

Fish Assemblages Near Barrow, Alaska–August 2005

John F. Thedinga and Scott W. Johnson

Auke Bay Laboratory, Alaska Fisheries Science Center, National Marine Fisheries Service

11305 Glacier Hwy.

Juneau, AK 99801

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SUMMARY

Fish assemblages were sampled with a beach seine near Barrow, Alaska from August 6–11, 2005. A total of 26 sites were sampled. Eleven of the sites (five near Barrow and six on Cooper Island) were sampled in 2004. Fifteen of the sites (two about 7 km southwest of the 2004 Barrow sites, four near Skull Cliff, three at Point Barrow, and four on the Tapkaluk Islands) were new. Sites on Cooper and the Tapkaluk Islands were located on either the Beaufort Sea (exposed side) or Elson Lagoon (protected side), and the other sites were on the Chukchi Sea. The beach adjacent to Barrow is eroding at a rapid rate, and Cooper Island, Point Barrow, and Skull Cliff have been proposed as possible sources of replacement sediment or rock. Seine sites at these locations were low gradient beaches with substrata predominantly comprised of sand and gravel. Total catch at all sites was 718 fish. Mean catch per seine haul was greatest for the Barrow sites (60 fish) and least at the Cooper Island, Elson Lagoon sites (6 fish). At Cooper Island, mean catch per seine haul was greater on the Beaufort Sea side of the island (18 fish) than in Elson Lagoon (6 fish). The most abundant fish captured on the seaward side of Cooper Island was juvenile cottids (Cottidae), whereas the most abundant species captured in Elson Lagoon was least cisco (*Coregonus sardinella*). The most abundant fishes at Point Barrow, the Barrow sites, and Skull Cliff were juvenile poachers (Agonidae), juvenile gadids (Gadidae), and capelin (*Mallotus villosus*). Overall, the most abundant fish captured was juvenile gadids, comprising 51% of the total catch.

INTRODUCTION

The objective of this study was to inventory nearshore fish assemblages in marine waters near Skull Cliff, Barrow, Point Barrow, the Tapkaluk Islands, 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 the village of Barrow (Friends of Cooper Island 2003). Point Barrow and Skull Cliff were also identified as possible sources of gravel and rock. The low shoreline near Barrow is subject to coastal erosion from westerly 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. In 2005, the survey area was expanded, and a total of 26 sites were sampled. Sampling in future years and other seasons is necessary to obtain a full inventory of the fish communities in the Barrow area.

METHODS

A total of 26 sites were sampled in 2005 (Figure 1). Eleven of the sites (five sites near Barrow, Alaska and six sites on Cooper Island, Alaska) were sampled in 2004. Fifteen of the sites (two about 7 km southwest of the 2004 Barrow sites, four near Skull Cliff, three at Point Barrow, and four on the Tapkaluk Islands) were new (Figure 1). Sites on Cooper and the Tapkaluk Islands were located on either the Beaufort Sea (exposed side) or Elson Lagoon (protected side), and the other sites were on the Chukchi Sea. One seine haul was made at each site. All sites were sampled during daylight from August 6–11, 2005. Based on visual observations, all sites were low gradient beaches with substrata predominantly 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 with a hand-held refractometer at an approximate depth of 20-cm.

Fish were sampled with a 37-m 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 substratum and the top floated on the surface.

Captured fish were identified to species and enumerated. Fork length (FL) was measured to the nearest mm for up to 50 individuals of 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

Juvenile gadids dominated the overall catch in 2005, comprising 51% of the total catch (Table 1). Mean FL of gadids was 17.4 mm (range = 11–27 mm). Young-of-the-year Pacific sand lance (*Ammodytes hexapterus*) were the next most abundant fish, accounting for 10% of the total catch.

At Skull Cliff, capelin was the most abundant fish (43% of catch) captured (Table 1). Of all capelin captured, 83% were from Skull Cliff. All capelin were adults (mean FL = 120 mm;

range 115–160) and most were gravid. Yellowfin sole (*Limanda aspera*) (mean FL = 86 mm) and Arctic sculpin (*Myoxocephalus scorpioides*) (mean FL = 98 mm) were the next most abundant species captured, comprising 23% and 13% of the total catch. The largest Arctic cod (FL = 138) at any site was captured at Skull Cliff.

At the Barrow sites, juvenile gadids were the most abundant fish captured, accounting for 73% of the total catch. Barrow sites had the greatest mean catch per seine haul (60 fish). Of all Pacific sand lance captured, 68% were from the Barrow sites; mean FL of sand lance was 41 mm.

At Cooper Island, total catch was greater on the Beaufort Sea side of the island (54 fish) than in Elson lagoon (18 fish) (Table 1). The most abundant fish captured at the Beaufort Sea sites were juvenile cottids (Cottidae) and Pacific sand lance, comprising 72% of the catch. The most abundant fish captured in Elson Lagoon was the least cisco (*Coregonus sardinella*), comprising 78% of the catch (Table 1). The Beaufort Sea side of the island was the only area that fourhorn sculpins (*Myoxocephalus quadricornis*) (mean FL = 169), and age-1 Arctic cod (*Boreogadus saida*) (mean FL = 80 mm) were captured. The Elson Lagoon sites had the lowest mean catch per seine haul (6 fish), but had the largest fish (mean FL = 263 mm, range 41–322 mm). Mean FL of fish captured at Cooper Island was 19 mm (range 15–24 mm) for juvenile cottids, 50 mm (range 39–55 mm) for Pacific sand lance, and 291 mm (range 245–322 mm) for least cisco.

At Point Barrow, juvenile poachers (Agonidae) were the most abundant (59% of catch) fish captured (Table 1). Mean FL of poachers was 22.6 mm. Arctic cod were the next most abundant fish (18% of catch).

At the Tapkaluk Islands, juvenile gadids were the most abundant fish (44% of catch) captured (Table 1). Juvenile cottids were the next most abundant fish, comprising 25% of the catch. One Arctic cisco (*Coregonus autumnalis*) was captured on the Beaufort side of the Tapkaluk Islands.

Water temperature varied among all sites (7.0–11.0 °C). The coolest temperatures (mean = 7.4 °C) were at the Barrow and Point Barrow sites and the warmest (mean = 10.6 °C) were at Skull Cliff. Salinity was similar at all sites, averaging about 35 PSS.

DISCUSSION

In late summer, juvenile gadids, Pacific sand lance, juvenile cottids, and capelin were the dominant fish present in the Chukchi and Beaufort Seas near Barrow. The least cisco was the most abundant fish in Elson Lagoon. Capelin is an 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). Arctic cod, a dominant species in the 2004 seine catches, comprised only 2% of the total 2005 catch. Based on our 2004 catches near Barrow, the 2005 juvenile gadids were probably Arctic cod, in which case the contribution of Arctic cod to the total catch would increase to 52%, a greater proportion than in 2004. Similar species and catches to ours have been reported in other nearshore studies in Arctic waters (Craig 1984, Bond and Erickson 1989).

The differences in salinity between the Elson Lagoon and Beaufort and Chukchi Sea sites in 2004 were not observed in 2005. A storm that produced strong southwesterly winds may have caused the intrusion of high saline waters from the Beaufort Sea into Elson Lagoon, resulting in

similar salinities at all sites in 2005. A usual 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). 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).

Catches were much less in 2005 than in 2004. In 2004, total catch was > 3,200 fish (11 hauls) compared to only 718 fish in 2005 (26 hauls). Mean catch per seine haul was over 10 times greater in 2004 than in 2005. Annual variation in seine catches was also reported by Thedinga et al. (in press); they attributed the variation to year-class strength of walleye pollock (*Theragra chalcogramma*).

Because we captured mostly juvenile fish, nearshore waters near Barrow from Skull Cliff to Cooper Island appear to be important rearing areas in summer, especially for capelin and young-of-the-year Arctic cod. Anecdotal information also suggests that capelin may spawn on beaches near Barrow in mid-July. Further study is needed 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. Because of the large differences in catch between 2004 and 2005, sampling in 2006 is recommended to better define fish use of the Barrow nearshore waters in summer.

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Table 1. Number of fish captured with a beach seine at 26 sites near Barrow, Alaska, August 5–11, 2005 (See Figure 1 for site locations). A blank represents the absence of a species from a site.

		Skull Cliff	Barrow	Point Barrow	Tapkaluk Islands		Cooper Island	
					Elson Lagoon	Beaufort Sea	Elson Lagoon	Beaufort Sea
Juvenile gadids	Gadidae		307	7	6	39		5
Pacific sand lance	<i>Ammodytes hexapterus</i>	1	50		3	4		16
Juvenile cottids	Cottidae	2	6		13	13		23
Capelin	<i>Mallotus villosus</i>	34	4			1		2
Arctic sculpin	<i>Myoxocephalus scorpioides</i>	18	10		2	5	1	1
Unidentified poacher	Agonidae	1	4	26	1	1		
Unidentified larvae			19	1		1		
Juvenile stichaeids	Stichaeidae		10			6		
Least cisco	<i>Coregonus sardinella</i>					1	14	
Arctic cod	<i>Boreogadus saida</i>	1	2	8				2
Yellowfin sole	<i>Limanda aspera</i>	11	1			1		
Longhead dab	<i>Limanda proboscidea</i>	2	6	1				3
Ninespine stickleback	<i>Pungitius pungitius</i>	6	1				1	
Juvenile snailfish	Liparidae	2	1	1	2			
Arctic cisco	<i>Coregonus autumnalis</i>					1	2	
Plain sculpin	<i>Myoxocephalus jaok</i>	1						
Fourhorn sculpin	<i>Myoxocephalus quadricornis</i>							2
Number of sites		4	7	3	2	4	3	3
Total catch		79	421	44	29	73	18	54
Mean catch per seine haul		20	60	15	15	18	6	18

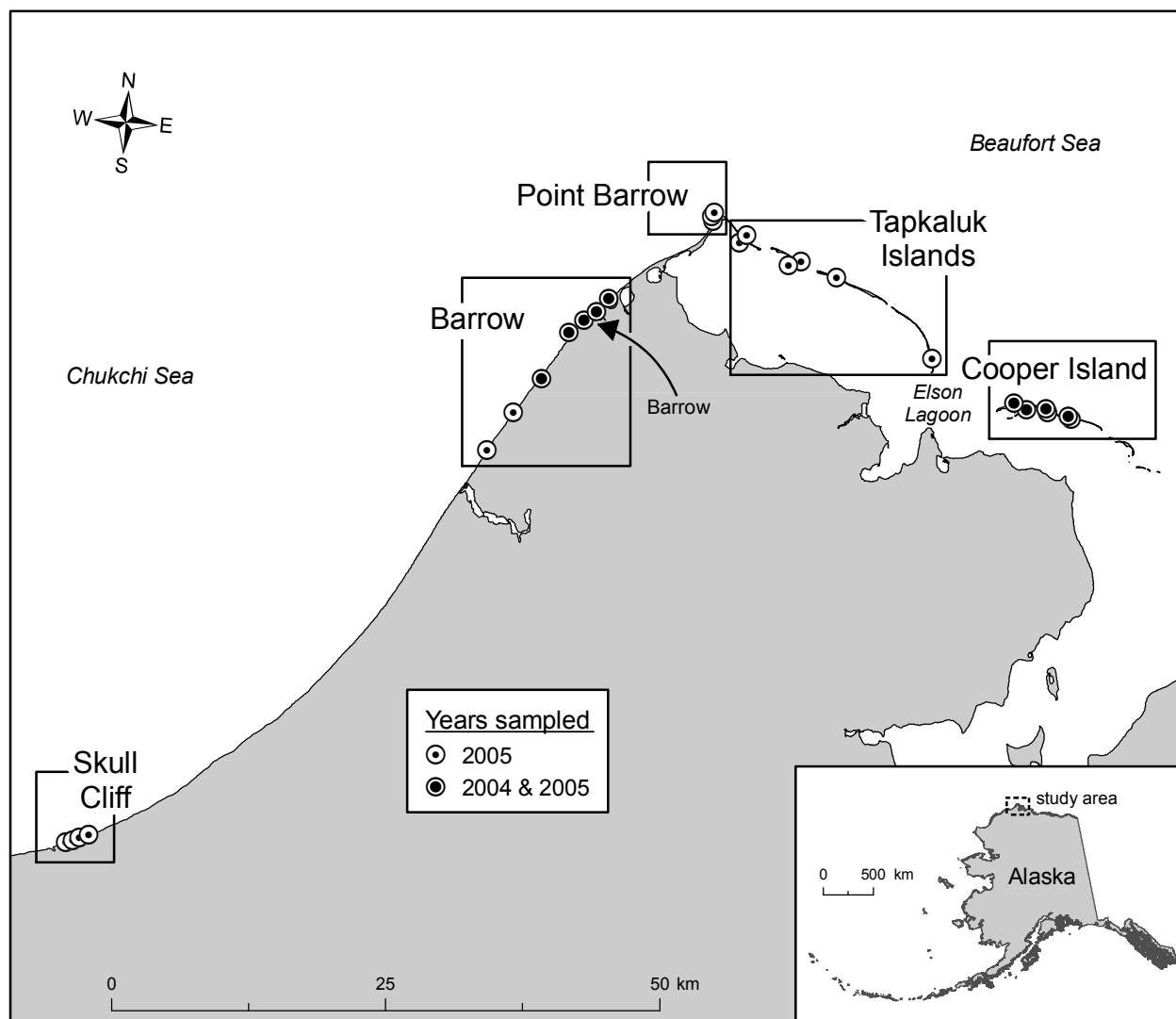


Figure 1. Twenty six sites sampled with a beach seine for fish assemblages at five locations near Barrow, Alaska, August 2004 and 2005.