A long-term (1986-2010) phytoplankton dataset from the LTER-Italy site Lake Candia

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ABSTRACT

In this paper we describe a 25-year (1986-2010) dataset of phytoplankton cell density abundance and biovolume in Lake Candia, a eutrophic, natural, small, and shallow lake located in north-western Italy, with data that are made available through the GBIF repository. The lake belongs to the national (LTER-Italy), European (LTER-Europe) and International (ILTER) long-term ecological research (LTER) networks. Phytoplankton samples were collected approximately monthly at the maximum depth station of the lake (7.7 m) and analysed with the inverted microscope, estimating both the cell density abundance and biovolume of each taxon. The dataset includes 10,120 georeferenced occurrences related to 545 taxa. During this 25-year period, the lake underwent profound modifications mainly related to the lake biomanipulation activities addressed to the management of aquatic macrophyte and to the evolution of the trophic condition. Making this dataset available represents a contribution to the current activities of the LTER networks for defining and reconstructing spatial and temporal dynamics and to identify and compare reliable trends.

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Key words: Darwin Core; GBIF; phytoplankton; LTER-Italy; Lake Candia.

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INTRODUCTION

Lake Candia is located near the city of Tourin in north-western Italy (Fig. 1). It is a natural, small, and shallow lake. Its main morphometric characteristics are reported in Tab. 1. The lake was subjected to biomanipulation experiments aiming to improve its water quality since 1986 to 2010, with positive results (Giussani *et al.*, 1990; Galanti *et al.*, 1990). During the same period, monthly sample and analysis of zooplankton, phytoplankton, and physical and chemical parameters were carried to evaluate the effects of biomanipulation experiments to the restauration of the lake in respect to eutrophication.

The purpose of this paper is to make the data of phytoplankton collected during the manipulation period (1986-2010) available through the GBIF repository, adopting its specifications about openness and interoperability. The data provided are the occurrences of the species or higher taxonomic ranks and the phytoplankton diversity (i.e., list of taxa with cell density abundance and biovolume).

As phytoplankton data from lakes are not yet common in GBIF, this dataset can be useful for further ecological and biodiversity studies on small and shallow lakes. The interest of the dataset is also remarkable because Lake Candia belongs to the national (LTER-Italy), European (LTER-Europe) and International (ILTER) long-term ecological research (LTER) networks, where the long-term site-based monitoring approach and the site comparison are important to determine spatial and temporal trends and changes.

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Summary statistics

During 266 sampling events, from March 1986 to December 2010, the 10,120 georeferenced occurrence records at the species level or higher taxonomic rank were collected. They are uploaded to the GBIF repository (https://doi.org/10.15468/8k32hw).

Tab. 1. Main morphometric characteristics of Lake Candia.

Surface area	km^2	1.5
Shoreline length	km	5.7
Maximum depth	m	7.7
Mean depth	m	4.7
Volume	10^6 m^3	7.1
Drainage surface area	km^2	9.9

Dataset description

The dataset was structured based on the Darwin Core standard (DwC, Wieczorek *et al.*, 2012), with each row containing a record of the occurrence of a taxon from a sample. The columns report taxonomical (e.g., scientificName, scientificNameID, taxonRank), geographic (e.g., decimalLatitude, decimalLongitude, geodeticDatum) information, along with cell density and biovolume for each taxon recognised in the sample (Tab. 2).
Object name: 2022_Lake_Candia_Phytoplankton
Data set citation: 2022_Lake_Candia_Phytoplankton
Character encoding: UTF-8
Format name: CSV
Format version: 1.0
Distribution (permanent link): GBIF (https://doi.org/10.15468/8k32hw)
Date of creation: 10 November 2022

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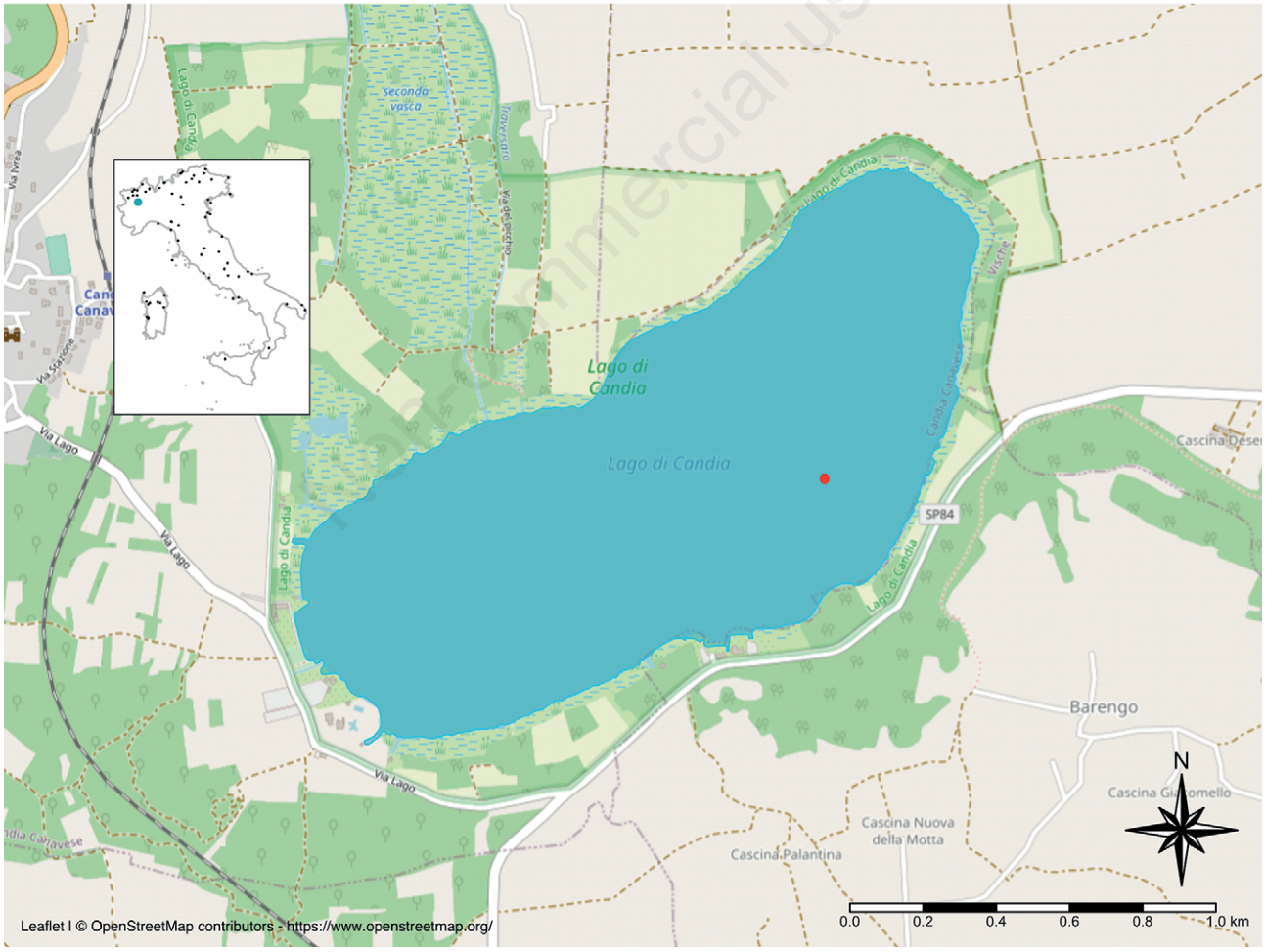

Fig. 1. Map of the LTER site Lake Candia (DEIMS.ID https://deims.org/c7fe4203-24b1-4d11-a573-99b99204fede). The red dot represents the maximum depth station, where phytoplankton samples were collected. The inset map represents all LTER-Italy sites (black dots) and the position of Lake Candia site respect the country (blue light dot; Oggioni, 2021).

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Language: English
Licence of use: both access and use are free to any user (CC-BY 4.0). The authors would appreciate users providing a link to the original dataset GBIF https://doi.org/10.15468/8k32hw) or citing the present paper when using the data in research projects. Stakeholders interested in additional information can contact authors via the contact information provided in the metadata.
Metadata language: English
Metadata managers: Martina Austoni (martina.austoni@cnr.it), Lyudmila Kamburska (lyudmila.kamburska@irsa.cnr.it)

Management details

Project title: A long-term (1986-2010) phytoplankton dataset from the LTER-Italy site Lake Candia
Database managers: Alessandro Oggioni and Martina Austoni
Temporal coverage: from 1986-03-06 to 2010-12-14
Record basis: historical database of Lake Candia data
IT specialists: Alessandro Oggioni and Martina Austoni
Funding grants: Convention between National Research Council – Institute of Ecosystem Study (CNR-ISE), currently CNR-IRSA, and Management Authority of the Natural Park of Provincial Interest of Lake Candia.

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Tab. 2. Columns label of dataset and URI to the Darwin Core terms.

	Occurrences file	Darwin Core terms
Column 1	occurrenceID	http://rs.tdwg.org/dwc/terms/occurrenceID
Column 2	basisOfRecord	http://rs.tdwg.org/dwc/terms/basisOfRecord
Column 3	eventDate	http://rs.tdwg.org/dwc/terms/eventDate
Column 4	originalNameUsage	http://rs.tdwg.org/dwc/terms/originalNameUsage
Column 5	scientificName	http://rs.tdwg.org/dwc/terms/scientificName
Column 6	scientificNameID	http://rs.tdwg.org/dwc/terms/scientificNameID
Column 7	kingdom	http://rs.tdwg.org/dwc/terms/kingdom
Column 8	phylum	http://rs.tdwg.org/dwc/terms/phylum
Column 9	class	http://rs.tdwg.org/dwc/terms/class
Column 10	order	http://rs.tdwg.org/dwc/terms/order
Column 11	family	http://rs.tdwg.org/dwc/terms/family
Column 12	genus	http://rs.tdwg.org/dwc/terms/genus
Column 13	taxonRank	http://rs.tdwg.org/dwc/terms/taxonRank
Column 14	identifiedBy	http://rs.tdwg.org/dwc/terms/identifiedBy
Column 15	decimalLatitude	http://rs.tdwg.org/dwc/terms/decimalLatitude
Column 16	decimalLongitude	http://rs.tdwg.org/dwc/terms/decimalLongitude
Column 17	geodeticDatum	http://rs.tdwg.org/dwc/terms/geodeticDatum
Column 18	coordinateUncertaintyInMeters	http://rs.tdwg.org/dwc/terms/coordinateUncertaintyInMeters
Column 19	verbatimCoordinateSystem	http://rs.tdwg.org/dwc/terms/verbatimCoordinateSystem
Column 20	countryCode	http://rs.tdwg.org/dwc/terms/countryCode
Column 21	country	http://rs.tdwg.org/dwc/terms/county
Column 22	waterBody	http://rs.tdwg.org/dwc/terms/waterBody
Column 23	locality	http://rs.tdwg.org/dwc/terms/locality
Column 24	verbatimLocality	http://rs.tdwg.org/dwc/terms/verbatimLocality
Column 25	locationAccordingTo	http://rs.tdwg.org/dwc/terms/locationAccordingTo
Column 26	organismQuantity	http://rs.tdwg.org/dwc/terms/organismQuantity
Column 27	organismQuantityType	http://rs.tdwg.org/dwc/terms/organismQuantityType
Column 28	measurementValue	http://rs.tdwg.org/dwc/terms/measurementValue
Column 29	measurementUnit	http://rs.tdwg.org/dwc/terms/measurementUnit
Column 30	occurrenceStatus	http://rs.tdwg.org/dwc/terms/occurrenceStatus
Column 31	taxonomicStatus	http://rs.tdwg.org/dwc/terms/taxonomicStatus

Geographic coverage

Study area: Lake Candia belongs to the Italian, European and International Long-Term Ecological Research (LTER) Networks: Candia (https://deims.org/c7fe4203-24b1-4d11-a573-99b99204fede). Data are georeferenced according to WGS 84 datum (EPSG:4326, https://epsg.io/4326.wkt).
Bounding box: min Longitude: 7.898237 – min Latitude 45.318548 – max Longitude: 7.922160 – max Latitude: 45.332683.
Sampling design: Phytoplankton integrated samples in the whole euphotic zone were gathered approximately monthly, at the station of lake maximum depth (7.7 m). They were then analysed in the lab through the inverted microscope, estimating cell density abundance and biovolume of each taxon from March 1986 to December 2010.
Habitat type: Pelagic of lake, water column.
Biogeographic region: Within the Palearctic realm, according to the definitions of the European Environmental Agency (2017), the dataset covers the Alpine European biogeographical regions.
Country: Italy.
Quality control for geographic data: Reliability of coordinates was checked with open-source Geographic Information System (Quantum GIS – http://www.qgis.org/) to identify the correctness of sampling station position. Geographic coordinate format and the absence of anomalous ASCII characters in the dataset were also double checked.

Sampling protocols

Phytoplankton data were collected monthly from 1986 to 2010, at the point of lake maximum depth (7.7 m) as integrated samples of the euphotic water column (Fig. 1).

Phytoplankton determinations were carried out on subsamples of the integrated sample preserved in acetic Lugol's solution. Phytoplankton organisms were counted using the Utermöhl technique (Utermöhl, 1958), classifying the taxa to the species level, whenever possible, using a Zeiss Axiovert 10 inverted microscope at 200x and 400x until 400 cells for the most important taxa were counted. Biovolume of each taxon in the sample was estimated from cell density abundance data and original measurements of cell volume (Smayda, 1978; Hillebrand *et al.*, 1999; Sun and Liu, 2003). Finally, total biovolume was calculated from the sum of the biovolumes of each taxon in the sample (cell number x specific cell volume).

Taxonomic coverage

General description: The dataset covers Cyanobacteria with 1663 occurrences (100% of this phylum); total occurrences of Plantae are 4626, with 1302 occurrences (28.1%) of Charophyta and 3324 occurrences (71.8%) of Chlorophyta; Protozoa occurrences are 426 (100% of this group); total occurrences of Chromista are 3403, with Ochrophyta (1737 occurrences, 51.0%), Cryptophyta (1213 occurrences, 35.6%), Myzozoa (345 occurrences, 10.1%), and Haptophyta (108 occurrences, 3.2%) (Fig. 2).

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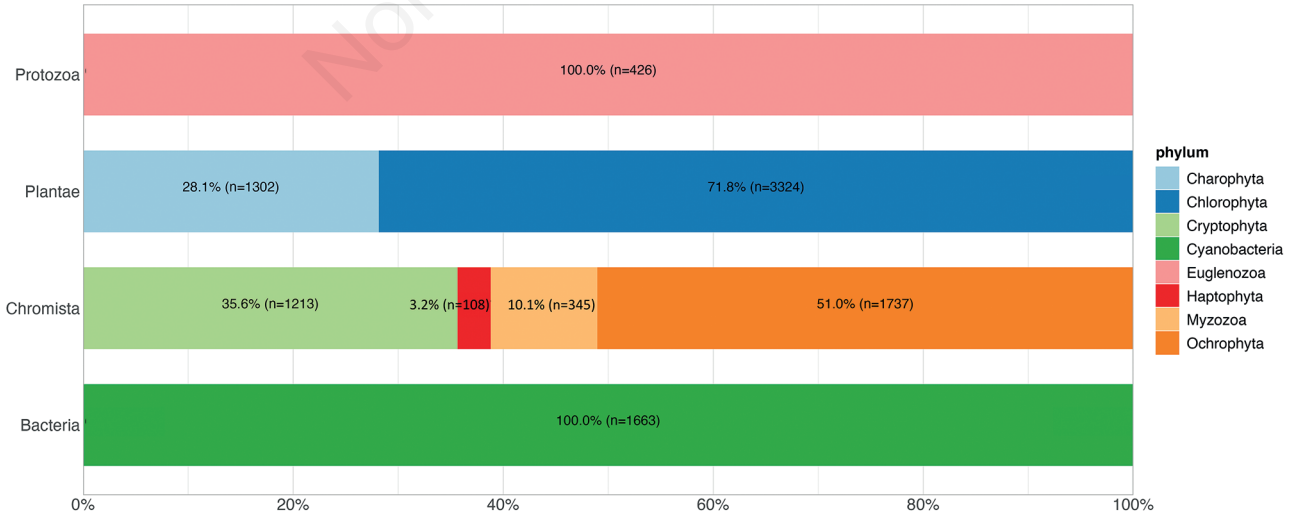

Fig. 2. Distribution of occurrences among kingdoms. The different colours correspond to the different phyla occurring in the kingdoms and the superimposed labels show the percentage of occurrences out for total in the kingdom and number the amount of the occurrences for different phyla.

Taxonomic ranks: Data are generally reported as species, but occurrences reported at genus and higher taxonomic rank level are also included in the dataset.
Taxonomic methods: All records are validated to the currently accepted nomenclature using the taxonomic backbone of GBIF, Algaebase: Listing of World's Algae (Guiry and Guiry, 2022), and World Register of Marine Species WoRMS (Ahyong *et al.*, 2022). Life Science Identifiers (LSIDs) are used to identify univocally the taxon and to facilitate data integration and interoperability.
Taxon specialists: Martina Austoni, Radiana Cozza, Giuseppe Morabito, Alessandro Oggioni, Pierisa Panzani, Alessandra Pugnetti, Teresa Ruffoni, Delio Ruggiu, Karin Sparber.
Quality control for taxonomic data: Nomenclature validation and cleaning were based on the global algal database AlgaeBase (Guiry and Guiry, 2022), World Register of Marine Species WoRMS (Ahyong *et al.*, 2022) and on the taxonomic backbone of GBIF. To check the taxonomic classification and to fill the information about taxa, taxon rank, occurrences status, and taxonomic status we used ReLTER R package (Oggioni *et al.*, 2022).

Data availability

All georeferenced occurrence data are available at GBIF: DOI 10.15468/8k32hw.

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