



# Assessment of Epizootic Ulcerative Syndrome (EUS) in Estuarine Fishes Collected from Arasalar Estuary, Puducherry State, India

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**Authors' contributions**  
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*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

## Article Information

DOI: 10.56557/UPJOZ/2023/v44i243814

### Editor(s):

(1) Dr. Belisario Dominguez-Mancera, University Veracruz, Mexico.

### Reviewers:

(1) Ali Reza Radkhah, University of Tehran, Iran.

(2) Mohammed Jard Kadhim, Al-Furat Al-Awsat Technical University, Iraq.

**Original research Article**

**Received: 06/10/2023**  
**Accepted: 12/12/2023**  
**Published: 19/12/2023**

## ABSTRACT

Fishes form an important source of cheap protein for people of many countries. The majority of the global production comes from freshwater aquaculture (58%) followed by marine (36%) and brackish water (6%). With an average increase in aquaculture production of 11% during the last decade, aquaculture has become the fastest growing sector of the world food economy. However, fish diseases are now posing a great threat to achieve maximum production and has become a limiting factor to the success of aquaculture. Among the various diseases, Epizootic Ulcerative Syndrome (EUS) is a disease affecting a wide range of wild and farmed freshwater and estuarine fish which has spread across south-east Asia and India. From the fish survey, Food Fishes were collected from the Arasalar estuary, Puducherry State, India. The fish caught were identified and average 200

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species of each fish were examined for EUS (Epizootic ulcerative syndrome) infection for the four seasons of the year (Pre-summer, Summer, Post-summer and Rainy season). The results of the number of fishes with EUS that could be identified in the different seasons are reported. Of the 75 fishes, that were examined, 12 were affected with EUS. This shows that 16% of the fishes were subjected to infection.

Among *Lizaparsia*, 11 species were infected representing 14.6% of infection and among *Mystus*, seven fishes were infected forming 9.3% of infection. With regard to *Oreochromis mossambicus*, only four species were infected forming 5.3% of infection. With regard to *Glossogobius giuris*, nine species were infected thus 12% of infection. Nevertheless, during this period, the range of infection ranged from nil to 16%.

During the pre-summer season, the percentage of infection again ranged from nil but to 12%. The maximum infection was noticed in *Liza parsia* (9 fishes) representing 12% infection, *Puntius filamentosus* (8 fishes) recording 10.6% followed by *Glossogobius* and *Mystus* (8%) and *Oreochromis mossambicus* (1.33%) infection respectively. During the summer and the post-summer season, none of the fishes that were investigated recorded any signs of EUS. Thus, an overall comparison reveals that the highest percentage of EUS was recorded in the rainy season followed by the pre-summer season and least in summer and post-summer season.

**Keywords:** Arasalar estuary; estuarine fishes; epizootic ulcerative syndrome; seasons.

## 1. INTRODUCTION

Fishes form an important source of cheap protein for people of many countries [1]. This has resulted in an enormous increase in the number of aquaculture farms worldwide. As a result, fish culture has now become a commercially important industry worldwide [2,3,4]. Aquaculture now represents more than 30% of the total fish production of consumption [3,5].

The majority of the global production comes from freshwater aquaculture (58%) followed by marine (36%) and brackish water (6%) [6]. With an average increase in aquaculture production of 11% during the last decade, aquaculture has become the fastest growing sector of the world food economy [7]. However, fish diseases is now posing a great threat to achieve maximum production and has become a limiting factor to the success of aquaculture.

Among the various fish pathogens, fungi come next in importance to bacterial diseases in their impact and cause considerable economic losses in aquaculture [8,9]. Among fungi, Oomycetes of the order *Saprolegniales*, *Achlya* and *Aphanomyces* species are endemic to aquatic habitats around the world. They are responsible for the main types of fungal infection in fish and shellfish in aquaculture, fish farms and hobby fish tanks [10,6,11,12].

Among the various diseases, Epizootic Ulcerative Syndrome (EUS) is a disease affecting a wide range of wild and farmed

freshwater and estuarine fish [13] which has spread across south-east Asia, India and later to Pakistan and Africa [14]. Pathological survey of skin ulcers revealed that the microbe associated is *Aphanomyces* [15]. Other diseases like red-spot disease in Australia [16] mycotic granulomatosis in Japan [17] and ulcerative mycosis in USA [18] are now recognized as the same disease [19].

EUS is one of the listed diseases of fishes as perennial [20] and has been found to infect more than 100 species of fishes causing huge economic losses to countries like Australia, Thailand, Bangladesh, Pakistan and India. Hence, the present study was attempted to find the prevalence of this disease in the fishes found in this system during the different seasons of the year at Arasalar estuary, Karaikal region of Puducherry.

## 2. MATERIALS AND METHODS

### 2.1 Study Area

The Arasalar estuary is situated in the Bay of Bengal on the East Coast of India (Latitude 79° 52° N; Longitude 10° 55°, Figure 1). The river Arasalar has its origin from Cauvery in Kabishtalam near Papanasam, Thanjavur District and runs through some important places like Sakkotai, Andropodhi, Agalangannu and traverses a distance of about 86 km to form an estuary at Karikal (Puducherry State). The River Arasalar has two branches, namely, Arasalar and

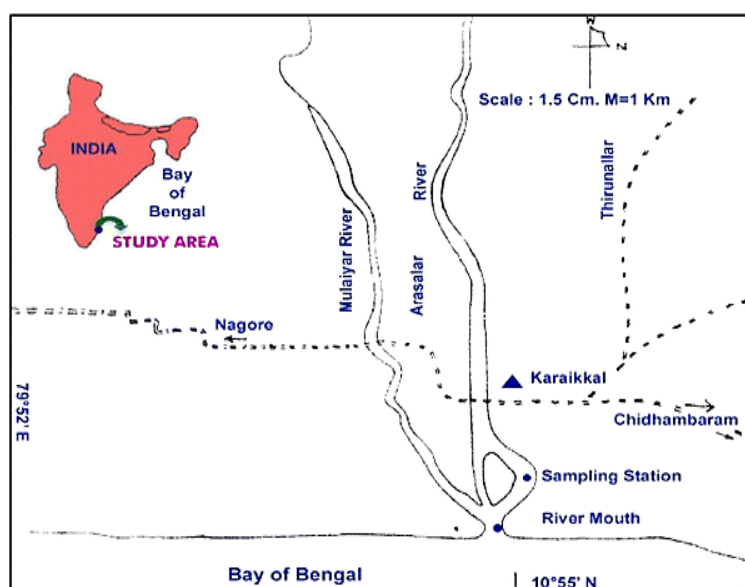


Fig. 1. Study Area

Natar at a distance of 36 km from the origin. The width of the estuary is 64 meters at the river mouth, whereas at sampling station the width is 103.5 meters. The average depth of the water is 3 meters and the maximum depth observed in the estuary during high tide (during monsoon) is 4.34 meters. Arasalar estuary is an open estuary and so there is free communication with the Bay of Bengal water sampling station was selected at a distance of one km from the river mouth. The tidal effect is felt up to a distance of one and half kilometre from the river mouth. The estuary is subjected to fluctuations due to various factors caused by (a) the amount of fresh water discharged, (b) the level of tidal activity, and (c) circulation exchanges between estuarine and neurotic waters.

## 2.2 Sample Collection

Seasonal survey (once in three months) of fin fishes of the estuary were carried out in the present study for an year (2019-2020). Using standard net with help of fisherman fishes collected from the boat and brought to the collection point of Arasalar estuary station. All fish specimens were collected and identified using standard keys (Talwar and Jhingran, 1991; Ababouch, 2006), counted, length and weighed on the board. The survey was done in the early morning around 4 to 5 a.m. Each species of fish was counted separately.

From the fish survey, Food Fishes were collected from the Arasalar estuary, Puducherry State. The fish caught were identified and 75 species of

each fish were examined for EUS (Epizootic ulcerative syndrome) infection for the four seasons of the year 2019-2020 (Pre-summer, Summer, Post-summer and Rainy season). Microbial studies also done by using standard methods by Saxena [21].

## 3. RESULTS AND DISCUSSION

The results of the number of fishes with EUS that could be identified in the different seasons are presented in Table-1. As evident from the table, during the rainy season, among the various fishes, the maximum infection was found in *Puntius* species. Of the 75 fishes, that were examined, 12 were affected with EUS. This shows that 16% of the fishes were subjected to infection. Among *Lizaparsia*, 11 species were infected representing 14.6% of infection and among *Mystus*, seven fishes were infected forming 9.3% of infection. With regard to *Oreochromis mossambicus*, only four species were infected forming 5.3% of infection. With regard to *Glossogobius giuris*, nine species were infected thus representing 12% of infection. Nevertheless, during this period, the range of infection ranged from nil to 16%. Where *Puntius filamentosus* average weight 15gm, 6.5 cm length, *Mystus gulio* average weight 33gm, 17.5 cm length, *Liza parsia* average weight 30gm, 9.5 cm length, *Oreochromis mossambicus* average weight 105 gm, 12 cm length, *Mugil cephalus* average weight 42 gm, 11 cm length and *Glossogobius giuris* average weight 82 gm, 20 cm length.

Table 1. Prevalence of EUS infection (season wise) in various fishes

S. No.	Fish Species	Numbers in each species	Number of infected species							
			Rainy season		Pre-summer season		Summer Season		Post-summer season	
			No.	%	No.	%	No.	%	No.	%
1.	<i>Puntius filamentosus</i>	75 ± 0.72	12 ± 0.12	16.0	8 ± 0.32	10.60	0	0	0	0
2.	<i>Mystus gulio</i>	75 ± 0.34	7 ± 0.41	9.3	6 ± 0.45	8.00	1 ± 0.20	0.2	1 ± 0.12	0.2
3.	<i>Liza parsia</i>	75 ± 0.26	11 ± 0.56	14.6	9 ± 0.26	12.00	1 ± 0.30	0.2	0	0
4.	<i>Oreochromis mossambicus</i>	75 ± 0.52	4 ± 0.26	5.3	1 ± 0.80	1.33	0	0	0	0
5.	<i>Mugil cephalus</i>	75 ± 0.45	0	0	0	0	1 ± 0.24	0.2	1 ± 0.14	0.2
6.	<i>Glossogobius giuris</i>	75 ± 0.02	9 ± 0.52	12.0	6 ± 0.86	8.00	0	0	0	0

During the pre-summer season, the percentage of infection again ranged from nil but to 12%. The maximum infection was noticed in *Liza parsia* (9 fishes) representing 12% infection, *Puntius filamentosus* (8 fishes) recording 10.6% followed by *Glossogobius* and *Mystus* (8%) and *Oreochromis mossambicus* (1.33%) infection respectively. During the summer and the post-summer season, none of the fishes that were investigated recorded any signs of EUS. Thus, an overall comparison reveals that the highest percentage of EUS was recorded in the rainy season followed by the pre-summer season and least in summer and post-summer season.

John and George [14] reported that snakeheads were the most seriously affected species even though species like *Puntius clarias*, Indian major carps, *Anabas*, *Mugil*, *Glossogobius*, *Spiny eel*, *Swamp eel* and *Gouramis* were also affected. These results are in line with the observations noticed in the present study. Ahmed and Rab [22] and Roberts et al. [13] also maintained that fishes like milk fish, *Tilapia* and Chinese carps were consistently resistant to EUS. This statement also appears to be true as *Tilapia* in the present study were not affected by EUS in all the seasons.

In the present study, maximum EUS was observed during the rainy season followed by the pre-summer season. Literature reveals that Vijayakumar et al. [23] while studying the prevalence EUS in an estuarine system also reported maximum EUS to occur during the rainy season followed by the post-monsoon season. In addition, they noticed its complete absence during the summer and post-summer season as noticed in the present study. The highest percentage of EUS noticed in the rainy season may be attributed to the heavy influx of river water entering the estuaries which would have brought about copious amount of pollutants from afar leading to stressful conditions and decrease of immunity leading to the invasion of *Aphanomyces*. Rashmikumari and Chandankumar [2] also suggested that fungal infectious are mainly caused by immune suppression.

Vijayakumar et al. [23] also suggested that the invasion of *Aphanomyces* may be due to influx of pollutants during the rainy season. Another possible reason could be due to the change in salinity and temperature. During the rainy season due to dilution of water and low temperature, conditions would have been favorable for the

growth of *Aphanomyces* while in summer and post-summer, salinity and temperature would be high for decreasing favorable conditions for growth of this fungus.

An overall comparison of the results of the number of food fishes that were affected by Epizootic Ulcerative Syndrome (EUS) during the different seasons reveals that the highest percentage of EUS was recorded in the rainy season followed by [24] the pre-summer season and least in summer and post-summer seasons at Arasalar estuary. Further need to study more microbiological studies in this area to protect our estuary.

#### 4. CONCLUSION

An overall comparison of the results of the number of food fishes that were affected by Epizootic Ulcerative Syndrome EUS (Epizootic ulcerative syndrome) during the different seasons reveals that the highest percentage of EUS (Epizootic ulcerative syndrome) was recorded in the rainy season followed by the pre-summer season and least in summer and post-summer seasons at Arasalar estuary.

Due to Environmental Pollution, development of civilization, microbial pollution load are increasing in the Arasalar estuary, Karaikal region of Puducherry of East Coast of India. In this pathogenic microorganism affecting important food fishes in the estuary, we have to save the estuary food fishes on the way of scientific studies in the context of conservation of estuary fishes and the environment for the younger generation.

#### ACKNOWLEDGEMENT

Author is very thankful to the Principal of Aringar Anna Government Arts College, Musiri 621 211 as well as the Bharathidasan University, Tiruchirappalli – 620 024 and Tamil Nadu Government.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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