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Research Article

Fish Fauna Diversity and Conservation Status of Pulicat Lagoon in Tamil Nadu

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Keywords

- Pulicat lagoon
- Physico- chemical properties
- Biodiversity

Abstract

Fish fauna is considered as a good indicator of water quality. The aim of this study was to assess the influence of environmental factors on the fish distribution and conservation status in Pulicat Lagoon. Bimonthly surveys were conducted from September 2013 to August 2015 in which 83 fish species were recovered, belonging to 14 orders and 50 families. The dominant order was Perciformes which were represented by 44 species. Various physico-chemical parameters and nutrients were found to be suitable for growth of plankton and stocking of fish species. Hence, the present study there are only few fish species were near threatened and endangered of in the Pulicat therefore serious conservation action and renovation is required to prevent the loss of biodiversity.

INTRODUCTION

Fishes are an important vertebrate group of the animal world and contribute overwhelmingly to global biodiversity. Fishes are used as a food source and contain many vital vitamins and fatty acids. The study of fish and their stability is important because fish populations very significantly from year to year. They play an important role, as they are not only useful for food and recreation, but also act as a tool for biological control by feeding upon the planktonic population and aquatic vegetation [1]. Worldwide 27,977 valid species of fishes under 62 orders, 515 families and 1,494 genera [2]. Indian species represent about 8.9 % of the known fish species in the world. Venkatraman [3] estimated 4,000 species of fish belonging to 969 genera, 254 families and 40 orders in the Indian region. The coastal region is a place of hectic human activity owing to urbanization and industrialization resulting in human interference of rapid development. In recent years, the coastal ecosystems have become highly disturbed and very much threatened and attributed to problems like pollution, siltation, erosion, flooding, salt water intrusion and storm surges [4]. Pulicat Lagoon, which is located in the North Chennai coastal region, is a typical brackish water ecosystem of great importance with regard to its biodiversity and aesthetic value. Due to its morphological and brackish water characteristics, it is the most suitable breeding and nursing ground habitat for fishes in the North Chennai coastal region. It runs parallel to the coast of the Bay of Bengal, being separated from it by an extensive sand-strip called the Sriharikota Island, on which the Sriharikota High Altitude Range (SHAR) of the Indian Space Research Organization (ISRO) is located [5]. Water is the natural habitat of fishes and other aquatic animals, it is therefore of great importance to study water quality while studying fish production especially when done in an artificial setting [6]. In particular, fish populations are highly dependent upon the variations of physicochemical characteristics of their aquatic habitat which supports their biological functions [7]. The present study was conducted to determine the physico-chemical parameters of water, icthyofaunal diversity and conservation status of Pulicat Lagoon.

MATERIALS AND METHODS

Study area

The fishes were collected from the Pulicat Lagoon during the period of Sept 2013 - Aug 2015 from the following locations Barmouth (S1), Kunankuppam (S2), Light house kuppm (S3) Sattankuppam (S4) and Jameelabad (S5).

Collection and analysis

The water quality parameters like temperature, pH, dissolved oxygen etc., must be watched commonly, individually or synergistically to keep the aquatic habitat positive for existence of fish. Water samples were collected early in the morning in sterilized sampling bottles and physico-chemical parameters like pH, (Figure 1), temperatures were analysed at site. Dissolved oxygen (DO), phosphate were analyzed in accordance with American Public Health Association [8].

Fish samples were collected from different stations during the study period from September 2013 to August 2015 with the help of local fishermen using different types of nets namely gill nets, cast nets and dragnets [9]. Fish specimen were collected

and preserved in 10% formaldehyde solution. Fishes were keyed and identified using Day [10-11].

RESULT AND DISCUSSION

Eighty three species, 14 orders and 50 families were found during our survey. The Perciformes were dominant with 44 species, followed by Tetraodontiformes with 9 species, Pleuronectiformes with 7 species, Clupeiformes, Siluriformes Mugiliformes with 3 species each, Beloniformes with 5 species, Anguilliformes and Scorpaeniformes with 2 species each, Carcharhiniformes, Gonorynchiformes, Myliobatiformes, Torpediniformes and Syngnathiformes 1 species each (Figure 2) (Table 1). Regarding their conservation status 22 species were least concern, 2 species were data deficient, one species for vulnerable (*Epinephelus lanceolatus)*, Endangered (*Thunnus thynnus)*, Near Threatened (*Gymnura poecilura)* and 57 species were not assessed (IUCN-Version 2015) (Table 1).

Perciformes were the dominant order that were recovered from our surveys, a trend that is similar across various independent studies. Nath and Patra [12] reported 25 Perciformes species from Hooghly river of West Bengal India. Abu Hanif [13] investigated 35 Perciformes species from Southern coastal waters of Bangladesh and 27 Perciformes species of Nizampatnam coastal Andhra Pradesh [14]. Thirteen species were recorded from Cuddalore, located at the southeast coast of India by Asta Lakshmi [15]. Similarly, in the present study, 44 species were the dominant order (Table 1).

Temperature is an important factor for the growth of biodiversity and influences the biological, biochemical, chemical characteristics of aquatic systems [16]. In the present study, temperature minimum as 24.6°C and maximum was 32.2°C at study area (Figure 3). It varied as expected with seasonal climates and showed a great variation season wise. According to Food and Agriculture Organization (FAO) report [17], the increase of temperature directly or indirectly impacts species distribution and the seasonality of production in fishes. Temperature is commonly considered the most important single ecological factor in the coastal and estuarine ecosystem which can influence the distribution of marine organisms [18].

pH was recorded slightly alkaline in Pulicat Lagoon were lowest 7.6 and highest 9 (Figure 4). According to the report of Northeastern Regional Aquaculture Centre (NRAC) by Fluctuations in pH values during different seasons of the year is attributed to factors like removal of carbondioxide by photosynthesis through bicarbonate poverty, dilution of sea water by fresh water influx, reduce of temperature and decomposition of organic matter as suggested by Zingde et al., [19]. In the present investigation pH an attention indicates the alkaline nature of water in the study area. Dissolve oxygen observed were minimum 0.6 mg/l and maximum 4.9 mg/l (Figure 5). Solubility of oxygen in water is inversely proportional to temperature [20]. The low dissolved oxygen concentration observed during summer may be attributed to the higher salinity of the water, higher temperature and less inflow of freshwater coupled with biological processes such as consumption of available oxygen by the organisms for respiration and active decomposition of organic matter during summer. It is well known that the temperature affect the dissolution of oxygen [21].

Additional the bulk of weathering of rocks and soluble alkali metal phosphates in the upstream area are approved into the estuaries [22]. The addition of super phosphates applied in the agricultural fields as fertilizers and alkyl phosphates used in households as detergents can be other sources of inorganic phosphate throughout the monsoon season [23]. The variation may also be due to the processes like adsorption and desorption of phosphates and buffering action of sediment under varying environmental conditions [24]. In the present study, the phosphate lowest was 3.29 mg/ml during at summer and highest 5.44 was observed in monsoon (Figure 6).

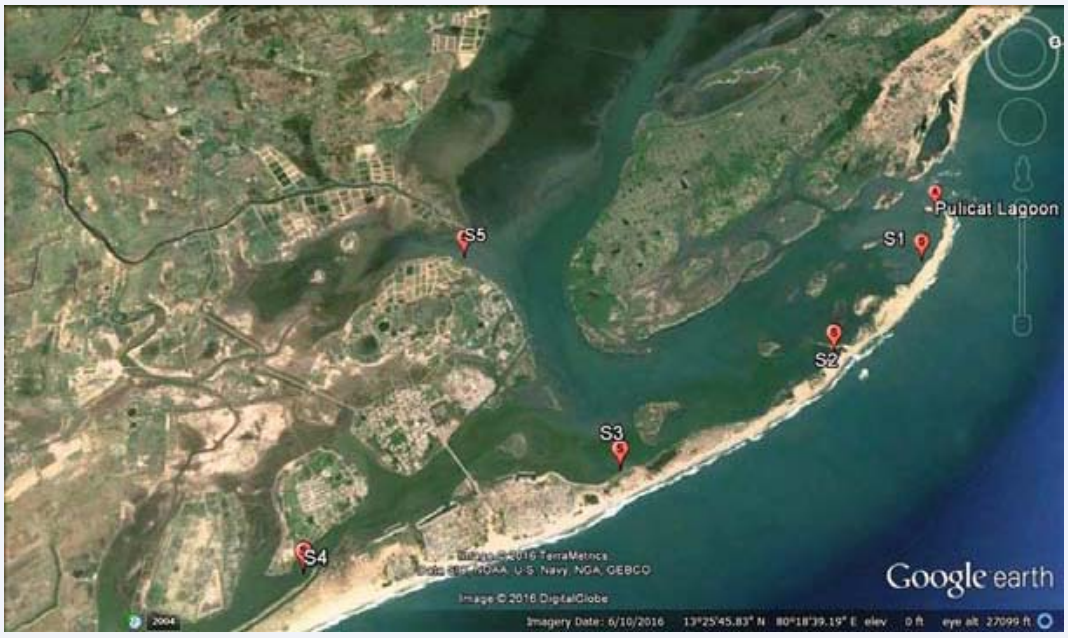

Figure 1 Satellite map of Pulicat lagoon (Source: Google Earth).

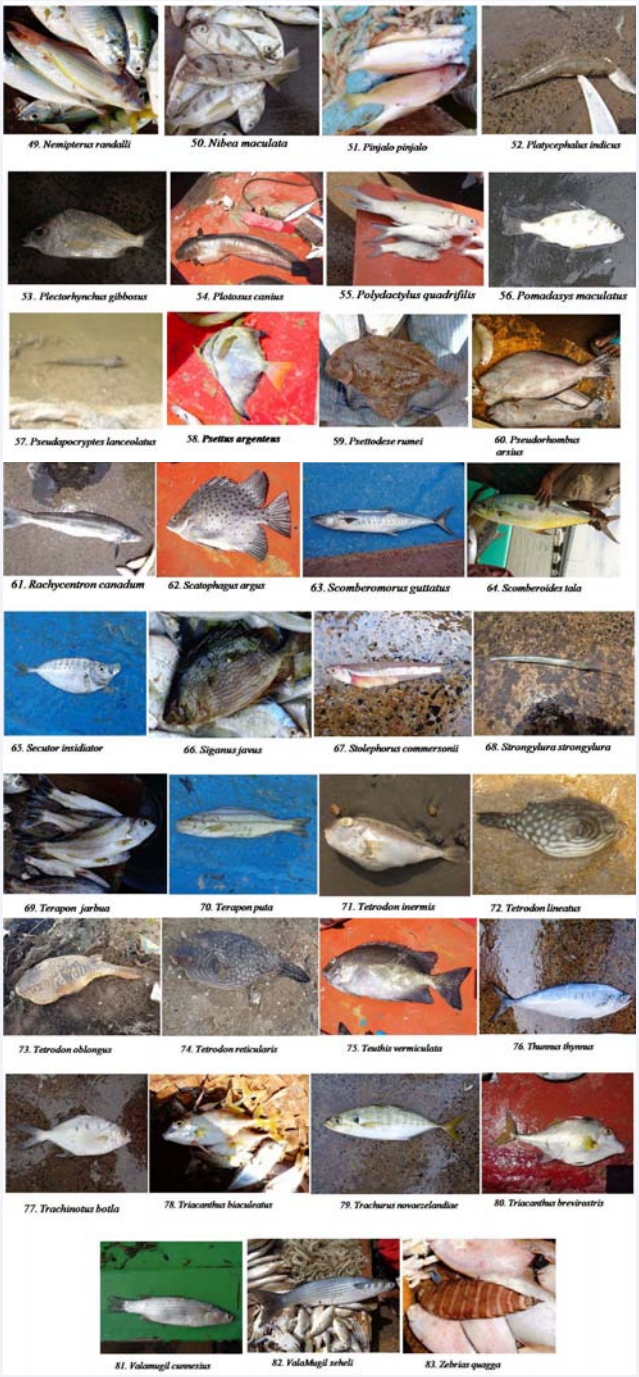

Figure 2 Fish species in Pulicat lagoon from Sept 2013 – Aug 2015.

CONCLUSION

Pulicat Lagoon indicated that an altered environment supported less biological communities while less anxious sites were characterized by a diverse fish faunal diversity. We found 83 species of 14 various orders; Perciformes represents the order maximum species recorded in study area. The water quality was also affected by pollutants which act on elements existing in water such as DO or produces substances such as phosphates, other elements and therefore affects the fish fauna indirectly. It is significant to take effective strategies for the maintenance of fish

Table 1: List of fish fauna recorded from Pulicat lagoon.

S.Noa	Order	Family	Scientific Name	IUCN Red list 2015
	Perciformes	Acanthuridae	*Acanthurus mata*	LC
	Perciformes	Carangidae	*Alepes kleinii*	NA
	Perciformes	Carangidae	*Alectis indica*	NA
	Perciformes	Carangidae	*Alectis ciliaris*	LC
	Perciformes	Lutjanidae	*Aphareus rutilans*	NA
	Siluriformes	Ariidae	*Arius thalassinus*	NA
	Tetraodontiformes	Balistidae	*Balistes niger*	LC
	Beloniformes	Belonidae	*Belone strongylurus*	NA
	Perciformes	Carangidae	*Caranx heberi*	NA
	Gonorhynchiformes	Chanidae	*Chanos chanos*	NA
	Tetraodontiformes	Tetraodontidae	*Chelenodon patoca*	NA
	Clupeiformes	Chirocentridae	*Chirocentrus nudus*	NA
	Siluriformes	Clariidae	*Clarias batrachus*	LC
	Pleuronectiformes	Cynoglossidae	*Cynoglossus puncticeps*	NA
	Pleuronectiformes	Cynoglossidae	*Cynoglossus macrostomus*	NA
	Perciformes	Haemulidae	*Diagramma pictum*	NA
	Tetraodontiformes	Diodontidae	*Diodon hystrix*	LC
	Perciformes	Echeneidae	*Echeneis brachyptera*	LC
	Perciformes	Serranidae	*Epinephelus fasciatomaculosus*	NA
	Perciformes	Ephippidae	*Ephippus orbis*	NA
	Perciformes	Serranidae	*Epinephelus lanceolatus*	V
	Perciformes	Serranidae	*Epinephelus retouti*	NA
	Perciformes	Cichlidae	*Etroplus suratensis*	LC
	Perciformes	Scombridae	*Euthynnus affinis*	LC
	Beloniformes	Exocoetidae	*Exocoetus bahiensis*	LC
	Beloniformes	Exocoetidae	*Exocoetus poecilopterus*	NA
	Syngnathiformes	Fistulariidae	*Fistularia serrata*	NA
	Perciformes	Carangidae	*Formio niger*	NA
	Perciformes	Gerreidae	*Gerres lucidus*	NA
	Pleuronectiformes	Pleuronectidae	*Glyptocephalus cynoglossus*	NA
	Myliobatiformes	Gymnuridae	*Gymnura poecilura*	NT
	Anguilliformes	Muraenidae	*Gymnothorax reticularis*	NA
	Beloniformes	Hemiramphidae	*Hemiramphus limbatus*	NA
	Pleuronectiformes	Paralichthyidae	*Hippoglossina oblonga*	LC
	Perciformes	Kyphosidae	*Kyphosus vaigiensis*	LC
	Perciformes	Leiognathidae	*Leiognathus splendens*	LC
	Perciformes	Trichiuridae	*Lepturacanthus savala*	NA
	Perciformes	Lutjanidae	*Lutjanus ehrenbergii*	NA
	Perciformes	Lutjanidae	*Lutjanus jocu*	NA
	Perciformes	Lutjanidae	*Lutjanus Priacanthid*	NA
	Mugiliformes	Mugilidae	*Mugil cephalus*	LC
	Anguilliformes	Muraenesocidae	*Muraenesox cinereus*	NA
	Carcharhiniformes	Triakidae	*Mustelus canis*	NA
	Scorpaeniformes	Cottidae	*Myoxocephalus octodecemspinosus*	NA
	Torpediniformes	Narcinidae	*Narcine timlei*	DD
	Clupeiformes	Clupeidae	*Nematalosa nasus*	LC
	Perciformes	Nemipteridae	*Nemipterus bipunctatus*	NA
	Perciformes	Nemipteridae	*Nemipterus metopias*	NA
	Perciformes	Nemipteridae	*Nemipterus randalli*	NA
	Perciformes	Sciaenidae	*Nibea maculata*	NA
	Perciformes	Lutjanidae	*Pinjalo pinjalo*	NA
	Scorpaeniformes	Platycephalidae	*Platycephalus indicus*	DD
	Perciformes	Haemulidae	*Plectorhynchus gibbosus*	NA
	Siluriformes	Plotosidae	*Plotosus canius*	NA
	Perciformes	Polynemidae	*Polydactylus quadrifilis*	LC
	Perciformes	Haemulidae	*Pomadasys maculatus*	LC

	Perciformes	Gobiidae	*Pseudapocryptes lanceolatus*	LC
	Perciformes	Monodactylidae	*Psettus argenteus*	NA
	Pleuronectiformes	Psettodidae	*Psettodese rumei*	NA
	Pleuronectiformes	Paralichthyidae	*Pseudorhombus arsius*	NA
	Perciformes	Rachycentridae	*Rachycentron canadum*	LC
	Perciformes	Scatophagidae	*Scatophagus argus*	LC
	Perciformes	Scombridae	*Scomberomorus guttatus*	NA
	Perciformes	Carangidae	*Scomberoides tala*	NA
	Perciformes	Leiognathidae	*Secutor insidiator*	NA
	Perciformes	Siganidae	*Siganus javus*	NA
	Clupeiformes	Engraulidae	*Stolephorus commersonii*	NA
	Beloniformes	Belonidae	*Strongylura strongylura*	NA
	Perciformes	Terapontidae	*Terapon jarbua*	LC
	Perciformes	Terapontidae	*Terapon puta*	NA
	Tetraodontiformes	Tetraodontidae	*Tetrodon inermis*	NA
	Tetraodontiformes	Tetraodontidae	*Tetrodon lineatus*	NA
	Tetraodontiformes	Tetraodontidae	*Tetrodon oblongus*	LC
	Tetraodontiformes	Tetraodontidae	*Tetrodon reticularis*	LC
	Perciformes	Siganidae	*Teuthis vermiculata*	NA
	Perciformes	Scombridae	*Thunnus thynnus*	E
	Perciformes	Carangidae	*Trachinotus botla*	NA
	Tetraodontiformes	Triacanthidae	*Triacanthus biaculeatus*	NA
	Perciformes	Carangidae	*Trachurus novaezelandiae*	NA
	Tetraodontiformes	Triacanthidae	*Triacanthus brevirostris*	NA
	Mugiliformes	Mugilidae	*Valamugil cunnesius*	NA
	Mugiliformes	Mugilidae	*Valamugil seheli*	NA
	Pleuronectiformes	Soleidae	*Zebrias quagga*	NA

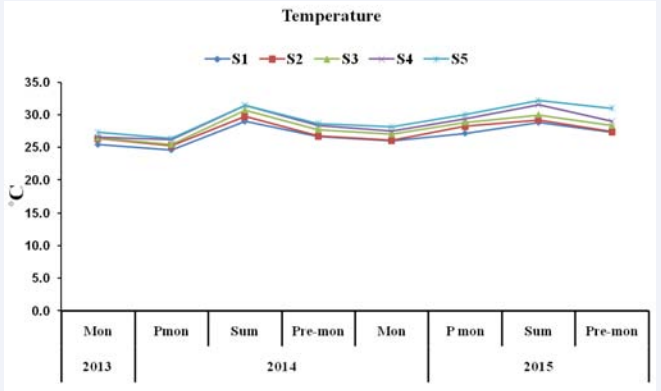

Figure 3 Variations in surface water temperature (°C) recorded at five different stations.

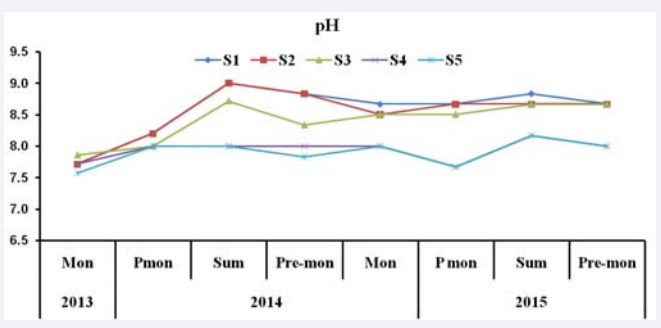

Figure 4 Variations in water pH recorded at five different stations.

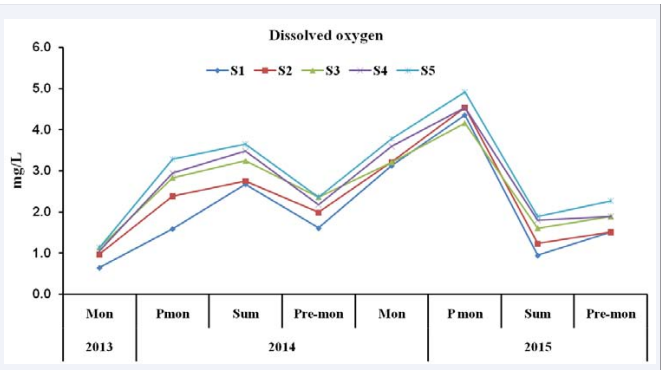

Figure 5 Variations in dissolved oxygen (mg/l) recorded at five different stations.

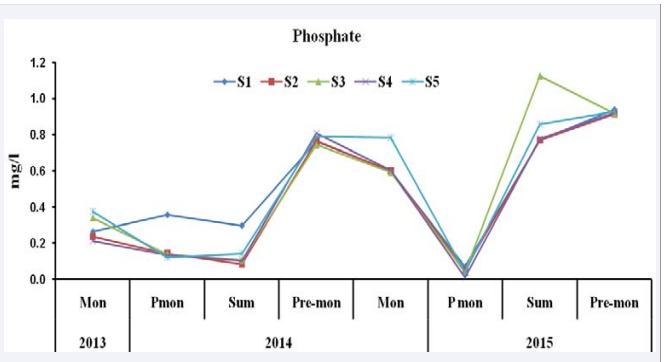

Figure 6 Variations in phosphate (mg/l) recorded at five different stations.

fauna of Pulicat lagoon in order to protract biodiversity and the balance of this aquatic ecosystem.

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