Special database management system for storing, processing, and analyzing of marine biological data at the species level

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Studies of interaction between biological and physical processes in the ocean are based on a collection and comprehensive analysis of large multivariable oceanographic data sets. The Database Management System OceanBase was developed for this purpose and successfully applied in several international and national projects in the Black Sea region (NATO TU Black Sea Project, NATO SfP ODBMS project), the Caspian Sea (Caspian Environment Programme), the Mediterranean Sea (IMS METU, Turkey), the Atlantic Ocean (NatMIRC, Namibia), and the World Ocean overall (Darwin Initiative Project).

The possibilities of the OceanBase were gradually upgraded recently. One of the modifications of the OceanBase (version 2.02.PLANKTON) allows to manage marine biological data at the species level. Individual plankton data loaded into the database consists of: species name, stage, size (min and max length), abundance, average species weight, biomass, sample volume, and sample depth range. Zooplankton and phytoplankton taxonomic classifications are stored in the database and used for selection of biological characteristics. Taxonomic classification is based on the Integrated Taxonomic Information System (ITIS Project, US). Limitations of the system on plankton data are as follows: up to 7 levels of taxonomic classification, up to 1000 species names in standard version (can be adjusted according to individual database needs).

The OceanBase system provides possibilities to make the complicated search in the database using multi-parameter criteria, prepare selected data for producing maps, sections and other standard types of oceanographic data presentation, moreover, it possesses a set of embedded graphical tools such as mapping, plotting, histogram calculation, etc. OceanBase allows one to select not only the biomass and abundance of individual plankton species but also to calculate summaries for taxonomic groups: from Genus and Family to total Plankton as the whole. To simplify this task, the special Plankton Query interface was designed, which represents taxonomic classification in the form of a hierarchical taxonomic tree. Each node of the taxonomic tree contains a check box, which, when checked, results to calculation of summaries on the sub-tree. After selection, plankton data can be processed jointly with other parameters using the full set of possibilities of OceanBase tools.

Several specialized databases, containing marine biological data at the species level, were created with the help of OceanBase version 2.02.PLANKTON. Among these, databases are created in the Marine Hydrophysical Institute and in the Institute of Biology of the Southern Seas of the National Academy of Science of Ukraine in the framework of the Darwin Initiative Project, and two databases are created in the Institute of Marine Sciences, Turkey, which contain time series marine ecological data collected in the Black Sea (Sinop) and Mediterranean Sea (Erdemli), including zooplankton and phytoplankton data.