

BENEFIT-BCLME Project Ref. No. EV/PROVARE/02/05

Retrospective Analysis of Plankton Community Structure in the Benguela Current Large Marine Ecosystem (BCLME), to provide an Index of Long-term Changes in the Ecosystem

**Progress report of the Data Manager on development of the inventory and database for plankton data in the Benguela Current
Submitted by the International Ocean Institute, Southern Africa**

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This report details progress made by the Data Manager on the development of the inventory for plankton data in the Benguela Current Large Marine Ecosystem between February 2006 and July 2006.

The Benguela Plankton Portal

In April 2006 approval was given by Dr Hans Verheye, Dr Neville Sweijd and Ms Lesley Staegeman to use the Metadata Authoring Tool (MATT) for authoring the inventory of metadata, and the SADC Marine Fisheries/ Environmental Metadata Directory as a storage facility for the metadata. MATT was developed by the SADC Regional Fisheries Information Systems Project through support from BENEFIT, and is operational via the SADC Marine Fisheries/ Environmental Metadata Directory at <http://196.21.45.131:8080/metadata/index.html>. The MATT tool allows simple online authoring of the metadata via the internet, and does not require either input or output users to have specialized or advanced computing skills. Metadata descriptions submitted via MATT can be searched and viewed as web pages over the internet, and are thus very accessible to users.

There is, however, more to the plankton inventory than simply the metadata directory, and it was decided that a Benguela Plankton Portal be developed so as not to fragment the different aspects of the plankton inventory. This Benguela Plankton Portal consists of three main elements: 1) the metadata and metadata directory, 2) the database, and 3) the bibliography.

A very simple architecture has been designed for the Plankton Portal (Figure 1). This will be accessed directly from the BENEFIT home page (with permission for this having been granted by Dr Neville Sweijd). The link on the BENEFIT home page will open a new window for the Benguela Plankton Portal, which will contain the metadata directory table and a link to the bibliography (see below). The metadata directory table follows the same format as the SADC Marine Fisheries/ Environmental Metadata Directory. Clicking on the metadata title will provide access to the full metadata record. An additional column headed "Data availability" will be added. Although this information is already embedded in the metadata, adding this column to the table allows one to see immediately whether the data are available through the portal or not. For those metadata records where the data are available on the portal, clicking on this column will provide direct access to the data in Excel spreadsheets.

The link to the bibliography will open a new page for the Benguela Plankton Bibliography. This page will include a link to the list of keywords used (in the form of a subject index), a search facility, and a 'Display all' facility. Using the search facility users will be able to search for publications in the bibliography using the following fields, all linked with an "and/or" operator: Author, Date, and Keywords (up to three Keywords may be selected). The search facility will pick

up keywords from both the keywords associated with each publication, and from words which appear in the title of the publication.

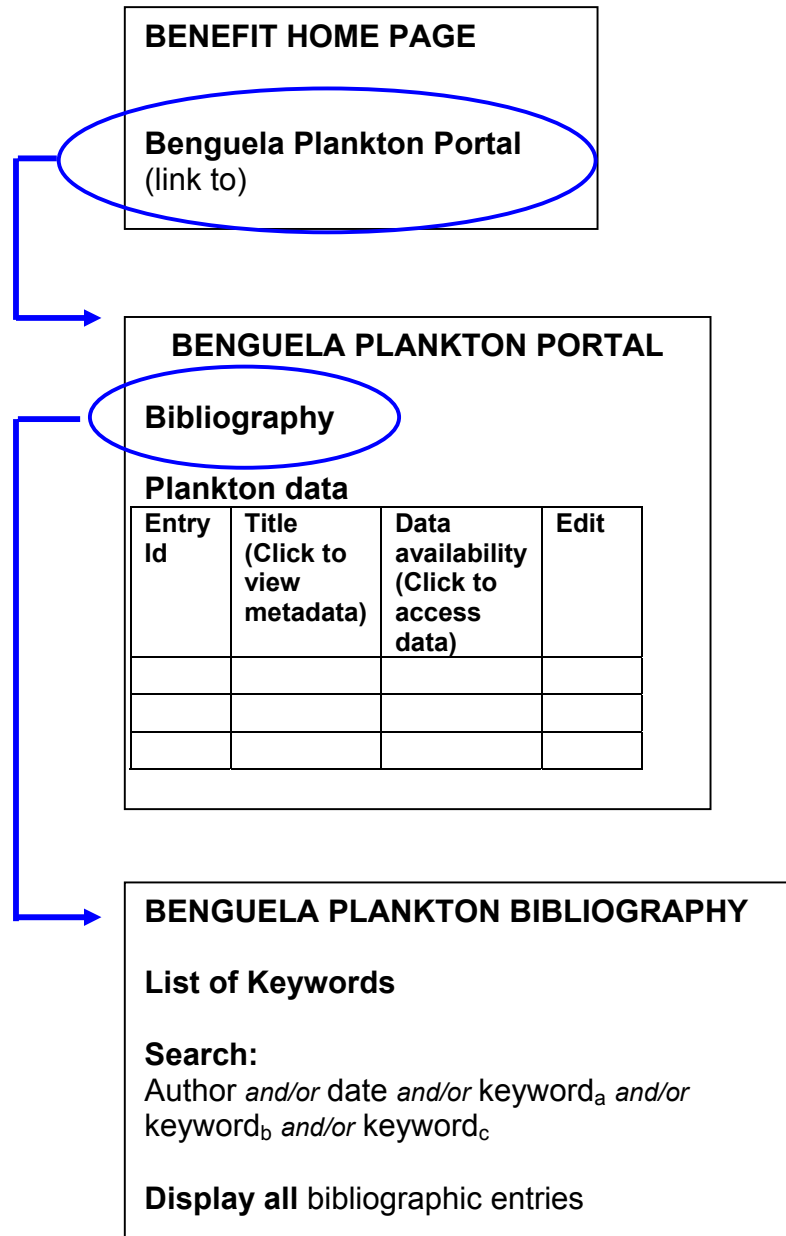


Figure 1. Architecture of the Benguela Plankton Portal on the BENEFIT website at www.benefit.org.na

Metadata

Entry of the metadata into the metadata inventory is currently on hold until the portal structure is completed. Additional visits to Angola and Namibia may be necessary to assist our colleagues there to enter the metadata using the Metadata Authoring Tool (MATT).

Database

A number of data sets have been acquired for the plankton inventory, and since they do not necessarily have an 'institutional home', will be housed along within the Benguela Plankton Portal. These data sets will be accessible as Excel files through the main portal web-page. Details of these data sets are provided below. Other data sets are also currently being sourced, and will be added to the database and the metadata inventory.

Russian data

As reported on previously (progress report dated February 2006) the data set belonging to the Institute of the Southern Seas in the Ukraine, is freely available via the internet on the COPEPOD database (Coastal and Oceanic Plankton Ecology, Production and Observation Database) hosted by NOAA. These data can be downloaded from <http://www.st.nmfs.gov/plankton/intro/index.html>. The full data set consists of 23 Excel files spanning the central and southern Atlantic between 1963 and 1989. However, not all of the files in this data set fall within the BCLME region as defined in this project. For this reason, those data pertinent to the BCLME region were extracted to a new set of files. A total of 13 of the original 23 files contained data pertinent to the BCLME region, and these files have been 'cleaned' to include only data within the region, i.e. all data falling outside of the pre-defined BCLME region were deleted from the files. These files contain a total of 85 444 records spanning 324 samples at 259 stations between 1963 and 1989.

Lazarus thesis

Data contained in the unpublished thesis of Lazarus (Lazarus, B. I. 1974. The inshore zooplankton of the Western Cape, Unpublished PhD thesis, University of Stellenbosch) were captured from hard-copy into electronic form in an Excel file. The file consists of a number of worksheets, the first containing the pertinent metadata. The second worksheet contains the full taxonomic record, together with the station, year and number of individuals captured. This sheet contains a total of 2 325 entries. Subsequent sheets (14 in total) provide details of the size, sex and/or stage of the different taxonomic groups, including the Polycheta, Chaetognatha, Brachiopoda, Ostracoda, Copepoda, Cirripedia, Mysidacea, Cumacea, Isopoda, Amphipoda, Euphausiacea, Decapoda, Hoplocarida, and Echinodermata.

Globallast data

The plankton data from the Globallast port survey at Saldanha Bay have been requested, and these will be made available through the Benguela Plankton Portal.

UCT Oceanography Department data

Earlier in 2006, IOI-SA was made aware of data contained in the publication “Trotti, L. & Welsh, J.G. 1961. Hydrographic and plankton observations made during cruises on board the “John D. Gilchrist” 1959-1960. Publication No. 2. Oceanography Department, University of Cape Town” by Dr Hans Verheye. This publication is currently under request through inter-library loans, and will be assessed for its potential for inclusion in the database once it arrives.

Bibliography

The Plankton Bibliography is being developed as an additional product during the development of the Benguela Plankton Portal. A total of 305 publications dealing with plankton in the Benguela region (as delimited in this project) have been compiled into a bibliographic database and key-worded to date. The bibliography will be accessible via the internet through the Benguela Plankton Portal on the BENEFIT website, and will be searchable by Author and/or Date and/or Keywords, making it simple for researchers and managers to identify the appropriate literature for their purposes. To aid the Keyword search, a list of all Keywords used, grouped within larger categories in the form of a subject index, is also provided. The bibliography can be updated and added to by updating the bibliographic database. The bibliography is still under construction, but the preliminary list of keywords is provided as an example in Table 1.

Table 1. Preliminary list of keywords used the Benguela Plankton Bibliography.

Category	Keywords
Abundance & diversity	Abundance, biomass, bloom, production/productivity, red tide, size composition, species composition, standing stock
Biochemistry & physiology	Absorption, biochemistry, bioluminescence, carbon, food, isotope ratios, nitrogen, nutrient uptake, nutrients, photosynthesis, pigment
Biology	Biometry, diet, egg development, egg production, encystment, growth, gut pigment, larvae, life history, malformation, photosynthesis, recruitment, reproduction, respiration, resting spores, starvation, survival, temperature
Comparative	Atlantic, global, Humboldt, within-Benguela
Distribution	Biogeography, horizontal, loss (eggs & larvae), transport, vertical

Ecology	Ecology, ecosystem effects, environmental correlates, faunistic mixing, food webs, particle flux
Geographical	Agulhas Bank, Cape Columbine, Cape Peninsula, Coastal/inshore, Hondeklip Bay, Namibia, Northern Benguela, Olifants River, Orange River, Saldanha Bay, Southern Benguela, St Helena Bay, Walvis Bay
Historical	History of data collection
Impacts	Aquaculture
Methodology	Acoustic observations, Coulter counter, ecosystem models, long-term, modeling, remote sensing
Oceanographic feature or process	Advection, Angola-Benguela Front, Hydrography, Loss (eggs & larvae), Subtropical front, transport, upwelling cycle, upwelling front
Palaeoceanography	Nannofossils, Palaeoceanography, Pleistocene
Physico-chemical environment	Biogeochemistry, Diatomaceous mud, organic-rich, sediment, sulphur, trace elements
Taxonomic	Aequorea aequorea, anchovy, bacterioplankton, Calanoides carinatus, Calanus agulhensis, Chaetoceros, Chaetognatha, checklist, Chrysaora hysoscella, clupeoid, Cnidaria, coccolithophores, Copepoda, Ctenophora, diatoms, dinoflagellates, eggs & larvae, Engraulis capensis, Engraulis encrasicolus, Euphausia lucens, Euphausiacea, Foraminifera, Gastropoda, HABs, Hudromedusae, Hydrozoa, Hyperia medusarum, ichthyoplankton, Jasus lalandii, lanternfish, macroplankton, Merluccius capensis, mesoplankton, Noctiluca scintillans, palynomorph, parasites, phyllosoma, phytoplankton, Pleurobranchia pileus, Radiolaria, Sagitta friderici, Sagitta tasmanica, sardine, Sardinops sagax, Scyphozoa, silicoflagellates, Siphonophora, taxonomy, Trichodesmium, West Coast Rock Lobster, zooplankton, Zygabikodinium lenticulatum
Trophic interactions	Consumption, predation by, predation on, trophic interactions
Variability	Decadal, diel rhythms, inter-annual, latitude, long-term, seasonality, spring, summer, variability, winter

Completion & Continuation

It is envisaged that the Benguela Plankton Portal will be completed and available on the BENEFIT website by the end of September 2006, including the metadata inventory, the database, and the bibliography. Such a project is, however, never truly completed as information is added over time, either in the form of newly-generated information, or information which has remained 'hidden' and later comes to light.

The current primary concern regarding 'completion' is the inclusion of metadata from Angola into the metadata inventory, as communications with this country are exceptionally difficult. IOI-SA will, however continue its commitment to the Benguela Plankton Portal until the end of the 2006, striving to include the Angolan metadata, capturing hard-copy data into electronic form, and adding data sets to the database.

Once the Benguela Plankton Portal is in place, new metadata will be able to be authored and added to the metadata inventory at any time by users using the MATT tool. Adding new datasets to the database will, however, require some input from the website administrator, and arrangements will need to be made for the hosting of the database and bibliography. Since the Benguela Plankton Portal will be an integral part of the BENEFIT website, these tasks will be covered by BENEFIT's existing hosting and web administration agreement (which is currently with IOI-SA), and additional resources will thus not be required to ensure the maintenance and updating of these online resources.

Updating of the content of the bibliography does, however, require some consideration. It is envisaged, however, that it will be sufficient to do this only once every year or two in order to capture new publications since the inception of the bibliography. This is likely to be a fairly small task as the number of relevant publications per year is fairly low, and will be able to be done by a competent student. It is suggested that BENEFIT, as a regional organisation, take responsibility for this small task.