, scientific study and tourism.

MANGROVE RESOURCE UTILIZATION

In the past, the mangrove forests of Brunei Darussalam were a major source of wood for the charcoal industry (Lim and Sharifuddin 1975), firewood for local use and for export and manufacture of dye used in the tanning industry. At present, mangrove forests continue to be exploited for charcoal and poles for filling in the construction work. Charcoal production, however, is declining because of the increasing use of natural gas (Stewart 1986).

On the other hand, the demand for mangrove poles has increased markedly in recent years as a result of the substantial development of the construction industry. Some mangrove areas are being developed as residential and industrial sites and coastal aquaculture sites in Brunei-Muara District. These are: 154 ha Pengkalan Sibabau resettlement project, 33 ha industrial site in the Kg. Lumut, and 10 ha shrimp farm project at Pengkalan Sibabau.

MANGROVE MANAGEMENT AND CONSERVATION

Understanding the existing and potential adverse consequences on these valuable mangrove forests in the country due to human activities, the DOF implemented a mangrove management program in 1992 (DOF-MIPR 1992) to promote the sustainable development of the mangrove resources of Brunei Darussalam thus, optimizing the benefits to its present and future generations. The program pursues the following specific objectives.

- To preserve mangrove systems needed for the protection of genetic resources and biological diversity and as source for restoring areas where management has failed or accidents have occurred;
- To conserve mangrove resources (plant, animals, physical space or land) for maximum benefit of the people; and

- To minimise or avoid conversion uses (e.g. housing, aquaculture, and agriculture) that eliminate mangrove resources.

In order to achieve these objectives a mangrove use zonation scheme (Zamora 1992) has been proposed to allocate the 18,418 ha of mangroves as follows:

2. 58% (10,686 ha) for conservation and environment protection;
3. 41% (7533 ha) for wood production (poles, charcoal) on a sustainable basis; and
4. 1% (199 ha) for conversion uses into brackishwater aquaculture and human occupancy.

A reforestation scheme was also proposed under this program particularly for wood production areas.

IMPACT OF SHRIMP FARMING ON MANGROVE HABITATS

Brackishwater shrimp farming industry has been blamed to cause massive destruction of mangrove forests in many parts of the world. The estimated world wide loss of primary mangrove forests due to shrimp farming during the last two decades is about one million ha (Greenpeace report 1997). The industry also blamed to cause heavy silt accumulation in the areas where extensive mangrove clearance has occurred, and destroy other important habitats such as seagrass beds and coral reefs.

In Brunei Darussalam, a responsibility has been given to DOF to ensure a sustainable development in brackishwater shrimp farming. Hence, the development of shrimp farms in the country is carried out under the strict vigilance of the DOF. All aquaculture farms in the country are required to register with the DOF and obtain a permit for pond construction and subsequent operations. The shrimp farmers are required to follow the instructions given by the DOF.

Aside from the land code (Chapter 40 Article 12) stipulating that a belt of land fifty yards wide is reserved to the state along the banks of all rivers, streams and creeks and along the sea shore above high water marks, the DOF also ensure that in developing shrimp farm areas, a buffer zone of 50 to 100 meters in coastal and river areas, is strictly observed. So far, shrimp farming in Brunei Darussalam does not show significant impact on the mangrove habitats as the industry is small and the government strictly controls its expansion.

REFERENCES

- DOF-MIPR (Department of Fisheries, Ministry of Industry and Primary Resources, Brunei Darussalam). 1992. The integrated management plan for the coastal zone of Brunei Darussalam. ICLARM Tech. Rep. 29, 122p.
- Lim, T.S. and P.M. Sharifuddin. 1975. Charcoal production on Brunei. *Brunei Mus. J.* 3(4): 201-220.
- Stewart, M.B. 1986. A geography of Negara Brunei Darussalam Dewan Bahasa dan Pustaka Brunei, Bandar Seri Begawan, Brunei Darussalam.
- Zamora, P.M. 1992. Mangrove resources of Brunei Darussalam. Status and Management. pp. 39-58. In G. Silvestre, H.J.H. Matdanan, P.H.Y. Sharifuddin, M.W.R.N. De Silva and T.E. Chua (Eds.) *The coastal resources of Brunei Darussalam: Status, Utilisation and Management*. ICLARM Conference Proceedings 34, 214 p. Department of Fisheries, Ministry of Industry and Primary Resources, Bandar Seri Bagawan, Brunei Darussalam, and International Center for Living Aquatic Resources Management, Manila, Philippines.