

August 2010

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Stefan Eberhard

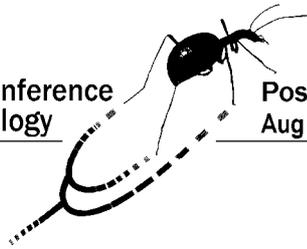
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Impacts of Climate Change on Stygofauna in Southwest Western Australia

Stefan Eberhard

*Subterranean Ecology, Scientific Environmental Services, Unit 8/37 Cedric, Street, Stirling ,
6021, Western Australia. www.subterraneanecology.com.au*

Southwest Western Australia has experienced an unparalleled climate shift since the mid 1970's, characterised by reduced rainfall which has contributed to declining groundwater levels. Climate modelling attributes part of this change to atmospheric greenhouse gases, and predicts the drying trend will increase over coming decades.

Groundwater pools and streams in limestone caves at Yanchep and the Leeuwin-Naturaliste region are habitat for assemblages of stygofauna associated with tree roots which grow in the cave pools and streams. Because of the declining water levels, these Aquatic Root Mat Communities were listed as Threatened Ecological Communities (TECs) (status Endangered) under the Federal Environmental Protection and Biodiversity Conservation Act.

A study of the Leeuwin-Naturaliste caves and dependent stygofauna communities characterised their ecological relationships with hydrology, vegetation, rainfall, climate and other potential threatening processes. Radiometric dating and stratigraphic levelling of sediments were used to reconstruct a history of groundwater changes in Jewel Cave spanning the Early Pleistocene to Present. The lowest palaeo groundwater levels were recorded near the end of the Pleistocene (ca. 12,000 BP), followed by generally elevated levels through the Holocene. Molecular genetic evidence from two species of crustaceans endemic to Jewel Cave suggests that the stygofauna survived in situ, the low groundwater levels experienced in the Late Pleistocene. In the last five years however, groundwater in Jewel Cave has declined below the lowest recorded Pleistocene limit, and all known occurrences of its stygofauna community have disappeared, and are presumed extinct.

Recovery Plans prepared for the Leeuwin-Naturaliste and Yanchep TECs have met with limited success. Faced with a continued drying climate trend in southwest Western Australia, the future outlook for survival of the Leeuwin-Naturaliste communities, and other stygofauna in shallow limestone aquifers, is less than optimistic. The impact of a drying climate in this region is compounded by increasing extractive demands on groundwater resources associated with urbanisation in the Perth Basin. The coastal limestone aquifers, which occupy a narrow linear band and provide the most prospective habitat for stygofauna, are also most impacted by urban developments, reduced water quality and contamination, and potentially saltwater intrusion caused by pumping or sea level rise.

Recently the Augusta-Margaret River Tourism Association (AMRTA) has instigated measures to control and manage the groundwater decline in Lake Cave, by harvesting rainfall to supplement groundwater recharge and sustain the cave lake, which is a major ecotourism drawcard. In tandem with this, a major study is underway to understand the hydrology and stygofauna in Lake Cave, with the ultimate goal of developing management strategies for coping with climate change.