International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2016): 79.57 | Impact Factor (2015): 6.391

A Study of Mangroves and Prawn Diversity in Kavanattinkara

Amala Sebastian, Sr. Jessy Joseph Kavumkal

[1]Student, Department of Zoology, Kuriakore Elias College, Mannanam, Kottayam, Kerala, India
[2]HOD, Department of zoology, Kuriakore Elias College, Mannanam, Kottayam, Kerala, India

Abstract: ***Mangroves are known as the lungs of nature. Kerala once had over 70, 000 hectares of mangroves, fringing its unique estuarine systems. It is considered as the breeding ground of prawns species. There are many factors which facilitate the diversification and abundance of prawn in mangrove area. The detritus content, hiding area, mineral availability, temperature, pH etc. are some of those influential characters. Many prawn species are available in mangrove areas. They are either cultured or naturally occurring. Some of them were studied such as Fenneropenaeus indicus, Metapenaeus dobsoni, Metapenaeus affinis, Macrobranchium rosenbergi, Metapenaeus monoceros. The interview or enquiry method was used for the study.***

Keywords: Mangroves, Prawn Diversity

1. Introduction

Biodiversity is an index of the incredible health of habitat. Major portion of biodiversity was occupied by the flora and fauna of an ecosystem. As a nutrient filter and synthesizer of organic matter, mangroves create a living buffer between land and sea. The rich and diversified life of this ecosystem is due to high energy production capacity of mangroves especially towards estuarine and marine fertility (Herald and Odum 1970; Macnae 1974). Mangroves are the characteristic littoral plant formations of tropical and subtropical sheltered coastlines and are at the interface between the land and the sea. The importance of mangroves stems from their pivotal role in both terrestrial and aquatic production, and by the many amenities provided within and beyond its boundaries. Although these ecosystems are economically extremely valuable, they are under increasing threat of being wiped out by rapid human encroachment and environmental pollution. Thus an understanding of these ecosystems is vital to their survival. In this ecosystem the diversified Kerala once supported about 700km2 mangroves along its coast (Ramachandran et al., 1986) and what is seen now are only relics of the great past. The increasing pressure on the coastal area as the population density increases initiates a radical transformation of the natural environment. Early development of the state was mainly through sea trade in the past and more recent changes in agricultural and industrial sectors resulted in consumption of large extents of mangrove vegetation. Moreover, the ecological significance of this unique ecosystem was not at all understood. By the time the ecological importance are realized, the mangroves had dwindled from 700km2 to about 17km2.

The entry of tidal waters regularly from the sea, the enrichment of 30 estuaries and backwaters with the regular supply of fresh water flowing from the 44 perennial rivers create a peculiar ecological environment leading to the development of a unique mangrove vegetation on the fringes of the backwaters, estuaries, and creeksitats like the tree, soil and water are occupied by different groups of organisms exposed to different sets of environmental conditions. The animals inhabiting the intertidal region exhibit constant interaction with variable salinity, muddy substratum and periodic tidal flush and are unique to this habitat. The fauna, as a whole, have greater mobility to choose their habitat, unlike the plant community. Hence the number of species representing the fauna is very much greater than the number of plant species occurring in mangrove area.

Visually the density of the fingerlings or schooling of juvenile population in the mangrove waters is comparatively more than open waters. The crustacean fauna of mangroves are vast and varied and includes prawns, shrimps, crabs, lobsters, hermit crabs, cirripedes, isopods, mysids etc. Diversity of mangrove ecosystem of India, seems to be varied and rich, it is far from being comprehensive, due to inadequacy of coverage and lack of comparable data bases. However, the inputs during last ten years or. So promises comprehensive information in years to come.

The study was conducted in the water systems associated with Kumarakom Bird sanctuary and Kavanattinkara. The location map of the area of study is given below.

The study was on the prawn diversity in and around the mangrove forest at Kumarakom. Mangrove environment sieves as the potential -area for brackish water aquaculture of prawns as it happens to be Nature's own aquaculture, system which is more stable and less susceptible to diseases and epidemics

2. Review of Literature

The classic work of Heald (1969) and Odum (1970) on mangrove productivity in Florida have attracted wide attention to the general significance of mangrove communities in the coastal zone. Mangrove forest areas and their associated food chain and nutrient cycles are often closely linked to those in adjacent coastal waters (Alongi et al., 1993; Alongi, 1996). The trees can be regarded as links between the terrestrial and marine ecosystem (Chale, 1993), and mangrove ecosystems are open with exchange of nutrients, detritus and sediment facilitated by tidal flushing (Wood roffe, 1985; Lee, 1995). The habitat receives nutrient and organic detritus from land and from fresh water streams (Morell and Corredor, 1993) and nutrients are effectively recycled within the ecosystem. The extent to which the mangrove systems exchange dissolved and particulate nutrients with adjacent waters depends on several factors including geomorphology, tidal regime and ~Iimate (Alcr~~;, ~ 996). ~. ~3:1groves is considered to play an important role in controlling coastal hydrodynamics and sediment movements (80to, 1992; Eong, 1993).

A mangrove is a tree, shrub, palm or ground fern, generally exceeding one half meter in height, and which normally grows above mean sea level in the intertidal zone of marine coastal environments, or estuarine margins. Of late, the terms 'mangroves' or 'mangal' are being synonymously used to refer to the mangrove habitat although the former is far more popular. Mangroves are a diverse group of predominantly tropical trees and shrubs growing in the marine intertidal zone, sheltered coastlines, mudflats and river banks in many parts of the world, belong to a variety of plant families. Here they are subject to both short term rhythms of tides and seasons, as well as to longer-term changes of climate and sea level. As a group, they share several highly specialized and collectively well- known adaptations, notably exposed breathing roots and support roots. Salt excreting leaves, and viviparous water ~ dispersed propagules. These characteristics are not shared equally by all species. It is believed that the variation at particular sites influences both the types of mangroves that can become established and survive (Karim. 1991). And their morphology (Soto and Corrales, 1987: Duke, 1990.

Patches of varying extent exist along the sides of the railway line especially in the Trivandrum-Quilon, Ernakulam- Alleppy and Thanur-Kasargode sectors. In most places the vegetatinn is in a \/"";. ' “! arrow linear ~trip. Bigger bits are available in some parts especially on the sides of the line from Mahe to Dharmadom, Pazhayangadi, Ezhimala, Payyannur, Edakkad and so on. These are comparatively bigger patches, and support fairly good and developed mangrove vegetation. The Quilon strip has a length of O. 75km and a varying width of 1-10metres from the water front. The total extent of this may be around 2ha. Kumarakom which is declared as a bird sanctuary supports a narrow belt of approximately one-kilometer long mangrove vegetation along the fringe of Vembanad lake varying in width from 10-20m. This area comes approximately to 4ha including vacant marshy patches.

The Vypeen area in Ernakulam district, support about 10ha of mangroves. These forms a part of the naturally accreted area called Puthuvypu at the southern tip of Vypen Island located on the North- Western bank of Cochin bar-mouth. In Kerala some of the mangrove vegetation are under the forest department. In Ernakulam district the land called "Mangala VanamN also supports a good amount of mangrove vegetation.

Mangrove forests are best developed on tropical shorelines where there is an extensive intertidal zone, with an abundant supply of fine grained sediment (Walsh, 1974). While mangroves are generally associated with low-energy, muddy shorelines, particularly tropical deltas, they can grow on a wide variety of substrates, including sand, volcanic lava or carbonate sediments.

A comprehensive understanding of nutrient behavior in aquatic ecosystems requires their study in both the water and sediments. Bonanni et al. (1992) showed that sediments play an important role in the accumulation and regeneration of nutrients. Organic matter produced by phytoplankton in eutrophic shallow lakes settles to the sediment and decompose by aerobic and anaerobic processes, during which different carbon, nitrogen and phosphorus compounds are produced (Anders0n and Jensen, 1992). Furthermore, decomposing organic matter affects changes in oxygen concentration and redox potentials which in turn affect nitrogen and phosphorus release from sediments to the overlying water. In order to obtain a complete picture of the effects of flooded soils on plant productivity, relatively long term studies on nutrient status, redox potential, pH, soil mineralogy, and salinity changes must be made. The redox potential is a convenient measure of the extent to which the soil is in a reducing or anaerobic stage. The large positive values of redox potential indicate a well oxidized or aerated stage. As the oxygen supply is limited, it is rapidly consumed by bacterial respiration. It was found that this process takes place at an Eh range of +350 to +380mV. When all the oxygen is consumed the conversion of Mn +4 to Mn +2 and N03 to N2 takes place. When Mn+2 and N03 are completely consumed, then Fe+3 is reduced to Fe+2 and so on until the soil eventually reaches a highly anaerobic state where the reduction of dioxide to methane takes place. The rate at which all these processes depends upon the time of flooding and organic carbon present in the soil.

The ecological significance of carbon as a nutrient is manifested through its organic forms. The concentration of total organic carbon is often used in correlation with other elements. For example carbon to nitrogen and carbon to phosphorus ratio is used to characterize the association of nitrogen and phosphorus in organic matter. Nitrogen

species include organic nitrogen, ammonia nitrogen, and nitrate and nitrite nitrogen. Biological activities in living dead tissues produces reduced forms of organic nitrogen ranging from simple amines to complex proteins. Ammonia is the most common form of inorganic nitrogen, and is the product of decomposition of organic matter. Bacterial oxidation in the nitrification cycle produces nitrite and nitrate. Phosphorus species in the environment include organic phosphorus compounds, inorganic phosphates, and mineralized inorganic complexes with iron, calcium and aluminium. Phosphorus precipitates to form low solubility compounds and metallic complexes, and is relatively immobile compared to carbon and nitrogen. The natural abundance of nutrients of interest is carbon, nitrogen and phosphorus. Due to this sequence, phosphorus is often considered to be the limiting nutrient in the ecological cycle. Sediments receive a mixture of labile and refractory organic and inorganic phosphorus compounds from the overlying waterand the surrounding landmasses. Some of these compounds behave as inert material and are simply buried in their orginal form. Others decompose or dissolve and simply release the phosphate to the sediment pore water. The regenerated phosphate may be released to the overlying water, reprecipitated within the sediment as an authigenic phase or adsorbed by other constituents of the sediment. Adsorption on metal oxides in the sediment has been identified as one of the principal reactions involving phosphate. (Lijklema 1976; Krom and Berner 1981 :Frolich 1988). Mangrove soils are expected to contain a high proportion of organic phosphorus compounds due to their generally high organic matter content (Boto, 1988). Boto has pointed out that much of this organic phosphorus is in the phytate form and bound to humic compounds, and has been found in lake sediments, and is not probably not available for microbial and mangrove plant nutrition. The inorganic phosphate represents the largest potential pool of plant available, soluble reactive phosphorus. Most of the inorganic phosphorus in mangrove sediments is either bound in the form of Ca, Fe, and AI phosphates or as soluble reactive phosphorus adsorbed onto, or incorporated into hydrated Fe and AI sesquioxides. Total organic P concentrations, proportionally greater in surface sediments, reflect the influence of roots, whereas the inorganic fractions mainly Fe bound. phosphorus, proportionally and in real terms increase gradually with depth reflecting the influence of increasing anoxia p~rticularly below the root layer.

Every organism participates to some extent in the phosphorus cycle by virtue of its need to assimilate organic and/or inorganic phosphorus for growth and maintenance, and by excreting phosphorus containing byproducts. Bacteria, algae and higher plants, including mangroves, take up dissolved orthophosphate; and organic phosphates are either taken up directly or first hydrolysed by extracellular alkaline phosphates. Organic phosphorus may be very resistant to hydrolysis and not readily assimi:able to organisms. Orthophosphate is coupled to ADP to form A TP in cells, and is essential for energy transfer and phosphorylations, and for synthesis of nucleic acids, phospholipids and phosphoproteins (Ingraham et al., 1983). In comparison with release rate of phosphorus from mineral phosphates a refractory organic material, the turnover time for P uptake, utilization and excretion by living organisms is very short, on the order of minutes to tens of hours, depending on the rate of biological activity and the amount of available phosphorus. Once P is taken up and used in cells as phosphate, it is eventually liberated via excretion or through mineralisation of detritus as phosphte. This means that all organisms have evolved efficient uptake mechanisms for a very small and virtually constant proportion of the earth's P in a very competitive cycle, and P on a localized level may limit growth of biomass. Local P cycle can be very efficient in tropical mangroves, where it has been estimated that up to 88% of the forest P pool is retained within the sysem (Boto and Bunt, 1982). The cycling of phosphorus through mangrove food web is presumably similar to that in other aquatic systems. At the base of pelagic and benthic food webs, a 'microbial loop'exists in which interactions among bacteria, microalgae and nanoprotozoans and larger protests facilitates net release of phosphorus into the water column and pore water.

An increasing number of studies have investigated the influence of mangrove forest on coastal nutrient cycles and food chain and found that the actual amount of dissolved and particulate matter exchanged depends on the factors such as aerial extend of the forest, tidal amplitude and seasonality. Tropical mangrove forests, on average, appear to export particulate nutrients and to import some dissolved species, depending upon season, tidal amplitude and geomorphology. (Along et al., 1993).

Mangrove environment plays a vital role in the biology of its faunal component. But this unique ecosystem had not so far drawn the attention it deserved as far as its faunal comporlent is concerned until recently. In the last 30 years, distribution of animal species has been inventoried from some parts of the mangrove ecosystem along the west coast, east coast and bay islands of Andaman and Nicobar. McClelland (1869) was the pioneer in exploring the malacofauna of brackish water systems of Iower Bengal. It was followed by the works of Annandale (1907- 1925) on Hydrozoa, Polyzoa, Entoprocta, etc. Kemp (1 9 19- 1923) on crustaceans and Hora (1929-1955) on fishes who have contributed much to our' knowledge of these estuarine animals occurring in mangroves of Sundarbans. Studies on fauna with special reference to estuarine biology of the Sundal-ban mangroves have recently been given a boost by Choud hury and his co-workers (1978-onwards). A wealth of information was gathered from such sources which are of immense value for further faunistic studies of the mangrove habitat. It was beyond the scope of this study to include and or review all such publications, however, important and recent articles are referred here in. Nandi and Misra (1987) have recently compiled a bibliography of the Indian part of Sundarban with special reference to fauna, in which literature pertaining to zoological researches, faunal studies and fishery has been dealt with.

The crustacean fauna of mangroves are vast and varied and includes prawns, shrimps, crabs, lobsters, hermit crabs, cirripedes, isopods, mysids etc. After Adcock’s work on the Indian Decapod crustacea, some valuable contri1.

1utions another crustaceans were made on the taxonomy of Amphipoda by Annandale (1907); Much work has been done on prawns and their fisheries from Hooghly estuarine system by Rao (1969).

Almost a1 the works are on the population of prawns in the backwaters or estuaries. The following are the work done in some of the estuaries and backwaters, where mangroves arc located. Henderson and M athai (19 lo), studied some species of Palasrnorz from South India. A preliminary study on the prawns from Travancore was done by Nataraj (1947). Observations on the prawn fisheries of the Killai backwaters were made by Gemma Evangchne et-al, (1972). Dwivedi (1982) studied the prospects of prawn culture. The prawn fisheries of Godavari estuarine sys tern was studied by Ganapati (1969). Jayachandran (1984) made a detailed study on the biology of the Palaemonid prawns of the south west coast of India. Jayachandran and Joseph (1985) described a ncw species of Macrobrarzchium from the south-west coast of India. The palaemonid prawns resources of the cstuuriev of JCerala was studied in detail by, l;iyachandran (1 987). The ecobiology, taxoilomy and dis tri b utiun proximate, composition of the palaemonid pniwns of south west coast of India was also studied by Jayachandran and Joseph (1989). Rajendran (1999) reported seasonal occurrence of juvenile prawn and environmental factors in a Rhizophora mangal of south east coast. Hoq et a1 (2001) studied the abundance and seasonal distribution of Penaeus monodon post larvae in the Sundarbans mangrove. Jisha (2002) reported the fauna of a mangrove ecosystem in a tropical estuary. Fisheries structure and management implications in Sundarban mangroves were studied by Hoq et al (2003).

Chakravarthy and Choudhary (1986) have reported four species of fiddler crab, belonging to genus Uca from Sundarban mangroves. Crab and Crab fisheries of Sudarbans were reported by Nandi et al (1994). Nandi and Das (1999) studied the distributioh of fiddler crabs in Sundarban and found that sediment with mclre sand particle is the deciding factor for their distributio~l. Nandi and Das(1999) discussed the vertical distribution of macrobenthos and noted that middle zone was occupied by Brachyuran crab, Fiddler crab etc, the upper zone is occupied by sesarma (Brachyura) and Uca sp (Brachyura). Insect fauna had not - received any attention until recently.

Recent and worthwhile works on malacological fauna of Sundarban mangroves are those of Subba Rao et-a1 (1983) and Nandi et a1 (1999). Kasinathan and Shanmugham (19861, while reporting of the molluscan fauna of Pitchavaram have reviewed the mangrove molluscs of Mahanade estuary and also of Godavari estuary, Krishna estuary and Machilipatnam swamp, all along the coast of Andhra Pradesh and have presented an inventory of 15 genera and 3 1 species of gastropods as well as 7 genera and 9 species of pelecypods. Wood boring fauna of mangroves of India has been reported (Santha Kumaran 1986) to comprise of 22 species under 12 genera of mollusc. Ross et a1 (1997) studied the distribution and abundance of barnacles in a mangrove forest. Faunal zonation and assemblages in the pacific colwnbian mangrove were reported by Cantera et a1 (1999). Jisha 2002 reported the molluscan fauna of a mangrove ecosystem in a tropical estuary.

Vertebrate species in the mangrove fauna of India are varied and rich. All the classes and a species under Hemichordates are documented. Extensive studies have been made on fish and fisheries on the Hooghly-Matlah estuarine system. Many fishes of the river Ganges described by Hamilton-Buchanan (1 822) are known from estuaries of Sundarban mangrove environment.

Annandde (1907, 1922) and Hora (1933, 1934, a, b, 1935, 1940, 1943a) and more recently several authors Viz Banerjea (1965a, b), Gopalakrishnan (1968), Jhingran (1968), Datta et-al, (1971) and Jayaram (1999) have contributed to the study of fish fauna of Hoaghly Matlah rivers. Gopalakrishnan (19731, Naskar and Ctlakraborthy (1984) have reported on the fish and fishery resources of the Sundarban delta. Christensen (1983) while studying the benefits of rnanbq-oves give a picture of the indirect impact of mangroves on the cash value of commercial fish catches. Krishnamurthy and Prince (1981) studied the early history of fishes from Pichavaram mangrove ecosystem. Prince Jayaseelan (198 1) also studied the icthyofauna of the mangroves of Pichavaram. Manuel of fish eggs and larvae from Asian mangrove waters were prepared by Jeyaseelan et. al, (1998).

In Kerala observations on the fish and fisheries of the Vembanad estuary was done by Shetty (1965). Kurien (1980) studied the fauna of the mangrove swamps of the Cochir~ estuary. Apart from this there are no other studies on the fish fauna of the mangroves in Kerala. Nair et al (1983) made a preliminary survey of the fishery resources of the Ashtaniudi estuarine system. Kurup and Samual (1983) studied the systematics and distribution of fishes of the family Leiognathidae (pisces) of the Vembanad estuary. They again in 1985 made an elaborate study of fish and fishery resources of the ~emb-mad estuary. Kurup et a1 (1990) studied the impact of Thanneermukkom barrier on the fishery resources of tlie Vembanad estuary. Attempts were made to study the fish fauna of the the Kumarakom and Asramom mangroves by Mohandas (1993). Salirn Ali (1984) has done an elaborate study of the birds of Kerala. He has cited the early works of birds in Kerala such as the publications of Ferguson (1870) and Hume (1876 and 1878). Salim Ali (1935) has published a paper on the Ornithology of Travancore and Cochin and later 1953 he has published a book on the birds of Travarlcore and Cochin. Neelakantan (1958) has published a book in the regional language, m;xlayalam with the caption "Keralathile pakshikal". 1'3illon (196 1) published a book on the birds of India and Pakistan enlisting 2100 species and subspecies from this subcontinent. Chang (1 984) reported the presence of Brahminy Kite in Malaysian mangroves. Sreekumar et a1 (1987) has made a preliminmy ecological study on the birds of the Kadalundi estuary. Deepakumar and Narayanakurup (1991) has made a study on the migrant shore birds in the estuarine habitat of Kadalundi and Bharatapuzha estuaries. Jayson and Mathew (1 993) has studied the birds of the Silent Valley National Park and the adjoining forests of the Western Ghats of Kerala. En 1994 Mohandas made a comparative

account of birds of Asrarnom and Kumarakom mangroves. Jayson (2001) studied the structure, composition and conservation of birds in Mangalavanam mangroves, Cochin.

Comprehensive account of Mammaliar1 fauna from Sundarban was available. Mukherjee (1965, 197'1, 1981), and Chaudhury and Chakraborty (1981) have reported on the wild life of Sundarban and Mandal and Mukherjee (1965) have studied the Rhesus macaque of Sundarban. A comprehensive general account of Sundarban has recently been completed by Mandal and Ghosh. Sanyal (1992) has enumerated ten genera twelve species uf mammals, including tiger, civet cats, otter, dalphi11, porpoise, batmonkey, deer and wild boa. A review of otters in Malaysian and Singapore mangroves were reported by Sivasothi et a1 (1994). When compared with available data (Clough 1993) from the mangroves of Indonesia, Thailand, Ecuador, the faunal diversity of India with 5 13 species, so far listed, is not only higher and richer than in Indonesia (l36 sp) in Thailand (2 19 sp) Colombia (395 sp) and Ecuador (207 sp) but more pertinently it reflects on the quantum and quality of relevant studies and surveys in India (Banarjee, 199 1). Sundarban mangroves.

Tropical marine ecosystem of Kerala coast includes lagoons, mangrove swamps, sandy and rocky shores and opens sea front. The CMFRI (Central Marine Fisheries Research Institute), Kochi conducts studies on marine biodiversity. A close relationship between the abundance of Oil Sardines (Sardinella longiceps) and abundance of Fragilaria Oceanica in the west coast was reported. About 291 species of phytoplankton were listed in the Kozhikode coast. Fragilaria oceanica, Coscinodiscus gigas, species of Chaetoceros, Rhizosolenia, Bacteriastrum, Skeletonema, Eucampia and Asteronella were the dominat diatoms. Copepods formed the largest zooplankton community in the Kozhikode area. The other economically important groups in Protozoa are foraminifers and radiolarians. Flagellates form major groups with high productivity and high turnover. Macro algae belong to the families of Cholorophyceae, Phaeophyceae, Rhodophyceae and Cyanophyceae. Out of the total 64 families and 215 genera found in India, Kerala and Lakshadweep area have 25 families and 75 genera.

Sea grasses in the West coast are found in small shallow beds. Halophila ovalis is associated with mangroves. Other species are Halophila beccari, Halodule pinifolia, Enhalus acoroides and Cymodocea rotundata.

Mangrove vegetation is an important coastal ecosystem associated with tidal / mud flats and back water systems. According to one estimate in the recent past Kerala had 70, 000 ha. of mangrove, which had diminished to less than 4200 ha (Mohanan, 1997). Some other estimate indicates the extend of mangrove vegetation to be 1671 ha at present within a distance of 500m from the coastline. Mangroves are found in small isolated patches along the coast and back waters. The major concentrations are found in the Vallapattanam river mouth, Kannur district, Puthuvypene at Ernakulam district and Kumarakom (Vembanad lake east bank) at Kottayam district. Certain patches are also found in Kozhikode districts, Alappuzha, Kollam and Thiruvananthapuram. Important mangrove species are Rhizophora apiculata, Rhizophora mucronata, Bruguiera gymnorrhiza, Avicenia officinalis, Sonneratia caseolaris, Sonneratia apetala, Kandelia candal. Mangrove associates are Cerbera manghas, Hibiscus tiliaceous, Derris trifoliata, Pandanus tectorius. These species grow behind the tidal mangrove zone. The fern Acrostichum aureum grows in degraded habitats and Acanthus ilicifolius colonizes saline marshes.

The strand vegetation (sand dune vegetation) comprises mainly sand binding ipomoea pes- caprae, Spinifix littoralis, Indigofera spicata, Portulacca oleracea. The common shrubs of the region are Calotropis gigantea, Dodonea viscosa, Scaveola taccada, Hugonia mystax. Estuarine vegetation is classified into tidal mangroves, prohaline and euhaline types. Prohaline type of vegetation is composed of salt tolerant fresh water plants such as Ceratopteris siliquosa, Corchorus aestuans, Hygrophila quadrivalvis, Salviania molesta and Sphenoclea zeylanica. Eury haline type consists of highly salt tolerant plants like acanthus ilicifolius, Acrostichum and Pandamus facicularis.

Kerala is endowed with a rich diversity of marine fishes with a numerical strength of more than 300. They represents mainly under clupeids, perches, elasmobranhs, leiognathids, coakers, threadfin breams, flat fishes, carangids, red mullets, etc. There are about 54 species of prawns and shrimps commercially exploited in India. Te number of marine mollusks exceeds 300 species with more than 10 commercially important species. The marine echinoderm fauna comprised of around 80 species while the ancillary resources such as sea fans, gorgonids, etc. constitute another 110 species. The state is also enodowed with more than 25 species of sea weeds among them 12 species are commercially very important. Macrobrachium rosenbergii, the giant freshwater prawn is the largest prawn seen in Keralabackwaters. Apart from this there are more than 12 spcies of prawn inhabits in the estuaries and backwaters of Kerala among them M. idella is commercially very important. Commercially important lobsters occurring in the Kerala coast are Panulirus homarus and Panulirus polyphagus. Other species are Scyllarus sordidus and Panulirus ornatus. Important crab species used in food are Matuta lunaris, matuta panpipes, Scylla serrata, Neptunus sanguinolentus, Neptunus pelagicus, Charybdis cruciata, Charybdis annulata, Charybdis edwardsi, Charybdis natator and Varuna litterata.

Five species of marine turtles are found in Indian waters. The Hawksbill (Eretmochelys imbricata) variety is common in tropical water. Olive Ridley (Lepidochelys olivacea) turtle are found to nest in Kozhikode coast near Pyyoli.

Mangrove forests in India are habitats of around 177 resident and migratory birds, of which 45 species are reported in the mangrove forests of Kerala alone. The common species are heron, kingfisher, sea eagle, kites and storks.

India has good pelagic fishery resources comprised of mainly of oilsardine and lesser sardines, mackerel, tuna, carangids, seer fishes, and demersal fishes such as cat fishes, elasmobranches, sciaenids, silver bellies, besides shrimps and other crustaceans. About 60% of marine fish yield of the country comes from the west coast, of which Kerala contributed as high as 30%. The coastal waters in Kerala are highly productive, the mud bank formations in the Kerala coast add to the high fish turn over.
The common hydrophytes found in the wetlands of Kerala are classified as submerged and emerged types and they are further classified as free-swimming (phytoplanktons) and floating types. Some one of the common wetland flowering plants are Eichornia crassipes, Pistia stratiotes, Monochoria vaginalis, Monochoria hastata, Limnocharis flava, Lagenandra meeboldii, L. toxicaria, Colocasia esculenta, Nelumbo nucifera, Nymphaea nouchali, Blyxa aubertii, Blyxa octandra, Hydrilla verticillata, Hygrophila auriculata, Xyris indica, Limnophylla chinensis, Limnophylla indica, Pandanus furcatus, Pandanus fascicularis and Pandanus thwaitesii.

Important medicinal plants available in the coastal belt which help in local traditional medical practices are Vaymabu (Acorus calamus), Adalodakam (Adhatoda vasica), Aloe vera, Perumaram (Ailanthus triphysa), Koovalam (Aegle marmelos, Kiriath) (Andrographis paniculate), Aristolochia tagala, Sathavaari (Asparagus racemosus), Bramhi (Bacopa monnieri), Thazhuthama (Boerhavia diffusa), Mukkuti (Biophytum sensitivum), Bramhi (Bacopa monnieri), Kanikonna (Cassia fistula), Uzhinja (Cardiospermum halicacabum), Kodangal (Centella asiatica), Vayana (cinnamomum verum), Cheruthekku (Clerodendron serratum), Veluthashangupuspam (Clitoria ternatea), Nilapana (Curcrligo orchioides), Karuka (Cyperus dactylon), Mulapalkodi (Euphorbia hirta), Kaiyonni (Eclipta prostrata), Chakkarkolli (Gymnema sylvestre) Adumbuvalli (Ipomoea per-caprae), Neerkanthalam (Lagenandra ovata), Kizhanelli (Phyllanthus amarus), Kalluruki (Scoparia dulcis), Krunthotti (Sida cordifolia), Amrutu (Tinospora cordifolia), Nerinjil(Tribulus-terrestris).

3. Materials and Methods

The project entitled 'A STUDY OF MANGROVES AND PRAWN DIVERSITY IN KAVANATTINKARA' was intended to study the influence of mangroves in the diversification and breeding of different prawn species, conducted during dec2015-March 2016. The method used for this project was the interview method

Arthropods from the mangrove areas were collected and procured from local fisherman for the present study. Some prawns were procured from the fisherman. The methods of investigation adopted in the present study Data was collected through questionnaires and interviews with people from different walks of life – aged people, fisherman and other stakeholders. A sort of survey was conducted to obtain data regarding products, cost of labor, etc. Samples were collected.

Along the selected site where the mangroves vegetation is present, were visited for assessment of species diversity the prawns. An average number of prawns belong to each species were counted, both from mangrove area and normal brackish water source nearby. A graph was plotted to represent the diversity of prawn species during the period of June 2015, December 2015, March 2016.

Questionnaires

1. Questions asked to Ansar C. P (Assistant prof. - Fisheries division - Agricultural University – Kavanattinkara - Kumarakom)

Sl No.	Questions
1	What are the adaptations of mangroves in wetlands?
2	Do you think that mangroves have any role in the development and breeding of prawns?
3	How do the mangroves enhance the prawn growth and its diversification?
4	Why is mangroves considered as the shelter area for prawns?
5	What is the difference between a prawn and a shrimp?
6	Which are the common predators of young prawns?
7	What is the significance of prawn filtration fields? Will it lead to the destruction of the mangroves?
8	What is the process of prawn filtration?
9	Can you name some prawn capturing and sampling methods?
10	Which are the economically important freshwater prawns?
11	Is there any exclusively marine prawn species?
12	Name some common brackish and saline prawn species.
13	Which are the other varieties of organisms found in mangrove areas?
14	How will the destruction of mangroves affect prawn diversity and breeding?
15	What is the need of conserving mangroves? What are ways to do it?

2. Questions asked to Sreedharan (fisherman) and kumaran (Grama panchayat fish stall)

Sl No	Questions
1	Which are common prawn varieties available in market?
2	Which is the biggest prawn species among them? What is its price?
3	What are ways of prawn capturing? Which are the different types of nets used?
4	Name some economically important prawn species?
5	Which are the months in which plenty prawns are available?
6	Does the recent extreme hot climate affect the availability of brackish prawn species?
7	Which are the different types of tiger prawns? Which is the season in which it is available abundantly?

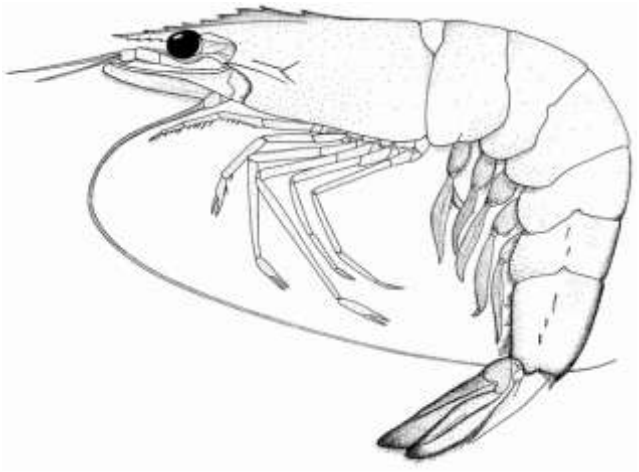
COMMON PRAWN SHRIMP SPECIES IN MANGROVE AREA	
SLNO.	NAME
1	*Feneropenaeus indicus*
2	*Fenneropenaeus merguiensis*
3	*Metapenaeus monodoni*
4	*Metapenaeus monoceros*
5	*Metapenaeus affinis*
6	*Metapenaeus dobsoni*
7	*Macrobrachium rosenbergii*
8	*Macrobrachium idella*
9	*Penaeus semisulcatus*
10	*Penaeus esculentus*

4. Observation

In Kumarakom mangroves are found by low species diversity but having larger populations. Most of the earlier taxonomic descriptions were made using preserved or dead specimens, which provide no possibility of studying the natural colour pattern of the faunal members. As the present study provides live photographs of the fauna, the life colour can easily be understood. In the mangrove area the following species of Prawns were observed.

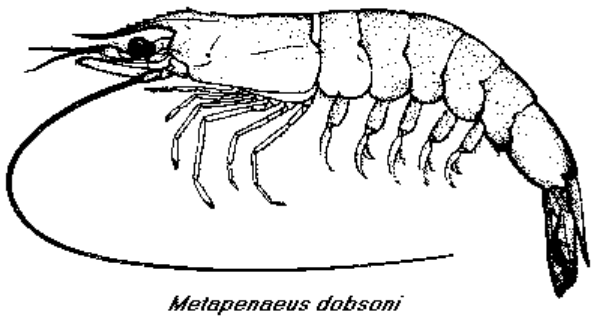
SLNO	SCIENTIFIC NAME	COMMON NAME	MALAYALAM NAME
1	***Fenneropenaeus indicus***	Indian white shrimp	**Naran**
2	***Metapenaeus dobsoni***	Flower tail prawn (brown shrimp)	**Poovalan or Thelly**
3	***Macrobrachium rosenbergi***	Giant freshwater shrimp	**Attu konchu**
4	***Metapenaeus monoceros***	Indian prawn	**Choodan**
5	***Metapenaeus affinis***	Indian prawn (King shrimp)	**Kazhanthan**

Feneropenaeus indicus



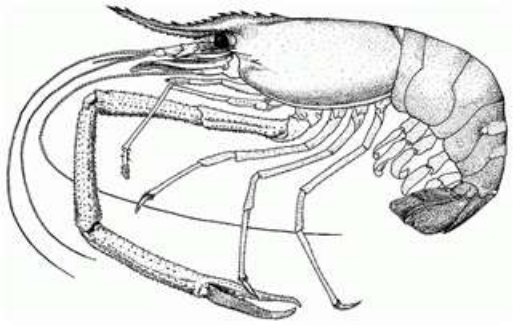
Indian white prawn. P. indicus is the second most important species in the rice field shrimp farming of the Kerala coast of S. W. India. Bottom mud or sand. Adults marine, juveniles estuarine. Bathymetry: from 2 to 90m. Size-Maximum total length 184 mm (male), 228 mm (female) usually much smaller (170 mm); maximum carapace length 56 mm. Malayalam name is Narran.

Metapenaeus dobsoni



Kadal shrimp. Size / Weight / Age-Max length : 11. 8 cm TL male/unsexed; 13 cm TL (female), Environment-Demersal; depth range 1 - 37 m, Climate / Range-Tropical, Distribution-Indo-West Pacific: west coast of India to the Philippines and New Guinea. Can tolerate a wide range of salinity, 3-43 ppt. Members of the order Decapoda are mostly gonochoric. Mating behavior: Precopulatory courtship ritual is common (through olfactory and tactile cues); usually indirect sperm transfer.

Macrobrachium rosenbergi

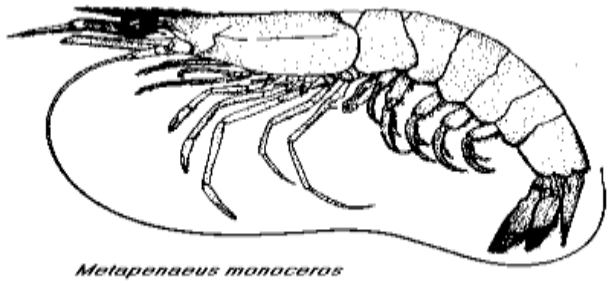


Habitat and Biology-Fresh and brackish water, sometimes marine, Size-Maximum total length 320 mm (male), 250 mm (female). Males can reach total length of 320 mm; females 250 mm. Body usually greenish to brownish grey, sometimes more bluish, darker in larger specimens. Antennae often blue; chelipeds blue or orange. 14 somites within cephalothorax covered by large dorsal shield (carapace); carapace smooth and hard. Rostrum long, normally reaching beyond antennal scale, slender and somewhat sigmoid; distal part curved somewhat upward; 11-14 dorsal and 8-10 ventral teeth. Cephalon contains eyes, antennulae, antennae, mandibles, maxillulae, and maxillae. Eyes stalked, except in first larval stage. Thorax contains three pairs of maxillipeds, used as mouthparts, and five pairs of pereiopods (true legs). This species lives in tropical freshwater environments influenced by adjacent brackish water areas. It is often found in extremely turbid conditions. Gravid females migrate downstream into estuaries, where eggs hatch as free-swimming larvae in brackishwater. Before metamorphosis into post larvae (PL), the planktonic larvae pass through several zoeal stages. After metamorphosis, PL assumes a more benthic life style and begins to migrate upstream towards freshwater. Larvae swim actively tail first, ventral side uppermost. From PL onwards prawns swim forwards, dorsal side uppermost. From metamorphosis onwards prawns can also walk, not only on the sub-stratum but also over damp areas including stones by river edges, up vertical surfaces (small waterfalls, weirs, etc.) and across land. Larvae mostly consume zooplankton (mainly minute crustaceans), very small worms, and larval stages of other crustaceans. Post larvae and adults are omnivorous, eating algae, aquatic plants, molluscs, aquatic insects, worms, and other crustaceans. Males and females have different growth rates and males exhibit heterogenous individual growth (HIG); these are vitally important factors in grow-out management.

Male

Female

Metapenaeus monoceros

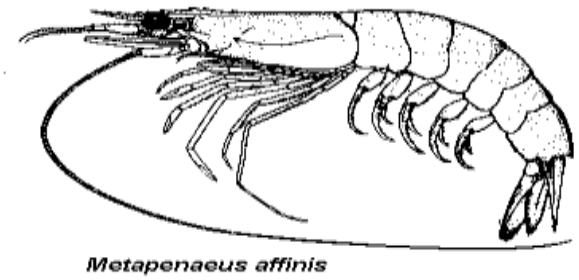


Metapenaeus monoceros is a species of prawn in the family Penaeidae. It is also known as speckled shrimp, brown shrimp and pink shrimp in English, crevette mouchetée in French, camarón moteado in Spanish, koraney chingri or honye chingri in India, ginger prawn in South Africa and choodan chemmeen in Malayalam.

Distribution and ecology-Metapenaeus monoceros is native to the Indo-West Pacific from Durban to the Red Sea along the African coast and around India. Now it has also invaded into the eastern Mediterranean Sea through the Suez Canal, Metapenaeus monoceros is found up to a depth of 170 metres (560 ft) but commonly found between 10 m (33 ft) and 30 m (98 ft). They prefer sandy or sandy mud bottoms. They live in brackish water or marine ecosystem. Adult M. monoceros are pale grey with dark brown spots giving them the name brown shrimp or speckled shrimp. Their body is covered with short hairs. They have red–orange antennae. They are medium-sized prawns with males growing up to 15 centimeters (5. 9 in) and females growing up to 20 cm (7. 9 in). Males have a prominent curved spine on fifth pereiopod (walking leg). [4] The maximum recorded weight is 170 grams (6. 0 oz), but most individuals weigh less than 30 g (1. 1 oz). Reproduction-Metapenaeus monoceros is believed to be a continuous breeder with two major spawning seasons. These seasons were found to vary with time and location

and environmental factors. In Tunisia, spawning seasons are May–June and October–November. In Egypt, May and July–October were found to be the spawning seasons. In Turkey spawning occurred between November and January. In India, December–April and August–September are the two main spawning seasons.

Metapenaeus affinis



Size / Weight / Age-Max length: 22. 2 cm TL male/unsexed; ; common length : 17. 0 cm TL male/unsexed; Environment-Demersal; brackish; depth range 5 - 92 m. Climate / Range-Tropical, Distribution-Indo-Pacific: from Persian Gulf and Arabian Sea to South China Sea and Hawaii. From edge sub tidal to depths of 60 m. Prefers mud and sandy-mud bottoms; juveniles found intertidally. Members of the order Decapoda are mostly gonochoric. Mating behavior: Precopulatory courtship ritual is common (through olfactory and tactile cues); usually indirect sperm transfer.

5. Result and Discussion

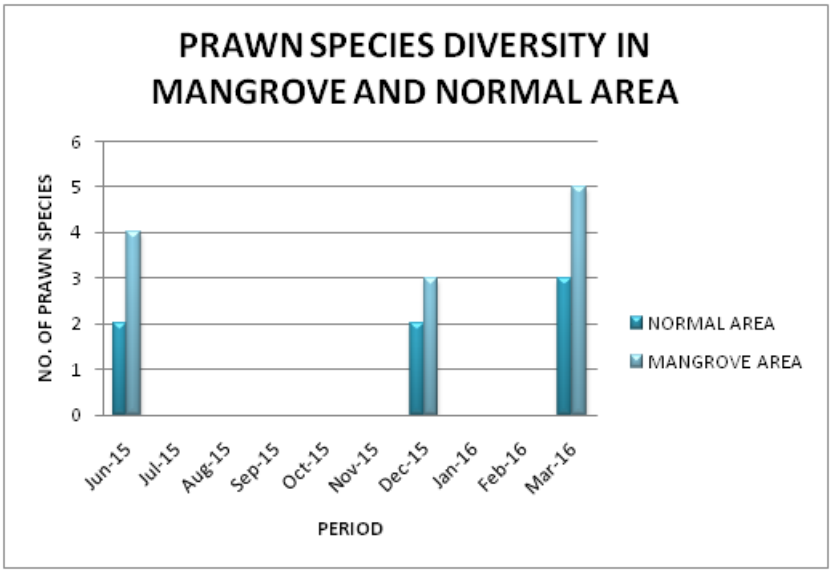
Mangroves form a belt like region surrounding the shore. It prevents soil erosion. It is considered as a breeding ground for prawn varieties. The mangroves facilitate the decomposition of dead and dried organic matter. This makes sure that the minerals and nutrients for prawn development are available throughout the year. It is a shelter area for shrimp species. It helps the larvae to escape from the predators. The common predators of prawns are birds, large fishes, crabs etc. As the water circulates always in intertidal mangrove areas, there is a high availability of oxygen. This helps the young ones and the mothers in proper breeding and growth. This also leads to the abundance of phytoplankton and zooplankton which is needed for prawns as their food. The breeding cycle of prawns is connected to the mangrove areas as they are the breeding grounds. The adult prawns migrates to the brackish water mostly the mangrove areas for egg laying. After the development of juveniles they go back to saline water. This cycle repeated according to the seasonal change which results in monthly variation of climate. Mangroves also lead to the increase in number of each prawns and the increase in species diversification. The pneumatophores of mangroves act as a substrate for the adhering of the prawns and other fish species. The installation and usage of prawn filtration field in mangrove areas shows the abundance of shrimps in this particular region.

The graph shows the comparative study of no. of species of prawn in mangrove area and normal brackish water area at different periods of the study. The average count of the species in one single catch is used. This was obtained from the age old fisherman. This graph implies that the number of prawn species in the mangrove is always greater than that of the normal brackish water region. This can be considered as a part of the result for the study. Because this data and the graph shows that mangroves are definitely the breeding beds of prawn. One another aspect that supports this statement is that, most of the prawns captured from the mangrove area are of young stage. Culturing of prawns along the mangrove belts is yet another proof.

Table showing the name of species in a selected mangrove area and normal brackish water in different periods

Sl. No	Period	Name Of Species In Mangrove Area	No. Of Species In Mangrove Area	Name Of Species In Normal Area	No. Of Species In Normal Area
1.	JUNE 2015	➢ *Fenneropenaeus indicus* ➢ *Metapenaeus dobsoni* ➢ *Metapenaeus monoceros* ➢ *Macrobranchium rosenbergi*	4	➢ *Feneropenaeus indicus* ➢ *Macrobranchium rosenbergi*	2
2.	DECEMBER 2015	➢ *Fenneropeneus indicus* ➢ *M. dobsoni* ➢ *M. affinis*	3	➢ *Macrobranchium rosebergi* ➢ *Fenneropenaeus indicus*	2
3.	MARCH 2016	➢ *Fenneropeneus indicus* ➢ *M. dobsoni* ➢ *M. affinis* ➢ *M. monoceros* ➢ *Macrobranchium rosenbergi*	5	➢ *Macrobrachium rosenbergi* ➢ *M, dobsoni* ➢ *Fenneropenaeus indicus*	3

GRAPH



6. Conclusion

This project work was an attempt to describe some aspects of mangroves in connection with the prawn diversity in a selected area. From this project it is obvious that mangroves play a distinguishable role in prawn diversification and its breeding. A total of five species were studied. Many more species are yet to be studied and identified. This was because of the seasonal variation in the availability of different prawn species. Through the enquiry or interview method and construction of species diversity graph showing the abundance of species in mangrove areas in different period of the year, this notion was proved beyond doubt. This project also points out the importance of mangrove conservation for the availability of many natural resources and its abundance.

Reference

[1] Alongi, D. M., 1986. Quantitative estimates of benthic protozoa in tropical marine systems using silica gel: a comparison of methods. Estuar. coast. Shelf Sci. 23: 443–450.

[2] Alongi, D. M., 1988. Bacterial productivity and microbial biomass in tropical mangrove sediments. Microb. Ecol. 15: 59–79.

[3] Blaber, S. J. M. & T. J. Blaber, 1980. Factors affecting the distribution of juvenile estuarine and inshore fish. J. Fish. Biol. 17: 143–162.

[4] Blaber, S. J. M., D. T. Brewer & J. P. Salini, 1989. Species composition and biomass of fishes in different habitats of a tropical Northern Australian estuary: their occurrence in the adjoining sea and estuarine dependence. Estuar. coast. Shelf Sci. 29: 509–531.

[5] Boto, K. G. & J. S. Bunt, 1981. Tidal export of particulate organic matter from a Northern Australian mangrove system. Estuar. coast. Shelf Sci. 13: 247–255.

[6] Chong, V. C., 1977. Studies on the small grey mullet*Liza malinoptera*. J. Fish. Biol. 11: 293–308.

[7] Chong, V. C., 1980. The biology of the white prawn*Penaeus merguiensis* de Man (Crustacea: Penaeidae) in the Pulau Angsa Klang Strait waters (Straits of Malacca). M. Sc. thesis. Department of Zoology, University of Malaya, Kuala Lumpur. 141 pp.

[8] Chong, V. C. & A. Sasekumar, 1981. Food and feeding habits of the white prawn*Penaeus merguiensis*. Mar. Ecol. Prog. Series 5: 185–191.
[9] Chong, V. C., A. Sasekumar, M. U. Leh & R. D'Cruz, 1990. The fish and prawn communities of a Malaysian coastal mangrove system, with comparisons to adhacent mudflats and inshore waters. Estuar. coast. Shelf Sci. 31: 703–722.
[10] Coull, B. C. & S. S. Bell, 1979. Perspectives in marine meiofaunal ecology. In R. J. Linvingston (ed.), Ecological Processes in Coastal and Marine Systems. Plenum Press, New York: 189–216.
[11] Cyrus, D. P. & S. J. M. Blaber, 1987. The influence of turbidity on juvenile marine fishes in estuaries. Part I. Field studies at Lake St. Lucia on the southeastern coast of Africa. J. exp. mar. Biol. Ecol. 109: 53–70.
[12] de Freitas, A. J., 1986. Selection of nursery areas by six Southeast African Penaeidae. Estuar. coast. Shelf Sci. 23: 901–908.
[13] Hatcher, B. G., R. E. Johannes & A. I. Robertson, 1989. Review of research relevant to the conservation of shallow tropical marine ecosystems. Oceanogr. Mar. Biol. annu. rev. 27: 337–414.
[14] Jansson, B. O., A. D. McIntyre, S. W. Nixon, M. M. Pamatmat, B. Zeitzschel & J. J. Zijlstra, 1988. Coastal-offshore interactions — an evaluation of presented evidence. In B. O. Jansson (ed.), Coastal-Offshore Ecosystem Interactions. Springer-Verlag: 357–363.
[15] Kesteven, G. L., 1960. Manual of field methods in fisheries biology. FAO Manuals in Fisheries Science. No. 1, FAO, Rome. 152 pp.
[16] Leh, M. U. & A. Sasekumar, 1984. Feeding ecology of prawns in shallow waters adjoining mangrove shores. In E. Soepadmo*et al.* (eds), Proc. Asian Symp. Mangrove Environment — Res. & Management: 331–353.
[17] Leh, M. U. & A. Sasekumar, 1991. Ingression of fish into mangrove creeks. In Alcala (ed.), Proc. Asean-Australian 'Living Resources in Coastal Areas' Project. 30 Jan–1 Feb. 1989. Manila: 495–501.
[18] Little, C., P. J. Reay & S. J. Grove, 1988. The fish community of an East African mangrove creek. J. Fish. Biol. 32: 729–747.
[19] Macintosh, D. J., 1979. Predation of fiddler crabs (*Uca* spp.) in estuarine mangroves. In Srivastava, P. B. et al. (eds), Proc. Symp. mangrove and estuarine vegetation in Southeast Asia. University of Agriculture, Malaysia: 101–110.
[20] Macnae, W., 1974. Mangrove forests and fisheries. FAO, Rome. 35 pp.
[21] Moriarity, D. J. M., 1976. Quantitative studies on bacteria and algae in the food of the mullet*Mugil cephalus* L. and the prawn*Metapenaeus bennettae*(Racek & Dall). J. exp. mar. Biol. Ecol. 22: 131–143.
[22] Pinto, L., 1988. Population dynamics and community structure of fish in the mangroves of Pagbilao, Phillipines. J. Fish. Biol. 33 (Supplement A): 35–43.
[23] Robertson, A. I., 1986. Leaf-burying crabs: their influence on energy flow and export from mixed mangrove forests (*Rhizophora* spp.) in northeastern Australia. J. exp. mar. Biol. Ecol. 102: 237–248.
[24] Robertson, A. I. & N. C. Duke, 1987. Mangroves as nursery sites: comparisons of the abundance and species composition of fish and crustaceans in mangroves and other nearshore habitats in tropical Australia. Mar. Biol. 96: 193–205.
[25] Rodelli, M. R., J. N. Gearing, P. J. Gearing, N. Marshall & A. Sasekumar, 1984. Stable isotope ratio as a tracer of mangrove carbon in Malaysian ecosystems. Oecologia 61: 326–333.
[26] Sasekumar, A., 1981. The ecology of meiofauna on a Malayan mangrove shore. Ph. D. thesis. Department of Zoology, University of Malaya, Kuala Lumpur. 183 pp.
[27] Sasekumar, A., T. L. Ong & K. L. Thong, 1984. Predation of mangrove fauna by marine fishes. In E. Soepadmo *et al.* (eds), Proc. Asian Symp. Mangrove Environment — Res. and Management: 378–384.
[28] Stoner, A. L. & R. J. Zimmerman, 1988. Food pathways associated with penaeid shrimps in a mangrove-fringed estuary. Fish. Bull. 86: 543–551.
[29] Thayer, G. W., D. R. Colby & W. F. Hettler, Jr., 1987. Utilization of red mangrove prop habitat by fishes in South Florida. Mar. Ecol. Prog. Series 35: 25–38.
[30] Turner, R. E., 1977. Intertidal vegetation and commercial yields of penaeid shrimp. Trans. am. Fish. Soc. 106: 411–416