

## Trace element analysis of a turtle carapace for documenting acidification of a coastal lake

BEAVIS, S G\*, TYNAN, S AND BEAVIS F R<sup>123</sup>

<sup>1</sup>Fenner School of Environment and Society, Australian National University, Canberra, Australia

(\* correspondence sara.beavis@anu.edu.au)

<sup>2</sup>Research School of Earth Sciences, Australian National University, Canberra Australia (sarah.tynan@anu.edu.au)

<sup>3</sup>GHD, Perth, Australia. (fern.beavis@ghd.com)

Bondi Lake is a small, freshwater terminal lake located immediately behind beach dunes on the far south coast of New South Wales, Australia. The sediments of the lake bed and landward foreshores comprise sulfidic clays with abundant Fe sulfide minerals. Oxidation of these minerals is associated with acidification and the release of Fe and trace metals.

A severe, prolonged dry period, referred to as the 'Millennium Drought' occurred throughout south eastern Australia 1999-2009. During the drought, the water level dropped in the lake, due to reduced inflows and evaporation losses, resulting in oxidation and acidification of the sulfidic sediments, and both acidification and salinisation of the water. In 2008, the pH of the water was 3.6 and the electrical conductivity 22mS/cm. Field observations indicated an exodus of eastern long necked turtles, *Chelodina longicollis* (Family Chelidae) from the lake during acidification with ~20 dead turtles sighted around the lake shorelines and nearby surrounding bush. Other research has shown that *Chelodina longicollis* responds to wetland drying either by migration to other waterbodies or extended periods of inactivity through estivation in protected localities including close to the dry waterbody [1]. The migration at Bondi Lake, however, occurring prior to wetland drying, is assumed to be a response to reduced water quality due to acidification and the dissolution of metals within the sulfidic clay substrate.

The analysis of growth rings on turtle carapace plates has been used previously to assess age and growth rate [2]. However, in this study, laser ablation ICP-MS analysis of the trace metals found within the plates has been used to obtain a record of the aquatic conditions throughout the turtle's life/duration of growth. This record has been used to elucidate the episode of turtle exodus and mortality as ambient conditions grew increasingly hostile.

[1] Roe and Georges (2009) *Ecology* **89** (2) 485-494 [2] Wilson, Tracey and Tracey (2003) *Herpetologica* **59** (2), 178-194