Environmental crisis in the Erhai catchment, Yunnan Province, China 2600 BCE to present

INTRODUCTION

The results here derive from a Leverhulme funded internationally driven inter-disciplinary project that critically evaluates the impacts of both global, regional and local change on vulnerable human communities by studying climate and human impacts over the past 6500 years in the Erhai catchment in Yunnan Province, China. A range of sedimentary sources and analytical techniques and methods are set against proxy records of temperature and precipitation and archaeological and documentary archives to reconstruct long-term hydrological trends in the Erhai catchment (Figure 1). In particular, this poster illustrates the evidence for major environmental changes occurring to the main tributary and inflow to Erhai the Miju River as a result of upland land use changes in the Erhai basin, most notably signalled by evidence from the Baihan Dry Gorge. It is thought that this signal has wider ramifications indicating both long, medium and short-term environmental crisis throughout the wider Erhai catchment, the later starting in the Ming Dynasty still has ramifications for the decision makers of environmental managers and policy makers today.

Figure 1: Erhai catchment

Figure 2: The long term record of environmental change

Figure 3: Analysis of the recent sediment, Erhai Lake Basin. Significantly an increased in sedi in in west of the catchment at ~6370 cal, yr BP. The early phases of human clearance is characterised by the selective removal of species in particular broadleaved species and later Tsuga. This ultimately leads to the collapse of the ecological structure and function gradient that existed in the catchment from the Late-glacial. The subsequent expansion of secondary pine forest suggests that these early clearances were part of a sustained period of shifting agriculture.

Figure 4: An argument from silence is made for environmental and hydrological change based on the implications of the great travel writer Xu Xiake’s description of the Miju River in 1639 (Elvin & Crook, 2000). From Xu Xiake’s account it is noticeable that the key features of the hydraulic landscape that were to distinguish it during the century of hydraulic difficulties between about 1750-1850 were absent. Thus, documentary sources point to the onset of the environmental crisis, with its social and economic costs, as being rapid with the probable causes stemming from the extension of late traditional farming practices beyond sustainable limits particularly in the region of Tower Base Mountain that resulted in the construction of the Baihan Dry Dyke at the head of the Putuo Gorge (Elvin et al., 2003).

Figure 5: The long term record of enviromental change

Figure 6: Oppurtunistic sampling on the Miju River

Figure 7: A marked decline in arboreal taxa coupled with increased levels of grass (Poaceae) and other disturbance taxa provides the first evidence for human impact in the catchment at ~6370 cal, yr BP. This early phase of forest clearance is characterised by the selected removal of species in particular broadleaved species and later Tsuga. This ultimately leads to the collapse of the ecological structure and function gradient that existed in the catchment from the Late-glacial. The subsequent expansion of secondary pine forest suggests that these early clearances were part of a sustained period of shifting agriculture.

Figure 8: Opportunity for further evidence on the Miju River

Environmental Archives

The case-study presented here is a regional example of the IGBP/PAGES programme entitled “Human Impact on Terrestrial Environments”. Late sediment sequences, floodplain sequences, geomorphic erosional land forms, monitored records and documented environmental history from the late-catchment system provide independent and complementary records of forcings and environmental responses and may allow the unravelling of interacting effects of human actions and climate change.

Dr Darren Crook, University of Hertfordshire, Division of Geography and Environmental Studies, Hatfield AL10 9AB, UK, d.crook@herts.ac.uk

with the help of:

Richard Jones, University of Exeter, Department of Geography, Exeter EX4 4RU, UK, r.jones@exeter.ac.uk
Mark Elvin, Australian National University, Research School of Pacific and Asian Studies, Canberra ACT 0200, Australia, Mark.Elvin@anu.edu.au
John Dearing, University of Liverpool, Department of Geography, Liverpool L69 7TJ, UK, J.dearing@liv.ac.uk
Shen J, Chinese Academy of Sciences, Nanjing Institute of Geography and Limnology, Nanjing 210008, China, shenj63@hotmail.com
Yang Xiangdong, Chinese Academy of Sciences, Nanjing Institute of Geography and Limnology, Nanjing, 210008, China, xdyang@niglas.ac.cn

References:


Documentary Sources

An argument from silence is made for environmental and hydrological change based on the implications of the great travel writer Xu Xiake’s description of the Miju River in 1639 (Elvin & Crook, 2000). From Xu Xiake’s account it is noticeable that the key features of the hydraulic landscape that were to distinguish it during the century of hydraulic difficulties between about 1750-1850 were absent. Thus, documentary sources point to the onset of the environmental crisis, with its social and economic costs, as being rapid with the probable causes stemming from the extension of late traditional farming practices beyond sustainable limits particularly in the region of Tower Base Mountain that resulted in the construction of the Baihan Dry Dyke at the head of the Putuo Gorge (Elvin et al., 2003).