Integrated Marine Biogeochemistry and Ecosystem Research

The IMBER Programme - High Latitude Science

E. Hofmann[1], S. Beauvais[2] & L. Maddison[2]

The goal of IMBER is "**to investigate the sensitivity of marine biogeochemical cycles and ecosystems to global change, on time scales ranging from years to decades**".

Theme 1– Identify and understand the **interactions between biogeochemical cycles and marine food webs** impacted by global change

Theme 3 – Understand **feedbacks to the Earth System -** Capacity of the ocean to control the climate system

Theme 2 – Understand the **sensitivity of marine biogeochemical cycles and ecosystems** and their interactions to global change

Theme 4 – **Responses of Society** Understand feedbacks between human and ocean systems including adaptation and mitigation

IMBER ANTARCTIC AND SUB-ARCTIC REGIONAL PROGRAMMES ECOSYSTEM-CLIMATE RESPONSES AT HIGH LATITUDES

ICED

Goal: to determine the major controls on Southern Ocean ecosystem dynamics and the potential for feedbacks as part of the Earth System.

Question: What are the major drivers of Southern Ocean ecosystem variability and change?

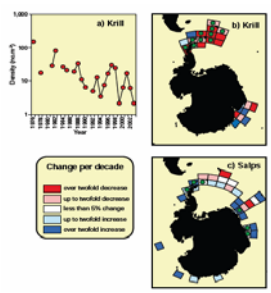
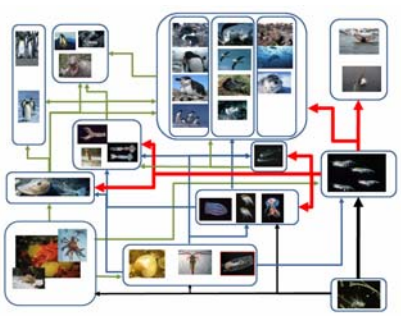


Fig.1: Spatial and temporal changes of Antarctic krill and salps. a) Krill density in the southwest Atlantic sector of the Southern Ocean (4,948 stations in years with >50 stations).
Temporal trends include:
b) post - 1976 krill data from scientific trawls;
c) 1926 - 2003 circumpolar salp data south of the Southern Boundary (SB) of the Antarctic Circumpolar Current. (*Atkinson et al. 2004 Nature 432*).

These changes have profound implications for the Southern Ocean food web.



Development of new integrated ecosystem models

ESSAS

Goal: to compare, quantify and predict the impact of climate variability and global change on the productivity and sustainability of sub-Arctic marine ecosystems.

Question: How will climate change affect the marine ecosystems of the sub-Arctic seas and their sustainability?

1960's 1970's 1980's

Fig.2: Changed composition of trawls catches, from shrimp- (left) to fish- (right) dominated in Alaska (*Botsford et al. 1997 Nature 277*).

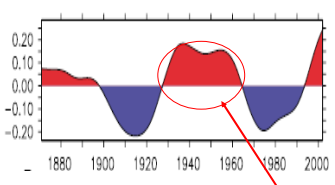


Fig.3: The AMO index, 1871 to 2003 (*Rowan & Hodson 2005 Science 309*).

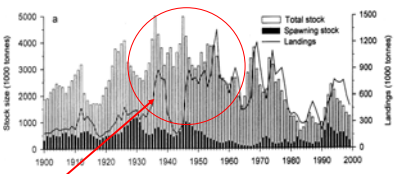


Fig.4: Total and spawning stock biomasses and CPUE maximum for NE Arctic cod stock during early 20th century warm period (*Hylen A. 2002 ICES Marine Science Symposia 215*).

Responses of NE Arctic cod stock to the Atlantic Multidecadal Oscillation (AMO): higher temperatures lead to higher cod stocks. (*Drinkwater K.F. 2006 Progress in Oceanography 68*)

The comparative approach used in ICED and ESSAS provides insights into biogeochemical, physical and ecological processes that are unique within particular systems and highlights differences and similarities across systems.

[1] Eileen Hofmann, IMBER chair
hofmann@ccpo.odu.edu

[2] IMBER International Project Office
Institut Universitaire Européen de la Mer (IUEM)
Place Nicolas Copernic, 29280
Plouzané, France
imber@univ-brest.fr

www.imber.info