

Prevalence of *epizootic ulcerative syndrome (EUS)* in carps

Sarita Baidya and Archana Prasad

Central Department of Zoology, Tribhuvan University, Kirtipur, Nepal

Abstract

In present study examination of fishes, present in 15 fish ponds, were done for the infestation of EUS in Chitwan, Nepal. Nine ponds or 60% of them were recorded infested and confirmed to be EUS positive. Among 1491 fish samples examined, 170 fish samples were found with lesions and 165 of them were confirmed to be EUS-positive. Two culture fish species like *Labeo rohita* and *Catla catla* was found to be containing lesions among different fish species. So, they were sampled for histological study. Other fish species like common carp, silver carp, grass carp and big head carp were not found to be EUS positive. The risk of EUS infestation was found high in fish ponds connected with paddy fields and flooded water supplying wild fish species. Ponds with poor management and use of contaminated nets also had a high risk of EUS infestation.

Keywords: *Labeo*, *Catla*, culture fish, lesions, pond management

Introduction

EUS is a fungal fish disease caused *Aphanomyces invadans* or *A. piscicida* belonging to family Saprolegniaceae. The disease has a complex infectious aetiology, clinically characterised by the presence of invasive *Aphanomyces* infection and necrotising ulcerative lesions. The early signs of the disease include loss of appetite, float on the surface and red spots on the body surface, head, operculum or caudal peduncle.

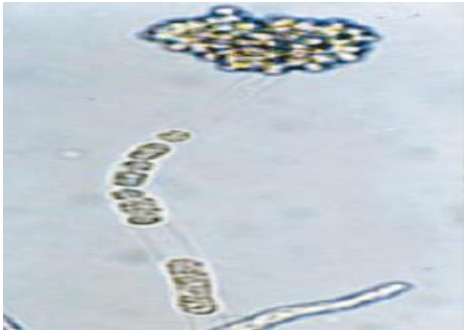


Plate 1. Aphanomyces

EUS is a highly infectious fish disease causing great loss in fish production specially tropical and sub tropical areas of South East Asia. Bangladesh suffered severe losses from EUS in 1988, 1989 and 1993. It was reported that 15-20% of total fish production loss in Nepal during initial EUS outbreaks (ADB/NACA 1991). Bhutan and the eastern Terai of Nepal were first affected in 1989. Later EUS was found to spread into Himalayan valley regions like Pokhara and Kathmandu in 1993 and cold water species (*Tor* spp) was also found to be infested (Phillips 1989). Pakistan was highly affected by EUS in snakeheads in Punjab Province in 1996 and in *Cirrhinus mrigala* in Sindh Province in 1998 (DFID 1998). Bhaumik et al. (1991) reported 73% of the culture ponds affected in West Bengal with about 30-40% fish loss.

Materials and Methods

General Field Surveys

The study was conducted in Shankar Chowk, Gujanagar VDC – 3, Chitwan from February 2012 to May 2012, recognized as EUS-season in Nepal. On arrival at the sampling pond site, information was gathered from the farmer and this was followed by the measurement of water quality parameters and examination of some susceptible fish. One or two fish of each species was sampled for histopathology study in the laboratory. Fish with lesion was killed and muscle of size 1cm³ taken from the lesion and surrounding for histology study. Samples were fixed immediately in 10% formalin and labeled. During the study period of 3 months, the randomly selected ponds were visited two times (15 days fortnightly).

Water quality parameters

Five important water quality parameters, i.e. Temperature, pH, Dissolved Oxygen, Alkalinity, Turbidity (Transparency), were measured fortnightly (15 days) two times in a

month in situ using portable water analysis kit (Hack kit) in 15 ponds. Water sample was collected between 7- 8 am from the surface (10 cm below).

- Dissolved Oxygen: Dissolved oxygen was measured fortnightly by using titration method.
- Alkalinity: Alkalinity was measured fortnightly by using titration method.
- Temperature: Temperature was measured fortnightly by using water thermometer-portable water analysis kit (Hack Kit) directly. Temperature was measured between 9- 10 am.
- pH: pH was measured fortnightly by pH meter in between 9- 10 am.
- Turbidity: Turbidity was measured fortnightly by using Secchi Disc (Boyd and Tucker 1992).

Histopathological analysis

Processing of formalin fixed tissues was carried out at Histopathological lab, Jana Maitri Hospital, Balaju, Kathmandu. First material was infiltrated with a medium that would give adequate support so that thin section (5-7 μ m) could be made by using Microtome laboratory (Chinabut and Roberts 1999).

Result

Occurrence of Ulcerative Lesions

Amongst the cultured fish species, rohu and naini (Indian major carps) were found to be affected by EUS. The total number of major carps examined was 1491. Among them, naini and rohu were comprised 1191 and 300 respectively. Of these, 170 were sampled with external lesions with histological damage and 165 of them were confirmed as EUS-positive based on the presence of mycotic granulomas. The average occurrence of EUS was 11.3 and 10.0 in naini and rohu respectively (Table 1).



Plate 2. Naini (*Cirrhinus mrigala*)



Plate 3. Rohu (*Labeo rohita*)

Table 1. Prevalence of EUS in carp pond fishes.

Name of Farmers	Fish Species	No. of fish examined			Confirm (EUS-positive)	Percentage (%)
		Total	Healthy	With Lesions		
Mr. Ghale	Naini	400	350	50	50	12.5
Mr. Badri	Rohu	300	265	35	30	10.0
Mr. Chaudhary	Naini	392	347	45	45	11.5
COA Group	Naini	399	359	40	40	10.0
	Total	1491	1321	170	165	Mean:11

Water quality and the occurrence of EUS

Aphanomyces invadans was found to grow best at 20–30°C but did not grow at 37°C. The *Aphanomyces* could transfer from one fish to another through the water supply. Both low and high temperatures appeared to influence outbreak. But low temperatures influenced the severity of EUS lesions and its outbreak.

Mis-management and the occurrence of EUS

The occurrence of EUS diseases was depended upon mismanagement of fish farms. The survey showed 45.5% of ponds in study areas did not have permanent source of water and

depended on other sources. Fish ponds that had water source from rice field, river, reservoir or wetland recorded relatively high incidence of EUS in comparison to ponds that had received water from underground source. The study showed 60% of the fishponds were not dried after harvest and remaining 40% of the ponds were recorded dried in the previous year only. About 36.8% of EUS occurrence was reported in ponds which were not dried in the previous year. 70% of the fish growers in study area were found not applying lime during pond drying and post stocking management period. All of the EUS positive confirmed cases were noted from the ponds that were not limed before.

Histological study

EUS disease can be confirmed by histological diagnosis. The early skin lesions of some samples was observed and found to be principally in the areas of epithelial necrosis with surrounding oedema, haemorrhaging of the underlying dermis and some inflammatory cell infiltration. The epidermis at the margins of the ulcer itself was degenerated and thickened due to the enclosing of a very small number of fungal hyphae within an epitheloid capsule. In advanced lesions, there is massive necrotising granulomatous mycosis of the underlying muscle fibres.

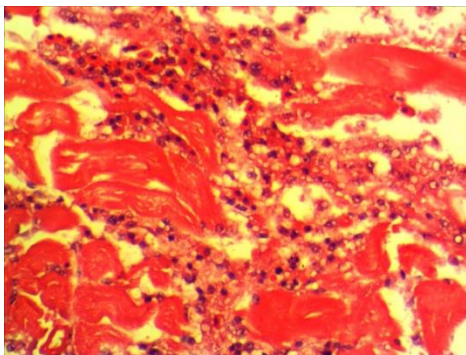


Plate 4. T.S. of skin of Rohu

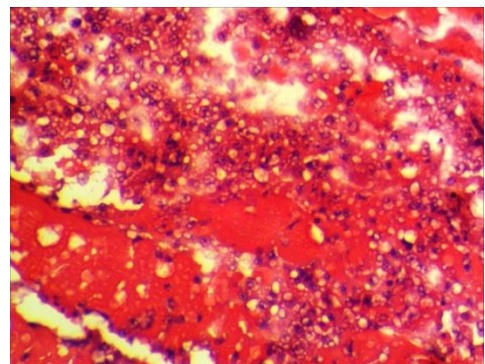


Plate 5. T.S. of skin of Naini

Discussion

EUS was a seasonal epizootic condition of great importance in freshwater carps. It was clinically characterized by the presence of invasive infection and necrotising ulcerative lesions. EUS is caused by the oomycete known as *Aphanomyces invadans* (Lilley et al. 2001b; Baldock et al. 2005; EFSA 2007, World Organisation for Animal Health OIE 2009).

Aphanomyces invadans could attach to the skin and invade underlying tissues. EUS outbreaks depended upon seasonal factors and water quality. *A. invadans* hyphae grew only poorly at temperatures above 31°C and do not grow at 37°C (Hatai et al. 1977; Fraser et al. 1992; Roberts et al. 1993).

The present study showed that 45.5% of ponds in Chitwan did not have permanent source of water and depended on rainfall. About 30 percent of ponds received water from the canal connected to the rice field while 20.0 percent received water from canal connected to river. Ponds that received water coming through rice field and river/ditch had showed high relative risk of EUS while the occurrences of this disease was less in ponds that had received water only from underground source. Similarly, ponds that were repeatedly flooded that year also showed a higher relative risk. Failure to drain and lime ponds prior to stocking has a high risk of outbreak of EUS (Mohan and Shankar 1994; Jha and Shrestha 2003).

References

Baldock F.C., Blazer V., Callinan R., Hatai K., Karunasagar I., Mohan C.V. and Bondad-Reantaso M.G. 2005 Outcomes of a short expert consultation on epizootic ulcerative syndrome (EUS): Re-examination of causal factors, case definition and nomenclature. In: Diseases in Asian Aquaculture V, Walker P., Laster R. & Bondad-Reantaso M.G., eds. Fish Health Section, Asian Fisheries Society, Manila, Philippines, 555–585.

Bhaumik, U., Pandit, P.K. and Chatterjee, J.G. 1991. Impact of epizootic ulcerative syndrome on the fish yield, consumption and trade in West Bengal. *Journal of the Inland Fisheries Society of India* **23**(1): 45-51.

EFSA, 2007. Scientific Opinion of the Panel on Animal Health and Welfare on a request from the European Commission on possible vector species and live stages of susceptible species not transmitting disease as regards certain fish diseases. *The EFSA Journal* 584, 1-163.

EFSA, 2008. Scientific Opinion of the Panel on AHAW on a request from the European Commission on aquatic animal species susceptible to diseases listed in the Council Directive 2006/88/EC. *The EFSA Journal* 808, 1-144.

Fraser G.C., Callinan R.B. and Calder L.M. 1992. *Aphanomyces* species associated with red spot disease: an ulcerative disease of estuarine fish from eastern Australia. *J. Fish Dis.*, **15**: 173–181.

Hatai K., Egusa S., Takahashi S. & Ooe K. 1977. Study on the pathogenic fungus of mycotic granulomatosis – I. Isolation and pathogenicity of the fungus from cultured-ayu infected with the disease. *Fish Pathol.* **12**: 129–133.

Jha, D.K. and Shrestha, M.K. 2003. Occurrence of Epizootic Ulcerative Syndrome in Chitwan, p.54. In Book of Abstract. International Conference on Disease Management for Sustainable Fisheries held in Trivandram, India. 25-28 August, 2003.

Lilley, J.H., S. Chinabut, and J. C. Miles, 2001b. Applied Studies on Epizootic Ulcerative Syndrome. Institute of Aquaculture, University of Stirling, Scotland; Aquatic Animal Health Research Institute, Department of Fisheries, Thailand, Stirling.

World Organisation for Animal Health OIE, 2009. Manual of Diagnostic Tests for Aquatic Animals, OIE, Paris,

Philips, M.J. 1989. A report on the ACA workshop on the regional research programme on ulcerative syndrome in fish and the environment, 20-24 March 1989. Network of Aquaculture Centres in Asia-Pacific, Bangkok, Thailand.

Roberts, R. J., Willoughby, L. G. and Chinabut, S. 1993. Mycotic aspects of Epizootic Ulcerative Syndrome (EUS) of Asian fishes. *J. Fish. Dis.* **16** (3): 169-183.