A Census of Arctic Zooplankton Communities

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Our knowledge of abundance, composition and distribution of zooplankton communities in the Arctic Ocean is poor compared to most other northern regions. The Chukchi Sea represents a key oceanographic gateway into the Arctic, but our ability to understand its complex dynamics have been hampered by the political border that has prevented critically needed synoptic surveys. We have undertaken a comprehensive survey and census of zooplankton species in the Bering Strait through central Chukchi Sea at 33 stations to understand the transport patterns of Pacific zooplankton into the Arctic and serve as a baseline for future studies on ecosystem change in this climatically sensitive region.

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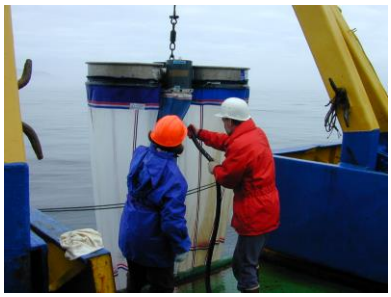
Photo: B. Holladay

The census has been conducted using plankton nets of 150 and 53 µm mesh with analysis to involve a combination of traditional taxonomic enumeration and identification, along with comprehensive molecular sequencing to be undertaken by Ann Bucklin (University of New Hampshire). Photographic documentation has been completed for a number the species encountered. To determine why zooplankton biomass remains low despite the incredibly high primary production in much of this region, egg production experiments have been conducted at 22 stations with several of the dominant copepod species in this region (i.e. primarily *Pseudocalanus* spp., with variable contributions by *Metridia pacifica*, *Eucalanus bungii*, and *Calanus marshallae*). These rates are expected to be very sensitive to modification by climate change.

The differences in zooplankton communities encountered on the transect lines has been striking, with communities on the eastern side having an "estuarine" community structure characteristic of Alaska Coastal water (i.e. *Acartia longiremis*, *Eurytemora affinis*, *Centropages abdominalis*, *Pseudocalanus* spp., *Podon leuckarti*, *Evadne nordmanni*). Moving westward, communities characteristic of Bering shelf water, with large population of the larvacean *Oikopleura vanhoeffeni*, and overwhelming numbers of barnacle nauplii and cyriped larvae were found suspended in a soup of phytoplankton. Along the Russian coastline, phytoplankton biomass remained high, and zooplankton again shifted toward more coastal forms, but differed in the relative composition of species as compared to the Alaska coast. On the more northern transects, a pronounced change in community composition was also evident, with communities on the western and central waters very similar to the Bering Shelf communities encountered to the south, while water on the eastern side was lower in phytoplankton and zooplankton and had a more coastal character. Egg production experiments were conducted most consistently with *Pseudocalanus* species, and they suggest that reproduction occurs throughout the region but is significantly enhanced in Bering shelf waters compared to coastal waters. A fuller characterization of the communities and their reproductive rates will require more detailed analysis of the samples.



Ksenia Kosobokova and Russ Hopcroft. Photo: K. Crane

This work will represent an extension of work begun in the Canada Basin under the Ocean

Exploration Office, provide geographic coverage of the zooplankton community to compliment the concurrent Shelf-Basin Interactions program, and ties into the Arctic Ocean Biodiversity project by the Census of Marine Life. All of these efforts share common methods that will allow for the first comprehensive broad-scale mapping of zooplankton communities and processes throughout the Western Arctic Ocean.

	Lat.	Long.	Date	Time	Depth	Egg Production experiments
Sta#	Nome	Nome		(local)		
6	65.688	191.822	August 10, 2004	8:00	49	Ps
7	65.779	191.415	August 10, 2004	14:00	52	
8	65.873	190.892	August 10, 2004	16:00	45	Ps, Eu
9	65.943	190.52	August 11, 2004	2:00	53	
10	65.995	190.368	August 11, 2004	4:00	54	Ps
11	66.934	189.009	August 11, 2004	16:45	53	Ps
12	67.175	189.703	August 12, 2004	0:30	48	
13	67.432	190.367	August 12, 2004	4:20	51	Ps
14	67.636	190.98	August 12, 2004	12:30	53	
15	67.881	191.686	August 12, 2004	18:50	59	attempted, too few for expt
16	68.127	192.373	August 13, 2004	8:00	ABORTED	
17	68.304	192.954	August 13, 2004	10:45	39	Ps
18	68.95	193.09	August 13, 2004	22:15	48	Ps
19	69.03	192.11	August 14, 2004	7:50	51	
20	69	191.14	August 14, 2004	9:45	54	Ps
21	68.88	190.4	August 14, 2004	18:45	57	
22	68.74	189.58	August 14, 2004	20:50	57	
23	68.52	188.54	August 15, 2004	3:00	56	Ps,Mp,Cm
24	68.34	187.66	August 15, 2004	12:50	53	
25	67.87	187.15	August 15, 2004	19:45	49	Ps
26	67.67	186.81	August 16, 2004	2:20	49	
27	67.39	186.33	August 16, 2004	6:00	31	attempted, too few for expt
106	70.74	184.47	August 18, 2004	10:45	72	Ps
44	70.984	184.0234	August 18, 2004	21:45	56	Ps,Cm
49	70.871	184.8915	August 19, 2004	3:15	71	
57	70.92	185.98034	August 19, 2004	9:00	44	
58	71.404	185.64517	August 19, 2004	12:30	55	Ps
66	71.387	184.51884	August 19, 2004	18:00	36	Ps
67	71.752	183.78783	August 19, 2004	22:00	42	Ps, Cm
74	71.924	184.633	August 20, 2004	3:05	73	
79	72.047	185.24134	August 20, 2004	6:50	61	Ps
80	72.347	184.74984	August 20, 2004	9:00	51	Ps
85	72.316	184.01634	August 20, 2004	14:00	103.5	Ps
89	72.284	183.284	August 20, 2004	18:00	74	Ps
73B	71.9	184.51183	August 21, 2004	5:00	hand only	Ps
62B	71.395	185.08183	August 21, 2004	17:40	76.5	Ps
107	70.889	187.324	August 21, 2004	3:50	40	