

Fish Assemblages Near Barrow, Alaska–August 2004

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SUMMARY

Fish assemblages were sampled with a beach seine at two locations near Barrow, Alaska between 12-15 August 2004. Five sites were seined on a 9 km stretch of beach immediately adjacent to the village of Barrow and six sites were seined on Cooper Island, about 37 km east of Barrow. The beach adjacent to Barrow is eroding at a rapid rate and Cooper Island has been proposed as a possible source of replacement sediment. Seine sites at both locations were low gradient beaches with substrates predominately comprised of sand and gravel. Total catch (all seine hauls) was greater at Barrow (>2,000 fish) than at Cooper Island (1,213 fish). The most abundant species captured near Barrow were capelin (*Mallotus villosus*) and young-of-the-year Arctic cod (*Boreogadus saida*)—overall, capelin comprised about 85% of the total catch and Arctic cod about 14%. At Cooper Island, total catch was greater on the Beaufort Sea side of the island (1,180 fish, 3 seine hauls) than in Elson Lagoon (33 fish, 3 seine hauls). The most abundant species captured on the seaward side of Cooper Island were capelin and Arctic cod, whereas the most abundant species captured in Elson Lagoon were least cisco (*Coregonus autumnalis*) and juvenile cottids (Cottidae). Capelin and Arctic cod are important species in the diets of marine mammals, birds, and other fish species, and least cisco is an important species in subsistence fisheries.

INTRODUCTION

The objective of this study was to inventory nearshore fish assemblages in marine waters adjacent to the village of Barrow and at Cooper Island, Alaska. Cooper Island has been identified as a potential source for 3 million cubic meters of sand and gravel needed to replenish the rapidly eroding coastline near Barrow (Friends of Cooper Island 2003). The low shoreline near Barrow is subject to coastal erosion from prevailing northeasterly winds in summer and sea ice in winter. Several locations near Barrow and on Cooper Island were sampled with a beach seine in August 2004 to identify fish assemblages. Additional sampling in summer and other seasons is required, however, to obtain a full inventory of the fish communities in the Barrow area.

METHODS

Five sites were selected near Barrow and six sites on Cooper Island (Figure 1). Sites were selected to cover the area of major erosion near Barrow and to represent the fish fauna present on the exposed (Beaufort Sea) and protected (Elson Lagoon) sides of Cooper Island (Figure 1). One seine haul was made at each site. All sites were sampled during daylight between 12 and 15 August 2004. Based on visual observations, all sites were low gradient beaches with substrates predominately comprised of sand and gravel. Water temperature and salinity were measured at each site. Water temperature was measured at the surface with a thermometer and salinity (practical salinity scale, PSS) was measured at approximately 20-cm depth with a hand-held refractometer.

Fish were sampled with a 37-m long variable-mesh beach seine that tapered from 5 m

wide at the center to 1 m wide at the ends. Outer panels were each 10 m of 32-mm stretch mesh, intermediate panels were each 4 m of 6-mm square mesh, and the bunt was 9 m of 3.2-mm square mesh. We set the seine as a “round haul” by holding one end on the beach, backing around in a skiff with the other end to the beach about 18 m from the start, and pulling the seine onto shore. The seine had a lead line and a float line so that the bottom contacted the substrate and the top floated.

Captured fish were identified to species and enumerated. Fork length (FL) was measured to the nearest mm for up to 50 individuals of the selected species, primarily commercially important and forage fish species (e.g., capelin, *Mallotus villosus*). Fish were anesthetized in a mixture of 1 part carbonated water to 2 parts seawater for identification and measurement. Smaller individuals (<50 mm FL) of some families of fish (e.g., Cottidae) that could not be easily identified to species in the field were grouped and recorded as juvenile cottids.

RESULTS

Data sheets with catch data for beaches adjacent to the village of Barrow were unfortunately lost. Scientists, however, were able to reconstruct catch data reasonably well within a few days after sampling. Total catch and species composition were consistent among all seine hauls near Barrow; about 300–500 fish were captured per seine haul. Capelin and young-of-the-year (YOY) Arctic cod (*Boreogadus saida*) comprised about 85% and 14% of the total catch at each site. Other species captured were about 15 Pacific sand lance (*Ammodytes hexapterus*), one kelp snailfish (*Liparis tunicatus*), one longhead dab (*Limanda proboscidea*), two tubenose poachers (*Pallasina barbata*), three Arctic sculpins (*Myoxocephalus scorpioides*),

two juvenile cottids, and five unidentified larvae (Table 1). Most fish captured were juveniles—mean size of capelin captured was 68 mm FL (range 42–127 mm; n = 80).

At Cooper Island, total catch was greater on the Beaufort Sea side of the island than in Elson lagoon (Table 1). At the Beaufort Sea sites, total catch ranged from 79 to 928 fish, whereas at the Elson Lagoon sites, total catch ranged from 6 to 20 fish (Table 1). Capelin and YOY Arctic cod were the most abundant species captured at sites in the Beaufort Sea, and least cisco (*Coregonus sardinella*) was the most abundant species captured in Elson lagoon (Table 1). Other fish captured in low numbers at Cooper Island included juvenile cottids, Pacific sand lance, and unidentified larvae (Table 1). Mean size of fish captured at Cooper Island was 61 mm FL (range 41–75 mm; n = 90) for capelin, 32 mm FL (range 25–40 mm; n = 66) for Arctic cod, and 269 mm FL (range 229–310 mm; n = 14) for least cisco.

Water temperature was similar among all sites (8.0–9.0°C), whereas salinity was lowest in Elson Lagoon compared to all other sites. Salinity in Elson Lagoon was 24 PSS compared to 29 PSS on the Beaufort Sea side of Cooper Island and 30 PSS near Barrow.

DISCUSSION

In late summer, capelin, Arctic cod, and least cisco were the dominant species present in Arctic waters near Barrow. Capelin and Arctic cod are important forage species in the diet of marine mammals, sea birds, and other fish species (Craig et al. 1982, Alaska Sea Grant 1993). Least cisco have some importance as a sport fish, but are more valued in rural subsistence fisheries (Griffiths et al. 1992, Alaska Department of Fish and Game 2004). Similar species and catches to ours have been reported in other nearshore studies in Arctic waters (Craig 1984, Bond

and Erickson 1989).

Differences in salinity likely attributed to the presence or absence of some species in our catches. For example, least cisco and Arctic cisco were only captured in the more protected brackish waters of Elson Lagoon (24 PSS) and not on the seaward side of Cooper Island or near Barrow where salinity was about 30 PSS. Similarly, capelin and Arctic cod were only captured on the seaward side of Cooper Island and not in Elson Lagoon. A band of brackish water (10-25 PSS) adjacent to the Beaufort Sea shoreline in summer provides important feeding habitat for many species like least cisco and Arctic cisco (Craig 1984). Marine species such as Arctic cod, however, will enter nearshore waters in late summer when salinities increase (Craig 1984)—in mid-August, Arctic cod was one of the most abundant species that we captured near Barrow and on the seaward side of Cooper Island. Differences in number of species and total catch of Arctic fishes between seaward and more protected shoreline areas have also been reported by Bond and Erickson (1989).

Because we captured mostly juvenile fish, nearshore waters adjacent to Barrow and Cooper Island appear to be important rearing areas in summer, especially for capelin and Arctic cod. Anecdotal information also suggests that capelin may spawn on beaches near Barrow in mid-July. Further study is needed throughout the Arctic summer to identify all species and life stages that use shoreline habitats near Barrow that may be affected by the removal or addition of beach sediments. This study only provides a snapshot of the fish assemblages present near Barrow over a few days.

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Table 1. Number of fish captured with a beach seine at five sites near Barrow and at six sites on Cooper Island, Alaska, August 2004. Three sites each were sampled on the Elson Lagoon side and the Beaufort Sea side of Cooper Island. One seine haul was made at each site. For Barrow, a single asterisk indicates presence and a double asterisk represents abundant. For all sites a blank represents absent.

Site		Cooper Island						
		Barrow	Elson Lagoon			Beaufort Sea		
		1-5	1	2	3	4	5	6
Capelin	<i>Mallotus villosus</i>	**				59	619	119
Arctic cod	<i>Boreogadus saida</i>	**				16	298	40
Least cisco	<i>Coregonus sardinella</i>		3	7	4			
Arctic cisco	<i>Coregonus autumnalis</i>				1			
Pacific sand lance	<i>Ammodytes hexapterus</i>	*					9	
Nine-spine stickleback	<i>Pungitius pungitius</i>		1					
Yellowfin sole	<i>Limanda asper</i>					1		
Longhead dab	<i>Limanda proboscidea</i>	*						
Tube-nose poacher	<i>Pallasina barbata</i>	*						
Veteran poacher	<i>Podothecus veterinus</i>					2		3
Kelp snailfish	<i>Liparis tunicatus</i>	*				1		1
Arctic sculpin	<i>Myoxocephalus scorpioides</i>	*						
Juvenile cottids	Cottidae	*	2	9			1	4
Unid. poacher	Agonidae			1				
Unid. larvae		*	1	3	1		1	6
Total catch		>2000	7	20	6	79	928	173

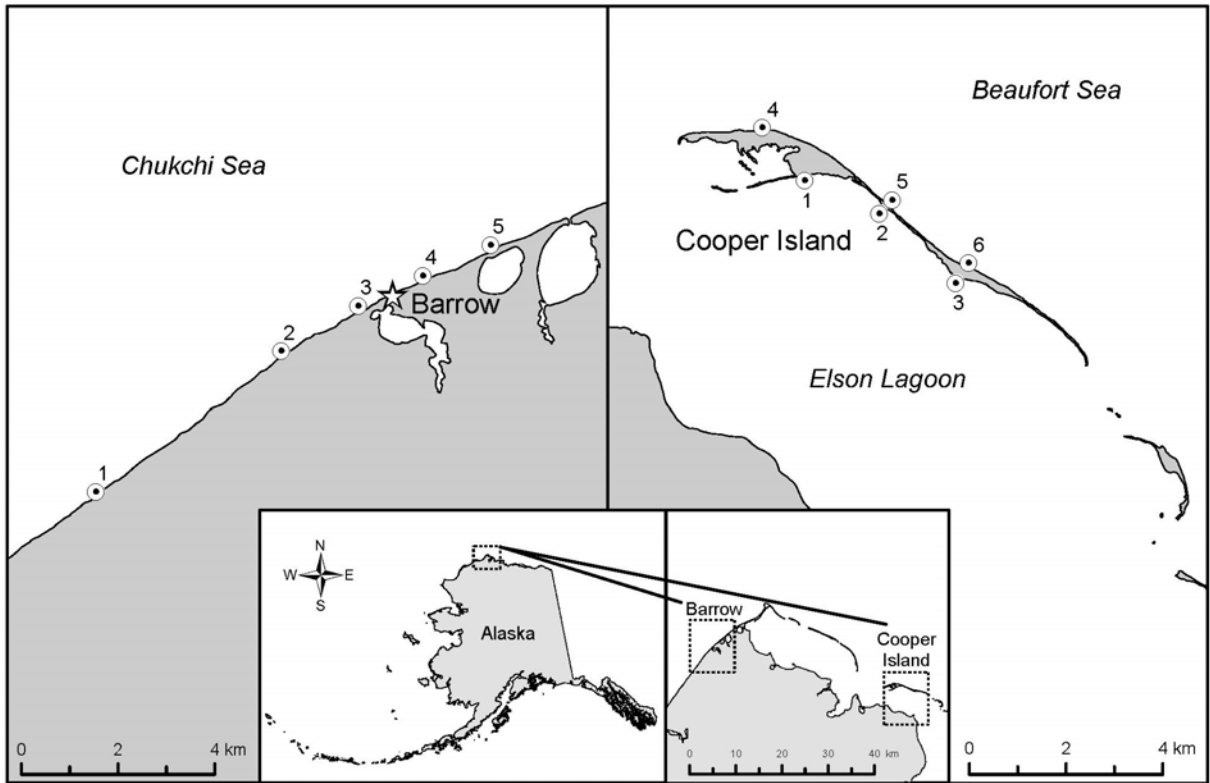


Figure 1. Locations of sites sampled for fish assemblages near Barrow and at Cooper Island, Alaska in August 2004. Five sites were sampled by beach seine near Barrow and six sites at Cooper Island.