

- Selvanathan, M. and M. Kaliyamurthy. 1972. New Records of Fishes from Pulicat Lake. *Rec. Zool. Sur. India*, 67: 367-371.
- Sivasubramaniam, K. and C. Angell. 1992. A Review of the Culture, Marketing and Resources of the Mud Crab (*Scylla serrata*) in the Bay of Bengal Region. In: *The Mud Crab: A report on the Seminar convened in Surat Thani, Thailand, November 5-8, 1991*. Bay of Bengal Programme, Madras, India.
- Sunder Raj, S.K. and P.J. Sanjeeva Raj. 1984. Polychaeta of Pulicat Lake, (Tamil Nadu). *J. Bom. Nat. Hist. Soc.* 84: 84-104.
- Thangavelu, R. and P.J. Sanjeeva Raj. 1985a. Fishery and Biology of the clam *Meretrix casta* (Chemnitz) in the Pulicat Lake. *J. Mar. Biol. Ass. India*, 27 (1 & 2): 75-83.
- Thangavelu, R. and P.J. Sanjeeva Raj. 1985b. Exploitation of Shell-Deposits in Pulicat Lake. *J. Mar. Boil. Ass. India*, 27(1 & 2): 124-128.
- Thangavelu, R. and P.J. Sanjeeva Raj. 1988a. Boring and Fouling Organisms of the Edible Oyster *Crassostrea madrasensis* (Preston) from the Pulicat Lake, South India. *J. Mar. Bio1. Ass. India*, 30(1 & 2): 47-53.
- Thangavelu, R. and P.J. Sanjeeva Raj. 1988b. Distribution of Molluscan Fauna in Pulicat Lake. *National Seminar on Shellfish Resources and Farming*. Aug. 1988. *CMFRI Bulletin*, 42, Part I, pp. 58-67.
- Thomas, A.J. 1971. Crab-Fishing of the Pulicat Lake. *J. Mar. Biol. Ass. India*, 13 (2): 278-280.
- Venkataraman, K. 2003, Natural Aquatic Ecosystems of India, Thematic Biodiversity Strategy and Action Plan, The National Biodiversity Strategy Action Plan, India 1-275 .



MACRO FAUNA OF PULICAT LAKE

P.J. Sanjeeva Raj

2006



National Biodiversity Authority
Chennai, TamilNadu, India

Copyright: National Biodiversity Authority

No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise without the prior permission of the publisher.

Citation : Sanjeeva Raj P.J. 2006. Macro Fauna of Pulicat Lake, NBA Bulletin No. 6, National Biodiversity Authority, Chennai, Tamil Nadu, India p67.

For further information, please contact

The Chairman
National Biodiversity Authority
475, 9th south cross street,
Kapaleeswarar Nagar,
Neelankarai,
Chennai – 600 041.

Printed by :

Frontline Offset Printers
26, New Street, Llyods Road,
Triplicane, Chennai - 600 005.
Ph : 28470052

- Mohapatra, K.K. and P. Rao. 1991. Some Wader Records from Coastal Andhra Pradesh. *J. Bom. Nat. Hist. Soc.* **89**: 250-251.
- Mohapatra, K.K. and P. Rao. 1992. Further Evidence of the Occurrence of the Black Tern (*Chlidonias niger*) (Linnaeus) on India's Eastern Coast. *J. Bom. Nat. Hist. Soc.* **90**: 511.
- Munro, I.S.R. 1982. *The Marine and Fresh Water Fishes of Ceylon*. Indian Reprint, Soni Reprints Agency, New Delhi, 110 031, 1982.
- Paul Raj, R. 1976. *Studies on the Penaeid Prawns of Pulicat Lake, South India*. Ph.D. Thesis, University of Madras.
- Raman, K., K.V. Ramakrishna, S. Radhakrishnan and G.R.M. Rao. 1975. Studies on the Hydrobiology and Benthic Ecology of Lake Pulicat. *Bull. Dept. Mar. Sci. Univ. Cochin*, VII (4): 855- 884.
- Rao, P. and K. K. Mohapatra. 1992. Occurrence of the Knot (*Calidris canutus*) in Andhra Pradesh. *J. Bom. Nat. Hist. Soc.* **90**: 509.
- Sanjeeva Raj, P.J. 1966. *Ozobranchus branchiatus* (Menzies, 1791). (Hirudinea: Annelida) from Pulicat Lake, South India. *J. Bom. Nat. Hist. Soc.*, **62**(3): 582-584.
- Sanjeeva Raj, P.J. 1968. Occurrence of *Dentalium* (Scaphopoda: Mollusca) in Pulicat Lake. *Curr. Sci.* **37** (4): 110.
- Sanjeeva Raj, P.J. and L.R. Penner. 1962. Concerning *Ozobranchus branchiatus* (Menzies, 1791) (Piscicolidae: Hirudinea) from Florida and Sarawak. *Trans. Amer. Mic. Soc.* **LXXXI**: 364-371.
- Sanjeeva Raj, P.J. and J. Azariah. 1967. Occurrence of the Cephalochordate, *Branchiostoma lanceolatum* (Pallas) from the Pulicat Lake, South India. *J. Mar. Bio1. Ass. India*, IX (1): 179-181.
- Sanjeeva Raj, P.J., S. Jayadev Babu and M. Gladstone. 1977. Anatomical Details of Two Fish-licees from the Pulicat Lake, South India. *J. Mar. Boil. Ass. India*, **19**(1): 35- 43.
- Sanjeeva Raj, P.J., J.L. Tilak and G. Kalaimani. 2002. Experiments in restoration of benthic biodiversity in Pulicat Lake, South India. *J. Mar. Boil. Ass. India*, **2000**, **44**(1&2): 37- 45.

REFERENCES

- Caratini, C. 1994. Pulicat: A four century story. The Hindu, Sunday, October 9, p. II.
- Chacko, P.L., J.G. Abraham and R. Anda. 1953. Report on a Survey of the Flora, Fauna and Fisheries of the Pulicat Lake, Madras State, India, 1951-52. Contribution from the Freshwater Fisheries Biological Station, Madras, No.8 of 1953.
- Jamari, Z.B. 1992. Preliminary Studies on rearing the larvae of the Mud Crab (*Scylla serrata*) in Malaysia. In: **The Mud Crab: A Report on the Seminar convened in Surat Thani, Thailand**, November 5-8, 1991. pp. 143-147. Bay of Bengal Programme, Madras, India.
- Jayadev Babu, S. 1967. Two New Fish-leeches from Pulicat Lake. *Curr. Sci.*, 36(20): 548-549.
- Jayadev Babu, S. 1975. **Studies on the Parasites of some common Food-Fishes from the Pulicat Lake**. Ph.D. Thesis, University of Madras.
- Joel, D and P.J. Sanjeeva Raj. 1981. Epizoic Fauna of some Portunid Crabs of the Pulicat Lake. *J. Mar. Biol. Ass. India.*, 23(1 & 2): 173 -180.
- Joel, D.R., P.J. Sanjeeva Raj and R. Raghavan. 1986. Distribution and Zonation of Shore Crabs in Pulicat Lake. *Proc. Ind. Acad. Sci. (Ani. Sci.)*, 95 (4): 437- 445.
- Kalyani, N. 1988. **The Meiofauna in and around the Pulicat Lake**. Ph.D. Thesis, University of Madras.
- Krishnamurthy, K.N. 1971. Preliminary studies on the bottom biota of Pulicat Lake. *J. Mar. Biol. Ass. India*, 13(2): 264-269.
- Marichamy, R and S. Rajapackiam. 1992. Experiments on larval rearing and seed production of the mud crab, *Scylla serrata* (Forska1). In: **The Mud Crab: A Report on the Seminar convened in Surat Thani, Thailand**, November 5-8, 1991, pp. 135-141. Bay of Bengal Programme, Madras, India.
- Melluish, R.A.S. 1965. More Notes from Madras. *News Letter to Birdwatchers*, 5 (10), Oct, 1966, pp.1-8.

CONTENTS

	<u>Page</u>
FOREWORD	
PREFACE	
INTRODUCTION.....	1
BRACKISHWATERS, INDIAN LAGOONS AND PULICAT LAKE ECOLOGICAL AND HABITAT DIVERSITY OF PULICAT LAKE ECOLOGICAL CRISES FACING THE PULICAT LAKE	
MACRO FAUNA: TAXONOMY.....	7
PHYLUM ANNELIDA.....	8
CLASS ARCHIANNELIDA	
CLASS POLYCHAETA.....	9
CLASS HIRUDINEA.....	15
PHYLUM ARTHROPODA.....	16
CLASS CRUSTACEA	
SUB-CLASS CIRRIPIEDIA.....	16
SUB-CLASS MALACOSTRACA.....	17
ORDER ISOPODA	
ORDER AMPHIPODA	
ORDER DECAPODA.....	17
SUB-ORDER NATANTIA: PENAEID PRAWNS...	17
SUB-ORDER REPTANTIA: HERMIT CRABS.....	22
FIDDLER CRABS...	23
CRABS.....	23
PHYLUM MOLLUSCA.....	30
CLASS GASTROPODA.....	31
CLASS PELECYPODA.....	34
CLASS SCAPHOPODA.....	35
CLASS CEPHALOPODA.....	35
PHYLUM CHORDATA.....	35
SUB-PHYLUM CEPHALOCHORDATA	
CLASS ELASMOBRANCHII AND TELEOSTOMI:FISHES...	36
CLASS AMPHIBIA : FROGS AND TOADS.....	54
CLASS REPTILIA : SNAKES AND TURTLES.....	54
CLASS AVES : WATER BIRDS.....	55
GENERAL TOPICS.....	60
RARE/UNIDENTIFIED SPECIES	
MACRO PARASITES OF FISHES.....	61
BIODIVERSITY AT OYSTER-BEDS.....	63
MEIOFAUNA.....	64
REFERENCES.....	65

பேராசிரியர் முனைவர் ச. கண்ணையன்

Prof. Dr. S. KANNAIYAN
M.Sc., (Ag.) Ph.D., C. Biol., M.Biol., (London)
FIBA (Cambridge), FABI (USA), FNAAS, FISB, FAMI
CHAIRMAN



FOREWORD

Pulicat Lagoon about 60 km North of Chennai and extending between the Andhra Pradesh and Tamil Nadu is a natural coastal wetland of about 30,000 to 46,000 ha, the second largest lagoon in India. It took its origin 6,650 years ago during the Holocene geological period as a major marine transgression on to lowlying coastal marsh followed by two regression and a major lowering of the sea level. Wetlands are permanent or temporary but shallow bodies of water. Wetlands are quite significant for harbouring biodiversity and richer than any other aquatic ecosystem. Coastal wetlands are buffers against the fury of cyclonic storms, storm surges and tsunamis.

Pulicat lake supports the livelihood of about 44,000 fisher folk and an equal number of poor people. It is a vast nursery of about 12 species of prawns, 19 species of crabs and 168 species of finfish and harbours several endemic, endangered and keystone species. During 1995-2003 an annual average of about 77,000 waterfowl belonging to 37 species sojourned on this lake during winter season, of which atleast 25 species breed at the nearby areas.

Pulicat lake is an interesting and unique ecosystem in the world. The Pulicat lake coastal wetland has been studied extensively and systematically by the author Dr. P.J. Sanjeeva Raj over 40 years. He is an involved and committed ecologist make significant scientific contributions in coastal wetland ecosystem. Based on his rich experience he prepared the book an "Macrofauna of Pulicat Lake". My compliment and congratulations to the author Dr. Sanjeeva Raj, for his efforts in preparing the book for publication. I am confident that the book will be useful to the Planners, Policy makers, Government Officials, Scientists, Teachers, Ecologists, Scholars, Students, NGO's involved in Coastal wetland ecosystem.

Place : Chennai

Date : 06.09.2006



NATIONAL BIODIVERSITY AUTHORITY
475, 9th South Cross Street, Kapaleeswarar Nagar,
Neelankarai, Chennai - 600 041, Tamilnadu.
Tel : 044-24490805 Fax : 044-24491390
e-mail : nba_india1@vsnl.net
Website : www.nbaindia.org

Prof. S. Kannaiyan

Larger associated organisms are shrimps like *Alpheus malabaricus*, smaller crabs like *Pinnotherus* sp., *Thalamita crenata*, *Scylla serrata*, *Scylla tranquebarica* and gobiid fishes like *Glossogobius giurus*.

Some gastropods like *Clithon oualaniensis* and *Nassaria stolata*, bivalves like *Catylisia opima* and *Irus exoticus* may be seen. Much rarer are large brownish planarians, small ophiuroids (brittle stars) and a wide variety of tubicolous polychaetes, listed under the Polychaeta of the Pulicat Lake, may also be seen.

Since the Edible Oyster promotes a rich biodiversity in Pulicat Lake, this 'keystone' species needs to be given the topmost priority, for conservation. The author is currently engaged in its conservation. After examining oyster shells in Pulicat Lake for a study of the rich biodiversity they promote, students should restore them to their natural habitats (see Appendix-II).

MEIOFAUNA

The spaces between sand-grains in a sandy aquatic substratum are inhabited by a wide variety of minute organisms, which are compositely called as Interstitial fauna or Meiofauna.

Meiofauna can be collected by vigorously churning a small sample of sand or clay in a beaker of seawater to which 7% Magnesium Chloride solution is added to narcotise and dislodge organisms attached to sand-grains. The supernatant water with such dislodged organisms can be filtered through nylon net, with a mesh-size of about 64 microns. Meiofauna left over on the net can be washed twice in 10% ethyl alcohol and then preserved in 5% formaldehyde, for a later study, at convenience.

One can expect Foraminifera, Ciliates, Cnidaria, Turbellaria nematodes, Archiannelids, Polychaetes, Oligochaetes, Copepods, Isopods, Gastrotricha, Kinorhyncha, Nemertines, Holothurians and Lancelets, in such a meiofaunal collection. Since most of them are less than about one millimeter in size, excepting Archiannelids and polychaetes which are described under Annelida in this writing, they are not dealt with in any details, here.

However, it is to be noted that interstitial habitat is another important ecosystem with rich biodiversity, sometimes acting as ecological indicators of an aquatic ecosystem.

BIODIVERSITY AT OYSTER-BEDS

Pulicat Lake is an ideal habitat for the Edible Oyster, *Crassostrea madrasensis* (Preston). This species of oyster was introduced and cultured in Pulicat Lake, by the Fisheries Department of the erstwhile Madras Presidency (now Tamil Nadu), during the 1920's. Unfortunately, all those extensive Oyster-beds are now lost, due to heavy siltation, and also due to over-exploitation of the beds for oyster-shells, for baking them into lime. Yet some remnant patches of them are left over, particularly in the southern region of the lake.

The Edible Oyster in Pulicat Lake can be called a 'Keystone' species, since it provides ideal niches for a wide variety of organisms to encrust onto their shells, as biofoulers or settlers or sessile organisms. Several free-living organisms also are attracted to colonise the crevices of oyster-shells or to burrow into the silt deposited in such crevices. Any student can observe the rich biodiversity at such oyster clusters, within a short time, of even an hour.

Thangavelu and Sanjeeva Raj (1988a) have described the epizoic organisms in such oyster clusters in Pulicat Lake. More recently, during 1996 to 1998, Sanjeeva Raj, Tilak and Kalaimani, have installed batteries of roof-tiles, at 16 'protected areas', all over the Pulicat Lake, to enable the 'keystone' species namely the Edible Oyster to settle and to promote biodiversity colonisation, so as to bring about eco-restoration in a degrading lake, like the Pulicat Lake. (Sanjeeva Raj *et al.*, 2002)

On a cluster of oyster shells in Pulicat Lake, some of the predominant biofoulers that can be seen are species of the Rock Barnacles, *Balanus amphitrite*, *Balanus reticulatus* and *Balanus cirratus*. The polychaete worm living in sinuous calcareous tubes, *Hydroides norvegica* can be seen encrusted to oyster shells. A few sessile bivalves like *Modiolus metcalfei* and small-sized Green Mussel, *Perna viridis* also can be seen, amidst barnacles on oyster shells. The spionid worm, *Polydora ciliata* creates blisters and burrows into oyster shells.

Some of the free-living organisms, colonising this specific ecological niche are polychaetes like *Nereis chilensis* and *Heteromastus similis*, living within silt that is deposited in the crevices of oyster shells. Amphipods like *Corophium* sp. and the small white isopod *Cirolana fluviatilis* can be seen crawling on oyster shells.

PREFACE

Pulicat Lake is a major coastal wetland in India. It is the second largest lagoon and has a very rich biodiversity. Taxonomy is basic to studies on biodiversity, but up-to-date there has been no consolidation of taxonomic and ecological studies done by various organisations on Pulicat Lake. The author and his team of students have been working on the fauna, fisheries and ecology of the macro fauna of the Pulicat Lake for over forty four years.

It is not only the studies on the macro fauna of the Pulicat Lake that are exhaustively understood, but much more it is the relationship of the fisheries, avifauna and the nearly 30 to 40 thousand fisherfolk on this lake, to such a rich biodiversity, that is rather the unique contribution.

Students of Zoology and researchers work on similar lagoon ecosystems all over the country, and this Guide will serve as a model, for all such ecosystems. Since most of such ecosystems are facing identical issues of ecological degradation, depletion of fauna and fisheries, and above all, posing problems of livelihood security for the traditional fisherfolk and tribals living on such ecosystems, eco-restoration and biodiversity restoration on such ecosystems should be undertaken.

I thank the University Grants Commission, New Delhi, for the grant they provided, during 1986 to 1989, to undertake this work. I also wish to thank the authorities of the Madras Christian College, Tambaram, for all their help, particularly for allowing me the use of their Estuarine Biological Laboratory at Pulicat, which I happened to found, in 1968 when I was serving in this college, from 1948 till 1985. The Centre for Research on New International Economic Order (CRENIEO), which has an Integrated Fisherfolk Development Project (IFDP) at Pulicat, also was a great help during my field studies on the Pulicat Lake. To my team of students, undergraduate, postgraduate and doctoral candidates, who worked with me on the Pulicat Lake, as pioneers, I owe a great debt of gratitude and appreciation. It is the local fishermen that educated me and inspired me about the hidden treasures of this unique ecosystem, and therefore to them, I dedicate this volume.

I am grateful to the late Prof. B.M. Thirunaranan, who has drawn the map of the Pulicat Lake for me in 1965, which has been widely used by all subsequent workers on this lake.

I wish to record my appreciation to my wife, who along with my son Dr. Stephen Sumithran and my daughter Mrs. Surekha Harris, ever since their ages of one year even, spent several days camping on the Pulicat Lake, and were helping me while I was collecting and studying the fauna of the lake.

P.J. SANJEEVA RAJ,
Consultant Ecologist,
17/1724, 21st Main Road,
Anna Nagar, Chennai-40.

Date : 20th April, 2006

INTRODUCTION

Brackishwaters

Brackishwater has a salt content (salinity) *via* media, between freshwater and sea water. Estuaries (river-mouths) and lagoons (bays or backwaters) usually have brackishwater. Brackishwater in such ecosystems is said to be highly productive biologically, more productive than fresh or sea water. Over and above this, tropical brackishwaters are more productive than temperate brackishwaters.

Indian Lagoons

A lagoon (bay) has freshwater streams flowing into it from the hinterland or the catchment areas, on one side, and on the otherside, the lagoon opens into the sea through a comparatively narrow mouth. India has three major lagoons, the Chilika Lake (978 sq. km.) in Orissa, perhaps the largest lagoon in Asia, the Pulicat Lake (350 sq. km.) between Andhra Pradesh and Tamil Nadu, and the Vembanad Lake (300 sq. km.) in Kerala. These three major lagoons of India are not only identical with each other, broadly in their hydrological as well as biological features, but are also identical with similar major lagoons in South and Southeast Asia.

Topography and Morphometry of the Pulicat Lake

Pulicat Lake (13° 26' to 13° 43' N latitude and 80° 03' to 80° 81' E longitude) (Map. 1) is said to be the second, largest lagoon in India. It was about 461 sq. km. in its average area of water spread, but now it has shrunk so much that it may be hardly 350 sq. km. today, and is still shrinking rapidly. It is basically a shallow lagoon, whose average depth was said to be about 1.5 metres at the beginning of the 20th century, but today its average depth also has shrunk to less than about one metre, chiefly due to siltation of the lagoon.

This lagoon was about 55 km. north to south, but today, it may be only 35 km., with a maximum width of about 18 to 19 km. The lagoon extends between the Nellore District of Andhra Pradesh and the Thiruvallur District of Tamil Nadu. It runs parallel to the coast of the Bay of Bengal, being separated from it by a broad sand-strip called the Sriharikota Island, on which the SHAR of the Indian Space Research Organization (ISRO) is located.

PARASITE	HOST	SITE OF INFECTION
TREMATODA: <i>Helicometrina platycephali</i> sp.nov. <i>Didymozoon brevicolle</i> <i>Acanthostomum praeteritum</i>	<i>Platycephalus insidiatrix</i> <i>Platycephalus insidiatrix</i> <i>Therapon jarbua</i>	Stomach & intestine Stomach wall Stomach
CESTODA: <i>Pithophorus</i> sp. <i>Carpobothrium</i> sp. <i>Marsipocephalus</i> sp. <i>Cephalobothrium</i> sp.	<i>Rhynchobatus djeddensis</i> ,, ,, ,,	Spiral Valve ,, ,, ,,
NEMATODA: <i>Philometra insidiatrix</i> sp.nov.	<i>Platycephalus insidiatrix</i>	Ovary
ACANTHOCEPHALA: <i>Acanthosentis antspinis</i> <i>Arhythmacanthus septacanthus</i> <i>Cleaveius secundus</i> <i>Parapallisentis leignathi</i> gen. et sp. nov. <i>Indorhynchus indicus</i>	<i>Mystus gulio</i> <i>Plotosus canius</i> <i>Plotosus canius</i> <i>Leiognathus equulus</i> <i>Arius nenga</i>	Intestine Intestine Intestine Intestine Intestine
HIRUDINEA: <i>Pterobdella amara</i> <i>Zeylanicobdella arugamensis</i>	<i>Trygon sephen</i> <i>Plotosus canius</i>	Mouth region Allover head
COPEPODA: <i>Acanthochondria bu1bosus</i> <i>Ergasilus latus</i> <i>Lernanthropus shishidoi</i> <i>Lernanthropus spinicephala</i> sp.nov. <i>Nipergasilus bora</i> <i>Parataeniacanthus platycephali</i> <i>Parabomolochus gerres</i> sp. nov	<i>Platycephalus insidiatrix</i> <i>Mugil cunnesius</i> <i>Mugil cephalus</i> <i>Gerres oyena</i> <i>Mugil cuunesius</i> <i>Platycephalus insidiatrix</i> <i>Gerres oyena</i>	Buccal floor Gills Gills Gills Gills Gills Inside opencular and gills Gills
ISOPODA: <i>Anilocra longicauda</i> <i>Cymothoa krishnai</i>	<i>Polynemus tetradactylus</i> <i>Arius nenga</i> <i>Mystus gulio</i> <i>Platycephalus insidiatrix</i> <i>Polynemus tetradactylus</i> <i>Lutianus johnii</i> <i>Lutianus argentimaculatus</i> <i>Nematolossa nasus</i> <i>Chanos chanos</i> <i>Mystus gulio</i> <i>Arius nenga</i>	Nape Buccal cavity Buccal cavity Chin region Nape & Buccal cavity Buccal cavity Buccal cavity Pectoral fin Buccal cavity Buccal cavity Buccal cavity
<i>Nerocila pulicatensis</i> sp. nov. <i>Nerocila trivittata</i>	<i>Mystus gulio</i> <i>Arius nenga</i>	Buccal cavity Buccal cavity

allergy. They call it *sori*, in Tamil. These may belong to the species *Acromitus flagellatus*, the common brackishwater jelly fish.

Sea anemones, occur attached as biofoulers on the carapace of the mud crab *Scylla*. As Joel and Sanjeeva Raj (1981) identified them, they belong to *Anemonia indicus* and *Cribrinopsis rebertii*. These may occur attached to oyster-shells also. Occasionally, one comes across larger anemones, buried in sand in shallow waters, nearer the lake-mouth. One can spot them out in undisturbed water, when their crowns of tentacles are spread out.

Planarians, large and deep brown in colour, may be noted crawling, amidst oyster-shells. *Nemertines*, light pink in colour, about one inch long, and of rare occurrence, nearer the lake-mouth.

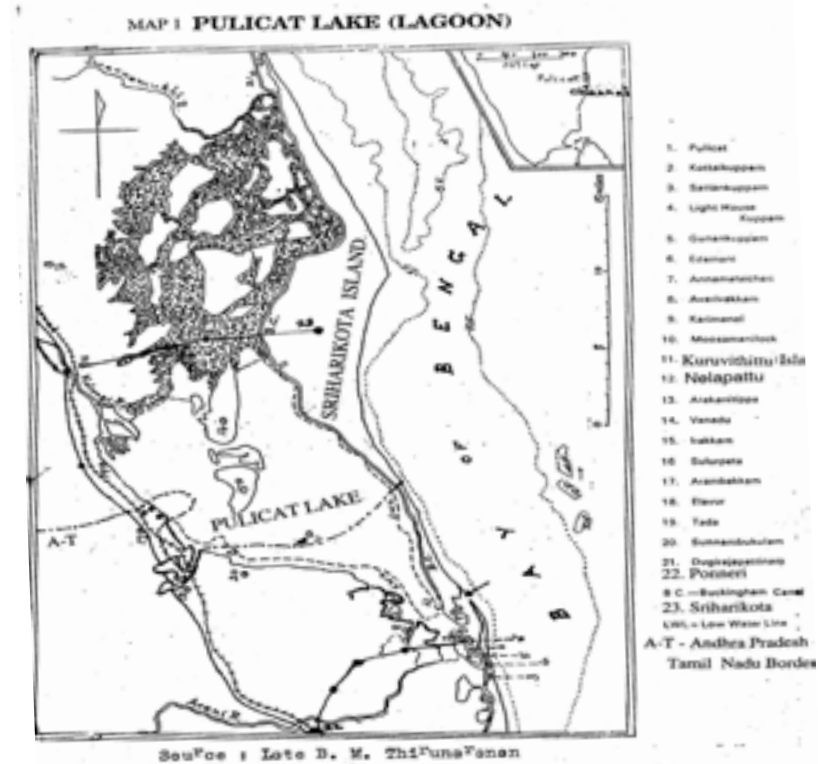
Brachiopods, the lamp-shells, may be of the genus *Glottidia*, were collected once in large numbers, from dark sandy ooze, in shallow waters, nearer the fishing village, Gunankuppam. Local people call it *matti*, meaning a kind of clam, out of their ignorance.

Blind gobiid fish, less than about two inches long, and bright red or maroon in colour, were dredged once, from two feet-deep silt, at a point where the Buckingham Canal opens into the Pulicat Lake, nearer the village Dhonirevu.

MACRO PARASITES OF FISHES

Of the 50 species of fish examined by Jayadev Babu (1975), 16 had macro parasites, and the higher incidences are from species of fish like *Plotosus canius*, *Arius nenga*, *Platycephalus insidiatrix*, *Leiognathus equulus* and *Polynemus tetradactylus*.

Name of the host-fish, name of parasite and the precise site of infection in the host, are given in the following table:-



Of the three monsoonal rivulets Swarnamukhi, Kalangi and Arni that flow into the lagoon, the opening of the northernmost rivulet Swarnamukhi is fully silted up. The Buckingham Canal (East Coast Canal) which runs along the east coast from Kakinada in the Andhra Pradesh in the north upto Marakanam near Pondicherry in the south, flows through the Pulicat Lake, at its southern end, near the Pulicat Town. The most important waterway connection of this lagoon is with the sea, the Bay of Bengal, at the southern end of the lake, through a lake-mouth, about 200 to 300 metres wide, and about one or two metres deep. In certain years, a second narrower mouth also opens south of this, and during monsoon floods supernumerary mouths may open out from the lake into the sea, flushing out the flood waters into the sea.

There are two large inhabited islands, Venaadu and Irukam in the northern region of the lake in Andhra Pradesh. Several smaller mud-flats, some of which have developed into small but uninhabited islands, also exit mostly in the northern region of the lake.

ECOLOGICAL AND HABITAT DIVERSITY OF PULICAT LAKE

Hydrology (nature of water) and benthic substrata (bottom habitats) are the two vital parameters which determine the biodiversity (flora and fauna) in this lake, their ecology and physiology.

Hydrology

The lake-mouth is one of the most dynamic features which determines the mixing and circulation of waters, of not only widely varying salinities and dissolved-oxygen, but also of primary production, plankton, biodiversity and fisheries in this lake.

Depending on the width and depth of the lake-mouth, during various seasons (summer, pre-monsoon, monsoon and post-monsoon), the salinity in the lake varies from zero during the monsoon to about 52 ppm (hypersaline) (Raman *et al.*, 1975), a very wide range indeed, for biodiversity to adjust to, particularly the sessile and sedentary species. Several interesting species, amazingly euryhaline, adjusted even to hypersaline conditions, are inhabiting this lagoon.

The benthic or the bottom habitat of this lagoon has been broadly classified into three zones (Map.2). One zone in the south, predominantly sandy with a little admixture of mud, a second zone at the northern region, entirely muddy and a third zone in between, with sand and mud in almost equal parts, overgrown with patches of weeds. This third zone is said to be rich in benthic biodiversity (Krishnamurthy, 1971).

ECOLOGICAL CRISES FACING THE PULICAT LAKE

Impact of Lake-Mouth Closure on Hydrology

The lake-mouth which is such a major determining factor for the hydrology, biodiversity and fisheries in this lake, tends to get narrower and shallower during the post-monsoon months (January to September), chiefly due to the accretion of sand, resulting in the formation of a sand-bar across the lake-mouth. As a result, the impact of the ebb (low) and flow (high) tides in the lake tends to be feeble, in the sense that the ingress of sea water into the lake is less, and hence the depth of the water in the lake tends to decline. This has major consequences on the biodiversity and fisheries in this lake. If the sand-bar closes up the lake-mouth completely, as it happened during some severe summers, the lake water gets impounded, gets subjected to evaporation and reaches hypersaline levels. During monsoon floods,

Family ANATIDAE

Lesser Whistling Teal	<i>Dendrosigna javanica</i>
Marbled Teal	<i>Marmaronetta angustirostris</i>
Common Teal	<i>Anas crecca</i>

Family ACEPTRIDAE

Black Winged Kite	<i>Elanus caeruleus</i>
Brahminy Kite	<i>Haliaeetus indus</i>
White-bellied Sea Eagle	<i>Haliaeetus leucogaster</i>
White-backed Vulture	<i>Gyps bengalensis</i>
Marsh Harrier	<i>Circus aeruginosus</i>
Plae Harrier	<i>Circus macrurus</i>
Common Kestrel	<i>Flace tinnunculus</i>

Family CHARADRIIDAE

Golden Plover	<i>Pluvialis apricaria</i>
Little Ringed Plover	<i>Charadrius dubius</i>
Kentish Plover	<i>Charadrius alexandrinus</i>
Spotted Redshank	<i>Tringa erythropus</i>
Marsh Sandpiper	<i>Tringa stagnatilis</i>
Green Sandpiper	<i>Tringa ochropus</i>
Wood Sandpiper	<i>Tringa glareola</i>
Common Snipe	<i>Gallinago gallinago</i>
Temminck's Stint	<i>Calidris temminckii</i>
Ruff and Reeve	<i>Philomachus pugnax</i>

GENERAL TOPICS

RARE / UNIDENTIFIED SPECIES

The following are some species that have been collected in the lake on rare occasions, and some of them could not be identified.

Charybdis cruciata is a marine crab, characterised by the cross-mark on its carapace, comes up occasionally in the shore-seine (*baadi-valai*) catches.

Ranzania laevis, the Lesser Trunk-Fish, normally inhabiting surface waters on the high seas, far away from the coast, was drifted once into the Pulicat Lake, during the heavy cyclone and tidal waves in November, 1984. This specimen was about 22 inches long and 10 inches in height, and brilliantly striped in front, vertically.

Jelly Fish are common in the Pulicat Lake, throughout the year, and fishermen dare not touch them because of the possible stings and consequent

Family CHARADRIIDAE: Plovers, Sandpipers, Snipe

Yellow-wattled Lapwing	<i>Vanellus malabaricus</i>
Grey or Black-bellied Plover	<i>Pluvialis squatarola</i>
Lesser Sand Plover	<i>Charadrius mongolus</i>
Curlew	<i>Numenius arquata</i>
Black-tailed Godwit	<i>Limosa lapponica</i>
Redshank	<i>Tringa totanus</i>
Terek Sandpiper	<i>Tringa terek</i>
Common Sandpiper	<i>Tringa hypoleucos</i>
Knot	<i>Calidris canutus</i>
Eastern Knot	<i>Calidris tenuirostris</i>
Little Stint	<i>Calidris minuta</i>
Curlew Sandpiper	<i>Calidris testacea</i>
Red-necked Phalarope	<i>Phalaropus lobatus</i>

Family RECURVIROSTRIDAE: Stilts, Avocets

Black-winged Stilt	<i>Himantopus himantopus</i>
Avocet	<i>Recurvirostra avosetta</i>

Family BURHINIDAE: Stone Curlews, Thick Knees

Great Stone Plover	<i>Esacus magnirostris</i>
--------------------	----------------------------

Family LARIDAE: Gulls, Terns

Herring Gull	<i>Larus argentatus</i>
Brown-headed Gull	<i>Larus brunnicephalus</i>
Black-headed Gull	<i>Larus ridibundus</i>
Indian Whiskered Tern	<i>Chlidonias hybrida</i>
Black Tern	<i>Chlidonias niger</i>
Gull-billed Tern	<i>Gelochelidon nilotica</i>
Caspian Tern	<i>Hydroprogne caspica</i>
Common Tern	<i>Sterna hirundo</i>
Little Tern	<i>Sterna albifrons</i>
Large Crested Tern	<i>Sterna bergii</i>
Indian Lesser Crested Tern or Fairy Tern	<i>Sterna bengalensis</i>

Odd W. Jacobsen and P.J. Sanjeeva Raj (author) have recorded the following additional birds, during the winters of 2000 to 2005:-

Family PHALACROCORACIDAE

Indian Shag	<i>Phalacrocorax fuscicollis</i>
-------------	----------------------------------

Family ARDEIDAE

Indian Reef Heron	<i>Egretta gularis</i>
-------------------	------------------------

Family CICONIDAE

White Stark	<i>Ciconia ciconia</i>
-------------	------------------------

Family THRESKIORNITHIDAE

Glossy Ibis	<i>Plegadis falcinellus</i>
-------------	-----------------------------

hydrological conditions are just the opposite of what is described above, for the summer months.

Siltation and Substratum

Another major ecological crisis facing the Pulicat Lake is the rapid rate of siltation of the lake. During the Northeast monsoon (October to December), flood water from all catchment (watershed) areas around the lake flows into the lake, erodes top-soil and brings it into the lake, as silt. The rivulets and the Buckingham Canal also bring in heavy loads of silt into the lake. According to Caratini (1994), Pulicat Lake has been getting silted up at the rate of about one metre, per each century. Its average depth of about 3.8 metres, prior to the 17th century,



Source : D.R. Joel

- | | |
|------------------|-------------------|
| 1. Sullurpet | 6. Annamalaicheri |
| 2. Tada | 7. Kuruvithittu |
| 3. Arambakkam | 8. Irakkam |
| 4. Mangodu | 9. Venadu |
| 5. Sunnambukulam | |

when Pulicat Lake served as a natural harbour for the Dutch, is today, reduced to less than a metre. In some areas of the lake, during the monsoon, even one-foot depth of silt gets deposited. Such heavy siltation of the lake not only impedes navigation for fishing, but much more seriously, it buries all benthic (bottom) habitats, flora and sessile fauna, resulting in a large-scale or mass-mortality of biodiversity in the lake, during every monsoon. As a chain-reaction, natural food-chains, their reproductive potential and replenishment of stocks are greatly handicapped in this lake ecosystem, ultimately leading to extensive depletion of biodiversity and fisheries in the lake.

Shrinkage of the Lake

Pulicat Lake has been shrinking not only in its area of waterspread, but also in its depth simultaneously, so that fishes that prefer deeper waters are rapidly dwindling in the lake. More than about 12 to 15 species of fish and one or two species of prawns have either vanished from the lake totally, or are fast declining in populations, since the past 20 years. As per Caratini's (1994) predictions, Pulicat Lake may totally disappear, within another century, being filled up, by silt.

HUMAN ISSUES ON THE LAKE

Developmental Interventions

According to local fishermen, the North Chennai Thermal Power station (NCTPS), located at Ennore in the south, draws its coolant water indirectly from the Pulicat Lake in the south, through the Buckingham Canal, which passes through this lake. Thus, the NCTPS adds to the rapid draining of the lake, even from early summer, onwards.

Aquafarms

Prawn and crab farms set up by private entrepreneurs, along the margins of the Pulicat Lake, also add to the draining of the lake water, right round the year. More than this, these aquafarms, unfortunately discharge untreated effluent waters from the culture ponds, back into the lake, degrading the quality of water and substratum in the lake, and bringing about changes in the benthos (bottom biodiversity), nekton (swimming organisms), including fish. Such polluted effluent water may even incorporate toxic pollutants and pathogenic organisms into the biodiversity, food-chains and into locally consumed and exported seafoods like prawns, crabs and fish.

Salt Pans

During summer, the hypersaline waters in the northern regions of the lake are harnessed to extract manufacture salt, which also contributes to the depletion of lake water as well as to salination of soils (Map 3).

Fishermen vs Fisheries

At least about 52 fishing villages are said to be located all around the Pulicat Lake, harbouring about 30 to 40 thousand fisherfolk, who have been subsisting for generations, exclusively on fishing on this lake. Their population has naturally been growing, but the fishery resources in the lake have been inversely dwindling rapidly, so that there is a severe competition

more tree-coverage, particularly by mangroves, right in the lake, but far away from human habitation, should be tried.

The following is a list of some of the more common waterfowl that one can hope to see on the Pulicat Lake and its bird sanctuaries.

Family PODICIPEDIDAE: Grebes

Little Grebe *Podiceps ruficollis*

Family PELECANIDAE: Pelicans

Spotted-billed Pelican *Pelicanus philippensis*

Family PHALACROCORACIDAE: Cormorants

Cormorant *Phalacrocorax carbo*

Little Cormorant *Phalacrocorax niger*

Darter *Anhinga rufa*

Family ARDEIDAE: Herons, Egrets, Bitterns

Grey Heron *Ardea cineria*

Pond Heron or Paddy Bird *Ardeola grayii*

Cattle Egret *Bulbulcus ibis*

Large Egret *Ardea alba*

Little Egret *Egretta garzetta*

Indian Reef Heron *Egretta gularis*

Night Heron *Nycticorax nycticorax*

Family CICONIDAE: Storks

Painted Stork *Mycteria leucocephala*

Openbill Stork *Anastomus oscitans*

White-necked Stork *Ciconia episcopus*

Family THRESKIORNITHIDAE: Ibises

White Ibis *Threskiornis aethiopica*

Black Ibis *Pseudibis papillosa*

Spoonbill *Platalea leucorodia*

Family PHOENICOPTERIDAE: Flamingoes

Flamingo *Phoenicopterus roseus*

Family ANATIDAE: Ducks, Geese, and Swans

Bar-headed Goose *Anser indicus*

Pintail *Anas acuta*

Common Teal *Anas crecca*

Shoveller *Anas clypeata*

Tufted Duck *Aythya baeri*

Cotton Teal or Quacky Duck *Nettapus coromandelianus*

Family RALLIDAE: Rails, Coots

Indian Moorhen *Gallinula chloropus*

Coot *Fulica atra*

pelicanries of Southeast Asia. This is very ably managed by the Wildlife Division of the Forest Department of Andhra Pradesh, who have developed it as a good educational centre. This sanctuary has been traditionally protected by farmers in villages around the sanctuary, who were enjoying the benefit of the excreta-saturated water of the sanctuary for irrigating their paddy fields, without using any other fertilizers. The actual sanctuary is made up of two adjacent irrigation tanks, totally a waterspread area of about 83 hectares, near the Village Nelapattu in the Doravarisathram Mandal of the Nellore District, in Andhra Pradesh. To reach the Nelapattu Sanctuary, one has to reach Doravarisathram Village on the National Highway 5, about 80 km., south of Nellore or about 95 km., north of the Chennai City, and then take an east diversion on to a country road, for about 1.5 km. The total area of the sanctuary, with the reserve forest, is about 459 hectares. The Check-list of birds at this Nelapattu Bird Sanctuary enumerates about 117 species, inclusive of breeding, wintering water birds as well as land birds; and also the raptors or the predator birds.

In order to conserve the waterfowl on the Pulicat Lake, some of the following may be kept in mind:-

The untreated effluents of the aquafarms may be polluting the lake-bed, bringing about habitat changes and changes in food-chains of these feeding birds.

Increasing paddy cultivation on the mud-flats, in the north may release chemical fertilizers and pesticides, which are detrimental to the habitats, food- chains as well as for the breeding birds.

Capture of juvenile fishes by using bamboo-traps in the northern region, along the SHAR road, may deprive the birds, particularly the pelicans, of their natural food.

Draining the lake waters by the various developmental interventions like the North Chennai Thermal Power Station and by aquafarms, may cut short the period of sojourn for these wintering birds, for sheer dearth of water and food.

In order to provide more sites for birds to rest during their non-breeding seasons, to roost at night and to take shelter during the day-time,

between the escalating fishing pressures and the depelting fishery resources, on this lake.

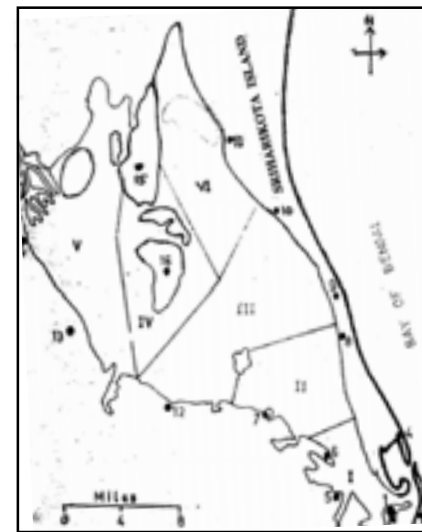
Seafood Exports

Since the 1970s, more than about 34 companies for exporting prawn, mud-crab and fish from Pulicat Lake are set up, right at the Pulicat Town, and this has escalated the over-exploitation of prawns, crabs and fish from this lake, sometimes using even destructive fishing gear and methods.

Non-Fishermen

Being lured by the lucrative trade in prawn exports, several non-fishermen (agricultural labourers) from the distant villages around the Pulicat Lake also have started fishing for prawns on this lake. They come late in the evening, after their farm labour is over, and fish throughout the night, on the lake.

MAP 3. ZONATION OF THE PULICAT LAKE
(1-16 are 'Protected Areas' or Field Stations)



Zone I, II and III Constitute the Southern Region.
Zone IV, V and VI Constitute the Northern Region.

More than adding to the already prevailing fishing pressures from the traditional fishermen on this lake, these non-fishermen practice destructive fishing gear and methods, like drag-nets (*konda-valai*), which destroy both the bottom habitats on which they tread and the fishery stocks, by catching even tiny juveniles.

Hand-Picking by Triba1 Women

Tribal women (*Irulas Yanadies*), living in five hamlets at the southern end of the Pulicat Lake, have been traditionally picking juvenile prawns and mud-crabs, with their hands, while they tread on the lake-bed, in shallow waters. This method, unfortunately, disturbs and destroys the lake bottom habitats, and also it destroys the juvenile prawns and crabs, without giving them a chance to grow.

Obstructing Migratory Fisheries

In a nursery like Pulicat Lake, growing-juveniles need to migrate, but fishermen in the northern regions of the Pulicat Lake, lay fine-meshed stake-nets (*kattu-valai* and *ara-valai*), right across the whole width of the lake, and retain such nets continuously for days together, day in and day out, so that not only all prawn, small or large, are totally filtered, but also, these juveniles are not given a chance to migrate south, along with the tides, to grow, thus practicing a very unscientific and unethical method of prawn-fishing on this lake.

All the above and several other such issues on the Pulicat Lake are escalating both the habitat as well as species destruction in the lake, so that biodiversity in the Pulicat Lake has been dwindling rapidly in the Lake, almost to a vanishing point. Under these formidable ecological and human threats to the Pulicat Lake ecosystem, unless local fishermen are conscientised about these crises facing the lake, and unless they are mobilised by their NGOs, to restore and conserve the habitats and biodiversity, in the lake, assisted by research scientists, students and teachers also, the rich and rare biodiversity of the Pulicat Lake may be totally lost, for our posterity.

This inventory of biodiversity could be used to press forward the demand to get the Pulicat Lake declared as a 'Ramsar Site' for international protection.

MACRO FAUNA: TAXONOMY

Since the chief objective of this Field Guide is to help zoology students to identify and study the brackishwater fauna of the Pulicat Lake, in the field, within the short time of a day or two, only the larger organisms (macro fauna) are described herein.

The most useful part of this taxonomic account is the dichotomous keys provided for their identification, in field. They would enable students not only to make use of the conventional taxonomic keys provided in reference

THE PULICAT BIRD SANCTUARY

The Wildlife Division of the Forest Department of the Andhra Pradesh Government is efficiently managing both the Pulicat Bird Sanctuary as well as the Nelapattu Bird Sanctuary. The Pulicat Bird Sanctuary extends to the whole of the Pulicat Lake in Andhra Pradesh, which may be a waterspread of about 300 sq. km. From October to the following March, several winter-visiting water birds can be seen feeding in different parts of the lake, particularly in the mornings and evenings. The Checklist of birds prepared by the Wildlife Division of the Andhra Pradesh have listed 115 species of birds both water (aquatic) as well as land (terrestrial) birds in the Pulicat Bird Sanctuary. The more important observation spots, according to the Checklist are the following:-

1. The SHAR Road, from Sullurpet to Sriharikota, around the islands Atakanitippa, Venadu and Pernadu, where about 15,000 flamingoes may be seen feeding, in flocks.
2. Tada wharf, about 1.5 km east at the 65th km, on the National Highway 5, from the Chennai City.
3. The Village Bodilingalapadu, at 200 metres east, at the 67th km, on the National Highway 5, from the Chennai city. Herons and Cormorants can be seen breeding on *Ficus* and Neem trees.
4. At the Village Vedurupattu, about 8 km., left of the 91st km., on the National Highway 5, from the Chennai City. One can see Painted Storks, Cormorants, Egrets and Spoonbills breeding,
5. At Mejur near Sullurpet, north of the SHAR Road, a wide variety of water birds will be feeding, and
6. When water recedes into the Kudiri Tank in early summer, one can see a Pandora's Box of diverse birds, foraging for the fast vanishing food organisms.

THE NELAPATTU BIRD SANCTUARY

Whereas the Pulicat Bird Sanctuary is an open feeding ground for water birds wintering on the Pulicat Lake, Nelapattu Bird Sanctuary is chiefly a breeding ground for these birds. This is said to be one of the larger

TURTLES (*CHELONIA*)

Turtles also are more marine forms, but occasionally they stray across the lake-mouth and wander in the deeper parts of the lake, which happen to be more saline. The Green Turtle, *Chelone mydas*, is one such turtle which gets trapped in the shore-seine (*Baadi vala*).

CLASS AVES

WATER BIRDS

Water birds being migratory for food and for breeding, their species diversity and numbers are very variable, according to seasons and feeding grounds, on the Pulicat Lake. Melluish (1965) and Mohapatra and Rao (1991 and 1992), Rao and Mohapatra, (1992) have recorded some rare birds in the northern parts of the Pulicat Lake. The Wildlife Division of the Andhra Pradesh Forest Department maintains excellent records of the water birds of the Pulicat Bird Sanctuary as well as those breeding at the Nelapattu Bird Sanctuary.

Although the diversity and populations of waterfowl that visit and breed on the Pulicat Lake, a major coastal wetland of India, justifies its recognition as another 'Ramsar Site' for international protection, yet it is not yet recognized. This vast wetland is not uniformly populated by waterfowl, but they seem to prefer the northern regions of the lake. This may be for obvious reasons like the shallow, turbid and less saline waters, with vast stretches of mud-flats, paddy-fields, algal-beds and fish nurseries, available in the north. Majority of water birds that visit Pulicat Lake, being waders and swimmers in shallow waters, these feeding birds prefer such ideal habitats that the northern regions of the lake provide, particularly on either sides of the SHAR Road, extending between Sullurpet and Sriharikota, more around the island Atakanitippa. Therefore, if any bird-watcher visits the southern part of the lake, expecting to see water birds, particularly around the Pulicat Town, they are bound to get disappointed. One should go to Sullurpet on the National Highway 5, and go east by the SHAR Road on to the Pulicat Lake, to see feeding flocks of water birds, particularly flocks of flamingoes. If in the southern part of the lake, one must go up north, towards Annamalaicheri on the western margin of the lake to watch birds, early in the morning.

books, but will also help them to construct similar keys for organisms they collect, elsewhere also.

It should be remembered however, that the macro fauna or biodiversity of Pulicat Lake is highly variable, according to seasons, localities and the time spent in field collection. Several marine species, particularly planktonic forms and fishes, from the inshore as well as the offshore waters of the adjacent Bay of Bengal with which the Pulicat Lake is connected, may straggle into the lake, stay therein for a shorter or longer duration. When one comes across such species, they could be added to the lists provided herein, and fit them into the taxonomic keys. Therefore, this list of macrofauna is not necessarily complete, for all times. A very wide diversity of macro fauna is bound to appear in this rich and vast lake, and the lists provided herein are only basic and rather of more common species, that occur in the lake. However, constant search should be made to collect new migrants and settlers, which would only go to show how resourceful Pulicat Lake is.

PHYLUM ANNELIDA

CLASS ARCHIANNELIDA

Archiannelids are the most primitive among annelids. They are rare and hence it is interesting that some species of archiannelids are common on the coast of the Bay of Bengal, in India, and some are even endemic (exclusive to this geographical region alone, in the whole world). Archiannelids are small and pale worms, about a centimetre or less in length, found buried upto 10-15 centimetres deep, in sandy beaches. They live in spaces in between sand-grains (interstitial), usually in the inter-tidal zone, (between the lowtide and midtide levels. Such fauna is called the interstitial fauna or the meiofauna.

Pulicat Lake amazingly has six species of these rare archiannelids, collected and described by Kalyani (1988), from the sandy beaches, around the southern margin of the lake-mouth. They are *Dinophilus gyrotilatus*, *Polygordius madrasensis*, *Polygordius uroviridis*, *Protodrilus pierantonii*, *Protodrilus, indicus* and *Saccocirrus minor*.

Method of Collection and Study

A 'corer', made out of a metal tube of about 5 cm in diameter and about 50 cm in length, is used to collect a core sample of sand. The tube is split lengthwise into two halves, which are so hinged as to open and close. This corer is thrust into sandy substratum to a desired depth, the sand around

it removed, so as to close the bottom of the corer, with a metal plate. Then the corer is taken out and the two halves are opened out to collect the cylindrical core of sand, which can be sliced across, into segments of desired lengths (depths). Each segment of the core sample is then churned vigorously, in a 100 ml solution of 7% Magnesium Chloride, to dislodge interstitial organisms from sand grains and to narcotise them so that they can float in the solution. If this solution is filtered through a nylon net of about 64µ mesh-size, interstitial organisms can be collected on the nylon net. They can be preserved in 5% formalin and studied under a stereoscopic binocular microscope. For better contrast, they can be stained with Rose Bengal (0.1 grams of stain, added to 200 ml of 5% formalin).

CLASS POLYCHAETA

Polychaetes or bristle-worms are common in shallow inshore waters as well as in brackishwaters. 25 species of polychaetes belonging to 13 families (exclusive of meiofauna that lives in spaces between sand-grains in sandy substratum) are recorded and described from this lake by Sunder Raj and Sanjeeva Raj (1984).

Methods of Collection and Study

Since most species of polychaetes live buried in substratum, they are collected by sieving samples of sand or sandy-silt or even dark ooze, from the lake. Those that live in crevices of oyster-shells can be collected by splitting apart clusters of oyster-shells.

Brackishwater polychaetes from Pulicat Lake can be maintained alive in a laboratory, by keeping them in wide-mouthed plastic containers of about five-litre capacity, with natural substratum from where the worms are collected, and with water of about 25 to 35 ppm, under constant aeration.

The stocking density may be about 10 worms per one litre of water.

Polychaetes constitute important links in the food-chains of Pulicat Lake and they are the common food items for several species of top carnivores like fishes and birds, in the lake.

TAXONOMIC KEYS FOR THE IDENTIFICATION OF POLYCHAETES

The following taxonomic key is extracted from Sunder Raj and Sanjeeva Raj (1984)

KEY FOR IDENTIFICATION

a) KEY TO IDENTIFY ERRANTIA AND SEDENTARIA

Body vermiform, undivided into two regions; all segments nearly alike, Free living.....ERRANTIA

CLASS AMPHIBIA – FROGS AND TOADS

Pulicat Lake, being a salt water lake, frogs cannot tolerate such high salinities. However, during the Northeast monsoon season (November – December), when the whole lake is inundated by flood water, *Rana crassa* may inhabit the lake and also its surrounding ponds and puddles. In fact, this frog may even breed in Pulicat Lake, since its tadpoles have been collected from the lake. Most of the year, this frog may inhabit the less saline ponds around the lake.

This is an interesting frog physiologically, because in order to keep its blood and body fluids isotonic to the surrounding salt water, it feeds on crabs, releasing their calcium content into the blood, just to keep it hypertonic. A similar frog, *Rana cancrivora*, called the Crab-eating Frog, lives in the lagoons of Malaysia. This physiological identity of *Rana crassa* needs to be investigated, in depth.

The common toad, *Bufo melanostictus* can be seen at night, hopping along the margins of the lake, on the inter-tidal zone and on mudflats.

CLASS REPTILIA

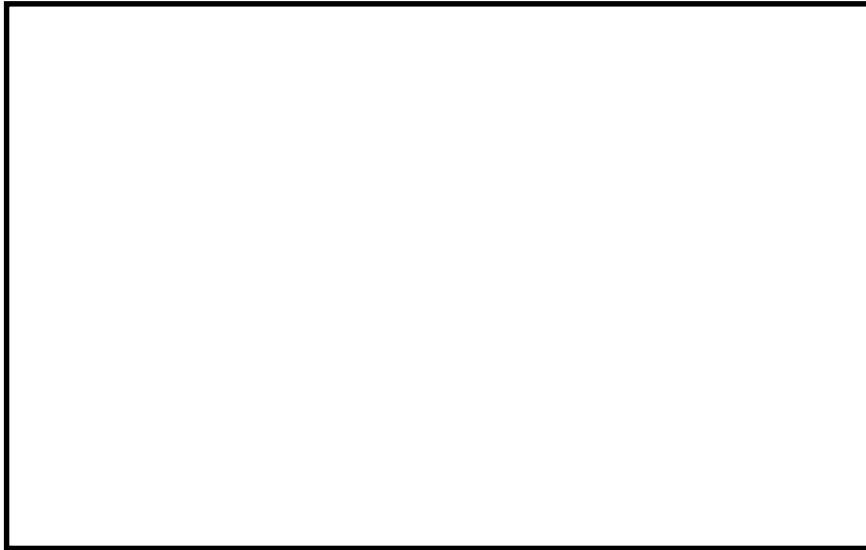
SNAKES (*OPHIDIA*)

The commonest snake in Pulicat Lake is the Dog-faced Water Snake, *Cerberus rhynchops*. It is more often seen at night, under the dead algal mats, thrown ashore. This snake can be reared in fresh water aquaria, feeding it with trash-fish and frogs. It is a live-bearer and will breed in freshwater also. This is said to be a harmless snake.

Pelamis platurus, the Yellow and Black Sea Snake, occurs occasionally in the lake also, particularly in the shore-seine (*Baadi valai*) catches. The dorsum is dark and the lower parts are yellow and the tail is flattened, from side to side.

The Hook-nosed Sea Snake, *Enhydrina schistosa* also occurs in the shore-seine (*Baadi valai*) catches. It is dark grey with white streaks at the sides and has a laterally flattened tail. It has venom but it seldom bites, and the bite also is not effective, since it is rear-fanged.

PLATE 4



**Openbill Storks in the Nelapattu Sanctuary
(Photo: Odd W. Jacobsen)**



**Diverse, Species of ducks on a marsh
(Photo : Odd W. Jacobsen)**

Body divided into two distinct regions, thorax and abdomen; usually tubicolous.....**SEDENTARIA**

b) KEY TO IDENTIFY FAMILIES OF ERRANTIA

1. Elytra present on a limited number of segments only; the posterior segments carry cirri.....**APHRODITIDAE**
Elytra absent.....2
2. Proboscis armed with four teeth; Prostomium fused with buccal segment; feet uniramous.....**PISIONIDAE**
3. Tentacles four to five; dorsal and ventral cirri foliaceous; setae compound.....**PHYLLODOCIDAE**
Dorsal cirri long and moniliform.....4
4. Head with two pairs of eyes; two or three tentacles; palps present or absent.....**HESIONIDAE**
Proboscis with paragnaths.....5
5. Proboscis armed with a single pair of toothed jaws; tentacles two; parapodia biramous.....**NEREIDAE**
Proboscis armed with two pairs of jaws tentacles four or more; parapodia biramous or sesquiramous.....6
6. Prostomium conical, ringed with four small tentacles; palps absent.....**GYLCERIDAE**
Prostomium distinct and well developed with tentacles and palps; proboscis complex.....**EUNICIDAE**

c) KEY TO IDENTIFY FAMILIES OF SEDENTARIA

1. Body clearly divided into regions.....2
Body not clearly divided into regions; prostomium without tentacles; palps without suckers; dorsal and ventral cirri foliaceous; dorsal and ventral cirri foliaceous; hooded hooked setae.....**SPIONIDAE**
2. Prostomium conical without appendages; probosics unarmed; dorsal and ventral cirri absent.....**CAPITELLIDIAE**
Prostomium not conical.....3
3. Prostomium rimmed with a cephalic plate; anal funnel with cirri. No gills.....**MALDANIDAE**
Prostomium trilobed or hidden.....4

4. Prostomium trilobed, buccal tentacles long and retractile into the mouth; three to four pairs of subulate branchiae inserted on the anterior segments**AMPHARAETIDAE**
 Prostomium hidden; with or without operculum.....5
4. With an operculum; a thoracic membrane; tube calcareous**SERPULIDAE**
 Without operculum; no thoracic membrane; tube membranous.....
**SABELLIDAE**

d) **KEY TO IDENTIFY GENERA AND SPECIES**

FAMILY 1 APHRODITIDAE

Eyes four; prostomium bilobed; three tentacles; dorsal setae stouter than the ventral with bidentate tips; sessile; elytra fringed with small papillae; ventral lamellae conspicuous.....*Harmothoe ampullifera*

FAMILY 2 PISIONIDAE

Presence of two non-serrated buccal spines between the two palps with genital papillae in the 35th segment.....*Pisione complexa*

Absence of buccal spines and palps longer than dorsal cirri of the buccal parapodia.....*Pisionidens indica*

FAMILY 3 PHYLLODOCIDAE

Prostomium with two pairs of tentacles and two pairs of tentacular cirri; proboscis with soft rows of papillae.....*Eteone barantollae*

FAMILY 4 HESIONIDAE

Prostomium with two tentacles; palps absent; proboscis unarmed; paired brown spots on each intersegmental line.....*Hesione intertexta*

FAMILY 5 NEREIDAE

1. Feet uniramous; eyes arranged in a line; dorsal setae absent.....
*Lycastis indica*

Feet biramous.....2

2. Paragnaths present; dorsal cirrus longer and larger than ventral cirrus; no dorsal homogomph falcigerous bristles in posterior feet.....*Nereis chilkaensis*

Paragnaths absent; ventral setigerous lobe bilobed in few segments; jaws with 12 teeth.....*Tylonereis fauveli*

FAMILY 6 EUNICIDAE

1. Tentacular cirri present; tentacles with cirratophores.....

PLATE 3



**White- spotted Shovelnose Ray at the lake-mouth
 (Photo: Author)**



**Lesser Trunk-fish straggled into the lake, during the 1984 cyclone
 (Photo: D. Chandra Mohan)**

S.No.	Class, Order & Species	Common English Name	Local Tamil Name
147.	<i>Periophthalmus koelrewteri</i>	Mud-Skipper	_____
ORDER: PLEURONECTIFORMES			
148.	<i>Pseudorhombus orsius</i> 747, P.259, Pl.49	Large-Toothed Flounder	_____
149.	<i>Platophrys pantherinus</i> 755, P.261, Pl.50	Leopard Flounder	_____
150.	<i>Brachirus orientalis</i> 762, P.263, Pl.50	Oriental Sole	_____
151.	<i>Cynoglossus puncticeps</i> 771, P.264, Pl.51	_____	_____
152.	<i>Cynoglossus semifasciatus</i> P.265	_____	_____
ORDER: MASTACEMBELIFORMES			
153.	<i>Macragnathus aculeatus</i> 777, P.267, Pl.52	Lesser Spiny Eel	_____
ORDER: TETRADONTIFORMES			
154.	<i>Triacanthus brevirostris</i> 795, P.273, Pl.54	Short-Nosed Tripod Fish	<i>Mullaru</i>
155.	<i>Tetradon nigropunctatus</i> 825, P.283	Black-Spotted Blow Fish	_____
156.	<i>Tetradon leopardus</i> 825, P.232	Banded Leopard Blow Fish	_____
157.	<i>Arothron immaculatus</i> 824, P.282, Pl.55	Immaculate Blow Fish	_____
158.	<i>Chelonodon patoca</i> 821, P.282, Pl.55	Gangetic Blow Fish	_____
159.	<i>Gastrophysus lunaris</i> 819, P.280, Pl.55	Green Rough-Backed Blow Fish	_____
160.	<i>Torguinger oblongus</i> 816, P.280, Pl.55	Oblong Blow Fish	_____
161.	<i>Cynoglossus brachycephalus</i> 772, P.265, Pl.51	Short-headed Tongue Sole	_____
162.	<i>Synopterus commersoni</i> 761, P.262, Pl.49	Commerson's Sole	_____
163.	<i>Bothus polylepis</i> 752, P.260, Pl.49	Many-Sealed Flounder	_____
164.	<i>Arothron reticularis</i> 829, P.284, Pl.55	Reticulated Blow Fish	_____
165.	<i>Triacanthus biaculeatus</i> 796, P.273, Pl.54	Hollow Snouted Tripod Fish	_____
166.	<i>Lagocephalus inermis</i> 817, P.280, Pl.55	Smooth Black Blow Fish	_____
167.	<i>Chelonodon fluviatilis</i> 822, P.282, Pl.55	Estuarine Blow Fish	_____
168.	<i>Tetradon lunaris</i> 819, P.280, Pl.55	Green Rough-Backed Blow Fish	_____

-*Diopatra neapolitana*
Tentacular cirri absent.....2
2. Gills present, pectinate; comb setae arranged in middle region of the body.....*Marphysa gravelyi*
Gills absent.....3
3. Gills and eyes absent; feet with wing capillary setae and hooks absent.....*Lumbriconereis simplex*
Hooks present.....*Lumbriconereis polydesma*

FAMILY 7 GLYCERIDAE

Gills inserted on the dorsal edge of the foot; proboscis with four long jaws; Dorsal Setae simple capillary and ventral Setae compound and winged; posterior lobes unequal*Glycera alba*

FAMILY 8 SPIONIDAE

Prostomium conical; bidentate; hooded hooks; gills in anterior segments; anal cup present.....*Nerine cirratulus*

Prostomium rounded; gills pinnate; hooked hooks with four teeth; median anal cirrus present.....*Prionospio krusadensis*

Prostomium rounded, but slightly notched in front and prolonged up to the 3rd segment.....*Polydora ciliata*

FAMILY 9 CAPITELLIDAE

1. Thorax with seven segments; dorsal and ventral hooks begin from tenth segment; gills present in posterior segments.....
.....*Branchiocapitella singularis*
Thorax with more than seven segments.....2

2. Thorax with 11 segments; segments one to five capillary setae; segments six to 11 long hooks; short hooks in the rest *Barantolla sculpta*

FAMILY 10 MALDANIDAE

Head with cephalic plate; anal segment with anal cirri; total segments 19; ocelli present in cephalic plate; median ventral cirrus in caudal funnel stouter than others.....*Euclymene annandalei*

Absence of ocelli in cephalic plate; median ventral cirrus in caudal funnel longer than others.....*Euclymene insecta*

FAMILY 11 AMPHARETIDAE

Thorax 17 segments; gills four pairs and arranged on either side of the first two segments.....*Ampheteis gunneri*

FAMILY 12 SABELLIDAE

Thorax six segments; no pickaxe-shaped setae; branchiae four pairs.....*Laonome indica*

Thorax seven segments; presence of pickaxe-shaped setae; Branchiae six pairs.....*Potamilla leptochaeta*

FAMILY 13 SERPULIDAE

Operculum compound; funnel shaped with a crown of horny spines; radii of operculum sharp with more than one pair of lateral processes ...*Hydroides norvegica*

Ecological Notes

The distribution of polychaetes in Pulicat Lake is determined chiefly by the salinity of water and the nature of substratum. There are about 17 species occurring in the more saline regions, 14 in brackishwaters, and only five in more freshwater regions, in the lake. Species like *Nereis chilensis*, *Marphysa graveleyi* and *Heteromastus similis* are widespread, in diverse habitats in the lake. Substratum-wise, sandy areas have about eight species, sandy-silt about six species, with rather dense populations, weedy zones have about four species, chiefly *Marphysa graveleyi*, and crevices of oyster-shells have about eight species.

Crevices of oyster-shells harbour the following species of polychaetes in Pulicat Lake, of which the first two are the most common ones:-

Polydora ciliata, *Hydroides norvegica*, *Hesione intertexta*, *Harmathoe ampullifera*, *Amphiteis gunneri*, *Laonome indica*, *Diapatra neopolitana* and *Nereis- chilensis*.

Interstitial habitats harbour about 12 species of polychaetes, belonging to eight genera. Eight of these species are from sandy, and six are from sandy-silt habitats. Interstitial polychaetes are microscopic and hence are not covered in this description.

More recently, two more species of polychaetes, *Pectinaria abranchiata* and *Harmathoe imbricata* have been collected from roof-tile habitats, laid in shoal waters of the Pulicat Lake. They are not described by Sunder Raj and Sanjeeva Raj (1984).

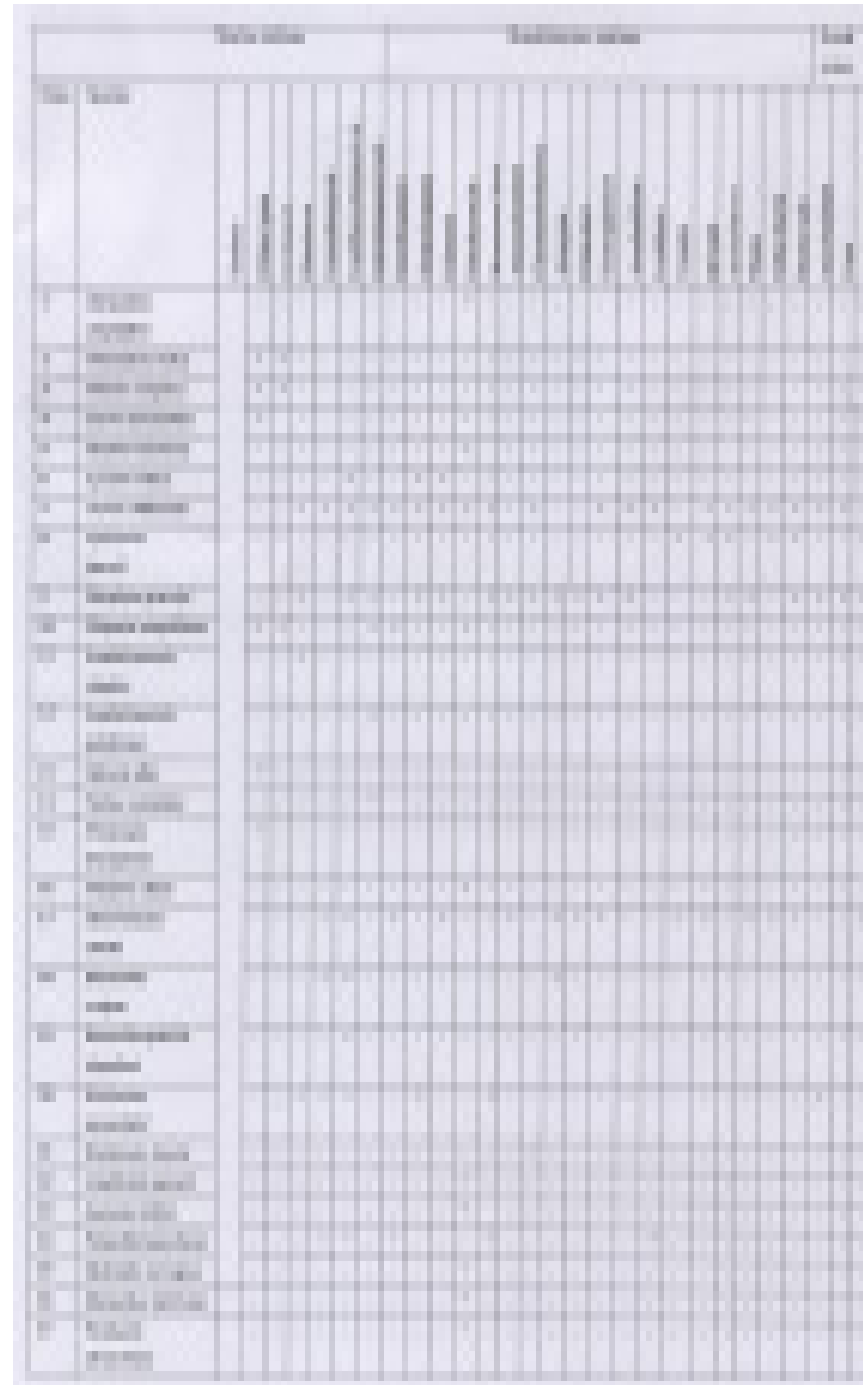
Harmathoe imbricata can be distinguished from *H. ampullifera* by the absence of nepridial papillae and *ventral lamellae*.

Pectinaria abranchiata, belonging to the family Amphictinidae, is a tubicolous polychaete, with the body divided into thorax, abdomen and caudal regions and with the total absence of branchiae.

S.No.	Class, Order & Species	Common English Name	Local Tamil Name
124.	<i>Gobius madraspatensis</i> P.235	————	————
125.	<i>Oligolepis acutipinnis</i> 689, P.235, Pl.45	Pointed Finned Goby	————
126.	<i>Oxyurichthys tentacularis</i> 687, P.237	Tentacle Goby	————
127.	<i>Pseudoapocryptes lanceolatus</i> 704, P.242	Pointed Tailed Goby	————
128.	<i>Platycephalus scaber</i> 730, P.251, Pl.48	Rough Flatfish	————
129.	<i>Gymnapistes niger</i> 708, P.245, Pl.47	Black Smooth Stingfish	————
130.	<i>Pterois volitana</i> 711, P.245, Pl.47	Winged Firefish	————
131.	<i>Minous monodactylus</i> 728, P.251, Pl.48	Grey Goblin fish...	————
132.	<i>Lutjanus johnei</i> 380, P.135, Pl.55	Mosses Perch	————
133.	<i>Lutjanus Kasmira</i>	Blue and Yellow Snapper	————
134.	<i>Ambassis dayii</i> 282, P.107, Pl.17	Day's Glassy Perchlet	————
135.	<i>Gerrus oyena</i> 414, P.144, Pl.28	Lined Silver Bidy	————
136.	<i>Gerrus filamentosus</i> 411, P.143, Pl.28	Long-Rayed Silver Bidy	————
137.	<i>Gerrus oblongus</i> 412, P.143, Pl.28	Oblong's Silver Bidy	————
138.	<i>Gobius cristatus</i> 687, P.236, Pl.45	Small Scaled Goby	————
139.	<i>Caranx armatus</i> 353, P.127, Pl.22	Armed Trevally	————
140.	<i>Caranx Calla</i> 347, P.126, Pl.23	Golden Scad	————
141.	<i>Zeus insidiator</i> 416, P.145, Pl.27	Slender Barred Pony fish	————
142.	<i>Teuthis vermiculata</i> 621, P.210, Pl.41	Vermiculated Spine foot	————
143.	<i>Carangoides praeustes</i> 348, P.126, Pl.23	Brown-Backed Trevally	————
144.	<i>Mugilogobius valiguwa</i> 701, P.241, Pl.46	Mullet-Headed Goby	————
145.	<i>Psettus argenteus</i> 490, P.166, Pl.33	Silver Boat fish	<i>Moolen</i>
146.	<i>Scatophagus argus</i> 500, P.166, Pl.34	Spotted Butterfly	<i>Pulli Ilethi</i>

S.No.	Class, Order & Species	Common English Name	Local Tamil Name
101.	<i>Sciana dussumieri</i> 446, P.153	Dussumieri's Jewfish	————
102.	<i>Sciana russeli</i> 444, P.153	Russel's Jewfish	————
103.	<i>PlatyGLOSSUS dussumieri</i> P.193	————	————
104.	<i>PseudosCARUS ghobban</i> 581, P.196	Flame Parrot fish	————
105.	<i>ParupENEUS indicus</i> 484, P.164, Pl.32	Indian Goat fish	<i>Kal Makharai</i>
106.	<i>UpENEUS tragula</i> 477, P.162	Black Tipped Goat fish	————
107.	<i>Monodactylus argentiUS</i> 490, P.166, Pl.33	Silver Bat fish	<i>Moolen</i>
108.	<i>Sparus berda</i> 475, P.161	Black Bream	————
109.	<i>Ephippus orbis</i> 496, P.168, Pl.33	Spade fish	<i>Thirali</i>
110.	<i>Platax pinnatus</i> P.169	Bat fish	————
111.	<i>Drepane punctata</i> 499, P.169	Spotted Bat fish	<i>Painthi</i>
112.	<i>Tilapia mossambica</i> 519, P.176, Pl.36	Tilapia	<i>Jilebi</i>
113.	<i>Siganus oramin</i> 619, P.209, Pl.41	White Spotted Spinefoot	————
114.	<i>Siganus spinus</i> 618, P.209, Pl.41	Marbled Spinefoot	————
115.	<i>Siganus javus</i> 620, P.209, Pl.41	Streaked Spinefoot	————
116.	<i>Acanthurus bleekeri</i> 628, P.213	Bleeker's Lined Surgeonfish	————
117.	<i>Acentrogobius cyanosmos</i> P.24	————	————
118.	<i>Acentrogobius ornatus</i> 700, P.241	Ornate Goby	————
119.	<i>Acentrogobius reichiei</i> P.140	————	————
120.	<i>Acentrogobius viridipunctatus</i> 697, P.240, Pl.46	Green Spotted Goby	————
121.	<i>Ctenogobius criniger</i> P.236	————	————
122.	<i>Glossogobius biocellatus</i> 693, P.238, Pl.46	Two Spot Goby	————
123.	<i>Glossogobius giurus</i> 694, P.239, Pl.46	Bar-Eyed Goby	<i>Uluvai</i>

DISTRIBUTION OF POLYCHAETES IN PULICAT LAKE



CLASS HIRUDINEA

Leeches in Pulicat Lake are represented by only the fish-leeches (Family Piscicolidae), which are all ectoparasites on fishes or turtles. The three fish-leeches known from the Pulicat Lake are *Ozobranchus branchiatus*, *Pterobdella amara* and *Zeylanicobdella arugamaensis*.

TAXONOMIC KEYS FOR IDENTIFICATION

1. Eleven pairs of dendritic gills at the sides of abdomen*Ozobranchus branchiatus*
Gills absent.....2
2. Anterior part of abdomen with wing-like lateral expansions*Pterobdella amara*
Wing-like expansion absent, but pairs of pulsatile vesicles present on the sides of abdomen*Zeylanicobdella arugamaensis*

Ecological Notes

1. *Ozobranchus branchiatus*, was collected and described by Sanjeeva Raj (1966) and Sanjeeva Raj and Penner, (1962). These leeches are about 2 to 9 mm in length, pale yellow in colour. The most distinguishing character is the presence of seven pairs of digiti form gills at the sides of the abdomen, which are more obvious when the leeches are put into water or formalin. These very rare and interesting leeches are ectoparasites on the Green Turtle (*Chelone mydas*), usually on the plastron.

2. *Pterobdella amara*, was collected from the Pulicat Lake from the gums (below the upper lip) of the Sting Ray (*Trygon sephen*) and was described by Jayadev Babu (1967) and by Sanjeeva Raj, *et al.* (1977).

These are 15 to 20 mm long, dark leeches, with a flat body and with lateral wing-like expansions of the anterior part of abdomen, but with no lateral pulsatile vesicles. Even a day after the death of the host, these leeches were found alive, strongly attached to the mouth region of the host.

3. *Zeylanicobdelle arugamaensis* are small and slender leeches of about 3 to 10 mm in length, without gills or wing-like expansions at the sides of the abdomen, but with pulsatile vesicles. Jayadev Babu (1967) collected them from the chin and the ventral opercular regions of the Canine Catfish (*Plotosus canius*), and the anatomical details were described by Sanjeev Raj *et al.* (1977). In live-condition, these leeches are olive-green in colour, with dark spots all over, and the posterior sucker has light-brown radial bands.

S.No.	Class, Order & Species	Common English Name	Local Tamil Name
79.	<i>Anabas scandens</i> 661, P.226	Climbing Perch	<i>Kovaiyan</i>
80.	<i>Etroplus suratensis</i> 521, P.177	Banded Etroplus	<i>Sethal Kenda</i>
81.	<i>Etroplus maculatus</i> 520, P.177	Spotted Etroplus	<i>Kenda</i>
82.	<i>Ambassis urotaenia</i> 284, P.107, Pl.17	Banded-Tail Glassy Perchlet	————
83.	<i>Epinephalus lanceolatus</i> 297, P.111	Grouper	<i>Komeri Kelavan</i>
84.	<i>Serratus tumilabris</i> P.105	————	————
85.	<i>Pelatus quadrilineatus</i> 314, P.115, Pl.20	Trumpeter Perch	————
86.	<i>Alectis indica</i> 341, P.125, Pl.22	Indian Thread-finned Trevally	————
87.	<i>Caranx carangus</i> 362, P.129, Pl.23	Black-Tailed Trevally	————
88.	<i>Caranx ire</i> 348, P.126	Brown-Backed Trevally	————
89.	<i>Citula armata</i> 353, P.127	Armed Trevally	————
90.	<i>Scomberoides tala</i> 365, P.130	Deep Queen Fish	<i>Tol Para</i>
91.	<i>Scomberoides lysan</i> 363, P.130	Leather Skin	<i>Katta</i>
92.	<i>Trahcinottus blochii</i> 368, P.130	Bloch's Dart	<i>Kutuli</i>
93.	<i>Lutjanus vitta</i> 391, P.137	Olive-Striped Snapper	————
94.	<i>Nemipterus tolu</i> P.140	————	————
95.	<i>Leiognathus blochii</i> 421, P.144	Short Nosed Pony fish	————
96.	<i>Leiognathus equaalus</i> 420, P.146, Pl.27	Greater Pony fish	————
97.	<i>Leiognathus insidiator</i> 416, P.145	Slender Barred Pony fish	————
98.	<i>Pomadasys maculatus</i> 429, P.148, Pl.29	Spotted Grunter	————
99.	<i>Plectorynchus niger</i> 437, P.151	Black Sweetlip	————
100.	<i>Pseudosciana diacanthus</i> 447, P.153, Pl.28	Two-Spined jewfish	<i>Kopayen</i>

S.No.	Class, Order & Species	Common English Name	Local Tamil Name
56.	<i>Lutjanus quinquelinearis</i> 390, P.135	Blue and Yellow Snapper	————
57.	<i>Ambassis gymnocephalus</i> 285, P.107	Naked-Head Glassy Perchlet	————
58.	<i>Apogon nigripinnis</i> P.120	————	————
59.	<i>Therapon puta</i> 316, P.116	Small-Scaled Banded Gunter	<i>Kove Kitchan</i>
60.	<i>Therapon jarbua</i> 317, P.116	Crescent Perch	<i>Palin Kitchan</i>
61.	<i>Pristopoma dussumieri</i> 427, P.147	Banded Grunter	————
62.	<i>Gerrus setifer</i> 410, P.143	Black Tipped Silver Bidy	<i>Uduvan</i>
63.	<i>Lethrinus nebulosus</i> 462, P.158, Pl.31	Starry Pin-Faced Bream	<i>Pulli</i> <i>Vellameen</i>
64.	<i>Chrysophrys datnia</i> 476, P.162	Japanese Silver Bream	<i>Karuppu</i> <i>Mattavan</i>
65.	<i>Teuthis concatanata</i> P.209	————	————
66.	<i>Sciaena coiter</i> P.151	————	————
67.	<i>Caranx affinis</i> 345, P.126	One-Finlet Scad	————
68.	<i>Chorinemus meadetta</i> 364, P.130	Silver Queen Fish	————
69.	<i>Leiognathus ruconius</i> 415, P.144	Deep-Bodied Pony fish	<i>Kavel</i>
70.	<i>Leiognathus fasciatus</i> 419, P.145	Banded Pony fish	————
71.	<i>Sillage sihama</i> 334, P.121	Silver Whiting	<i>Kilanganan</i>
72.	<i>Platycephalus puctatus</i> 736, P.253	Spotted Flat head	<i>Griyal</i>
73.	<i>Platycephalus insidiator</i> 735, P.253	Indian Flat head	————
74.	<i>Gobius gymnocephalus</i> P.232	————	————
75.	<i>Gobius griseus</i> 696, P.239	Grey Goby	————
76.	<i>Aprocryptus serparaster</i>	————	————
77.	<i>Boleophthalmus bodardii</i>	————	————
78.	<i>Trypauchen vagina</i> 707, P.243	Burrowing Goby	————

PHYLUM ARTHROPODA

CLASS CRUSTACEA

Crustaceans constitute the most dominant group of arthropods in aquatic ecosystems. They have a very high biological diversity, admirably adapted to their ecological niches, from microscopic planktonic crustacean larvae and adults like copepods to larger prawns, lobsters and crabs.

Pu1icat Lake also has a rich and diverse planktonic crustaceans and since they are microscopic, they are not described herein.

Crustaceans constitute the chief food-chains, much sought after by almost all higher organisms, including humans. Therefore, crustaceans constitute a vital component of the food-chains, in an aquatic ecosystem. Larger forms like shrimp, prawn, lobster and crab are even commercially cultured, for local as well as for export markets.

SUB-CLASS CIRRIPIEDIA

Cirripeds are exclusively saline forms. Cirripeds or barnacles are all sessile in their adult stage, attached to objects in brackish or sea water. There are chiefly two kinds of barnacles, Goose-Barnacles with a peduncle, and Rock-Barnacles, without a peduncle; Their bodies are covered with calcareous plates, a dorsal median unpaired carina, and two pairs of tergum and scutum, which are of great taxonomic value.

Cirripeds do not constitute major food-chains, but they are of great importance as biofoulers, encrusting to submerged parts of boats, ships, wharfs, piles, jetties and most important, to underwater pipelines, chocking the interior of coolant water pipes in power plants. Some of them are epizoic on oysters, crabs and turtles *etc.*

KEY TO THE IDENTIFICATION OF CIRRIPEDES

1. Pedunculate (*Goose Barnacles*) Lepadomorpha.....2
Non-pedunculate (*Sessile*) (*Rock Barnacles*) Balanomorpha.....5
2. Peduncle short*Conchoderma virgatum*
Peduncle long3
3. All valves (tergum, scutum and carina) present..... *Octolasmis warwickii*
One or two valves absent..... 4

4. Tergum absent.....*Octolasmis cor*
Tergum and Carina absent.....*Octolasmis angulata*
5. Small, pyramidal, circular at base and numerous.*Balanus amphitrite*
Large, low and dome-like, oval at base and few.....6
6. Orifice narrow and oval with entire margins.....*Chelonobia patula*
Orifice large, polygonal with toothed margins.....*Chelonobia testudinaria*
Concoderma virgatum, with a Y-shaped scutum is*forma hunteri*.
Octolasmis cor, with large scutum bifid at base is Var. A, scutum large but not bifid is Var. B, and scutum thin and linear is Var. C.

SUB-CLASS MALACOSTRACA

ORDER ISOPODA

Boat-lice (*Ligia* sp.) are very commonly seen, running round actively, in plank boats. They look like half-grown cockroach nymphs, dark-grey in colour, hiding within the crevices of the boat

Cirolana sp., are much smaller and white isopods, with distinct dark eyes, that can be seen crawling slowly amidst biofoulers on oyster shells, or on any hard substratum in brackishwaters.

1. Dark-grey, moving actively in plank boats.....*Ligia exotica*
Tiny white forms, with distinct dark eye- spots, living amidst biofoulers
..... *Cirolana fluviatitiis*

ORDER AMPHIPODA

Sand-hoppers or Amphipods are rather common in Pulicat Lake, living in the midst of bottom vegetation, amidst oyster shells and on silty or clayey substrata, all over the lake. They constitute the food of several species of fish and of birds. Amphipods in the Pulicat Lake may belong to the genus *Corophium*. It is not only that the species is not established, but it is possible that several genera and species may be existing, but not studied so far, taxonomically.

ORDER DECAPODA : SUB ORDER NATANTIA

PENAEID PRAWNS

Penaeid prawns constitute a major fishery in Pulicat Lake. Prawns being highly priced and exported item, the whole fishing pressure in Pulicat Lake is chiefly for prawns. Not only traditional fishermen but also non-fishermen (agricultural labourers) and tribals are, all the time, engaged in

S.No.	Class, Order & Species	Common English Name	Local Tamil Name
38.	<i>Hyporhamphus unifasciatus</i> 205 (a), P.74	Silver Lined Half Beak	_____
ORDER: SYNGNATHIFORMES			
39.	<i>Syngnathus cyanospilos</i> P.82	_____	_____
ORDER: CYPRINODONTIFORMES			
40.	<i>Applocheilus blochii</i> 234, P.85	Lesser Top Minnow	_____
41.	<i>Oryzias melastigma</i> 232, P.85	Estuarine Top Minnow	_____
42.	<i>Haplochilus</i> sp.	_____	_____
ORDER: MUGILIFORMES			
43.	<i>Mugil cunnesius</i> 255, P.93	Round Head Mullet	_____
44.	<i>Mugil jerdoni</i> P.93	_____	_____
45.	<i>Mugil dussumieri</i> 256, P.93	Dussumieri's Mullet	_____
46.	<i>Mugil cephalus</i> 251, P.92, Pl.16	Grey Mullet	<i>Madava</i>
47.	<i>Mugil bornensis</i> 263, P.94	Borneo Mullet	_____
48.	<i>Sphyraena obtusata</i> 247, P.90, Pl.16	Blunt-Jawed Sea-Pike	_____
49.	<i>Sphyraena jello</i> 249, P.91, Pl.16	Giant Sea-Pike	<i>Cheela</i>
50.	<i>Atherina melanostigma</i>	_____	_____
ORDER: POLYNEMIFORMES			
51.	<i>Polynemus tetradactylus</i> 266, P.96	Four-Thread Tussel Fish	<i>Kala Meen</i>
ORDER: OPHIOCEPHALIFORMES			
52.	<i>Ophiocephalus puctatus</i> 276, P.100, Pl.17	Green Snakehead	<i>Koruvai</i>
ORDER: PERCIFORMES			
53.	<i>Lates calcarifer</i> 279, P.106, Pl.20	Giant Perch	<i>Koduva</i>
54.	<i>Serranus sexfasciatus</i> P.110	_____	_____
55.	<i>Lutjanus argentimaculatus</i> 381, P.135	Red Snapper	<i>Shankara</i>

S.No.	Class, Order & Species	Common English Name	Local Tamil Name
19.	<i>Thrissocles purava</i>	_____	_____
ORDER: SCOPELIFORMES			
20.	<i>Saurida tumbil</i> 101, P.37, Pl.10	Greater Lizard Fish	<i>Nai Meen</i>
ORDER: CYPRINIFORMES			
21.	<i>Ophichthys boro</i> P.68	_____	_____
22.	<i>Macrones gulio</i> 154, P.55, Pl.9	Long-whiskered Cat Fish	_____
23.	<i>Macrones vittatus</i> 156, P.56, Pl.10	Striped Dwarf Cat Fish	_____
24.	<i>Arius jello</i> 153, P.55, Pl.9	Small-Eyed Cat Fish	_____
25.	<i>Barbus dorsalis</i> 115, P.43, Pl.8	Long-Snouted Barb	<i>Kendhai</i>
26.	<i>Esomus danricus</i> 108, P.42, Pl.7	Flying Barb	_____
27.	<i>Puntius sophore</i> P.43	_____	_____
28.	<i>Plotosus anguillarlis</i> 139, P.51, Pl.10	Strpied Cat Fish-Eel	<i>Kandal Keluthi</i>
29.	<i>Ployosus canius</i> 138, P.51, Pl.10	Canine Cat Fish	<i>Irung Keluthi</i>
ORDER: ANGUILLIFORMES			
30.	<i>Anguilla bengalensis</i> 158, P.59	Long Finned Eel	<i>Pulli Vilangu</i>
31.	<i>Thyrsoidea macrura</i> 163, P.60, Pl.12	Giant Morays	_____
32.	<i>Muraenosox cinereus</i> 178, P.64, Pl.12	Silver Conger Eel	_____
33.	<i>Anguilla bicolor bicolor</i> 157, P.57, Pl.12	Level Finned Eel	_____
ORDER: BELONIFORMES			
34.	<i>Tylosurus strongilura</i> 201, P.73, Pl.13	Round Tailed Alligator Gar	<i>Pambu Mural</i>
35.	<i>Hemiramphus contori</i> P.73	_____	_____
36.	<i>Hemiramphus xanthopterus</i> 204, P.74	Red-Tipped Half Beak	_____
37.	<i>Strongilura crocodilus</i> 200, P.72	Fork Tail Alligator Gar	_____

catching prawn of all sizes indiscriminately, day in and day out, employing even destructive gear (nets) and methods, all for the exportable prawn. Of the two exportable species of prawns, the White Prawn (*Penaeus indicus*) is plenty in Pulicat Lake, which happens to be an ideal nursery for this species. The Tiger Prawn (*Penaeus monodon*) which grows to larger size than the white, is also available in the lake, but is declining in numbers.

There are about 12 species of penaeid prawns in the Pulicat Lake, of which seven species belong to the genus *Penaeus* and five belong to the genus *Metapenaeus*. The following taxonomic account of these prawns is based on studies by Paul Raj (1976).

TAXONOMIC LIST OF PRAWNS IN PULICAT LAKE

Genus *Penaeus*

Species 1. *Penaeus indicus*. White Prawn (*Vellera*, in Tamil)

2. *Penaeus monodon*. Tiger Prawn (*Kotera*, *Karuppera*)

3. *Penaeus semisulcatus*. Green Prawn (*Pasera*)

4. *Penaeus canaliculatus*. Striped Prawn (*Variera*)

5. *Penaeus japonicus*. Kuruma Prawn (*Variera*)

6. *Penaeus latisulcatus*. (*Colour era*)

7. *Penaeus merguensis*. Banana Prawn (*Porera*)

Genus *Metapenaeus*

Species 1. *Metapenaeus monoceros*. Speckled Prawn (*Poochera*)

2. *Metapenaeus dobsoni*. (*Chamakera* or *Kalakera*)

3. *Metapenaeus affinis*. (*Poochera*)

4. *Metapenaeus brevicornis*. Yellow Prawn (*Manchalera*)

5. *Metapenaeus burkenroadi*.

FAMILY PENAEIDAE

Pleurae of the second abdominal somite overlapping those of the 1st somite; 3rd leg with chela. Last two pairs of walking legs well developed; Gills, numerous with double series of arthrobranches.

KEY FOR THE GENERA

Rostrum, with ventral teeth.....Genus *Penaeus*

Rostrum, without ventral teeth.....Genus *Metapenaeus*

KEY FOR THE SPECIES OF THE GENUS PENAEUS

1. Adrostral carina reaching almost to posterior border of carapace; gastro-frontal carina present..... 2
 Adrostral carina not reaching beyond middle of carapace; gastro-frontal carina absent.....4
2. Telson unarmed.*Penaeus canaliculatus*
 Telson armed, usually with three pairs of spinules..... 3
3. Adrostral sulcus narrower than post-rostral carina; anterior plate of thelycum rounded at apex.....*Penaeus japonicus*
 Adrostral sulcus as wide as post-rostral carina; anterior plate of thelycum bifid at apex.....*Penaeus latisulcatus*
4. Hepatic carina present.....5
 Hepatic carina absent.....6
5. Hepatic carina horizontally straight; 5th pereopod without exopodite*Penaeus monodon*
 Hepatic carina inclined at an angle of 20° antero-ventrally; 5th pereopod with a small exopodite.....*Penaeus semisulcatus*
6. Castro-orbital carina occupying the posterior 2/3 the distance, between hepatic spine and orbital angle; rostral crest may be elevated but not triangular in profile..... *Penaeus indicus*
 Gastro-orbital carina absent, or not reaching hepatic spine, occupying the middle 1/2 the distance between hepatic spine and orbital angle; rostrum has a deltoid basal crest, which is triangular in profile.....
*Penaeus merguensis*

KEY FOR THE SPECIES OF THE GENUS METAPENAEUS

1. Disto-median petasml projections, with fully developed or vestigial apical filament; thelycum of impregnated females usually with white conjoined pads.....2
 Disto-median petasml projections without apical filament; thelycum of impregnated females without conjoined pads.....3
2. Posterior part of rostrum with a distinctly elevated crest; basal spine on male 3rd pereopod simple; apical petasml filaments slender, slightly converging; thelycum with a large anterior and small lateral plates

S.No.	Class, Order & Species	Common English Name	Local Tamil Name
CLASS: ELASMOBRANCHII			
ORDER: LAMNIFORMES			
1.	<i>Carcharinus melanopterus</i> 17, P.7, Pl.1	Black Shark	<i>Perunthalai Surah</i>
ORDER: RAJIFORMES			
2.	<i>Rhynchobatus djeddensis</i> 24, P.10, Pl.2	White-spotted, Ray Shovel-Nosed	<i>Pal Uluvai</i>
3.	<i>Dasyatis sephen</i> 36, P.13, Pl.3	Cow-Tail Ray	<i>Ada Thirukkai</i>
4.	<i>Dasyatis uarnak</i> 42, P.14, Pl.3	Banded Whip-Tailed Sting Ray	<i>Manal Thirukkai</i>
CLASS: TELEOSTII			
ORDER: CLUPEIFORMES			
5.	<i>Sardinella fimbriata</i> 65, P.26, Pl.4	Fringe-Scale Sardine	<i>Salai</i>
6.	<i>Hilsa kanagurta</i> P.25	—————	—————
7.	<i>Ilisha elongata</i> 70, P.27	Slender Shad	<i>Puvali</i>
8.	<i>Anodontostoma chakunda</i> 80, P.30, Pl.6	Short-Nosed Gizzard Shad	—————
9.	<i>Nematolosa nasus</i> 78, P.29	Long-Rayed Bony Bream	<i>Koi Meen</i>
10.	<i>Anchoviella indica</i> 83, P.31, Pl.5	Indian Anchovy	<i>Nethili</i>
11.	<i>Anchoviella commersonii</i> 82, P.31, Pl.5	Commerson's Anchovy	—————
12.	<i>Coilia dussumieri</i> P.30	—————	—————
13.	<i>Elops saurus</i> 52, P.21, Pl.6	Giant Herring	<i>Manna</i>
14.	<i>Megalops cyprinoides</i> 53, P.23, Pl.6	Tarpon	<i>Marua</i>
15.	<i>Anchoviella bengalensis</i> P.31	—————	—————
16.	<i>Anchoviella heteroloba</i> P.31	—————	—————
17.	<i>Kowala coval</i> 55, P.24, Pl.4	White Sardine	<i>Vellai Suda</i>
18.	<i>Thrissocles dussumieri</i> 91, P.33, Pl.5	Dussumieri's Anchory	—————

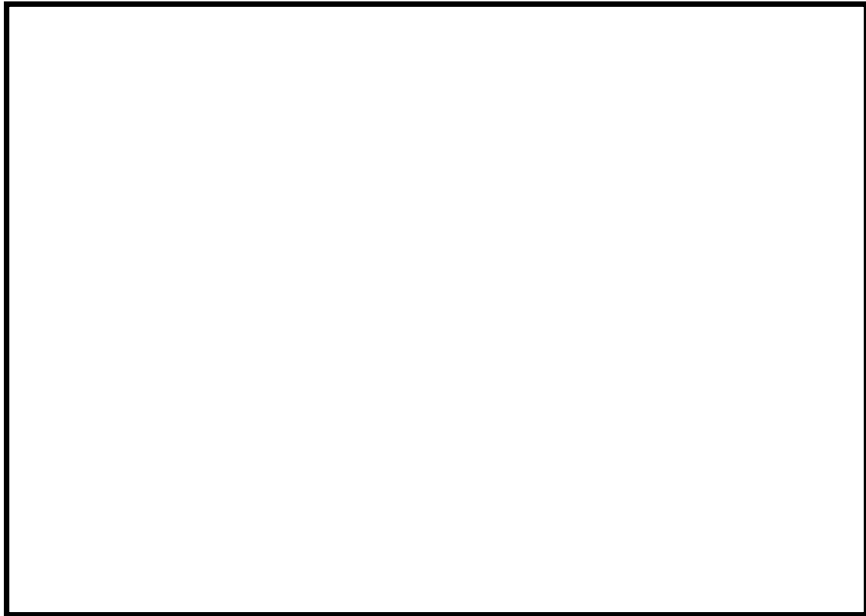


FIG. 4

Explanation of characters of the bony fishes, Class Teleostomi.

- a. – General external anatomy.
- b. – Additional characters of the head.
- c. – Structures of a gill component.
- d. – Typical ctenoid scale.
- e. – Typical cycloid scale.
- f. – Inside of roof of mouth showing bones which may bear teeth.
- G – Principal bones which form the skull and gill-coverings

TAXONOMIC LIST OF FISHES RECORDED FROM PULICAT LAKE

The following list of fishes recorded from the Pulicat Lake, is classified according to the reference book, "The Marine and Fresh Water Fishes of Ceylon," by Ian S.R. Munro. The serial number of the fish species, page (P) on which it is described and the plate (Pl) from this book are given below, for each species. For more details, this book may be referred to.

-*Metapenaeus brevicornis*
- Posterior part of rostrum without a distinctly elevated crest; basal spine on male 3rd pereopod long and barbed; apical petasmas not readily visible; anterior thelycal plate tongue like
-*Metapenaeus dobsoni*
- 3. Ischial spine on 1st pereopod distinct.....*Metapenaeus monoceros*
Ischial spine absent.....4
- 4. Branchio-cardiac carina distinct, extending from posterior margin of carapace almost to hepatic spine; anterior thelyca1 plate longitudinally grooved, wider posterior than anteriorly; disto-median petasmas projections crescent- shaped.....*Metapenaeus affinis*
Branchio-cardiac carina feeble or ill-defined; anterior end not exceeding posterior 1/3 of carapace; distal margin of anterior thelycal plate convex to indistinctly triangular; petasma with laminose and strongly diverging disto-median projections.....
.....*Metapenaeus burkenroadi*

Ecological Notes

The White Prawn (*Penaeus indicus*) (*Vellera*, in Tamil) is the commonest penaeid prawn in Pulicat Lake, constituting about 50 to 60% of the total prawn landings, from the lake. It is caught more during the post-monsoon months of December and January, and more so, from the northern regions of the lake. This is a very euryhaline species, tolerating zero to 55 ppm. Average size of these prawns is between 55 to 130 mm long, but maximum growth can be even upto 161 mm. This is an exportable species. Pulicat Lake is an ideal nursery for this species.

The Tiger Prawn (*Penaeus monodon*) (*Kotera*, or *Karuppera* in Tamil, and *Kathambera* for the larger ones from the sea), is the most highly priced prawn from Pulicat Lake, but it constitutes only about 6 to 10% of the total landings from the lake. It is certainly dwindling in numbers in the lake, perhaps due to over fishing as well as due to habitat changes of loss of algal and weedy beds in the lake. Since this species is a fast-growing species, attaining larger sizes than all the other penaeid prawns in the whole world, this is highly coveted for prawn-culture. This species prefers lower salinities like 10 to 20 ppm. Juveniles prefer to attach to green vegetation or algal beds at the bottom, but since such benthic vegetation is being silted up, this species is perhaps declining in Pulicat Lake. The average size is between 70

to 160 mm in Pulicat Lake, and the maximum size may be upto 224 mm and 250 grams, per a single piece.

The Green Prawn (*Penaeus semisulcatus*) (*Pasera*, in Tamil) used to occur all through the year in Pulicat Lake, more so at weedy beds, but perhaps because of the siltation of such beds, and habitat changes, this species is fast declining in Pulicat Lake, almost to a vanishing point.

Some species like *Penaeus canaliculatus* *Penaeus japonicus* and *Penaeus latisulcatus* are more saline forms, occurring only in the region of the lake-mouth, and certain others are restricted to post-monsoon months alone.

Prawn-Fishing

An encircling stake-net called *Suthu-valai* in Tamil is the most common gear and the most efficient as well as an eco-friendly gear (net) used for catching prawn in Pulicat Lake. Usage of this net is a prerogative of the padu fishermen alone, and others cannot use it. This net is laid at sunset and the catches will be emptied right through the night.

Veesu-valai or Cast-net is used anywhere in the lake by anybody, and this also is an eco-friendly method. In the northern regions of the lake, particularly in the Andhra Pradesh, they use *Ara-valai* and *Kattu-valai*, stake-nets which are rather destructive type of nets, with smaller mesh, and laid, day-in-and day-out, continuously, for days together, filtering all juveniles also, not allowing them to migrate, and thus resulting in total depletion of stocks in the lake. This is being objected to by fishermen in the south of the lake.

Tribal (*Yanadi* or *Irula*) women follow a traditional method of hand-picking prawn-juveniles in Pulicat Lake. About six to even twenty of them, in a single file, squat in neck-deep waters, and move forward, picking up juvenile prawns and crabs from the lake bottom. They drop them into a palmyra basket (*part*) tied to their brow, and carried at the back of their head. This is an eco-hostile method of fishing, since these women tread on the lake-bottom and destroy or disturb the bottom habitat, and also since they catch juveniles, not allowing them to grow to sub-adult or adult stages. Until alternate means of livelihoods are provided for these tribal women, one cannot rectify this mismanagement practice.

	Anal spines not forming a separate anterior fin; first vertebra free from skull.....	33
33.	Dorsal and anal fins followed by 5 or more detached finlets.....	
	<i>Order</i> PERCIFORMES (<i>SCOMBROIDFI</i>), p. 218	
	Dorsal and anal fins without series of detached finlets (except where lateral scutes are present).....	34
34.	Suprabranchial organ for accessory air breathing.....	
 <i>Order</i> PERCIFORMES (<i>ANABANTOIDEI</i>), p. 225	
	No accessory air breathing organ.....	35
35.	Mouth much reduced; gill-openings reduced to small pore.....	
	<i>Order</i> PERCIFORMES (<i>CALLIONYMOIDEI</i>), p. 207	
	Mouth with moderate to large gape; gill -openings normally wide...36	
36.	Males with a characteristic denticulated crest on the supraoccipital.....	
	<i>Order</i> PERCIFORMES (<i>KURTOIDEI</i>), p. 228	
	No such crest in either sex.....	37
37.	Bony ridge across cheek, its end articulating with the front edge of the opercle; head armoured with bony plates and many spiny projections....	
	<i>Order</i> PERCIFORMES (<i>COTTOIDEI</i>), p. 243	
	Head not armoured in such fashion.....	38
38.	Ventral fins close together or united, forming a sucking disc.....	
	<i>Order</i> PERCIFORMES (<i>GOBIOIDEI</i>), p. 228	
	Ventral fins moderately far apart, never forming a sucking disc.....	
	<i>Order</i> PERCIFORMES (<i>PERCOIDEI</i>), p. 103	

24. Fresh water species with accessory air-breathing apparatus; depressed head covered with large plate-like scales; ventrals when present, the racic with 6 rays.....*Order* OPHIOCEPHALIFORMES, p. 99
 Marine species without accessory air-breathing apparatus; head naked or with small scales only; ventrals when present, jugular or mental with 1 or 2 rays.....*Order* PERCIFORMES (OPHIDIOIDEI), p. 206
25. Scales present.....26
 Scales absent (or never wholly scaly).....28
26. Scales large and strongly serrated or spinous; head with mucous cavities.....
Order BERYCIFORMES, p. 86
 Scales small and smooth; head without mucous cavities.....27
27. Anal with 7 spines*Order* PERCIFORMES (SIGANOIDEI), p. 208
 Anal with 2 or 3 spines.....
Order PERCIFORMES (ACANTHUROIDEI), p. 210
28. Anterior dorsal spines modified as a movable lure equipped with a terminal organ.....*Order* LOPHIIFORMES, p. 286
 Anterior dorsal spines not modified.....29
29. First dorsal with 2-4 short stout spines.....
Order BATRACHOIDIFORMES, p. 285
 First dorsal with more than 4 spines.....
Order PERCIFORMES (BLENNIOIDEI), p. 200
30. First dorsal fin modified to a sucking disc on upper surface of head.....
Order ECHENEIFORMES, p. 268
 Dorsal fins normal.....31
31. Pectorals very large and divided into 2 portions.....
Order DACTYLOPTERIFORMES, p. 255
 Pectorals moderate and normal.....32
32. A short anterior anal fin of 3 spines; first vertebra firmly attached to skull
Order ZEIFORMES, p. 89

Prawn Exports

Pulicat Town is a major prawn-exporting centre, since the 1970s. Prawn catches landed at the Pulicat fishmarket are bought up by middlemen who advance financial loans to fishermen, or bought by local agents of prawn-exporting companies, stored in ice, either unprocessed or deheaded, peeled and deveined, and sent by refrigerated trucks to prawn-exporting centres, in Chennai and the neighbourhood. Prawn exports at Pulicat Town, have not only brought about considerable socio-economic development among fisherfolk families, but have also introduced severe competition between traditional fishermen and non-fishermen, leading to overfishing, destructive methods of fishing, and thus to rapid depletion of prawn-stocks in the lake, as well as disturbance and destruction of bottom-habitats, which are the natural habitats of prawns.

Prawn Culture

Another impact of this lucrative prawn-export and trade at Pulicat is the multiplication of prawn-farms, all around Pulicat Lake. Quite against the Supreme Court's verdict of prawn farms restricted to beyond the 1000-metre mark, from the Pulicat Lake margins, several farms have come up, within this zone, and they not only drain the lake water for their culture ponds, but worst still, discharge the untreated effluent water from their prawn-farms, back into the same lake, almost at their intake point, polluting their own farms as well as polluting the whole lake, and even disseminating viral infections, if any, from their farms into the lake and to the wild stock of prawn in the lake, thus dangerously spreading the infection into the open waters also.

SUB ORDER REPTANTIA: HERMIT CRABS

KEY TO THE IDENTIFICATION OF HERMIT CRABS

FAMILIES

1. Antennal flagellum ending as a tapering filament Fam: *Diogenidae*
 Antennal filament ending blindly Fam: *Coenobitidae*

GENERA OF DIOGENIDAE

1. Chelipeds equal..... Genus *Clibanarius*
 Chelipeds unequal..... 2
2. Left cheliped larger than right Genus *Dardanus*
 Left cheliped slender and longer than right.....Genus *Diogenes*

SPECIES OF GENUS CLIBANARIUS

1. Eye-stalk shorter than antennal peduncle.....2
Eye-stalk as long as antennal peduncle.....3
2. Inner lower border of cheliped-merus serrated, without bearing spine.....
.....*Clibanarius clibanarius*
Inner lower border of cheliped-merus bears a strong spine.....
.....*Clibanarius infraspinatus*
3. Eye-stalk and legs with crimson stripes.....*Clibanarius padavensis*
Eye-stalk without stripes, but legs with blue longitudinal stripes.....
.....*Clibanarius longitarsus*

SPECIES OF GENUS DARDANUS

1. Dactyle tip of chelipeds calcareous and black rostrum rudimentary, setose fleshy spur present behind third pleopod, third leg with transverse squamiform markings.....*Dardanus setifer*

SPECIES OF GENUS DIOGENES

1. Dactyle tip of chelipeds calcareous and white, rostrum replaced by narrow laminae.....*Diogenes avarus*

GENUS AND SPECIES OF FAMILY COENOBITIDAE

1. A brush of hair-like setae present on right chela only (land- dwelling)
.....*Coenobita cavipes* SUB

ORDER REPTANTIA: FIDDLER CRABS

KEY TO THE IDENTIFICATION OF FIDDLER (DHOBY) CRABS

1. Carapace yellowish with blue and black patches, male chelipeds yellowish and pointed.....*Uca triangularis*
Carapace red, and male chelipeds pale red externally, white-tipped and less pointed.....*Uca annulipes*

SUB ORDER REPTANTIA: CRABS

Pulicat Lake has a rich diversity of nearly 29 species of crabs (Joel *et al.*, 1986) representing marine, brackishwater, freshwater and terrestrial crabs. Of these, the brackishwater crabs like the mud-crabs (*Scylla tranquebarica* and *Scylla serrata*) and the euryhaline portunid crab (*Portunus pelagicus*) are the commonest ones occurring all over the lake, and all through the year. In fact, Pulicat Lake, among all brackishwater bodies in India, produces the largest amount of mud-crabs (Sivasubramaniam and Angell, 1992).

14. Gill-membranes broadly united with isthmus; jaws without teeth.....
Order CYPRINIFORMES (CYPRINOIDEI), p. 38
Gill-membranes free from isthmus; jaws usually with teeth.....15
15. Lateral line when present, situated in upper half of sides, never forming a raised ridge.....16
Lateral line extremely low on sides, forming a raised ridge.....17
16. Head scaly and depressed; ventrals moderately large.....
Order CYPRINODONTIFORMES, p. 85
Head naked and compressed; ventrals small.....
Order CLUPEIFORMES, p.21
17. Tail tapering to a point; ventrals with 9 rays.....
Order HALOSAURIFORMES, p. 70
Tail forked, truncate or rounded; ventrals with 6 rays.....
Order BELONIFORMES, p. 71
18. First dorsal with soft rays only; second dorsal adipose.....
Order SCOPELIFORMES, p. 36
First dorsal with spines only; second dorsal with soft rays.....19
19. Pectoral with lowermost rays detached and filamentous.....
Order POLYNEMIFORMES, p. 96
Pectoral fin entire, with no free rays.....*Order MUGILIFORMES*, p. 90
20. Ventral fins with I spine and 5 rays.....30
Ventral fins with other than I spine and 5 rays.....21
21. Fins without true spines (sometimes 1 or 2 ossified rays in dorsal only).....22
Fins with true spines.....25
22. Two dorsal fins, first short, usually with 1-2 ossified rays.....23
A singly dorsal fin with no ossified rays.....24
23. Free caudal fin present.....*Order GADIFORMES*, p. 76
Tail tapers to sharp point without free caudal fin.....
Order MACRURIFORMES, p. 77

3.	Body extremely long, cel-like or ribbon-like.....	4
	Body short, not cel-like or ribbon-like.....	7
4.	Body cylindrical; caudal fin present.....	5
	Body flattened and ribbon-like; caudal fin absent.....	
	Order PERCIFORMES (TRICHIUROIDEI), p. 216	
5.	Dorsal and anal fins without spines.....	6
	Dorsal and anal fins with spines.....	
	Order MASTACEMBELIFORMES, p. 267	
6.	Two gill-openings, lateral in position..	Order ANGUILLIFORMES, p. 57
	One gill-opening on ventral surface.....	
	Order SYMBRANCHIFORMES, p. 102	
7.	Scales modified into minute sharp granules, needle-like spines, calcareous plates or fused into a bony casing	
	Order TETRADONTIFORMES, p. 269	
	Scales when present are normal overlapping type.....	8
8.	Large sub-cylindrical fishes with upper jaw prolonged into a sword.....	
	Order PERCIFORMES (SCOMBROIDEI, part), p. 218	
	Small oval fishes with upper jaw not prolonged into a sword.....	
	Order PERCIFORMES (STROMATEOIDEI), p. 223	
9.	Ventral fins abdominal.....	10
	Ventral fins thoracic or jugular.....	20
10.	Body naked or with bony plates or rings.....	11
	Body with normal overlapping scales.....	13
11.	Snout produced into a tube; barbels absent.....	12
	Snout normal; several pairs of long barbels.....	
	Order CYPRINIFORMES (SILUROIDEI), p. 38	
12.	Pelvics with 1-3 enlarged feeler-like rays.....	
	Order PEGASIFORMES, p. 290	
	Pelvics with 3-7 small normal rays...Order SYNGNATHIFORMES, p. 79	
13.	One spineless dorsal fin.....	14
	Two distinct dorsal fin.....	18

Distribution of crabs in Pulicat Lake, according to Joel *et al.*, 1986) seems to be chiefly determined by the moisture content of the substratum such as dry sandy-supralittoral, moist-supralittoral, moist-inter-tidal and below tidal (aquatic) zones *etc.*, Within the inter-tidal zone, which provides them the food and the burrowing sites, the nature of substratum, whether sandy or clayey or admixture of both, and the salinity regime do count very much in determining the inter-tidal species and their population compositions.

Of the 29 species of crabs, most species are confined to the southern region of the lake, and in fact, all the 29 species are represented near the lake-mouth (at the southern end of the lake). The northern region of the lake, perhaps because of the feeble-tidal influence and because of the consequent absence of a broad inter-tidal zone, the sites for burrowing are missing, as well as food, so that the inter-tidal crab fauna is poor, except *Ocypoda ceratophthalma*, a terrestrial scavenger which needs no specific inter-tidal zone. Purely aquatic forms like the mud-crabs and the portunid crab of course, are available in water, even in the northern regions.

Mud-crabs provide a substratum on their carapace, for a wide variety of biofoulers or epizoic forms, to settle down (Joel and Sanjeeva Raj, 1981). *Cardiosoma carnifex* the Ghost-crab, locally called as the *Peyi nandu* in Tamil, lives far away from water, in grasslands, in deep burrows. They are more active at night or at day times, when nobody is in the vicinity. As prawn-farms are being dug in such habitats, these crabs are losing their habitat and thus the species is dwindling fast, in nature.

Crab-Fishing

Mud crabs are scavengers and prefer to eat decomposing fish-meat. This behavioural trait is exploited for capturing them, by using putrefying trash-fish pieces like those of rays, sharks, catfish and eels, as bait. One method of fishing (Thomas, 1971) is with *silangu*, a long-line, wherein a 250 metre long coir-rope, with loops at intervals of about a metre, with bait at their tips, are laid in shallow waters. After a while, the long rope is pulled out starting at one end, and if mud-crabs happen to be nibbling at the bait, their immediate reaction is to grab the bait on the loop being pulled out, and the fishermen use a scoop-net (*katcha*), quite skillfully and scoop out the crab grabbing the bait.

Another method is by using a *katcha*, without a handle. Each *katcha* is made up of an iron ring of about two feet in diameter, with nylon bag-like net attached to the ring. At the centre of the net, the bait is fastened and from the ring nylon ropes are attached to a float. Such *katchas* are laid in shallow waters, marked by the float, and after a while, each *katcha* is pulled out, and if one or many crabs are feeding at the bait, they are automatically pulled out of water, enclosed in the nylon bag net.

The moment crabs are captured, their chelipeds and walking legs are tightly bound to their bodies with fibre or fibre-rope. Usually, *non-padu* fishermen are engaged in crab-fishing, on Pulicat Lake.

Crab Export

Mud crabs, being very hardy, live outside water, even for a week, they are suited for exporting them alive to distant inland markets by road or rail, and even to foreign markets like Singapore, Hong Kong and Japan by air from the Pulicat Town *via* Chennai. Crabs weighing over half a kilogram a piece are preferred for export and fetch a higher price than crabs below that size. Berried crabs fetch a still higher price, but at great risk of sacrificing their reproductive potential. Because, each berried crab has a potential for 800, 000 to 2,000,000 eggs or larvae (Jamari, 1992) in Malaysia, and 1.5 to 2.0 million eggs (Marichamy and Rajapackiam, 1992), in the Indian forms.

Crab-Fattening

There are a few farms on the Pulicat Lake engaged in crab-fattening. Water- crabs or soft-crabs (soon after their moulting) are bought cheap by these farmers, and are stocked in ponds along the lake margin. They are supplied intensive feeding with trash-fish so that they gain nearly double their initial weight within a short period of about one or two months, reaching an export size of more than half a kilogram, a piece. Crab-fattening technology is less polluting for the lake than prawn-farming.

KEY TO THE CRABS OF THE PULICAT LAKE

(TO FAMILIES, SUB FAMILIES, GENERA AND SPECIES)

1. Last pair of legs normal or modified; mouth-frame triangular, produced forwards over epistome.....TRIBE OXYSTOMATA..... 3
2. Last pair of legs normal; mouth-frame quadrate.....
.....TRIBE BRACHYGNATHA.....9

Explanation of differences between Class Elasmobranchii and Class Teleostomi.

a -Dissection of head of an elasmobranch showing gill structure

b-Similar dissection of a teleost

c-d -Denticles of sharks

e-f -Asperites and bucklers of rays and skates

g -Lateral view of a buckler

h -Section of a denticle

j -Overlapping scales of a normal teleost

k -Plate-like scales of Ostracioidei

l -Section through scales of a normal teleost

m -Spine-like scale of Balistoidei

n-Spine like scales of Tetradontoidei

KEY TO IDENTIFY THE ORDERS OF BONY FISHES

(after Munro, 1982)

BONY FISH

Class TELEOSTOMI

Subclass ACTINOPTERYGII

Skeleton composed of true bone. Skin normally covered with overlapping scales which in some families may be obsolete, and in others modified by calcification into a hard covering, ossified dermal plates or a complete bony casing. Gills covered by a bony operculum and have only one external opening on each side caudal fin nearly symmetrical.

1. Body asymmetrical with eyes both on same side of head
.....*Order* PLEURONECTIFORMES, p. 256
Body bilaterally symmetrical with eyes on opposite sides of head.....2
2. Ventral fins absent.....3
Ventral fins present (if greatly reduced or absent, the snout is tube-like and the body encased in bony rings).....9

KEY TO IDENTIFY THE ORDERS OF CARTILAGENOUS FISHES
(after Munro, 1982)

SHARKS, SKATES AND RAYS
Class **ELASMOBRANCHII**
Subclass **SELACHII**

Skeleton composed of cartilage which is sometimes partly calcified. Skin covered with small denticles instead of overlapping scales, but smooth in Electric Rays and Eagle Rays. A single nostril on each side. Five separate gill-openings and no bony operculum covering the gill-arches. Never more than one spine in each fin, Caudal fin asymmetrical, upper lobe longer than lower, Males with a pair of claspers alongside pelvic fins.

1. Gill-openings on the sides; body cigar shaped.....
.....Order LAMNIFORME (SHARKS), p. 2
Gill-openings on lower surface; body flattened, discoid.....2
2. Electric organs absent.....Order RAJIFORMES (SKATES, RAYS), p. 9
Electric organs present.....
.....Order TORPEDINIFORMES (ELECTRIC RAYS), P. 17

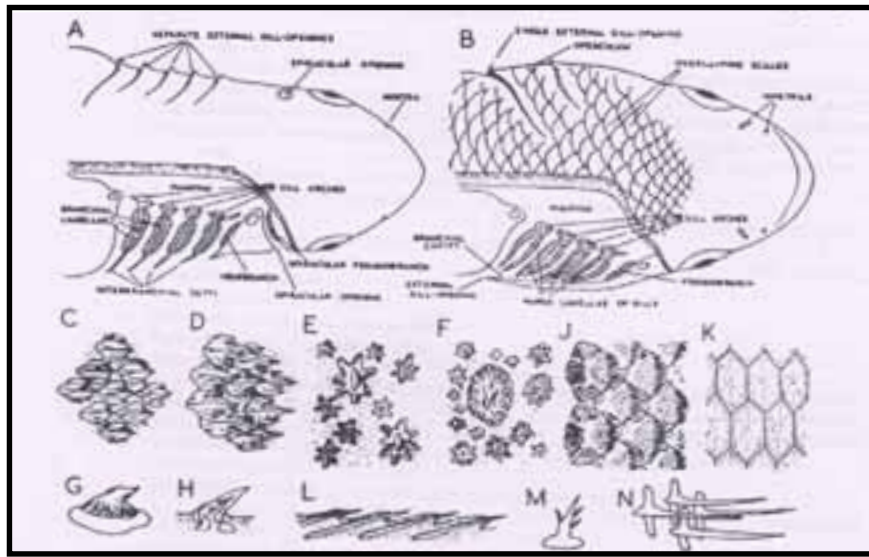


FIG. 1

3. Afferent branchial openings are in front of the bases of chelipeds; legs are normal in position; antennae small.....FAMILY CALIPPIDAE.....5
4. Afferent gill channels are found on either sides of the endostome; gills are about six on either sides; antennae are small or obsolete
.....FAMILY LEUCOSIIDAE.....8
5. Third maxillipedes completely cover the buccal cavern; legs natatory, distal joints flattened and expanded.....SUB FAMILY MATUTINAE.....6
6. A distinct spine at the angle of the hand, where it comes in contact with the external angle of the arm; carapace with minute red dots.....*Matuta lunaris*
7. Only a tubercle at the angle of the hand, where it touches the external angle of the arm; Carapace with vermicular lines.....*Matuta planipes*
8. Carapace circular; its surface only partly, and very variably granular; chelipeds of adult male more than twice as long as the carapace.....
.....*Philyra scabriuscula*
9. Body narrowed in front; rostrum usually distinct; orbits generally incomplete
SUBTRIBE OXYRHYNCHA.....11 & 12
10. Body not narrowed in front; rostrum reduced or wanting; orbits well formed.....SUBTRIBE BRACHYRHYNCHA.....13
11. Long epistome; antennules concealed by the front; median spine of the rostrum of moderate length; three teeth on either lateral borders of carapace.....FAMILY HYMENOSOMIDAE*Hymenius wood-masoni*
12. Median spine of the rostrum very long; no teeth on the lateral borders of Carapace.....
.....*Hymenius inachoides*
13. Last pair of legs modified for swimming.....
FAMILY PORTUNIDAE.....14 & 15
14. Anterio-lateral borders cut into nine teeth, all of equal size.....
Genus *Scylla*.....19 & 20
15. Last tooth on the anterio-lateral borders, enlarged in the form of a long spine; carapace with irregular line.....*Portunus pelagicus*

16. Carapace with three red spots, and the 9th spine is the largest.....
.....*Portunus sanguinolentus*
17. Anterio-lateral borders cut into six teeth.....
GENUS CHARYBDIS.....21-23
18. Anterio-lateral borders cut into five teeth.....
GENUS THALAMITA.....24 &25
19. A spine on the outer orbital borders of the carpus of chelipeds is present;
relatively large species and occurs in abundance
.....*Scylla tranquebarica*
20. Spine in the outer orbital border of the carpus of chelipeds is absent;
generally very large species..... *Scylla serrata*
21. First tooth on the anterio-lateral borders, anteriorly truncated and
notched; a cross mark on carapace.....*Charybdis cruciata*
22. First tooth on the anterio-lateral borders acute; four whitish spots on
the carapace.....*Charybdis lucifera*
23. Second tooth on the anterio-lateral borders rudimentary.....
.....*Charybdis orientalis*
24. Teeth on anterio-lateral borders subequal in size.....
.....*Thalamita crenata*
25. Fourth tooth on anterior-lateral borders rudimentary
.....*Thalamita prymna*
26. Palp of external maxillipeds inserted at or near the anterio-internal
angle of the merus; carapace usually oval; last pair of legs not
flattened.....FAMILIES CRONOPLACIDAE & XANTHIDAE..... 27
27. Ridges that define the efferent branchial channels extend to the anterior
boundary of the buccal cavern, and very strong, front less than a fifth
of the greatest breadth of carapace; orbital hiatus open
.....Genus *Menippe*
28. Basal antennal joint broadly in contact with the front; dactylus of
smaller hand as long as the entire lower border of the palm; orbital
hiatus open.....Genus *Ozius*

(Sanjeeva Raj and Azariah, 1967). They were collected from about two to three inches deep in clear and fine sand, on the lake-beach, between Gunankuppam and the lake-mouth. It was in the month of October, and the salinity was about 24 ppm. Obviously, there is a breeding colony of these lancelets established in Pulicat Lake, because just a month preceding, in September, we could collect larval forms of this lancelet in the plankton, near the lake-mouth.

CLASS ELASMOBRANCHII AND CLASS TELEOSTOMI

Pulicat Lake is rich in fish diversity, mostly marine species, some truly brackishwater and a few freshwater species. Mulletts and Catfish particularly are the characteristic brackishwater fish, which have been providing sustenance-fishing for all the lake fishermen, since ages.

Chacko *et al.*, (1953) listed 65 species of fish from this lake and described the food habits of 24 species. Selvanathan and Kaliyamurthy (1972) added 81 more species, making a total of 146 species of fish, from this lake. Their student batches from the Madras Christian College, from 1962 to 1985 on field work have been collecting all biodiversity, and 22 more species of fish have been recorded by them, making a total of 168 species of fish, from the Pulicat Lake. Since the lake opens into the adjacent Bay at Bengal, several species of stragglers enter into this lake and sojourn therein for a shorter or longer period. Occasionally, during a cyclone, several such stragglers even from the far off oceans can be noticed in the lake. Some species of fish however, have been gradually dwindling in numbers in this lake, perhaps because of the rapid decrease in depth of the lake due to siltation, because of change of habitats and also may be because of over fishing. Pulicat Lake is a nursery for several species of fish.

The best way to study the fish diversity of the Pulicat Lake, is to watch the catches of lake-fishermen. Since fishermen use a wide variety of nets (gear), fish from different habitats and different seasons, will give a broad picture of the lake fishes. Also, the local fish market is another source to study the fish diversity in this lake. However, since even, catches from the sea are landed in the same market, one should not confuse lake fishes from the sea fishes.

9. Strongly convex valves, smooth, cardinal teeth at antero-lateral, and finely striated.....*Meretrix casta*
Oval shell, with raised and widely separated lines of growth; lives amidst oyster shells.....*Irus exoticus*

CLASS SCAPHOPODA

Live specimens of *Dentalium*, the Elephant-Tusk Shell, normally known to be a marine species, but rare in brackishwaters, was recorded from Pulicat Lake by Sanjeeva Raj (1968). The species is *Dentalium octangulatum*. They were buried in sandy substratum, near the Moosamani Lock, at the southern tip of Sriharikota Island. It is interesting that these marine forms were collected from salinities of about 28 ppm. Search must be made to rediscover some more of these rare mollusks, from the Pulicat Lake.

CLASS CEPHALOPODA

Cuttlefishes are also more marine forms, but occasionally they also straggle in to the lake, through the lake-mouth. Usually, they are dragged ashore in the shore-seine (*Baadi-valai*), which fishermen lay in deeper waters, near the lake-moth.

Sepiella inermis is a cuttlefish, with small circular patches or spots along the sides of the body on the dorsal side, and the shell internally has no spine.

Octopus rugosus was collected crawling on a gunny bag, floating in water near Jamilabad, and another specimen, from amidst roof-tiles, laid at Munai Jelly.

PHYLUM CHORDATA

SUB PHYLUM CEPHALOCHORDATA

Cephalochordates are very rare and primitive chordates of great phylogenetic significance, to deduce the origin of chordates. Four species of lancelets are known from the Indian waters, of which *Branchiostoma lanceolatum* is the commonest. They are normally marine forms, living buried in sand in coastal regions.2

Twenty specimens of this *Branchiostoma lanceolatum*, about 6.5 to 12 mm in total length, were collected from the Pulicat Lake and described

29. Carapace without any trace of regions; front-cut straight and square..... *Eurycarcinus orientalis*
30. Carapace transversely oval, or moderately convex, fairly well areolated.....Genus *Pilumnus*
31. Carapace sub-circular, with very concave postero-lateral borders, strongly convex, usually strongly areolatedGenus *Actunnius*
32. The palp of the external maxillipeds articulates at or near the antero-internal angle of the merus, never at the antero-external angle, or at the middle of the anterior border; exognath of the external maxillipeds is of normal size, and is not concealed, inter-antennular septum is a thin plate; division of the orbit into fossae is not accented.....FAMILY GONOPLACIDAE
33. Orbits wider, mostly than the front; carapace squarish.....
..... FAMILY OCYPODIDAE..... 34
34. Chelipeds slightly unequal in both sexes; cornea large, ventral, occupying the greater part of the surface of the eye-stalksGenus *Ocypoda*..... 36-39
35. Chelipeds in the female equal; in males, one is greatly larger than the other; eyes terminal and small, on long and slender eye-stalks.....
Genus *Uca*.....40-41
36. No stridulating ridge on the palm, eye-stalks not prolonged beyond the eyes*Ocypoda cardimana*
37. Antero-lateral angles -of carapce pronounced.....
.....*Ocypoda ceratophthalma*
38. Fingers of chelipeds expanded at tip; stridulating, consists chiefly of striae.....*Ocypoda macrocera*
39. Stridulating ridge narrow, consisting entirely of small tubercles; no brush or hairs on the propodites on any of the legs.....
.....*Ocypoda platytarsis*
40. Front 1/5 to 1/6th of carapace with greatest width.....*Uca annulipes*
41. Tips of the larger chelipeds of males pointed; irregular patches of blue, yellow and black on carapace.....*Uca triangularis*

42. No pouch between the second and third pairs of legs; abdomen of male not constricted.....Genus *Dotilla*..46 & 47
43. A conspicuous brush of hairs between the bases of 1st and 2nd legs; abdomen of male, with the 4th and 5th segments constricted.....
.....Genus *Scopimera*..44& 45
44. Lateral border of carapace defined by a crest, only in its anterior half; chelipeds of adults (males) three times the length of carapace.....
.....*Scopimera pilula*
45. Tympana on meral segments of legs (except on the last leg) divided longitudinally by a narrow ridge; abdomen of female with convex lateral margins.....*Scopimera investigatorus*
46. Each finger has a large tooth, so arranged, that when the tips of both the fingers are opposed, it gives an hour-glass shape
.....*Dotilla elepsydudactylus*
47. Membranous spaces (Tympana) on meropodites of legs; fourth abdominal segment of male fringed with bristle....*Dotilla myctrioides*
48. No tympana on legs; abdomen normal.....
.....SUB FAMILY MACROPHTHALMINAE....49
49. Carapace broader than long; anterio-lateral angles are acute and spiniferous Genus *Macrophthalmus*.....50-52
50. Sides of carapace divergent posteriorly.....
.....*Macrophthalmus pacificus*
51. Four teeth on the lateral borders of carapace.....
.....*Macrophthalmus bitreillei*
52. Carapace 2/3 as long as broad; front 1/7 of the breadth of carapace.....*Macrophthalmus depressus*
53. A large rhomboidal gap between the external maxillipeds; carapace square.....FAMILY GRASPIDAE.....54
54. Male abdomen occupying all the space between bases of the last legs.....SUB FAMILY GRASPINAE
55. Male abdomen not occupying all the space available between the bases of the last pair of legs.....SUB FAMILY VARUNINAE58

CLASS PELECYPODA

Bivalves or Lamellibranchs in Pulicat Lake, inhabit bottom substratum or are attached as biofoulers to living or non-living objects, at various depths. The Edible Oyster (*Crassostrea madrasensis*) is a 'keystone species', widespread at all suitable substrata in the southern regions of the lake. The crevices of these oyster-shells provide an ideal habitat for several other biofoulers or sessile organisms in the lake. The other common bivalves in the Pulicat Lake are the Mud-Clam (*Meretrix casta*) and the Blood-Clam (*Anadora granosa*) both living buried in dark sandy-clay in the southern region. *Modiolus metcalfei* is more common in the northern regions of the lake, living attached to hard substrata, in rather turbid waters.

The Pearl Oyster, perhaps *Pinctada vulgaris* occurs sparingly amidst oyster shells or on roof tiles, but on metal sheets, it seems to encrust, more densely.

KEY TO THE IDENTIFICATION OF PELECYPODS OF PULICAT LAKE

1. Hinge teeth absent.....2
Hinge teeth present..... 6
2. Equivalved shell; umbo at front end.....3
Inequivalved shell; no clear umbo..... 5
3. Shell smooth and green*Perna viridis*
Shell with hairy proostracum.....4
4. Shell smooth with no concentric striae.....*Modiolus perfragilis*
Shell with concentric striae.....*Modiolus metcalfei*
5. Large thick shell and very irregular shape.....*Crassostrea madrasensis*
Smaller and thinner shell.....*Crassostrea cuculata*
6. Hinge teeth straight, with numerous minute teeth.....*Anadora granosa*
Hinge teeth few and prominent..... 7
7. Shell more or less triangular.....8
Shell oval or circular..... 9
8. Keel extends from umbo to hind lower angle.....*Donax cuneatus*
No keel, but radial depression present in the middle..... *Tellina* sp.

PLATE 2



Oyster, the keystone species in Pulicat Lake (Photo: Author)



Painted Storks feeding (Photo: Odd W. Jacobsen)

- 56. Front, less than half the greatest breadth of carapace.....
.....*Graspus strigosus*
- 57. Front, more than half the greatest breadth of the carapace; last segment of male abdomen triangular.....*Metopograspus messor*
- 58. Last three joints of legs compressed and plumed for swimming
..... *Varuna litterata*
- 59. Carapace squarish; pterygostomial regions with a sieve-like reticulation
..... Genus *Sesarma*.....60 and 61
- 60. Two oblique pectinated ridges on the palm of male chelipeds; upper surface of dactylus in the male, with a milled ridge of 11-19 lamellae.....*Sesarma quadrata*
- 61. Two teeth on the lateral borders behind the orbital angles.....
.....*Sesarma oceanica*
- 62. No reticulation on the pterygostomial region; male abdomen with seven separate segments..... *Metaplex distincta*
- 63. Freshwater crab available in ponds and paddy fields; a spine near the far end of the upper border of merus of chelipeds; post-orbital crests ending in rear of the lateral epibranchial tooth, which is small.....
.....*Paratelphusa (Oziotelphusa) hydrodromus*
- 64. Crab, found on land (grassy-lands); grey in colour and large; expod of the external maxilliped exposed with the flagellum; dactylus of legs is spinose; epibranchial tooth, behind the outer orbital angle
.....*Cardisoma carnifex*

PHYLUM MOLLUSCA

The distribution of the molluscan fauna in the Pulicat Lake has been described by Thangavelu and Sanjeeva Raj (1988b) and they have also described the extensive mining of molluscan shells (Thangavelu and Sanjeeva Raj, 1985b) in the northern regions of the Pulicat Lake. These shells are used in baking lime out of them, in the lime-kilns, in the nearby villages like Sunnambukulam, or at distant places like Chennai. The Edible Oyster (*Crassostrea madrasensis*) is the most extensively distributed bivalve in this lake, and in fact, Pulicat Lake is ideally suited for the culture of this oyster. This species of oyster is literally the keystone species in this lake, since several other species of animals belonging to various phyla get encrusted or

live amidst these oyster-shells, thus promoting the colonisation of biodiversity, in this lake. Thangavelu and Sanjeeva Raj, 1985a, 1985b, 1988a and 1988b Sanjeeva Raj *et al.* (2002) Next to this oyster, perhaps the other common species of bivalve is *Meretrix casta*, the Mud-Clam (Thangavelu and Sanjeeva Raj, 1985a). The Blood-Clam (*Anadora granosa*) also is more common in the southern region of the lake, where the Mud-Clam and the Blood-Clam also live buried in dark clayey-sand.

Among the rarer molluscs, it is interesting to note that live-specimens of the very rare, rather marine species, the Elephant-tusk Shell (*Dentalium octangulatum*) were collected and described by Sanjeeva Raj (1968), from this lake. More recently, live specimens of the cephalopods *Octopus rugosus* and the Cuttlefish *Sepiella inermis* also have been collected in this lake.

CLASS GASTROPODA

Excepting *Cerithidea cingulata* which lives in populous colonies on inter-tidal mudflats, all over the Pulicat Lake, chiefly in the south, other gastropods are rather poorly represented in Pulicat Lake. Empty shells of *Cerithidea cingulata* harbour the common hermit crab, *Clibanarius longitarsus*. Rare gastropods in the Pulicat Lake are the Sea-Hares, (*Aplysia cornigera* and *Aplysia benedicti*) which straggle into the higher saline regions of the lake, through the lake-mouth.

KEY TO THE IDENTIFICATION OF GASTROPODS OF PULICAT LAKE

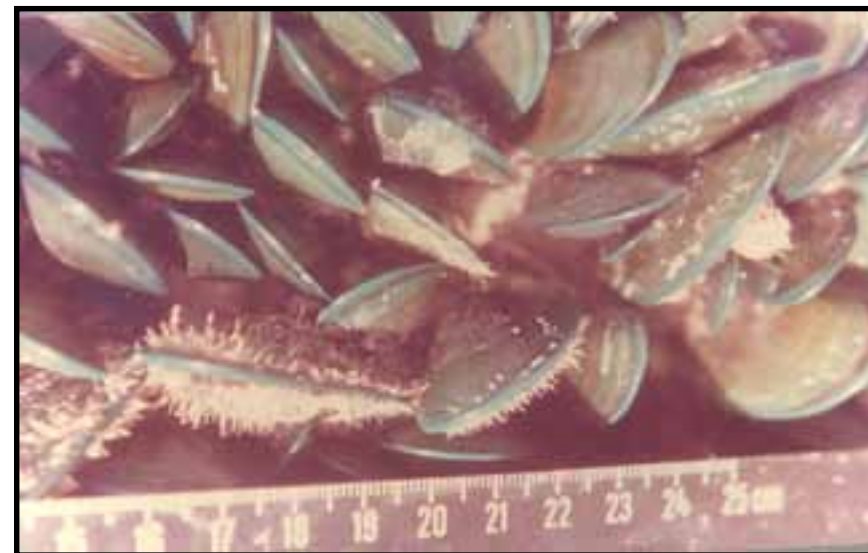
- 1. Shell reduced and internal; parapodia present.....2
Shell external and well developed; parapodia absent.....3
- 2. Parapodia small and posterior tentacles small.....*Aplysia cornigera*
Parapodia large and posterior tentacles large.....*Aplysia benedicti*
- 3. Spire reduced or absent.....4
Spire long.....7
- 4. Spire absent.....5
Spire reduced.....6
- 5. Shell conical or cup shaped, with appendage inside..... *Calyptreaea*
.....(*Crucibulum*) *extinctorium*
Shell flat, attached to the mouth region of other Gastropod shells.....
.....*Crepidula walshi*
- 6. Body whorl rounded, outer lip thick, and aperture D-shaped.....
.....*Clithon oualaniensis*

- Spire depressed, highly polished and brilliantly coloured shells.....
.....*Umbonium vestiarium*
- 7. Anterior canal long.....*Cerithidea cingulata*
Anterior canal short.....*Nassaria stolata*

PLATE 1



Juvenile White Prawns (Photo: Author)



Green Mussel at the Lake-mouth (Photo: Author)