



## ICHTHYOFAUNAL DIVERSITY OF THE ADYAR WETLAND COMPLEX, CHENNAI, TAMIL NADU, SOUTHERN INDIA

M. Eric Ramanujam<sup>1</sup>, K. Rema Devi<sup>2</sup> & T.J. Indra<sup>3</sup>

<sup>1</sup>Principal Investigator (Faunistics), Pitchandikulam Forest Consultants, Auroville, Tamil Nadu 605101, India

<sup>2</sup>Scientist E, <sup>3</sup>Assistant Zoologist, Zoological Survey of India (Southern Regional Station), 130, Santhome High Road, Chennai, Tamil Nadu 600028, India

<sup>1</sup>ericramanujamowl@yahoo.com (corresponding author), <sup>2</sup>remadevi\_zsi@yahoo.com, <sup>3</sup>jpandurangan@hotmail.com

ISSN

Online 0974–7907

Print 0974–7893

OPEN ACCESS

**Abstract:** Most parts of the Adyar wetland complex—Chembarampakkam Tank, Adyar River, Adyar Estuary and Adyar backwater (including a wetland rehabilitation site)—were sampled for ichthyofaunal diversity from March 2007 to June 2011. A total of 3,732 specimens were collected and 98 taxa were identified. Twenty-two new records are reported from the estuarine reach. Forty-nine species were recorded at Chembarampakkam Tank. In the upriver stretch 42 species were recorded. In the middle stretch 25 species were encountered. In the lower stretch only five species were recorded. This lack of diversity in the lower stretch of the river can be directly linked to pollution, especially the lower reaches from Nandambakkam Bridge to Kotturpuram which exhibit anoxic conditions for most of the year. In brackish, saline and marginal waters of the estuarine reach 66 species were recorded, of which 47 occurred in the estuary proper, 34 at the point of confluence with the Bay of Bengal and 20 in the backwater which forms the creek. At the rehabilitation site, popularly referred to as the Adyar Eco Park, which is the westernmost region of the backwater, 28 species were recorded in 2011 which is a sharp increase from just four in 2007 when the area was an environmental disaster. A significant finding was *Mystus cf. gulio* which showed a marked morphometric difference concerning its maxillary barbels and efforts are on to discern its taxonomic status.

**Keywords:** Adyar Eco Park, Adyar Poonga, alien species, homogenisation, rehabilitation, translocated species, water quality, wetland complex.

**DOI:** <http://dx.doi.org/10.11609/JoTT.o2905.5613-35> | **ZooBank:** <urn:lsid:zoobank.org:pub:9024036E-18C6-458B-9C7C-B37EBA8F8A4D>

**Editor:** Neelesh Dahanukar, IISER, Pune, India.

**Date of publication:** 26 April 2014 (online & print)

**Manuscript details:** Ms # o2905 | Received 08 August 2011 | Final received 12 March 2014 | Finally accepted 21 March 2014

**Citation:** Ramanujam, M.E., K.R. Devi & T.J. Indra (2014). Ichthyofaunal diversity of the Adyar Wetland complex, Chennai, Tamil Nadu, southern India. *Journal of Threatened Taxa* 6(4): 5613–5635; <http://dx.doi.org/10.11609/JoTT.o2905.5613-35>

**Copyright:** © Ramanujam et al. 2014. Creative Commons Attribution 4.0 International License. JoTT allows unrestricted use of this article in any medium, reproduction and distribution by providing adequate credit to the authors and the source of publication.

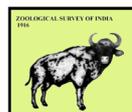
**Funding:** Government of Tamil Nadu and Chennai River Restoration Trust (CRRT).

**Competing Interest:** The authors declare no competing interests.

**Author Contribution:** KR D undertook the identification of all fish specimens with the help of TJI. MER collected the specimens and prepared the ms with inputs from KR D.

**Author Details:** M. ERIC RAMANUJAM has been a wildlife illustrator for over two decades and has a background in the advertising industry. Since 1997 he has been involved in full time conservation and has been part of a team which undertook wildlife surveys in the Kaliveli region near Puducherry, Adyar wetland complex in Chennai and the Eastern Ghats. His main sphere of interest is the natural history of the Indian Eagle Owl *Bubo bengalensis*. DR. K. REMA DEVI is a retired senior scientist from the Zoological Survey of India (Southern Regional Station) and an ichthyologist who has published over a hundred papers including descriptions of several new species. She obtained her DSc degree from the University of Madras in November 2012. She has served as the Regional Co-Chair of the Freshwater Fish Specialist Group (FFSG) of the IUCN for South Asia from 2009–2012. DR. T.J. INDRA is a senior scientist from the Zoological Survey of India (Southern Regional Station) and an ichthyologist who is also a specialist on scorpions. She has published several papers including descriptions of new species.

**Acknowledgements:** We are thankful to the Government of Tamil Nadu / Chennai Rivers Restoration Trust (CRRT) for facilitating this survey. We are also grateful to Dr. R.J. Ranjit Daniels for his valuable inputs and constructive criticism. We also wish to thank J.D. Marcus Knight for helping with this effort.



## INTRODUCTION

Ichthyofaunal constituents of two areas of the Adyar wetland complex have been documented: the Adyar Estuary (Raj 1916; Panikkar & Aiyar 1937; Anon 1950; Evangeline 1967b; Nammalwar 1982) and one source of the river at Chembarampakkam (Ragunathan 1978; Daniels & Rajagopal 2004). These benchmarks have proved invaluable to the present analysis because it is now possible to correlate historical data to present findings.

In addition, an 'Adyar Poonga Ecological Restoration Plan', popularly referred to as the 'Master Plan', for the rehabilitation of a part of the Adyar Creek was submitted which contained information of species encountered on the proposed site (Anonymous 2007) and this was followed by a survey of parts of the Adyar Wetland complex (Ramanujam et al. 2008, 2010). This allows for further comparative analysis and it is now possible to report on colonisation processes at the rehabilitation site.

This is a consolidated report representing data generated from 2007–2011. It aims to present findings of ichthyofaunal diversity of the Adyar Estuary, Adyar Creek, Adyar River and Chembarampakkam Tank. It also correlates historical data to present surveys of the estuarine reach. Such a comparative analysis has not been attempted for Chembarampakkam as results and analysis of a more intensive survey have already been published (Knight 2010b). Nevertheless, the results of our sampling are included in Table 1 as there are a few

records that are unique to this survey.

## STUDY AREAS (Image 1)

**Chembarampakkam Tank (13°0'N & 80°03'E):** This is a large reservoir with a catchment of approximately 357km<sup>2</sup> with bunds running for at least 9km around it. It offers a number of seasonal microhabitats - first there is extensive open water that is deep. Along the margins, where earth has been quarried, there are smaller temporary pools supporting dense growth of *Hydrilla* and *Urticularia*. Elsewhere, the water flows as small streams towards the sluice gates and beyond creating smaller ponds with water lilies and emergent vegetation including *Cyperus* and *Ipomea carnea* (Daniels & Rajagopal 2004). The man-made Bangaru Canal constructed in 2004–2005 connects it via the Kortaliyar River to the Poondi Reservoir and there forth to the Krishna River. The outfall of the canal occurs at Settipalayam.

**Adyar River:** The river flows for about 42km before joining the Bay of Bengal in Adyar. It varies in depth from approximately 0.75 m in its upper reaches to 0.5 m in its lower reaches. It discharges upto 940 million cu m of water to the sea annually. From its origins to Tirunermalai the water is unpolluted. A little after Tirunermalai, the Pammal drain joins the river bringing tannery effluents and sewage. In spite of this, fishing activities are common during the rainy seasons up to Nandambakkam [the stretch of river from sources to

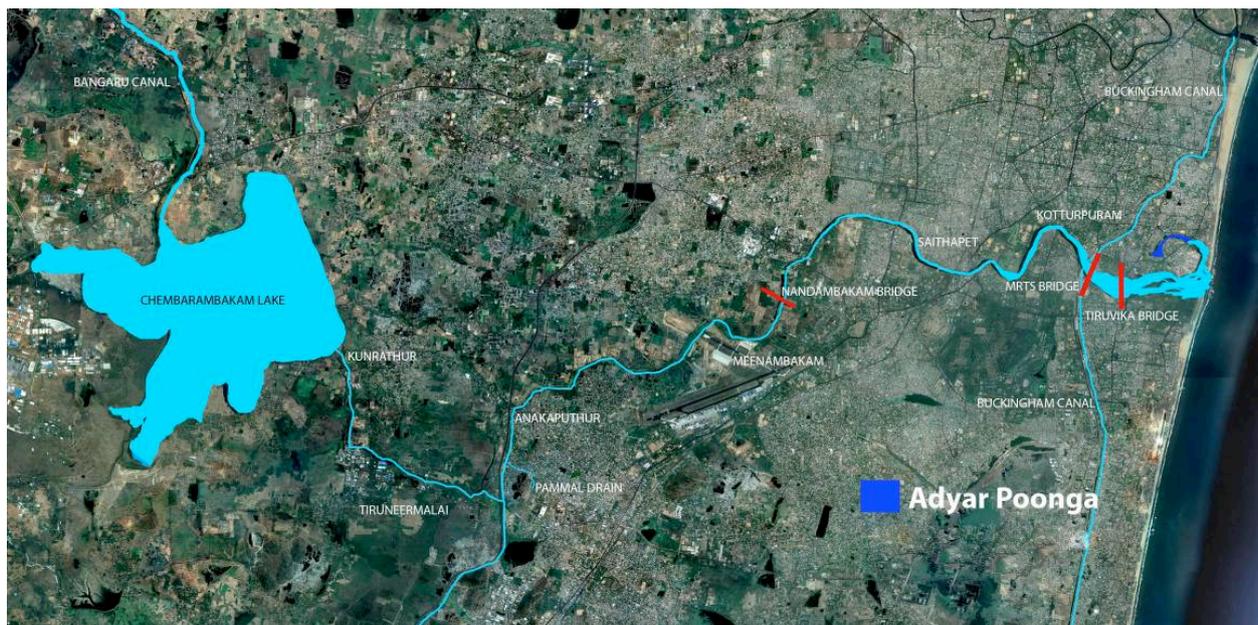


Image 1. Adyar wetland complex from Chembarampakkam tank to point of confluence with the Bay of Bengal

Nandambakkam has been referred to as upriver in this manuscript]. The river receives a sizeable quantity of sewage and other pollutants from Chennai after reaching Nandambakkam Bridge and the water quality from here to M.R.T.S. Bridge at Kotturpuram is poor [this stretch has been referred to as downriver]. Just below the Adyar Boat Club the Buckingham Canal joins the Adyar River. This canal, built between 1806 and 1878 is a 420km channel running parallel to the coast from Vijayawada on the banks of the Krishna River in Andhra Pradesh to Alamparai, near Marakkanam, in Tamil Nadu. The canal connects most of the waterways along the coast, including the Adyar.

**Adyar Estuary (13°0'N & 80°16'E):** Historically, it was a typical bar-mouth estuary, i.e., the mouth remained closed for most of the year (about 9–10 months) during the dry period due to the formation of a sand bar and during the north-east monsoon (October to December) heavy freshwater flow from upriver opened the barrier to the sea. This condition was temporary and existed only during the monsoonal period. The reason for this is that the southeastern seaboard of India, also known as the Coromandel Coast, has a dissymmetric climatic regime - i.e., though the average rainfall in a year is about 1,200mm, the bulk of it (approximately 800mm) falls during the north-east monsoon due to depressions formed in the Bay of Bengal (Blasco & Legris 1972; Meher-Homji, 1974–1975). Due to the shallowness of the estuary, as one approaches the point of confluence with the Bay of Bengal, a few island formations can be seen east of the Tiruvika and Elphinstone bridges. As with all estuaries worldwide, this was an 'oscillating ecosystem' and the temporal occurrence of free swimming faunal elements was at one time dictated by the opening and closing of the sand bar (Panikkar & Aiyar 1937). There are strong indications that the entire area was well vegetated with mangroves and mangrove associates, not only on the bank of the Theosophical Society campus, but also on the islands and mudflats and records indicate that they occupied an area of about 48ha (Selvam et al. 1994).

Estuaries, the world over, are indicators of environmental health, not only because of anthropogenic activities affecting them directly, but also because all the accumulated upriver abuse is discernable here. This is especially pertinent to estuaries within metros - many of the world's great cities (like London, New York and Tokyo), and Indian ones too (Calcutta, Mumbai and Chennai), developed around them because they were natural harbours. As a result, they are centres for accumulated pollution and have been dredged or filled and transformed into seaports, parks, cities and

garbage dumps. Many have been obliterated and most surviving ones are endangered (Castro & Huber 1997). The Adyar estuary is no exception. It is heavily polluted by a variety of industries, commercial establishments and direct and indirect discharge of sewage resulting in physical, chemical and biological changes. The discharge of sewage and industrial effluents is indicated by the high quantities of dissolved solids, total suspended solids, total dissolved solids, HOD, COD, ammonia and sulphates, and the concentration of heavy metals like cadmium and lead is higher than safe levels (Sivakumari et al. 2005). The morphology of the estuary too has been tampered with. During the survey the mouth was kept open in the hope that pollutants would wash away into the sea. The vegetation is a faint shadow of its former self - only a few *Avicennia marina* exist on the banks of the Theosophical Society campus. The islands have been completely overrun by *Prosopis juliflora* and are hotbeds of antisocial activities.

**Adyar Creek:** The overwhelming factor here is encroachment. Encroachments from all quarters, viz.: government agencies (e.g., Ambedkar Mani Mandapapam), builders (e.g., Belisha Towers, Raja Muthia Chettiar Residential Apartments, Leela Hotel, Rani Meyyamai Apartments, Jain Sagarika) and slums at Srinavasapuram. As a result, the morphology of the wetland has been irrevocably altered and the water spread has shrunk drastically.

It is ironic that the first anthropogenic activity that intruded into the wetland concerned fish. Under the 'Second Five Year Plan' (1956–1961) the Brackish Water Fish Farm was established which was the first of its kind in Tamil Nadu (then the Madras State). The farm was 55.4 acres in extent of which 36 acres comprised of a reservoir formed by the construction of a regulator across the narrowest portion of the creek. The operation of this regulator (which consisted of three pairs of screw gearing shutters) during tidal ingress and egress facilitated the entrapping of fish, mostly during the juvenile stages. A series of nurseries, rearing ponds, stock ponds and marketing ponds covering an area of 19.4 acres was situated on the southern bank of the reservoir (Evangeline 1967a).

Since then, development based on reclamation took precedence because of the burgeoning human population associated with urbanization. The area between the seafront and creek was converted into a housing colony to accommodate displaced slum dwellers. This place of relocation, called Srinivasapuram, was begun in 1976–1977. Originally the housing colony consisted of LIG (Low Income Group) flats, but almost immediately hutments

and small brick structures sprang up around them. Encroachments into the wetland were inevitable and a post tsunami count disclosed 647 huts in Srinivasapuram, of which 54 occupied the creek itself.

Development, construction and encroachment are ongoing processes and construction debris and other wastes continue to be dumped into the creek extending its banks up to 20m and obliterating all mudflats. Due to this the creek has shrunk in width to only a narrow channel which hardly allows any tidal influence to the upper parts on a daily basis. In addition, a bus terminus and a memorial to Dr. Ambedkar were constructed on prime wetland habitat and more development activities based on reclamation were planned. A group of concerned citizens, members of EXNORA and Citizen Consumer and Civic Action Group (CAG), moved the court and a stay order prevented further development. In February 2008 the Government of Tamil Nadu's proposal to develop an eco-park and rehabilitate the wetland was accorded permission by the Madras High Court and the 'Adyar Poonga Ecological Restoration Plan' was put into operation. This included clearing of thousands of tonnes of rubble, stopping pollution entering the site, elimination of alien invasive *Prosopis juliflora* and *Eichhorhia crassipes*, planting of mangroves and other suitable coastal vegetation, etc. Since bio-inventorisation processes were fundamental to evolve conservation strategies, faunal surveys were undertaken and this report is an outcome of such an exercise.

**Period:** The survey went through three phases:

1. The institutional 'Master Plan' stage was the preliminary phase that documented vertebrate diversity from March–June 2007.

2. A vertebrate diversity inventorisation process of the Adyar Wetland complex was jointly undertaken from July 2007 to October 2008 by the Zoological Survey of India (Southern Regional Station), Pitchandikulam Forest Consultants and Trust for Environment Monitoring and Action Initiating. Sampling occurred in Chembarampakkam, Adyar River, Adyar Estuary and the creek - including the rehabilitation site.

3. Updating is a continuing process. Sampling at Chembarampakkam had to be discontinued as the governmental TOR was confined to the creek and estuary alone.

This is a consolidated report of all three phases—i.e., from March 2007 to June 2011, a period of four years and three months.

## METHODS

Fish were collected with the help of local fishermen who used hand-operated dragnets, seine nets, cast nets, and the hook and line. In addition, small fish that commercialists ignore were collected by the survey team using dip nets. Identification was according to established literature (Daniels 2002; Jayaram, 1981, 2006, 2010; Talwar & Kacker 1984; Talwar & Jhingran 1991).

## RESULTS AND DISCUSSION

A total of 101 species were encountered during the survey. Forty-nine species occurred in Chembarampakkam Tank, 22 in the upriver stretch from Chembarampakkam to Nandambakkam and four in the downriver stretch from Nandambakkam to Kotturpuram [the four species were *Puntius chola*, *Mystus cf. gulio*, *Oreochromis mossambica* and *Anabas testudineus*]. The lack of fish fauna can be linked to poor water quality because in summer, even when the sandbar is opened, this stretch is reduced to a languid line of sewage and sullage. It is unreasonable to suppose that fishes do not occur in polluted water stretches—Narayanan (1980) reported seven species from polluted waters of the Cooum [for the record: *Megalops cyprinoides*, *Muraena* sp., *Leiognathus* sp., *Terapon jarbua*, *Oreochromis mossambica*, *Liza microlepis* and *Mugil cephalus*] and subsequently two other species were recorded in it as recently as 2007 [*Oreochromis mossambica* and *Mystus gulio* (Bai et al. 2007)]. Fifty-seven species were recorded in the estuarine reach of the Adyar, of which 49 were encountered in the estuary, 35 at the point of confluence with the Bay of Bengal and 20 in Srinivasapuram Creek. At the rehabilitation site (Adyar Poonga) 28 species have been recorded so far of which 13 species were encountered in brackish water east of the spillway and 21 in fresh water west of the spillway. For more details refer Table 1 and Fig. 1.

Prior to this survey five studies were conducted in the estuary from 1916–1982: in order of reporting, Raj (1916), Panikkar & Aiyar (1937), Anon (1950), Evangeline (1967b), Nammalwar (1982). Including this survey 144 species have been known to occur in the estuarine reach. From a casual perusal of Fig. 2 one would be inclined to conclude that the species inventory during this survey is higher than those of 1916 (which recorded 33 species), 1937 (50 species), 1967 (41 species) and 1982 (45 species). This may not be an accurate estimate as the ambiguity concerning the area, period and intensity of surveys may have created a bias. Another bias could

Table 1. Distribution of fishes in the Adyar Wetland complex during the survey (2007–2011)

		Chem-baram-pakkam	Upriver	Downriver	Estuary	Point of confluence	Srinvasapuram Creek	Adyar Poonga (east of spillway)	Adyar Poonga (west of spillway)
	<b>Class: Chondrichthyes (Cartilaginous Fishes)</b>								
	<b>Order: Rajiformes (Rays)</b>								
	<b>Family: Rhinobatidae (Guitarfishes)</b>								
1	Grey Guitarfish <i>Rhinobatus obtusus</i> Muller & Henle	-	-	-	+	+	-	-	-
	<b>Family: Dasyatidae (Stingrays)</b>								
2	Honeycombed Stingray <i>Dasyatis uarnak</i> (Forsskal)	-	-	-	-	+	-	-	-
3	<i>Taeniura sp.</i> Muller & Henle	-	-	-	-	+	-	-	-
	<b>Class: Osteichthyes (Bony Fishes)</b>								
	<b>Order: Osteoglossiformes</b>								
	<b>Family: Notopteridae (Featherbacks)</b>								
4	Grey Featherback <i>Notopterus notopterus</i> (Pallas)	+	-	-	-	-	-	-	-
	<b>Order: Clupeiformes (Herrings and allies)</b>								
	<b>Family: Clupeidae (Sardines and Shads)</b>								
5	Kelee Shad <i>Hilsa kelee</i> (Cuvier)	-	-	-	+	-	-	-	-
6	Bloch's Gizzard Shad <i>Nematalosa nasus</i> (Bloch)	-	-	-	+	+	+	-	-
7	Goldstripe Sardinella <i>Sardinella gibbosa</i> (Bleeker)	-	-	-	+	-	-	-	-
8	White Sardine <i>Escualosa thoracata</i> (Valenciennes)	-	-	-	+	-	-	-	-
	<b>Family: Engraulidae (Anchovies)</b>								
9	Malabar Thryssa <i>Thryssa malabarica</i> (Bloch)	-	-	-	+	+	-	-	-
10	Moustached Thryssa <i>Thryssa mystax</i> (Schneider)	-	-	-	+	+	-	-	-
	<b>Order: Elopiformes</b>								
	<b>Family: Elopidae (Ladyfishes and Tenpounders)</b>								
11	Tenpounder <i>Elops machnata</i> (Forsskal)	-	-	-	+	+	+	-	-
	<b>Family: Albulidae (Bonefishes)</b>								
12	Bonefish <i>Albula vulpes</i> (Linnaeus)	-	-	-	+	+	-	-	-
	<b>Family: Megalopidae (Tarpons)</b>								
13	Indo-Pacific Tarpon <i>Megalops cyprinoides</i> (Broussonet)	-	-	-	+	-	+	+	+
	<b>Order: Anguilliformes (Eels)</b>								
	<b>Family: Anguillidae (Freshwater Eels)</b>								
14	Indian Shortfin Eel <i>Anguilla bicolor</i> McClelland	-	-	-	+	-	+	+	+
	<b>Family: Ophichthidae (Snake Eels)</b>								
15	<i>Ophichthus microcephalus</i> (Day)	-	-	-	+	+	-	-	-
16	Rice-paddy Eel <i>Pisodonophis boro</i> (Hamilton)	-	-	-	+	-	-	-	-
	<b>Order: Gonorynchiformes</b>								
	<b>Family: Chanidae (Milk Fish)</b>								
17	Milk Fish <i>Chanos chanos</i> (Forsskal)	-	-	-	+	-	+		
	<b>Order: Cypriniformes</b>								
	<b>Family: Cyprinidae (Carps and allies)</b>								
18	Swamp Barb <i>Puntius chola</i> (Hamilton)	+	+	+	-	-	-	+	+
19	Rosy Barb <i>Puntius conchonius</i> (Hamilton)	+	+	-	-	-	-	-	+
20	Long-snouted Barb <i>Puntius dorsalis</i> (Jerdon)	+	+	-	-	-	-	-	-
21	Black-spot or Indian Tiger Barb <i>Puntius filamentosus</i> (Valenciennes)	+	+	-	-	-	-	-	-

		Chem-baram-pakkam	Upriver	Downriver	Estuary	Point of confluence	Srinvasapuram Creek	Adyar Poonga (east of spillway)	Adyar Poonga (west of spillway)
22	Olive Barb <i>Puntius sarana sarana</i> (Hamilton-Buchanan)	+	-	-	-	-	-	-	-
23	Spotfin or Swamp Barb <i>Puntius sophore</i> (Hamilton)	+	+	-	-	-	-	-	+
24	Firefin or Two-spot Barb <i>Puntius ticto</i> (Hamilton)	+	-	-	-	-	-	-	-
25	Kooli Barb <i>Puntius vittatus</i> Day	+	-	-	-	-	-	-	-
26	<i>Puntius mahecola</i> (= <i>P. amphibius</i> ) (Valenciennes)	+	-	-	-	-	-	-	-
27	<i>Puntius sharmai</i> Menon & Rema Devi	-	-	-	-	-	-	-	+
28	Indian Glass Barb <i>Laubuca laubuca</i> (Hamilton)	+	-	-	-	-	-	-	-
29	Bloch's Razorbelly Minnow <i>Salmostoma clupeioides</i> (Bloch)	+	-	-	-	-	-	-	-
30	Indian Carplet <i>Amblypharyngodon microlepis</i> (Bleeker)	+	+	-	-	-	-	-	+
31	Flying Barb <i>Esomus danricus</i> (Hamilton-Buchanan)	+	+	-	+	-	-	+	+
32	Sri Lanka Flying Barb <i>Esomus thermoicos</i> (Valenciennes)	+	-	-	-	-	-	-	-
33	Cauvery Rasbora <i>Rasbora caverii</i> (Jerdon)	+	-	-	-	-	-	-	-
34	Blackline Rasbora <i>Rasbora daniconius</i> (Hamilton)	+	+	-	-	-	-	-	+
35	Kalabans <i>Labeo dero</i> (Hamilton)	+	-	-	+	-	-	-	-
36	Catla <i>Gibelion catla</i> (Hamilton)**	+	+	-	+	-	-	-	-
	<b>Family: Cobitidae (Loaches)</b>								
37	Guntea Loach <i>Lepidocephalus guntea</i> (Hamilton)***	+	+	-	-	-	-	-	-
38	Malabar Loach <i>Lepidocephalus thermalis</i> (Valenciennes)	+	-	-	-	-	-	-	-
	<b>Order: Siluriformes (Catfishes)</b>								
	<b>Family: Bagridae</b>								
39	Gangetic Mystus <i>Mystus cavasius</i> (Hamilton)	+	-	-	-	-	-	-	-
40	Striped Dwarf Catfish <i>Mystus vittatus</i> (Bloch)	+	+	-	-	-	-	-	-
41	Day's Mystus <i>Mystus bleekeri</i> (Day)	+	-	-	-	-	-	-	-
42	<i>Mystus cf. gullo</i>	+	+	+	+	-	+	+	+
	<b>Family: Siluridae</b>								
43	Shark Catfish <i>Wallago attu</i> (Schneider)	+	-	-	-	-	-	-	+
	<b>Family: Schilbeidae</b>								
44	Indian Potasi <i>Neotropius atherinoides</i> (Bloch)	+	-	-	-	-	-	-	-
	<b>Family: Heteropneustidae</b>								
45	Stinging Catfish <i>Heteropneustes fossilis</i> (Bloch)	+	+	-	-	-	-	-	+
	<b>Family: Ariidae</b>								
46	Hamilton's Catfish <i>Arius arius</i> (Hamilton)	-	-	-	+	+	+	-	-
47	Small-eyed Catfish <i>Arius jella</i> Day	-	-	-	+	+	-	-	-
48	Spotted Catfish <i>Arius maculatus</i> (Thunberg)	-	-	-	+	-	-	-	-
	<b>Family: Loricariidae (Suckermouth Armoured Catfish)</b>								
49	<i>Pterygoplichthys sp.*</i>	+	-	-	-	-	-	-	-
50	<i>Pseudacanthicus sp.*</i>	+	-	-	-	-	-	-	-
	<b>Order: Mugiliformes</b>								
	<b>Family: Mugilidae (Mulletts)</b>								
51	Goldspot Mullet <i>Liza parsia</i> (Hamilton)	-	-	-	+	+	+	-	-
52	Borneo Mullet <i>Liza macrolepis</i> (Smith)	-	-	-	+	+	+	+	-
53	Tade Grey Mullet <i>Liza tade</i> (Forsskal)	-	-	-	+	+	-	-	-
54	Flathead Grey Mullet <i>Mugil cephalus</i> Linnaeus	-	-	-	+	+	+	+	-

		Chem-baram-pakkam	Upriver	Downriver	Estuary	Point of confluence	Srinvasapuram Creek	Adyar Poonga (east of spillway)	Adyar Poonga (west of spillway)
	<b>Order: Beloniformes</b>								
	<b>Family: Adrianichthyidae</b>								
55	Ricefish <i>Oryzias dancena</i> (Hamilton)	+	-	-	-	-	-	-	-
56	<i>Oryzias carnaticus</i> (Jerdon)	+	-	-	-	-	-	-	-
	<b>Family: Belontiidae (Fullbeak Garfishes)</b>								
57	Freshwater Garfish <i>Xenentodon cancila</i> (Hamilton)	+	+	-	-	-	-	-	-
	<b>Family: Hemiramphidae (Halfbeak garfishes)</b>								
58	Congaturi Halfbeak <i>Hyporhamphus limbatus</i> (Valenciennes)	+	-	-	-	-	-	-	-
	<b>Order: Cyprinodontiformes</b>								
	<b>Family: Aplocheilidae (Panchax Minnows)</b>								
59	Dwarf Panchax <i>Aplocheilus parvus</i> Raj*****	+	-	-	-	-	-	-	+
	<b>Family: Poeciliidae (Livebearers)</b>								
60	Guppy <i>Poecilia reticulata</i> Peters*	-	-	-	-	-	-	-	+
61	Mosquitofish <i>Gambusia affinis</i> (Baird & Girard)*	+	+	-	-	-	-	-	+
	<b>Order: Synbranchiformes</b>								
	<b>Family: Mastacembelidae (Spiny Eels)</b>								
62	Onestripe Spiny Eel <i>Macragnathus aral</i> (Bloch & Schneider)	+	-	-	-	-	-	-	-
63	Striped Spiny Eel <i>Macragnathus pancalus</i> Hamilton	+	-	-	-	-	-	-	-
	<b>Order: Perciformes</b>								
	<b>Family: Centropomidae (Sea Perch)</b>								
64	Giant Seaperch or Seabass <i>Lates calcarifer</i> (Bloch)	-	-	-	+	+	+	+	-
	<b>Family: Ambassidae (Glassfishes)</b>								
65	Commerson's Glassy Perchlet <i>Ambassis commersoni</i> Cuvier	-	-	-	+	+	+	+	-
66	Indian Glassy Fish <i>Pseudambassis ranga</i> (Hamilton)	+	-	-	-	-	-	-	-
67	Elongate Glass Fish <i>Chanda nama</i> (Hamilton)	+	-	-	-	-	-	-	-
	<b>Family: Sillaginidae (Sillagos)</b>								
68	Silver Sillago <i>Sillago sihama</i> (Forsskal)	-	-	-	+	+	+	-	-
	<b>Family: Carangidae (Horse Mackerels)</b>								
69	Tille Trevally <i>Caranx tille</i> Cuvier	-	-	-	+	+	-	-	-
70	Yellowfin Jack <i>Caranx ignobilis</i> (Forsskal)	-	-	-	+	+	-	-	-
71	Tille Jack <i>Caranx sexfasciatus</i> Quoy & Gaimard	-	-	-	+	-	-	-	-
72	Banded Scad <i>Caranx para</i> Cuvier	-	-	-	+	-	-	-	-
73	<i>Alepes sp.</i>	-	-	-	-	+	-	-	-
	<b>Family: Leiognathidae (Ponyfishes)</b>								
74	Splendid Ponyfish <i>Leiognathus splendens</i> (Cuvier)	-	-	-	+	-	+	+	-
75	Pugnose Ponyfish <i>Secutor insidiator</i> (Bloch)	-	-	-	+	-	+	-	-
76	Deep Pugnose Ponyfish <i>Secutor ruconius</i> (Hamilton)	-	-	-	+	-	-	-	-
77	Toothed Ponyfish <i>Gazza minuta</i> (Bloch)	-	-	-	+	-	-	-	-
	<b>Family: Gerreidae (Mojarras)</b>								
78	Whipfin Mojarra <i>Gerres filamentosus</i> Cuvier	-	-	-	+	-	-	-	-
79	Common Mojarra <i>Gerres oyena</i> (Forsskal)	-	-	-	+	-	-	-	-
80	Silvery Mojarra <i>Gerres poeiti</i> Cuvier	-	-	-	+	-	-	-	-

		Chem-baram-pakkam	Upri-ver	Down-river	Estuary	Point of confluence	Srinva-sapuram Creek	Adyar Poonga (east of spillway)	Adyar Poonga (west of spillway)
	<b>Family: Pomadasyidae (Sweetlips)</b>								
81	Black Sweetlip <i>Plectorhynchus nigrus</i> (Cuvier)	-	-	-	-	+	-	-	-
	<b>Family: Polynemidae (Threadfins)</b>								
82	Common Threadfin <i>Polydactylus plebius</i> (Broussonet)	-	-	-	+	+	-	-	-
	<b>Family: Teraponidae (Perches and Grunters)</b>								
83	Jarbuga Terapon or Target Perch <i>Terapon jarbua</i> (Forsskal)	-	-	-	+	+	+	-	-
84	Small-scaled Banded Grunter <i>Terapon puta</i> Cuvier	-	-	-	+	+	-	-	-
	<b>Family: Mullidae (Goatfishes)</b>								
85	Yellow Goatfish <i>Upeneus sulphureus</i> Cuvier	-	-	-	-	+	-	-	-
	<b>Family: Ehippiidae (Drepanes)</b>								
86	Banded Drepane <i>Drepane longimana</i> (Bloch & Schneider)	-	-	-	-	+	-	-	-
	<b>Family: Scatophagidae (Butterfishes)</b>								
87	Spotted Scat <i>Scatophagus argus</i> (Linnaeus)	-	-	-	+	+	+	-	-
	<b>Family: Sphyrnidae (Barracudas)</b>								
88	Banded Barracuda <i>Sphyrna jello</i> Cuvier	-	-	-	+	+	-	-	-
	<b>Family: Siganidae (Rabbitfishes)</b>								
89	Streaky Spinefoot <i>Siganus javus</i> (Linnaeus)	-	-	-	+	+	+	-	-
	<b>Family: Cichlidae (Cichlids)</b>								
90	Orange Chromide <i>Etroplus maculatus</i> (Bloch)	+	+	-	-	-	-	+	+
91	Tilapia or Egyptian Mouthbreeder <i>Oreochromis mossambica</i> * (Peters)	+	+	+	+	+	+	+	+
	<b>Family: Gobiidae (Gobies)</b>								
92	Tank Goby <i>Glossogobius giurus</i> (Hamilton)	+	-	-	-	-	-	-	+
	<b>Family: Belontiidae (Gouramies)</b>								
93	Dwarf Gouramy <i>Colisa lalia</i> (Hamilton)***	+	+	-	-	-	-	-	+
94	Threespot Gouramy <i>Trichogaster trichopterus</i> (Pallas)*	+	+	-	-	-	-	-	+
95	Giant Gourami <i>Osphronemus goramy</i> Lacepede*	+	-	-	-	-	-	-	-
	<b>Family: Anabantidae (Climbing perch)</b>								
96	Climbing Perch <i>Anabas testudineus</i> (Bloch)	+	+	+	+	+	+	+	+
	<b>Family: Channidae (Snakeheads)</b>								
97	Spotted Snakehead <i>Channa punctatus</i> (Bloch)	+	+	-	-	-	-	-	+
98	Striped Snakehead <i>Channa striatus</i> (Bloch)	+	+	-	-	-	-	-	+
	<b>Family: Stromateidae (Pomfrets)</b>								
99	Silver Pomfret <i>Pampus argenteus</i> (Euphrasen)	-	-	-	-	+	-	-	-
	<b>Order: Tetradontiformes</b>								
	<b>Family: Triacanthidae (Tripod Fishes)</b>								
100	Tripod Fish <i>Triacanthus brevirostris</i> Schlegel	-	-	-	+	+	-	-	-
101	Short-nosed Tripod Fish <i>Triacanthus biaculeatus</i> (Bloch)	-	-	-	+	+	-	-	-

+ = Present; - = Absent; \* = Exotics; \*\* = Translocated species; \*\*\* = Species occurring due to the linking of waterways; \*\*\*\* = Species of controversial origin; \*\*\*\*\* = Reintroduction;  = Freshwater;  = Brackish and saline water

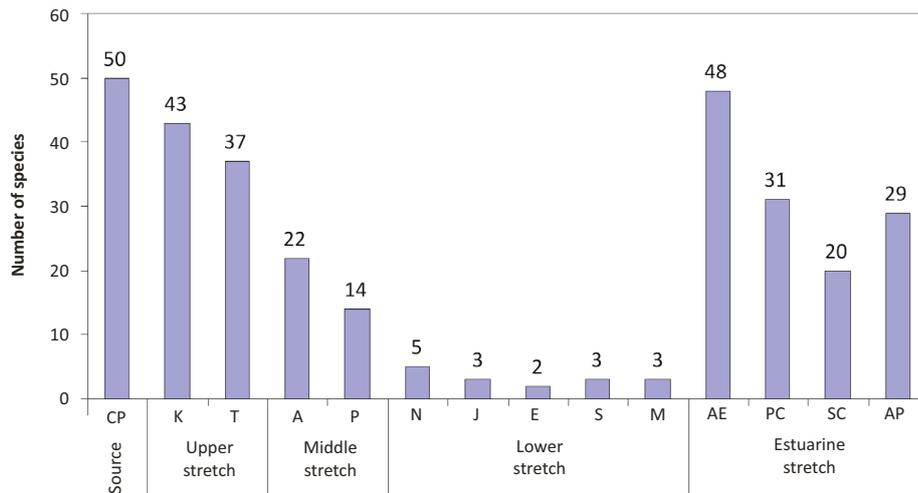


Figure 1. Distribution of fish in the Adyar wetland complex during the survey (2007–2011)

have arisen from fundamental sampling procedures - for example, fisheries oriented samplings may have focussed principally on commercially viable species. The present survey was the most comprehensive, intensive and longest running one—for a period of four years and three months—and hence may have recorded more diversity. Another eye opener is the Fishery Report from April 1949 to March 1950 (Anonymous 1950) which documented 73 species. What is pertinent is that 87 species recorded during earlier surveys were not encountered during this survey. For further details refer Table 2 and Fig. 2.

Twenty-three new records have been established for the estuarine reach. Among the findings was *Caranx tille*. Talwar & Kacker (1984) mentioned that “there is no positive record of *C. tille* in our region (though mentioned in the literature)”. Another notable finding was *Mystus cf. gulio*. The specimens encountered in the wetland showed a marked aberrant feature—viz., the maxillary barbels were very short. This is in stark contrast to the description by Jayaram (2003, 2006) who mentioned that the maxillary pair reached the middle or sometimes almost end of pelvic fins. This is ironic because the common name for *Mystus gulio* is the “Long Whiskered Catfish”. Efforts are on to determine the taxonomic validity of the specimens. Nevertheless, morphometric values of the specimens have been presented here (Table 4). This is pertinent because Linder (2000) states “*Mystus gulio*: as presently understood, is a collection of brackish *Mystus* that likely represent many valid species” and the presence of a new taxon at the restoration site could have immeasurable conservation value.

The heartening factor is the colonization processes underway at the rehabilitation site. In 2007 only four species were recorded (Anonymous 2007) when the

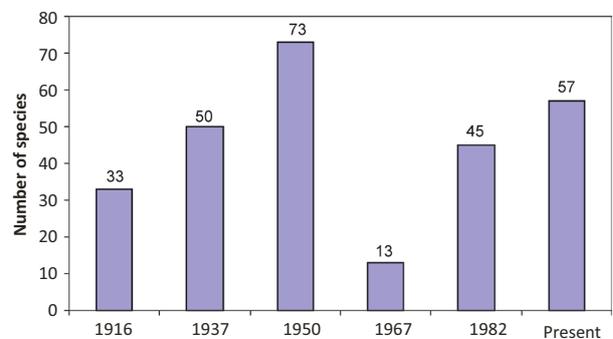


Figure 2. Total number species recorded in Adyar from 1916 to present.

site was an environmental disaster. After the removal of debris, prevention of pollution entering the site, removal of invasive Water Hyacinth *Eichhornia crassipes*, expanding the water spread and linking the water bodies, 13 species were recorded during the follow up survey from July 2007 to October 2008 (Ramanujam et al. 2008). Presently the count stands at 28. For further details refer Table 3 and Fig. 3.

The striking feature of the survey was the number of alien species encountered in the wetland. Two fish species listed as some of the “100 of the world’s worst invasive alien species” (Lowe et al. 2000) occur in the wetland (and even the rehabilitation site)—viz., Mosquito Fish *Gambusia affinis* and Egyptian Mouthbreeder or Tilapia *Oreochromis mossambica*. Though it is unknown when the first was introduced [Ragunathan (1978) is the first record for the wetland], the introduction of *O. mossambica* and the aftereffects are well documented. Devadoss & Chacko (1953) suggested the introduction of *O. mossambica* for fisheries purposes and 15,000

Table 2. Fish known to occur in the Adyar estuarine reach: historical records in relation to the present survey

	Species	1916*	1937	1950	1967	1982	Present
	<b>Class: Chondrichthyes (Cartilaginous Fishes)</b>						
	<b>Order: Rajiformes (Rays)</b>						
	<b>Family: Rhinobatidae (Guitarfishes)</b>						
1	Grey Guitarfish <i>Rhinobatus obtusus</i> Muller & Henle	-	-	-	-	-	+
	<b>Family: Dasyatidae (Stingrays)</b>						
2	Honeycombed Stingray <i>Dasyatis uarnak</i> (Forsskal)	-	-	-	-	-	+
3	<i>Taeniura</i> sp. Muller & Henle	-	-	-	-	-	+
	<b>Class: Osteichthyes (Bony Fishes)</b>						
	<b>Order: Clupeiformes (Herrings and allies)</b>						
	<b>Family: Clupeidae (Sardines and Shads)</b>						
4	Kelee Shad <i>Hilsa kelee</i> (Cuvier)	-	-	-	-	-	+
5	Bloch's Gizzard Shad <i>Nematalosa nasus</i> (Bloch)	-	-	-	-	-	+
6	Goldstripe Sardinella <i>Sardinella gibbosa</i> (Bleeker)	-	+	+	-	-	+
7	Fringescale Sardinella <i>Sardinella fimbriata</i> (Valenciennes)	-	-	-	-	+	-
8	White Sardinella <i>Sardinella albella</i> (Valenciennes)	-	-	-	-	+	-
9	White Sardine <i>Escualosa thoracata</i> (Valenciennes)	-	-	-	-	-	+
	<b>Family: Chirocentridae</b>						
10	Wolf Herring <i>Chirocentrus dorab</i> (Forsskal)	-	-	-	-	+	-
	<b>Family: Engraulidae (Anchovies)</b>						
11	Malabar Thryssa <i>Thryssa malabarica</i> (Bloch)	-	-	-	-	+	+
12	Moustached Thryssa <i>Thryssa mystax</i> (Hamilton)	-	-	-	-	+	+
13	Gangetic Anchovy <i>Thryssa purava</i> (Hamilton)	+	+	+	+	+	-
14	Commerson's Anchovy <i>Stolephorus commersonii</i> Lacepede	-	+	+	?	-	-
15	Indian Anchovy <i>Stolephorus indicus</i> (van Hasselt)	-	-	-	?	+	-
	<b>Order: Elopiformes</b>						
	<b>Family: Elopidae (Ladyfishes and Tenpounders)</b>						
16	Tenpounder <i>Elops machnata</i> (Forsskal)	+	+	+	+	+	+
	<b>Family: Albulidae (Bonefishes)</b>						
17	Bonefish <i>Albula vulpes</i> (Linnaeus)	-	-	-	-	-	+
	<b>Family: Megalopidae (Tarpons)</b>						
18	Indo-Pacific Tarpon <i>Megalops cyprinoides</i> (Broussonet)	+	+	+	+	+	+
	<b>Order: Anguilliformes (Eels)</b>						
	<b>Family: Anguillidae (Freshwater Eels)</b>						
19	Indian Shortfin Eel <i>Anguilla bicolor</i> McClelland	+	-	-	-	+	+
	<b>Family: Ophichthidae (Snake Eels)</b>						
20	<i>Ophichthus microcephalus</i> (Day)	-	-	+	-	-	+
21	Rice-paddy Eel <i>Pisodonophis boro</i> (Hamilton)	-	-	-	-	-	+
	<b>Order: Gonorynchiformes</b>						
	<b>Family: Chanidae (Milk Fish)</b>						
22	Milk Fish <i>Chanos chanos</i> (Forsskal)	-	+	+	+	+	+
	<b>Order: Cypriniformes</b>						
	<b>Family: Cyprinidae (Carps and allies)</b>						
23	Long-snouted Barb <i>Puntius dorsalis</i> (Jerdon)	+	+	+	?	-	-
24	Black-spot or Indian Tiger Barb <i>Puntius filamentous</i> (Valenciennes)	+	-	+	?	-	-
25	Spotfin or Swamp Barb <i>Puntius sophore</i> (Hamilton)	+	+	+	?	-	-
26	Firefin or Two-spot Barb <i>Puntius ticto</i> (Hamilton)	-	-	+	?	-	-
27	Kooli Barb <i>Puntius vittatus</i> Day	+	-	-	?	+	-

	Species	1916*	1937	1950	1967	1982	Present
28	<i>Puntius mahecola</i> (=P. <i>amphibius</i> ) (Valenciennes)	+	+	+	?	-	-
29	Bloch's Razorbelly Minnow <i>Salmostoma clupeioides</i> (Bloch)	+	-	+	-	-	-
30	Silver Razorbelly Minnow <i>Salmostoma acinaces</i> (Valenciennes)	-	-	+	-	-	-
31	Indian Carplet <i>Amblypharyngodon microlepis</i> (Bleeker)	+	-	+	-	-	-
32	Flying Barb <i>Esomus danricus</i> (Hamilton)	+	-	+	-	-	-
33	Kalabans <i>Labeo dero</i> (Hamilton)	-	-	-	-	-	+
34	Fringe-lipped Peninsular Carp <i>Labeo fimbriatus</i> (Bloch)	-	-	+	-	-	-
35	Malabar Labeo <i>Labeo dussumieri</i> (Valenciennes)	-	-	-	-	+	-
36	Reba Carp <i>Cirrhinus reba</i> (Hamilton)	+	-	+	-	-	-
37	Catla <i>Gibelion catla</i> (Hamilton)	-	-	-	-	-	+
38	Hamilton's Baril <i>Barilius bendelisis</i> (Hamilton)	-	-	+	-	-	-
	<b>Order: Siluriformes (Catfishes)</b>						
	<b>Family: Bagridae</b>						
39	Keletius <i>Mystus keletius</i> (Valenciennes)	+	+	+	-	-	-
40	Striped Dwarf Catfish <i>Mystus vittatus</i> (Bloch)	+	+	+	+	-	-
41	<i>Mystus cf gulo</i> **	-	+	+	+	-	+
	<b>Family: Clariidae (Airbreathing Catfish)</b>						
42	Magur <i>Clarius batrachus</i> (Linnaeus)	+	-	-	-	-	-
	<b>Family: Plotosidae (Eeltail Catfish)</b>						
43	Canine Catfish Eel <i>Plotosus canius</i> Hamilton	-	+	+	-	-	-
44	Striped Eel Catfish <i>Plotosus lineatus</i> (Thunberg)	-	-	-	-	+	-
	<b>Family: Siluridae</b>						
45	Shark Catfish <i>Wallago attu</i> (Schneider)	-	-	+	-	-	-
	<b>Family: Ariidae</b>						
46	Hamilton's Catfish <i>Arius arius</i> (Hamilton)	-	-	-	?	-	+
47	Small-eyed Catfish <i>Arius jella</i> Day	-	-	-	?	-	+
48	Spotted Catfish <i>Arius maculatus</i> (Thunberg)	+	-	-	?	+	+
49	Dussumier's Catfish <i>Arius dussumieri</i> Valenciennes	-	-	-	?	+	-
	<b>Order: Mugiliformes</b>						
	<b>Family: Mugilidae (Mulletts)</b>						
50	Goldspot Mullet <i>Liza parsia</i> (Hamilton)	-	-	+	?	+	+
51	Borneo Mullet <i>Liza macrolepis</i> (Smith)	-	-	-	?	+	+
52	Tade Grey Mullet <i>Liza tade</i> (Forsskal)	-	-	-	?	+	+
53	Diamondscale Grey Mullet <i>Liza vaigiensis</i> (Quoy & Gaimard)	-	-	-	?	+	-
54	Bluespot Grey Mullet <i>Valamugil seheli</i> (Forsskal)	-	-	-	?	+	-
55	Flathead Grey Mullet <i>Mugil cephalus</i> Linnaeus	-	+	+	?	+	+
	<b>Order: Beloniformes</b>						
	<b>Family: Adrianichthyidae (Ricefishes)</b>						
56	Ricefish <i>Oryzias dancena</i> (Hamilton)**	-	+	+	-	-	-
	<b>Family: Belonidae (Fullbeak Garfishes)</b>						
57	Freshwater Garfish <i>Xenentodon cancila</i> (Hamilton)	+	-	+	-	-	+
	<b>Family: Hemiramphidae (Halfbeak garfishes)</b>						
58	Congaturi Halfbeak <i>Hyporhamphus limbatus</i> (Valenciennes)	-	-	+	-	-	-
	<b>Order: Cyprinodontiformes</b>						
	<b>Family: Aplocheilidae (Panchax Minnows)</b>						
59	Dwarf Panchax <i>Aplocheilus parvus</i> Raj**	-	+	+	-	-	-
	<b>Order: Synbranchiformes</b>						
	<b>Family: Mastacembelidae (Spiny Eels)</b>						

	Species	1916*	1937	1950	1967	1982	Present
60	Onestripe Spiny Eel <i>Macragnathus aral</i> (Bloch & Schneider)	-	-	+	+	-	-
61	Striped Spiny Eel <i>Macragnathus pancalus</i> Hamilton	+	-	+	-	-	-
	<b>Order: Scorpaeniformes</b>						
	<b>Family: Platycephalidae (Flatheads)</b>						
62	Indian Flathead <i>Platycephalus indicus</i> (Linnaeus)	-	+	+	-	-	-
63	Large-spined Flathead <i>Platycephalus rodericensis</i> Cuvier	-	-	-	-	+	-
64	Rough Flathead <i>Platycephalus scaber</i> (Linnaeus)	-	+	-	-	-	-
65	Serrated Flathead <i>Platycephalus serratus</i> Cuvier	-	-	-	-	+	-
	<b>Order: Perciformes</b>						
	<b>Family: Centropomidae (Sea Perch)</b>						
66	Giant Seaperch or Seabass <i>Lates calcarifer</i> (Bloch)	+	-	+	+	-	+
	<b>Family: Ambassidae (Glassfishes)</b>						
67	Commerson's Glassy Perchlet <i>Ambassis commersoni</i> Cuvier		+	+	?	+	+
68	Myops Glassy Perchlet <i>Ambassis miops</i> Gunther	+	+	+	?	-	-
69	Indian Glassy Fish <i>Pseudambassis ranga</i> (Hamilton)	+	-	+	-	-	-
70	Elongate Glass Fish <i>Chanda nama</i> (Hamilton)	-	-	+	-	-	-
	<b>Family: Apogonidae</b>						
71	Twobelt Cardinal <i>Apogon taeniatus</i> (Cuvier)	-	-	+	-	-	-
72	Ring-tailed Cardinal Fish <i>Apogon aureus</i> Lacepede	-	-	+	-	-	-
	<b>Family: Serranidae (Groupers)</b>						
73	Greasy Grouper <i>Epinephelus tauvina</i> (Forsskal)	-	-	-	?	+	-
74	Malabar Reefcod <i>Epinephelus malabaricus</i> (Schneider)	-	-	-	?	+	-
75	Red-banded Grouper <i>Epinephelus fasciatus</i> (Forsskal)	-	+	+	?	-	-
	<b>Family: Sillaginidae (Sillagos)</b>						
76	Silver Sillago <i>Sillago sihama</i> (Forsskal)	-	+	+	+	-	+
	<b>Family: Carangidae (Horse Mackerels)</b>						
77	Tille Trevally <i>Caranx tille</i> Cuvier	-	-	-	-	-	+
78	Yellowfin Jack <i>Caranx ignobilis</i> (Forsskal)	-	-	-	-	-	+
79	Tille Jack <i>Caranx sexfaciatus</i> Quoy & Galmard	-	-	-	-	-	+
80	Banded Scad <i>Caranx para</i> Cuvier	-	-	-	-	-	+
81	Malabar Trevally <i>Carangoides malabaricus</i> (Bloch)	-	-	-	-	+	-
82	<i>Alepes sp.</i>	-	-	-	-	-	+
83	Threadfin Trevally <i>Alectis ciliaris</i> (Bloch)	-	+	+	-	-	-
	<b>Family: Lutjanidae (Snappers)</b>						
84	John's Snapper <i>Lutjanus johni</i> (Bloch)	-	+	+	?	+	-
85	Bigeye Snapper <i>Lutjanus lineolatus</i> (Ruppell)	-	-	+	?	-	-
	<b>Family: Leiognathidae (Ponyfishes)</b>						
86	Splendid Ponyfish <i>Leiognathus splendens</i> (Cuvier)	-	-	-	-	-	+
87	Orangefin Ponyfish <i>Leiognathus bindus</i> (Valenciennes)	-	-	-	-	+	-
88	Striped Ponyfish <i>Leiognathus fasciatus</i> (Lacepede)	-	-	-	-	+	-
89	Pugnose ponyfish <i>Secutor insidiator</i> (Bloch)	-	-	+	-	-	+
90	Deep Pugnose Ponyfish <i>Secutor ruconius</i> (Hamilton)	-	-	-	-	-	+
91	Toothed Ponyfish <i>Gozza minuta</i> (Bloch)	-	-	-	-	-	+
	<b>Family: Gerreidae (Mojarras)</b>						
92	Whipfin Mojarra <i>Gerres filamentosus</i> Cuvier	-	-	-	+	-	+
93	Common Mojarra <i>Gerres oyena</i> (Forsskal)	-	-	+	-	-	+
94	Silvery Mojarra <i>Gerres poeti</i> Cuvier	-	-	-	-	-	+
	<b>Family: Lethrinidae (Breems)</b>						

	Species	1916*	1937	1950	1967	1982	Present
95	Starry Pigface Bream <i>Lethrinus nebulosa</i> (Forsskal)	-	-	-	-	+	-
	<b>Family: Pomadasyidae (Sweetlips)</b>						
96	Black Sweetlip <i>Plectorhynchus nigrus</i> (Cuvier)	-	-	-	-	-	+
	<b>Family: Polynemidae (Threadfins)</b>						
97	Common Threadfin <i>Polydactylus plebius</i> (Broussonet)	-	-	-	-	-	+
98	Sevenfinger Threadfin <i>Polydactylus heptadactylus</i> (Cuvier)	-	-	-	-	+	-
99	Indian Threadfin <i>Polydactylus indicus</i> (Shaw)	-	-	-	-	+	-
100	Fourfinger Threadfin <i>Eleutheronema tetradactylum</i> (Shaw)	-	+	+	-	-	-
	<b>Family: Teraponidae (Perches and Grunters)</b>						
101	Jarbua Terapon or Target Perch <i>Terapon jarbua</i> (Forsskal)	-	+	+	+	+	+
102	Small-scaled Banded Grunter <i>Terapon puta</i> Cuvier	-	+	+	-	+	+
103	Four-lined Terapon <i>Pelates quadrilineatus</i> (Bloch)	-	+	-	-	-	-
	<b>Family: Mullidae (Goatfishes)</b>						
104	Yellow Goatfish <i>Upeneus sulphureus</i> Cuvier	-	+	+	-	-	+
	<b>Family: Ehippidae (Drepanes)</b>						
105	Banded Drepane <i>Drepane longimana</i> (Bloch & Schneider)	-	-	-	-	-	+
	<b>Family: Scatophagidae (Butterfishes)</b>						
106	Spotted Scat <i>Scatophagus argus</i> (Linnaeus)	-	+	+	-	-	+
	<b>Family: Sphyraenidae (Barracudas)</b>						
107	Banded Barracuda <i>Sphyraena jello</i> Cuvier	-	+	-	-	-	+
108	Great Barracuda <i>Sphyraena barracuda</i> (Walbaum)	-	-	-	-	+	-
109	William's Barracuda <i>Sphyraena bleekeri</i> Williams	-	-	-	-	+	-
	<b>Family: Siganidae (Rabbitfishes)</b>						
110	Streaky Spinefoot <i>Siganus javus</i> (Linnaeus)	-	-	+	-	+	+
111	White-spotted Spinefoot <i>Siganus canaliculatus</i> (Park)	-	-	-	-	+	-
	<b>Family: Cichlidae (Cichlids)</b>						
112	Orange Chromide <i>Etoplus maculatus</i> (Bloch)	+	+	+	-	-	+
113	Banded Pearlsplit <i>Etoplus suratensis</i> (Bloch)	+	+	+	+	-	-
114	Tilapia or Egyptian Mouthbreeder <i>Oreochromis mossambica</i> (Peters)	-	-	-	+	+	+
	<b>Family: Gobiidae (Gobies)</b>						
115	Tank Goby <i>Glossogobius giurus</i> (Hamilton)	+	+	+	-	-	-
116	Tail-eyed Goby <i>Parachaeturichthys polynema</i> (Bleeker)	-	+	+	-	-	-
117	Horny Goby <i>Yongeichthys criniger</i> (Valenciennes)	-	+	+	-	-	-
118	Mangrove Goby <i>Psammogobius biocellatus</i> (Valenciennes)	-	-	-	-	+	-
119	Hasselt's Goby <i>Callogobius haselti</i> (Bleeker)	-	-	-	-	+	-
120	Sharptail Goby <i>Oligolepis acutipennis</i> (Valenciennes)	+	+	-	-	-	-
121	Meggitt's Goby <i>Bathygobius meggitti</i> (Hora & Mukerji)	-	+	-	-	-	-
122	Indo-Pacific Tropical Sand Goby <i>Favonigobius reichei</i> (Bleeker)	+	+	+	-	-	-
123	Spotted Green Goby <i>Acentrogobius viridipunctatus</i> (Valenciennes)	-	+	-	-	-	-
124	<i>Oxyrichthys tentacularis</i> (Valenciennes)	+	+	+	-	-	-
125	<i>Apocryptichthys sp.</i>	-	+	-	-	-	-
126	<i>Scartelos cantoris</i> (Day)	-	-	+	-	-	-
127	Boddart's Google-eyed Goby <i>Boleophthalmus boddarti</i> (Pallas)	-	+	+	-	-	-
128	Dusky Sleeper <i>Eleotris fusca</i> (Forster)	+	+	+	-	-	-
129	Atlantic Mudskipper <i>Periophthalmus barbarus</i> (Linnaeus)	-	+	+	-	-	-
130	Pearse's Mudskipper <i>Periophthalmus novemradiatus</i> (Hamilton)	-	+	+	-	-	-
	<b>Family: Blennidae</b>						
131	Zebra Blenny <i>Omobranchus zebra</i> (Bleeker)	-	+	-	-	-	-

	Species	1916*	1937	1950	1967	1982	Present
	<b>Family: Anabantidae (Climbing perch)</b>						
132	Climbing Perch <i>Anabas testudineus</i> (Bloch)	+	-	+	-	-	+
	<b>Family: Channidae (Snakeheads)</b>						
133	Spotted Snakehead <i>Channa punctatus</i> (Bloch)	+	-	+	?	-	-
134	Striped Snakehead <i>Channa striatus</i> (Bloch)	+	-	+	?	-	-
135	Asiatic Snakehead <i>Channa gachua</i> (Hamilton)	+	-	-	?	-	-
	<b>Family: Stromateidae (Pomfrets)</b>						
136	Silver Pomfret <i>Pampus argenteus</i> (Euphrasen)	-	-	-	-	-	+
	<b>Order: Tetradontiformes</b>						
	<b>Family: Triacanthidae (Tripod Fishes)</b>						
137	Tripod Fish <i>Triacanthus brevirostris</i> Schlegel	-	+	+	-	-	+
138	Short-nosed Tripod Fish <i>Triacanthus biaculeatus</i> (Bloch)	-	-	-	-	-	+
	<b>Family: Tetraodontidae (Puffers)</b>						
139	Milkspotted Puffer <i>Chelonodon patoca</i> (Hamilton)	-	+	+	-	-	-
140	Smooth Blaasop <i>Lagocephalus inermis</i> (Temminck & Schlegel)	-	+	+	-	-	-
	<b>Family; Soleidae (Tongue Soles)</b>						
141	Large-toothed Flounder <i>Pseudorhombus arsius</i> (Hamilton – Buchanan)	-	-	+	-	-	-
142	Day's Tongue Sole <i>Cynoglossus dispar</i> Day	-	-	+	-	-	-
143	Gangetic Tongue Sole <i>Cynoglossus cynoglossus</i> (Hamilton)	-	-	-	-	+	-
144	Long Tongue Sole <i>Cynoglossus lingua</i> Hamilton	-	-	-	-	+	-

+ = Present; - = Absent; ? = Only genus or group mentioned; species are conjunctural (hence the symbol '?')

\* - Raj (1916) mentions "..... my examination being confined to the rivers Cooum and Adyar.....". Hence it is conjunctured that species listed as "estuarine", "occurring within tidal influence", "brackishwater" and "backwater" were encountered by him in both the Cooum and Adyar estuaries

\*\* - Present systematics have been applied and nomenclature standardised [for example, *Aplocheilichthys parvus* was considered a synonym of *A. blochii* but Eapen (2007) has conclusively proved that species are distinct and *A. parvus* occurs along the east coast whereas *A. blochii* is restricted to the western region. The same applies to *Oryzias spp.* which have been revised recently (Roberts 1998)] The identity of the tentatively named *Mystus cf. gulio* needs to be confirmed based on revisionary work

specimens were introduced below Saidapet Road Bridge in December 1957 (Evangeline 1967b). As early as 1958 it was reported from fishermen's catches in the estuary (Chacko & Venketaswami 1958) and in 1964–1965 it had overtaken the mullet fishery - the mullet catch accounted for 19.02%, whereas the tilapia catch was 25.17%, an increase of over 5% (Evangeline 1967b). During the present survey the related *Etroplus suratensis* was not encountered and neither was it mentioned in an earlier report (Nammalwar 1982). Yet records state that it "was one of the most economically important fish of the Adyar river" (Anonymous 1950). The situation is alarming because two closely related alien species have been reported, viz.: *Oreochromis aureus* from Pallikaranai marsh in Chennai (Knight & Devi 2009) and *O. niloticus* in Chembarampakkam (Knight 2010b). In addition, the highly aggressive hybrid 'Flowerhorn' *Cichlasoma Amphilophus* has been encountered in Chennai waterways (Knight 2010a), and if it gets established, is sure to spread to other wetlands, not only within Chennai, but even the Godavary and Krishna rivers due to linkages. Other exotics encountered were the

suckermouth armoured catfishes *Pterygoplichthys* sp. and *Pseudacanthicus* sp., Guppy *Poecilia reticulata*, Threespot Gouramy *Trichogaster trichopterus* and Giant Gouramy *Osphronemus goramy*. *Poecilia reticulata* was recorded during the survey period July 2007–October 2008 at the rehabilitation site but not after that. It is interesting that *Gambusia affinis* was not recorded during that time and it is possible that it displaced *P. reticulata* at a later date.

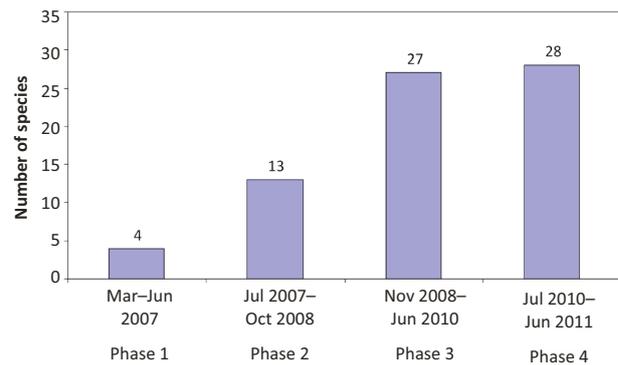
While the problem of exotics is addressed from time to time in literature, little is said of fish from other parts of India, especially the large number of north Indian carps (introduced to boost inland fisheries) that have invaded areas where they do not occur naturally (Daniels 2006) and *Gibelion catla* is a typical example of such a translocated species. The linking of rivers has led to some species like *Lepidocephalus guntea* colonizing new areas. This species, a native of the Godavary and Krishna rivers (David 1963; Jayaram 1995), was encountered in sizable quantities during the July 2007–October 2008 survey phase at Chembarampakkam. At one time it was believed that *L. guntea* had replaced the native *L. thermalis* (Ramanujam et al. 2008) since the latter were not encountered at that

**Table 3.** Fish of Adyar Poonga recorded during the three phases of this survey

	Species	Mar–June 2007	July 2007–Oct 2008	Nov 2008–June 2010	Jul 2010–June 2011
1	<i>Megalops cyprinoides</i>	+	+	+	+
2	<i>Anguilla bicolor</i>	-	+	+	+
3	<i>Chanos chanos</i>	-	-	+	+
4	<i>Puntius chola</i>	-	-	+	+
5	<i>Puntius conchonius</i>	-	-	+	+
6	<i>Puntius sophore</i>	-	-	+	+
7	<i>Puntius sharmai</i>	-	-	+	+
8	<i>Amblypharyngodon microlepis</i>	-	-	+	+
9	<i>Esomus danricus</i>	-	-	+	+
10	<i>Rasbora daniconius</i>	-	-	+	+
11	<i>Mystus cf. gulio</i>	+	+	+	+
12	<i>Wallago attu</i>	-	-	-	+
13	<i>Heteropneustes fossilis</i>	-	+	+	+
14	<i>Liza microlepis</i>	-	-	+	+
15	<i>Mugil cephalus</i>	-	+	+	+
16	<i>Aplocheilichthys parvus*</i>	-	-	+	+
17	<i>Poecilia reticulata**</i>	-	+	-	-
18	<i>Gambusia affinis**</i>	-	-	+	+
19	<i>Lates calcarifer</i>	-	-	+	+
20	<i>Ambassis commersoni</i>	-	+	+	+
21	<i>Leiognathus splendens</i>	-	-	+	+
22	<i>Etroplus maculatus</i>	-	-	+	+
23	<i>Oreochromis mossambica**</i>	+	+	+	+
24	<i>Glossogobius giurus</i>	-	-	+	+
25	<i>Colisa lalia</i>	-	+	+	+
26	<i>Trichogaster trichopterus**</i>	-	+	+	+
27	<i>Anabas testudineus</i>	+	+	+	+
28	<i>Channa punctatus</i>	-	+	+	+
29	<i>Channa striatus</i>	-	+	+	+

+ = Present; - = Absent; \* - Introduced in July 2009; \*\* - Exotics

time and even earlier (Daniels & Rajagopal 2004), but subsequently many specimens of *L. thermalis* were found during the later phase of surveys. Though pollution is presently touted to be the greatest threat to the wetland, it might be that homogenisation and colonization by alien species can be the greater threat to biodiversity. The fact is that invasive alien species are the second major cause of extinction of native and endemic species (Wilcove et al. 1998) and in the long run, if the wetland is restored to a semblance of its former self (and there are instances of

**Figure 3.** Fish diversity increase at the rehabilitation site during the four phases of the survey

the Thames, Sienne and other polluted waterways being restored since the technology and precedents exist), it will be the hardy aliens that will colonise and dominate newly restored habitats. Since there have been too few successful precedents of removal of alien fish, their removal may not only be expensive but unsuccessful since methodologies to cope with the phenomenon are still in their infancy on a global scale.

The occurrence of the Dwarf Gouramy *Colisa lalia* is controversial with some authorities claiming that it is not native to this part of India [Ragunathan (1978) had recorded *Colisa fasciata* at Chembarampakkam] and others favouring the opinion that it is indigenous to the region and populations boosted by the aquarium trade releases (R.J.R. Daniels pers. comm. 2010). The Dwarf Panchax *Aplocheilichthys parvus*, a native of the fresh waters of the east coast, was introduced as a larvicidal species into an artificial pond in June 2009 and has since spread into the wetland.

## REFERENCES

- Anonymous (1950).** Rural Piscicultural Scheme. Progress Report (Period: 1<sup>st</sup> April 1949 to 31<sup>st</sup> March 1950). Indian Council of Agricultural Research, Part 6: 64pp.
- Anonymous (2007).** Adyar Poonga - Draft Ecological Restoration Plan. Submitted by Adyar Poonga Trust. Report prepared by the lead consultants, Pitchandikulam Forest Consultants to the Adyar Poonga Trust, Part 1. 208pp.
- Bai, M.M., K.R. Devi & T.J. Indra (2007).** Fish as biological indicator in Cooum River. *Indian Hydrobiology* 10: 263–267.
- Blasco, F. & P. Legris (1972).** Dry Evergreen Forest of Point Calimere and Marakanam. *Journal of the Bombay Natural History Society* 70: 279–294.
- Castro, P. & M.E. Huber (1997).** *Marine Biology - 2<sup>nd</sup> Edition*. WCB/McGraw-Hill Companies Inc., 450pp.
- Chacko, P.I. & A.D. Venkataswamy (1958).** Development of brackishwater fisheries in Madras State. *Ind - Com Journal* 12: 157–159.
- Daniels, R.J.R. (2002).** *Freshwater Fishes of Peninsular India*. Universities Press (India) Private Limited, Hyderabad, 288pp+75figs.
- Daniels, R.J.R. (2006).** Introduced fishes: a potential threat to the

Table 4. Morphometric values for *Mystus cf. gulio* encountered in Adyar estuary and creek [n=5].

	Values	Specimen 1	Specimen 2	Specimen 3	Specimen 4	Specimen 5	Mean ± SD
1	Total length	198	190	162	175	150	175±19.67
2	Standard length	169	155	125	145	117	142±21.34
3	Head length	46.8	41.1	34.8	33.8	31.7	37.64±6.20
4	Head depth	23.6	21.7	20.9	21.7	18.1	21.2±2.00
5	Body depth	43.9	39.5	35.4	33.9	25.9	35.72±6.73
6	Predorsal hypural distance	64.2	58.9	47.7	53.7	47.2	54.34±7.31
7	Dorsal hypural distance	104.9	95.4	77.1	90.6	70.6	87.72±13.86
8	Caudal peduncle length	27.2	26.7	23.1	26.5	21.8	25.06±2.44
9	Caudal peduncle depth	24.9	22.1	18.3	18.9	18.3	20.5±2.92
10	Length of maxillary barbel	89.0	85.0	60.0	81.0	65.0	76±12.77
11	Eye diameter	8.6	6.7	6.4	6.5	5.7	6.78±1.08
12	Inter-orbital distance	19.2	16.0	12.3	14.1	12.8	14.88±2.81
13	Inter-narial distance	10.6	8.9	7.5	6.9	5.7	7.92±1.89

- native freshwater fishes of peninsular India. *Journal of the Bombay Natural History Society* 103: 346–348.
- Daniels, R.J.R. & B. Rajagopal (2004).** Fishes of Chembarampakkam Lake - a wetland in the outskirts of Chennai. *Zoos' Print Journal* 19(5): 1481–1483; <http://dx.doi.org/10.11609/JoTT.ZPJ.1041.1481-3>
- David, A. (1963).** Studies on fish and fisheries in the Godavary and Krishna River systems - Part 1. Proceedings of the National Academy of Sciences, India 33: 263–283.
- Devadoss, D.D.P. & P.I. Chacko (1953).** Introduction of the exotic cichlid fish, *Tilapia mossambica* Peters, in Madras. *Current Science* 22: 29.
- Eapen, A. (2007).** Systematics and larvivorous potential of Indian fishes of the genus *Aplocheilichthys* McClelland (Pisces: Cyprinodontiformes) with special reference to *Aplocheilichthys parvus* Raj. PhD Thesis, University of Madras, 207pp.
- Evangelina, G. (1967a).** *Chanos culture at the Brackishwater Fish Farm, Adyar. Madras Journal of Fisheries* 3: 68–115.
- Evangelina, G. (1967b).** Trend in the fisheries of the Adyar Estuary from April 1963 to March 1965. *Madras Journal of Fisheries* 4: 1–20.
- Jayaram, K.C. (1981).** *The Freshwater Fishes of India, Pakistan, Bangladesh, Burma and Sri Lanka - a Handbook.* Zoological Survey of India, 475pp+13pls.
- Jayaram, K.C. (1995).** *The Krishna River System: A Bioresources Survey.* Records of the Zoological Survey of India, 167pp+9pls.
- Jayaram, K.C. (2006).** *Catfishes of India.* Narendra Publishing House, Delhi, 383pp+11pls.
- Jayaram, K.C. (2010).** *The Freshwater Fishes of the Indian Region - 2<sup>nd</sup> Edition.* Narendra Publishing House, Delhi, 616pp+39pls.
- Knight, J.D.M. (2010a).** Invasive ornamental fish: a potential threat to aquatic biodiversity in peninsular India. *Journal of Threatened Taxa* 2(2): 700–704; <http://dx.doi.org/10.11609/JoTT.o2179.700-4>
- Knight, J.D.M. (2010b).** Addressing the Wallacean Shortfall: an updated checklist of ichthyofauna of Chembarampakkam Tank. *Taprobanica* 2: 25–29.
- Knight, J.D.M. & K.R. Devi (2009).** Record of *Oreochromis aureus* (Steindachner, 1864) (Teleostei: Perciformes: Cichlidae) in the natural waters of Tamil Nadu. *Taprobanica* 1: 126–129.
- Linder, R.S. (2000).** The Catfishes of Asia. <[www.catfishstudygroup.org/pdf/catfishes\\_of\\_asia](http://www.catfishstudygroup.org/pdf/catfishes_of_asia)> 4pp.
- Lowe, S., M. Browne & S. Boudjelal (2000).** *100 of the world's worst invasive alien species.* IUCN / SSC Invasive Species Specialist Group, Auckland, New Zealand, 11pp.
- Meher-Homji, V.M. (1974–1975).** The natural history of Pondicherry and its environs. *Revue Historique de Pondicherry* 12: 45–50.
- Nammalwar, P. (1982).** Some aspects of ecophysiology and biological concern of the Estuarine Mullet *Liza microlepis* (Smith) with reference to heavy metals pollution. PhD Thesis, University of Madras, Department of Zoology, 216pp.
- Narayanan, K. (1980).** Hydrobiological study of the River Cooum in Madras, S. India with special reference to Aquaculture. PhD Thesis, University of Madras, Madras, 196pp.
- Panikkar, N.K. & R.G. Aiyar (1937).** The brackish-water fauna of Madras. *Proceedings of the Indian Academy of Sciences - Section B* 6(5): 284–337; <http://dx.doi.org/10.1007/BF03051463>
- Raghunathan, M.B. (1978).** Studies on seasonal tanks in Tamil Nadu. 1: Chembarampakkam Tank. *The Indian Journal of Zootony* 19: 81–85.
- Raj, B.S. (1916).** Notes on the freshwater fish of Madras. *Records of the Indian Museum* 12: 249–294.
- Ramanujam, M.E., K.R. Devi, T.J. Indra & T. Murugavel (2008).** Vertebrate diversity survey of the Adyar wetland complex (2007–2008). Report submitted by Pitchandikulam Forest Consultants to Adyar Poonga Trust, 79pp.
- Ramanujam, M.E., K.R. Devi, T.J. Indra & T. Murugavel (2010).** Vertebrate survey at Adyar creek and estuary. Report submitted by Pitchandikulam Forest Consultants to Chennai Rivers Restoration Trust 67pp+16pls.
- Roberts, T.R. (1998).** Systematic observations on tropical Asian medakas or ricefishes of the genus *Oryzias*, with descriptions of four new species. *Ichthyological Research* 45(3): 213–224; <http://dx.doi.org/10.1007/BF02673919>
- Selvam, V., V. Hariprasad, R. Mohan & R. Ramasubramaniam (1994).** Diurnal variations in the water quality of sewage polluted Adayar mangrove water, east coast of India. *Indian Journal of Marine Sciences* 23: 94–97.
- Sivakumari, K., K. Jayamalini, V. Kalaiarasi & M. Sultana (2005).** Variations in hydrographic factors of Adyar Estuary during different seasons. *Nature Environment and Pollution Technology (formerly Journal of Environment and Pollution)* 4: 212–221.
- Talwar, P.K. & R.K. Kacker (1984).** *Commercial Sea Fishes of India.* Zoological Survey of India, Calcutta, 997pp.
- Talwar, P.K. & A.G. Jhingran (1991).** *Inland Fishes of India and Adjacent Countries - Volume 1 & 2.* Oxford and IBH Publishing Co. Pvt. Ltd., 1158pp.
- Wilcove, D.S., D. Rothstein, J. Dubow, A. Phillips & E. Losos (1998).** Quantifying threats to imperiled species in the United States. *BioScience* 48(8): 607–615.



Image 1. Grey Guitarfish *Himantura obtusus*



Image 2. Bonefish *Albula vulpes*



Image 3. Honeycombed Stingray *Himantura uarnak*



Image 4. Rice-paddy Eel *Pisodonophis boro*



Image 5. Kelee Shad *Hilsa kelee*



Image 6. Kalabans *Bangana dero*



Image 7. Bloch's Gizzard Shad *Nematalosa nasus*



Image 8. Catla *Gibelion catla*



Image 9. White Sardine *Escualosa thoracata*



Image 10- Tile Trevally *Caranx tille*

Photo credits for all images: © A. Lakshmikanthan



Image 11. Yellowfin Jack *Caranx ignobilis*



Image 12. Deep Pugnose Ponyfish *Secutor ruconius*



Image 13. Tille Jack *Caranx sexfaciatus*



Image 14. Toothed Ponyfish *Gazza minuta*



Image 15. Banded Scad *Alepes kleinii*



Image 16. Silvery Mojarra *Gerres longirostris*



Image 17. Whitemouth Jack *uraspis helvola*



Image 18. Black Sweetlip *Plectorhynchus gibbosus*



Image 19. Splendid Ponyfish *Leiognathus splendens*



Image 20. Common Threadfin *Polydactylus plebius*



Image 21. Guntea Loach *Lepidocephalus guntea*



Image 22. Indian Potasi *Neotropius atherinoides*



Image 23. Malabar Loach *Lepidocephalus thermalis*



Image 24. Stinging Catfish *Heteropneustes fossilis*



Image 25. Striped Dwarf Catfish *Mystus vittatus*



Image 26. Hamilton's Catfish *Arius arius*



Image 27. Day's Mystus *Mystus bleekeri*



Image 28. Small-eyed Catfish *Arius jella*



Image 29. *Mystus cf. gulio*



Image 30. Spotted Catfish *Arius maculatus*



Image 31. Shark Catfish *Wallago attu*



Image 32. *Pterygoplichthys* sp.



Image 33. *Pseudacanthicus* sp.



Image 35. Goldspot Mullet *Chelon parsia*



Image 37. Borneo Mullet *Chelon macrolepis*



Image 39. Tade Grey Mullet *Chelon planiceps*



Image 41. Flathead Grey Mullet *Mugil cephalus*



Image 43. Mosquitofish *Gambusia affinis*



Image 34. *Oryzias carnaticus*



Image 36. Freshwater Garfish *Xenentodon cancila*



Image 38. Congaturi Halfbeak *Hyporhamphus limbatus*



Image 40. Dwarf Panchax *Aplocheilus parvus*



Image 42. Guppy *Poecilia reticulata*



Image 44. Onestripe Spiny Eel *Macroglyphus aral*



Image 45. Ricefish *Oryzias dancena*



Image 47. Striped Spiny Eel *Macrognathus pancalus*



Image 49. Giant Seaperch or Seabass *Lates calcarifer*



Image 51. Commerson's Glassy Perchlet *Ambassis ambassis*



Image 53. Indian Glassy Fish *Pseudambassis ranga*



Image 46. Tille Trevally *Caranx tille*



Image 48. Banded Scad *Alepes kleinii*



Image 50. Whitemouth Jack *Uraspis helvola*



Image 52. Splendid Ponyfish *Leiognathus splendens*



Image 54. Silver Sillago *Sillago sihama*



Image 55. Elongate Glass Fish *Chanda nama*



Image 56. Banded Drepane *Drepane longimana*



Image 57. Tank Goby *Glossogobius giuris*



Image 58. Spotted Scat *Scatophagus argus*



Image 59. Dwarf Gouramy *Colisa lalia*



Image 61. Banded Barracuda *Sphyaena jello*



Image 60. Streaky Spinefoot *Siganus javus*



Image 62. Threespot Gouramy *Trichogaster trichopterus*



Image 63. Orange Chromide *Etroplus maculatus*



Image 64. Giant Gourami *Osphronemus goramy*



Image 65. Tilapia or Egyptian Mouthbreeder *Oreochromis mossambica*



Image 66. Climbing Perch *Anabas testudineus*



Image 67. Spotted Snakehead *Channa punctatus*



Image 68. Striped Snakehead *Channa striatus*



Image 69. Silver Pomfret *Pampus argenteus*



Image 70. Tripod Fish *Triacanthus brevirostris*



Image 71. Short-nosed Tripod Fish *Triacanthus biaculeatus*

