MACRO FAUNA OF PULICAT LAKE

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REFERENCES


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

Some gastropods like Clithon oualaniensis and Nassaria stolata, bivalves like Catenula opima and Iris exoticus may be seen. Much rarer are large brownish planarians, small ophiuroides (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 later study, at convenience.

One can expect Foraminifera, Ciliates, Cnidaria, Turbellaria nematodes, Archannelids, Polychaetes, Oligochaetes, Copepods, Isopods, Gastrot richa, Kinorhyncha, Nemertines, Holothurians and Lancelets, in such a meiofaunal collection. Since most of them are less than about one millimeter in size, excepting Archannelids 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 1920s. 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 flavitilis* can be seen crawling on oyster shells.

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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.

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**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.
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.

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 Dhornirevu.

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, Platyccephalus 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 Irukkm 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,
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, 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.
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 Pelecanus philippensis

Family PHALACROCORACIDAE: Cormorants
Cormorant Phalacrocorax carbo
Little Cormorant Phalacrocorax niger
Darter Anhinga rufa

Family ARDEIDAE: Herons, Egrets, Bitterns
Grey Heron Ardea cinerea
Pond Heron or Paddy Bird Ardeola grayii
Cattle Egret Bubulcus 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
Open-bill 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.
Hand-Picking by Tribal 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 watershed 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 Sricharitha, 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
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 Pulicat Lake is a typical example (in the whole world). Archiannelids are small and pale worms, about a centimetre or less in length, found buried up to 10-15 centimetres deep, in sandy beaches. They live in spaces in between sand-grains (interstitial), usually in the inter-tidal zone, (between the low tide and mid-tide 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 gyrociliatus*, *Polygordius madrasensis*, *Polygordius uroviridis*, *Protodrilus pierantonii*, *Protodrilus indica* 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 vigourously, 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 64 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 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 melanosticus* 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.

54
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..................................................PISONIDAE
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; proboscis unarmed; dorsal and ventral cirri absent..................................................CAPITELLIDAE
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 ........................................AMPHARAEIDAE

Prostomium hidden; with or without operculum..........................5

4. With an operculum; a thoracic membrane; tube calcareous ....SERFULAIDEA

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 amplifera

FAMILY 2 PISONIDAE

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.................................................................Pisonidens 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...............
### FAMILY 7 GLYCERIDAE

- **Diopatra neapolitana**
  - Tentacular cirri absent.................................................................................. 2

- **Marphysa gravelyi**
  - Gills present, pectinate; comb setae arranged in middle region of the body........................................................... 3

- **Lumbriconereis simplex**
  - Hooks present...........................................................Lumbriconereis polydesma

### FAMILY 8 SPIONIDAE

- **Glycera alba**
  - 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 ..............................................

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

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

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

### FAMILY 9 CAPITELLIDAE

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

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

- **Euclymene insecta**
  - Thorax with more than seven segments.........................................................

### FAMILY 10 MALDANIDAE

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

### FAMILY 11 AMPHARETIDAE

- **Amphiprion gani**
  - Thorax 17 segments; gills four pairs and arranged on either side of the first two segments...............................................

### ORDER: PLEURONECTIFORMES

- **Periophthalmus koelreuteri**
  - Mud-Skipper ———

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Common English Name</th>
<th>Local Tamil Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>147.</td>
<td>Mud-Skipper</td>
<td>—</td>
</tr>
</tbody>
</table>

### ORDER: PSEUDORHOMBIDAE

- **Pseudorhombus orsius**
  - Large-Toothed Flounder

### ORDER: MASTACEMBELIFORMES

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Common English Name</th>
<th>Local Tamil Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>148.</td>
<td>Lesser Spiny Eel</td>
<td>—</td>
</tr>
</tbody>
</table>

### ORDER: TETRADONTIFORMES

- **Triacanthus brevirostris**
  - Short-Nosed Tripod Fish

### ORDER: TETRADONIDAE

- **Synopterus commersoni**
  - Commerson’s Sole

### ORDER: AMPHARETIDAE

- **Amphiprion gani**
  - Thorax 17 segments; gills four pairs and arranged on either side of the first two segments...............................................

- **Amphiprion gani**
  - Thorax 17 segments; gills four pairs and arranged on either side of the first two segments...............................................

### ORDER: PERIOPHTHALMIIDAE

- **Branchiocapitella singularis**
  - Thorax with seven segments; dorsal and ventral hooks begin from tenth segment; gills present in posterior segments.................................
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 brackish waters, and only five in more freshwater regions, in the lake. Species like Nereis chilkensis, Marphysa gravelyi 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 gravelyi, 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 amphullifera, Amphictes gunneri, Laonome indica, Diapatra neopolitana and Nereis-chilkensis.

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. amphullifera 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.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Class, Order &amp; Species</th>
<th>Common English Name</th>
<th>Local Tamil Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>124.</td>
<td>Gobius madraspatensis</td>
<td>Pointed Finned Goby</td>
<td>———</td>
</tr>
<tr>
<td>125.</td>
<td>Oligolepis acutipinnis</td>
<td>Tentacle Goby</td>
<td>———</td>
</tr>
<tr>
<td>126.</td>
<td>Oxyurichthys tentacularis</td>
<td>Pointed Tailed Goby</td>
<td>———</td>
</tr>
<tr>
<td>127.</td>
<td>Pseudoapocypristes lanceolatus</td>
<td>Rough Flatfish</td>
<td>———</td>
</tr>
<tr>
<td>128.</td>
<td>Platycephalus scaber</td>
<td>Winged Firefish</td>
<td>———</td>
</tr>
<tr>
<td>129.</td>
<td>Gymnaptistes niger</td>
<td>Grey Goblin fish...</td>
<td>———</td>
</tr>
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<td>130.</td>
<td>Ambassis dayii</td>
<td>Blue and Yellow Snapper</td>
<td>———</td>
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<tr>
<td>131.</td>
<td>Gerrus oyena</td>
<td>Day's Glassy Perchlet</td>
<td>———</td>
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<tr>
<td>132.</td>
<td>Gerrus filamentosus</td>
<td>Lined Silver Biddy</td>
<td>———</td>
</tr>
<tr>
<td>133.</td>
<td>Gerrus oblongus</td>
<td>Long-Rayed Silver Biddy</td>
<td>———</td>
</tr>
<tr>
<td>134.</td>
<td>Gerrus cristatus</td>
<td>Oblong's Silver Biddy</td>
<td>———</td>
</tr>
<tr>
<td>135.</td>
<td>Caranx armatus</td>
<td>Small Scaled Goby</td>
<td>———</td>
</tr>
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<td>136.</td>
<td>Caranx Calla</td>
<td>Armed Trevally</td>
<td>———</td>
</tr>
<tr>
<td>137.</td>
<td>Zeux insidiator</td>
<td>Golden Scad</td>
<td>———</td>
</tr>
<tr>
<td>138.</td>
<td>Teuthis vermiculata</td>
<td>Slender Barred Pony fish</td>
<td>———</td>
</tr>
<tr>
<td>139.</td>
<td>Carangoides praecutes</td>
<td>Vermiculated Spine foot</td>
<td>———</td>
</tr>
<tr>
<td>140.</td>
<td>Mugil gobio valigwaa</td>
<td>Brown-Backed Trevally</td>
<td>———</td>
</tr>
<tr>
<td>141.</td>
<td>Psetus argentus</td>
<td>Mullet-Headed Goby</td>
<td>———</td>
</tr>
<tr>
<td>142.</td>
<td>Scatephagus argus</td>
<td>Silver Boat fish</td>
<td>———</td>
</tr>
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<table>
<thead>
<tr>
<th>S.No.</th>
<th>Common English Name</th>
<th>Local Tamil Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>101.</td>
<td>Sciana dussumieri</td>
<td>Dussumieri’s Jewfish</td>
</tr>
<tr>
<td>102.</td>
<td>Sciana russelii</td>
<td>Russel’s Jewfish</td>
</tr>
<tr>
<td>103.</td>
<td>Platyglossus dussumieri</td>
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</tr>
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<td>104.</td>
<td>Pseudescarus ghobban</td>
<td>Flame Parrot fish</td>
</tr>
<tr>
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<td>Parupeneus indicus</td>
<td>Indian Goat fish</td>
</tr>
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<td>Upenes tragula</td>
<td>Black Tipped Goat fish</td>
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<td>108.</td>
<td>Sparus berda</td>
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<td>Ephippus orbis</td>
<td>Spade fish</td>
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<td>Bat fish</td>
</tr>
<tr>
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</tr>
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<td>112.</td>
<td>Tilapia mossamhica</td>
<td>Tilapia</td>
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<tr>
<td>113.</td>
<td>Siganus oramin</td>
<td>White Spotted</td>
</tr>
<tr>
<td>114.</td>
<td>Siganus spinus</td>
<td>Marbled Spinefoot</td>
</tr>
<tr>
<td>115.</td>
<td>Siganus javas</td>
<td>Streaked Spinefoot</td>
</tr>
<tr>
<td>116.</td>
<td>Acanthurus bleekeri</td>
<td>Bleeker’s Lined</td>
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<tr>
<td>117.</td>
<td>Acentrogobius cyanesmos</td>
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<td>118.</td>
<td>Acentrogobius ornatus</td>
<td>Ornate Goby</td>
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<tr>
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<td>Acentrogobius reichiei</td>
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<td>120.</td>
<td>Acentrogobius viridipunctatus</td>
<td>Green Spotted Goby</td>
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<td>Ctenogobius criniger</td>
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<td>Glossogobius biocellatus</td>
<td>Two Spot Goby</td>
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<tr>
<td>123.</td>
<td>Glossogobius giurus</td>
<td>Bar-Eyed Goby</td>
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<td>Common English Name</td>
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</tr>
<tr>
<td>79.</td>
<td>Anabas scandens</td>
<td>Climbing Perch</td>
</tr>
<tr>
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<td>Etroplus suratensis</td>
<td>Banded Etroplus</td>
</tr>
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<td>Epinephalus lanceolatus</td>
<td>Grouper</td>
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<td>Seratrus tumilabris</td>
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<td>Caranx carangus</td>
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<td>Caranx ire</td>
<td>Brown-Backed Trevally</td>
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<td>89.</td>
<td>Citula armata</td>
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<td>90.</td>
<td>Scomberoides tala</td>
<td>Deep Queen Fish</td>
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<td>91.</td>
<td>Scomberoides ysan</td>
<td>Leather Skin</td>
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<td>92.</td>
<td>Traconnotus blochii</td>
<td>Bloch's Dart</td>
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<td>93.</td>
<td>Lutjanus vitta</td>
<td>Olive-Striped Snapper</td>
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<td>94.</td>
<td>Nemipterus tolus</td>
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<td>95.</td>
<td>Leiognathus blochii</td>
<td>Short Nosed Pony fish</td>
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<td>Leiognathus equaulus</td>
<td>Greater Pony fish</td>
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<td>Leiognathus insidiator</td>
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<td>Pomadasys maculatus</td>
<td>Spotted Grunter</td>
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<td>Plectorynchus niger</td>
<td>Black Sweetlip</td>
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<td>100.</td>
<td>Pseudosciana diacanthus</td>
<td>Two-Spined Jewfish</td>
</tr>
</tbody>
</table>

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 digitiform 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. Zeylanicobdella 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.
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.

Puticat 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 CIRRIPEDIA

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, choking 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 long ..................................................5

3. All valves (tergum, scutum and carina) present.....Octolasmis warwickii
   One or two valves absent........................................4

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Class, Order &amp; Species</th>
<th>Common English Name</th>
<th>Local Tamil Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>56.</td>
<td>Lutjanus quinquelinearis 396, P.135</td>
<td>Blue and Yellow Snapper</td>
<td>——</td>
</tr>
<tr>
<td>57.</td>
<td>Ambassis gymnocephalus 285, P.107</td>
<td>Naked-Head Glassy Perchlet</td>
<td>——</td>
</tr>
<tr>
<td>58.</td>
<td>Apogon nigripinnis P.120</td>
<td>——</td>
<td>——</td>
</tr>
<tr>
<td>59.</td>
<td>Therapon puta 316, P.116</td>
<td>Small-Scaled Banded Gunter</td>
<td>Kove Kitchan</td>
</tr>
<tr>
<td>60.</td>
<td>Therapon jarbua 317, P.116</td>
<td>Crescent Perch</td>
<td>Palin Kitchan</td>
</tr>
<tr>
<td>61.</td>
<td>Pristopoma dussumieri 427, P.147</td>
<td>Banded Grunter</td>
<td>——</td>
</tr>
<tr>
<td>62.</td>
<td>Gerrus sensier 410, P.143</td>
<td>Black Tipped Silver Biddy</td>
<td>Udavan</td>
</tr>
<tr>
<td>63.</td>
<td>Lethrinus nobulosus 462, P.158, Pl.31</td>
<td>Starry Pin-Faced Bream</td>
<td>Pulli Vellameen</td>
</tr>
<tr>
<td>64.</td>
<td>Chrysophrys datnia 470, P.162</td>
<td>Japanese Silver Bream</td>
<td>Karuppu Mattavan</td>
</tr>
<tr>
<td>65.</td>
<td>Teuthis conjugata P.209</td>
<td>——</td>
<td>——</td>
</tr>
<tr>
<td>66.</td>
<td>Scenua ostera P.151</td>
<td>——</td>
<td>——</td>
</tr>
<tr>
<td>67.</td>
<td>Caranx affinis 345, P.126</td>
<td>One-Finlet Scad</td>
<td>——</td>
</tr>
<tr>
<td>68.</td>
<td>Chorinemus meadetta 364, P.130</td>
<td>Silver Queen Fish</td>
<td>——</td>
</tr>
<tr>
<td>69.</td>
<td>Lestegonus ruconus 415, P.144</td>
<td>Deep-Bodied Pony fish</td>
<td>Kavel</td>
</tr>
<tr>
<td>70.</td>
<td>Lestegonus fasciatus 419, P.145</td>
<td>Banded Pony fish</td>
<td>——</td>
</tr>
<tr>
<td>71.</td>
<td>Sillage sihama 354, P.121</td>
<td>Silver Whiting</td>
<td>Kilanganan</td>
</tr>
<tr>
<td>72.</td>
<td>Platychelus pectatus 736, P.255</td>
<td>Spotted Flat head</td>
<td>Griyal</td>
</tr>
<tr>
<td>73.</td>
<td>Platychelus insidator 735, P.255</td>
<td>Indian Flat head</td>
<td>——</td>
</tr>
<tr>
<td>74.</td>
<td>Gobius gymnococephalus P.252</td>
<td>——</td>
<td>——</td>
</tr>
<tr>
<td>75.</td>
<td>Gobius griseus 696, P.239</td>
<td>Grey Goby</td>
<td>——</td>
</tr>
<tr>
<td>76.</td>
<td>Aprocrpyrus serparaster</td>
<td>——</td>
<td>——</td>
</tr>
<tr>
<td>77.</td>
<td>Boleophthalmus bodalii</td>
<td>——</td>
<td>——</td>
</tr>
<tr>
<td>78.</td>
<td>Trypauchen vagina 707, P.243</td>
<td>Burrowing Goby</td>
<td>——</td>
</tr>
</tbody>
</table>
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 fluviatilis

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
Penaed 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. Hyporhampus unifasciatus Silver Lined Half Beak ———
ORDER: SYNGNATHIFORMES
39. Syngnathus cyanospilos ——— ———
ORDER: CYPRINODONTIFORMES
40. Applocheilus blochii Lesser Top Minnow ———
41. Oryzias melastigma Estuarine Top Minnow ———
42. Haplochilus sp. ——— ———
ORDER: MUGILIFORMES
43. Mugil cunnesius Round Head Mullet ———
44. Mugil jerdoni ——— ———
45. Mugil dussumieri Dussumier's Mullet ———
46. Mugil cephalus Grey Mullet ———
47. Mugil bornensis Borneo Mullet ———
48. Sphyraena obtusata Blunt-Jawed Sea-Pike ———
49. Sphyraena jello Giant Sea-Pike Cheela
50. Atherina melanostigma ——— ———
ORDER: POLYNEMIFORMES
51. Polynemus tetradactylus Four-Thread Tussel Fish Kala Meen
266, P.96
ORDER: OPHIOCEPHALIFORMES
52. Ophiocephalus puctatus Green Snakehead Koruvai
270, P.100, PL.17
ORDER: PERCIFORMES
53. Lates calcarifer Giant Perch Koduva
279, P.106, PL.20
54. Serranus sexfasciatus ——— ———
P.110
55. Lutjanus argentimaculatus Red Snapper Shankara
381, P.135

17
<table>
<thead>
<tr>
<th>S.No.</th>
<th>Class, Order &amp; Species</th>
<th>Common English Name</th>
<th>Local Tamil Name</th>
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</thead>
<tbody>
<tr>
<td>19.</td>
<td>Thrissocles purava</td>
<td>———</td>
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<tr>
<td>ORDER:</td>
<td>SCOPELIFORMES</td>
<td></td>
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<tr>
<td>20.</td>
<td>Saurida tumbil</td>
<td>Greater Lizard Fish</td>
<td>Nai Meen</td>
</tr>
<tr>
<td>101, P.37, Pl.10</td>
<td></td>
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<td>ORDER:</td>
<td>CYPRINIFORMES</td>
<td></td>
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<tr>
<td>21.</td>
<td>Ophichthys bero</td>
<td>———</td>
<td>———</td>
</tr>
<tr>
<td>22.</td>
<td>Macrones guio</td>
<td>Long-whiskered Cat Fish</td>
<td>———</td>
</tr>
<tr>
<td>154, P.55, Pl.9</td>
<td></td>
<td></td>
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<tr>
<td>23.</td>
<td>Macrones vitatus</td>
<td>Stripped Dwarf Cat Fish</td>
<td>———</td>
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<tr>
<td>156, P.56, Pl.10</td>
<td></td>
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<tr>
<td>24.</td>
<td>Artus jello</td>
<td>Small-Eyed Cat Fish</td>
<td>———</td>
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<tr>
<td>155, P.55, Pl.9</td>
<td></td>
<td></td>
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<tr>
<td>25.</td>
<td>Barbus dorsalis</td>
<td>Long-Snouted Barb</td>
<td>Kendhai</td>
</tr>
<tr>
<td>115, P.43, Pl.8</td>
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<tr>
<td>26.</td>
<td>Esomus danicus</td>
<td>Flying Barb</td>
<td>———</td>
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<tr>
<td>108, P.42, Pl.7</td>
<td></td>
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<tr>
<td>27.</td>
<td>Puntius sophore</td>
<td>———</td>
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<td>153, P.55, Pl.9</td>
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<td>28.</td>
<td>Plotosus anguillaris</td>
<td>Stripped Cat Fish-Eel</td>
<td>Kandal Keluthi</td>
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<tr>
<td>139, P.51, Pl.10</td>
<td></td>
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<tr>
<td>29.</td>
<td>Physyosus canthus</td>
<td>Canine Cat Fish</td>
<td>Irung Keluthi</td>
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<td>138, P.51, Pl.10</td>
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<tr>
<td>ORDER:</td>
<td>ANGUILLIFORMES</td>
<td></td>
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<tr>
<td>30.</td>
<td>Anguilla bengalensis</td>
<td>Long Finned Eel</td>
<td>Pulli Vilangu</td>
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<tr>
<td>158, P.59</td>
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<tr>
<td>31.</td>
<td>Thyrsinoidea macrura</td>
<td>Giant Morays</td>
<td>———</td>
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<td>163, P.60, Pl.12</td>
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<tr>
<td>32.</td>
<td>Muraenosox cinereus</td>
<td>Silver Conger Eel</td>
<td>———</td>
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<td>178, P.64, Pl.12</td>
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<td></td>
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<tr>
<td>33.</td>
<td>Anguilla bicolor bicolor</td>
<td>Level Finned Eel</td>
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<td>157, P.57, Pl.12</td>
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<td>ORDER:</td>
<td>BELONIFORMES</td>
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<td></td>
</tr>
<tr>
<td>34.</td>
<td>Tylosurus stragiilura</td>
<td>Round Tailed Alligator Gar</td>
<td>Panbu Mural</td>
</tr>
<tr>
<td>201, P.73, Pl.13</td>
<td></td>
<td></td>
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<tr>
<td>35.</td>
<td>Hemirhamphus contori</td>
<td>———</td>
<td>———</td>
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<tr>
<td>204, P.74</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36.</td>
<td>Hemirhamphus xanthopterus</td>
<td>Red-Tipped Half Beak</td>
<td>———</td>
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<tr>
<td>200, P.72</td>
<td></td>
<td></td>
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<tr>
<td>37.</td>
<td>Strongilura crocoidus</td>
<td>Fork Tail Alligator Gar</td>
<td>———</td>
</tr>
</tbody>
</table>

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***

2. *Penaeus monodon*. Tiger Prawn (*Kotera, Karuppera*)
3. *Penaeus semisulcatus*. Green Prawn (*Paseru*)
4. *Penaeus canalsulcatus*. Stripped Prawn (*Variera*)
5. *Penaeus japonicus*. Kuruma Prawn (*Variera*)
6. *Penaeus latisulcatus*. (*Colour era*)
7. *Penaeus merguiensis*. 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 (*Manchakera*)
5. *Metapenaeus burkinirodi*.

**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 spines.................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 20º anterio-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)
   Castro-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 merguiensis)

KEY FOR THE SPECIES OF THE GENUS METAPENAEUS

1. Disto-median petasmal projections, with fully developed or vestigial apical filament; thelycum of impregnated females usually with white conjoined pads.......................................................... 2
   Disto-median petasmal 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 petasmal filaments slender, slightly converging; thelycum with a large anterior and small lateral plates

---

### Class, Order & Species

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Common English Name</th>
<th>Local Tamil Name</th>
</tr>
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<tbody>
<tr>
<td>44</td>
<td>CLASS: ELASMOBRANCHII</td>
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</tr>
<tr>
<td>1</td>
<td>Carcharinus melanopterus</td>
<td>Black Shark</td>
</tr>
<tr>
<td>65</td>
<td>Sardinella fimbriata</td>
<td>Fringe-Scale Sardine</td>
</tr>
<tr>
<td>32</td>
<td>Ilisha elongata</td>
<td>Slender Shad</td>
</tr>
<tr>
<td>11</td>
<td>Anodontostoma chakunda</td>
<td>Short-Nosed Gizzard</td>
</tr>
<tr>
<td>44</td>
<td>CLASS: TELEOSTII</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Anchoviella indicus</td>
<td>Indian Anchovy</td>
</tr>
<tr>
<td>17</td>
<td>Kowala coval</td>
<td>White Sardine</td>
</tr>
<tr>
<td>18</td>
<td>Thrissocles dussumieri</td>
<td>Anchoy</td>
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<table>
<thead>
<tr>
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<th>Common English Name</th>
<th>Local Tamil Name</th>
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<tbody>
<tr>
<td>1</td>
<td>Carcharinus melanopterus</td>
<td>Black Shark</td>
<td>Perunthalai Sarah</td>
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<tr>
<td>2</td>
<td>Rhychobatus djeddensis</td>
<td>White-spotted Ray</td>
<td>Pal Uruvai</td>
</tr>
<tr>
<td>3</td>
<td>Dasyatis sephen</td>
<td>Cow-Tail Ray</td>
<td>Ada Thirukkal</td>
</tr>
<tr>
<td>4</td>
<td>Dasyatis uarnak</td>
<td>Banded Whip-Tailed Sting Ray</td>
<td>Manal Thirukkal</td>
</tr>
<tr>
<td>5</td>
<td>Sardinella fimbriata</td>
<td>Fringe-Scale Sardine</td>
<td>Salai</td>
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<tr>
<td>6</td>
<td>Hilsa kanagurta</td>
<td>Slender Sardine</td>
<td>P.U.</td>
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<tr>
<td>7</td>
<td>Ilsha elongata</td>
<td>Short-Nosed Gizzard</td>
<td>Shad</td>
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<tr>
<td>8</td>
<td>Anodontostoma chakunda</td>
<td>Short-Nosed Gizzard</td>
<td>Shad</td>
</tr>
<tr>
<td>9</td>
<td>Nematoboa nasus</td>
<td>Long-Rayed Bony</td>
<td>Bream</td>
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<tr>
<td>10</td>
<td>Anchoviella commersoni</td>
<td>Commerson's Anchovy</td>
<td>Anchoy</td>
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<td>11</td>
<td>Anchoviella heteroloba</td>
<td>Anchoy</td>
<td>Anchoy</td>
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<tr>
<td>12</td>
<td>Coilia dussumieri</td>
<td>Giant Herring</td>
<td>Manna</td>
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<tr>
<td>13</td>
<td>Elops saurus</td>
<td>Giant Herring</td>
<td>Manna</td>
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<td>14</td>
<td>Megalops cyprinoides</td>
<td>Tarpon</td>
<td>Manna</td>
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<td>15</td>
<td>Anchoviella bengalensis</td>
<td>Indian Anchovy</td>
<td>Shad</td>
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<td>16</td>
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<td>Kowala coval</td>
<td>White Sardine</td>
<td>Vellai Suda</td>
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<td>18</td>
<td>Thrissocles dussumieri</td>
<td>Anchoy's Anchovy</td>
<td>Anchoy's Anchovy</td>
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</tbody>
</table>
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; basial spine on male 3rd pereopod long and barbed; apical petasmal filaments not readily visible; anterior thelycal plate tongue like

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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 thelycal plate longitudinally grooved, wider posterior than anteriorly; disto-median petasmal 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-net 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 (*Yanador Itul*) 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 (*parb* 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.

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**Anal spines not forming a separate anterior fin; first vertebra free from skull…………………………………………………………………………………35**

33. Dorsal and anal fins followed by 5 or more detached finlets………….. 
*Order PERCIFORMES (SCOMBROIDIFI)*, 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…………………..
*Order PERCIFORMES (ANABANTOIDEI)*, p. 225
No accessory air breathing organ……………………………………………35

35. Mouth much reduced; gill-openings reduced to small pore…………
*Order PERCIFORMES (CALLIONYMOIDEI)*, p. 207
Mouth with moderate to large gape; gill-openings normally wide..36

36. Males with a characteristic denticulated crest on the supraoccipital……
*Order PERCIFORMES (KURTOIDEI)*, 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....
*Order PERCIFORMES (COTTOIDEI)*, p. 243
Head not armoured in such fashion…………………………………………38

38. Ventral fins close together or united, forming a sucking disc…………
*Order PERCIFORMES (GOBIOIDEI)*, p. 228
Ventral fins moderately far apart, never forming a sucking disc………
*Order PERCIFORMES (PERCOIDEI)*, p. 103
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 dissiminating 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

GENERAE OF DIODGENIDAE

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 squmiform 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

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…………………………………………..............25
   Tail tapers to sharp point without free caudal fin…………………………...26
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 (TRICHIUROIDEL), p. 216
5. Dorsal and anal fins without spines......................................6
   Dorsal and anal fins with spines........................................6
      Order MASTACEMBELIFORMES, p. 267
6. Two gill-openings, lateral in position.Order ANGUILLIFORMES, p. 57
   One gill-opening on ventral surface....................................5
      Order SYMBRANCHIFORMES, p. 102
7. Scales modified into minute sharp granules, needle-like spines,
   calcareous plates or fused into a bony casing .......................7
      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........8
      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....................................15
11. Snout produced into a tube; barbels absent..........................12
    Snout normal; several pairs of long barbels.........................12
      Order CYPRINIFORMES (SILUROIDEI), p. 38
12. Pelvics with 1-3 enlarged feeler-like rays..........................14
    Pelvics with 3-7 small normal rays.Order PEGASIFORMES, p. 79
      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.............. 5
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 - Denticles of sharks
d - Asperites and bucklers of rays and skates
e - Lateral view of a buckler
f - Section through scales of a normal teleost
g - Spine-like scale of Balistoidi
h - Section through scales of a normal teleost
i - Spine-like scale of Ostracioidi
j - Overlapping scales of a normal teleost
k - Plate-like scales of Ostracioidi
l - Section through scales of a normal teleost
m - Spine-like scale of Balistoidi
n - Spine like scales of Tetradontoidi

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

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 LEUCOSIDAE........8

5. Third maxillipeds 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........ Hymenius wood-masoni

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. Anterior-lateral borders cut into nine teeth, all of equal size........
Genus Scylla.......................................................................................19 & 20

15. Last tooth on the anterior-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. Antero-lateral borders cut into six teeth……………………………………………………………………GENUS CHARYBDIS..........................21-23

18. Antero-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 antero-lateral borders, anteriorly truncated and notched; a cross mark on carapace……………………………………Charybdis cruciata

22. First tooth on the antero-lateral borders acute; four whitish spots on the carapace……………………………………Charybdis lucifer

23. Second tooth on the antero-lateral borders rudimentary……………………………………………………Charybdis orientalis

24. Teeth on antero-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 antero-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. Mullets 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 silting, 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.
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 posterio-lateral borders, strongly convex, usually strongly areolated.........Genus Actunnius
32. The palp of the external maxillipeds articulates at or near the anterio internal angle of the merus, never at the anterio-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. Chelipeds slightly unequal in both sexes; cornea large, ventral, occupying the greater part of the surface of the eye-stalks .........................Genus 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. Anterio-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 1/6 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

CLASS SCAPHOPODA
Live specimens of Dentalium, the Elephant-Tusk Shell, normally known to be a marine species, but rare in brackish waters, 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
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……………………………………………..*Crassostrea cuculata*
   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.*

29
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.............................Metopograpsus 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.................................Metaplax 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 (*Anadara 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……………….*Calyptraea*…
   …………………………………………..………………*(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*

7. Anterior canal long……………………………………..*Cerithidea cingulata*
   Anterior canal short……………………………………..*Nassaria siolata*

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**PLATE 1**

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