



Staphylococcal infection on the fins of an estuarine fish-*Etroplus suratensis*

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Abstract

The main aim of the present study is to compare the normal as well as infected fins of *Etroplus suratensis* with special reference to the scanning electron microscopic investigation. The normal structure of fins is found to be totally distorted in nature due to pathogenic infection of *Staphylococcus* bacteria. While viewing under a magnifying lens, the infected fins are characterized by a delicate, opaque and pale fin edge. Ultrastructurally, under SEM, the epidermal cells exhibited massive cytological alterations. A distorted structural alteration is seen in the distinctive microridge pattern of fins due to the staphylococcal infection. *Staphylococcus* is characterized by cells arranged in tetrad clusters while viewing through SEM. Poor water quality, poor oxygen content of water, increase of organic matter in water etc are some of the factors that enhance pathogenic infection in fishes.

Key words - *Etroplus suratensis*, *Staphylococcus*, fins, SEM.

INTRODUCTION

The presence of pathogens is a key parameter of interest, particularly for lakes in urban areas. Pathogens such as viruses, bacteria, and protozoans can cause various harmful diseases. Fishes are susceptible to a wide variety of bacterial pathogens especially because of many problems such as poor water quality, crowding, dietary deficiencies and overstocking. The infections of various pathogens can significantly affect the overall behavior, metabolism, body condition, fecundity and survival of fish. They are a critical concern in areas where waters are used for fishing, shell fishing, swimming, boating, or other pursuits that lead to human contact or food consumption. Infectious diseases are the main cause of economic losses in aquaculture industry which is negatively impacted by various pathogenic organisms such as *Edwardsiella tarda*, *Staphylococcus epidermidis* and *Aeromonas hydrophila* (Plumb 1997,

Abdel-Lah and Shamrukh 2001, Gamal *et al.* 2001)

Etroplus, popularly known as Karimeen is widely distributed in almost all the brackish and freshwaters of peninsular India. It is one of the edible and economically important fin fishes of Ashtamudi Lake. The present study aimed to compare the normal as well as infected fins of *Etroplus suratensis* with special reference to the scanning electron microscopic investigation.

MATERIALS AND METHODS

Etroplus suratensis is one of the commercially important fin fishes of Ashtamudi Lake. These fishes from two different sites namely site1-Kureepuzha and site 2-Perumon region were selected for the present study during the month of June 2013. The selected live fishes were collected by using cast net with the help of traditional fishermen during the early hours of the day. They were transported to the laboratory carefully in the plastic containers with the help of battery operated aerator. External characters on the caudal fins were observed carefully by using magnifying lens. Caudal fins were observed for colour, deformity and any other necroses.

Normal as well as infected caudal fins of *E.suratensis* were carefully taken and cut into small

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pieces of about 2mm diameter for SEM analysis. 2.5% gluteraldehyde was used as the fixative. Gluteraldehyde was carefully poured into small air tighted plastic bottles in which suitable labelling was also given to each of them. The preserved samples were then stored in coolest condition in refrigerator till its analysis using SEM. Gross morphological examination of fins and gills of targeted fishes were done via SEM JEOL model JSM-6390 LV. Identification of significant bacteria from the fins of fishes were carried out according to Cruickshank *et al.* (1975) and Austin and Austin (1999).

RESULTS & DISCUSSION

Normal as well as infected fins of *E.suratensis* were examined under SEM. In the present study fins of *E.suratensis* from site 1 was found to be normal morphological structure. Examination of normal fins under SEM revealed a smooth distal edge, whilst the surface of the fin consisted of alternating smooth and corrugated areas of epithelium. The branching, segmented fin rays or lepidotrichia can be seen supporting the membranous tissue of the normal fin. The smooth areas were situated over the fin rays. The corrugated areas between the rays would be capable of expansion during erection of the fin. The surface of the fin was covered with normal epithelium. The epithelium over the fin had a distinctive microridge pattern (Fig 1 to 3).

Figure-1 Normal fin of *E. suratensis*

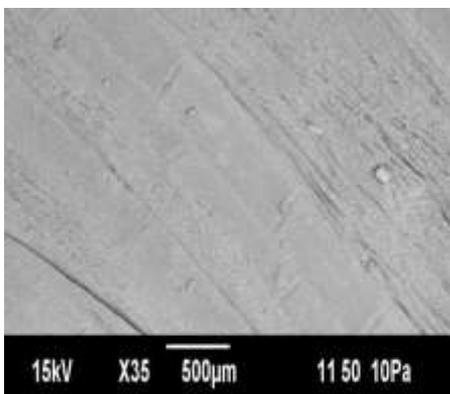


Figure- 2. Normal fin of *E. suratensis*

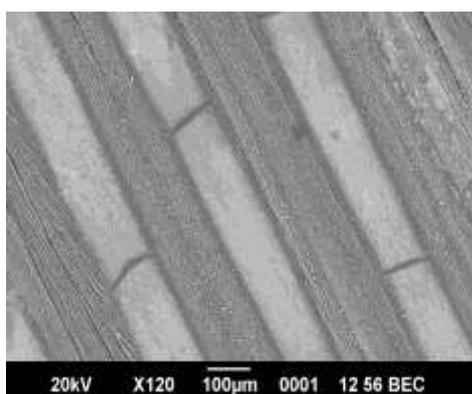


Figure-3. Normal fin of *E. suratensis*

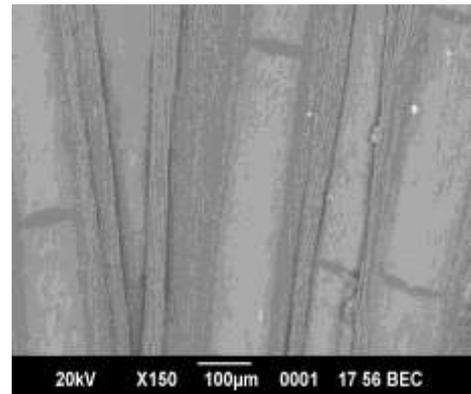


Figure-4 Fin infected with pathogen

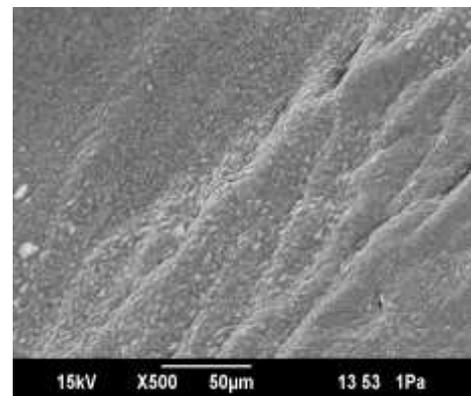


Figure-5 Fin infected with pathogens

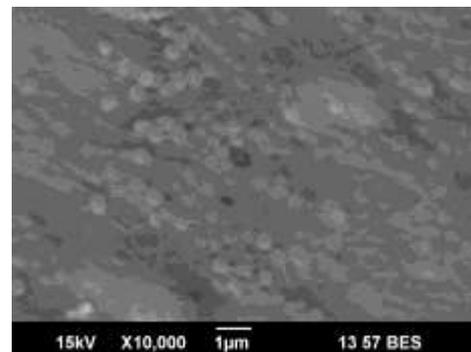
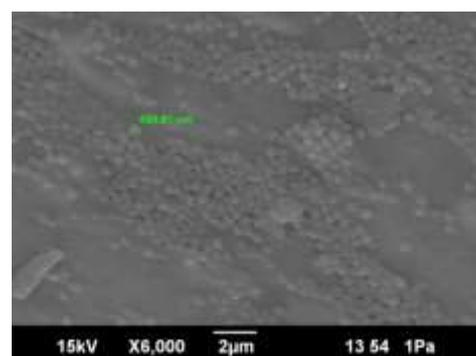


Figure-6 Fin infected with pathogens



The caudal fins of *E.suratensis* from site 2 were found to be infected in nature. The infected fins of fishes are found to be extremely different histological architecture when compared to the normal ones. The normal structure of fins is found to be totally distorted in nature due to pathogenic infection. In the present study fins of *E.suratensis* of from site 2 was identified to be infected with the pathogen *staphylococcus* bacteria (Cruickshank *et al.*, 1975, Austin and Austin 1999). *Staphylococcus* is a genus of Gram-positive bacteria which belongs to the family: *Micrococcaceae*. While viewing through SEM staphylococcus is characterized by cells arranged in tetrad clusters (four cells in a square formation). They are often irregular, large or grape-like clusters. Their name is derived from their latter frequent formation stemming from the Greek "Staphylococci" meaning grape (Alves *et al.*, 2000). While groups of cells together form these characteristic shapes, the individual bacterial cells themselves will appear as distinct circles within the chain or cluster (Fig 4-6).

While viewing under a magnifying lens, the infected fins are characterized by a delicate, opaque and pale fin edge. The base of the fins is inflamed. Haemorrhages at the base of the caudal fins with ulceration are observed. Necrotic changes were noted in the epithelium of fins due to pathogenic infection. Ultrastructurally, under SEM, the epidermal cell exhibited massive cytological alterations. Smooth and corrugated areas of epithelium of fins were found to be heavily infected with cluster of staphylococcus bacteria. Ulcerations and congestion were the most prominent features identified due to staphylococcal infections in the fins of *E.suratensis*. Fins exhibited severe pathological changes, such as hypertrophy and hyperplasia of epithelial cells. The fusion commonly occurred along the entire length of fins. Segmented fin rays or lepidotrichia were not observed in the infected fins. A distorted structural alteration is seen in the distinctive microridge pattern of fins due to the staphylococcal infection.

The staphylococcal infections which have been diagnosed so far on many fishes comprise several infectious systemic diseases. Exophthalmia, congestion, and ulcerations on the tail fins of tilapia were identified due to staphylococcal infections. In contrast, Kusuda and Sugiyama (1981) showed that typical signs in yellowtail (*S.quinquiradiata*) and red sea bream (*C. major*) caused by *S. epidermidis* included exophthalmia, congestion, and ulcerations on the tail. Similar findings were achieved by many authors in different kinds of fishes. (Miyazaki *et al.*, 1984, Pal and Pradhan 1989, Bercovier 1997). In 3 of 10 samples of fresh fish, higher counts of *S. aureus* were detected than permitted by Brazilian legislation (Vieira *et al.*, 2001). In the southern area of Brazil, *S. aureus* was isolated from 20% of 175 examined samples of fresh fish and fish fillets (*Cynoscion leiarchus*). *S.aureus* has also been detected during the process of drying and subsequent smoking of eels in Alaska in 1993 (Eklund *et al.*, 2004). The *Staphylococcus* species is the most common infectious diseases with significant economic and sanitary

repercussions for trout farms in Mediterranean countries during the summer months (Aziz ahmed *et al.*, 2001).

Conclusion

Commercially important fin fishes such as etroplus are a delicacy to humans that fetch a very high price in market. In the present study bacterial pathogens, *Staphylococcus* was identified from the caudal fins of *E.suratensis* from site 2. Hence it is clear that site 2 is more contaminated than site 1. Fins of fishes is vulnerable to various pathogenic infections as they are in immediate contact with water they inhabited. It is no doubt that like fins pathogens can accumulate in various body parts of fishes. Through the process of biomagnification the consumption of the infected fishes will inturn leads to diverse pathogenic toxicity in humans as well. Poor water quality, poor oxygen content of water, increase of organic matter in water etc are some of the factors that enhance pathogenic infection in fishes. The best cure for any fish health problem is prevention. Good water quality management and proper fish husbandry techniques will eliminate most parasites. Information concerning basic aquatic system management, water quality, and economics is very essential in order to conserve the aquatic organisms such as *E.suratensis* from severe pathogenic attack.

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Competing interests

The authors have declared that no competing interests exist.

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