

Cruise report for the 2011 NMFS Bering Sea trawl survey

Lauri L. Sadorus

International Pacific Halibut Commission

Robert Lauth

National Marine Fisheries Service

Abstract

The IPHC has participated in the NMFS annual Bering Sea shelf trawl survey since 1998. The 2011 standard survey took place from June 5 to July 25 and included two vessels. One vessel carried a biologist who sampled Pacific halibut for length, otoliths, gender, maturity, and prior hooking injuries, resulting in 1,664 samples. In addition, 97 samples were taken as part of a new clean otolith archive collection.

Introduction

In 2011, the International Pacific Halibut Commission (IPHC) participated in the National Marine Fisheries Service (NMFS) annual Bering Sea shelf trawl survey for the 14th straight year. The survey is a continuation of a time series started in 1975, and continued annually since 1979. Data collected on the trawl survey along with IPHC setline survey data and commercial catch information are used to create abundance estimates and map year-class strengths.

Two chartered fishing vessels, *F/V Alaska Knight* and *F/V Aldebaran*, were each staffed by six scientific crew, who carried out objectives related to stock assessment and year-class strength estimation for numerous species. The IPHC biologist was aboard the *F/V Alaska Knight* for the duration.

Objectives

The IPHC objective was to sample 100% of the halibut caught on one vessel for length, gender, maturity, otoliths, and prior hooking injuries. In addition to the general collection, a small subset of halibut were sampled as part of a clean otolith archive that is being constructed by the IPHC for future research (Wischniowski and Forsberg 2012). The information on prior hooking injuries is used to supplement data for a long-running IPHC special project also described in this report (Kaimmer 2012).

The primary NMFS objective was to continue the annual series of crab and groundfish assessment surveys for the eastern Bering Sea to provide information for the following purposes:

- to the North Pacific Fishery Management Council for understanding the distribution, abundance, and biological condition of important groundfish and crab resources.
- to the U.S. fishing industry for catch-per-unit effort and size composition of commercially-important groundfish species.
- to stock assessment scientists to support ongoing studies on the biology, behavior, and dynamics of key ecosystem components.

Survey area, vessels, and itinerary

The standard survey spanned a geographical region from the eastern Bering Sea (EBS) continental shelf from inner Bristol Bay to the shelf break, and from Unimak Pass to north of St. Matthew Island (Fig. 1). Two vessels were chartered by NMFS: *F/V Alaska Knight* and *F/V Aldebaran*. An IPHC biologist was aboard the *Alaska Knight* for the duration of the standard survey, and stayed aboard several additional days to help with NMFS-related special projects. The scientific crew boarded the *Alaska Knight* on June 1 in Dutch Harbor, where the first several days were spent setting up gear and testing equipment. The first standard survey tow was conducted on June 5. Fishing for the standard survey concluded on July 23rd for the *Alaska Knight* and the 25th for the *Aldebaran*.

Survey design

The standard survey consisted of 376 stations positioned on a 20x20 nmi grid on the continental shelf in the EBS, in depths ranging from 30-200 m. In areas surrounding St. Matthew and the Pribilof islands, grid block corners were also sampled to better assess blue king crab (*Paralithodes platypus*) concentrations. Survey sampling began in Bristol Bay and progressed westward toward the EBS outer shelf along alternate grid columns.

A NMFS 83-112 Eastern trawl, which has a 25.3-m (83 ft) headrope and 34.1-m (112 ft) footrope, was used. The net was attached to 54.9-m (30 fathoms) paired dandyines. Each lower dandyine had a 0.61-m chain extension connected to the lower wing edge to improve bottom tending characteristics. Steel “V”-doors measuring 1.8 x 2.7 m and weighing 816 kg were used to spread the net. Equipment that recorded data about each tow was attached to the trawl net: net mensuration equipment recorded net height and width while fishing, a Sea-Bird™ data logger recorded temperature and depth, and a tilt sensor was used to detect when the footrope was in contact with the bottom.

Halibut sampling

Halibut were sampled for length on all standard survey tows aboard both vessels. Halibut from tows aboard the *F/V Alaska Knight* were additionally sampled for otoliths, gender, maturity, and prior hooking injuries. Halibut caught in tows at the corner crab stations, the duplicate tows and all tows aboard the *F/V Aldebaran* were excluded from the individual specimen sampling but were eligible for inclusion in the clean otolith collection if the random sampling method dictated that the station be sampled as described in Wischiowski and Forsberg (2012). Halibut from two of six near-shore exploratory tows were sampled. Data from these exploratory tows will be added to the database but distinguished as separate from the standard survey. Halibut from the remaining four exploratory tows were measured and discarded alive if possible.

A determination of gender and maturity was made via macroscopic gonad examination for each sampled halibut. Female fish were assessed with four stages of maturity: immature, ripening, ripe/spawning, and spent/resting. Males had only two maturity stages: immature and mature. Immature for both genders meant that the fish would not be expected to participate in the upcoming spawning season. The other stages represented various phases of the spawning process. Fish in those categories were considered mature enough that they could participate in the upcoming spawning season.

Information concerning injuries to the mouth, jaw, or eye caused from longline gear has been collected in recent years as part of an IPHC special project. The objective was to assess the types of hooking injuries a fish might sustain and still survive. Full results from this project can be found in Kaimmer (2012).

Results

During the standard survey, the *F/V Alaska Knight* conducted 196 tows: 183 standard tows, 6 crab tows, 6 exploratory near-shore tows, and 1 gear test tow. On average, four to five tows were conducted daily. In total, 1,664 halibut were captured and sampled (Table 1): 1,285 on trip one, 340 on trip two, and 39 on trip three. Of those sampled, 805 were female, of which 1.4% were considered mature and 859 were male, 57.4% of which were considered mature (Table 2). Prior hooking injuries were found on 3.3% of the fish in the standard survey; 30 showed minor damage, 25 showed moderate damage, and none were severely damaged.

In addition, there were 107 halibut samples collected during the exploratory near-shore stations and 97 otolith pairs were collected for the clean otolith archive.

References

- Kaimmer, S. M. 2012. Prior hook injuries: results from the 2011 IPHC SSA and NMFS surveys. Int. Pac. Halibut Comm. Report of Assessment and Research Activities 2011: 539-552.
- Wischniowski, S. and Forsberg, J. 2012. Clean otolith archive collection. Int. Pac. Halibut Comm. Report of Assessment and Research Activities 2011: 453-458.

Table 1. Number of halibut sampled by 5-cm fork length category and gender (female=F and male=M) for all standard stations sampled on the 2011 NMFS Bering Sea shelf trawl survey.

Length (cm)	Trip 1			Trip 2			Trip 3			Grand Total
	F	M		F	M	Total	F	M		
15-19	5	6	11							11
20-24	2	19	21							21
25-29	6	18	24		2	2				26
30-34	87	124	211	3	7	10				221
35-39	52	53	105	9	6	15				120
40-44	32	72	104	13	22	35	3		3	142
45-49	71	120	191	30	40	70	1	1	2	263
50-54	96	91	187	26	38	64	3	1	4	255
55-59	89	98	187	27	23	50		1	1	238
60-64	72	42	114	18	9	27	4	1	5	146
65-69	31	15	46	10	4	14		2	2	62
70-74	20	13	33	8	5	13	2	2	4	50
75-79	12	5	17	6	3	9	2		2	28
80-84	9	3	12	8	2	10	2	2	4	26
85-89	9	2	11	5		5	4	2	6	22
90-94	7		7	2	1	3	1		1	11
95-99	1		1	3	1	4	1		1	6
100-104	1		1	1		1				2
105-109	2		2	2	1	3	2	1	3	8
110-114					1	1				1
115-119							1		1	1
125-129				2		2				2
135-139				2		2				2
Total	604	681	1,285	175	165	340	26	13	39	1,664

Table 2. Assessed maturity rating of Pacific halibut caught on the NMFS Bering Sea trawl survey in 2011. Females can receive one of four ratings: 1=immature, 2=ripening, 3=ripe/spawning, 4=spent/resting. Males can receive one of two ratings: 1=immature and 2=mature.

Length (cm)	Females				Males			Grand Total
	1	2	4	Total	1	2	Total	
15-19	5			5	6		6	11
20-24	2			2	19		19	21
25-29	6			6	20		20	26
30-34	90			90	128	3	131	221
35-39	61			61	51	8	59	120
40-44	48			48	37	57	94	142
45-49	102			102	57	104	161	263
50-54	125			125	33	97	130	255
55-59	115	1		116	13	109	122	238
60-64	94			94	1	51	52	146
65-69	41			41	1	20	21	62
70-74	30			30		20	20	50
75-79	20			20		8	8	28
80-84	19			19		7	7	26
85-89	18			18		4	4	22
90-94	9		1	10		1	1	11
95-99	3	1	1	5		1	1	6
100-104	2			2				2
105-109	3	3		6		2	2	8
110-114						1	1	1
115-119		1		1				1
125-129	1		1	2				2
135-139		1	1	2				2
Grand Total	794	7	4	805	366	493	859	1,664

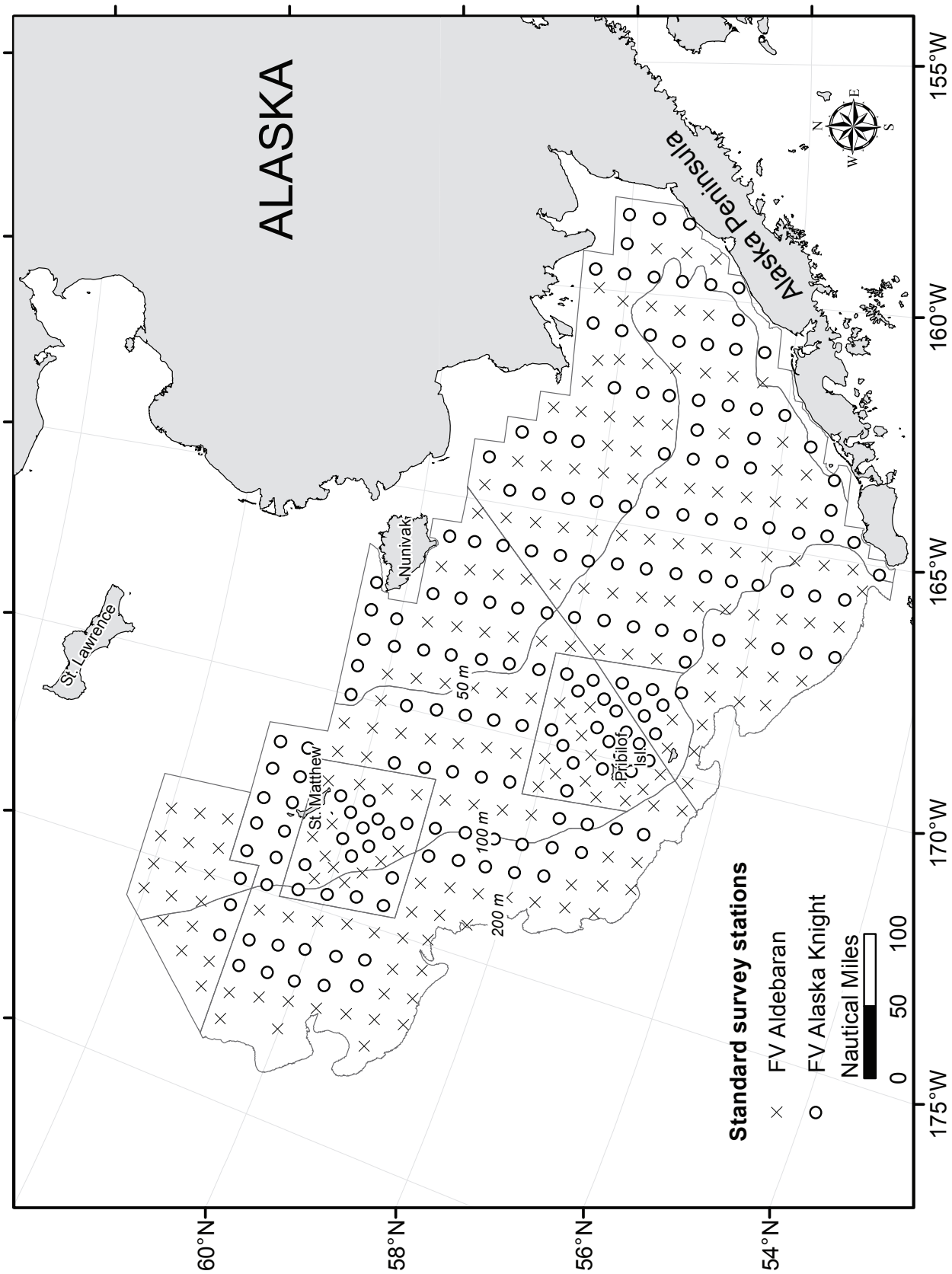


Figure 1. Planned fishing locations for the 2011 NMFS Bering Sea trawl survey.