

Histological confirmation of epizootic ulcerative syndrome in two cyprinid species from Lake Liambezi, Zambezi Region, Namibia

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Received 3 March 2014, Accepted 7 July 2014

Epizootic ulcerative syndrome (EUS) is a fish disease caused by an infection of the oomycete, *Aphanomyces invadans*. During a fish biodiversity assessment of Lake Liambezi, Zambezi Region, Namibia, in August 2011, two *Barbus haasi* and three *Barbus untaeniatus* with circular ulcerative skin lesions were collected. Lake Liambezi receives inflow from the Zambezi, Chobe and Linyanti rivers. The presence of EUS in the two species was confirmed histologically by: a loss of epidermis at the site of the lesion; hyphae visible deep into the muscle layer with an associated granulomatous inflammatory reaction; and muscle fibre degeneration visible with associated penetrating hyphae. This paper provides further histological confirmation of EUS from Lake Liambezi and the first record of the disease in *B. haasi*.

Key words: *Barbus haasi*, *Barbus untaeniatus*, Chobe River, fungal pathogen, histology.

Epizootic ulcerative syndrome (EUS) is a fish disease, which results in high biodiversity and economic losses (FAO 2009; Ojima 2012). The disease is caused by the oomycete *Aphanomyces invadans* (David & Kirk 1997) as listed in the Index of Fungi (IMI 1997), which causes epidermal lesions that penetrate into the underlying muscle tissue, ultimately resulting in skin erosion and exposure of underlying musculature and ulceration (Lilley & Roberts 1997). Globally, the first reports of EUS outbreaks were from South East Asia, when EUS caused high mortalities of wild and cultured fish (Lilley & Roberts 1997). In sub-Saharan Africa the first report of *A. invadans* and an associated EUS outbreak was from Botswana in 2007, followed by Zambia in 2008 (Andrew *et al.* 2008). Subsequently 27 fish species from the region have been shown to be susceptible to EUS (FAO 2009; Choongo *et al.* 2009; Songe *et al.* 2012; Huchtermeyer & Van der Waal 2012). Lesions, suspected to be associated

with EUS have previously been reported from Lake Liambezi by Van der Waal (2008, 2012).

The present study reports the findings of an EUS assessment of 91 fish, representing 16 species in seven families, that were sampled from Lake Liambezi, Zambezi Region, Namibia, as part of a biodiversity assessment in August 2011 (Fig. 1) (17°52.942'S, 24°33.706'E). As noted by Van der Waal (2012), this is highly relevant because the 300 km² Lake Liambezi is used extensively by artisanal fishermen and EUS-associated fish mortalities could impact on both food security and on local economies. Van der Waal (2012) further emphasized the importance for continued targeted surveillance for the prevalence of EUS in the lake. The lake also receives inflow from the Zambezi, Chobe and Linyanti Rivers which may facilitate spread of the pathogen into the currently unaffected Kwando River via the Linyanti swamps. The objective of this paper was therefore to provide insight into the current extent of EUS in Lake Liambezi. This was done by means of a histological assessment on fish that macroscopically exhibited signs of EUS.

Fish were sampled by means of gill nets, electro-fishing and angling. Live fish were transferred to a field laboratory, identified using keys provided by Skelton (2001), measured, and a presumptive EUS identification, based on the presence of typical clinical signs, including skin damage and haemorrhagic ulcerative skin lesions, was conducted in accordance with FAO (2009).

Of the 91 fish inspected, only five individuals showed macroscopic alterations to the skin (Table 1). The clinically affected fish species were *Barbus haasi* (David, 1936) and *B. untaeniatus* (Günther, 1866). Individuals of both these species exhibited varying degrees of severity of skin ulcerations. The lesions were mostly focal and varied

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