A PRELIMINARY REPORT ON THE ICHTHYOFAUNA OF KALIVELI FLOODPLAIN AND UPPUKALLI CREEK, PONDICHERRY, INDIA, WITH SOME NOTES ON HABITAT, DISTRIBUTION, STATUS AND THREATS

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ABSTRACT

There are, at present, at least 42 species of fish inhabiting Kaliveli floodplain and Uppukalli creek. Six species are confined to the floodplain, 19 are estuarine and 17 occur in both floodplain and creek. The IUCN Red List Category / Conservation status of 21 species could be determined: 1 Endangered, 5 Vulnerable, 14 Near threatened, and 1 Least concern. The only exotic was Oreochromis mossambica *which is an Alien Invasive species. High concentrations of Chlorides around prawn farms exist, and this could have adverse effects on aquatic biodiversity.*

KEYWORDS

Coromandel coast, estuary, ichthyofauna, India, Kaliveli floodplains, Pondicherry, status, Uppukalli creek, water quality, wetland

Kaliveli has been described as one of the two most important wetlands along the Coromandel coast of southern India - the other is Pulicat (Perennou, 1987; Perennou & Santharam, 1990). Though the avifauna of Kaliveli has been well documented (Balachandran, 1994; Perennou, 1987, 1989, 1990; Perennou & Santharam, 1990; Pieter, 1987), only a single note on ichthyofauna based on casual observations is available (Sharma, 1997); this listed just 11 species.

Presented here is a list of fish and water quality analysis of Kaliveli floodplain and Uppukalli creek that provides the basic qualitative data regarding fish distribution, status and perceived threats.

STUDY AREA

Kaliveli is a 13,200ha wetland (the southernmost point lies ca. 20km north of Pondicherry city) that extends for ca. 30km parallel to the coast. It can be divided into three distinct zones as one moves northward:

1) Kaliveli floodplain ($12^0$5'-$12^0$3'-$12^0$9'N & $79^0$47'-$79^0$51'-$79^0$53'E): Although called a lake or tank, it is by definition a floodplain (Keddy, 2000; Lowe-Mc Connell, 1987). This petal-shaped waterbody, covering an area of 7,040ha. is completely dry during the summer months. It begins to fill up with the advent of the southwest monsoons and reaches its maximum extent by the end of the northeast monsoons. Its catchment covers an area of 740km^2 and includes the Auroville plateau to the south, Marakkanam to the north and extends well beyond Tindivanam to the northwest. The copious run-off water from this entire area ultimately reaches the floodplain via the many tanks and streambeds (Fig. 1).

2) Uppukalli creek ($12^0$9'-$12^0$12'N & $79^0$53'-$79^0$56'E): A narrow channel that connects the floodplain to the estuary. Owing to its estuarine links, the character of this area is distinct from that of the floodplain. There is constant inflow of water from the estuary throughout the year and the water level varies with the tides and sea level.

3) Yedayanthittu estuary ($12^0$12'-$12^0$15'N & $79^0$56'-$80^0$0'E): Extending from a little north of Marakkanam road bridge to the point when it drains into the Bay of Bengal at Alamparai. It is an area of intertidal mudflats and salt pans. It was once linked to Pulicat lake 42km north of Chennai via the Buckingham Canal (Scott, 1989). This area was not assessed during this study.

The common aquatic vegetation is *Aponogeton natans*, *Eichhornia crassipes*, *Hydrilla verticillata*, *Limnophyton obtusifolium*, *Monochoria vaginalis*, *Vallisneria spiralis*, *Aristida adscensionis*, *Chloris barbata*, *C. montana*, *Polygala arvensis*, *Lindernia crastacea*, *Scoparia dulcis* and *Waltheria indica*. *Acacia nilotica*, *Alternanthera sessilis*, *Bacopa monnieri*, *Coldenia procumbens*, *Cyperas distans*, *Eclipta prostrata*, *Heliotropium indicum*, *Hygrophila angustifolia*, *Ludwigia perennis*, *Phyla nodiflora*, *Polygonum barbatum* and *Typha angustata* are found along the boundaries.

This region has a climatic dissymmetric regime. January to June is the statistically dry season. From July to September some rain is received due to the southwest monsoons, but the characteristic of the east coast is the violence of precipitation during the northeast monsoons from depressions formed in the Bay of Bengal. The average rainfall per year is ca. 1,300mm, the bulk falling during the northeast monsoons in October and November. (Blasco & Legris, 1972; Meher-Homji, 1975).

The entire area has long been subject to anthropogenic influences. Villages surround the area, croplands border the entire floodplain and encroachments are common (as soon as the water recedes the lake bed is planted with rice and irrigated with ground water). Fishing and poaching are activities directly linked to the fauna of the wetland. The entire area north of Marakkanam Road Bridge is an expanse of salt pans, which until recently was the only sizable industry in the area. The new and rapidly expanding industry is aquaculture - the entire area from Marakkanam Road Bridge, southwards, through Vandipalayam, to Settikuppam is an increasingly vast spread of prawn farms.

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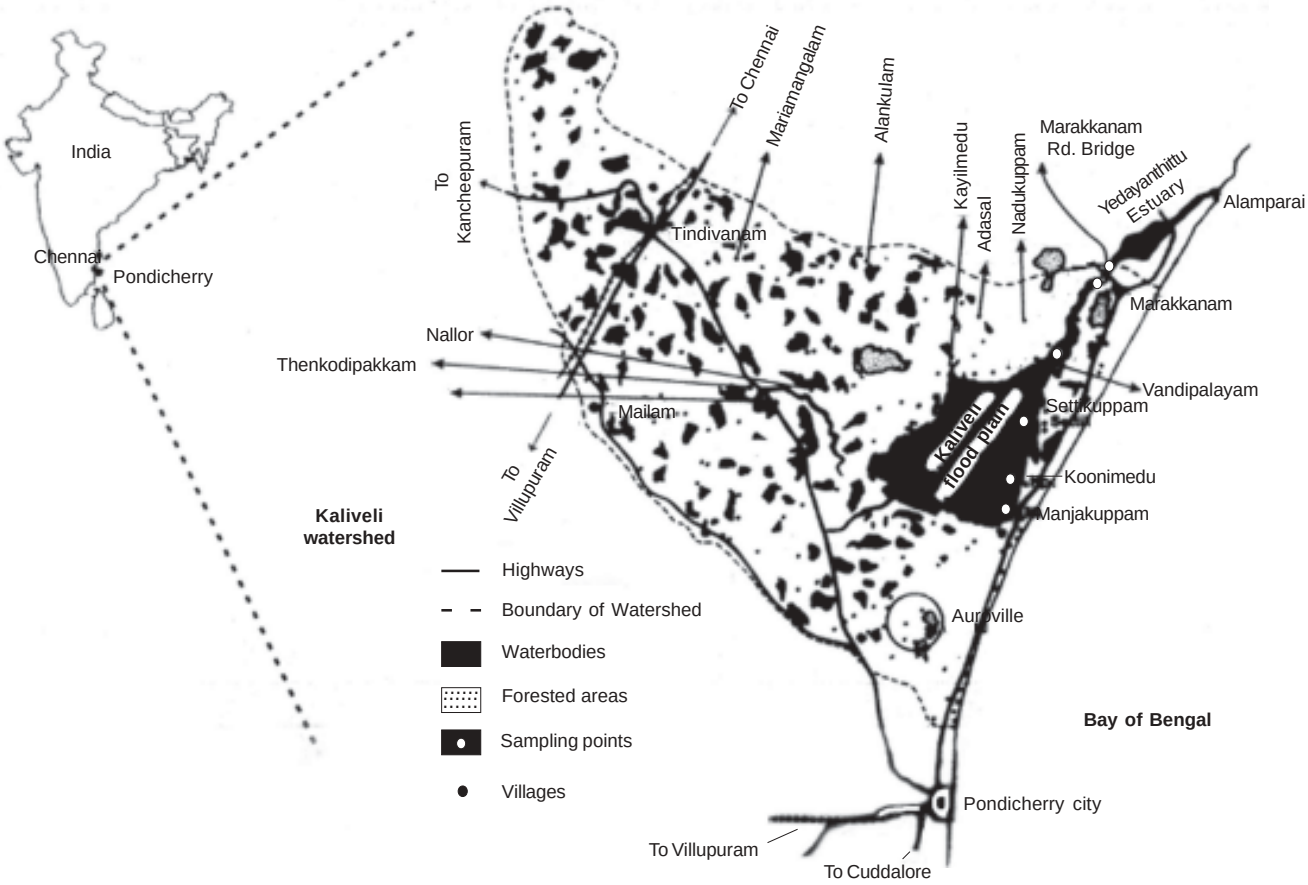

Figure 1. Map of Kaliveli floodplains in Pondicherry

METHODS

The study lasted from 21.7.2003 to 30.4.2004 - ie., from the time the first rains set in during the Southwest Monsoons to the time the floodplain dried up.

Specimens were collected with the help of local fishermen who used hand operated dragnets, casting nets, and the hook and line. In addition, small stranded fish (that commercialists ignore) were collected by the research team using dip nets. 5 collection points, regularly fished, were identified: three points along the eastern shore of the floodplain (Manjakuppam, Koonimedu and Settikuppam) and two points along the creek (Vandipalayam and either side of Marakkanam Road Bridge).

Identification of freshwater fishes was based on established literature (Daniels, 2002; Jayaram, 1999; Talwar & Jhingran, 1991). Nomenclature and classification was after Daniels (2002). Marine / estuarine species were identified by a well respected expert who wishes to remain anonymous.

Water samples were collected at all the above mentioned points and analysed by the Environmental Monitoring Service at Auroville as per the method prescribed by the Indian Standard Institution (Anon., 1964).

IUCN Conservation status / category of species was established by the Biodiversity Conservation Prioritisation Project (BCPP) and Conservation Assessment and Management Plan Workshops (CAMP) (Molur & Walker, 1998, Rao *et al*., 1998).

RESULTS

42 species of fish representing 25 families and nine orders were collected. Six species were confined to the floodplain, 19 were estuarine and 17 occurred in both floodplain and creek. Both anadromous (e.g., *Hilsa ilisha* and *Mugil cephalus*) and catadromous (*Anguilla bengalensis*) species were present. Two species listed by Sharma (1997), *viz*., Shark Catfish *Wallago attu* and Giant Snakehead *Channa* (= *Ophiocephalus*) *marulius* were not found.

Cultured species - Catla *Catla catla,* Rohu *Labeo rohita,* Mrigal *Cirrhinus mrigala* and Carps *Cyprinus spp.* - introduced into Alankuppam, Kayalmedu, Thenkodipakkam, Mariamangalam, Metutheru, Nallaoor and Idaicherry tanks within the watershed, were not found to have reached the floodplain.

The only exotic was *Oreochromis (= Tilapia*) *mossambica*. This species' predatory nature is said to eliminate all native species (Daniels, 2002). In addition, its prolific breeding and consequent over-population, resulting in severe competition

Table 1. Species diversity, status and occurrence of fish at Kaliveli floodplain and Uppukalli creek

Scientific Name	English Name	Local Name (Pho. Tamil)	Status in India	Occurrence Man	Koo	Set	Van	Mar
Anguilliformes								
Anguillidae								
1. *Anguilla bengalensis*	Indian Long-finned Eel	Vilangu	EN	A	P	P	P	P
Clupeiformes								
Clupeidae								
2. *Hilsa ilisha*	Hilsa, Indian Shad	Ullam	VU	P	P	P	P	P
3 *Nematalosa nasus*	Bloch's Gizzard Shad	Ponneli, Ponn kendai	LR-nt	P	P	P	P	P
4 *Nematalosa galatheae*	Gizzard Shad	Ponneli, Ponn kendai	x	P	P	P	P	P
5 *Clupea* sp.	Sardine	Nethili	x	A	A	P	P	P
6 *Thryssa* sp.	Anchovy	Poriva	x	A	A	A	A	P
7 *Coilia* sp.	Anchovy	Poriva	x	A	A	A	P	P
Gonorhynchiformes								
Chanidae								
8. *Chanos chanos*	Milkfish	Kulla kendai	LR-nt	P	P	P	P	P
Cypriniformes								
Cyprinidae								
9. *Puntius sophore*	Spotfin Barb	Kosuru Meen	LR-nt	P	P	P	A	A
Siluriformes								
Bagridae								
10. *Aorichthys seenghala*	Giant River Catfish	Periya keluthi	x	A	P	A	A	A
11 *Mystus gulio*	Long-whiskered Catfish	Keluthi	x	P	P	P	P	P
12 *Mystus vittatus*	Striped Dwarf Catfish	Keluthi	VU	P	P	P	P	A
13 *Tachysurus subrostratus*	Marine Catfish	Visha keluthi	x	A	A	A	A	P
14 *Tachysurus thassinus*	Marine Catfish	Visha keluthi	x	A	A	A	A	P
15 *Tachysurus arius*	Marine Catfish	Visha keluthi	x	A	A	A	A	P
16 *Clarius batrachus*	Magur / Black Walking Catfish	Masarai keluthi	VU	A	P	A	A	A
Mulgiformes								
Mugilidae								
17. *Mugil cephalus*	Common mullet	Madavai, Periya Madavai	LR-nt	A	P	P	P	P
18 *Liza dussumeri*	Mullet	Madavai	LR-nt	A	A	A	P	P
19 *Liza macrolepis*	Mullet	Madavai	LR-nt	A	A	A	P	P
20 *Liza parsia*	Mullet	Madavai,	LR-nt	A	A	A	P	P
Beloniformes								
Hemiramphidae								
21. *Hyporhamphus limbatus*	Indian/Congaturi Halfbeak	Otha-mookku kola	x	P	P	P	P	A
Belonidae								
22. *Strongylura strongylura*	Fullbeak Gar	Retta- mookku kola, Kola	x	A	A	P	P	P
Adrianithydae								
23. *Oryzias melastigma*	Estuarine Ricefish	Kosuru meen	x	A	P	P	A	A
Perciformes								
Chandidae								
24. *Ambassis commersoni*	Glassy Perchlet	Selathaan	LR-nt	P	P	P	P	P
Sillaginidae								
25. *Sillago sihama*	Silver Sillago	Kezhangan	LR-nt	A	A	A	A	P
Carangidae								
26. *Alepes kalla*	Horse Mackerel	Paarai	x	A	A	A	A	P
27 *Leiognathus splendens*	-	Kaarai	VU	A	A	A	P	P
Gerridae								
28. *Gerres abbreviatus*	-	Udaan	x	A	A	A	A	P
Theraponidae								
29. *Therapon jarbua*	Target Perch	Keesaan	LR-nt	A	A	A	P	P
30 *Therapon theraps*	Target Perch	Manja keesaan	x	A	A	A	A	P
Lutjanidae								
31. *Lutjanus fulviflammus*	Snapper	Kathaazhai meen	LR-nt	A	A	A	A	P
Scatophagidae								
32. *Scatophagus argus*	Scat	Pulli sethi	x	A	A	P	P	P
Siganidae								
33. *Siganus javus*	-	Oora	LR-nt	A	A	A	P	P
Cichlidae								
34. *Etroplus suratensis*	Pearl Spot	Seetha kendai, Pappai	x	P	P	P	P	P

Scientific Name	English Name	Local Name (Pho. Tamil)	Status in India	Occurrence Man	Koo	Set	Van	Mar
35 *Oreochromis mossambica*	Egyptian Mouth Breeder	Zilebi kendai / Tilapia	Invasive**	P	P	P	P	P
Gobiidae								
36. *Glossogobius giurus*	Tank Goby	Uluvai	LR-nt	P	P	P	A	A
Anabantidae								
37. *Anabas testudineus*	Climbing Perch	Panangottai meen	VU	P	P	P	P	P
Channidae								
38. *Channa punctatus*	Spotted Snakehead	Kuravai	LR-nt	P	P	P	P	A
39 *Channa striatus*	Striped/Banded Snakehead Veral	LR-lc	A	P	P	A	A	
Pleuronectiformes								
Pleuronectidae								
40. *Pseudorhombus arsius*	Tongue Sole / Flounder	Naakku meen	x	A	A	A	A	P
Tetradontiformes								
Sclerodermi								
41. *Triacanthus brevirostris*	Tripod Fish / File Fish	Mulluruvi	x	A	A	A	P	P
Gymnodontes								
42. *Tetrodon fluviatilis*	Puffer Fish / Globe Fish	Pandu meen	x	A	A	A	A	P

* IUCN Red List Categories: EN - Endangered (1); VU - Vulnerable (5); LR-nt - Lower Risk, near threatened (14); LR-lc - Lower Risk, least concern (1); x - Not evaluated, hence status unknown (20); ** IUCN Status: Anon (2000); *** Occurrence: P - Present; A - Absent
Man - Manjakuppam; Koo - Koonimedu; Set - Settikuppam; Van - Vandipalayam; Mar - Marakkanam Road bridge

Table 2. Water quality at the 5 study points

S. No	Collection point	Month & Year	pH	E.C	CO_3 meq/1	HCO_3 meq/1	Ca meq/1	Mg meq/1	Cl meq/1	Na meq/1	K meq/1	SAR
1.	Manjakuppam	Nov. 2003	6.9	5.3	1.2	37.9	3.0	12.2	-	37.1	0.5	13.5
2.	Koonimedu	Nov. 2003	8.7	1.9	1.2	4.0	3.0	4.0	13.5	11.0	0.4	5.9
3.	Koonimedu	Feb. 2004	7.4	4.7	-	1.4	1.3	1.8	0.9	1.2	0.2	0.7
4.	Settikuppam	Nov. 2003	8.9	5.5	0.4	0.3	2.6	9.6	41.9	42.2	0.5	17.1
5.	Settikuppam	Dec. 2003	7.2	1.3	-	6.2	4.0	2.0	6.7	4.1	2.8	2.3
6.	Settikuppam	Feb. 2004	7.4	10.9	-	18.0	20.0	30.0	132.0	104.0	3.1	14.7
7.	Vandipalayam	Nov. 2003	9.0	2.1	1.2	3.4	2.8	4.2	16.0	13.4	0.4	7.2
8.	Vandipalayam	Feb. 2004	6.8	39.0	-	20.0	800.0	60.0	301.0	245.0	4.1	24.4
9.	Marakkanam Rd. Bridge	Mar. 2004	7.9	62.2	-	23.0	44.0	51.0	53.0	391.0	6.1	40.0

with other species and threat to aquatic vegetation (Saxena, 1988), fills the criteria for it being classed as an Alien Invasive species (Anon., 2000).

Of the remaining 41 species collected, the conservation status of only 21 could be determined based on Molur and Walker (1998) and Rao *et al*. (1998). Threatened species recorded included the Indian Long-finned Eel *Anguilla bengalensis* (Endangered), *Hilsa ilisha*, *Mystus vittatus*, *Clarius batrachus*, *Leiognathus splendens* and *Anabas testudineus* (all Vulnerable). Fishes of Lower Risk categories included 14 near threatened species, and one least concern species (*Channa striatus*).

In many cases, names used by local fishermen and villagers differed markedly from those used by people in other regions of Tamil Nadu (Table 1).

The striking feature of water quality during the months of February and March 2004 was the presence of very high concentrations of chlorides in the area from Marakkanam road bridge to Settikuppam. This is the area of prawn farms and aquaculturists are known to dump vast quantities of bleaching powder ($CaOCl_2$) into the waterbody in an effort to ward off White-spot Disease which affects cultured prawns. As a result, it is not uncommon to see scores of dead or dying fish littering the banks (Table 2). Water samples analysed for pesticides at the creek around Vandipalayam (Organochlorine: Aldrin & Dieldrin, Alpha - BHC, Beta - BHC, Gamma - BHC, Endosulfan I & II, Endosulfan Sulfate, Endrin & Endrin Aldehyde, Heptachlor & Heptachlor Epoxide and DDT; Organophosphorous: Dichlorvos, Chlorpyrifos, Parathion Methyl, Malathion and Ethion] showed only the organochloride Beta - BHC to be above the detectable limit - 0.02µg/l (Correa, pers. comm.).

Discussion

Extensive flooding leading to temporary lotic conditions during the highwater season is a feature of the Kaliveli catchment. The principal freshwater fish stocks live in the many perennial water bodies within the catchment - Nadukuppam, Adasal, Munnoor, Thenkodipakkam and Kondamoor to mention but a few. Being surprisingly very mobile, many make long lateral journeys along with the floodwaters and reach the floodplain. Here they spawn and an explosive increase in fish stocks takes place. The peak water level and fish biomass is reached at the end of the monsoons and from then on begins to slowly diminish. Towards the end, strandings and heavy predation

(by both natural predators like waterbirds, and by man) are common. The entire cycle is repeated year after year.

Contrary to popular notion, in tropical lentic environments, there are no clear cut transitions from fresh to brackish water. As with most floodplains in the Oriental Region, Kaliveli has an extensive estuarine reach and immense outpourings of freshwater dilute the sea during the monsoon rains. After the rains abate, saltwater runs up long distances (especially during high tide) and also tends to move up beneath freshwater. All this allows estuarine species to move upriver more easily, and, vice versa, riverine species to reach the estuary. This also is said to facilitate the movement of migratory species.

High concentrations of chlorides around prawn farms will affect fish movements and stocks. The full extent of damage is not yet fully known. Only a detailed analysis and mature interpretation of data can satisfactorily answer empirical demands.

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