

Over the past 40 years, the total number of wild animals on Earth has halved. Humans are producing a mass extinction event greater than any in the past 62 million years. Decreasing biodiversity may be similar to popping out rivets from an aircraft. A few missing rivets will not cause too much harm. But continuing to remove them threatens a collapse. This artwork interprets research conducted by a team of academics (Doncaster et al 2016) in the UK & China on how increased pollution in Chinese lakes leads to changes in biodiversity which acted as a signal of an impending ecosystem collapse.

Lake Collapse

Healthy lakes have clear waters teeming with different plants, fish and insects. Fertiliser and human waste pollution can build up in lakes until they rapidly switch to algae clogged green water with much fewer species. This sudden change is called a **critical transition**.



A clearwater lake (top) and eutrophic lake (bottom)

Data & Theory

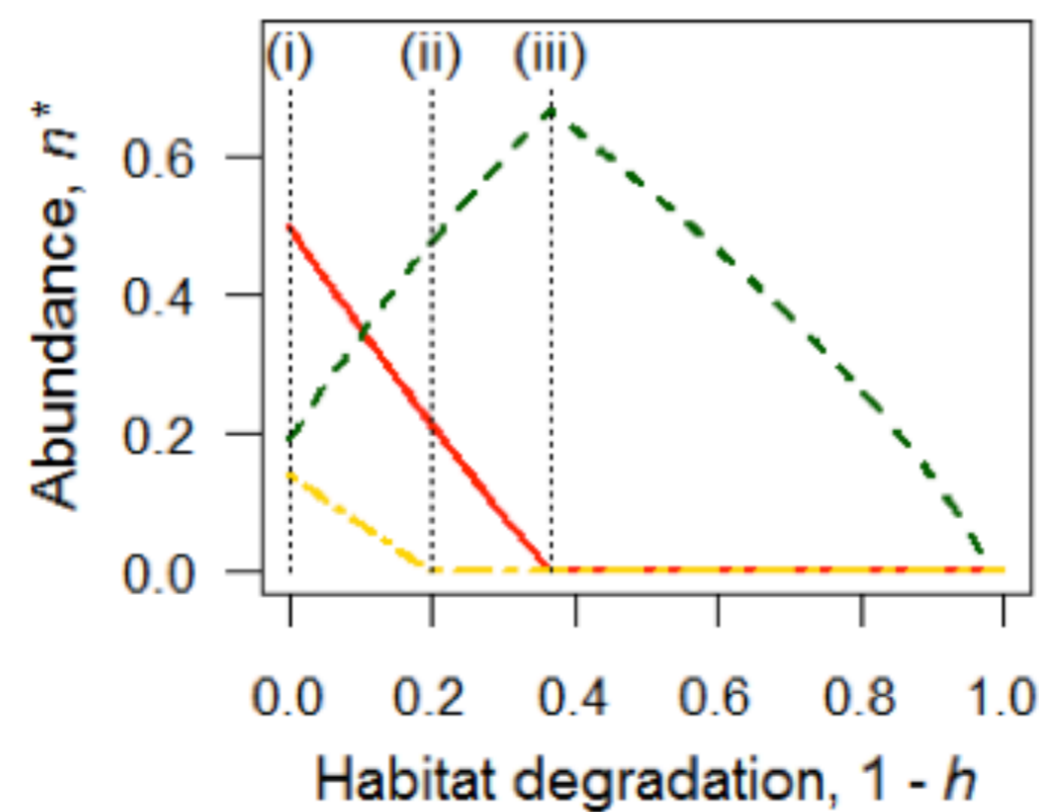
A record of *critical transitions* in lakes can be found in the layers of sediment which are deposited on the bottom. By boring down into this mud, researchers were able to reconstruct the history of a lake, its changes in water chemistry and vitally, its species of different types of tiny algae **diatoms**



Dr Rong Wang takes a core sample from lake Erhai, China

Keystone Species

Diatoms are photosynthetic algae that float near the lake surface. It was possible to classify diatoms into three types: **Keystone** which dominate in clear water, **Weedy** which do better in polluted water, **Canary** which are species sensitive to change.



Canary species yellow, keystone species red, weedy species green

Artwork

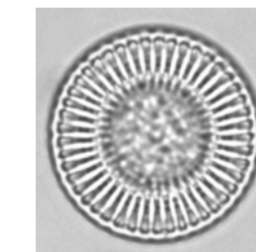
Southampton sculptor Chris Cudlip worked with Dr James Dyke to produce a clay representation of a lake sediment core. Different diatom species are represented in relief. A critical transition occurs halfway up the column

Weedy: *Fragilaria crotonensis*



Critical Transition

Keystone: *Cyclotella choctawhatcheeana*



Canary: *Navicula* sp

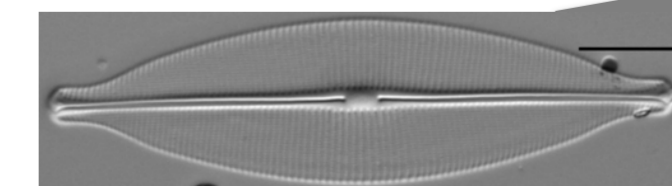


Photo: Chris Cudlip

Credits

Artwork conception Chris Cudlip & Dr James Dyke. Artwork creation Chris Cudlip cudlipsculpture.com

Doncaster, Alonso Chávez, Viguier, Wang, Zhang, Dong, Dearing, Langdon, Dyke (2016) Early warning of critical transitions in biodiversity from compositional disorder, *Ecology* 10.1002/ecy.1558

Diatom photos: Spaulding, S.A., Lubinski, D.J. and Potapova, M. (2010). Diatoms of the United States westerndiatoms.colorado.edu

Lake photo: Schindler 2006. Recent advances in the understanding and management of eutrophication. *Limnol. Oceanogr.*

www.keystonecollapse.site

