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Technical Report No. 27

Regulations of the Pacific Halibut Fishery, 1977 - 1992

by

Stephen H. Hoag, Gordon J. Peltonen, and Lauri L. Sadorus

Technical Report No. 28

The 1987 Bristol Bay Survey and the Bristol Bay Halibut Fishery, 1990 - 1992

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ABSTRACT

Bristol Bay is considered a nursery area for Pacific halibut and was closed to commercial halibut fishing from 1967 to 1989. In the summer of 1987 the International Pacific Halibut Commission (IPHC) conducted a survey in Bristol Bay to assess the commercial stock size of halibut and the incidence of sublegal fish. Three vessels fished the coastal area from Cape Newenham to Cape Seniavin. The catch per unit effort was 6 pounds, well below the catch per unit effort observed in other areas of the Bering Sea. The catch of sublegal halibut was low; less than 0.5 halibut per unit effort. The survey results suggested that a limited commercial fishery in Bristol Bay would not have an adverse impact on juvenile stocks. The IPHC extended the regulatory Area 4E boundary to allow commercial fishing in Bristol Bay in 1990. Fishing success has been poor compared to other areas and the number of vessels reporting landings in the fishery decreased from 97 in 1990 to 19 in 1992. Annual Bristol Bay catches have ranged from 14,000 to 26,000 pounds.

The 1987 Bristol Bay Survey and the Bristol Bay Halibut Fishery, 1990-1992

by

Heather L. Gilroy and Stephen H. Hoag

INTRODUCTION

The International Pacific Halibut Commission (IPHC) assesses the Pacific halibut (*Hippoglossus stenolepis*) stock and manages the fishery for Canada and the United States. Dunlop et al. (1964) reviewed the results of early investigations in the Bering Sea and concluded that concentrations of "commercial-sized halibut" are restricted to a narrow band on the edge of the continental shelf between Unimak Pass and the Pribilof Islands, and to a lesser extent along the Aleutian Islands. On the flats (east of a line between Cape Sarichef, Unimak Island and Cape Newenham, extending into Bristol Bay), commercial-sized halibut are distributed sparsely and younger halibut (two to four years old) are abundant. Hardman (1970) continued the examination of Bering Sea data for 1964 to 1970 and also concluded there were marked differences in size and age composition of halibut between some grounds in the Bering Sea.

Although there appears to be little intermingling between grounds in the Bering Sea (Hardman 1969), halibut move seasonally between the shallows of Bristol Bay and the deeper waters of the Bering Sea, depending on environmental conditions such as bottom temperature and ice cover (Best 1981). Halibut were found to move into Bristol Bay by June as the warming process took place. During those winter months when there was ice cover, halibut were concentrated in deeper, warmer water along the continental edge.

In the 1960s trawl surveys were conducted to monitor the distribution and abundance of juvenile halibut in the eastern Bering Sea (Best 1969a, b; 1970). In the 1963 and 1965 surveys, setline gear was also fished concurrently with the trawl gear. These investigations showed that trawl-caught halibut were smaller than setline-caught halibut, and that Bristol Bay was inhabited by a large number of halibut less than 65 cm long. As a result, Bristol Bay was designated as a nursery area and was closed to all halibut fishing in 1967 (IPHC 1968).

In the mid 1980s a proposal for a Bristol Bay commercial halibut fishery was presented to the IPHC by Bristol Bay industry groups. They argued that halibut over the legal size limit (81.3 cm) were available and that small halibut could be avoided. In 1987 the IPHC agreed to conduct an exploratory setline survey of the closed area to assess the commercial size stock and incidence of sublegal halibut. Although the scope of the survey was small, the results provided the scientific basis for the Commission's decision to open a portion of the closed area to commercial fishing in 1990.

This report presents the results of the 1987 Bristol Bay survey and the ensuing commercial fishery during 1990-1992.

1987 SURVEY

Methods

The objectives of the survey were to systematically sample the coastal area from Cape Newenham to Cape Seniavin and to fish areas where the local community reported catches of legal-sized halibut. The *F/V Valorous* was chartered to fish the complete coastal area of Bristol Bay moving an average of 19 miles each day; each day's fishing location was chosen by the skipper. The *Valorous* fished for 11 days from July 23 to August 2, 1987 at depths ranging from 4 to 32 fathoms. Two local Dillingham vessels, the *F/V Coral* and the *F/V Erica C*, were chartered to target on coastal areas where the local community thought halibut were concentrated. These vessels fished between July 27 and August 11, 1987. The *Erica C* and *Coral* fished for 8 and 6 days, respectively. Data from one day (two sets) from the *Coral* were not used as the bait was rotten and the observer was not aboard when the skates were finally hauled, after a two-day soak. The *Erica C* and *Coral* fished at depths between 2 and 21 fathoms.

All vessels fished with "snap-on" setline gear. The *Valorous* used No. 3 circle hooks spaced at 21-foot intervals and baited with herring and Pacific cod. The *Coral* and *Erica C* used No. 3 and No. 5 circle hooks spaced at 24 to 36-foot intervals and baited with salmon, herring, and octopus. All fishing effort was standardized to skates of 100 hooks at 18-foot intervals. The standard skates were calculated based on equations from Hamley and Skud (1978) using hook spacing (rig) and number of skates laid. The catch per unit of effort (CPUE) was calculated by (Sullivan, pers. comm.)[1]:

CPUE = catch / standard skate.
Where standard skate was calculated as

$$S_s = S_h * f_r * \frac{n_h}{100}$$

where S_s = standard skate
S_h = skates hauled
f_r = correction factor for rig
n_h = number of hooks

when f_r = 1.09 for rig > 19 and <= 22 foot
f_r = 1.16 for rig > 22 and <= 24 foot
f_r = 1.20 for rig > 24 and <= 29 foot
f_r = 1.34 for rig > 29 and <= 38 foot.

The *Valorous*, *Erica C*, and *Coral* hauled 330.0, 63.4, and 37.2 standard skates respectively. The soak time ranged from 4 to 10 hours on the *Valorous* and from 5 hours to 21 hours on the *Coral* and *Erica C*.

There were 210 halibut caught during the survey of which 166 were tagged and 44, that were not suitable for tagging, were killed to provide age and sex data. The 44 fish killed were from the *Erica C* and *Coral* and were sold in Dillingham. All of the halibut were measured from the tip of the lower jaw to the extreme end of the middle of the tail. The other species caught were recorded and their weights were estimated by set.

[1]Sullivan, P.J. Int. Pac. Halibut Comm. P.O Box 95009, Seattle, WA 98145.

Results and Discussion

The survey results are based on 431 standard skates during 25 vessel-days. Only 210 halibut were caught of which all were measured, 42 aged, and 166 tagged. Although conclusions may be speculative because of meager data and sampling effort, the length distribution, sex composition, and CPUE of the halibut were compared to previous data from other surveys in the Bering Sea.

The halibut lengths ranged from 52 cm to 133 cm for the *Valorous* and from 40 cm to 129 cm for the *Coral* and *Erica C.* Figure 1 shows the length distribution of halibut from the 1987 survey (all vessels) and from the longline experiments in 1963 and 1965 (Best 1970). The earlier longline surveys included the inside, not just the coastal area, as well as the area just outside of Bristol Bay. Even though the 1963 and 1965 surveys encompassed a larger area of Bristol Bay, the length distributions were similar to those of the 1987 survey.

The length distribution from the 1987 survey is similar to a length distribution observed from the Slime Bank in 1976, the farthest west coastal area of the closed nursery ground (Figure 2). Of the 422 fish from the Slime Bank, 45% were sublegal ($\leq$ 81 cm), similar to the 42% found in the 1987 Bristol Bay survey. By weight, the sublegal fish represented 20% and 15% in Bristol Bay and on the Slime Bank, respectively.

The length distribution and sex composition of halibut in the 1987 Bristol Bay survey were compared to those from other setline research surveys which took place between 1960 and 1977 in Bering Sea (Hoag et al. 1979). Over 42,000 halibut were measured during these surveys and a lower proportion of the fish were sublegal than in Bristol Bay (Figure 3); 14% of the fish were sublegal compared to 42% in Bristol Bay. Similar proportions of sublegal

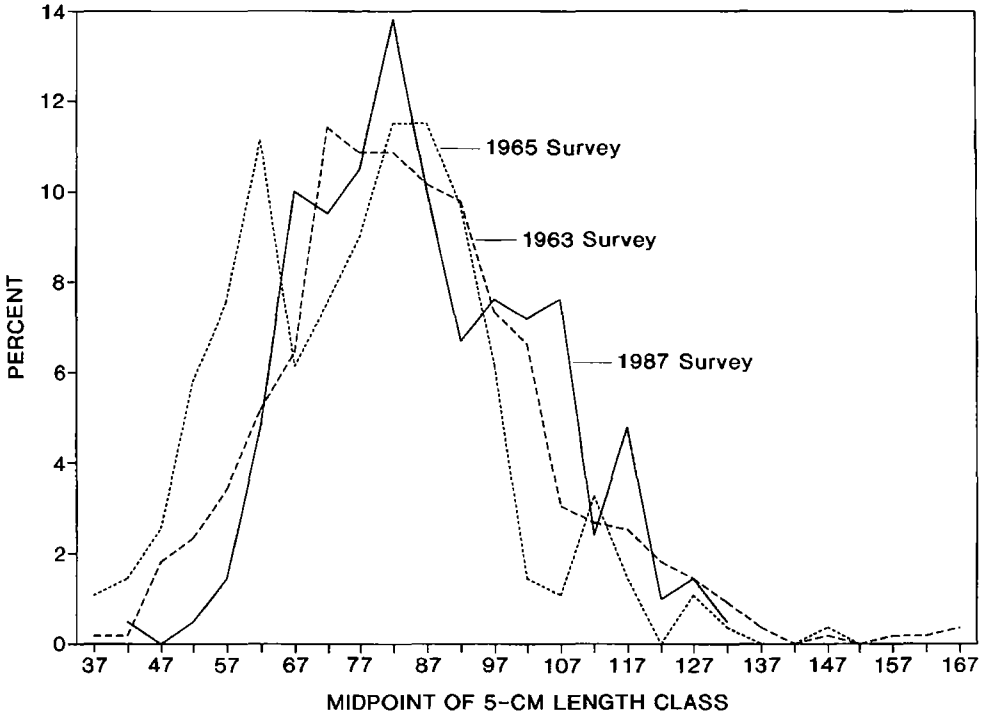

Figure 1. **Length distribution of halibut from the setline surveys in Bristol Bay. (1963 and 1965 surveys from Best 1970).**

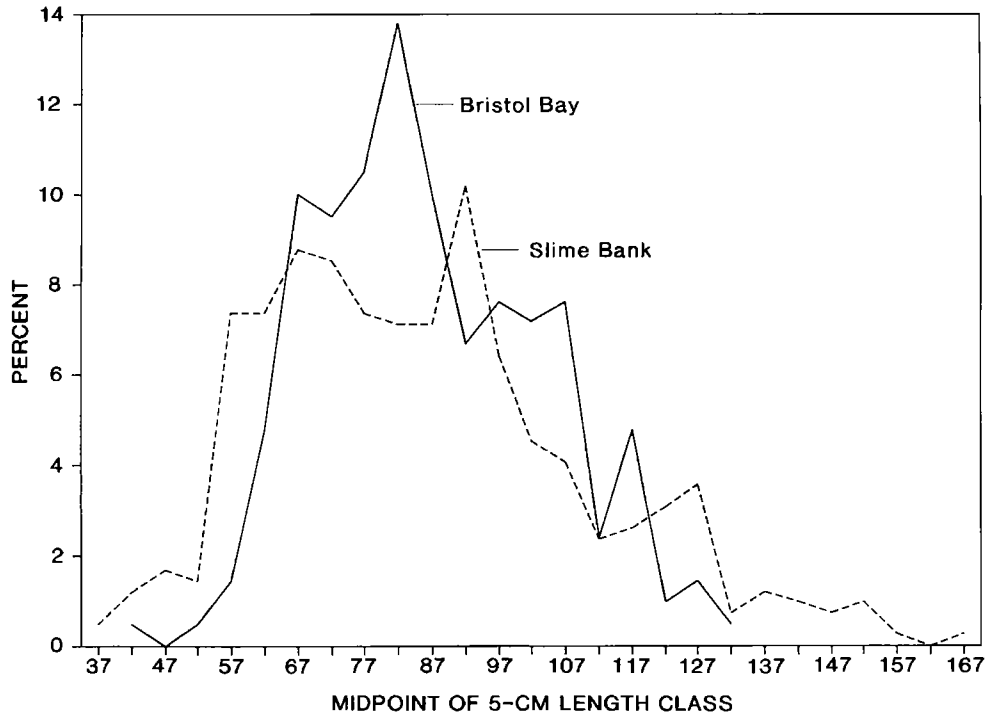

Figure 2. **Length distribution of halibut from the 1987 Bristol Bay setline survey and from the 1976 Slime Bank setline survey.**

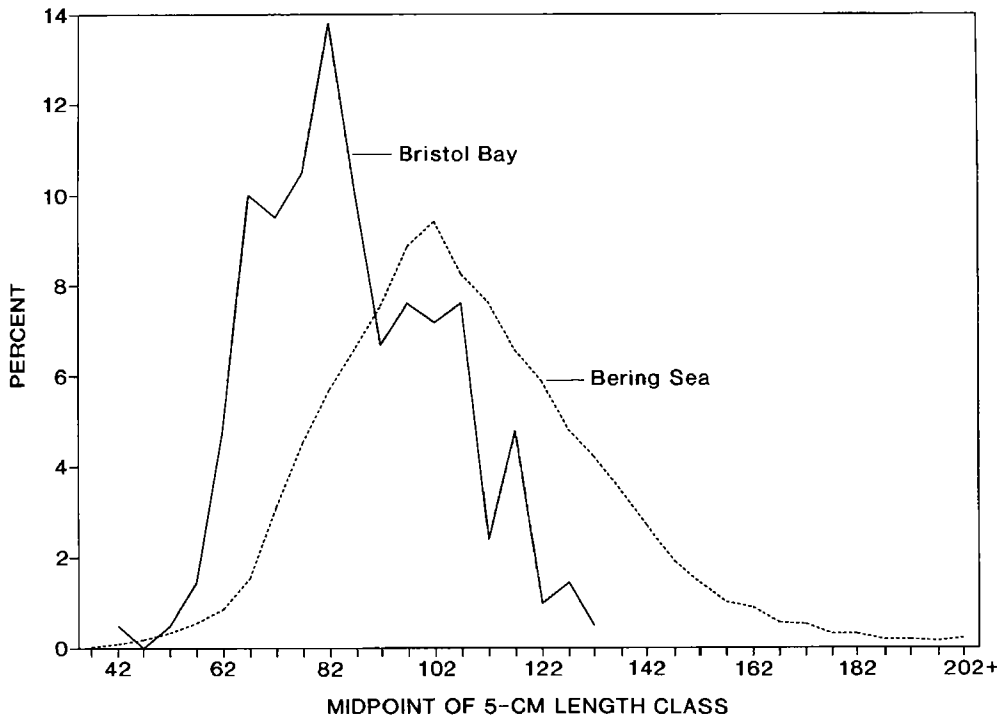

Figure 3. **Length distribution of halibut from the 1987 Bristol Bay setline survey and from the 1960-1977 Bering Sea setline catches. (Bering Sea from Hoag et al. 1979).**

Table 1. A summary of the tag recoveries from the Bristol Bay survey.

Tag Number	Recovery Date	Length		Location	
		Release	Recovery	Release	Recovery
44032	March 1989	85 cm	94 cm	58°26'N x 161°12'W	56°05'N x 165'05'W
44035	February 1989	100 cm	115 cm	58°25'N x 160°58'W	56°09'N x 163°30'W

halibut are still found in the Bering Sea. In a 1992 setline survey, 18.6% were sublegal (St-Pierre and Larsen, Unpub.[2]). Although there were more sublegal fish in Bristol Bay, the sex composition of 12% males in Bristol Bay was similar to the rate of 16% males found in the Bering Sea during the setline research catches (Hoag et. al. 1979).

The age composition of halibut found in Bristol Bay was similar to that found on the Slime Bank soon after the grounds were first fished with setline gear in 1952 (Dunlop et al. 1964). Although age was determined for only 42 fish from the 1987 Bristol Bay survey, the halibut ranged in age from 5 to 11 years old with an average age of 8.5 years. On the Slime Bank 80% of the halibut were under 12 years of age. Younger halibut of 2 to 4 years old have been found previously in Bristol Bay (Dunlop et al. 1964) but due to gear selectivity, these young fish are too small to be caught on the longline gear used in this survey. Small halibut cannot be caught effectively with No. 3 and No. 5 circle hooks.

Of the 166 fish tagged during this survey, 2 were recovered (1% recovery rate) by trawlers just outside of Bristol Bay in the winter of 1989 (Table 1), supporting the theory that fish move from Bristol Bay to the deeper grounds outside of Bristol Bay in the winter (Best 1977). The 1% recovery rate is within the range of recovery rates (0% to 11%) found from the tagging experiments in the Bering Sea between 1930 and 1959, and similar to the 3% recovery rate from the Slime Bank (Dunlop et al. 1964).

The location of each set and the catch of halibut by size category are provided in Appendix Table 1. The CPUE for legal and sublegal halibut are summarized by similar fishing locations (Figures 4 and 5). The *Valorous* caught 65 sublegal halibut and 66 legal halibut on 330 standard skates. The average weight (dressed, head-off) was 6.8 pounds for sublegal halibut and 18.7 pounds for legal halibut. The *Coral* and *Erica C* caught 24 sublegal halibut and 55 legal halibut on 101 standard skates. The average weight was 8.1 pounds for sublegal halibut and 23.4 pounds for legal halibut.

The average CPUE of legal halibut was 3.7 pounds for the *Valorous* and 12.8 pounds for the *Coral* and *Erica C*, and ranged from 0 to 26.7 pounds by fishing locations (Table 2). The CPUE of sublegal halibut was 1.3 pounds for the *Valorous* and 1.9 pounds for the *Coral* and *Erica C*, and ranged from 0 to 6.6 pounds by location. Thus, CPUE of sublegal halibut from this survey was small (less than .5 halibut per standard skate). The best fishing of the surveyed area occurred around the Hagemeister Island and Togiak Bay area.

The average CPUE of 6 pounds per skate found in Bristol Bay is well below the average catch per skate observed in other parts of the Bering Sea. For comparison, CPUE in the commercial fishery in 1987 in the other Area 4 IPHC regulatory areas (Figure 6) were 334, 219, 378, and 244 pounds per skate for Areas 4A, 4B, 4C, and 4D, respectively. Commercial CPUE data for Area 4E were not available in 1987 but averaged 50 pounds per skate in 1986. The highest CPUE of 27 pounds per skate found in Bristol Bay is closest to the CPUE found in Area 4E. One factor that may have reduced the Bristol Bay catch during this survey was a

[2]St.-Pierre,G. and M.J. Larsen. Unpub. 1992 Bering Sea and Gulf of Alaska Longline Survey. Int. Pac. Halibut Comm. Report of Assessment and Research Activites 1992: 241-250.

Table 2. Summary of catch (net pounds) and CPUE of Pacific halibut for each vessel by station.

					SUBLEGALS				LEGALS			
Vessel	Station	Location N Lat W Long	Depth (F)	Std Skates	No.	No./sk.	lbs.	lbs./sk.	No.	No/sk.	lbs.	lbs./sk.
Valorous	1	58°28' 161°24'	8-13	30.0	13	.43	83.7	2.8	21	0.40	198.6	6.6
	2	58°27' 161°00°	9-11	30.0	9	.30	65.6	2.2	11	0.37	230.1	7.7
	3	58°32' 158°38'	4-10	30.0	5	.17	34.7	1.2	12	0.40	279.6	9.3
	4	58°21' 159°36'	12-15	30.0	0	0	0	0	5	0.17	118.2	3.9
	5	58°14' 159°02'	9-10	30.0	3	.10	25.6	0.9	2	0.07	23.8	0.8
	6	58°07' 158°04'	15-18	30.0	1	.03	9.0	0.3	2	0.07	31.9	1.1
	7	57°52' 158°35'	20-23	30.0	2	.10	16.2	0.5	3	0.10	43.3	1.4
	8	57°41' 158°27'	19-23	30.0	2	.10	10.9	0.4	2	0.07	38.0	1.3
	9	57°05' 158°50'	11-21	30.0	4	.13	34.8	1.2	2	0.07	35.6	1.2
	10	56°53' 159°20'	14-21	30.0	3	.10	21.9	0.7	12	0.40	191.6	6.4
	11	56°17' 160°11'	17-32	30.0	23	.77	140.1	4.7	3	0.10	44.9	1.5
		TOTALS		330.0	65	.20	442.51	1.3	66	0.20	1235.6	3.7
Erica C	1	58°47' 161°52'	4-21	5.2	0	0	0	0	5	0.96	98.1	18.9
& Coral	2	58°40' 160°42'	4-6	6.0	4	.67	39.3	6.6	0	0	0	0
	3	58°45' 160°15'	2-17	31.4	1	.03	9.0	0.3	33	1.05	837.1	26.7
	4	58°37' 159°55'	11-16	8.4	1	.12	10.6	1.3	2	0.24	29.7	3.5
	5	57°37' 158°00'	3-14	41.2	17	.41	128.3	3.1	15	0.36	323.2	7.9
	6	58°15' 157°43'	5-8	8.4	1	.03	7.5	0.9	0	0	0	0
		TOTALS		100.6	24	.24	194.7	1.9	55	0.55	`1288.1	12.8

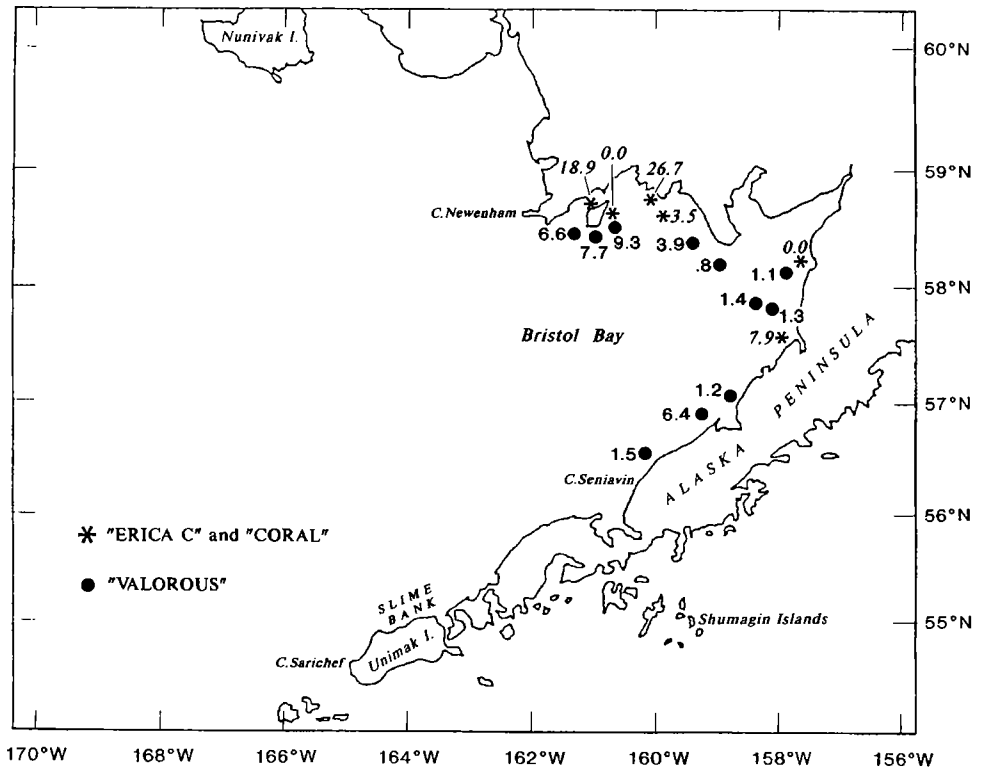

Figure 4. **Locations fished by all vessels with CPUE of legal pounds per standard skates.**

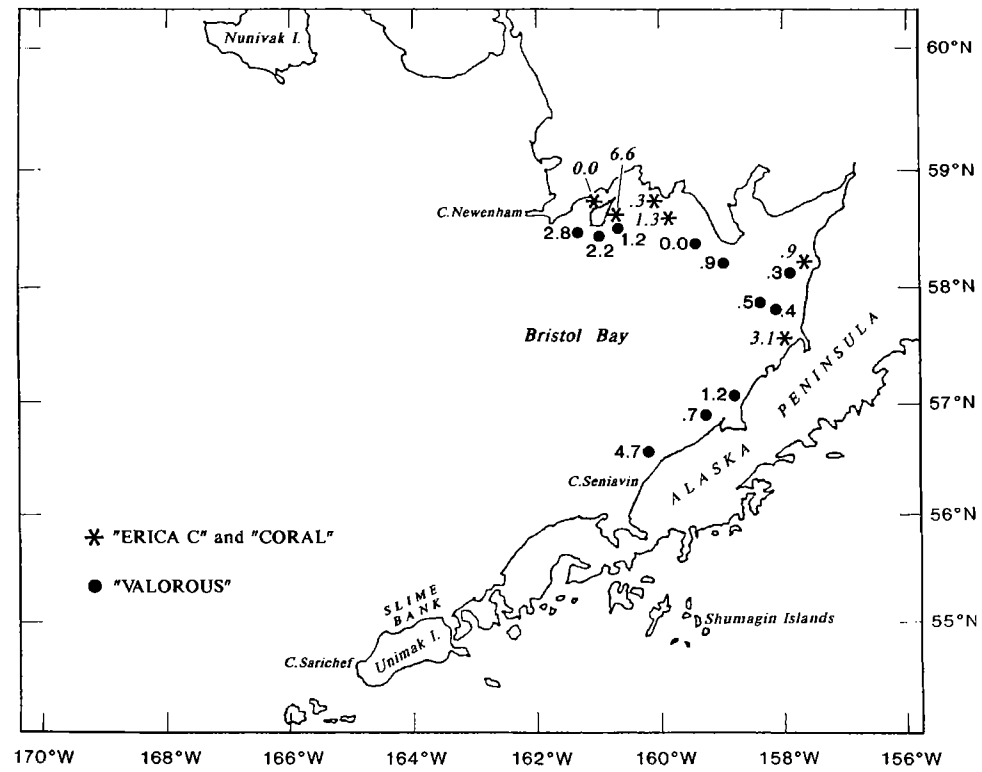

Figure 5. **Locations fished by all vessels with CPUE of sublegal pounds per standard skates.**

high incidence of starfish on the gear. Catches of starfish or other species are not summarized in this report but, except for starfish, there were very few other species caught. These species were grey cod, sculpin, yellowfin sole, dogfish, and skate. Very few baited hooks were retrieved.

In conclusion, the results from this survey suggest that the length distribution of halibut in Bristol Bay is similar both to that observed in the 1960s, and to that observed on the Slime Bank in 1976. The percentage of sublegal fish in Bristol Bay is higher than in the other Bering Sea areas. The survey, however, also showed that the catch of both legal and sublegal fish in Bristol Bay is low. Therefore, a small fishery would have little effect on the sublegal fish.

THE BRISTOL BAY FISHERY

In 1990 the IPHC opened Bristol Bay to commercial halibut fishing by extending the Area 4E boundary to include Bristol Bay (Figure 7). Prior to the 1990 fishing periods the U.S. government split Area 4E into two subareas (referred to here as Bristol Bay and Nelson Island), each with its own catch limit. The U.S. government limited the Bristol Bay area to 30% of the total Area 4E catch limit.

The North Pacific Fishery Management Council (NPFMC) approved a regulation to limit vessels to a maximum catch of 6,000 pounds of halibut per fishing period in Area 4E in 1988, and this regulation also applies to Bristol Bay. The purpose of this regulation is to discourage larger outside vessels from participating in the fishery. Another NPFMC regulation for Area

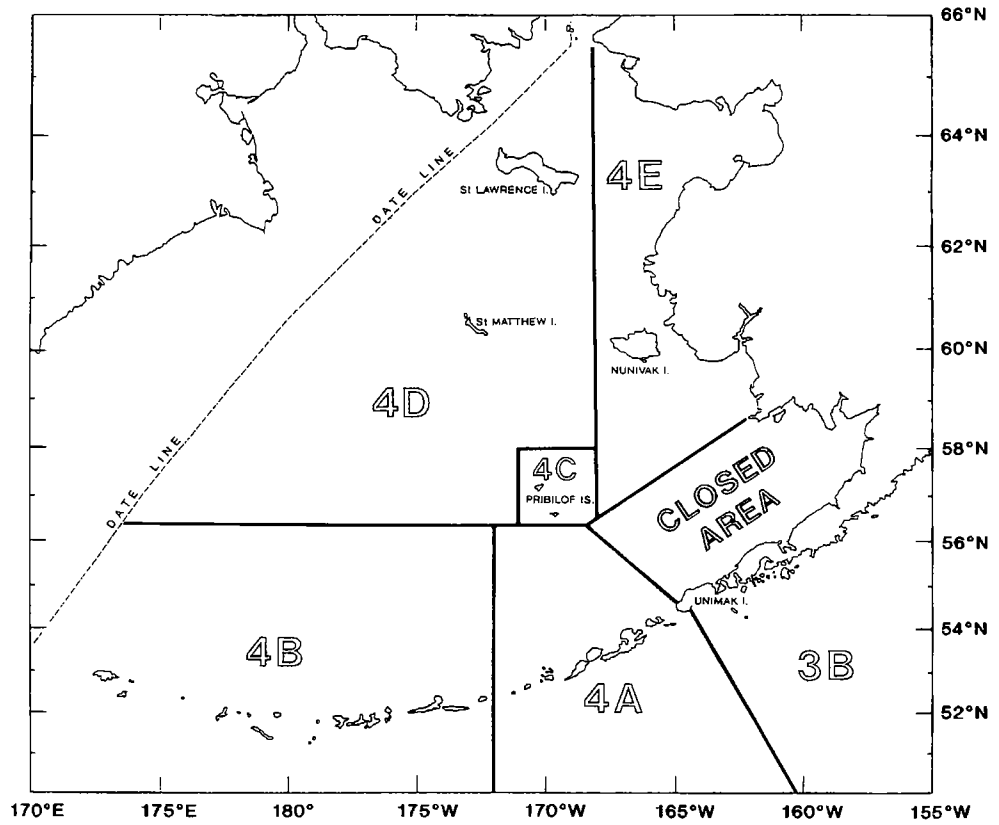

Figure 6. IPHC Regulatory Areas in the Bering Sea in 1987.

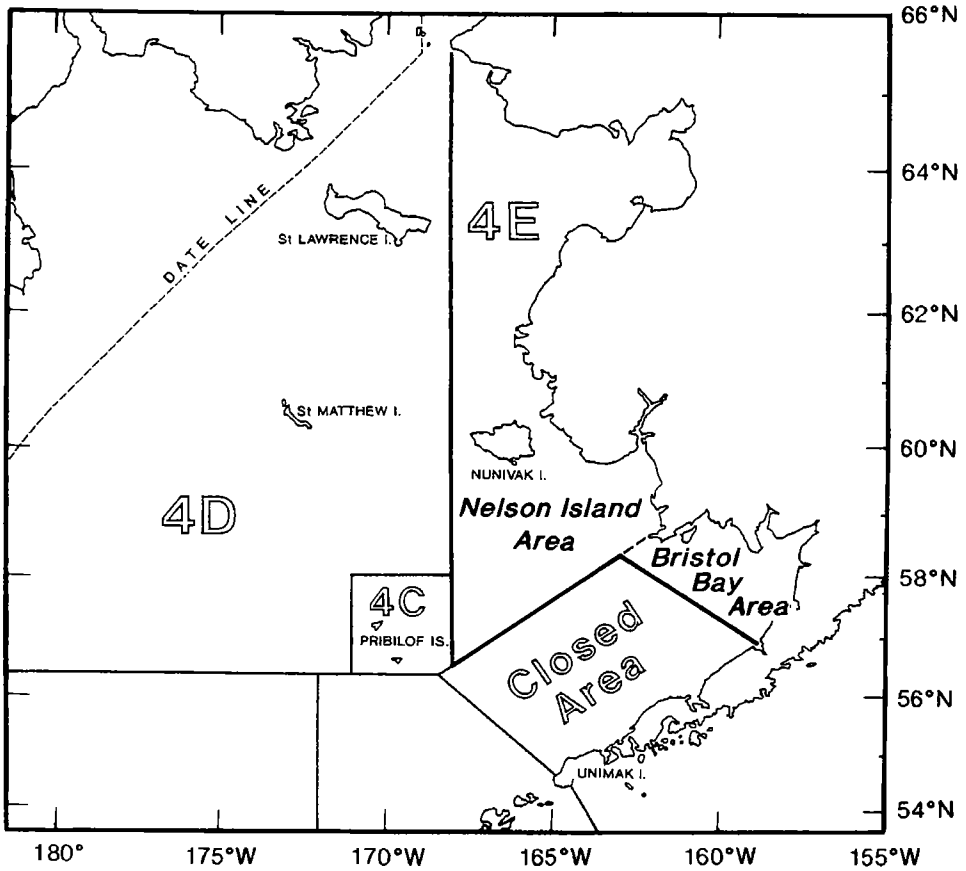

Figure 7. **IPHC Regulatory Area 4E showing the Bristol Bay and Nelson Island subareas.**

4E which applies to the Bristol Bay area is that any operator of a vessel that fished outside of Area 4E must "clear" (documenting the presence of the vessel) in Dutch Harbor or Akutan before fishing and prior to unloading. This regulation allows better monitoring of the fishery, but is also intended to discourage larger outside vessels from participating in the Area 4E fishery.

Although extending Area 4E to include Bristol Bay increased fishing opportunity, the Area 4E catch limit was not reached in 1990 or 1992 (Table 3).

In 1990, the catch limit in the Bristol Bay portion of Area 4E was 30,000 pounds. During the first (48 hours) and second (24 hours) fishing periods, 20,554 and 4,847 pounds were landed, respectively (Table 4). The second fishing period was shortened to 24 hours from 48 hours to avoid exceeding the catch limit. Although the seasons were only a week apart, the number of vessels landing halibut decreased from 93 to 22 for the second fishing period. The season was re-opened in late July and August to allow four more days of fishing but no catch was taken. Therefore, the season was closed with a total of 25,401 pounds landed, 4,599 pounds under the catch limit.

In June of 1990 it appeared that Bristol Bay might close for the year, with the Nelson Island catch limit not being taken. Although this did not occur in 1990, a regulation was passed in 1991 which stipulated that 50% of any remaining catch limit in Nelson Island

Table 3. A summary of the Pacific halibut commercial catch and catch limits for Area 4E and Bristol Bay by year (pounds, head-off, eviscerated).

Year	Area 4E		Bristol Bay	
	Catch Limit	Catch	Catch Limit	Catch
1990	100,000	60,300	30,000	25,401
1991	100,000	104,200	30,000	25,743
1992	130,000	72,200	39,000	14,439

Table 4. A summary of the number of vessels, catch (net pounds), average pounds per day in the Bristol Bay fishery by fishing period.

Year	Fishing Period	No. of Vessels Landing Halibut	Net Pounds	Avg lbs/vessel/ day
1990	6/1-3 (48 hrs)	93	20,554	110
	6/7-8 (24 hrs)	22	4,847	220
	7/31-8/1 (24 hrs)	0	0	0
	8/7-8 (24 hrs)	0	0	0
	8/21-22 (24 hrs)	0	0	0
	8/28-29 (24 hrs)	0	0	0
1991	6/1-3 (48 hrs)	33	17,148	270
	6/4-6 (48 hrs)	14	6,862	245
	6/7-9 (48 hrs)	2	792	198
	8/1-3 (48 hrs)	2	941	235
	8/4-15[1]	0	0	0
1992	5/31-6/2 (48 hrs)	16	9,445	295
	6/3-5 (48 hrs)	5	2,323	233
	6/6-8 (48 hrs)	5	2,272	227
	6/9-11 (48 hrs)	1	399	200
	6/12-9/18[2]	0	0	0
	9/19-10/31 (42 days)	0	0	0

[1]4 48-hour fishing periods
[2]34 48-hour fishing periods

would be transferred to Bristol Bay, after August 1. This regulation was to allow Bristol Bay more fishing time if it appeared that the total Area 4E catch limit might not be attained.

During the first three 1991 Bristol Bay fishing periods of 6/1-3, 6/4-6, and 6/7-9 the catches were 17,148, 6,862, and 792 pounds, respectively. The season was then closed to avoid exceeding the catch limit. By August 1 there were about 9,000 pounds landed in Nelson Island, thus half of the 61,000 pound catch limit became available in Bristol Bay. Therefore, the area re-opened on August 1 for five 48-hour fishing periods. Two vessels landed 941 pounds during the first August fishing period, after which no additional landings were made. By August 15, the 70,000 pound Nelson Island catch limit was taken; thus, the regulation of transferring catch from Nelson Island to Bristol Bay had no effect on Bristol Bay. Bristol Bay also closed on August 15 when the 30,000 pound catch limit was estimated to be taken. In fact, only 25,743 pounds were taken.

In 1992, 14,439 pounds of the 39,000 pound catch limit were landed during the first four 48-hour fishing periods in June. Immediately following this, the area remained open to fishing for 34 48-hour fishing periods but there were no landings. The area was then open continuously for 42 days between September 19 and October 31. As in 1991, additional catch limit became available from Nelson Island on August 1. Bristol Bay closed on October 31 with a catch of 14,439 pounds, less than half the original catch limit.

Catch per skate data are not available but the average vessel's catch per day provides a measure of fishing success. During the first period, 93 vessels had an average catch per day of 110 pounds. Only 22 vessels took part in the next opening and the average doubled to 220 pounds per day. The less successful fishers apparently dropped out in 1991 and 1992, when relatively few vessels fished, and the daily catch rate varied from about 200 to 300 pounds per day.

Only three non-local vessels landed halibut from the area during the three year period (Table 5). Non-local vessels are defined here as vessels which had to "clear" because they also fished in other IPHC regulatory areas. These three vessels averaged 3,400 pounds per fishing period. None landed the maximum fishing period limit of 6,000 pounds. The larger non-local vessels had a higher average catch per fishing period than the local vessels.

In conclusion, the low local abundance of halibut and the restrictive regulations (fishing period limits and clearance procedures) have limited the participation of non-local vessels in the Bristol Bay fishery. There has been little or no interest in the fishery by local vessels except for in June and the interest has decreased rapidly over the three year period. The total number of local and non-local vessels participating in the fishery has decreased from 97 to 19. However, the fishery does provide some opportunity for a few local fishers. Further, there is no evidence that this limited fishery will adversely impact either adult or juvenile populations in Area 4E.

Table 5. The number of vessels and catch by local and non -local vessels for Bristol Bay by year.

Year	Locals			Non-Locals		
	# of Vessels	# of Trips[1]	Total Pounds	# of Vessels	# of Trips[1]	Total Pounds
1990	97	115	25,401	0	0	0
1991	37	48	15,463	3	3	10,280
1992	19	27	14,441	0	0	0

[1] Trips=the number of vessel-landings per year (a vessel is counted once per fishing period even if unloads several times).

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LITERATURE CITED

Best, E.A. 1969 a. Recruitment Investigations: Trawl catch records, 1967. Int. Pac. Halibut Comm. Tech. Report No. 1: 23 p.

_____.1969 b. Recruitment Investigations: Trawl catch records Eastern Bering Sea, 1968 and 1969. Int. Pac. Halibut Comm. Tech. Report No. 3: 24 p.

_____.1970. Recruitment Investigations: Trawl catch records Eastern Bering Sea, 1963, 1965 and 1966. Int. Pac. Halibut Comm. Tech. Report No. 7: 52 p.

_____.1977. Distribution and abundance of juvenile halibut in the Southern Bering Sea. Int. Pac. Halibut Comm. Sci. Report No. 62: 23 p.

_____.1981. Halibut Ecology, p. 495-509. In D.W. Hood and J.A. Calder [eds.] The

_____.Bering Sea shelf: Oceanography and resources. Vol. No. 1.

Dunlop, H. A., F. H. Bell, R. J. Myhre, W. H. Hardman, and G. M. Southward. 1964. Investigation, utilization and regulation of the halibut in Southern Bering Sea. Report of the Int. Pac. Halibut Comm. No. 35: 72 p.

Hamley, J. M., and B. E. Skud. 1978. Factors affecting longline catch and effort: II. Hook-Spacing. Int. Pac. Halibut Comm. Sci. Report No. 64: 66 p.

Hardman, W. H. 1969. Relationship of halibut stocks in Bering Sea as indicated by age and size composition. Int. Pac. Halibut Comm. Tech. Report No. 4: 11 p.

_____.1970. The size, age, and sex composition of North American setline catches of halibut (Hippoglossus hippoglossus stenolepis) in Bering Sea, 1964-1970. Int. Pac. Halibut Comm. Tech. Report No. 8: 31 p.

Hoag, S. H., C. C. Schmitt, and W. H. Hardman. 1979. Size, age, and frequency of male and female halibut: Setline research catches, 1925-1977. Int. Pac. Halibut Comm. Tech. Report No. 17: 112 p.

International Pacific Halibut Commission. 1968. Regulation and investigation of the Pacific halibut fishery in 1967. Number 46: 23 p.

APPENDIX

Table 1. **Numbers and pounds of halibut caught by set for the *Valorous*, *Erica C*, and *Coral,* 1987.**

Appendix Table 1. Numbers and pounds of halibut caught by set for the *Valorous, Erica C*, and *Coral*, 1987.

							SUBLEGALS: ≤ 81cm		LEGALS: > 81 cm	
VESSEL	SET	DATE	N LAT	W LONG	DEPTH (F)	STD SKATES	NO.	LBS.	NO.	LBS.
Valorous	1	7/23	58°28'	161°25'	8-13	7.5	4	24.9	4	69.6
	2	7/23	58°27'	161°25'	13-13	7.5	2	14.1	2	35.9
	3	7/23	58°27'	'161°23'	12-13	7.5	1	7.2	1	13.8
	4	7/23	58°30'	'161°23'	8-12	7.5	6	37.5	5	79.3
	5	7/24	58°26'	161°01'	9-10	7.5	1	5.7	2	80.1
	6	7/24	58°26'	161°02'	10-11	7.5	2	14.4	2	44.3
	7	7/24	58°25'	160°58'	9-11	7.5	1	6.3	4	58.5
	8	7/24	58°27'	160°58	'10-11	7.5	5	39.2	3	47.2
	9	7/25	58°35'	160°38'	4-8	7.5	1	5.4	2	78.7
	10	7/25	58°33'	160°38'	8-9	7.5	3	19.2	8	165.8
	11	7/25	58°30'	160°38'	9-9	7.5	0	0	1	23.7
	12	7/25	58°28'	160°38'	9-10	7.5	1	10.1	1	11.4
	13	7/26	58°17'	159°36'	14-15	7.5	0	0	1	13.3
	14	7/26	58°20'	159°36'	13-14	7.5	0	0	0	0
	15	7/26	58°22'	159°35'	13-13	7.5	0	0	2	49.9
	16	7/26	58°25'	159°35	'12-13	7.5	0	0	2	55
	17	7/27	58°16'	159°05	'9-10	7.5	0	0	0	0
	18	7/27	58°15'	159°03'	9-10	7.5	0	0	0	0
	19	7/27	58°14'	159°01'	9-10	7.5	1	5.4	0	0
	20	7/27	58°12'	158°59'	10-10	7.5	2	20.2	2	23.8
	21	7/28	58°10'	158°03'	15-16	7.5	0	0	0	0
	22	7/28	58°08'	158°03'	16-18	7.5	1	9.0	1	11.0
	23	7/28	58°05'	158°04'	18-18	7.5	0	0	1	20.9
	24	7/28	58°03'	158°04'	15-18	7.5	0	0	0	0
	25	7/29	57°56'	158°35'	'20-20	7.5	0	0	0	0
	26	7/29	57°53'	158°35'	'20-21	7.5	0	0	2	31.4
	27	7/29	57°51'	158°35'	21-23	7.5	1	6.9	1	11.9
	28	7/29	57°48'	158°36'	21-23	7.5	1	9.3	0	0
	29	7/30	57°45'	158°27'	22-22	7.5	1	3.4	1	17.1
	30	7/30	57°42'	158°27'	19-22	7.5	0	0	1	20.9
	31	7/30	57°40'	158°27'	19-21	7.5	1	7.5	0	0
	32	7/30	57°37'	158°28'	21-23	7.5	0	0	0	0
	33	7/31	57°09'	158°50'	17-21	7.5	0	0	0	0
	34	7/31	57°06'	158°50'	13-17	7.5	3	25.1	0	0
	35	7/31	57°04'	158°50'	13-13	7.5	0	0	1	22.3
	36	7/31	57°01'	158°50'	11-13	7.5	1	9.7	1	13.3
	37	8/1	56°57'	159°20'	20-21	7.5	2	17.2	9	138.5
	38	8/1	56°55'	159°20'	19-20	7.5	0	0	0	0
	39	8/1	56°52'	159°20'	17-19	7.5	0	0	1	11.4
	40	8/1	56°49'	159°19'	14-17	7.5	1	4.7	2	41.7
	41	8/2	56°40'	160°11'	26-32	7.5	4	19.9	2	33
	42	8/2	56°38'	160°11'	25-26	7.5	6	38.9	1	11.9
	43	8/2	56°35'	160°11'	23-25	7.5	10	62.1	0	0
	44	8/2	56°33'	160°11'	17-23	7.5	3	19.2	0	0
TOTALS						330	65	442.5	66	1235.6

Appendix Table 1. (Continued) Numbers and pounds of halibut caught by set for the F/V Valorous, Erica C and Coral, 1987.

							SUBLEGALS: ≤ 81cm		LEGALS: > 81 cm	
VESSEL	SET	DATE	N LAT	W LONG	DEPTH (F)	STD SKATES	NO.	LBS.	NO.	LBS.
Erica C	1	7/27	58°51'	160°16'	6-7	1.7	0	0	0	0
	2	7/27	58°52'	160°22'	6	3.5	1	9	4	95.1
	3	7/28	58°45'	160°15'	13-15	3.6	0	0	1	28.5
	4	7/28	58°41'	160°07'	8-11	3.5	0	0	3	97.3
	5	7/29	58°45'	160°14'	14-15	1.7	0	0	13	313.5
	6	7/'30	58°47'	160°51'	15-21	3.5	0	0	4	83.2
	7	7/30	58°48'	160°53'	4-7	1.7	0	0	1	14.9
	8	7/30	58°39'	160°41'	4-6	4.0	2	20.3	0	0
	9	7/30	58°40'	160°44'	5-6	2.0	2	19	0	0
	10	7/31	58°37'	159°48'	11-16	6.7	0	0	2	29.7
	11	7/31	58°43'	159°54'	11-14	1.7	1	10.6	0	0
	12	8/7	57°42'	157°55'	10-12	3.6	0	0	0	0
	13	8/7	57°39'	157°53'	9-12	5.3	3	22.6	3	73.8
	14	8/8	57°43'	157°46'	3-6	5.4	4	24.1	3	70
	15	8/9	57°25'	158°04'	7-11	5.4	2	15.7	3	58.3
	16	8/9	57°22'	158°09'	7-9	4.9	1	10.1	4	68.3
	17	8/9	57°27'	158°08'	11-14	5.2	4	37.9	1	35..7
TOTALS						63.4	20	169.3	42	968.3
Coral	1	7/27	58°53'	160°12'	2-3	6.1	0	0	4	80.9
	2	7/27	58°48'	160°10'	14-17	2.6	0	0	3	109.4
	3	7/28	58°46'	160°12'	14-16	8.7	0	0	5	112.4
	6	8/9	57°31'	157°58'	9	4.4	2	13.2	0	0
	7	8/9	57°30'	158°00'	7-10	2.6	0	0	0	0
	8	8/10	57°30'	158°07'	14	4.4	1	4.7	1	17.1
	9	8/11	58°17'	157°43'	6-8	4.2	0	0	0	0
	10	8/11	58°15'	157°44'	5-8	4.2	1	7.5	0	0
TOTALS						37.2	4	25.4	13	319.8

Sets 4 and 5 of the *Coral* were not included due to the 2 day soak time and rotten bait.