

# The national research infrastructure NMDC (Norwegian Marine Data Centre) is providing seamless access to marine data

Helge Sagen, Institute of Marine Research (Norway), [Helge.Sagen@hi.no](mailto:Helge.Sagen@hi.no)

## Marine data

Marine research is by nature multi-disciplinary, combining physical, geological, chemical, and biological knowledge and data. High quality and efficient marine research require easy and rapid access to marine data across institutions and disciplines. Gathering information about the marine environment is very expensive due to the dependence on vessels with high investment and operating costs. New technological developments allow a broader approach to sampling of the ocean using buoys, drifters, and various bottom mounted equipment, but these are also generally expensive to develop and operate. Partly due to cost, information about the sea is extremely limited compared to our knowledge about ecosystems on land. The relative scarcity of marine data makes it vitally important to make the data that does exist easily accessible for efficient usage in science.

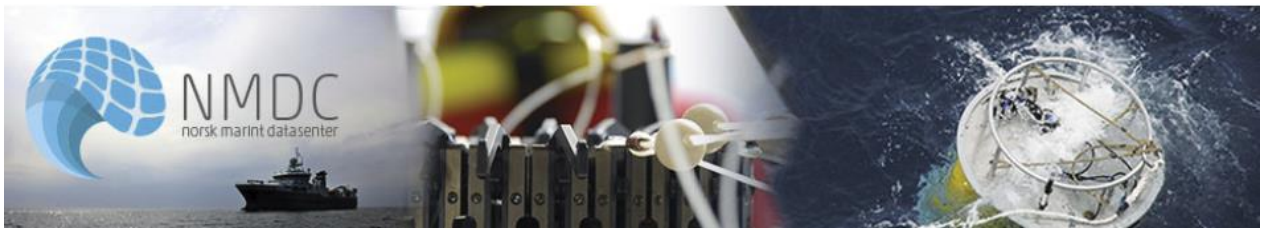


Figure 1: NMDC portal at [www.nmdc.no](http://www.nmdc.no)

## Integrated infrastructure

An integrated infrastructure NMDC addressing interoperability, data documentation, archiving, providing data access has been established. The infrastructure simplifies the technical obstacles scientists encounter when finding and using data from various sources. In addition, the infrastructure provides a cost-effective interface for data providers. NMDC is ensuring proper stewardship for data, both in the short and long term, uncovering the potential hidden in historical data sets by documenting and storing them in a long-term archive. The project has undertaken efforts in data archaeology to mobilize data that was previously unavailable before the establishment of the research infrastructure. An upgrade and further development of the infrastructure is needed to be in the forefront of the technical developments and advancements.

Establishing NMDC has shown the importance of standardization of data collection processes, data storage/exchange formats e.g. The marine data at each partner institution is managed differently. The NMDC infrastructure helps making data available and ensures that data undergo a standardization process including a metadata enriching process. The 16 partners have successfully worked together in making this possible and all partners have made their data go through a standardization process before being released in the infrastructure. The work has identified a long list of possible data that could be made available using the infrastructure.

## NMDC services

NMDC offers a search facility on the webpage [www.nmdc.no](http://www.nmdc.no) being able to filter on geographical area, time, science keywords, data providers or free text. The result list is presented with the title and access to detailed information about each dataset. Requesting details about one specific dataset will activate the landing page of the dataset. The landing page is a formatted web page with the metadata of the dataset and necessary download information to get the data itself.

NMDC is a joint effort of Norwegian institutions and universities, coordinated by the Institute of Marine Research IMR, to build a national research infrastructure for seamless access to documented research data. The data centre at IMR holds the certificate Core Trust Seal to ensure good data management practices. The establishing of NMDC is funded by the Norwegian Research Council. The infrastructure consists of distributed data nodes that provide a local node with metadata, which is used for discovery of relevant data sets. The information about all the data sets available within NMDC is accessible through a web portal, where researchers or other end users can search for relevant data. The NMDC data portal supports the usage of Digital Object Identifiers, DOI.

The NMDC portal search interface at [www.nmdc.no](http://www.nmdc.no)

The screenshot displays the NMDC search interface with the following components:

- Search Bar:** A search bar containing the text "Scientific\_Keyword (133)".
- Facets:**
  - Geographical coverage:** Filter by map bounding box. Operation: "Is within".
  - Temporal coverage:** Filter by temporal coverage. Operation: "Is within". From: "1980-01-01", To: "2020-04-07".
- Results:** A list of 364 data sets found, with the selected facet "Institute of Marine Research". The first few results are:
  - Barents Sea Northeast Arctic haddock bottom trawl index in winter 1994
  - Thermograph data from Hurtigruten - MS Vesterålen 2004
  - Thermograph data from Hurtigruten - MS Vesterålen 1999
  - MAREANO - Base-line mapping of fauna obtained with grab
  - Deep-water in the Skagerrak - Torungen-Hirtshals Section - Atlantic Water
  - IMR bottom trawl data 1980-2017
  - Hurtigruten Bergen-Kirkenes, 10-day mean temperatures
  - CTD data collected with R/V Håkon Mosby 2008
  - Evaluation of a national operational salmon lice monitoring system—From physics to fish
  - Institute of Marine Research Argo float 6903547
- Map:** A map of the North Atlantic region showing the search area.
- Footer:** Logos of partner institutions including HAVFORSKNINGSINSTITUTTET, Akvaplan niva, CMM, FFI, Forsvarets forskningsinstitutt, NINA, Meteorologisk institutt, NERSC, GEOLOGICAL SURVEY OF NORWAY, NIVA, UNIVERSITETET I BERGEN, UiO, Universitetet i Oslo, uniResearch, ARTSDATABANKEN, and UNIVERSITETET I BERGEN.

Figure 2: NMDC search interface

The search interface queries several parts of the metadata, free text, scientific keywords, data provider, geographical polygon and time interval. The geographical polygon search supports two cases, either all data set within the polygon or parts of the data set intersects with the polygon. The same functionality is implemented for the temporal coverage also.