



Fitness Landscapes and Optimal Environmental Windows

Compiled by

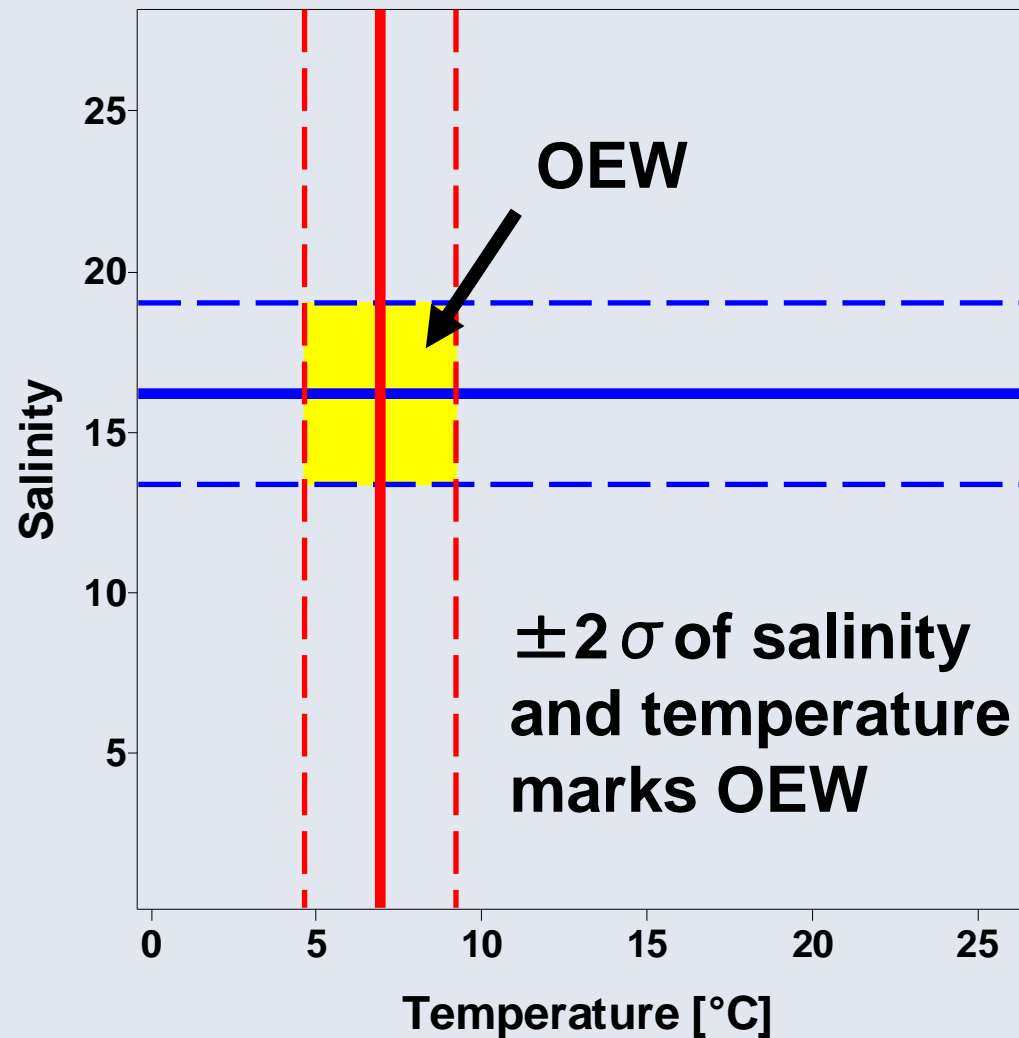
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Janina Werner

Introduction

- In this presentation we show the near coastal phytoplankton data as „optimal environmental window“ or as „fitness landscape“ considering the projected climate change in the Baltic Sea area (BACC 2008).

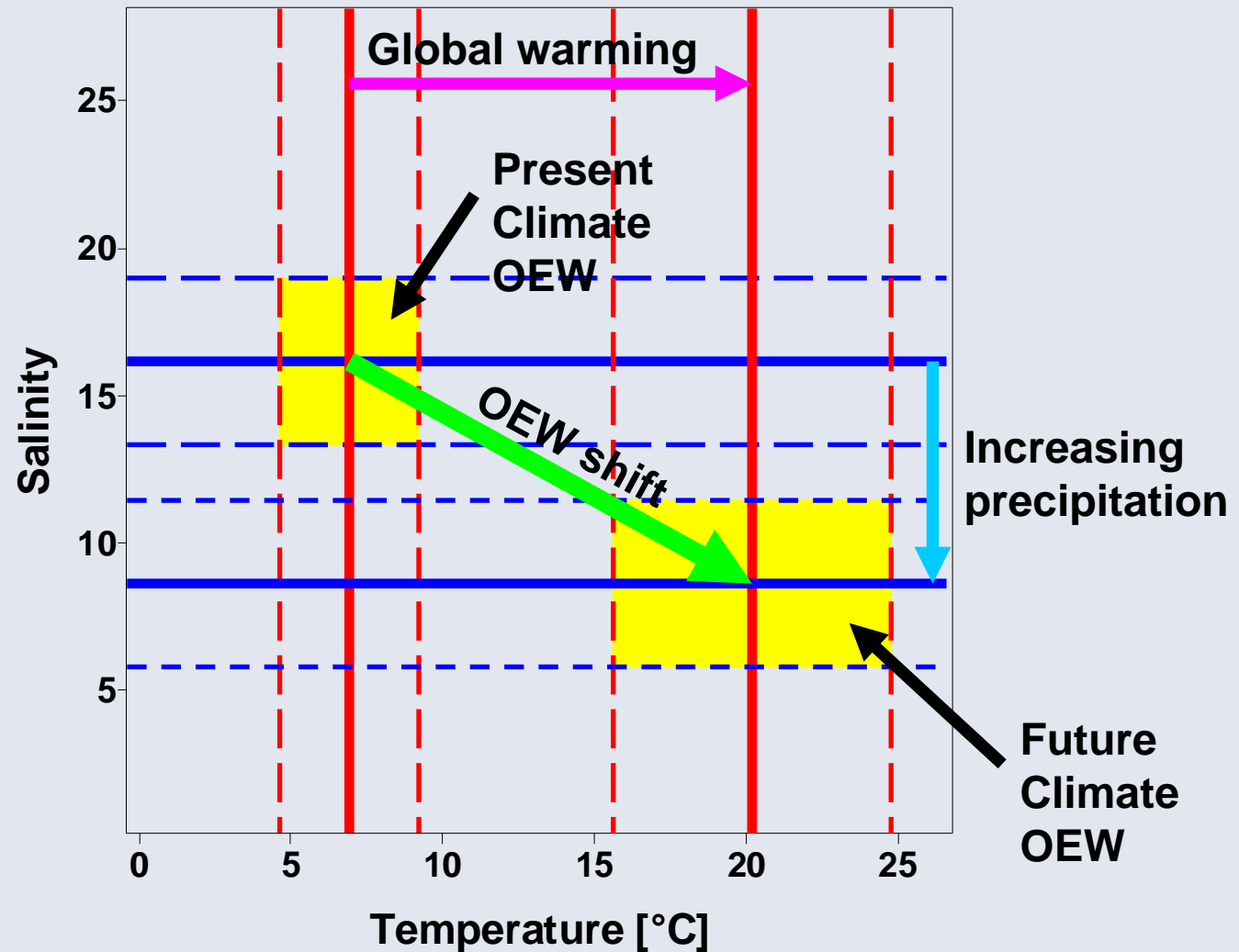


Optimal Environmental Window





OEW shift due to Climate Change

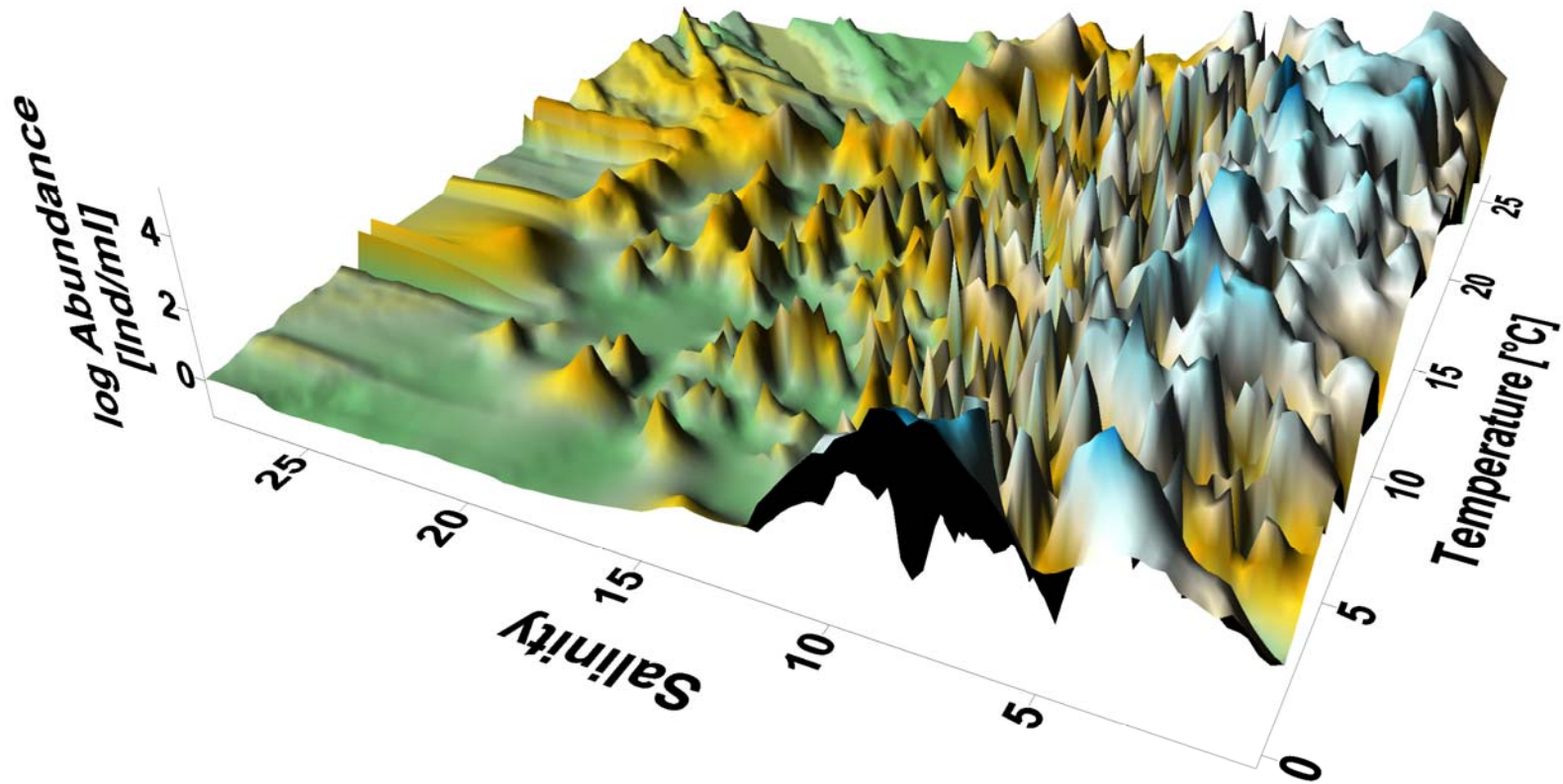


OEW and Fitness Landscape

- Fitness landscape is a useful concept in the theory of evolution (Fisher 1930, Eigen 1971, Feistel & Ebeling 1989). If fitness, here expressed as log abundance, is plotted against environmental parameters, it is conceptionally similar to the theory of optimal environmental window (Cury & Roy 1989).
- In the following fitness landscape is shown as a function of temperature and salinity for the whole range of monitoring data and then for the OEW of present climate and future climate projections (BACC 2008).



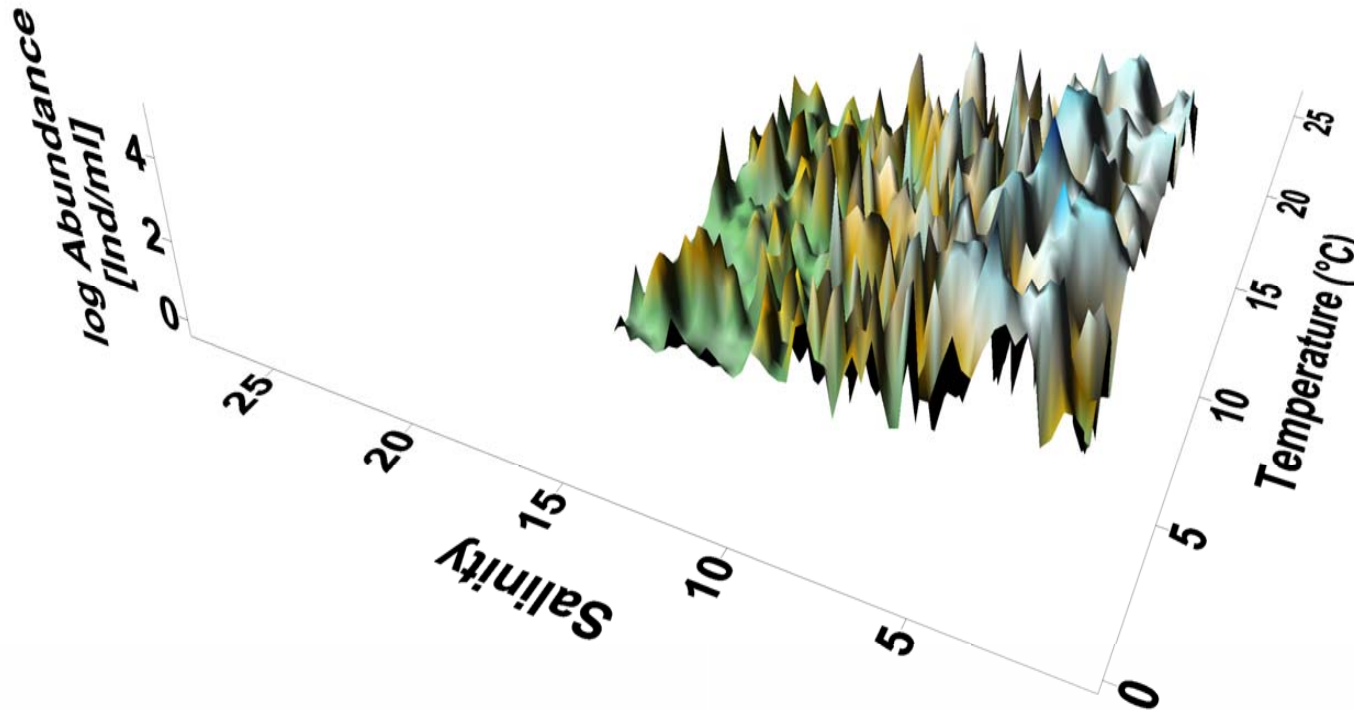
Chlorophyta





Chlorophyta

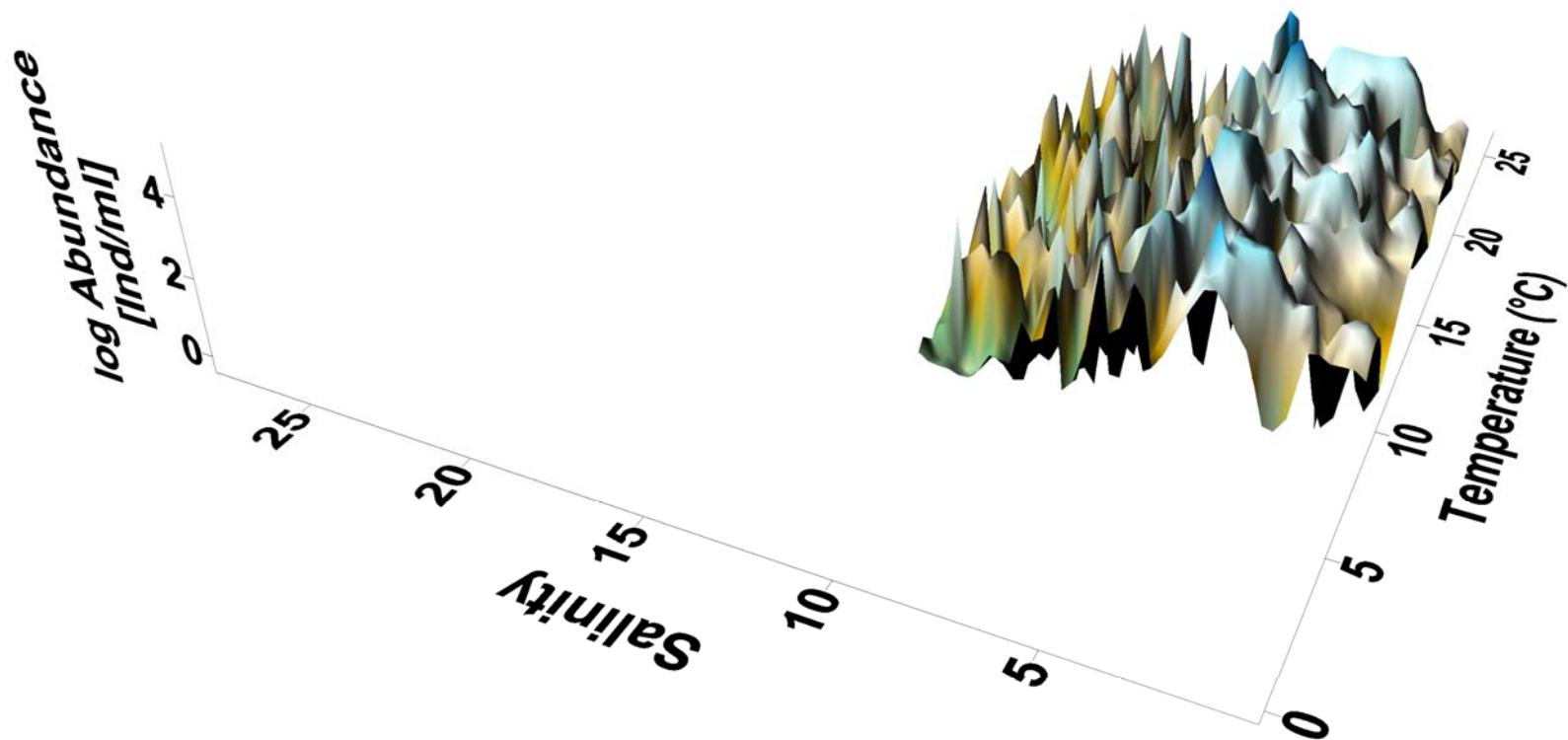
present climate



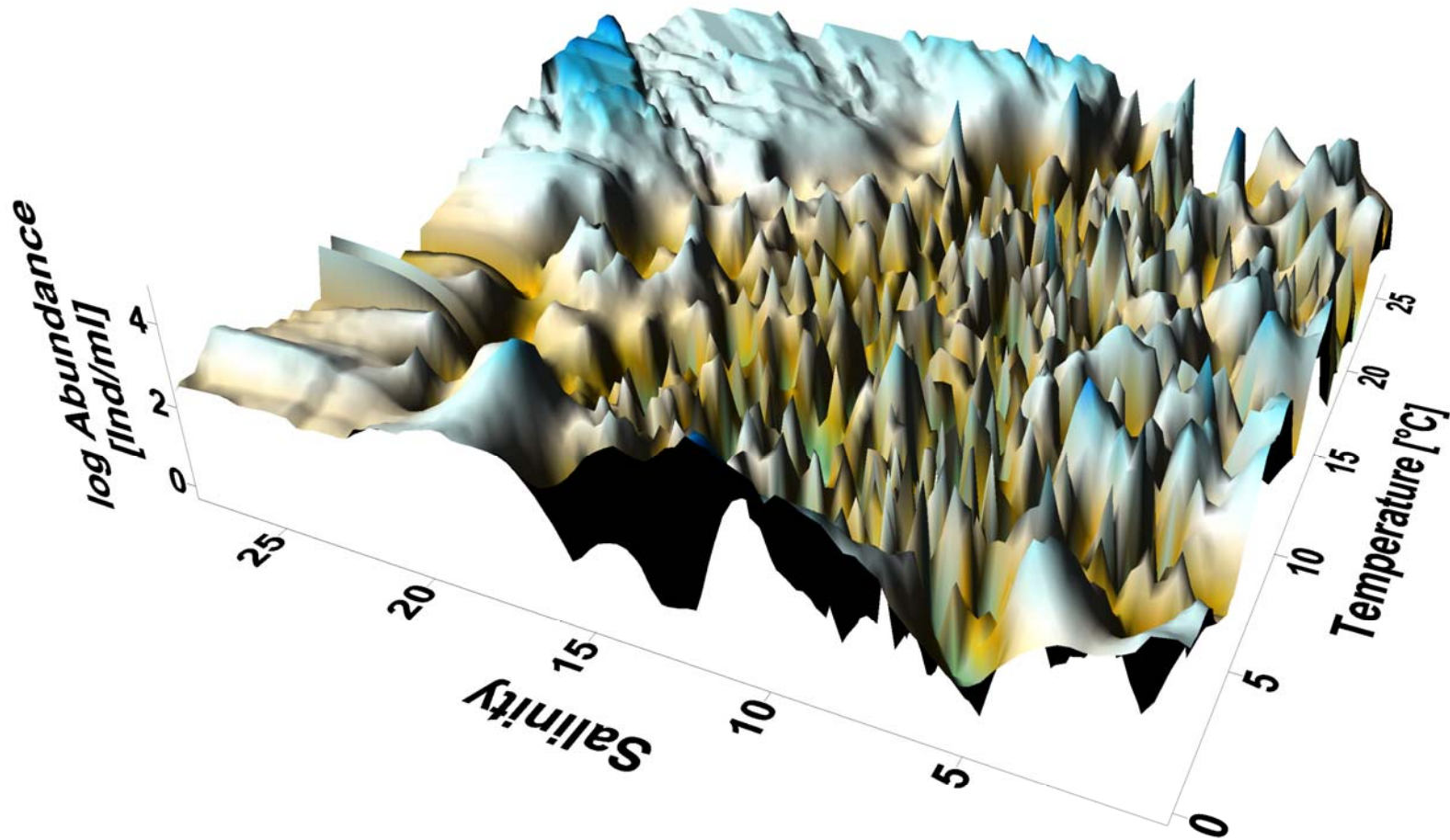


Chlorophyta

future climate



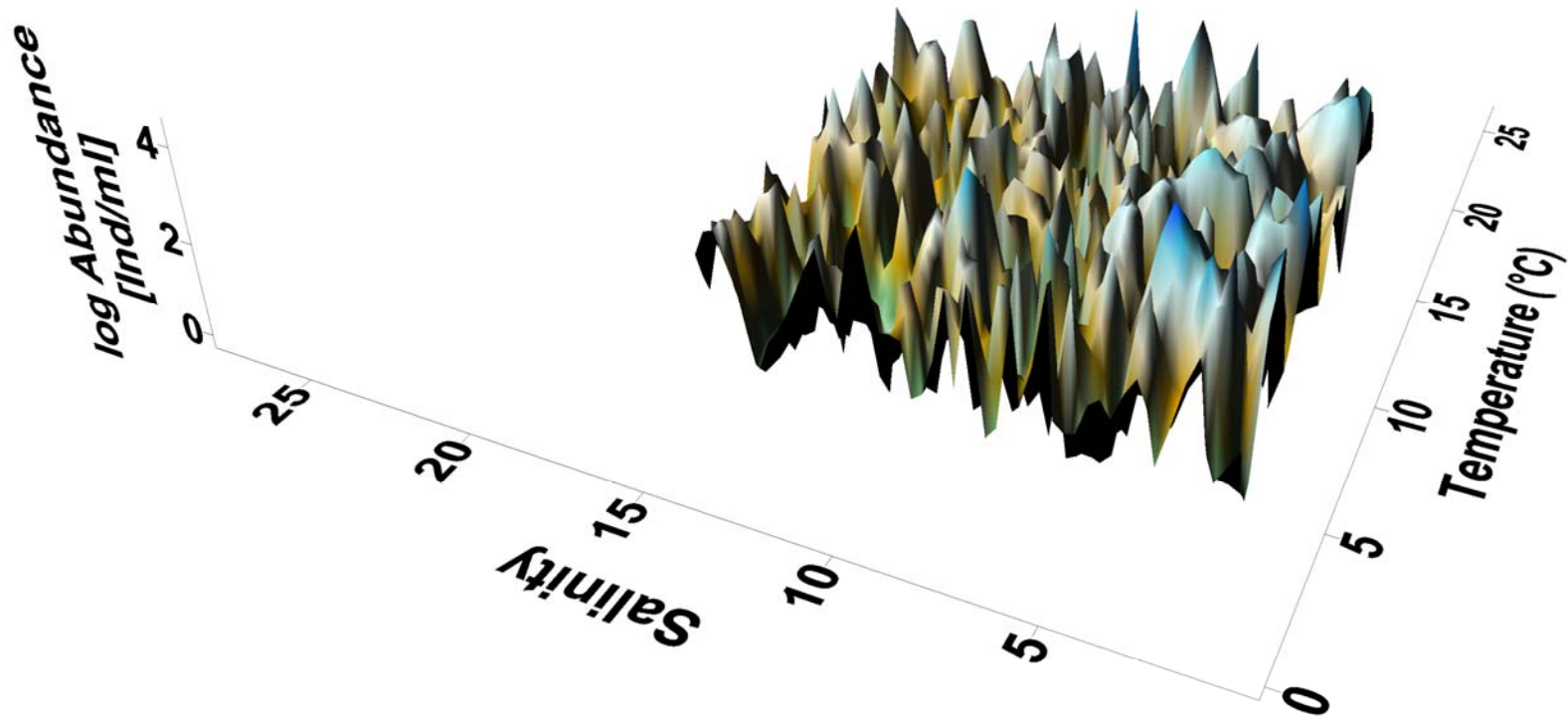
Chrysophyceae



Chrysophyceae



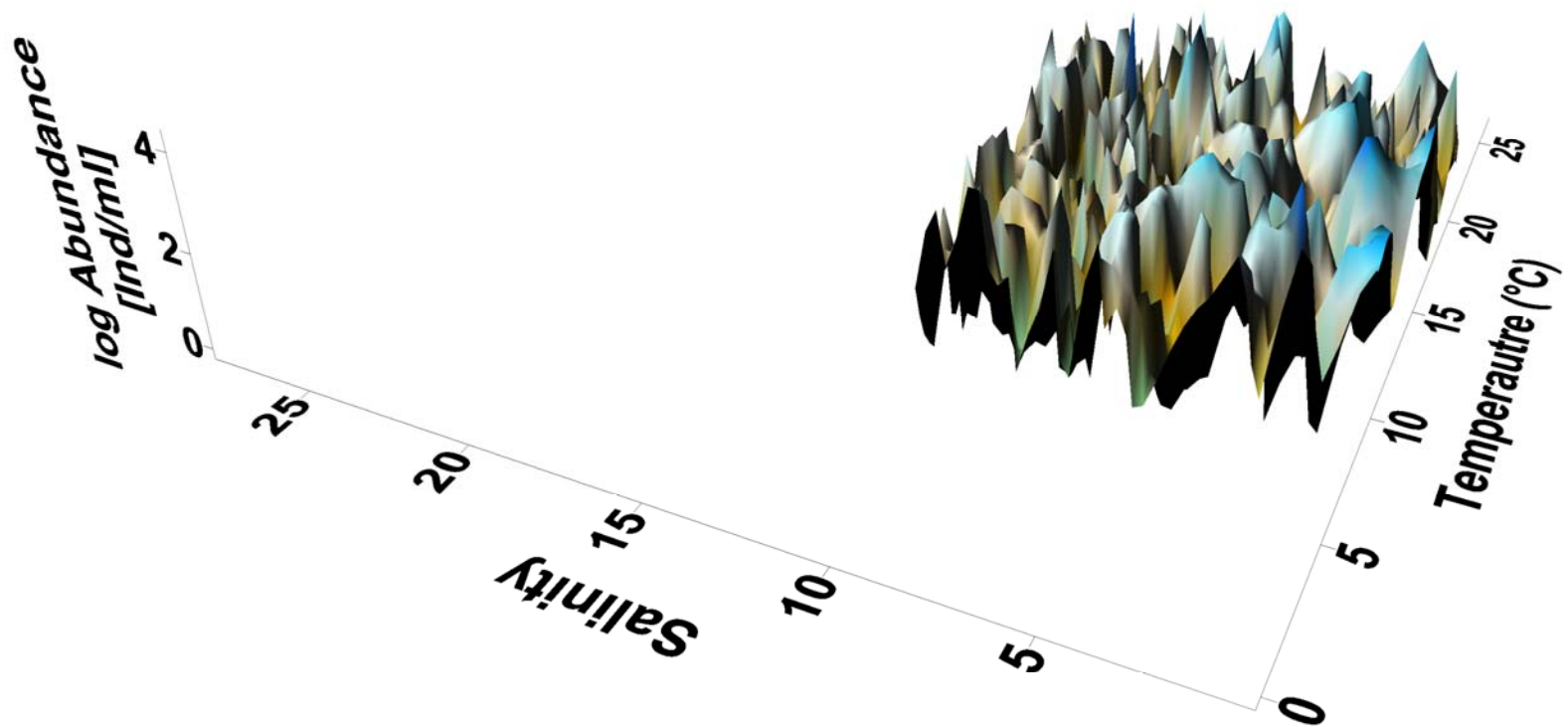
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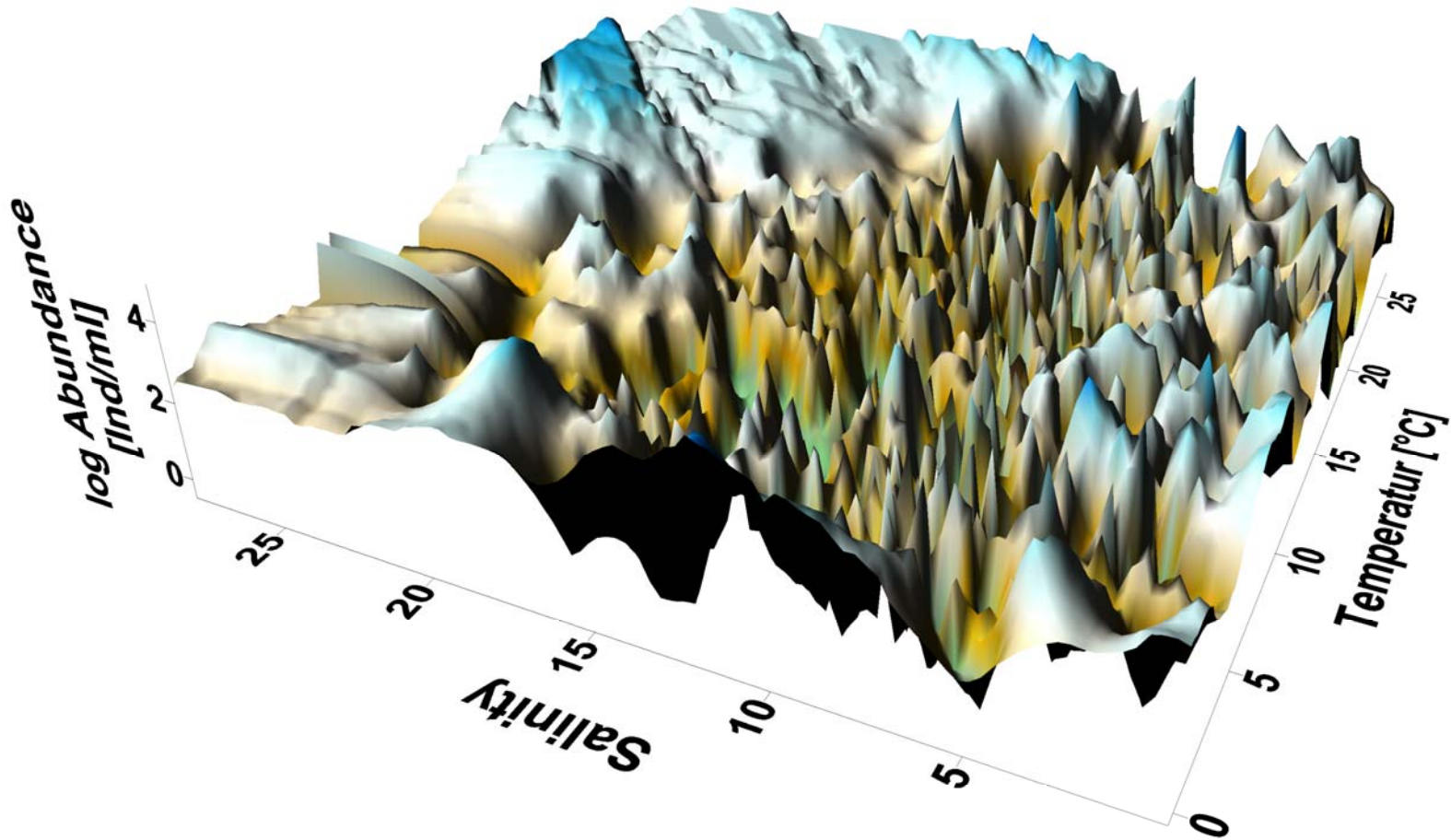
Chrysophyceae



future climate



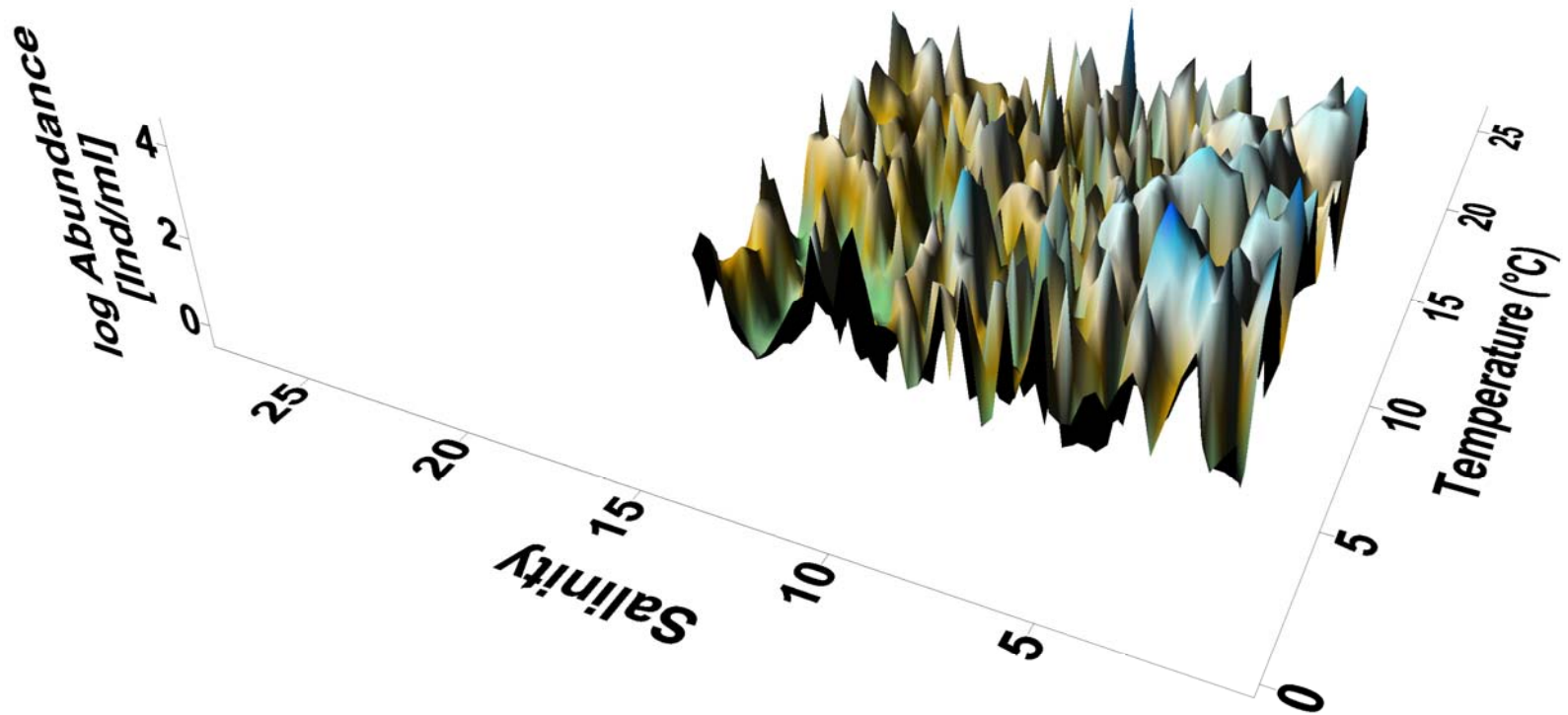
Bacillariophyceae





Bacillariophyceae

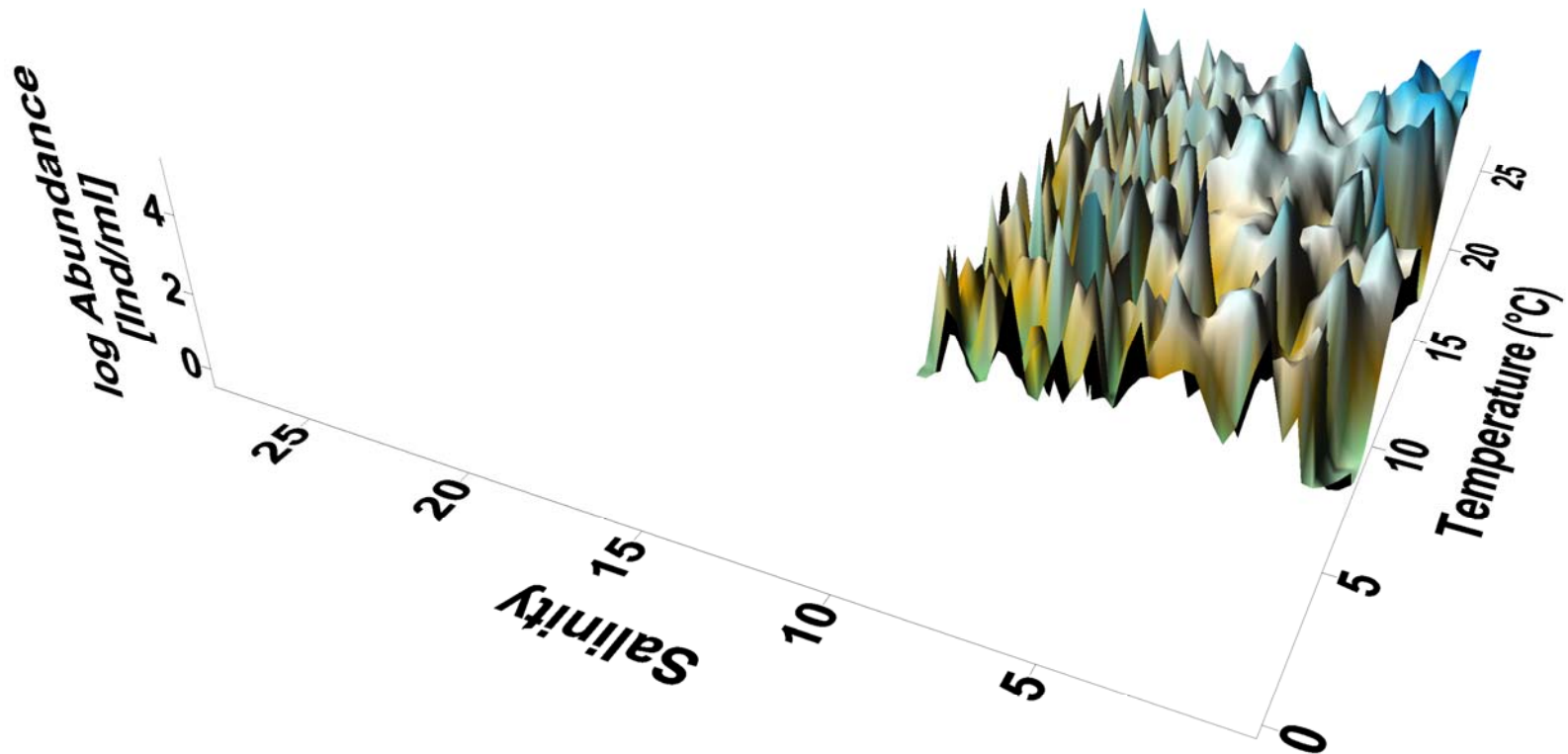
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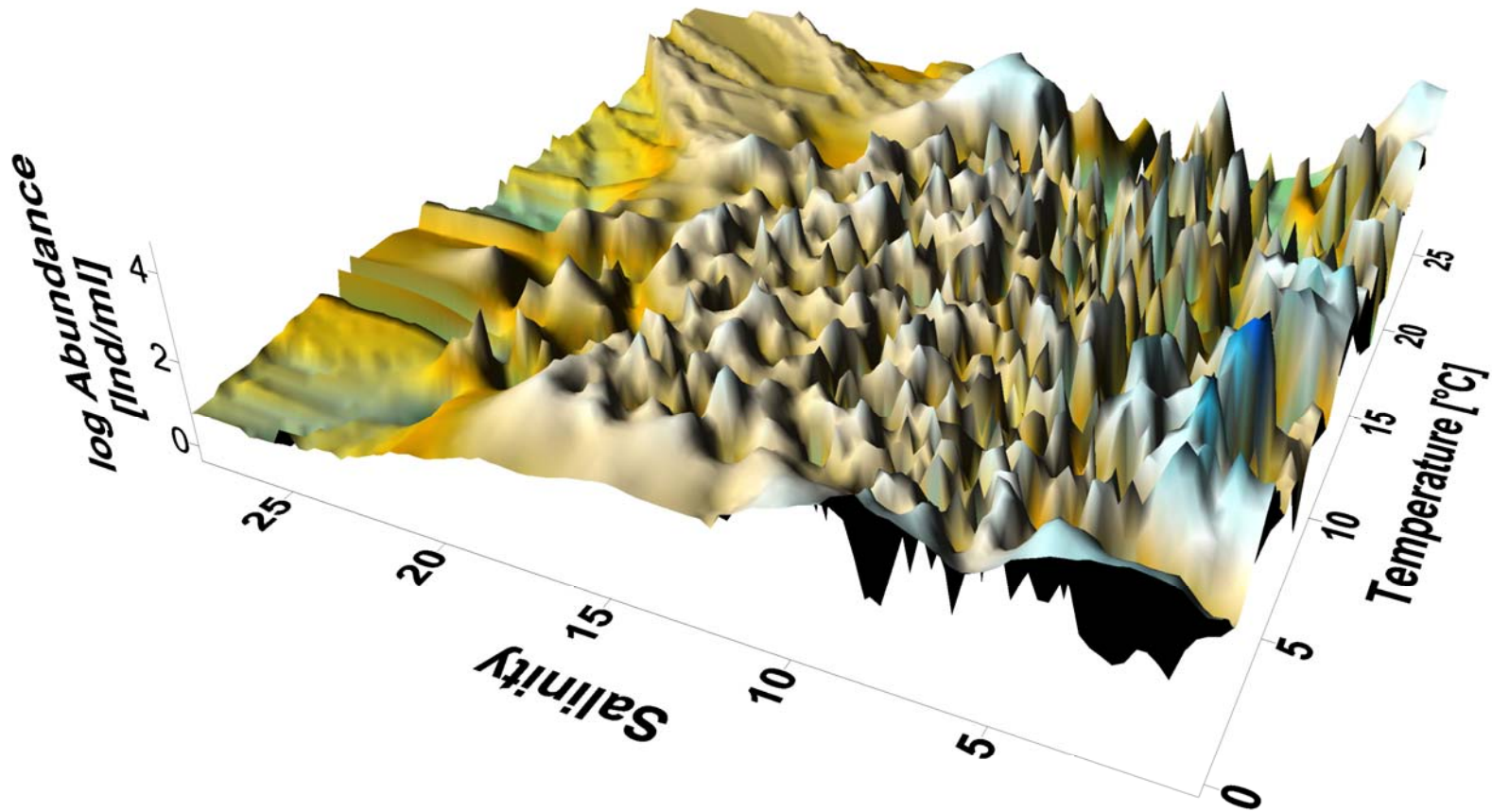


Bacillariophyceae

future climate



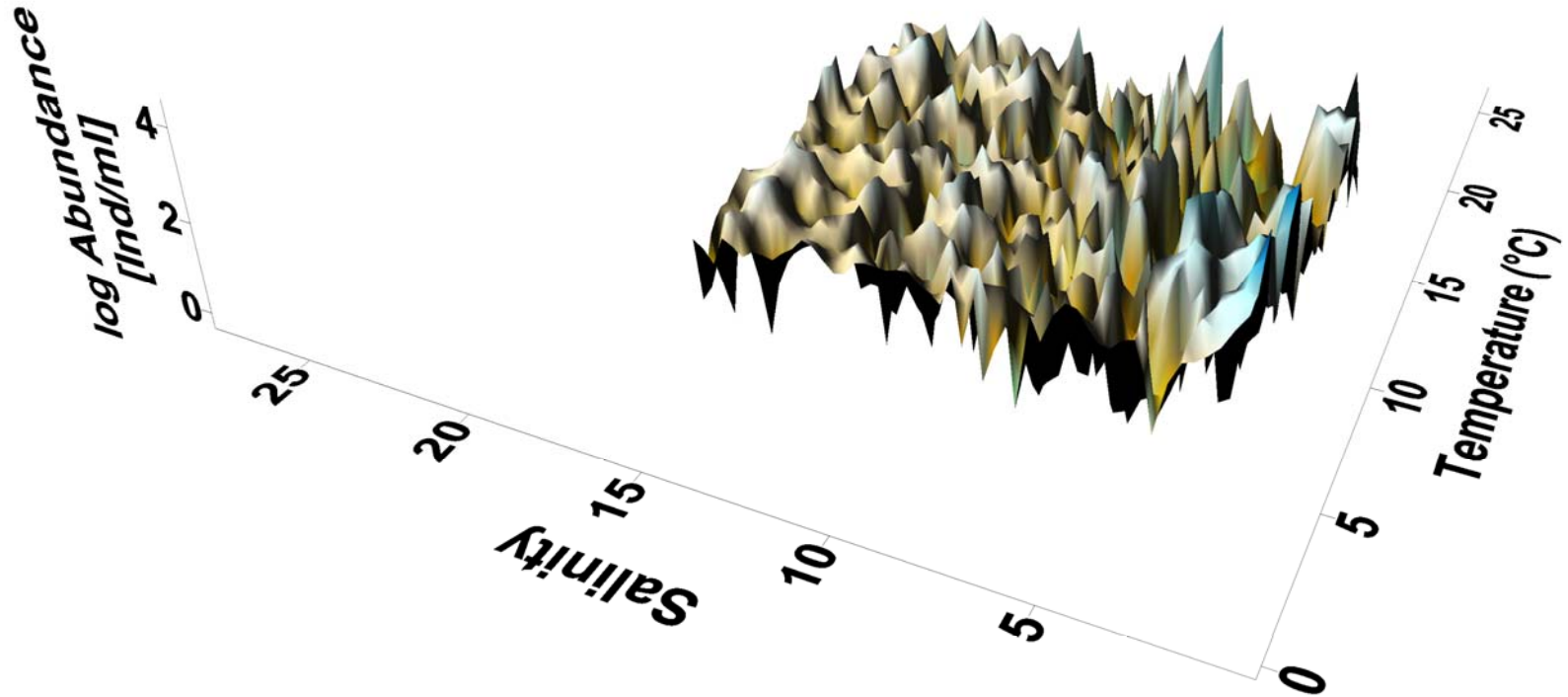
Cryptophyta



Cryptophyta



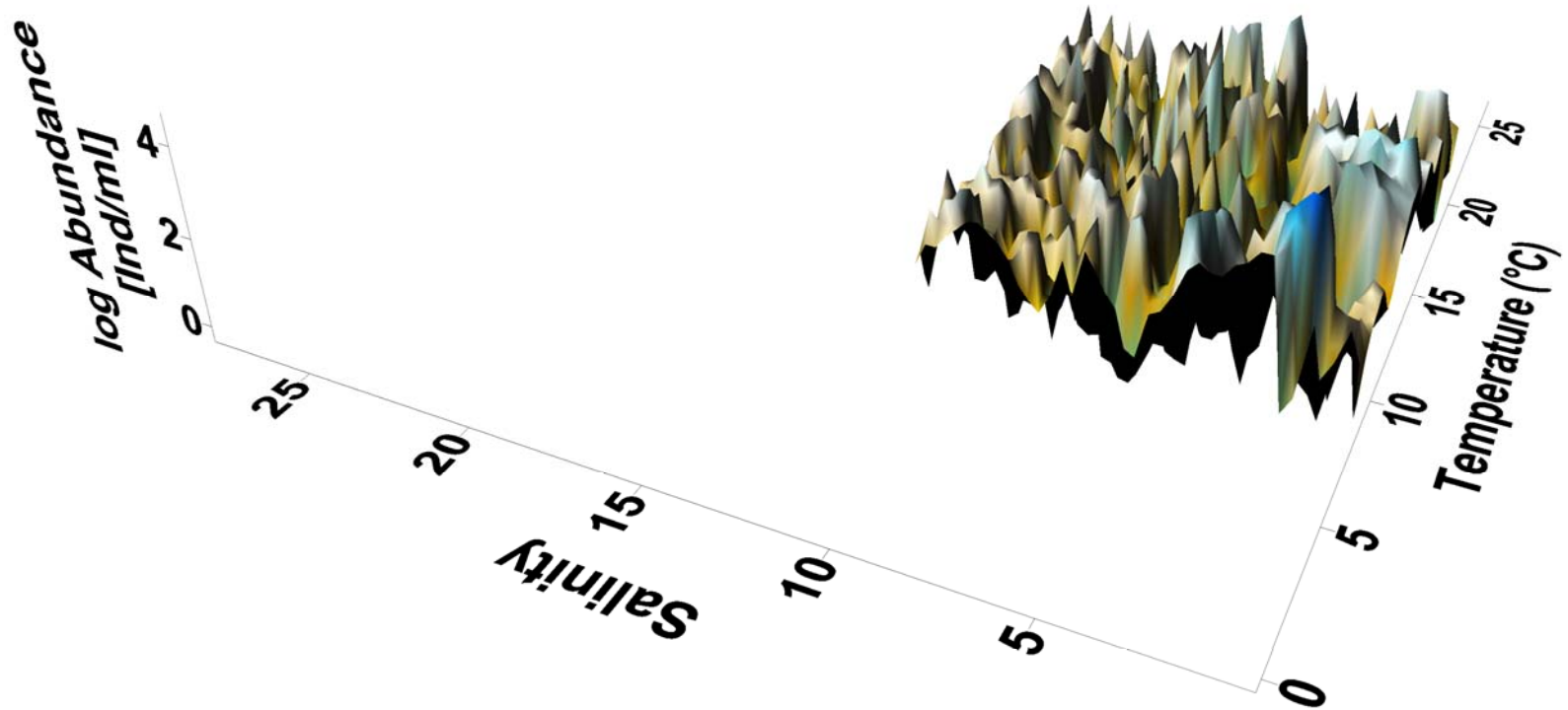
present climate



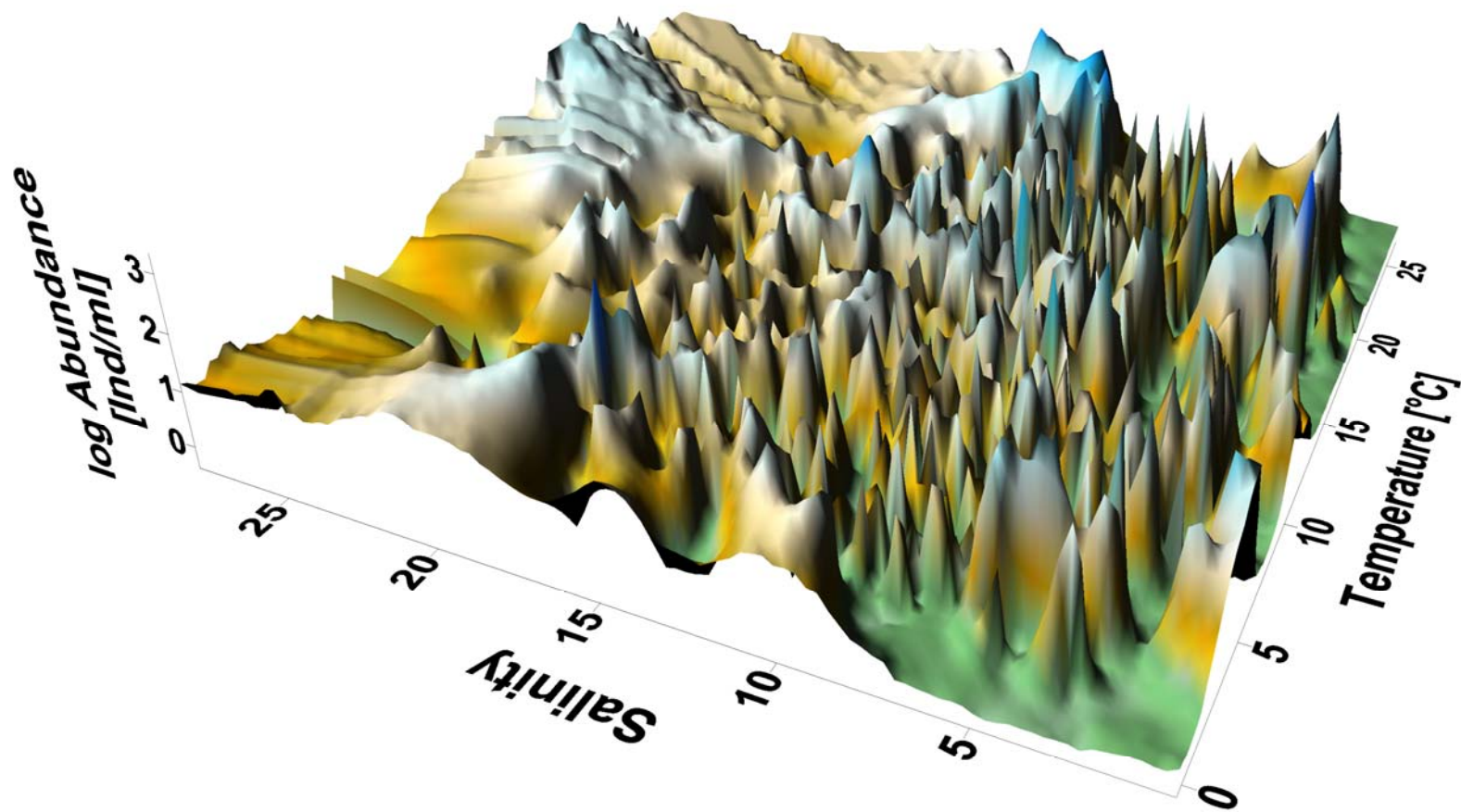


Cryptophyta

future climate



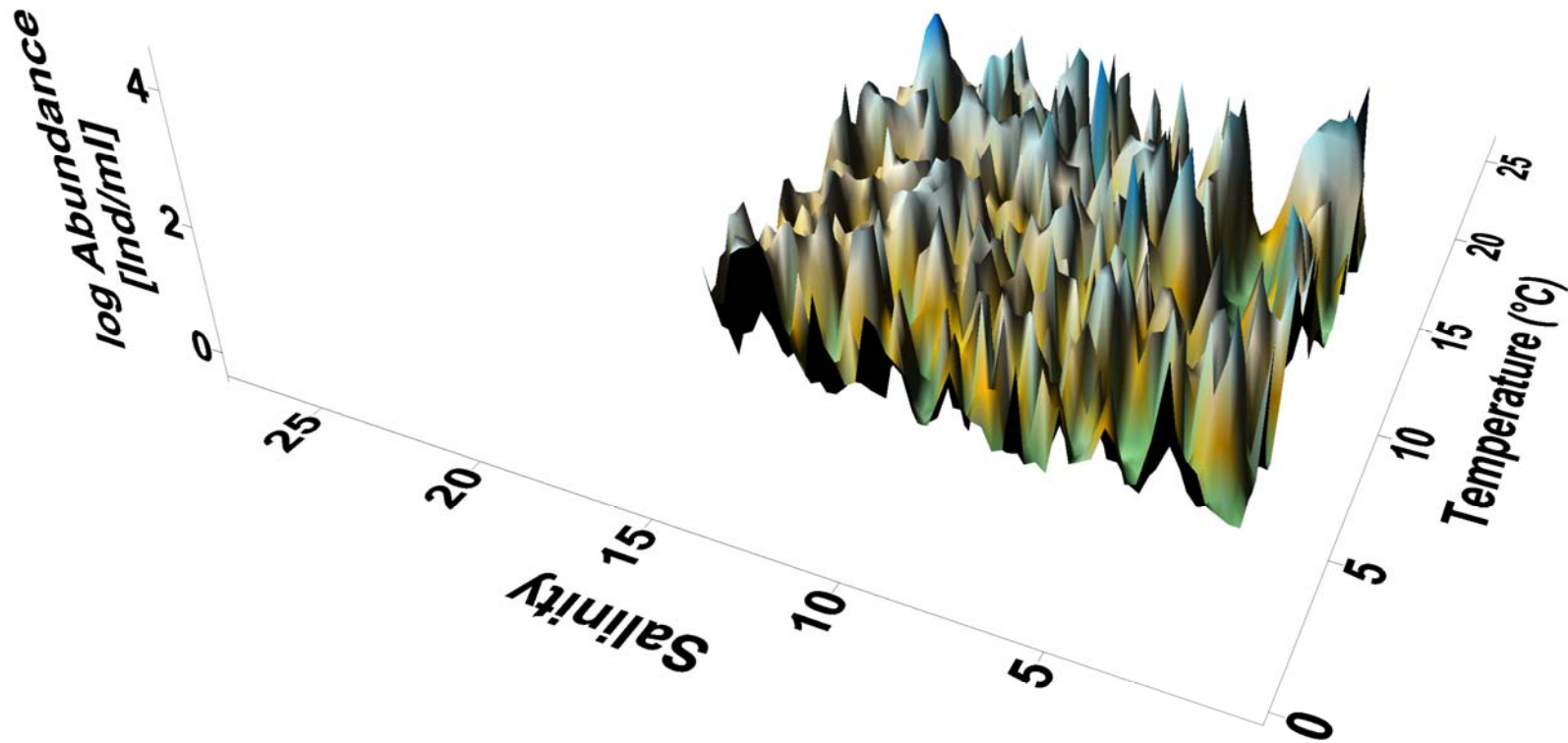
Dinophyta





Dinophyta

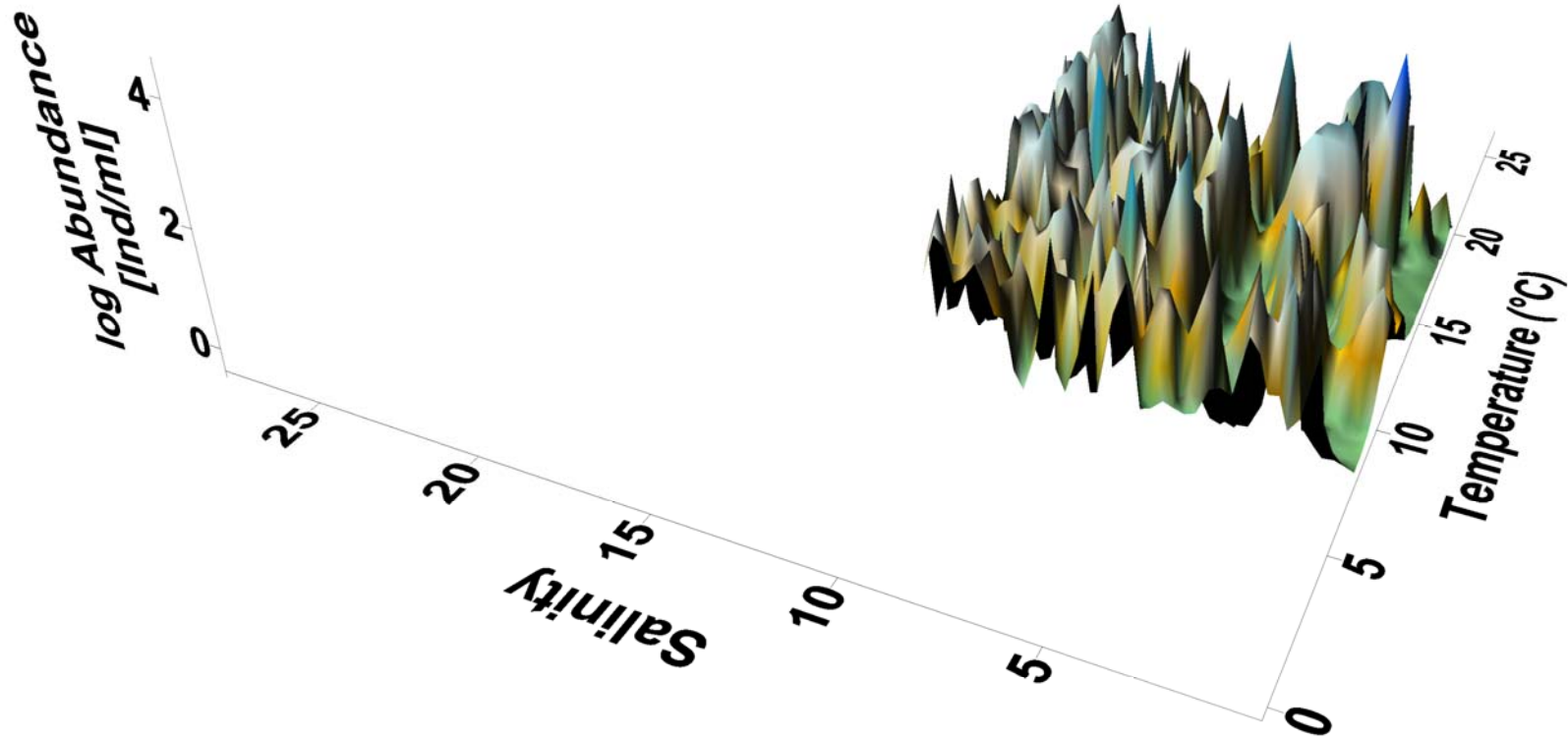
present climate



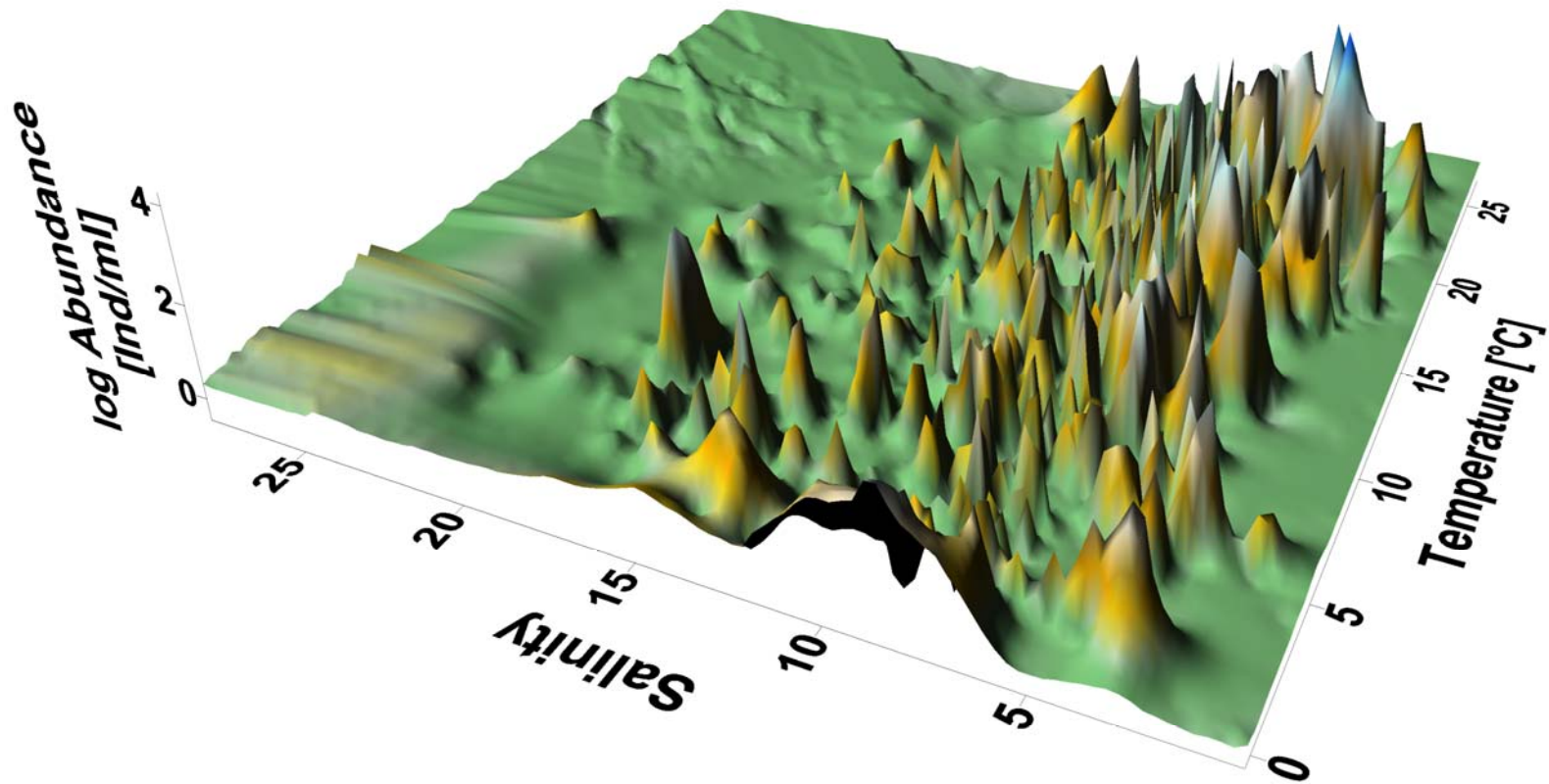


Dinophyta

future climate



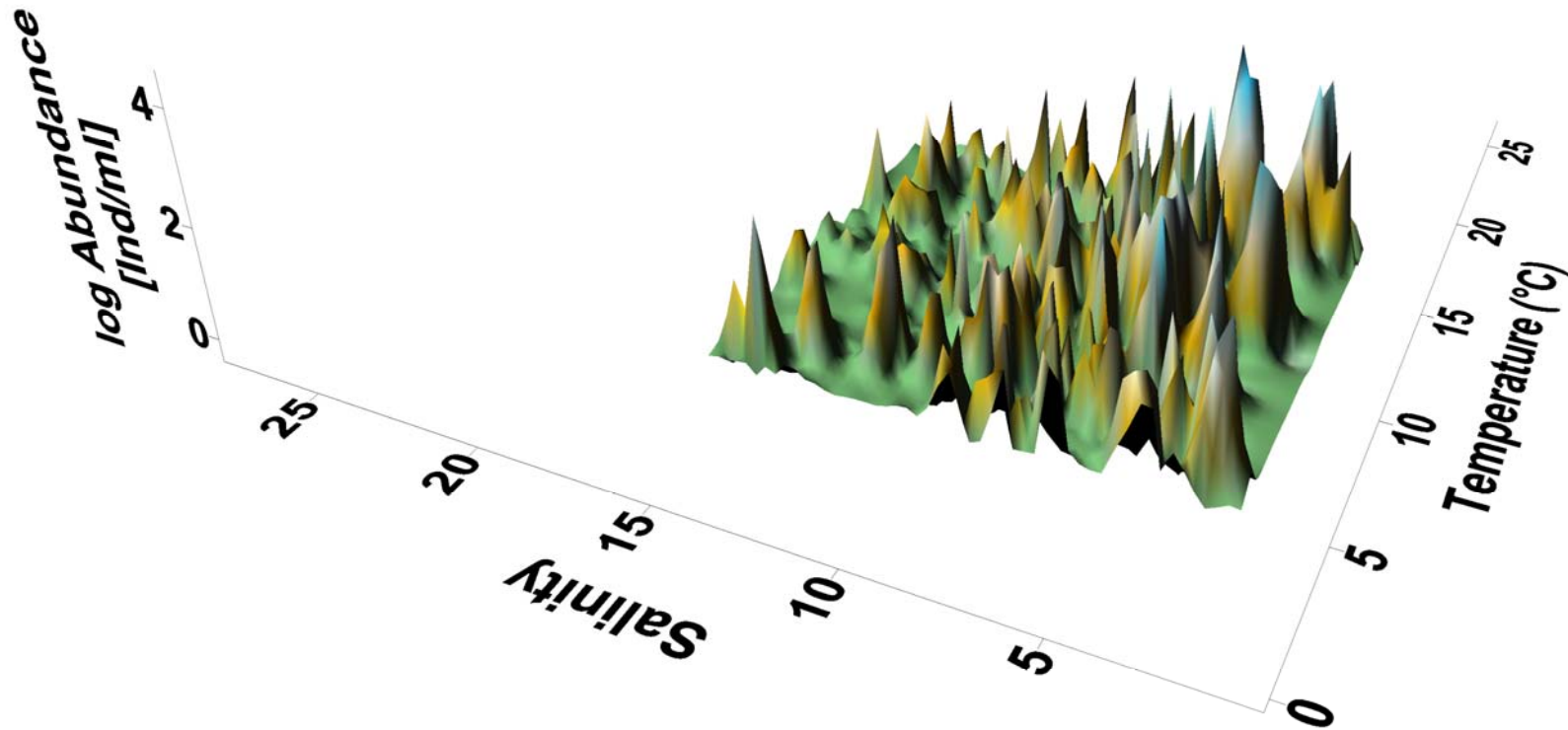
Euglenophyta





Euglenophyta

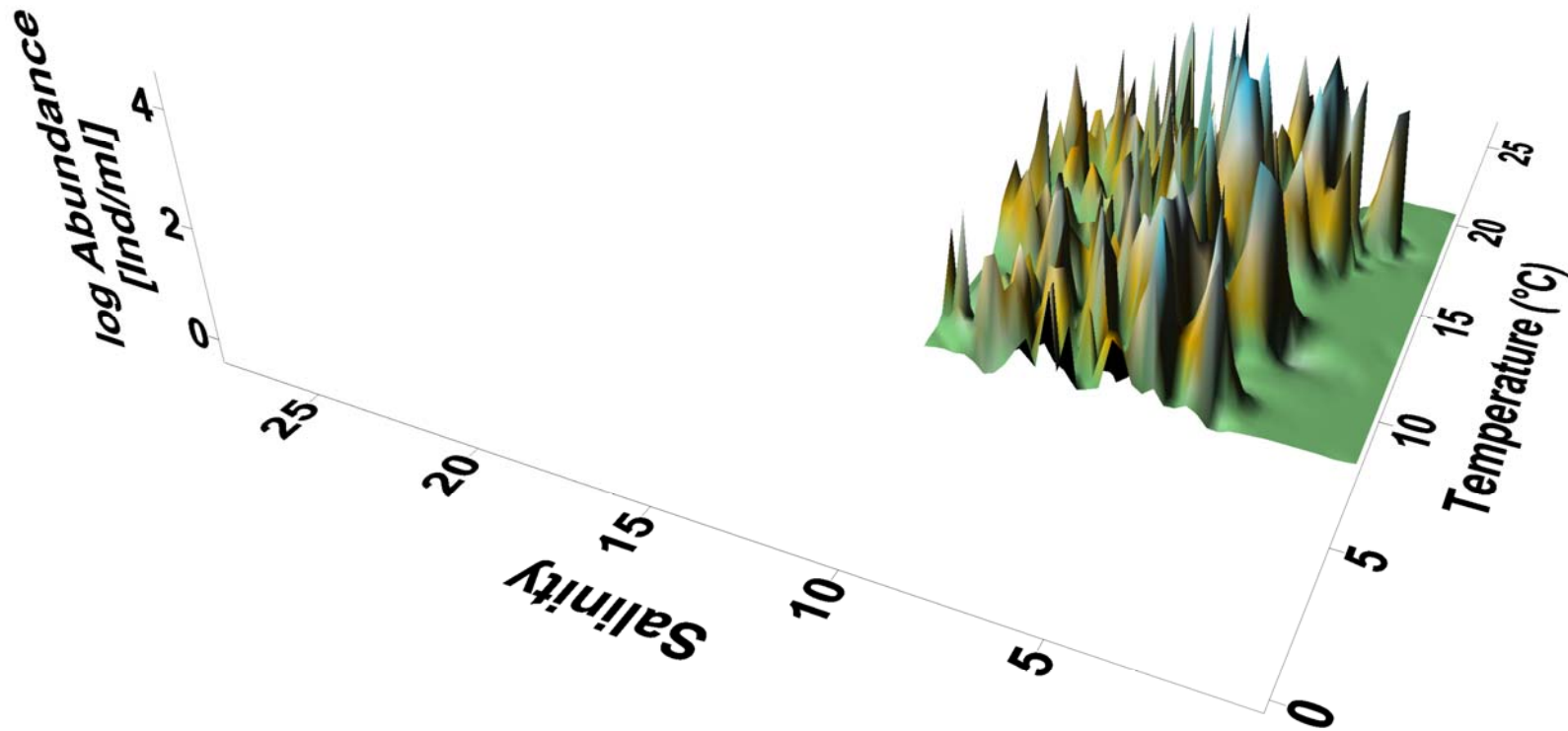
present climate



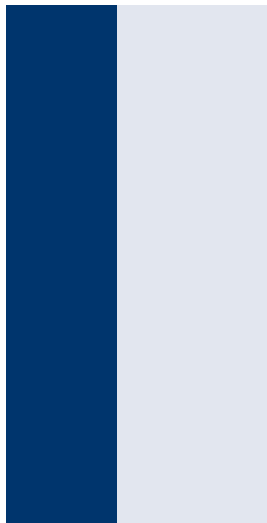
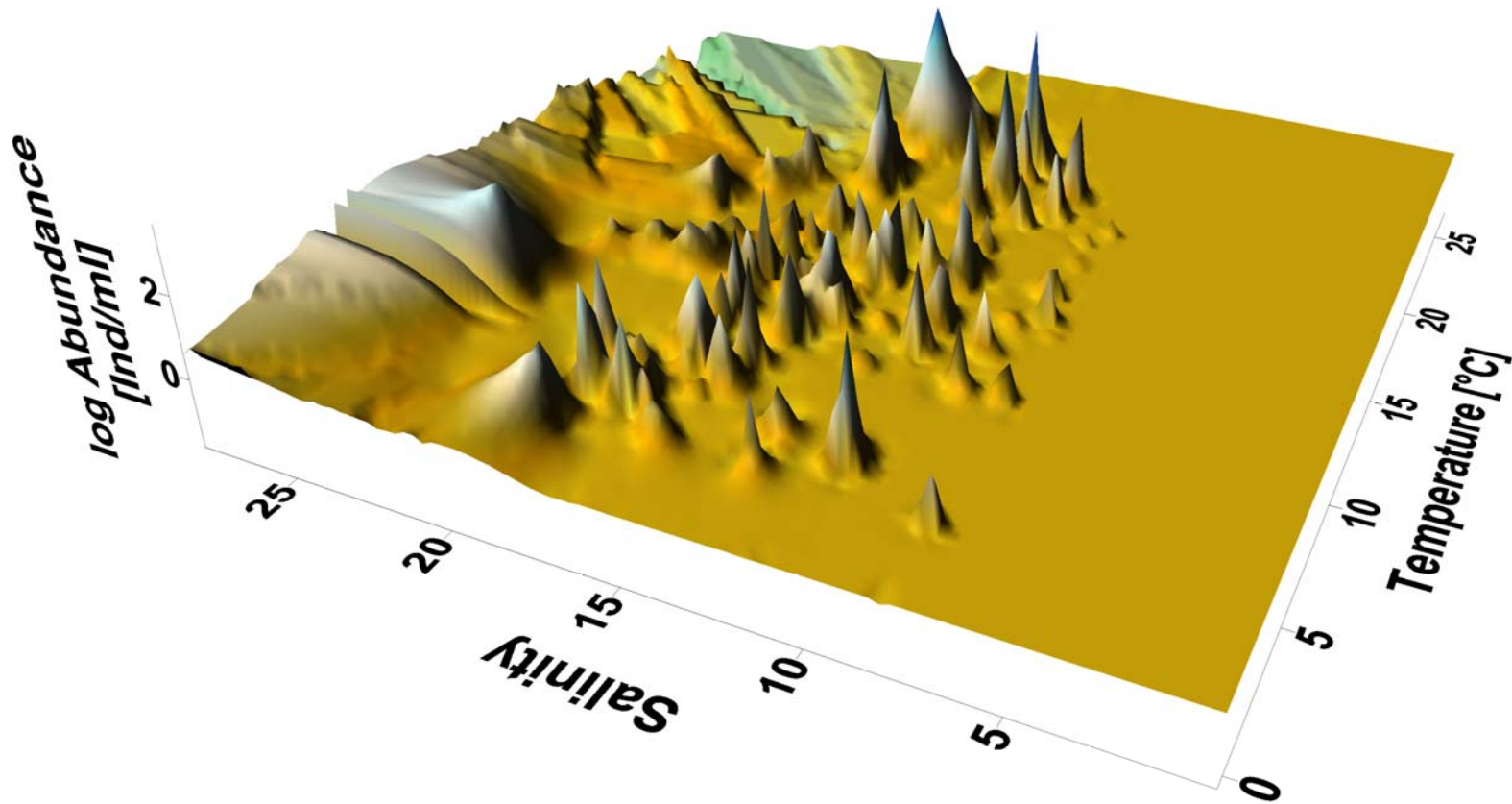


Euglenophyta

future climate



Haptophyta

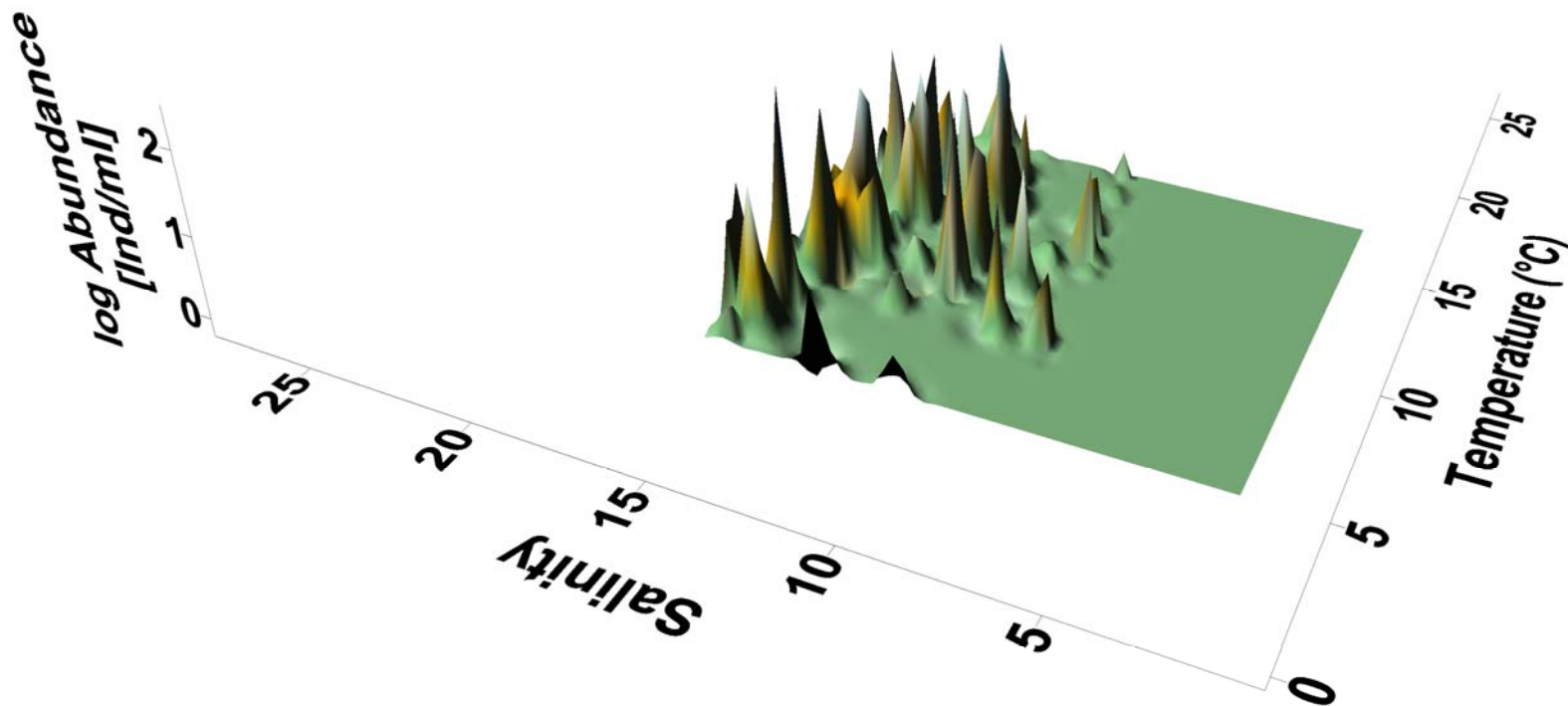


Haptophyta



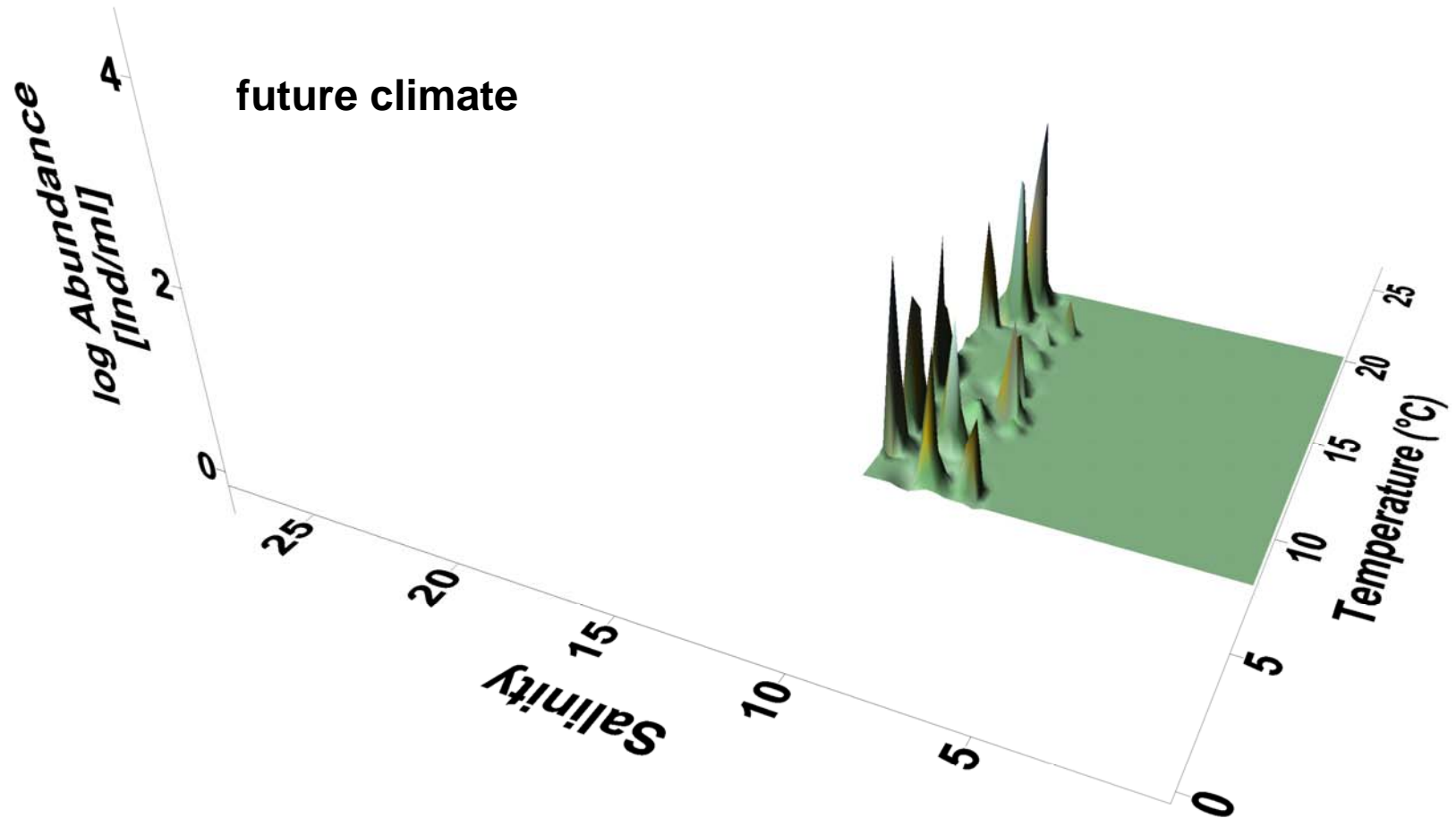
Federal Ministry
of Education
and Research

present climate

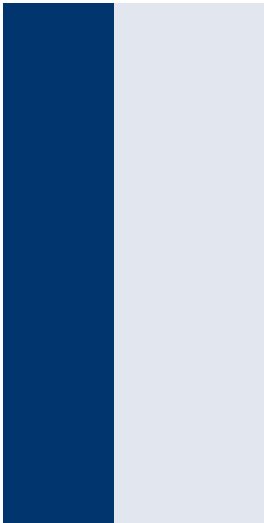
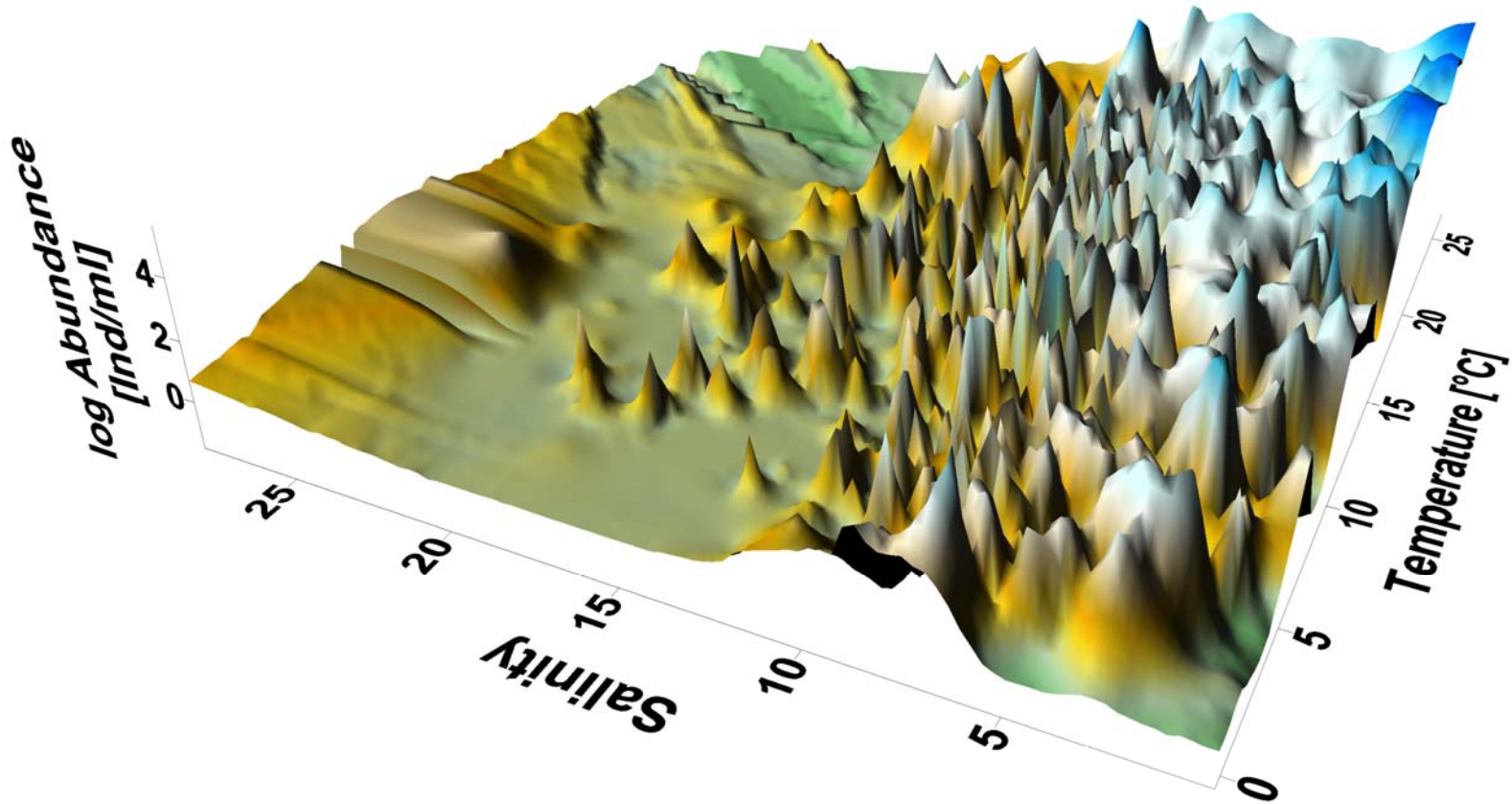




Haptophyta



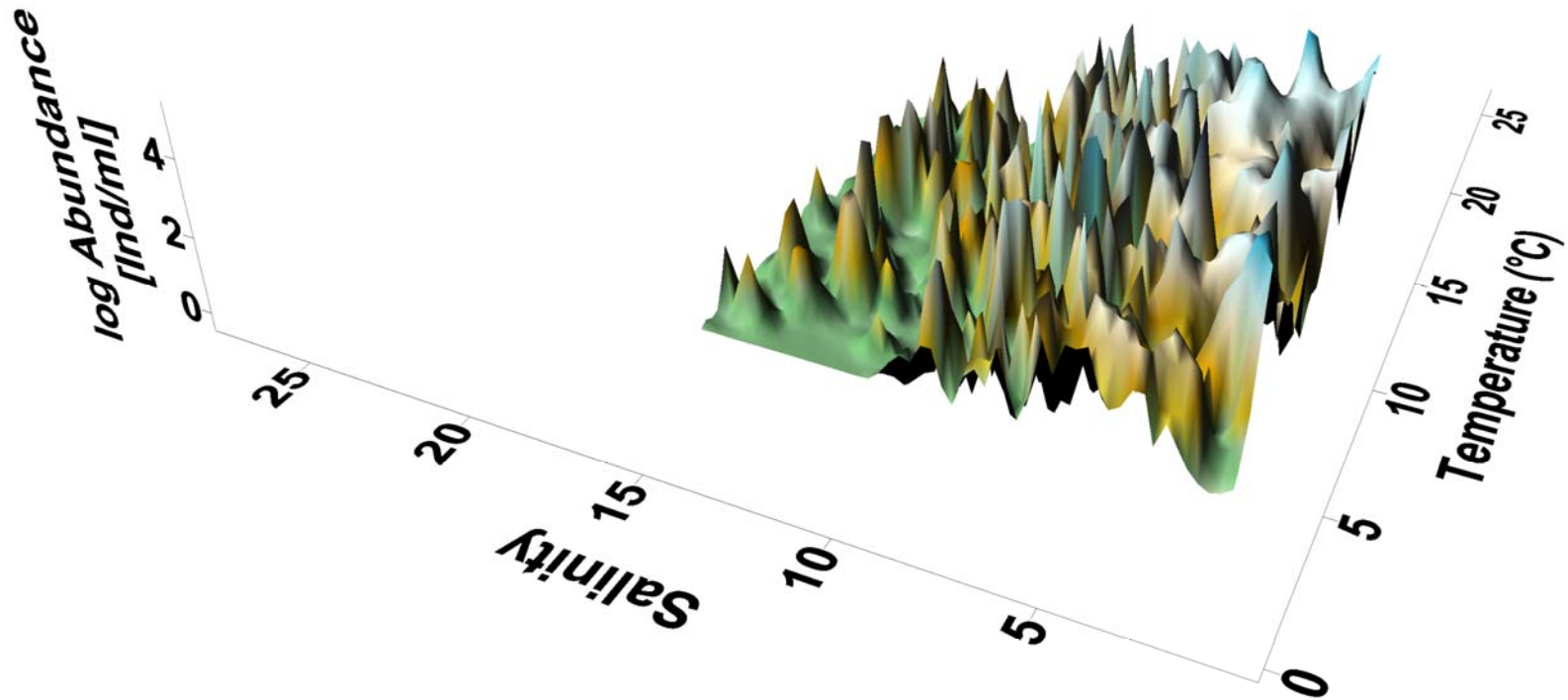
Cyanophyta





Cyanophyta

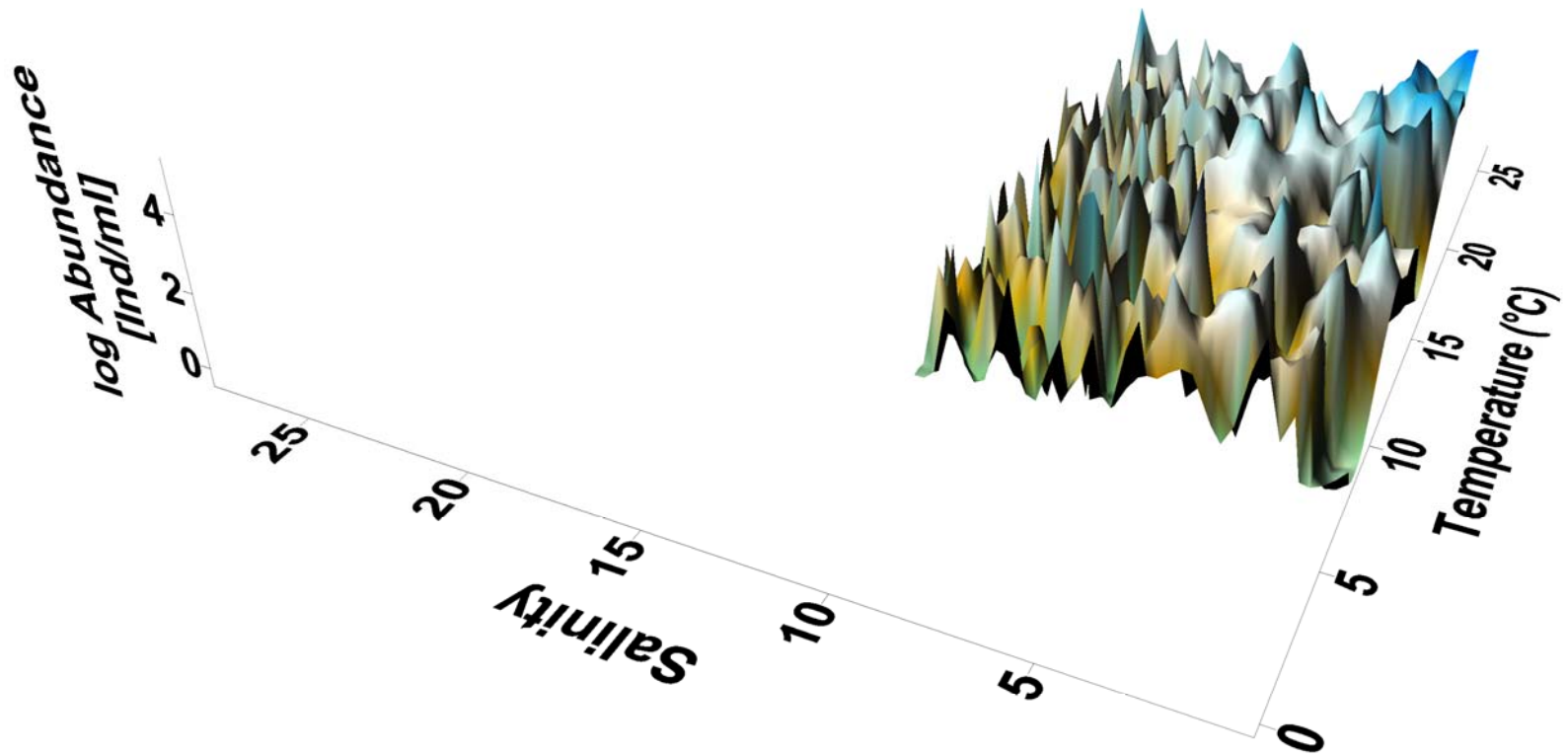
present climate



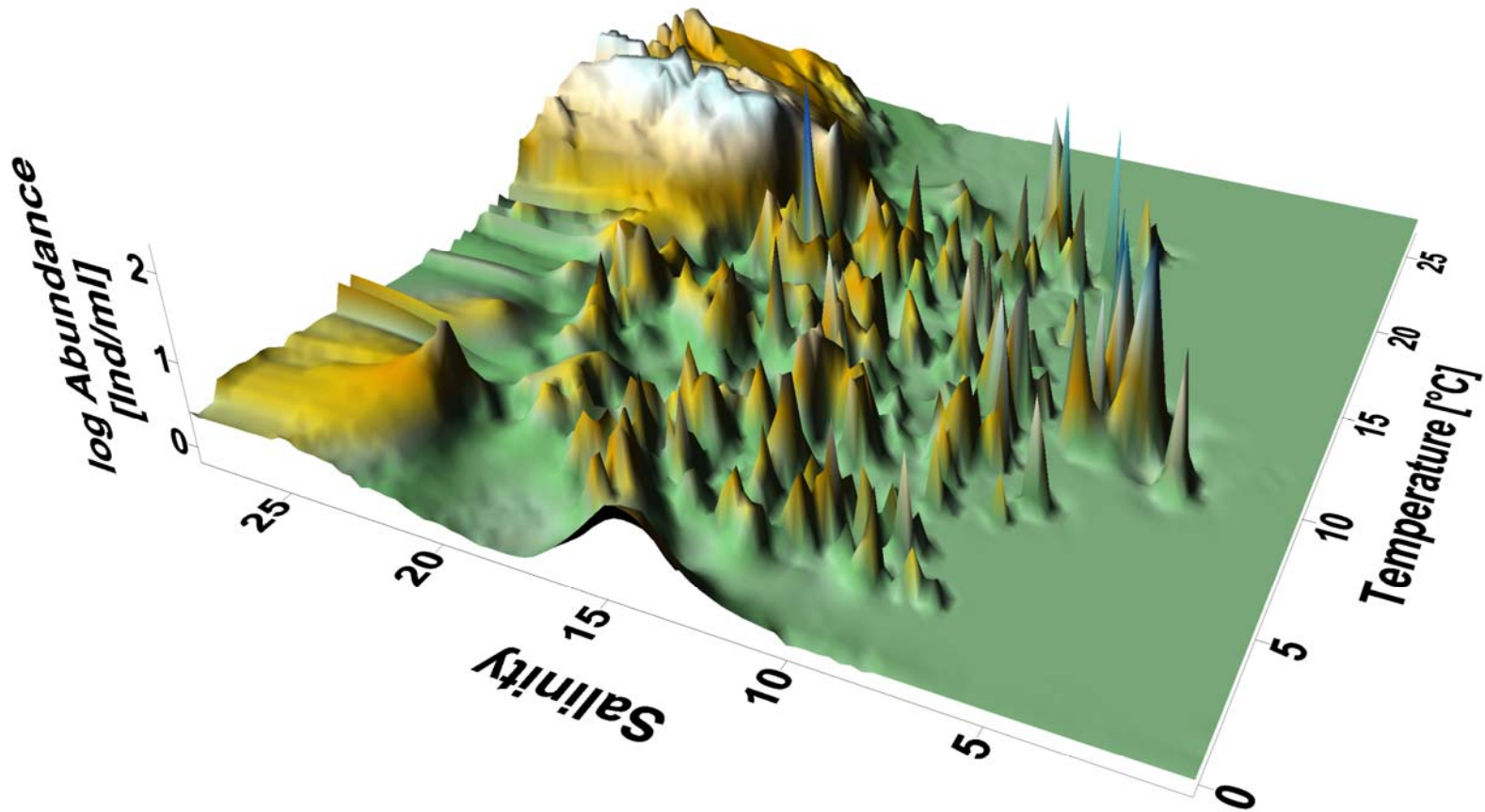


Cyanophyta

future climate



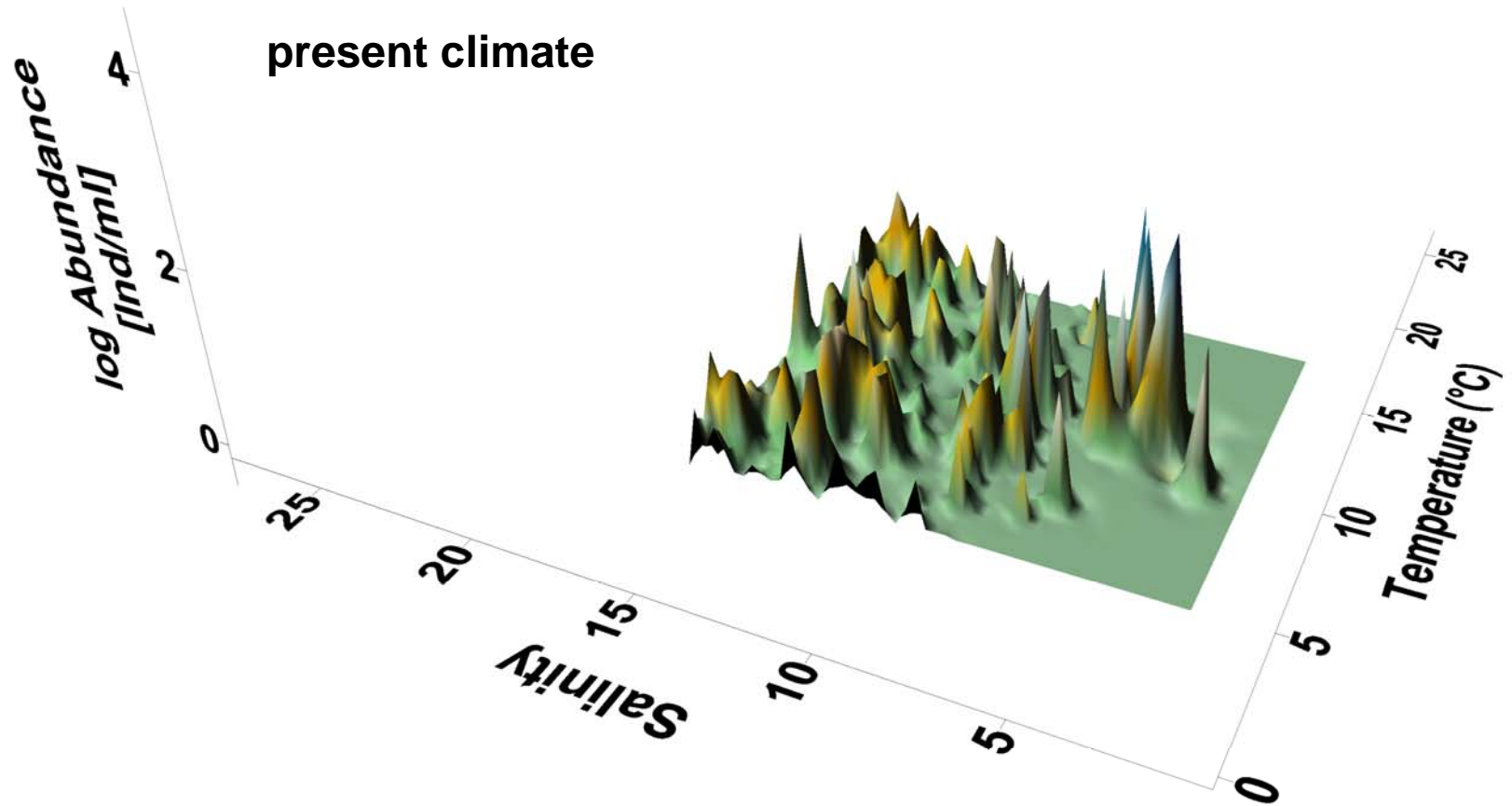
Ciliophora





Ciliophora

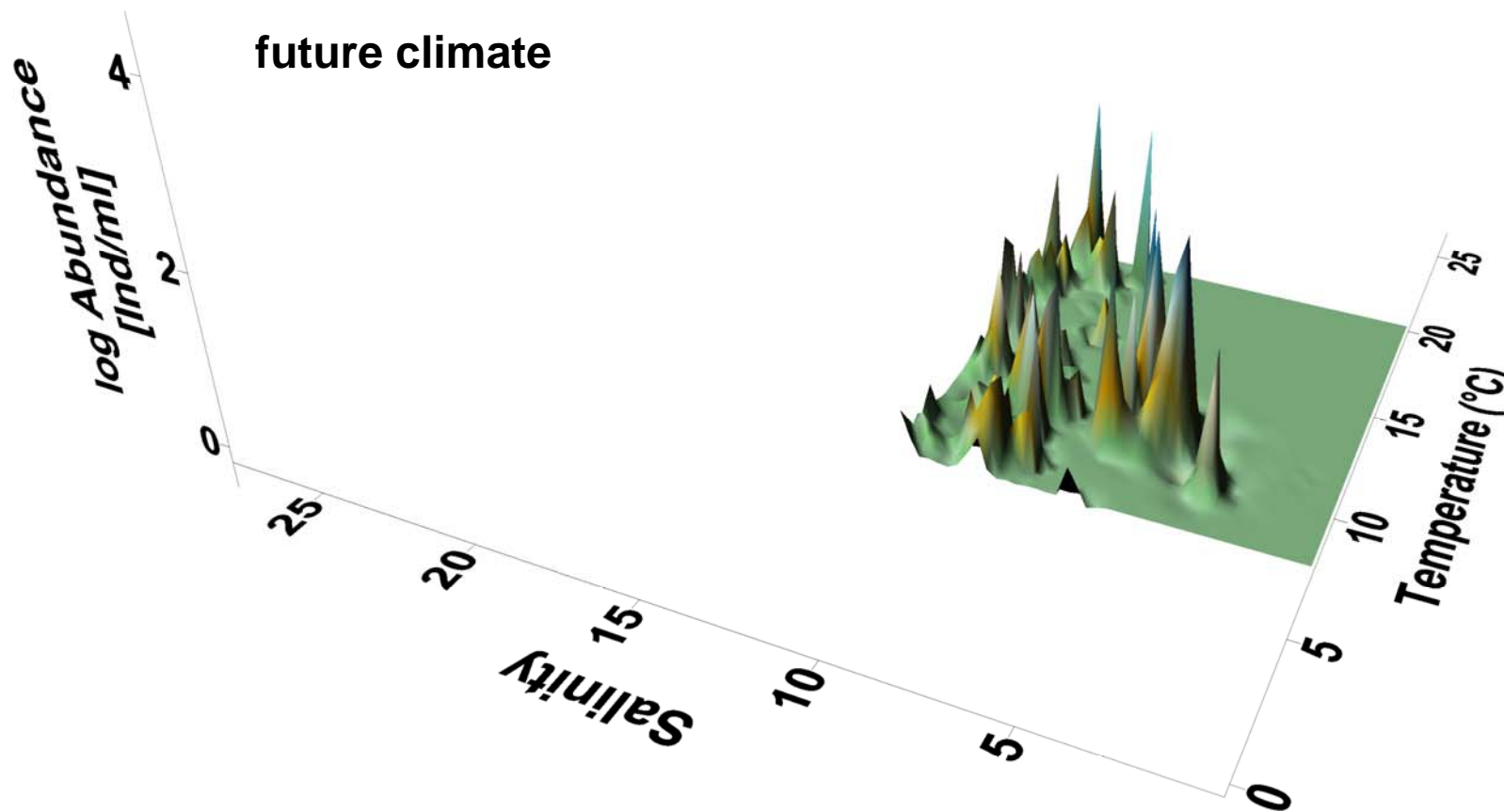
present climate



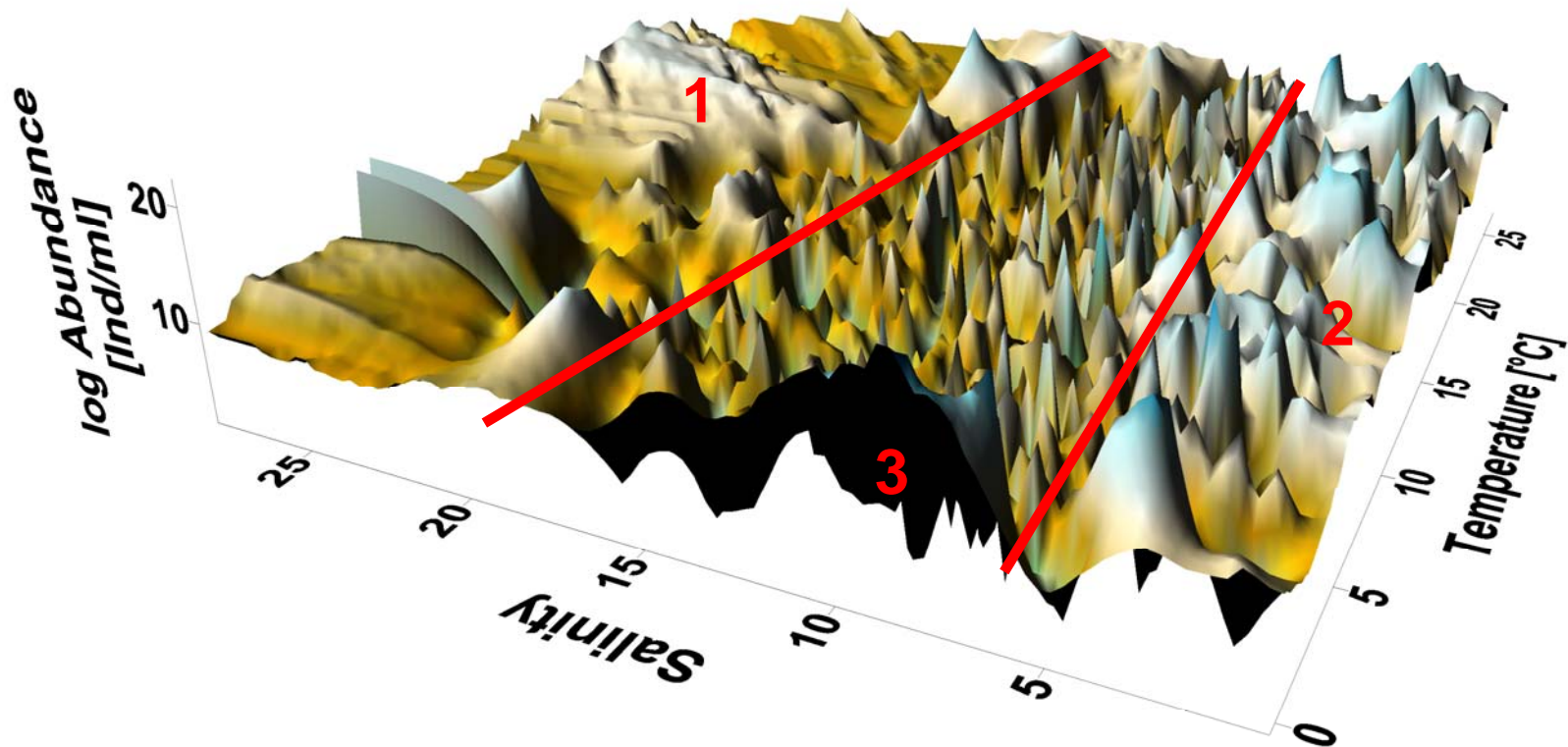
Ciliophora



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Total Phytoplankton



The lines mark changes in correlation length

The line between areas 2 and 3 represents the horohalinicum

Summary

- If we consider the projected climate change (BACC 2008) in the near coastal phytoplankton the taxonomic group of ciliophora, dinophyta, euglenophyta and haptophyta might decrease whereas cyanophyta might increase.



Acknowledgement

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References

- BACC (2008) Assessment of Climate Change for the Baltic Sea Basin, Springer Verlag Heidelberg, 473pp.
- Cury P. & Roy C. (1989) Optimal environmental window and pelagic recruitment fish success in upwelling areas. Can. J. Fish. Aquat. Sci., 42, 1640-1648.
- Eigen M. (1971) The selforganisation of matter and the evolution of biological macromolecules. Naturwissenschaften, 58, 465ff.
- Feistel R. & Ebeling W. (1989) Evolution of Complex Systems. Kluwer Academic Press, Dordrecht, 248pp.
- Fisher R.A. (1930) The genetical theory of natural selection. Oxford University Press

