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ANCIENT LAKES UNDER THE PRESSURE OF QUATERNARY CLIMATE CHANGE: HIGH RESILIENCE PREVENTS CATASTROPHIC ECOSYSTEMS COLLAPSES

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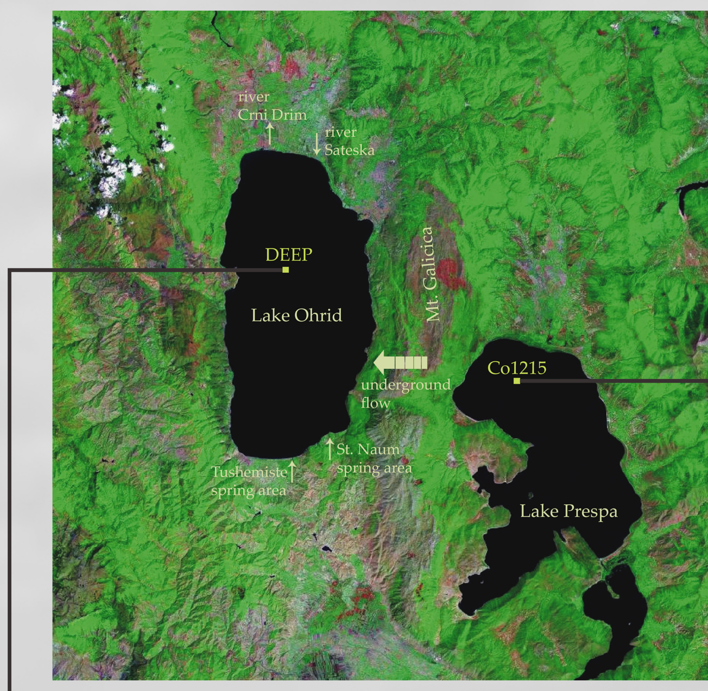


Property	Unit	Lake Prespa	Lake Ohrid
Altitude	m asl	849	693
Catchment area	km^2	1300	2610
Lake surface area	km^2	254	358
Maximum depth	m	48	288
Mean depth	m	14	155
Volume	km^3	3.6	55.4
Hydraulic residence time	yr	~11	~70
Average phosphorus TP concentration	mg P m^{-3}	31	4.5
Number of endemic species		?	300
Drill site water depth	m	14	243
Length of composite record (this study)	m	17.7	37.5
Age	ka	92.0	92.0
Sample resolution for diatom analysis	cm, ka	16, ca. 0.3–0.5	8, ca. 0.1–0.4
Total number of analyzed slides		222	235

-Diatom response: temperature tresholds (wind activity, light, nutrients)
-Ultra- to oligotrophic for the last 92 ka, no indication for lake-level changes
-Prolonged and gradual transitions (MIS 5/4 and 2/1)
RESISTANT ECOSYSTEM

-Diatom response: driven by moisture availability
-Multiple shifts in productivity: (oligo-) meso- to eutrophic, lake-level changes
-Abrupt regime shifts (MIS 5b, LGM)
RESILIENT ECOSYSTEM

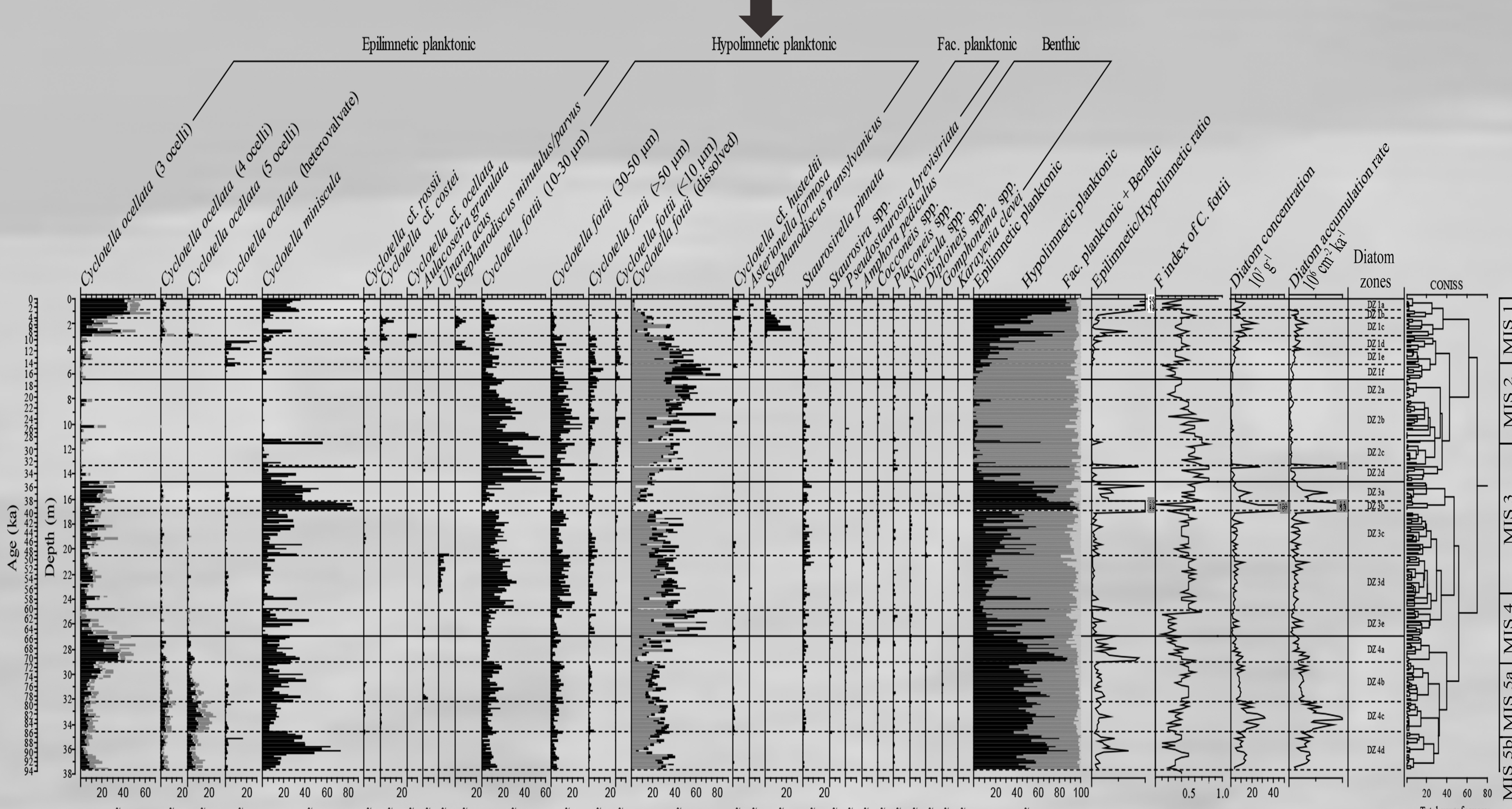


Fig 1. Stratigraphic diatom diagram showing species with >2 % abundance in Lake Ohrid DEEP site core, F index of Cyclotella fottii, DC and DAR. Diatom zone boundaries are defined by CONISS, Marine Isotope Stages (MIS) boundaries after Lisiecki and Raymo (2005).

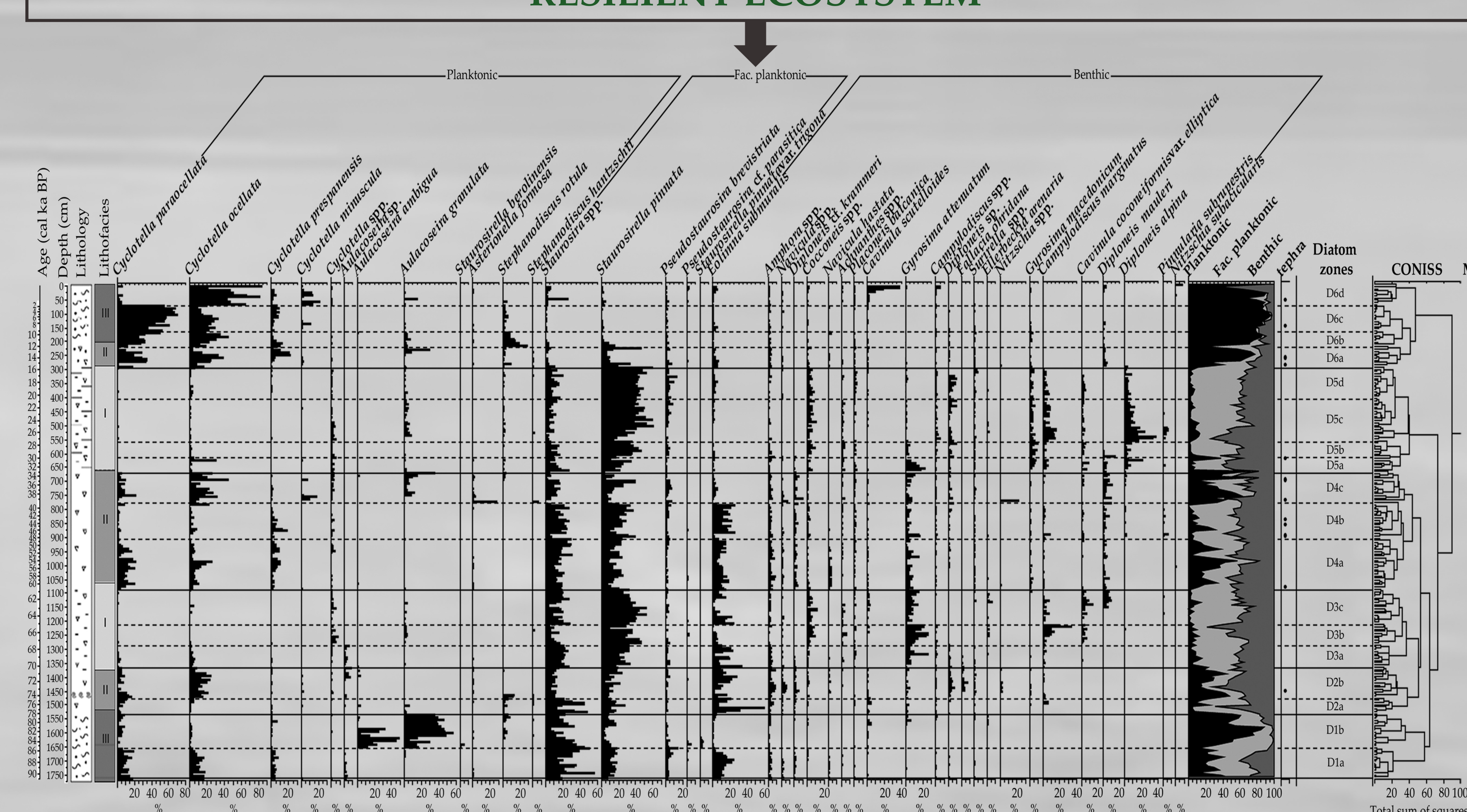


Fig. 2. Stratigraphic diatom diagram showing species with >2 % abundance in Lake Prespa core Co1215, displaying diatom zones defined by CONISS, lithology and lithofacies (Damaschke et al., 2013). IRD = Ice-rafted debris, Marine Isotope Stages (MIS) after Lisiecki and Raymo (2005).

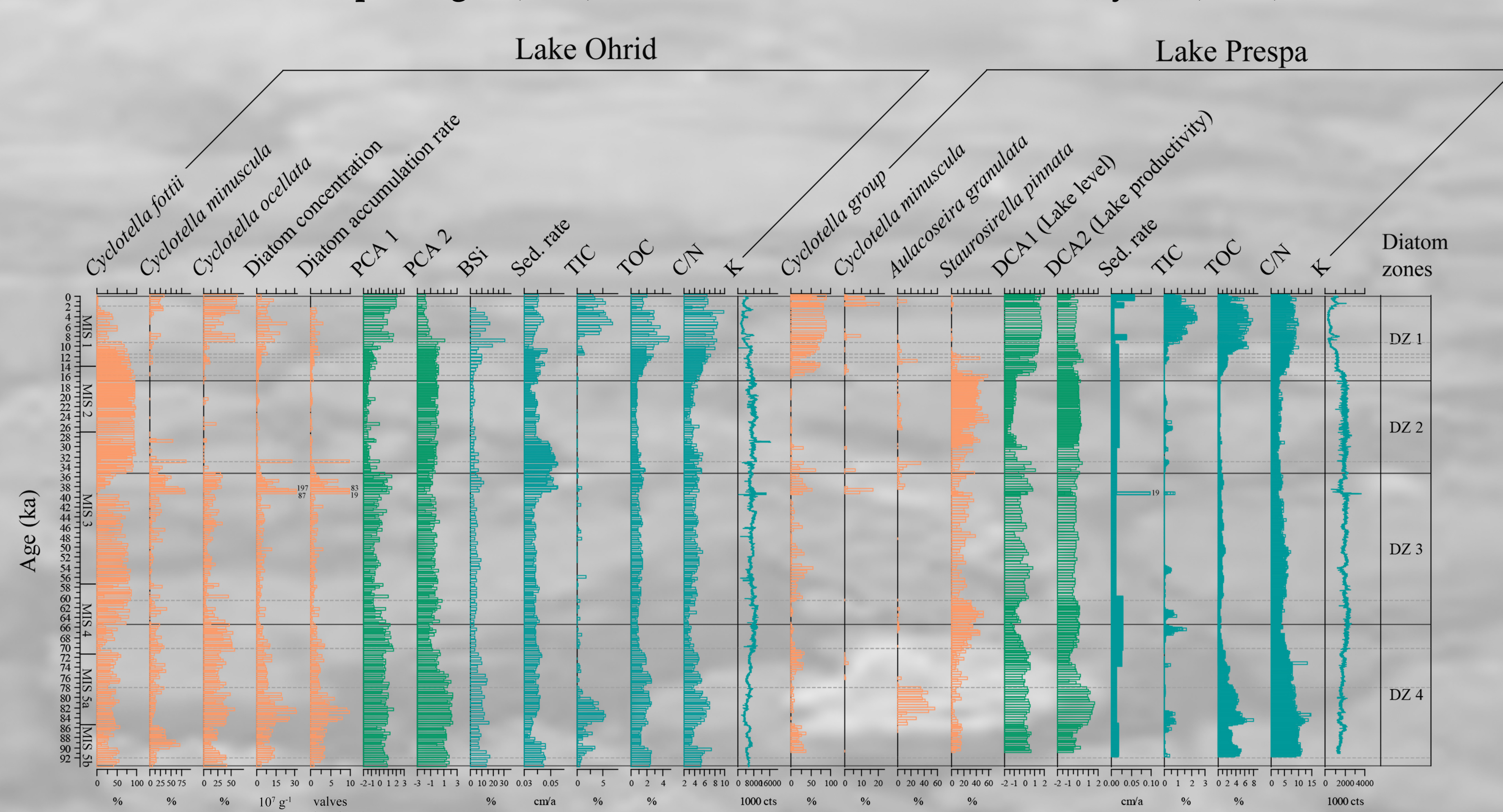


Fig. 3. Comparison diagram between Lake Ohrid DEEP site core and Lake Prespa core Co1215 showing the relative abundance data of selected diatom species, and (bio)geochemical data. DZ 1–4 from Lake Ohrid core DEEP; dotted lines mark the six diatom zones of core Co1215 (Cvetkoska et al., 2015).

MODEL PREDICTIONS:

Due to the underground connection through Mt. Galicica, a potential 20 m water-level decrease of Lake Prespa can cause a five-fold increase of its phosphorus concentration, which may lead to a 30% increase of the P load from Lake Prespa to Lake Ohrid.

AIMS:

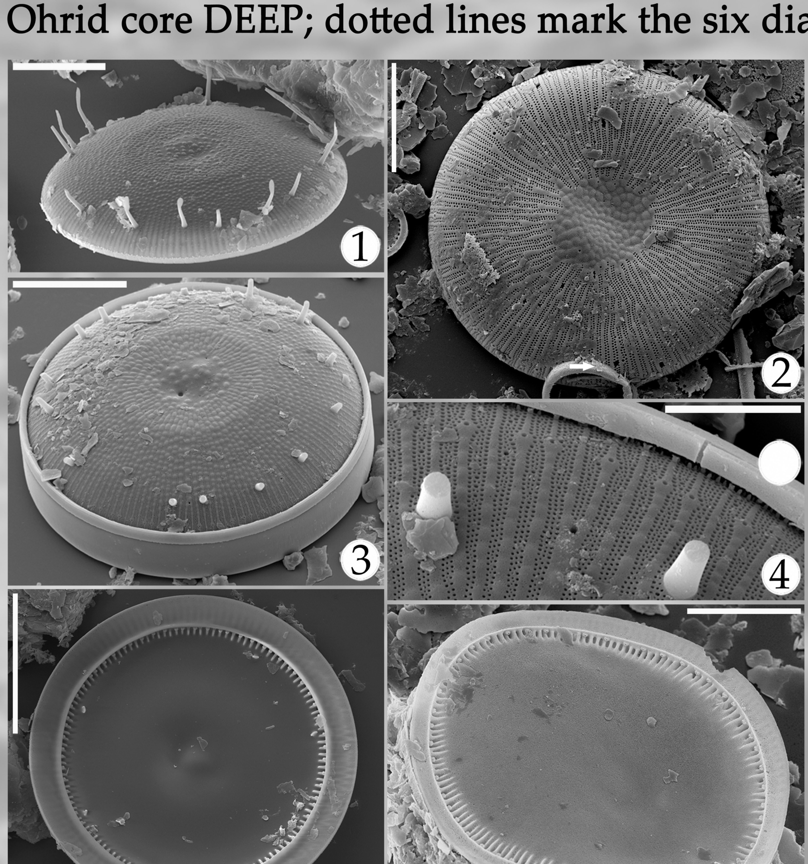
Assess the potential interconnectivity between the lakes and understand the role of Lake Prespa as possible driver of lake-level and/or nutrient shifts in Lake Ohrid over the past 92.0 ka.

RESULTS:

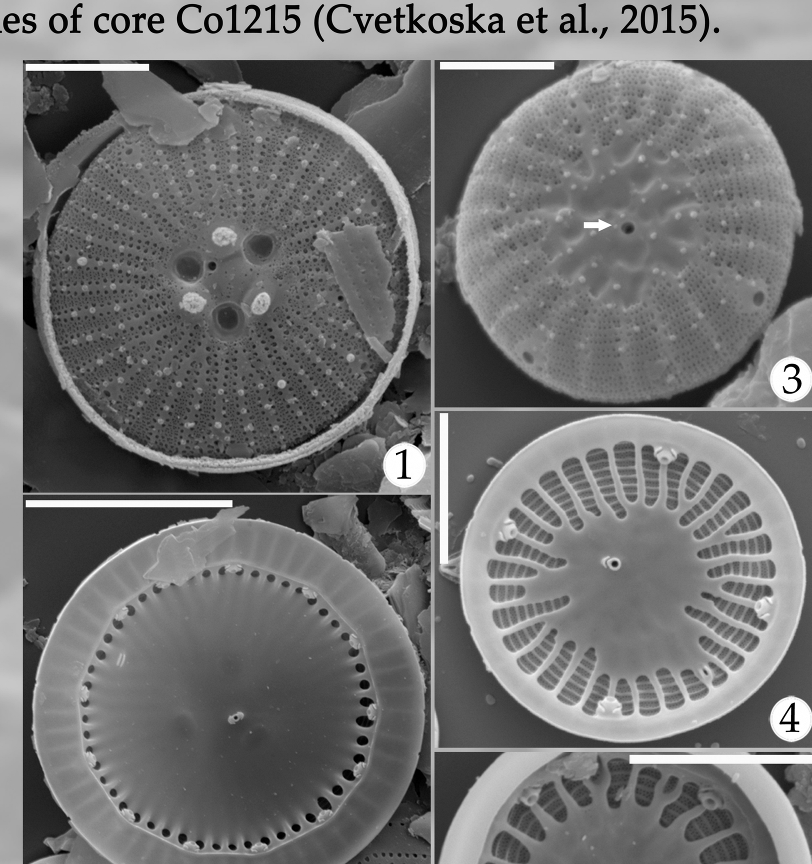
✔ The comparison provides sufficient evidence to disregard the theory of Prespa-dependent regime shifts in Ohrid.

✔ Complete collapse of the ecosystems functionality and loss of their diatom communities did not happen in either lake.

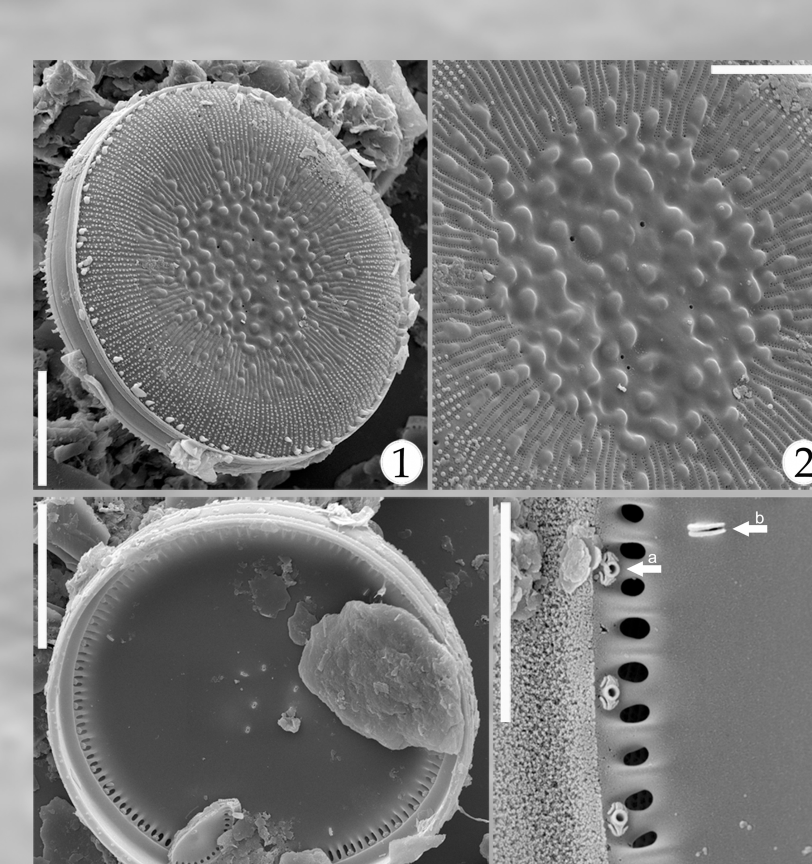
HIGH ECOSYSTEM RESISTANCE/RESILIENCE ➡ NO CATASTROPHIC EVENTS



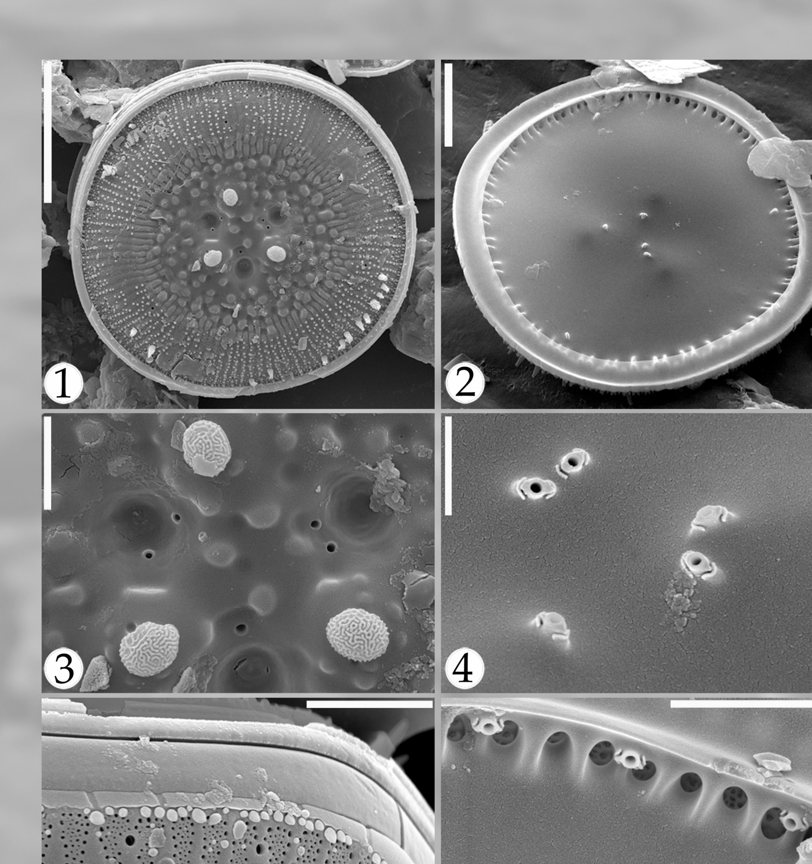
Lake Ohrid
Figs 1–6. SEM. *Cyclotella fottii* Hustedt. Figs 1–4. external valve views. Figs 5, 6. internal valve views. Scale bars: Figs 1, 3, 5 = 20 µm; Figs 2, 6 = 10µm; Fig. 4 = 5.



Lake Ohrid
Figs 1, 2. SEM. *Cyclotella ocellata* Pantocsek. Figs 3–5. *C. minuscula* (Jurilj) Cvetkoska. Scale bars: Fig. 2 = 5 µm; Figs 1, 4, 5 = 2 µm; Fig. 3 = 1µm.



Lake Prespa
Figs 1–4. SEM. *Cyclotella prespanensis* Cvetkoska, Hamilton, Ognjanova-Rumenova & Levkov. Scale bars: Figs 1, 3 = 10 µm; Fig. 2 = 5 µm; Fig. 4 = 3 µm.



Lake Prespa
Figs 1–6. SEM. *Cyclotella paraocellata* Cvetkoska et al. Scale bars: Fig. 1 = 10 µm; Fig. 2 = 5 µm; Figs 3, 5, 6 = 2 µm; Fig. 4 = 1 µm.

ACKNOWLEDGEMENTS
The SCOPSCO Lake Ohrid drilling campaign was funded by ICDP, the German Ministry of Higher Education and Research, the German Research Foundation, the University of Cologne, the British Geological Survey, the INGV and CNR (both Italy), and the governments of the Republics of Macedonia and Albania. Logistic support was provided by the Hydrobiological Institute in Ohrid. Drilling was carried out by Drilling, Observation and Sampling of the Earth's 21 Continental Crust's (DOSECC) and using the Deep Lake Drilling System (DLDS). A.C. would like to thank David Versluis, Keechy Akkerman and Jan van Tongeren for technical assistance.