

THE OPEN UNIVERSITY, MILTON KEYNES (UK)
STAZIONE ZOOLOGICA ANTON DOHRN, NAPLES (IT)



School of Life, Health and Chemical Sciences

Doctor of Philosophy (Ph.D.)

Phylogenetics and Phylogeography
in the Planktonic Diatom Genus *Chaetoceros*

Daniele De Luca (M.Sc.)

Personal ID: F3576948

Director of Studies

Dr. Wiebe H.C.F. Kooistra

Stazione Zoologica Anton Dohrn, IT

External Supervisor

Prof. Dr. Christine A. Maggs

Bournemouth University, UK

Internal Supervisor

Dr. Diana Sarno

Stazione Zoologica Anton Dohrn, IT

September 2019

Abstract

The initial aims of this thesis were to assess the systematics of the planktonic diatom genus *Chaetoceros* and the phylogeographic patterns of selected species in this genus across spatial and temporal scales. As expected in every experiment, some initial ideas have been pursued as they were; others have taken a different route and led to different questions. Consequently, the systematics of *Chaetoceros* has become a multigene phylogeny and a revision of the classical taxonomic scheme for the family Chaetocerotaceae (Chapter II). Then, the phylogeographic approach, initially meant as a Sanger sequencing of a few genes from specimens collected around the world, turned into the analysis of the *C. curvisetus* cryptic species complex by using an approach which combines haplotype networks and metabarcoding data (Chapter IV). The mapping of this complex against a temporal metabarcoding dataset (MareChiara, Gulf of Naples, IT) has become a story of concerted evolution and has been extended to different *Chaetoceros* species and supported by a single strain 18S-V4 high throughput sequencing (Chapter V). Amid these experiments, the potential of metabarcoding data for biological recording was explored and tested in the whole genus *Chaetoceros* to assess diversity and distribution (Chapter III). Such data were integrated with classical ones from public repositories and literature and used to produce, among the other results, distribution maps of *Chaetoceros* species.