CHAPTER 3

BIODIVERSITY OF PULICAT LAKE

A detailed study of biological organisms associated with the Pulicat Lake ecosystem has been thoroughly studied by the research team during the project period. This biodiversity report comprises, biological resources available in Pulicat Lake ecosystem, comparative status of the resources, exploitation of the resources, status of the ecosystem, impact analysis of the ecosystem, and relating other environmental conditions to the biological dimension. The Pulicat Lake ecosystem has been divided into 4 regions, *ie*, southern side of the lake (zone-5), central side of the lake (zone-6), northeastern side of the lake (zone-7) and northwestern side of the lake (zone-9) to describe the various factors working upon the biological dimension.

The results show that the fauna and flora of the ecosystem are changing both quantitatively and qualitatively, mainly due to the natural process, especially reduction in depth and reduction in water spread area. The anthropogenic influences like over exploitation of resources, land use changes and alteration of the habitats are also influence the ecosystem in minor extent. The land use changes are negatively correlated with the resources available in Pulicat ecosystem.

The lagoon supports a rich growth of algae, particularly filamentous algae. The seagrass *Halophila sp*., and *Siringodium sp* are densely distributed in this lake. Sriharkotta islansd have significant patches of residual, dry, evergreen forest and large area of littoral scrubs. There are small patches of woodland around villages on the edge of the lagoon. Large areas of the surrounding plains have been invaded by *Prosopis juliflora*. Length stretches of coastal area has been by the forest department with *Casuarinea sp*. Mangrove trees are transplanted by the local NGO's at some places of northern Pulicat lake and are growing well. *Rhizophora* is the species identified for transplantation techniques in Pulicat lagoon. *Avicennia marina* species is naturally

growing in some shallow areas of the lake, it denotes the ecosystem is changing due to the natural process like upliftment processes.

The research undertaken at selected 16 stations of various sides are Pulicat Lake ecosystem. There the physical, chemical and biological factors are recorded and undertaken for discussion. The analysed physico-chemical data for the standard locations has been described in Table 3.1. Major biological group compositions (species) have been described in the Table 3.2. Quantitative biological resources of Pulicat Lake are presented in Table 3.3.

Water in the lake is rich in population density and diversity of planktonic organisms. Two peaks of plankton production were observed in a year, the primary one is during March to May and secondary one is during July to September. The northeastern sector of the lake is more productive in terms of planktonic biomass. Eighty nine species of Zooplankters have been recorded so for from this area. Only 49 species of planktonic species has been recorded during the present study, and most of them are marine. Most of the zooplankton are meroplankton. Section 3.5 describes the zooplankton trend in the Pulicat Lake ecosystem.

Eighty-nine species of meiofauna has been recorded from this area. North western side of the lake is getting silted and turbid and has poor association of benthic organisms which, also limits the macro faunal assemblage of this area. Present status of the benthic faunal assemblage and the factors involving in distribution is described in section 3.6.

The changes in the Pulicat Lake ecosystem is evident through the qualitative and quantitative data of macro fauna. The economically and ecologically important macro faunal species are missing from the lake especially the gastropods of the lake, which are recorded during 1950's are very rare or extinct from the lake area. Macro faunal assemblages and changes are described in the section 3.7.

Fish faunal assemblage is also changing at certain parts of the lake. Since there is regular tidal flush with the open ocean, southern, central, and north eastern sides of the lake have not changed much as like that of the north western side of the lake. Quantity of the capture fishery is getting reduced mainly due to shrinkage of the lagoon and depth reduction. The fishery potential of Pulicat Lake including the finfish, crab, mollusc and prawn fishery has been described in section 3.8.

Pulicat is the third most important wetland for migratory shorebirds on the eastern seaboard of India, and is especially important during the spring and autumn season. Hence, this area has been declared as a RAMSAR site. It is an important area for a wide variety of resident and migratory waterfowls, notably pelicans, herons and egrets, storks, flamingos, ducks, shorebirds, gulls, and terns.

The lagoon supports significant population of *Tachybaptus ruficollis*, *Pelecanus philippensis*, *Phalacrocorax fuscicollis. P.niger.*, seven species of herons and egrets, *Mycteria leucocephalus*, *Platalea leucorodia*, *Dendrosygna javanica*, and *Anas poecilorhyncha*. The largest concentrations of filamingoes (*P.ruber*) occur in the Andhra Pradesh part of the sanctuary, around the islands of Venadu and Irukkam. The center of the lake have more migratory bird population diversity and density, because of the dense algal biomass distribution, where the faunal composition is comparatively higher. The relation ship between the various dimensions of the ecosystem is described in section 3.9.

3.1 Hydro-biological features of Pulicat Lake

Salinity of the lake shows wide seasonal and spatial variations, fluctuating between 0.5 and 80 ppm. During monsoon when fresh water inflow is greater, this lake is like positive estuary, but at the peak of summer the condition is reversed. Due to high evaporation, low run-off and precipitation, it becomes comparable to a negative estuary. Thus, this lake has an interesting environment, which has a profound influence on the flora and fauna.

The water temperature varies from 25.0 to 32.6° C, and dissolved oxygen from 3.8 to 10.0 ppm. The water in the lake is very rich in population density and diversity of planktonic organisms. The density and diversity is varying between the various regions and it is related to the physical parameters of the area. Two peaks of plankton production were seen in a year, the primary one is during March to May and the secondary one is during July and September.

The southern sector of the lake is more productive, in terms of plankton biomass, than the northern sector. Productivity of the waters ranged from 789 at northwestern side and maximum 1387 mgC/m^2/year at northeastern side of the lake. Production peaks coincided more or less with that of the phytoplankton peaks.

Summer and pre-monsoon periods are the peak production seasons, followed by post-monsoon. The lowest production is observed during monsoon. Since this lagoon has been exploited by traditional techniques, the impacts due to human influence are very meager.

3.2 Algal species distribution around the lake

Eighteen algal species has been recorded from this area, including the sea grasses of *Halophila sp* and *Halodule sp*. The variation of algal composition in the lake is significant when compared with the past 60 yrs. data. Various species distributed and recorded at various periods in the lake have been described in the Table 3.4. Algal biomass is higher at the central side of the lagoon (450 ww. gms/ m^2) and very less (85 ww.gm/ m^2) in northwestern side of the lake. Quantitative variation of the algal biomass in the lake has been described in Fig. 3.1. Recently (2000) the green algal species composition and diversity diversity is found to be increasing. Flow of nitrate and phosphate could induce the excessive growth of green algae especially *Enteromorpha* sp. (Silmonet, 1992). Algal composition changes are mainly due to the depth reduction, shallow area increase, sediment flow and water nutrient increases. The shallow calm areas of the lagoon have a high diversity and richness whereas the high stress zone have

the lowest diversity and density (Lehman and Tunnell, 1993). Factors for algal composition changes in the Pulicat lake ecosystem has been described in Fig 3.2.

The genus *Polysiphonia* (2 species) and *Cyprus* (3 species) were not recorded earlier. The reduced fresh water flow from the mainland has led to the increase of marine species biomass. Reduction in depth is enhanced certain algal species such as the *Enteromorpha* and *Chaetomorpha*. However it also reduced the biomass of certain sensitive algal species such as the *Gracilaria* sp., *Hypnea* sp., and *Padina sp*. The Seagrass species such as *Halophila sp* and *Halodule sp*. are increasing in biomass due to the increase of shallowness area of the lake area. The seagrasses occur densely in the center of the lake, which supports the various kinds of economically important fauna of this ecosystem. Presence of *Gracilaria sp* in this area indicates the potential for the culturing the species as an alternative employment opportunity to the lake dependent community. The average algal species density in various regions of Pulicat Lake is presented in Table 3.5. Depth, poor fleshing, suspended sediment concentration are the reasons for the variation in the quantity and quality of the macro-algae. Nitrogen and phosphorus are most commonly reported as limiting nutrients for the macro algal distribution (Dodds and Gudder, 1992).

3.3 Phytoplankton of Pulicat Lake ecosystem

Phytoplankton species composition in the Pulicat Lake ecosystem has been changing in relation to the changing physical and chemical environment of the ecosystem. Eighty-nine species of Phytoplankton species have been recorded so for from this area. Recorded phytoplankton species from the earliest period (1960) has been described in Table 3.6. Diatoms (63 sp.) are the major component in the phytoplankton followed by dinoflagellates (6 sp. common) and blue green algae (6 sp.).

Phytoplankton concentration is higher (1,40,000 cells/liter) at the northeastern side of the lake, where the depth is comparatively higher. Water level played an important role in the density and diversity of plankton community (Izaguirre and Vinocur, 1994). Minimum population of phytoplankton is recorded at the northwestern

side of the lake (16,800 cell/litre). Less number of phytoplankton species composition in this area is mainly due to suspended sediment concentration in this area. Transparency of the water column regulates the plankton density (Vazuez and Sanchez, 1984). Mixing and stratification dynamics appear to be the main factors regulating phytoplankton distribution of a lagoon system (Cozza et al, 1993). The mouth region has comparatively less number of phytoplankton.

Diatoms are the major component of the planktonic biomass. Population is higher at the northeastern side of the lagoon (130000 cells/ liter) where as it reduces towards the northwestern side of the lagoon (11000 cells/liter). This might be due to the increased suspended sediment concentration of this area. Dinoflagellate concentration is higher (9000 cells/liter) around the northeastern side of the lake where as it is less (4000) at the northwestern side of the lake. Blue green algae contributing significant amount to the phytoplankton soup. Blue green algal composition is less (1%) at the north eastern side of the lake whereas, it higher at the north western side of the lake (11%) (Fig. 3.3).

Totally 63 species of phytoplankton have been recorded so far from this area. Minimum numbers of cells (10,000/ liter) were present at the northwestern region of the lake while the maximum (1,30,000 cell/liter) distribution was recorded at the north eastern region of the lake (Fig. 3.4). Enrichment of nutrients such as phosphorus, silicate, nitrate, ammonia and carbon dioxide play a significant role in the growth of algae especially micro algae (Poehlmann et al, 1989). Diatom consumer population is also reducing the diatom density and diversity. Generally the densities of benthic diatoms were high when the densities of herbivorous snails were low (Kawamura, 1992). The research team of IOM could not find any variation in the thermal power plant wastewater released areas compared to the adjacent waters. But, Jackson et al (1990) found the thermal coolant water discharges slightly increase the abundance of *Rhizosolenia sp*.(diatom). Increased nutrients decrease the sinking rates and neutral buoyancy to the phytoplankton (Pan,-Yangdong and Lowe.,1994).

Seven species of the dinoflagellate were dominantly present in this area. The dinoflagellate population is ranging between 3500 and 9000 cells/liter. The main reason for the dinoflagellate abundances in the eastern region of the lake is depth, nutrient supply and less anthropogenic disturbances. In deep areas dinoflagellates dominated. This has been supported by Lapota et al. (1990). Phosphorus like nutrients are positively correlated with the population density of dinoflagellate (Ikeda etal.,1993) *Perdinium sp*, and *Protoperidinium sp* are the common dinoflagellates.

Blue green algae are the minor component of the planktonic biomass. Six species are recorded here. The blue green algal distribution within the lake area is ranging between 600 and 1800 cell/litre**.** The density of blue green algae is maximum around the northern region of the lake where monsoon input and shell processing activities are seasonally modifying the water quality. *Lyngbya sp.* is the most dominant blue green algae within the group. Cowell and Botts (1994) described the *Lyngbya sp.* biomass was negatively correlated with conductivity and alkalinity. Since the northern area is comparatively turbid, *Lyngbya sp.* and other blue green algae are dominating in this region. Speziale (1994) suggest that Lyngbya sp. can persist for long periods under extremely low light condition, as on deep water before forming surface mats. Elevated nutrient concentration due to the monsoon flow may be the major reason for blue green algal, maximum at north region of the lake part. Economically important blue green algae such as *Spirulina sp*. distributed here. Culture of this species may be an alternative employment opportunity to the community.

The members of the Cyanophyceae and Chlorophyceae were comparatively more in sewage or human influenced areas of the lake. The composition of phytoplankton changes by fresh water species dominate at estuarine mouth regions. Abundance of *Oscillatoria* and *Nitzchia* were recorded at polluted near mainland stations. The abundance and low diversity of brackish-marine and brackish, plank tonic diatoms seem to be the result of an influx of nutrients and pollutants and bottom sediments (Sakson and Miller, 1993). An increase of dinoflagellate is accompanied with a corresponding increase in primary production (Marasovic and Pucher-Petkovic, 1991).

The comparative changes in the phytoplankton composition in this area are mainly due to the reduction in the fresh water flow from the rivers and depth reduction of the lake. Various factors involving phytoplankton component changes in the lake ecosystem has been described in the Fig. 3.5.

3.4 Chlorophyll

The northeastern part of the lake shows the maximum Chlorophyll (total chlorophyll) compared to the northwestern side of the lake. The maximum value is 30 mg/liter and 17 mg/liter. Suspended sediment concentration by regulating the light penetration, plays a major role in chlorophyll (total) concentration. Depth is also an important factor for chlorophyll (total) distribution**.** Chlrophyll - a value in this area is ranging between 4.80 and 11.10 mg/liter. The Chlorophyll -b values are varying between 5.4 and 8.2 mg/liter. Chlorophyll -c concentration is ranging between 6.80 and 10.40 mg/liter. All the maximum values of chlorophyll-a,b,c has been recorded at Northeastern side of the lake, whereas the minimum values are recorded at northwestr side of the lake, as like the total chlorophyll concentration. Values of chlorophyll at varios regions of the lake is presented in the Fig. 3.6.

3.5 Zooplankton of Pulicat Lake ecosystem

Totally 88 zooplanktons has been recorded from this area of this 49% are meroplanktonic organisms. Recorded zooplankton species and groups from the earliest have been described in the Table 3.7. Zooplankton population is higher (90 ind. /l) at the north eastern side of the lake where the phytoplankton population and depth is higher, whereas the composition of the zooplankters are less (17 ind./litr.) in the north western region of the lake. Zooplankton concentration (ind/lit.) at various regions of the lake has been described in the Fig. 3.7. Crustacean larval population is higher in the zooplankton, of this copepod population is dominant. *Eucalanus* is the dominant species found in total zooplankton. Since most of the brackish water lagoon dwelling zooplanktons are adapted

to physical changes of the estuary or lagoon, it is possible that these organisms dominate in the lagoon ecosystem. Higher reproduction rate is also an important reason for the increased population density of the zooplankton groups (Alvarez-Cadena and Cortes-Altamirano, 1990). Water temperature fluctuations influenced the occurrence of the zooplankton. *Amphioxus sp. o*ne of the endangered animals are seen from the mouth region of the Pulicat Lake. The normal life of Amphioxus is not affected too much since it can tolerate salinity and temperature variations of this area. Veliger the molluscan larvae are found to be abundant at certain places, but the matured animals are less in areas other than the mouth region, this may be due to varying environmental conditions. Crab and prawn (crustacean) larvae are densely distributed in Pulicat Lake. Nutritional factors are important for brachyuran zoea development and settlement (Station and Sulkin, 1991; Garrison and Hagg, 1991). Since, brachionus did not follow any definite pattern of diurnal movements, they survive better in reduced depth of brackish water ecosystems. Fish eggs population is varying locally, and it is related to the predator pressure on the larval fish biomass. Cirrepede is also one of the dominant organisms in the zooplankton, because the cirrepede were the prolonged breeders. Fluctuations in the salinity values appear to have affected the settlement. Depth dependent changes were not significant in the settlement of fouling organisms (Srinivas, 1992). Lucifer population can serve as a good indicator of the presence of a school of fishes. Lucifers are densely distributed around the central side of the lake. *Sagitta sp*. are indicator organisms for warm water, neretic water, and mixing waters. *Sagitta sp* is one immigrant fauna from the sea to back waters of the lagoon. Salinity is the major controlling factor for the distribution of the *Sagitta sp.* population within the lake. Factors influencing the zooplankton density in Pulicat lake ecosystem have been described in Fig 3.8.

The maximum zooplankton was recorded at the northeastern side of the lake and the minimum recorded at northwestern side of the lake. The meroplankters, which are the major component of the zooplankton are resource dependent like shelter and food. The eastern side of the lake is comparatively deep and has the rich biomass of algae, which provide good shelter and feed to the zooplankton. The human activities like shell processing, increase the Suspended Sediment Concentration of the north western side of

the lake, which reduces the zooplankton distribution in this region. Average zooplankton distribution in various regions the lake is presented in Table 3.8.

3.6 Benthos of Pulicat Lake

Fifty-nine species of benthos including meio fauna have been recorded during the present study on Pulicat lake ecosystem. Recorded benthic organisms during various seasons have been described in Table 3.9. The population in the central side of the lagoon is high (avg. 2,800ind/25 cm^2) of biomass and it is very less (below 520 ind/25cm^2) along the northwestern side of the lake. Polychaetes and nematodes are the dominant organisms. This kind of animal domination shows that the area is organically rich comparing with other areas. Nematodes are densely populated at the center of the lagoon where the algal biomass is higher. Hemminga and Buth (1991) suggest that nematodes occur abundantly in association with halophyte litter. Radox potential with organic content, silt fraction of sediments was identified as the factors regulating the species assemblages of the benthos in various regions of the lake (Boucher and Gourbault, 1990). Isopods are densely present near to the shore of the lagoon. Jaramillo (1994) found the isopod domination and high population density near to the exposed sandy beaches. Crustacean population is higher at the shallow regions of the lake especially where the mangroves generating areas of the lake. The crustacean assemblages of each of the refuge components were related to the gradient of depth, area, and structural complexity. Sediment structure seems to be the main factor that controls the composition and the quantity of macrobenthic crustacean fauna.

The reason for the variation in benthic faunal composition in the different regions of the lake are explained in Fig. 3.9. Maximum concentration is recorded at the central part of the lagoon where the water flow and tidal flush is regular (Fig. 3.10). Since the water flow and deposition of organic matters are higher at the central part of the lake, the population density is positively correlated with the organic carbon load. The major man made activities such as aquaculture, agriculture, shell mining are affecting meio-benthos. The shell processing activity (Sunnambukkulam) is reduces the population of the bottom

fauna. The northwestern part of the lake has minimum quantity of the benthos due to the continuous deposition of silt which alters the nature of the habitat. The river input, during monsoon season also contribute significant amount of sediment flow into the area which also change the structure and texture of the sediment. The shell quarried from the lake is totally processed in this area, which increases the turbidity of the lake affecting the associated fauna and flora of the area. Dredging areas cause considerable negative effects on the bottom environment of the lagoon (Pravoni and Gionardi, 1994). Insufficient water mixing at the northwestern part of the lagoon is also playing a major role in meiobenthos distribution (less in quantity) of the area. Insufficient water mixing and the progressive silting up of the bottom have resulted in the reduction of benthic population (Zine and Menioui, 1992). The north-eastern part of the lake is moderately deep part and highly productive. Water and sediment associated bottom fauna are considerably higher in this region. The central part has comparatively huge quantity of macro algal biomass, which increases the organic compound in the sediment and thus increases the population of the benthos. Benthic faunal abundance was higher in the center of the lagoon on fine mud and on the intertidal areas (Quirtino et al, 1989). The local variation in the distribution of benthos within the lake is mainly due to water depth, temperature and salinity.

3.7 Macro-faunal species assemblages

Sixty-four species of macro faunal species are recorded so for from this area of this 43 are reported during 1960, during the present study only 26 macro faunal were recorded in the lake ecosystem. The macrofaunal species assemblage in various periods of the Pulicat Lake ecosystem has been described in Table 3.10.

The missing fauna are mostly mollusks especially gastropods. *Alpheus sp., Anemonia sp., Arca sp., Babylonia sp., Clibanarius sp., Metridium sp., Modiolus sp. Natica sp., Oliva sp., Penaeus carinatus., Penaeus carniculatus., Perna viridis., Placenta placenta., Tonna sp*. are the most important species which are not recorded or rarely represented.

These findings indicate that the lake is significantly losing its macro fauna. Above average temperature in the bottom, reduce the survival rate of the mollusks (Birkett and Cook, 1987). Various factors that influence the macro faunal species have been described in the Table 3.11.

3.8 Fishery of Pulicat Lake ecosystem

The earliest data on fishery show the reduction of annual catch from the lake from 2500 tonnes (1950) to 1150 tonnes (2000). Annual landings of fishes during 1999-2000 are given in the Fig. 3.11 and comparative capture fishery in Pulicat Lkae is presented in Table 3.12 and Fig. 3.11(a).

Fishing is the main occupation of the traditional fishing community living around this lake. Eighty-one species of fishes are recorded so far from this area. Of this, 30 species are common species. Present study on the fishes, confirms the species reduction in this area. The main reason for the changes are depth reduction, selective fishing, and reduction in fresh water flow and changes in water quality. Even though the species are reduced. Based on our estimation, around 1643 kg of fin-fishes has been harvested daily, which has an economic value of Rs 49,290 per day and about Rs 1,79,90,850 per annum. The research team analyzed the fecundity rate, predator population and recruitment rate and find the system (fish stock) is sustaining because the marine larval fishes are using the lake as a nursery ground. Of the fin-fishes captured, mullets are the dominant species. Other important fishes distributed in the lake are *Sarinella sp., Hilisa keele., Chanos chanos., Plotosus canius., Liza parsia., Mugil cephalus., Hemirampus far, Platycepahalus indicus., Lates calcarifer., Epinephelus tauvina., Silago sihama, Caranx sem, Leiognathus daura, Lutijanus sp, Gerres sp., Siganus javus* and *Tricanthus sp*. The larvae and young ones of these fishes are dense in the lake or canal connecting the lake. Recorded fish species within the Pulicat Lake during various periods is presented in the Table 3.13.

Crab is the important commercial resource exploited from the Pulicat Lake. Around 150 tones/yr. Crab has been harvested from this lake. Eight species of crab has been recorded in this lake. Of this, mud crab *Scylla serrata* is the most dominant species in crab fishery, which have high demand in International market. *Portunus pelagicus* has been recorded around the mouth region of the lake. The crab capture is higher at the central part of the lagoon compared with the other regions of the lake. Algal mat is the suitable feeding and nursery ground for crabs. Suspended sediment concentration (SSC) plays a major role in distribution and diversity of the crab through affecting its physiology and larval dispersal.

Prawns are the most important economic resource for the fishermen community living around this lake. It is estimated that around 1232 Kg (above the size of 10 gm) of prawn has been captured every day from the Pulicat Lake worth values (Rs 73,920 per day and Rs 2,69,80,800 per annum). Six species of prawns are recorded from this area. The dominant composition is *Penaeus monodon, Penaeus indicus, and P.semisulcatus*. Most of the harvested prawns are in the size of 15 gm to 25 gm. Prawns are more in number at the southern side of the lake, due to the organic rich mud, regular tidal flushing and the algal bed. The algal bed is providing shelter and nutrients to the nursing prawns. Factors and changes in fish quality in fish diversity is presented in Table 3.14.

3.9 Waterfowl Population

Birds are the components in the Pulicat Lake ecosystem and this area has been announced as a RAMSAR site. Around 1,10,000 migratory birds and local birds are depending on the lake ecosystem. The important migratory waterfowls are pelicans, herons and egrets, storks, flamingos, ducks, shorebirds, gulls, and terns. Pulicat is the third most important wetland for migratory bird population along the eastern seaboard of India, and is especially important during the spring and autumn migratory seasons. Around 212 species of birds have been recorded so for from this area at various seasons and periods. Locations of migratory birds in Pulicat Lake is shown in Fig. 3.12 and migratory bird population (individuals/1sq.km) at various locations of the lake has been

described in the Fig. 3.13. Local people and forest officers of the sanctuary have informed that the migratory bird population arrival to this sanctuary has been increasing for the past 10 years. It might be due to increasing wetland area and the laws and legislations implemented by the sanctuary authority. Various reasons for increase of migratory waterfowl population at Pulicat Lake ecosystem has been presented in Fig. 3.13.

Bird population is higher at the center of the lagoon where the benthic animal composition and algal biomass is higher. Whereas the North western side of the lake have comparatively less number of birds due to the siltation at the bottom and reduced benthic biomass. Bird population is generally higher at the southern side of the lake, which possess the dense, and diverse algal mat, which is the feeding and sheltering ground for the nurseries. The northern part of the lake have comparatively less number of bird population due to the turbidity and road passage which act as a corridor of the wild life.

Generally the migratory bird population has been threatened by the anthropogenic activities, but in Pulicat Lake the migratory bird accumulation is not threatened by the human population as seriously. This is due to various factors such as birds are non-marketable resources, indigenous people restrict to eat and hunt, legislations adopted by the sanctuary authorities and awareness created by the local NGOs.

Table 3.2 Major biological resources of Pulicat lake ecosystem

Resource	Overall total no of recorded species	1960	1980	2000
Phytoplankton	87	43	30	49
Macro algae	18	16	8	12
Zooplankton	88	31	44	31
Benthos (including interstitial fauna)	59	*	*	57
Macrofauna (including molluscs	64	43	28	26
Fishes	81	50	13	39
Birds	120	*	*	115

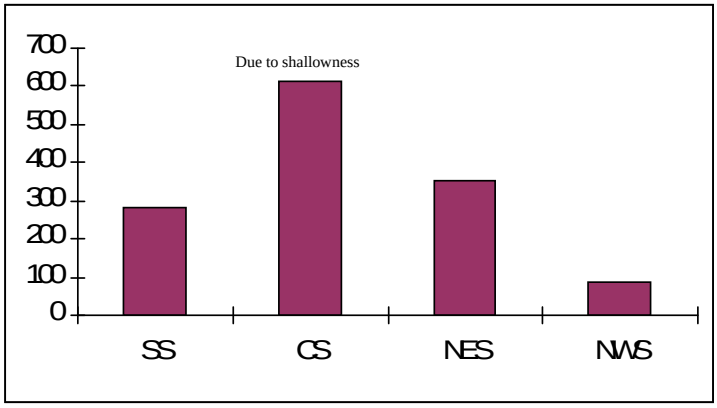
* Not available

Table 3.3 Quantitative Biological Resources of Pulicat lake

Components	SS	CS	NES	NWS	Unit
Phytoplankton	28600	32850	140400	16800	cells/liter
Diatom	24000	26000	130000	11000	cells/liter
Dinoflagellates	4,000	6000	9000	4000	cells/liter
Blue green algae	600	850	1400	1800	cells/liter
Macroalgae	139	450	230	85	ww.gm/m2
Chlorophyll – a	7.21	9.52	11.10	4.80	mg/m3
Chlorophyll-b	5.51	6.12	8.2	3.31	mg/m3
Chlorophyll-c	5.82	8.05	14.12	4.92	mg/m3
Productivity	985	1131.5	1387	789	gC/m2/year
Zooplankton	53	82	88	12	ind/liter
Meiofauna	1080	2800	2100	520	ind/10 cm2
Macrofauna	220	482	350	180	gm/m3
Fin fish	67	120	140	40	ww gm/1m2
Prawn	80	132	109	40	ww gm/1m2
Migratory birds	2	12	5	2	ind./10m2

SS=Southern Side, CS=Central Side, NES=North Easter Side, NWS=North Western side

Figure 3.1 Algal (including seagrass) distribution (ww/gm/1 sq.m) in various regions of the Pulicat lake



NWS=North wastern side of the lake, NES=North eastern side of the lake, CS=Centre of the lake, SS=South side of the lake

Figure 3.7 Zooplankton concentration (ind/lit) in various regions of the lake

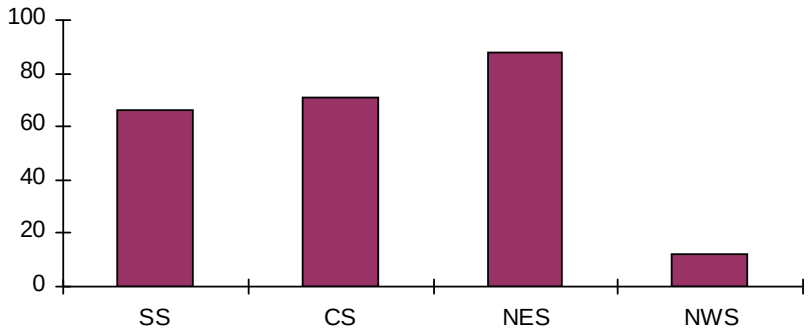


Figure 3.8 Factors influencing Zooplankton diversity and density

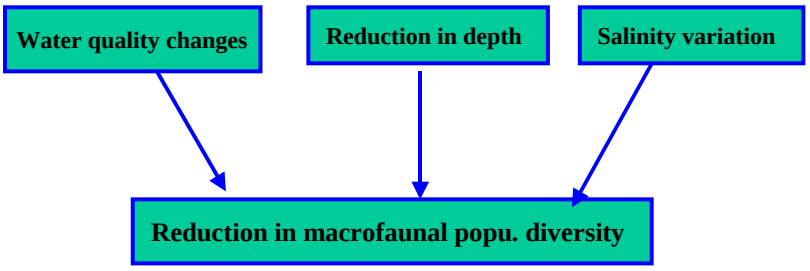


Figure 3.2 Factors for Algal Composition Changes

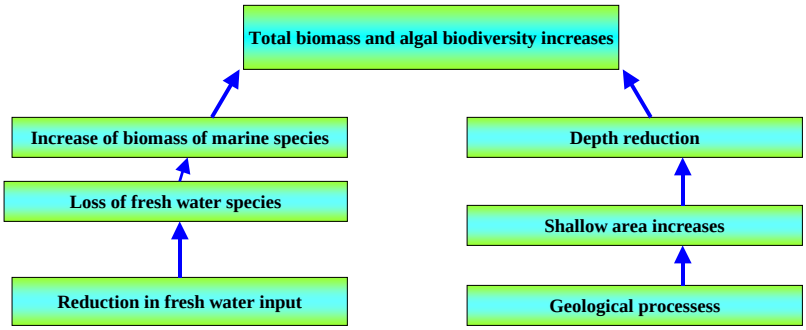


Figure 3.3 **Group wise Phytoplankton concentration (%) in various regions of the Pulicat lake**

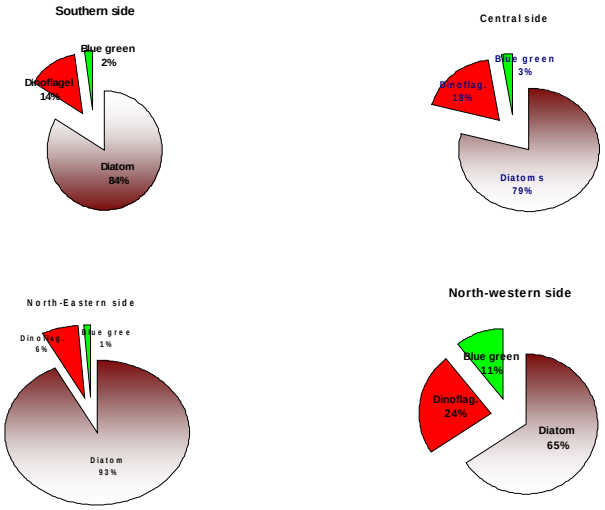
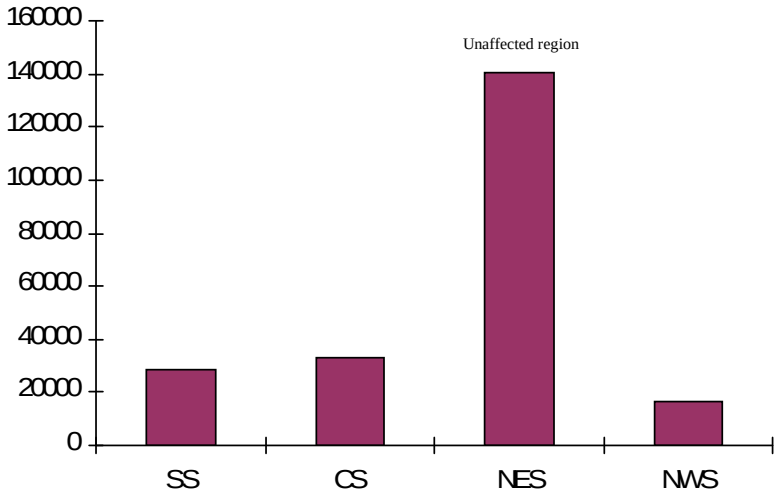


Fig 3.4 Phytoplankton Concentration (cells/litr.) in Various Regions of the Pulicat lake



SS=southern side, CS=Central Side, NES=North-Eastern Side, NWS=North-Western Side

Fig 3.5 Factors Influencing on Phytoplankton Species Composition changes

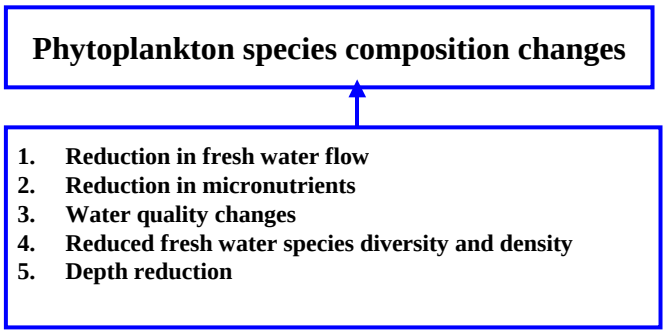


Fig 3.5 Factors Influencing on Phytoplankton Species Composition changes

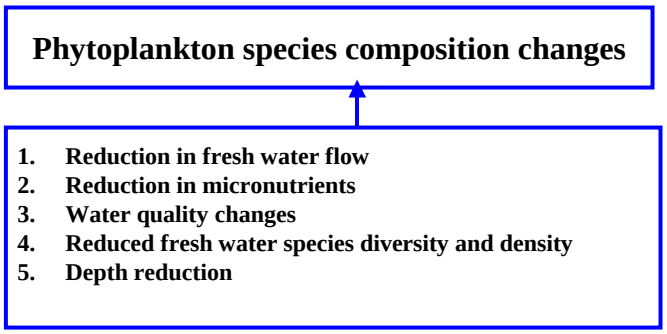


Fig 3.9 Meio-faunal composition variation in the lake

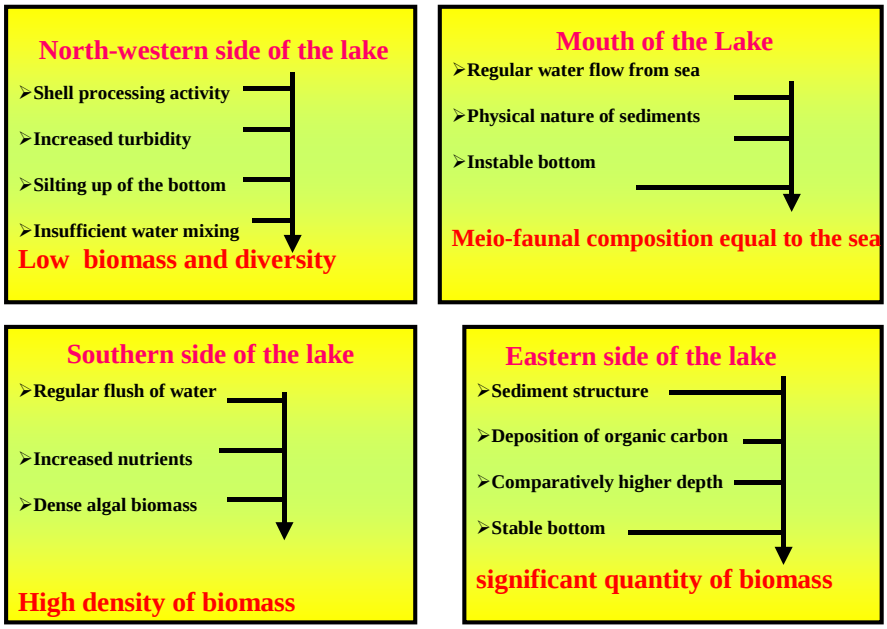
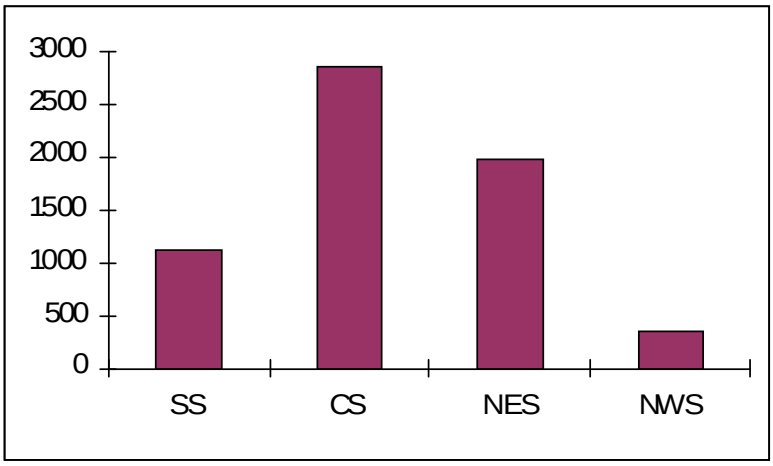


Figure 3.10 Benthos population (no/10 cm.sq) in Pulicat lake at various regions of Pulicat lake



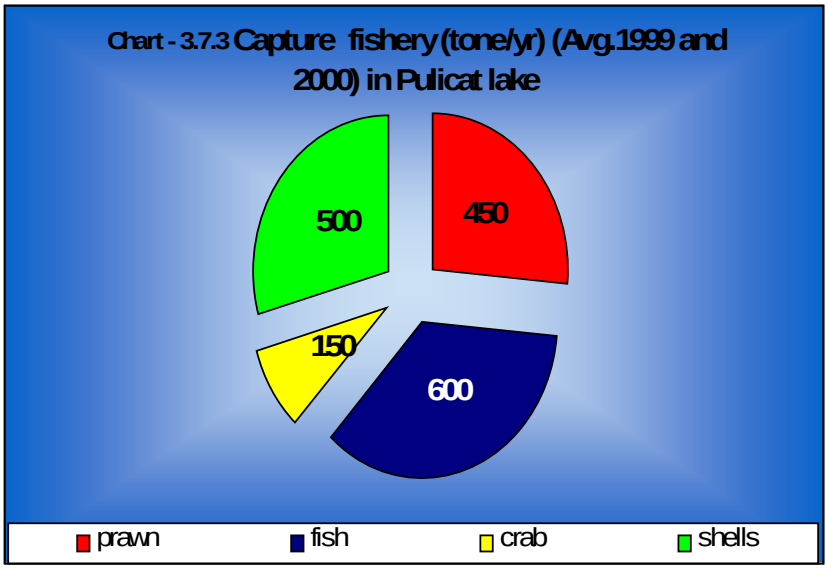


Figure 3.11 Average Capture Fishery (tonne/year) for the year 1999 and 2000 in Pulicat Lake

Figure 3.12 Locations of Migratory Birds in Pulicat Lake

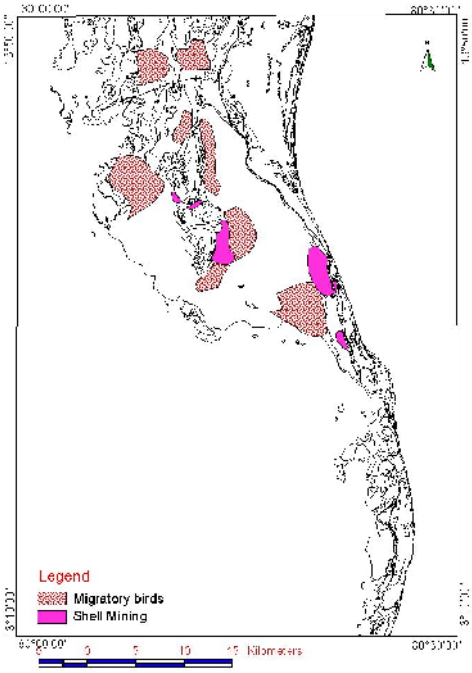


Table 3.12 Comparative capture fishery in Pulicat lake

Year	Capture fishery in tones	References
1951	2562	Chacko etal.,1951
1965	986	Fish and Fisheries by V.G.Jhingran.,1988
1970	1170	Fish and Fisheries by V.G.Jhingran.,1988
1975	759	Fish and Fisheries by V.G.Jhingran.,1988
1980	1412	Fish and Fisheries by V.G.Jhingran.,1988
1990	1200	WWF, Wetlands of India
1999	1120	Survey IOM team

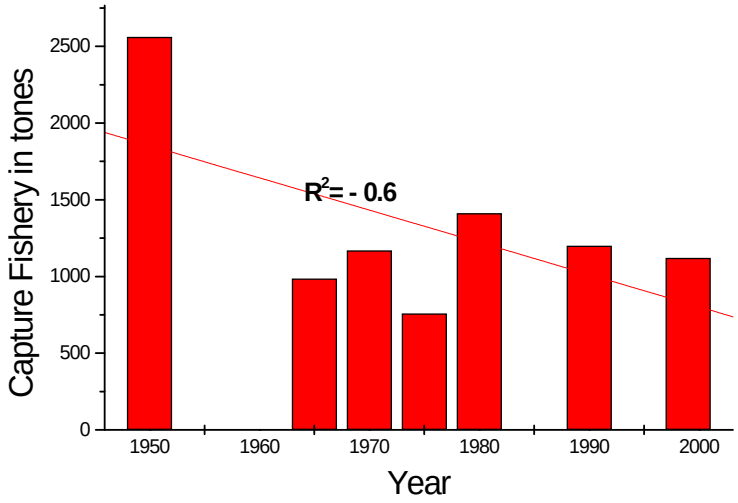


Figure 3..11(a) Capture Fishery in Pulicat Lake

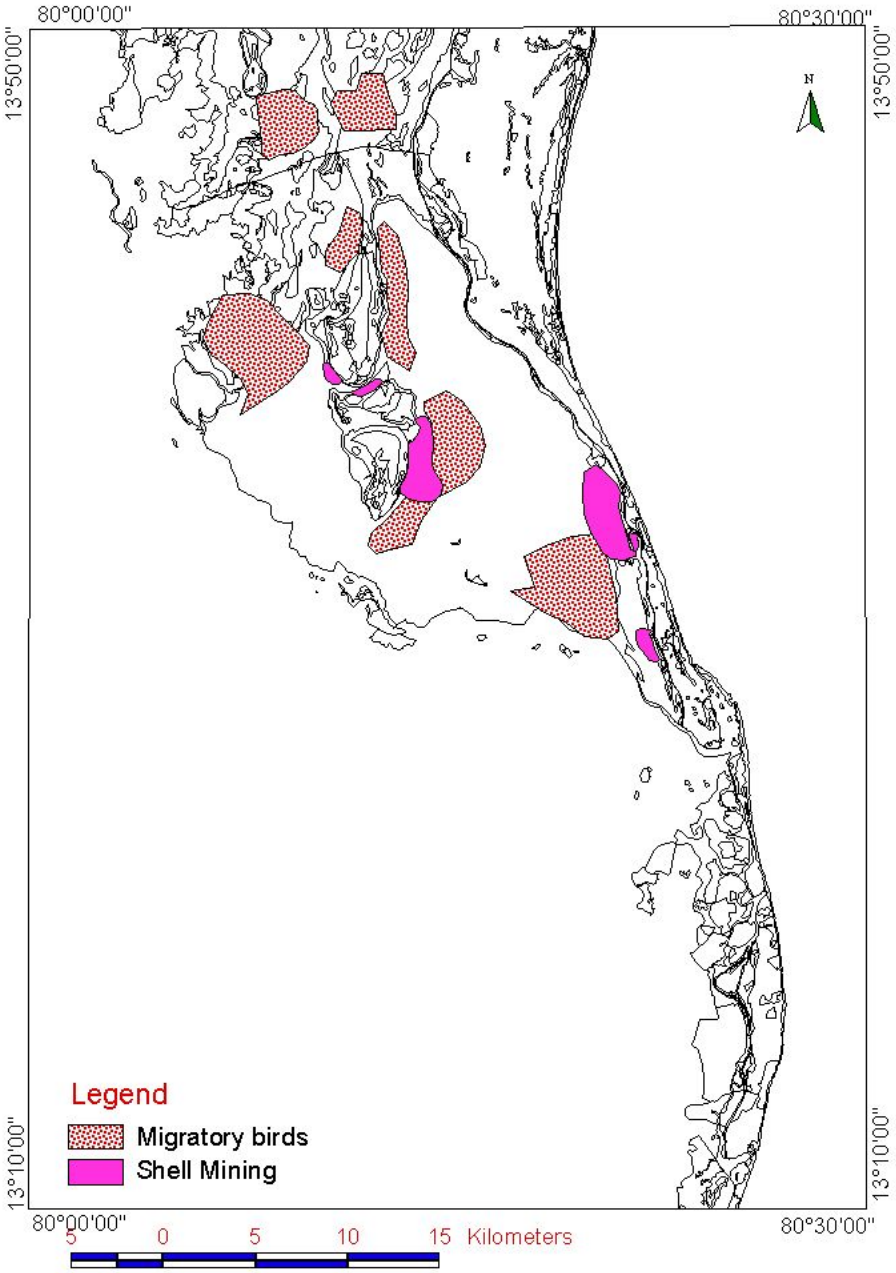


Figure 3.12 Locations of Migratory Birds in Pulicat Lake