

# Changes in Fish and Shellfish in Thondamanaru Lagoon, Jaffna, Sri Lanka

S. Piratheepa, G. Rajendramani, T. Eswaramohan

**Abstract**—Current study was conducted for one year from June 2014 to May 2015, with an objective of identification of fish and shellfish diversity in the Thondamanaru lagoon ecosystem. In this study, 11 species were identified from Thondamanaru lagoon, Jaffna, Sri Lanka. There are four fishes, *Chanos chanos*, *Hemirhamphus* sp., *Nematalosa* sp. and *Mugil cephalus* and seven shell fishes, *Penaeus indicus*, *Penaeus monodon*, *Penaeus latisulcatus*, *Penaeus semisulcatus*, *Metapenaeus monoceros*, *Portunus pelagicus* and *Scylla serrata*. Species composition of *Mugil cephalus*, *Penaeus indicus* and *Metapenaeus monoceros* was high during rainy seasons. However, lagoon is being subjected to adverse environmental conditions that threaten its fish and shellfish biodiversity due to lack of saline water availability and changes in rainfall pattern.

**Keywords**—Diversity, shell fish, shrimp, Thondamanaru lagoon.

## I. INTRODUCTION

THERE are around 40 lagoons around Sri Lanka. But most of the common lagoons are located along the southern, southeastern and eastern coasts of Sri Lanka, where littoral drift causes accumulation of sand as barriers and split at river mouths [8].

Thondamanaru lagoon is one of the lagoons in Jaffna; it separates the Vadamarachchy area from Valikamam and Thenmarachchy area. The lagoon's water is brackish to saline [2]. Barrage with sluice gate, sand bar and bridges are three existing structures in Thondamanaru lagoon. In 1953, the barrage with sluice gates was erected at a point about quarter mile from the mouth of the lagoon by the Irrigation Department. The barrage was erected to prevent the free flow of sea water into the lagoon and prevents it from mixing with sea water, ultimately creating a freshwater lake [2].

Principal vegetation of Thondamanaru lagoon is sea grass beds, mangrove, coconut, palmyrah, grass, rice paddy, scrub forest and open forest. The lagoon attracts a wide variety of water birds [1]. Also, lagoon provided employment and a livelihood for about 300 fishermen and their families, who netted approximately 150 tons of fish per year. The introduction of the barrage with sluice gate has thrown nearly 2/3 of the fishermen life and bringing down the fish production about 35 tons per year [2].

Due to the periodical narrowing of the mouth during the dry season and sometimes complete closure of the lagoon mouth,

salinity of the lagoon water is increased and high salinity is interfering with ichthyofaunal composition [1].

Thondamanaru lagoon is significant due to its natural productivity as well as rich diverse resources. Due to the prevailed war situation and security, field survey was not feasible about 30 years. Therefore, present study was conducted to identify and update data on the fauna of the Thondamanaru lagoon (Northern Province, Sri Lanka) and compare the changes in species composition with past records.

## II. MATERIALS AND METHODS

### A. Study Area

The Jaffna Peninsula is located at the northern province of the Island of Sri Lanka. It has an area of about 1 025.6 km<sup>2</sup>. Jaffna district has a coastal belt of 292.2 km by length and a continental shelf area of 3 360 square miles [3], [7].

Thondamanaru lagoon was selected for this study (Fig. 1). Similar to most other lagoons and estuaries in Sri Lanka, Thondamanaru lagoon also supports profitable shellfish and finfish fisheries. Thondamanaru lagoon lies approximately between 80°08'E– 80° 29' E longitudes and 9° 34' N – 9° 49' N latitudes [3], [7]. Thondamanaru lagoon is shallow tidal lagoon and its northwestern end is connected with Indian Ocean by narrow channel that is temporarily covered by sand bar [1].



Fig. 1 Location of the Thondamanaru lagoon

### B. Sampling

Random samples of shellfish and finfish were collected weekly from the commercial catches from June 2014 to May 2015. The observations were made between 6.30 p.m to 10.00 p.m weekly.

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Fig. 2 Existing structures of the Thondamanaru lagoon

Randomly collected samples were placed in polythene bags. All collected specimens were brought to the laboratory in an ice box and analyzed.

Samples were examined using hand lenses and under a binocular stereo microscope. Identification of samples was done up to the species level at the laboratory by observing the morphological characteristics. Photographs of all specimens were taken at the laboratory. Identification was confirmed with the help of widely used references [4]-[6].

### III. RESULTS AND DISCUSSION

Four finfishes, *Chanos chanos*, *Hemirhamphus* sp., *Nematalosa* and *Mugil cephalus* and seven shell fishes, *Penaeus indicus*, *Penaeus monodon*, *Penaeus latisulcatus*, *Penaeus semisulcatus*, *Metapenaeus monoceros*, *Portunus pelagicus* and *Scylla serrata* were identified.

#### *Chanos chanos*



Fig. 3 *Chanos chanos*

- Common name : Milkfish
- Colour: Body colour silvery on belly and sides, olive-green or blue colour on back. Dorsal, anal and caudal margins are dusky.
- Descriptive remarks: Body shape is fusiform, elongated, moderately compressed, smooth and streamlined. Single dorsal fin present. Formula of dorsal fin D<sub>14-16</sub>. Short anal fin present. Formula of dorsal anal fin A<sub>10-11</sub>. Dorsal fin is present opposite to ventrals.
- Anal fin is very close to caudal fin. Deeply forked large caudal fin present with large scale flaps at base in adults.

Pectoral fins and pelvic fins present with axillary scales. Scales are cycloid type. Toothless small mouth present.

- Size: Maximum about 180 cm.
- Habitat: Coastal waters including lagoons [6].

#### *Hemirhamphus* sp.



Fig. 4 *Hemirhamphus* sp

- Common name : Murril
- Colour: Bluish dorsally, silvery on sides
- Descriptive remarks: Dorsal fin present. Formula of dorsal fin D<sub>12-15</sub>. Anal fin present. Formula of anal fin A<sub>10-12</sub>. Anal fin originates opposite to dorsal fin. No scales present on dorsal and anal fin.
- Greatly prolonged, beak-like lower jaw present, end of the beak coral red, upper jaw short and triangular without scales, preorbital ridge absent. Total number of gill rakers on first gill arch 25-36; pectoral fins is short and not reaching past nasal pit when folded forward. Caudal fin forked. Lower lobe of caudal fin is longer than upper lobe. Dorsal and anal fins located posteriorly.
- Size: Maximum about 44 cm.
- Habitat: Coastal waters [6].

#### *Nematalosa* sp.



Fig. 5 *Nematalosa* sp.

- Common name : Koi
- Colour: Silvery body with yellow fins
- Descriptive remarks: Dorsal fin present. Formula of dorsal fin D<sub>15-19</sub>. Anal fin present. Formula of anal fin A<sub>17-26</sub>. Belly with 17 to 20 + 9 to 13, total 28 to 32 (usually 30) scutes (Ventral scutes) present. Black shoulder spot present. Occasionally a diffuse pink lateral band present. Snout is projecting.
- Size: Maximum about 22 cm.



- Habitat: Bays and lagoons [5], [6].

*Mugil cephalus*



Fig. 6 *Mugil cephalus*

- Common name : Flathead grey mullet
- Colour: Black blue/green, flanks and belly pale or silvery
- Descriptive remarks: Body is cylindrical and robust. Head is broad and flat, its width is more than width of mouth cleft, adipose eyelid is well developed and covering most of pupil; upper lip is thin. Two dorsal fins present. Formula of dorsal fin  $D_{IV}; 6-8$ . First dorsal fin is very closer to snout tip than to caudal fin. Anal fin present. Formula of anal fin  $A_{III}; 8-9$ . Scales present on back and flanks and it forms streaked longitudinal stripes. Pectoral axillary blotch is dark.
- Size: Maximum about 90 cm.
- Habitat: Estuarine, bays and lagoons [6].

*Penaeus monodon*



Fig. 7 *Penaeus monodon*

- Common name: Giant tiger prawn (E), Karawandu issa(S)
- Colour: Greenish grey body with dark brown bars present and yellow spot on pleopods. Antenna is uniform pink – brown.
- Descriptive remarks: The rostrum is well developed and toothed dorsally (7-8) and ventrally (3-4). The most distinct features for identification of this species are fifth pereiopods without exopod, carapace without longitudinal sutures and unarmed telson.
- Size: Maximum about 27 cm in males, females about 35 cm.

- Habitat: Post larvae and juveniles in estuaries, adults in the sea. Abundant in low salinity lagoons [5].

*Penaeus indicus*



Fig. 8 *Penaeus indicus*

- Common name : White Shrimp (E), Kiri issa (S)
- Colour: White body covered with numerous minute dark brown dots.
- Descriptive remarks: The rostrum is well developed and toothed dorsally (7-9) and ventrally (4-6). Carapace is without longitudinal sutures. There are no fixed subapical spines on telson. There are fifth pereiopods with exopod.
- Size: Maximum about 18 cm in males, females about 25 cm.
- Habitat: Very abundant on sand and mud. Showing preference for soft sand at depth of 30cm. Abundant in both low and high salinity lagoons [5].

*Penaeus latisulcatus*



Fig. 9 *Penaeus latisulcatus*

- Common name : Western King Prawn.
- Colour : Pale brown body. Short brown stripes present in abdomen with yellow pleopods.
- Descriptive remarks: The rostrum is well developed and toothed dorsally (9-12) and ventrally (1). Carapace is without longitudinal sutures. Exopod present on fifth pereiopods. Telson armed with 3 pairs of small movable spines.
- Size: Maximum about 16 cm in males, females about 20 cm.

- Habitat: Juveniles common in high salinity lagoons and at mouth of low salinity lagoons; rare in the sea [5].

*Penaeus semisulcatus*



Fig. 10 *Penaeus semisulcatus*

- Common name: Green tiger prawn or flower prawn (E), Kurutu issa (S)
- Colour: Antenna banded white and brown. Reddish brown to pale brown body with brownish grey dorsal transverse bands present.
- Descriptive remarks: The rostrum is well developed and toothed dorsally (5-8) and ventrally (2-4). Antenna banded white and brown. Carapace is without longitudinal sutures. Telson unarmed. Exopod present on fifth pereiopods.
- Size: Maximum about 18 cm in males, females about 23 cm.
- Habitat: Post larvae and juveniles in high salinity lagoons and near mouths of low salinity lagoons. Abundant in the sea on very soft green mud/burries in mud at daytime [5].

*Metapenaeus monoceros*



Fig. 11 *Metapenaeus monoceros*

- Common name: Speckled shrimp.
- Colour: Greenish grey body
- Descriptive remarks: The rostrum is well developed and toothed dorsally (9-12) and no ventral teeth. Carapace is without longitudinal or transverse sutures. Telson armed only with spicules. Fifth pereiopods have no exopod. Branchio cardiac ridge reaches the posterior extension of hepatic spine.

- Size: Maximum about 15 cm in males, females about 20 cm.
- Habitat: Post larvae and juveniles in estuaries, adults in marine on mud bank [5].

*Portunus pelagicus*



Fig. 12 *Portunus pelagicus*

- Common name : Blue swimming crab
- Colour: Blue in colour with white spots
- Descriptive remarks: Teeth on each anterolateral border of the carapace cut into nine teeth. The last pair of lateral tooth enlarged in the form of long spine. A single spine present at the distal end of posterior boarder of the cheliped.
- Males are blue with extensive white spots. The tips of the chelae and the distal segments of the legs are purple. Females are duller greenish/brownish colour with irregular patches and have rounded carapace. Laterally flattened legs present and last 2 segments of last pair paddle-like.
- Size: Carapace length about 18 cm for males, females about 16.5 cm.
- Habitat: Very wide spread generally marine. It is a marine crustacean that occurs in large shoals in shallow coastal water overlying sandy or muddy substrates. Commonly rise to the surface at night [5].

*Scylla serrata*

- Common name : Indo-Pacific swamp crab
- Colour: Greenish body
- Descriptive remarks: Carapace is smooth, with strong transversal ridges. Orange colour tipped strong chelipeds and well developed spines present on the outer surface. There are polygonal markings on all limbs and the two sharp spines on the outer margin of the carpus of the cheliped. Teeth of the anterio-lateral border of the carapace cut into nine and equal in size. Legs are marbled.
- Size: Carapace length to about 22cm.
- Habitat: Neritic, benthic on mud and sand and also on high silty substrata. In Sri Lanka, this species are most abundant in estuaries [5].





Fig. 13 *Scylla serrata*

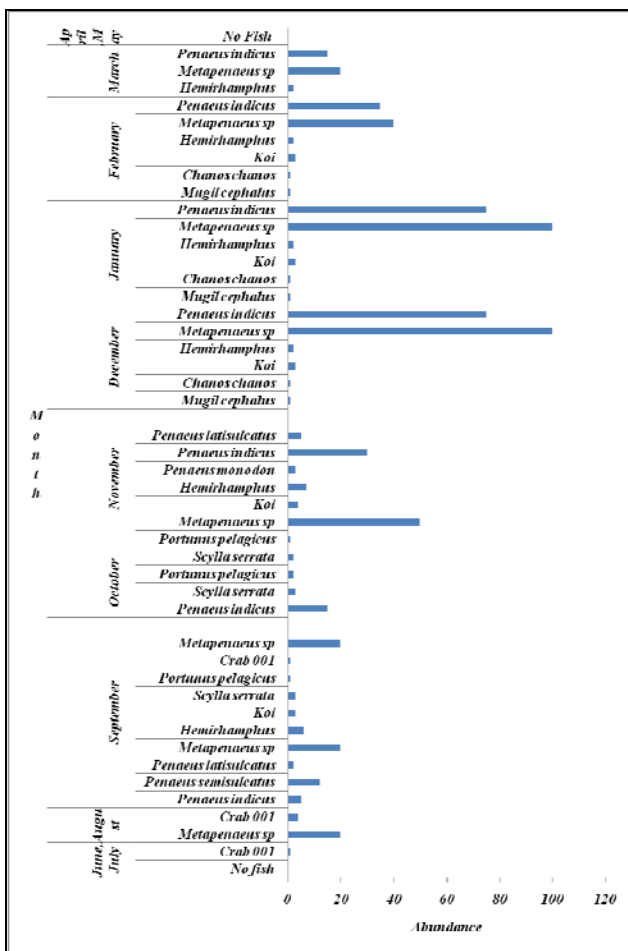


Fig. 14 Fluctuation in fish and shellfish in Thondamanaru lagoon

At Thondamanaru lagoon, *Penaeus indicus*, *Penaeus monodon* were present along with 33 species of fish. Out of the 33 species, 18 species were purely marine forms during 1963-1969 [1].

Prior to 1953, lagoon harboured all species. But after the introduction of the barrage with sluice gate, fish fauna had

been reduced from 47 species during 1967/68 to 15 species in 1978 [2].

Fluctuation of fish and shellfish were observed during the study period. During the rainy season, species diversity was observed high compared with other months. *Mugil cephalus*, *Penaeus indicus* and *Metapenaeus monoceros* were most abundant in this lagoon during rainy season from November to January (Fig 14).

Changes in fish and shellfish were observed due to the increased salinity in dry season [2]. Main causes for these changes in fish and shellfish are absence of water circulation, changes in water depth, salinity and absence of rainfall.

#### IV. CONCLUSION

Conducted field study revealed that 11 species of fish and shell fish were existed in Thondamanaru lagoon, Jaffna, Sri Lanka. They are *Chanos chanos*, *Hemirhamphus* sp, *Nematalosa* sp and *Mugil cephalus*, *Penaeus indicus*, *Penaeus monodon*, *Penaeus latisulcatus*, *Penaeus semisulcatus*, *Metapenaeus monoceros*, *Portunus pelagicus* and *Scylla serrata*.. After the introduction of the barrage with sluice gate, changes in fish and shellfish were observed due to the increased salinity in dry season.

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#### REFERENCES

- [1] Atputhanathan, M. and Chitravadivelu, K. (1968). Fishes of the Thondaimannar lagoon. Proc. Sri Lanka Association of Advancement of Science.25(1):68
- [2] Chitravadivelu, K. (1978). FWC Newslwter.IX(1):9-13
- [3] Chitravadivelu, K and Arudpragasam, K.D (1983). Studies on the prawn fishery in the Jaffna lagoon. Proceeding of Sri lanka Association for Advancement of Science.39(1) 47
- [4] Carpenter, K.E. and Niem, V.H. (1998). FAO species identification guide for fishery purposes. The living marine resources of the Western Central Pacific. Cephalopods, crustaceans, holothurians and sharks. Rome, FAO. Volume 2. pp 687-1396.
- [5] De Bruin, G.H.P., Russell, B. and Bogusch, A. (1994). The Marine Fishery Resources of Sri Lanka, *FAO species Identification guide for fishery purposes*. FAO, Rome.
- [6] Munro, I.S.R (1995). The Marine and freshwater fishes of Ceylon. Department of external affairs, Canberra, Australia.
- [7] Sachithanathan, K. and Perera, W.K.T. (1970). Topography and Substratum of the Jaffna lagoon. *Bulletin of the Fisheries research station Ceylon*.21:75-85.
- [8] Sanmugarajah, K. (1993). Report of water resources Development, Jaffna Peninsula.pp78

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