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# Saprolegniasis in Freshwater Catfishes Sold in Fish Markets in Asaba, Southern Nigeria

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***A*bstract:** The prevalence of saprolegniasis in freshwater catfishes sold in fish markets in Asaba was investigated. Two hundred and sixty-five freshly caught table-sized freshwater catfishes namely: *Clarias anguillaris* (Pellegrin), *Heterobranchus bidorsalis* (Geoffrey St. Hilaire), *Synodontis clarias* (Linnaeus)*, Schilbe mystus* (Linnaeus) and *Bagrus bayad* (Ruppell) were used for the study which lasted for three months. Fish samples bought on a weekly basis from two major markets (Ogbeogonogo and Cable point) were transported to the laboratory and examined by smear scrapping of mucus on skin of fish for saprolegniasis and possible secondary bacterial and protozoal infections using routine procedures. Isolates from cultures revealed the presence of saprolegniasis, scyphidian flora and bacterial infections of *Staphylococcus aureus* and *Escherichia coil*. Out of 265 catfishes examined, 46 (17.4%) had saprolegniasis. This prevalence of infection was not significant ($P > 0.05$). The number of fungal zoospores from saprolegniasis ulcerative lesion was however significantly ($P < 0.05$) higher than those of the control which were free from *Saprolegnia* infection. A significant ($P<0.05$) number, 25 (54%) of *Saprolegnia* infected catfishes had scyphidian flora. *S. aureus* was isolated from all catfishes examined while *E. coli* was found in 193 (72.8%) of the fishes. Fish culturist and fresh fish handlers should maintain good water quality for cultured fishes and a high standard of personal hygiene to avoid the health implications of fish diseases.

**Keywords:** Asaba, Catfishes, Fish markets, Nigeria, Saprolegniasis

## 1. Introduction

### 1.1. Research Problem

Fish diseases constitute one of the most important problems militating against the growth of fish farming, especially in the tropics. Diseases of fish have been reported to be common in intensive fish culture systems which are prone to continuous environmental fluctuations and poor management practices which render the fish susceptible to a wide variety of pathogens (Romney *et al.,* 1995).

### 1.2 Importance of the Problem

Among the many pathogens of fish is *Saprolegnia*, which has been reported to be the major fungus infecting freshwater fishes (Willoughby, 1976; Roberts, 1978; Singh *et al*., 1991). The fungus causes the disease saprolegniasis, which has a characteristic ulcerative skin lesion commonly noticed on the head and gill regions often making the infested fish unacceptable to consumers. Primary infection with saprolegniasis has been documented (Hoshina *et al.,* 1960). Recently however, Saprolegnia is well recognized as secondary infection of all types of piscine skin lesions (FAO, 1981; Al-Duboon *et al*., 2005). Romney *et al.* (1995) observed that most fishes which are

 

subjected to stress due to handling injuries, malnutrition, temperature shock, external parasitism and frequent spawning are susceptible to infection by *Saprolegnia.*

### 1.3 Relevant Scholarship

The inhabitants of Asaba especially the indigenes have a special delight for fresh fish which is abundant due to proximity to the River Niger and other sources of fresh fish. *Saprolegnia* infected fishes have been recently observed in fish markets in Asaba and this may soon become a source of concern to some consumers of fresh fish in the area.

### 1.4 Hypothesis

The prevalence of saprolegniasis in freshwater catfishes sold in fish markets in Asaba was reported. This was done to help ascertain the suitability of the fishes for human consumption.

## 2. Materials and Methods

### 2.1 Study Area

Asaba is the state capital of Delta State of Nigeria located on latitude 6°11'N and longitude 6°45'E. Asaba is bounded on the East by the River Niger. There are also smaller rivers such as River Anwai which discharges into the R. Niger. In addition, there are numerous streams, lakes and culture ponds in and around Asaba.

### 2.2 Collection of Samples

Freshly caught table-sized freshwater catfishes were bought on a weekly basis from the two major markets in Asaba: Ogbeogonogo and Cable point markets. A total of 265 freshwater catfishes bought were transported to the Fisheries laboratory of Delta State University, Asaba Campus, in open plastic buckets containing little amount of water and examined for possible infection. The catfishes examined were mud catfish, *Clarias anguillaris* (L.), catfish*, Heterobranclus bidorsalis* (Geoffrey Saint HiIaire), upside down catfish*, Synodontis clarias* (L.), butterfish*, Schilbe mystus (L)* and silver catfish*, Bagrus bayad* (Ruppell). The study lasted for three months.

### 2.3 Examination of Fishes

#### *2.3.1 Examination for Fungal Infection*

A smear scraping of mucus from the skin and the ulcerative portions of the skin of each catfish was done separately and scrapings cultured using sabouraud dextrose agar medium. Isolation and identification of *Saprolegnia* fungus was carried out according to Alexopoulus and Mins (1979).

#### *2.3.2 Examination for Bacterial Infection*

Also, smear scrapings were cultured for possible bacterial infection according to ICMSF (1986). Characterization and identification of bacterial isolates were done following the methods of MacFaddin (1980) and Buchanan and Gibbson (1976).

#### *2.3.3 Examination for Protozoal Infection*

For protozoal investigation, smear scrapings of mucus from the fish skin as well as the ulcerative portions of the skin were taken, mounted on slide in saline and examined for protozoal invaders according to Roberts (1978). Freshwater catfishes without ulcerative lesions were also examined for *Saprolegnia,* bacterial and protozoal infections.

### 2.4 Data Analysis

Data obtained was subjected to student 't' test statistics at 95% confidence limit.

# 3. Results

## 3.1 *Saprolegnia* Infection

Out of 265 freshwater catfishes examined for saprolegniasis, 46 (17.4%) were infected. Prevalence of infection was observed to be higher in *C. anguillaris* than in any other catfish examined (Table 1). Results as presented in Tables 2 and 3, show that the number of catfishes examined.were significantly ($P<0.05$) higher than the number of catfishes with saprolegniasis. Of the 150 catfishes obtained from Ogbeogonogo market, 28 (18.7%) were infected while 18 (15.7%) of 115 from Cable Point market were infected (Table 4). There was no significant difference ($P>0.05$) in the percentage prevalence of infection of fishes from the two markets surveyed (Table 5). The number of fungal zoospores from the saprolegniasis infected ulcerative lesions was significantly ($P<0.05$) higher than from those of the control which had no *Saprolegnia* infection. However, the number of fishes examined and the number of fishes with saprolegniasis were not significant ($P> 0.05$). Laboratory investigations also revealed the presence of scyphidian flora such as *Vorticella* and *Chilodonella.* Twenty five (54%) of the *Saprolegnia* infected catfishes examined had scyphidian flora. This was found to be significantly different ($P<0.05$) from the number of catfishes with saprolegniasis.

**Table 1.** Prevalence of *Saprolegnia* fungus in freshwater catfishes in Asaba

| | Catfishes | Number Examined | Number Infected | Percentage (%) Prevalence |
|---|---|---|---|---|
| 1 | *C. anguillaris* | 68 | 23 | 33.8 |
| 2 | *H. bidorsalis* | 37 | 3 | 8.1 |
| 3 | *S. mystus* | 53 | 2 | 3.8 |
| 4 | *B. bayad* | 45 | 6 | 13.3 |
| 5 | *S. clarias* | 62 | 12 | 19.4 |
| | ***Total*** | **265** | **46** | **17.4** |

**Table 2.** Results of t-test statistics showing prevalence of Saprolegniasis in fishes from Ogbeogonogo Market

**T-Test: Paired Two Sample for Means**

| | *48* | *13* |
|---|---|---|
| Mean | 25.5 | 3.75 |
| Variance | 67.66667 | 14.91667 |
| Observations | 4 | 4 |
| Pearson Correlation | 0.655746 | |
| Hypothesized Mean Difference | 0 | |
| Df | 3 | |
| T Stat | 6.800473 | |
| P(T<=t) one-tail | 0.003251 | |
| T Critical one-tail | 2.353363 | |
| P(T<=t) two-tail | 0.006502 | |
| T Critical two-tail | 3.182449 | |

There was a significant difference ($P<0.05$) in the number of fishes examined and number infected.

 

**Table 3.** Results of t-test statistics showing prevalence of Saprolegniasis in fishes from Cable Point Market

**T-Test: Paired Two Sample for Means**

| | *26* | *10* |
|---|---|---|
| Mean | 22.25 | 2 |
| Variance | 30.91667 | 0.666667 |
| Observations | 4 | 4 |
| Pearson Correlation | -0.36711 | |
| Hypothesized Mean Difference | 0 | |
| Df | 3 | |
| T Stat | 6.853914 | |
| P(T<=t) one-tail | 0.003179 | |
| T Critical one-tail | 2.353363 | |
| P(T<=t) two-tail | 0.006358 | |
| T Critical two-tail | 3.182449 | |

There was a significant difference (P<0.05) in the number of fishes examined and number infected.

**Table 4.** Prevalence of Saprolegniasis in Catfish in two markets in Asaba

| | **Ogbeogonogo Market** | | | **Cable Point Market** | | |
|---|---|---|---|---|---|---|
| **Catfishes** | **Number Examined** | **Number Infected** | **% Prevalence** | **Number Examined** | **Number Infected** | **% Prevalence** |
| *C. anguillaris* | 48 | 13 | 27.1 | 26 | 10 | 38.5 |
| *H. bidorsalis* | 15 | 2 | 13.3 | 22 | 1 | 4.6 |
| *S. mystus* | 27 | 0 | 0.0 | 30 | 2 | 6.7 |
| *B. bayad* | 25 | 4 | 16.0 | 20 | 2 | 10.0 |
| *S. clarias* | 35 | 9 | 25.7 | 17 | 3 | 17.7 |
| **Total** | **150** | **28** | **18.7** | **115** | **18** | **15.7** |

**Table 5.** Results of t-test statistics showing prevalence of Saprolegniasis between fishes from the two markets surveyed

**T-Test: Paired Two Sample for Means**

| | *27.1* | *38.5* |
|---|---|---|
| Mean | 13.75 | 9.75 |
| Variance | 112.3767 | 33.03 |
| Observations | 4 | 4 |
| Pearson Correlation | 0.76499 | |
| Hypothesized Mean Difference | 0 | |
| Df | 3 | |
| T Stat | 1.107344 | |
| P(T<=t) one-tail | 0.174476 | |
| T Critical one-tail | 2.353363 | |
| P(T<=t) two-tail | 0.348952 | |
| T Critical two-tail | 3.182449 | |

There was no statistical difference (P>0.05) in % prevalence of Saprolegniasis

## 3.2 Bacterial Infections

All freshwater catfishes examined had bacterial infections. *S. aureus* and *E. coli* were isolated and identified from catfishes examined, with or without ulcerative lesions. *S. aureus* was isolated from all the catfishes while *E. coli* was isolated from 193 (72.8%) of the 265 catfishes examined. Double bacterial infections of *S. aureus* and *E. coli* were isolated from only *C. anguillaris* and *S. clarias*. The other fish species had only *S. aureus*. *Saprolegnia* was not found on skin of fish without ulcerative lesion. Table 6 shows the pattern of occurrence of scyphidian flora and bacterial infections in catfishes examined. It was observed that most of the ulcerative lesions on the skin of the catfishes were as a result of handling injuries. In the markets, it was noted that fresh fish with the characteristic ulcerative skin lesions of *Saprolegnia* attracted lower prices than fresh fish without ulcerative lesions. Buyers of fresh fish were observed to prefer fishes with smoother skin, even though at a higher cost.

**Table 6.** Pattern of occurrence of scyphidian flora in Saprolegniasis and bacterial infections of fresh water Catfishes

| **Catfishes** | **Number Examined** | **Number with *Saprolegnia*** | **Number with Scyphidian flora (%)** | **Number with bacterial infections (%)** | |
|---|---|---|---|---|---|
| | | | | ***(%) S. aureus*** | ***E. coli*** |
| *C. anguillaris* | 68 | 23 | 21 (91.3) | 68 | 102 |
| *H. bidorsalis* | 37 | 3 | 0(0) | 37 | 0 |
| *S. mystus* | 53 | 2 | 0(0) | 53 | 0 |
| *B. bayad* | 45 | 6 | 1(16.7) | 45 | 0 |
| *S. clarias* | 62 | 12 | 3(25.0) | 62 | 91 |
| ***Total*** | **265** | **46** | **25(54.3)** | **165(100.0)** | **193(72.8)** |

 

## 4. Discussion

Fresh water catfishes examined had 17.4% prevalence of *Saprolegnia* infection. The presence of saprolegniasis in the catfishes is not uncommon as several cases of the fungal infection have been reported in many freshwater bodies, especially in intensive culture systems (Fedoruk, 1981; Muir, 1981; Hart *et al*., 2006). In Asaba, Nwabueze (2012) reported cases of protozoal, bacterial and fungal pathogens in fish and fish ponds. Klinger and Francis-Floyd (2002) reported that fungi spores are everywhere and that fungi are a common occurrence in fish tanks. A high prevalence of infection was observed for *C. anguiliaris* than in any other fish. *C. anguiliaris* is a well known cultured fish in this part of the country and according to Holden and Reed (1978) the fish species has the ability to withstand several common parasitic infections. This ability to tolerate parasitic infection may be the reason for the higher prevalence of saprolegniasis observed in the catfish. *Saprolegnia* infection was observed in fish from the two fish markets surveyed. This is expected since the markets depend on the same sources of supply of fish. Ogbeogonogo had a higher prevalence of infection than Cable Point market. This may be due to the fact that Ogbeogonogo currently has a higher sale outlet for freshwater fishes in Asaba.

The number of fungal zoospores from the *Saprolegnia* infected ulcerative lesions was significantly ($P < 0.05$) higher than from those of the control which had no *Saprolegnia* infection. This finding agrees with the work of Romney *et al.* (1995) who reported that *Saprolegnia* is an opportunistic fungus, which takes advantage of the stress condition of the fish to cause an infection. It was observed that majority of the catfishes infected with saprolegniasis had handling injuries. This may have increased the susceptibility of the catfishes to infection by *Saprolegnia.* Saprolegniasis has also been described as either a primary (Hoshina *et al*., 1960) or secondary infection (Durborow *et al*., 2003, Al-Duboon *et al*., 2005) of all types of piscine skin lesions. The presence of saprolegniasis is also indicative of a sewage or organic polluted environment which increased the conduciveness of the water bodies to saprotrophs. Saprotrophs are water moulds which breakdown cells and tissues enabling them to absorb nutrients such as proteins and carbohydrates (Willoughby, 1976; Roberts 1978). According to Romney *et al.* (1995), there is a potential for infection whenever fungal zoospores are present in excess of 23,000 spores / liter. Although the prevalence of saprolegniasis was not significant, Roberts and Wootten (2005) reported that there may be a danger in underestimating saprolegniasis. The number of fungal zoospores from the *Saprolegnia* infected ulcerative lesions was however significant from those of the control fish without saprolegniasis. This shows that the infection when present could rapidly spread in the fish population since the fungal zoospores may be abundant in the water bodies. It shows that any stressed fish in the water body is liable to having the infection. Salmon Society (2009) reported that poor maintenance of fish ponds can lead to an increase in parasitic organisms which the fish become predisposed to when they are stressed up.

Scyphidian flora was observed in 54.3% of *Saprolegnia* infected cases. The presence of scyphidian flora along with saprolegniasis has been reported as a common occurrence (FAO, 1981). *S. aureus* and *E. coli* were isolated and identified from catfishes examined with or without ulcerative lesions. Hart *et al*. (2006) observed that *Flavobacterium* coexist with *Saprolegnia*. The duo of *S. aureus* and *E. coli* has been reported in fresh fish samples as part of the natural micro-flora of fish. *S. aureus* contamination of fresh fish has been found to be from human handlers while *E. coli* is indicative of human waste polluted water body (Clucas and Ward, 1996). This implies that wild and culture ponds in and around Asaba may be polluted with organic matter as the fishers in fish markets get regular and most reliable supplies of fish from wild and culture ponds respectively (Nwabueze and Nwabueze, 2010). This is not healthy for the well being of the fishes in the water as well as human consumers of fresh fish in Asaba.

Maintenance of clean water bodies free of untreated sewage and other organic waste is highly recommended. Fish culturist and fresh fish handlers should maintain good water quality for cultured fishes and a high standard of personal hygiene to avoid the health implications of fish diseases.

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