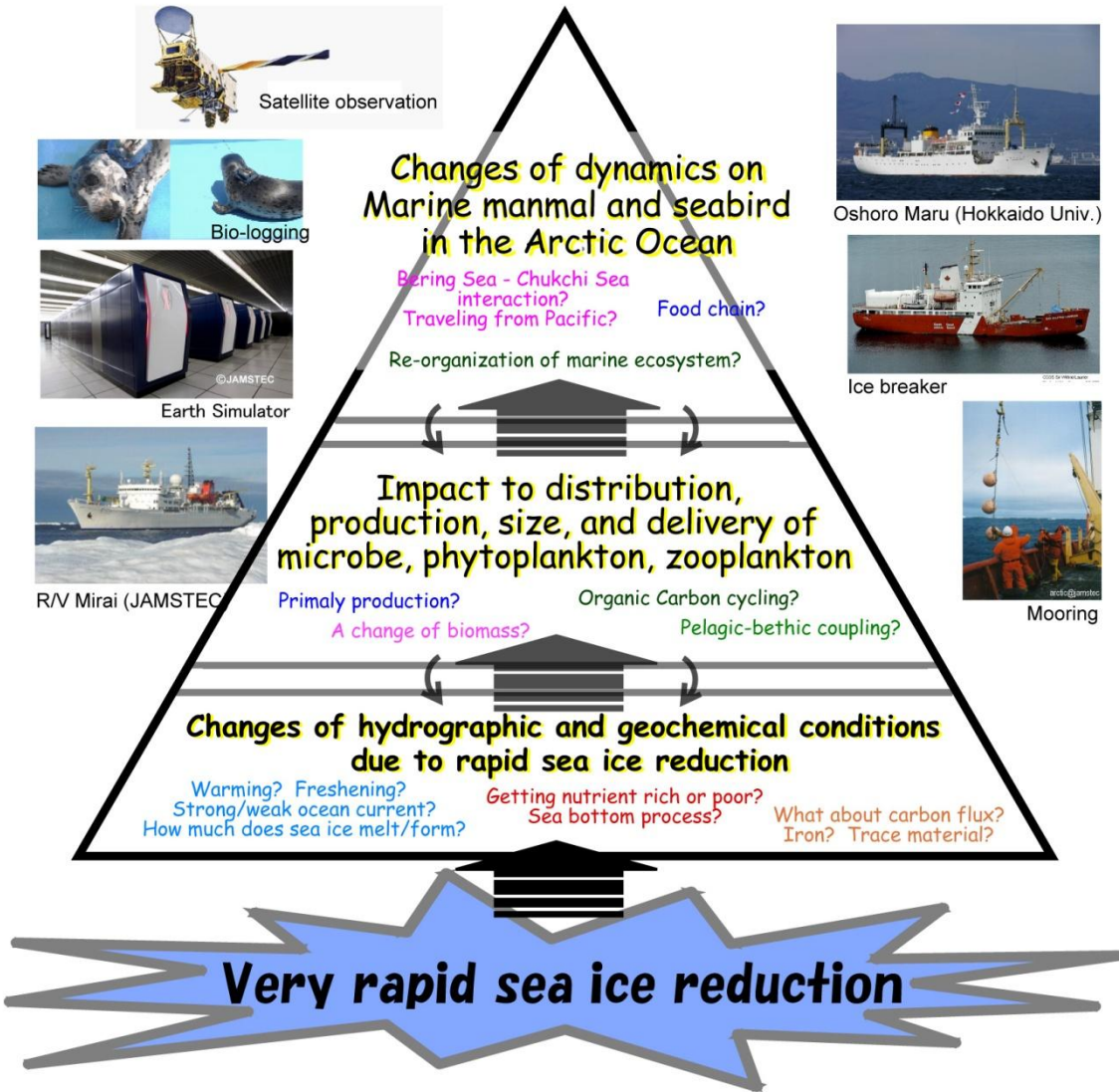




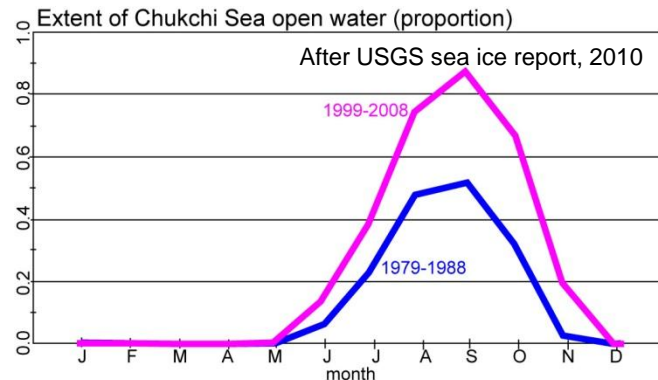
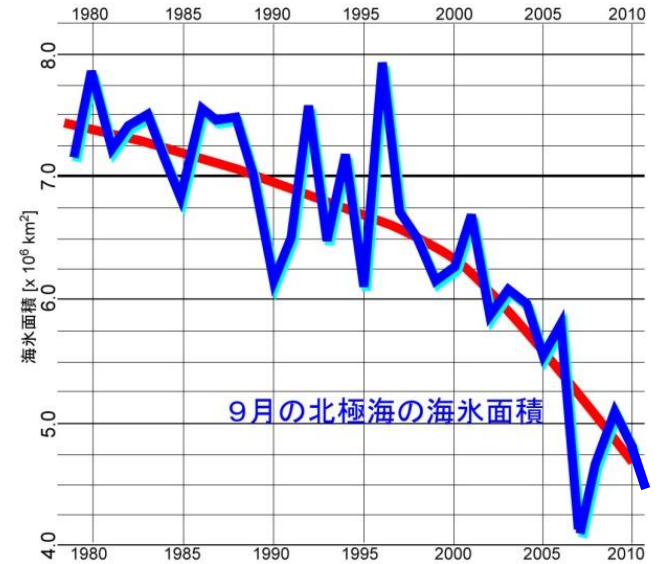
New Japanese project (2011-2015):

Sea ice reduction and its impact to Arctic marine ecosystem

Sea ice reduction and its impact to Arctic marine ecosystem



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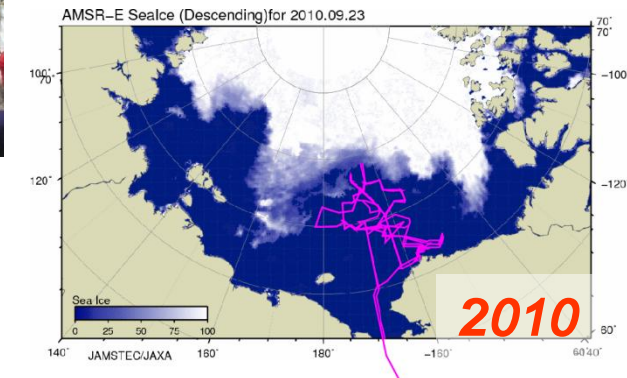
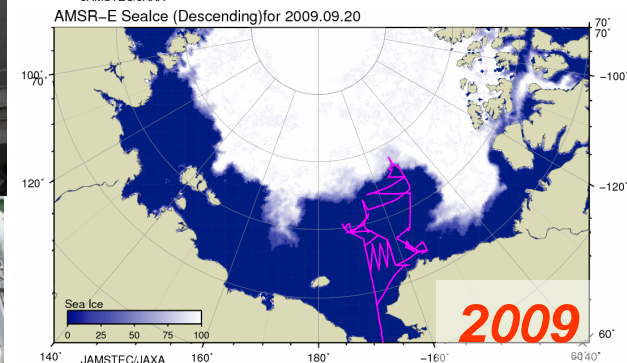
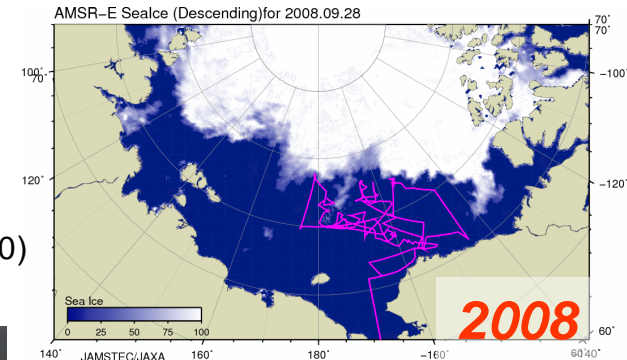
R/V Mirai (JAMSTEC) (1998~)



In collaboration with Japanese research institutions & universities, JAMSTEC have been conducting R/V Mirai Arctic Ocean Cruise since 1998. (1998, 1999, 2000, 2002, 2004, 2006, 2008, 2009, 2010)



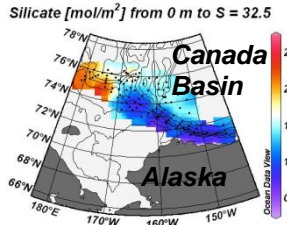
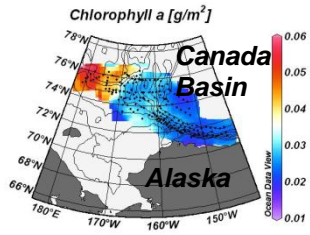
Based on the observational results in the sea-ice reduction area by R/V Mirai, we published lots of papers which shows evidences of Arctic environmental changes and the influences.



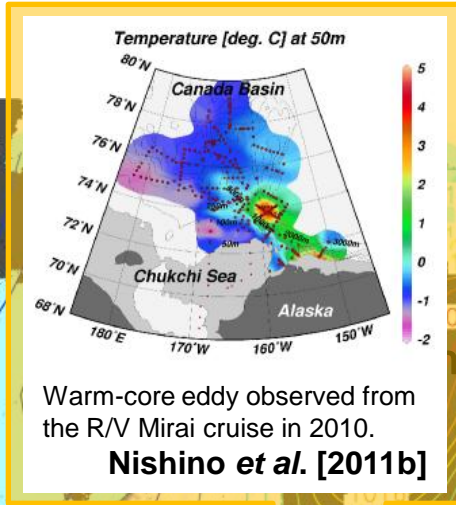


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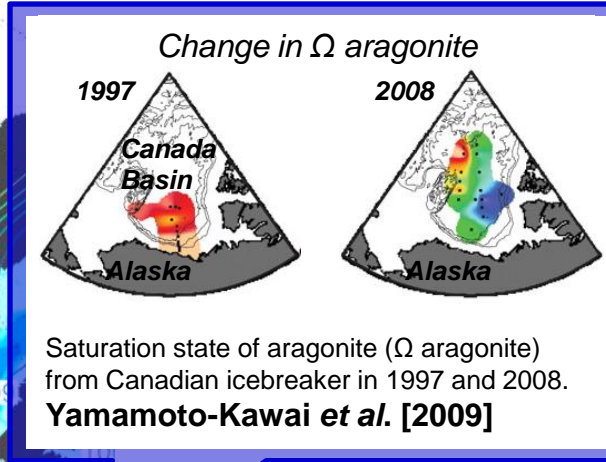
Sea ice reduction and its impact to Arctic marine ecosystem



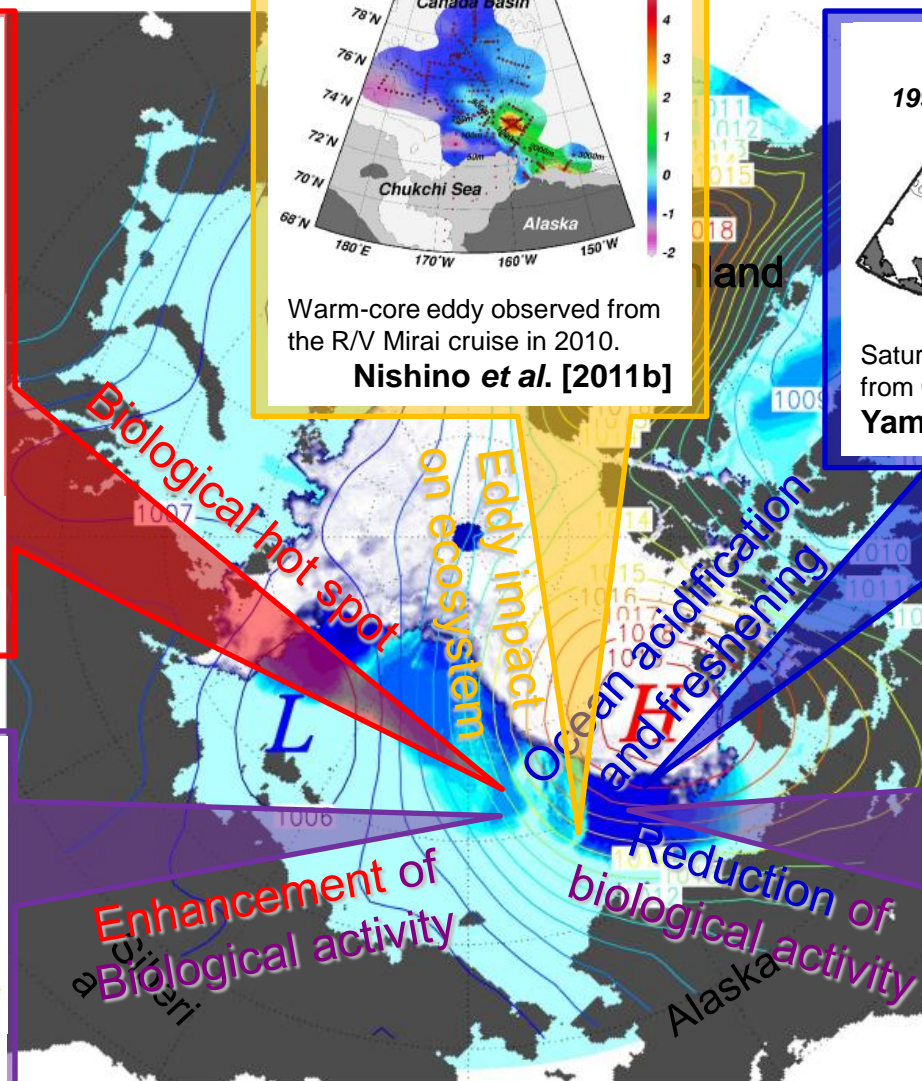
Chlorophyll a and silicate in a surface layer observed from the R/V Mirai cruise in 2004.
Nishino et al. [2008]



Warm-core eddy observed from the R/V Mirai cruise in 2010.
Nishino et al. [2011b]



Saturation state of aragonite (Ω aragonite) from Canadian icebreaker in 1997 and 2008.
Yamamoto-Kawai et al. [2009]



Biological hot spot
Eddy impact on ecosystem
Ocean acidification and freshening
Enhancement of biological activity
Reduction of biological activity

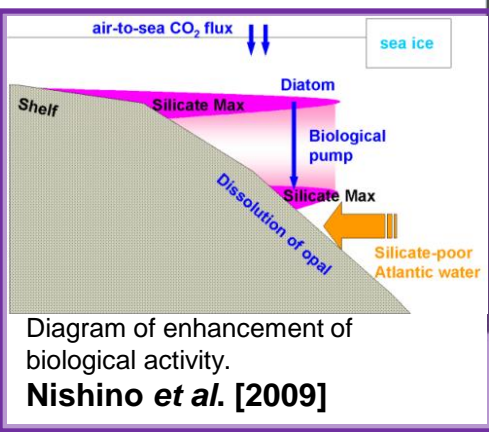


Diagram of enhancement of biological activity.
Nishino et al. [2009]

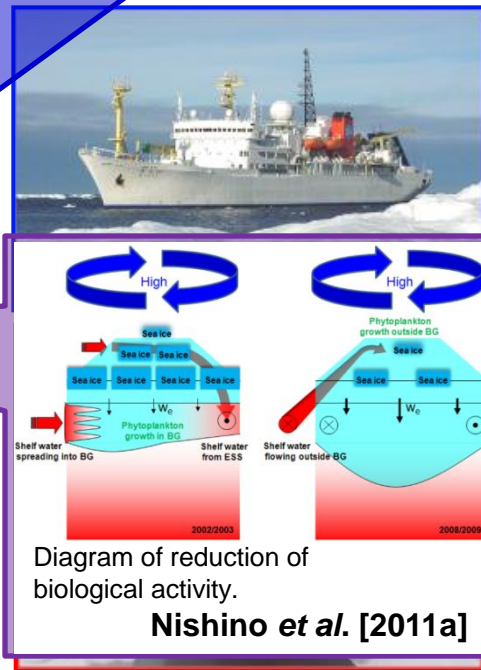


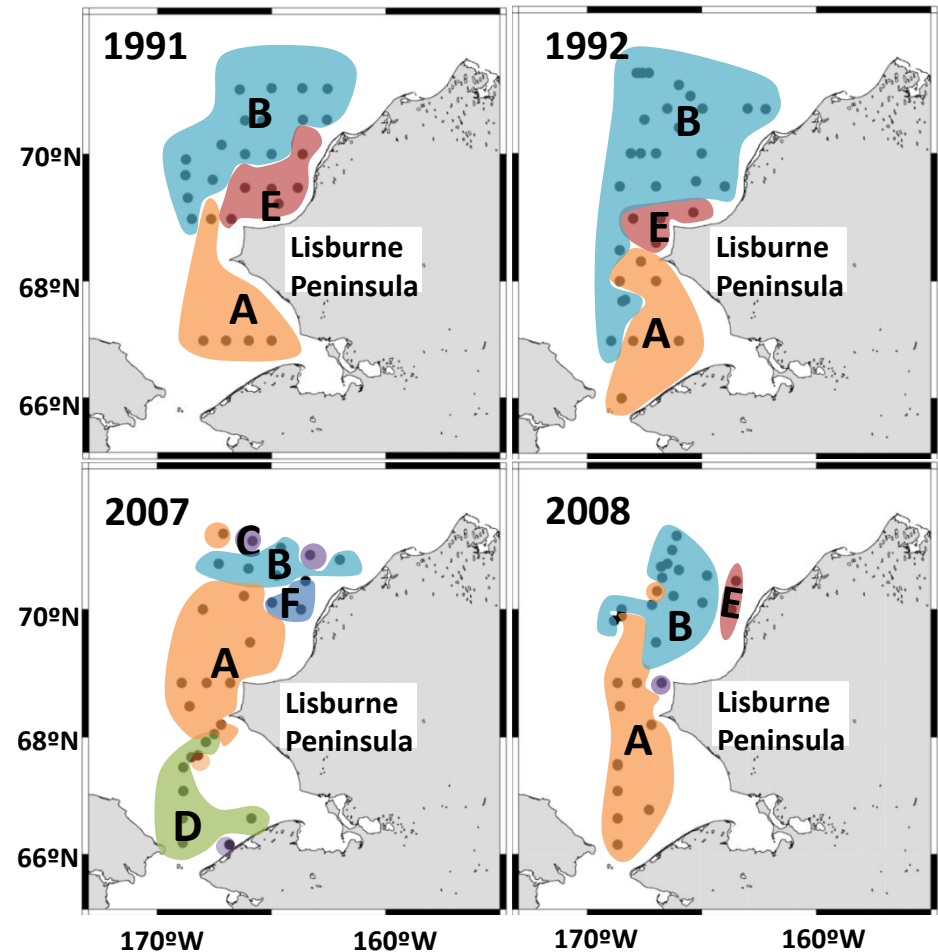
Diagram of reduction of biological activity.
Nishino et al. [2011a]

Sea-ice concentration on September 15, 2007, and mean sea level pressure during August-September, 2007.

Sea ice reduction and its impact to Arctic marine ecosystem

Oshoro-Maru (Hokkaido Univ.)

To investigate Arctic marine ecosystem,
Oshoro-Maru had observational cruise in the Chukchi Sea in 1991, 1992, 2007 and 2008.

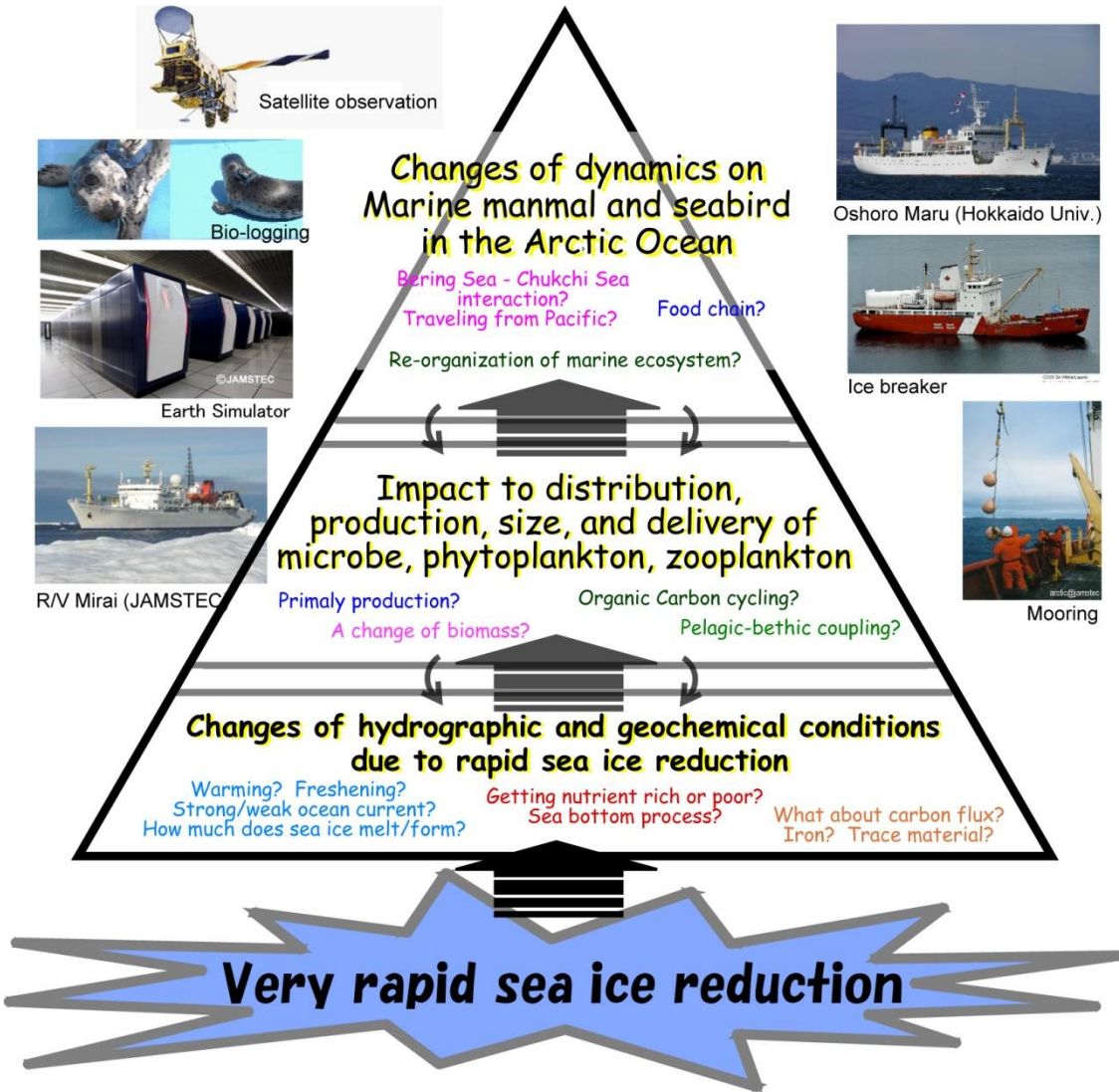




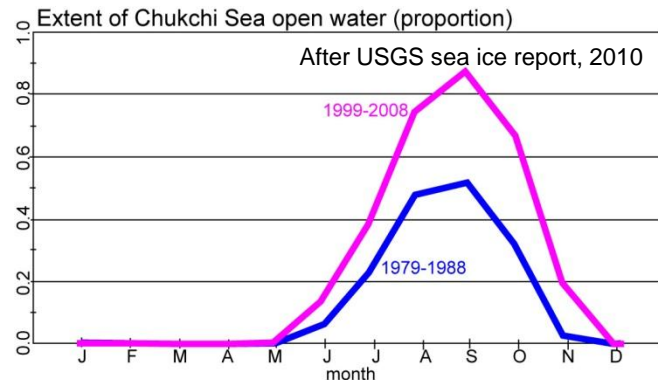
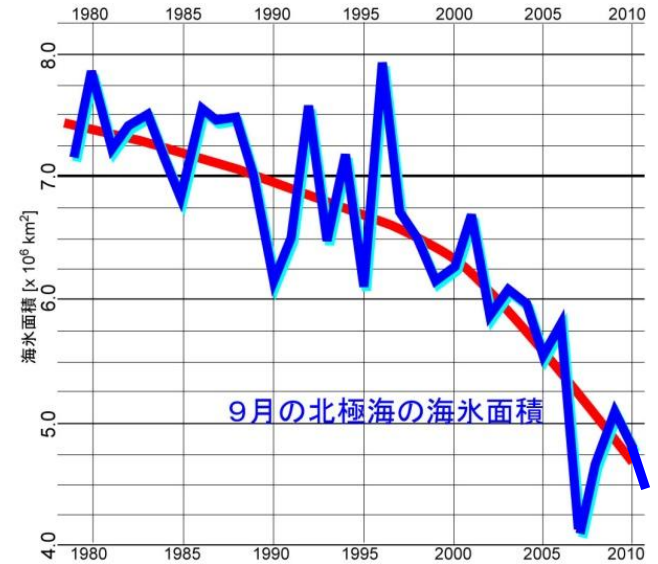
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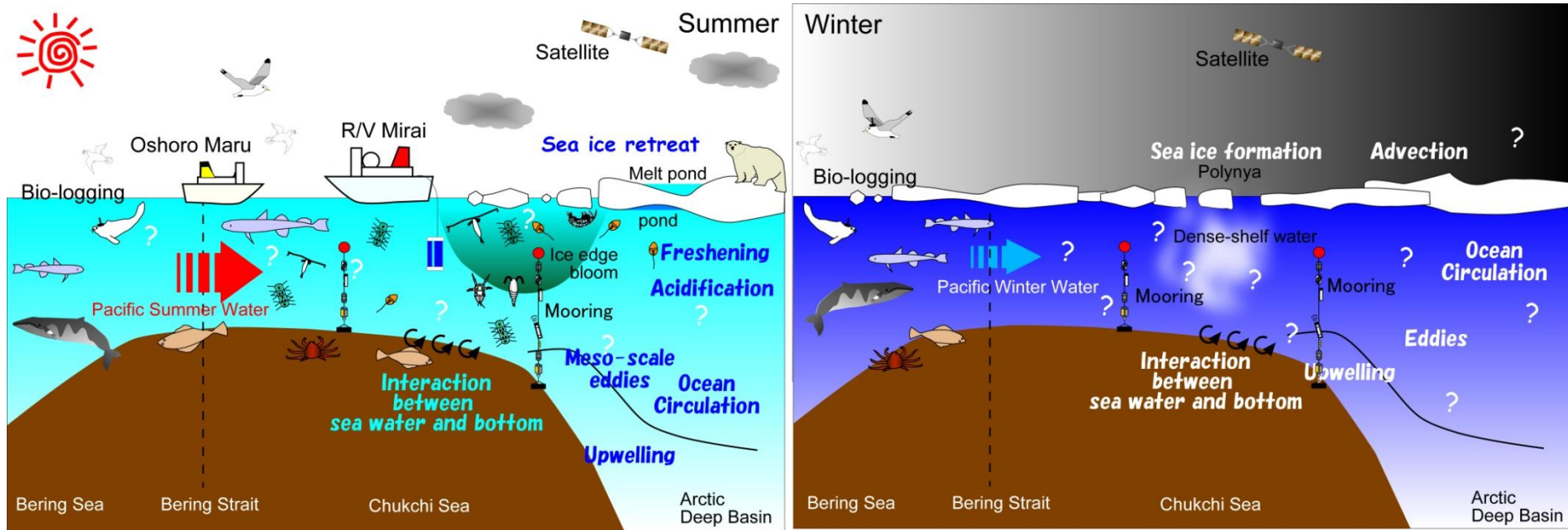


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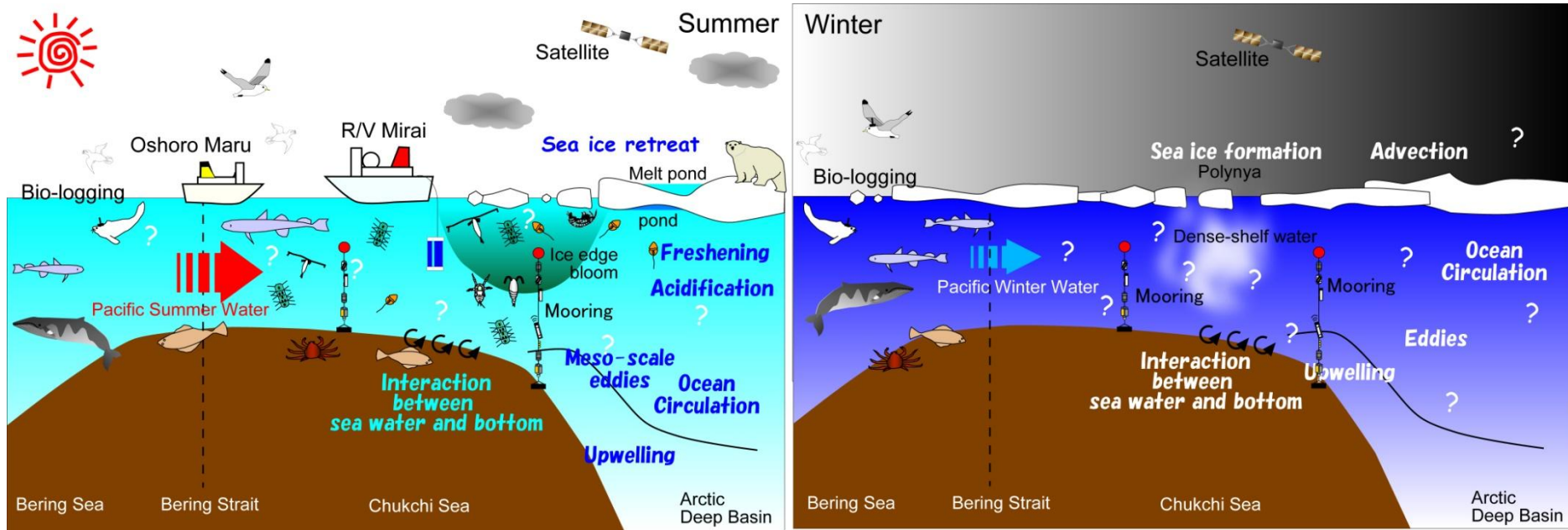


Question: **How does sea ice variability** (melting/formation, motion, seasonal cycle, recent inter-annually rapid decrease) **affect the Arctic Ocean environments** (physical, chemical, and biological)?

Keywords Ocean circulation, Water mass distribution/modification, Bottom processes (Nutrients, Fe, organic materials), Acidification, Organic carbon cycling, DOMs and microbial loop, Annual changes of biomass/distribution of phyto- and zoo- plankton, Primary production, Pelagic-Benthic coupling, Food chain,
 → **Re-organization of the Arctic marine ecosystem**

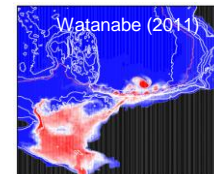
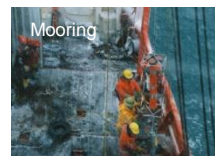
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Action




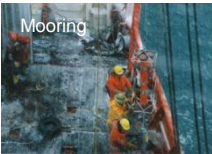

- 1) Ship-based observation by R/V Mirai and Oshoro-Marui
- 2) Mooring observation to find seasonal changes of ecosystem
- 3) Bio-Logging
- 4) Satellite monitoring
- 5) Numerical simulation

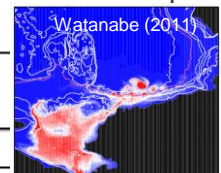


New Japanese project (2011-2015):

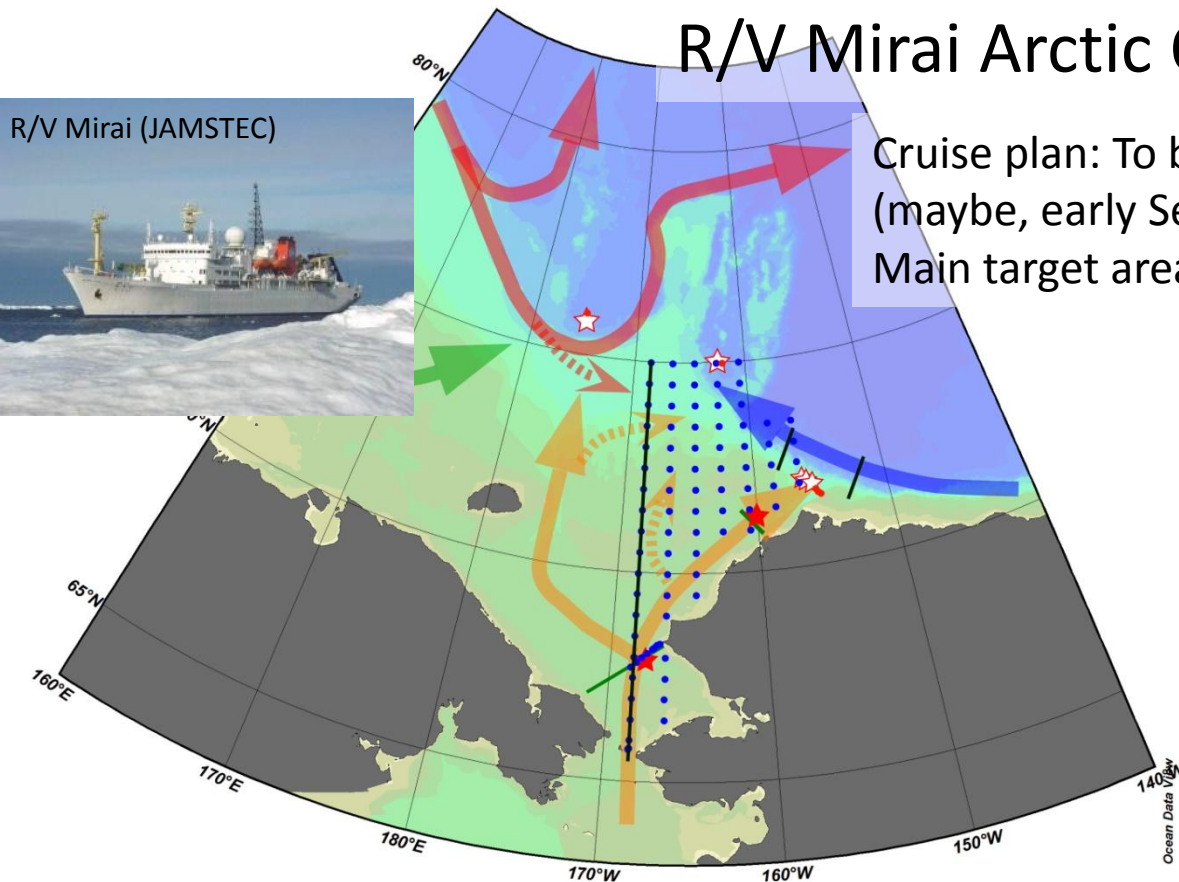
Sea ice reduction and its impact to Arctic marine ecosystem

Table 1 Yearly Plan of the project

	2011	2012	2013	2014	2015
1) Ship-based Observation	Preparation 	R/V Mirai Arctic Ocean cruise 	Oshoro-Marui Cruise R/V Mirai Arctic Ocean Cruise	Oshoro-Marui Cruise 	
2) Mooring	Preparation 	Jul. Deployment by SWL Sept. Recoveries & Deployments by Mirai	Sept. Recoveries & Deployments by Mirai	Sept.-Oct. Recoveries & Deployments by SWL(?)	Sept.-Oct. Recoveries by Mirai
3) Bio-Logging	Preparation	Bio-Logging 	Oshoro-Marui Cruise	Oshoro-Marui Cruise	
4) Satellite	(GCOM-W)	Collaboration with ship-based observations	Satellite monitoring Collaboration with ship-based observations	Collaboration with ship-based observations	
5) Numerical simulation			Model development & simulation		

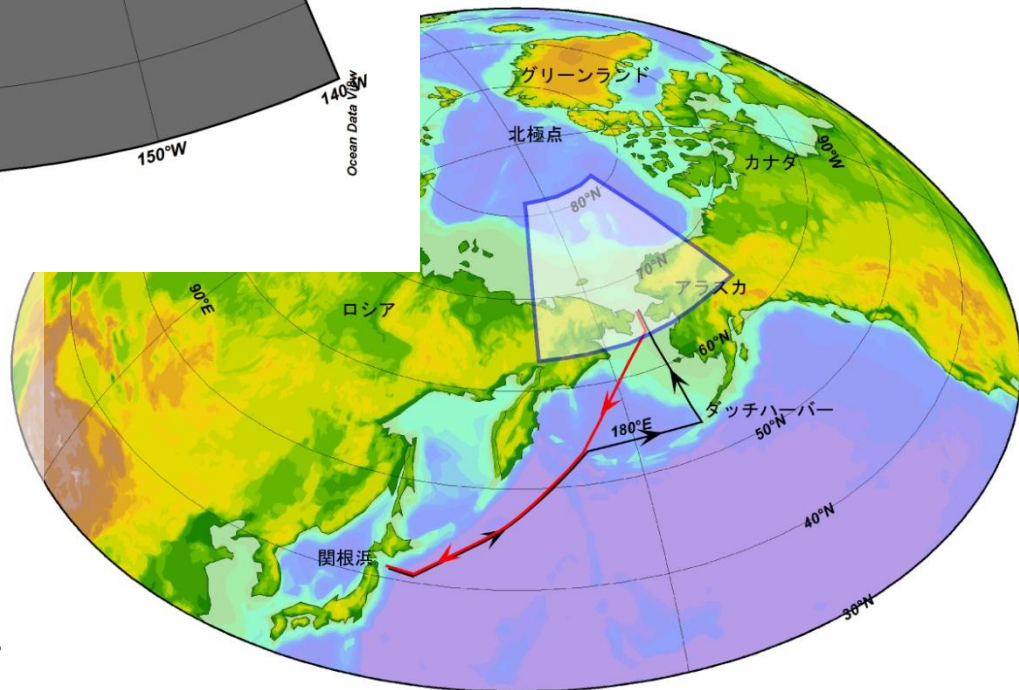


R/V Mirai Arctic Ocean cruise in 2012



Cruise plan: To be determined
(maybe, early September to late October, 2012)
Main target area: Chukchi shelf and shelf slope

- CTD/LADCP/water sampling & XCTD
- Mooring recovery/deployment
- Plankton net sampling
- Bio-geochemical measurements
- Multiple corer sampling
- General meteorological monitoring
- Surface water sampling/monitoring
- Shipboard ADCP monitoring and so on...



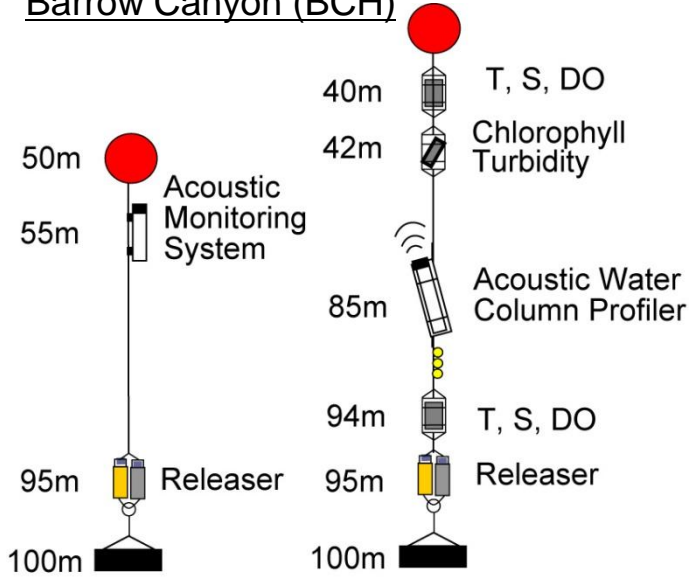


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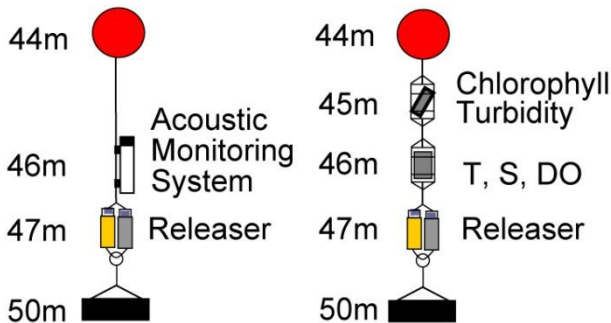
Sea ice reduction and its impact to Arctic marine ecosystem

Mooring observation

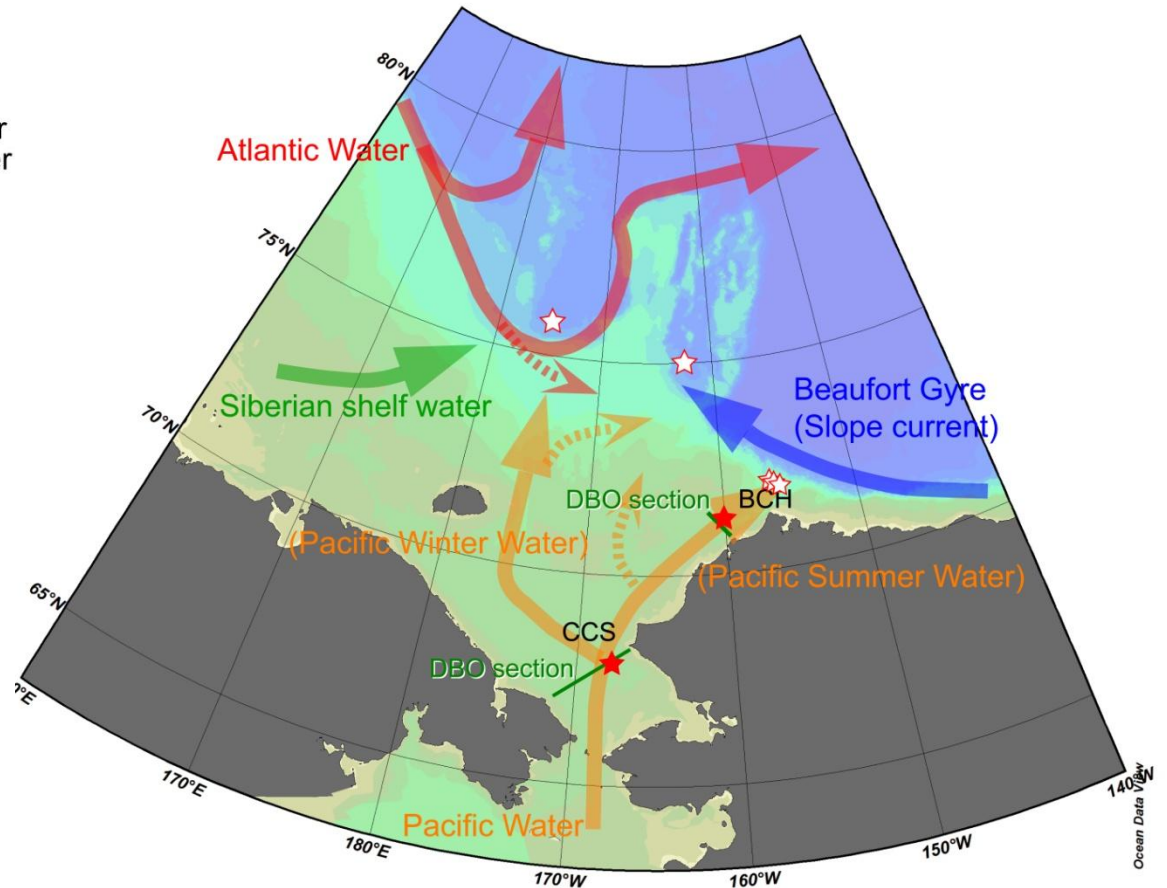
Barrow Canyon (BCH)



Chukchi continental shelf (CCS)



Not only physical but also chemical and biological sensors are equipped on the moorings. First (short-term) mooring will be deployed by CCGS Laurier cruise in July 2012. Year-round mooring observation will start from September 2012 (R/V Mirai cruise).



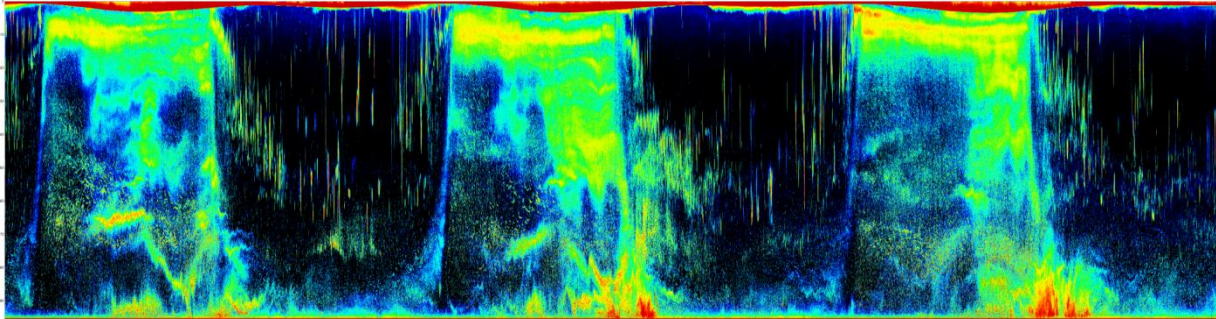


New Japanese project (2011-2015):

Sea ice reduction and its impact to Arctic marine ecosystem

Mooring observation

Acoustic Water Column Profiler (ASL Env. Sci.) will be used for detecting dynamics of marine zooplankton.









Example 200k Hz echo sounder data from the VENUS Observatory in Saanich Inlet (260,000 pings)

<http://venus.uvic.ca/data/data-plots/>

Three-day Echogram, September 12 – 14, 2006



Instrument Frequency (kHz)	Approximate Minimum Particle Size Detected (mm)		Representative Organisms	Estimated effective Range (m)
775	2		small copepods, nauplii	50
460	6		mysids, larval euphausiids	100
200	16		larval fish, euphausiids	200
125	20		adult euphausiids, mysids, amphipods	250
70	30		small fish	Est 275
38	75		larger fish	Est 325

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