Case Study:
Epizootic Ulcerative Syndrome (EUS)

HANG'OMBE BERNARD MUDENDA
UNIVERSITY OF ZAMBIA
SCHOOL OF VETERINARY MEDICINE
ZAMBIA.

Regional Training Seminar for OIE National Focal Points for aquatic animal diseases, Swakopmund, Namibia, 15-19 June 2010

INTRODUCTION

What is EUS?

EUS is "a seasonal epizootic condition of freshwater and estuarine warm water fish of complex infectious etiology characterized by the presence of invasive *Aphanomyces* infection and necrotizing ulcerative lesions typically leading to a granulomatous response" (ODA, 1994).

OIE CASE DEFINITION (OIE, 2006)

Epizootic ulcerative syndrome (EUS) is considered to be an infection with an oomycete known as *Aphanomyces invadans* commonly known as water moulds currently recognized as belonging to the group of heterokonts.

The disease affects wild and farmed freshwater and estuarine fish since it was first reported in 1971.

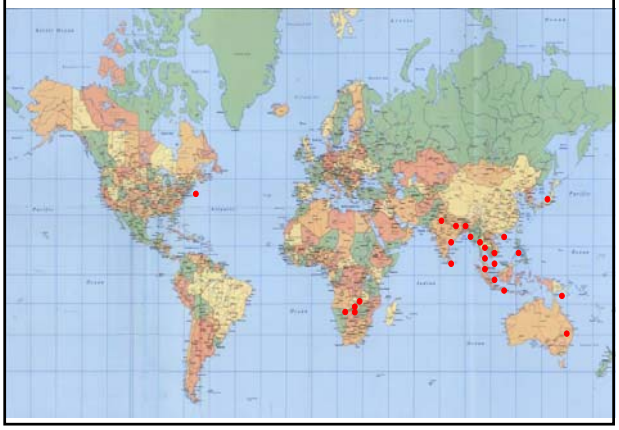
The disease is also known by other names:

Epizootic Ulcerative Syndrome (EUS);	Southeast Asia
EUS-related *Aphanomyces* (ERA);	Philippines
Red Spot Disease (RSD);	Australia
Mycotic Granulomatosis (MG);	Japan
Ulcerative Mycosis (UM);	East Coast USA

The disease has swept across Japan, Australia, USA and Countries of Asia.

As of 2006, The disease was reported in Africa.

CURRENT RECORDED EUS OUTBREAKS

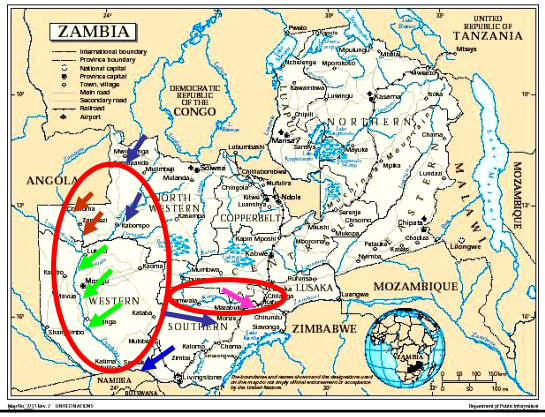


In Africa the disease was first reported in Botswana on the Chobe-Zambezi river, followed by Namibia and Zambia.

As of 2009, cases were still being reported in Namibia and Zambia with Zambia seeing major outbreaks.

In Zambia the disease has been spreading with the entire upper Zambezi river covered and now threatening the Kafue river system.

EUS CASES IN ZAMBIA



PATHOGENICITY OF *APHANOMYCES INVADANS*

Three major features:

1. Exposure of the dermis in a susceptible species of fish for entrance of *Aphanomyces invadans*.
2. Attachment of *Aphanomyces invadans* of the exposed dermis.
3. Establishment and multiplication of the *Aphanomyces invadans* leading to fungal invasion of underlying tissues.

POSSIBLE CAUSES OF DERMIS EXPOSURE

- Abrasion
- Acidified water exposure
- Viral dermatitis
- Bacterial dermatitis
- Skin damaged by parasites

CLINICAL SIGNS OF EUS

EUS causes ugly lesions in affected fish. These include:

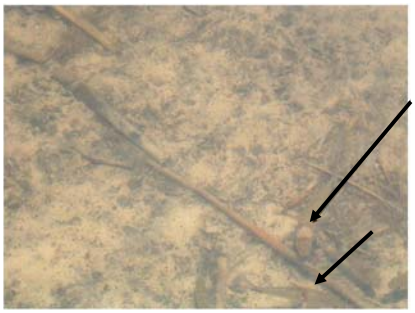
- Small pinpoint red spots.
- Haemorrhagic spots.
- Localized swelling with raised areas on the body surface.
- Protrusion and loss of scales.
- Skin erosion.
- Reddened areas of the skin under the scales.
- Exposure of underlying musculature and ulceration.

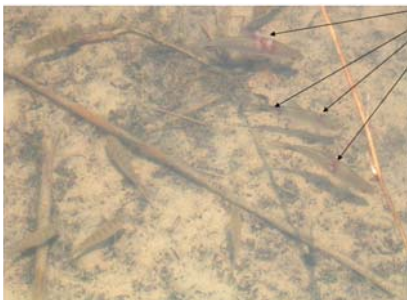
Small pinpoint red Haemorrhagic spots with localized swelling and raised areas on the body surface.

Loss of scales, Skin erosion, Reddened areas of the skin under the scales

Exposure of underlying musculature and ulceration.

Ulcers are found over a broad area especially the lateral surface with the center of the lesion being necrotic





Mass mortality of fish

Fish species	Common name
1. *Barbus paludinosus*	Straightfin barb
2. *Serranochromis angusticeps*	Thinface largemouth
3. *Clarias gariepinus*	Sharptooth catfish
4. *Clarias ngamensis*	Blunttooth catfish
5. *Sargochromis carlottae*	Rainbow bream
6. *Tilapia sparmanii*	Banded tilapia
7. *Hydrocynus vittatus*	Tigerfish
8. *Pharyngochromis acuticeps*	Zambezi happy
9. *Hepsetus odoe*	African pike
10. *Labeo lunatus*	Upper-Zambezi labeo
11. *Oreochromis andersonii*	Threespot tilapia
12. *Barbus poechii*	Dashtail barb
13. *Schilbe intermedius*	Silver catfish

Fish species	Common name
14. *Barbus unitaeniatus*	Longbeard barb
15. *Brycinus lateralis*	Striped robber
16. *Micralestes acutidens*	Silver robber
17. *Petrocephalus catostoma*	Northern churchill
18. *Marcusenius macrolepidotus*	Bulldog
19. *Labeo cylindricus*	Redeye labeo
20. *Tilapia rendalli*	Redbreast tilapia
21. *Oreochromis macrochir*	Greenhead tilapia
22. *Serranochromis robustus*	Nembwe
23. *Serranochromis macrocephalus*	Purpleface largemouth
24. *Sargochromis codringtonii*	Green bream
25. *Sargochromis giardi*	Pink bream

DIAGNOSTIC METHODS (OIE 2006)

- A) Field diagnostic methods
- B) Clinical methods
- C) Agent detection and identification methods

A. FIELD DIAGNOSIS

- EUS outbreaks are associated with mass mortality of fish in the wild and in farms during periods of low temperatures and after periods of heavy rainfall.
- Early signs of the disease include loss of appetite.
- Infected fish may float below the water surface, and become hyperactive with a very jerky pattern of movement.
- Fish will develop red spots or small to large ulcerative lesions on the body.

B. CLINICAL METHODS

- Red spots may be observed on the body surface, head, operculum or caudal peduncle.
- Large red or grey shallow ulcers, often with a brown necrosis, are observed in the later stages.
- In highly susceptible species, such as *Clarias spp*, the lesions are more extensive and can lead to complete erosion of the posterior part of the body.

- Non-septate hyphae of *Aphanomyces invadans* (12-25 µm in diameter) can be observed in muscle squash preparations of the infected area around the lesion.
- Lesion scrapes generally show secondary fungal, bacterial and/or parasitic infections.

SECONDARY ORGANISMS

FUNGAL

Achyla and *Saprolegnia spp*

BACTERIA

Aeromonas hydrophila, A. sobria, Pseudomonas and *vibrio spp*

PARASITES

Chilodonella spp. Trichodina spp. Ichthyoptherius spp. Thellohania spp. Epistylis spp. and *Monogenean spp.*

Agent detection and identification methods

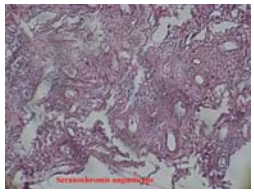
Histopathology

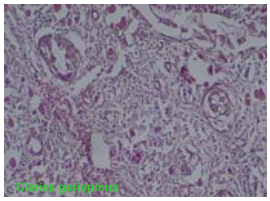
➢Early EUS lesions are erythematous dermatitis with no obvious oomycete involvement.

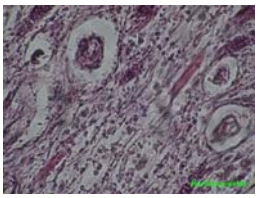
➢*Aphanomyces invadans* hyphae are usually observed growing in skeletal muscle and internal organs as the lesion progresses from a mild chronic active inflammation to a severe locally extensive necrotising granulomatous inflammation with severe floccular degeneration of the muscle.

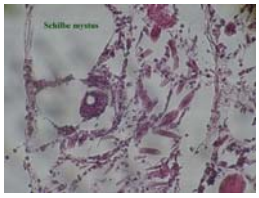
- **Histopathology cont.**

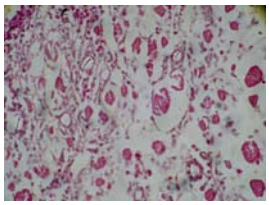
➢The oomycete elicits a strong inflammatory response and granulomas are formed around the penetrating hyphae. The granulomas are demonstrated using the H & E staining and the Glocott stain.



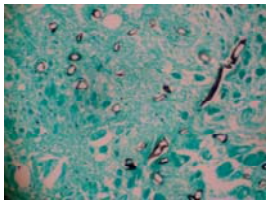








H & E staining



Glocott's staining

- **Isolation of *Aphanomyces invadans* from internal tissues**
- **Identification of *Aphanomyces invadans***

PREVENTION AND CONTROL

- Control of EUS in natural waters is probably impossible.
- In outbreaks occurring in small, closed water-bodies, liming water and improving water quality, together with removal of infected fish, is often effective in reducing mortalities and controlling the disease.

THANK YOU FOR YOUR ATTENTION