Board of Fisheries Statewide Dungeness Crab, Shrimp, Misc Shellfish meeting of March 16 – 20, 2009 at Egan Civic & Convention Center, Anchorage AK
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3	ADF&G	Department Written Reports/Oral Reports (contained within RC 2)
4	Cook Inlet Regional Planning Team	Comments in support of #380
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6	Sharon Minsch	Prop 366
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9	Northern Norton Sound AC	Prop 378
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ALASKA DEPARTMENT OF FISH AND GAME

STAFF COMMENTS ON DUNGENESS CRAB, SHRIMP, MISCELLANEOUS SHELLFISH, AND SUPPLEMENTAL ISSUES

ALASKA BOARD OF FISHERIES MEETING
ANCHORAGE, ALASKA

MARCH 16-20, 2009

Regional Information Report No. 2A09-01

The following staff comments were prepared by the Alaska Department of Fish and Game for use at the Alaska Board of Fisheries (Board) meeting, March 16–20, 2009 in Cordova, Alaska. The comments are forwarded to assist the public and Board. The comments contained herein should be considered preliminary and subject to change, as new information becomes available. Final department positions will be formulated after review of written and oral public testimony presented to the Board.

ABSTRACT

This document contains Alaska Department of Fish and Game (ADF&G) staff comments on Dungeness crab, shrimp, miscellaneous shellfish, and supplemental issues regulatory proposals for statewide management areas. These comments were prepared by ADF&G for use at the Alaska Board of Fisheries meeting, March 16–20, 2009 in Anchorage, Alaska. The comments are forwarded to assist the public and Board. The comments contained herein should be considered preliminary and subject to change, as new information becomes available. Final department positions will be formulated after review of written and oral public testimony presented to the Board.

Key words: Alaska Board of Fisheries, staff comments, Dungeness crab, shrimp, miscellaneous shellfish, management, regulatory proposals, and supplemental issues.

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COMMITTEE A: DUNGENESS, SCALLOPS, AND SUBSISTENCE SHELLFISH, AND STATEWIDE GROUNDFISH

Kodiak Dungeness

PROPOSAL 356 - 5 AAC 32.033. Tenders for Dungeness crab.

PROPOSED BY: Rick Ellingson.

WHAT WOULD THE PROPOSAL DO? This proposal would allow validly registered vessels fishing for Dungeness crab to simultaneously harvest and transport their own Dungeness crab catch in addition to tendering Dungeness crab from other validly registered vessels fishing for Dungeness crab in the Kodiak District of Registration Area J.

WHAT ARE THE CURRENT REGULATIONS? Under statewide provisions (**5 AAC 32.033**), a vessel used to tender Dungeness crab may not have Dungeness crab gear on board and may not be used to fish for Dungeness crab while tendering. Tender operators must register with ADF&G in the appropriate registration area or district prior to taking Dungeness crab deliveries, then report the amount, by weight or number of Dungeness crab on board, as well as the vessel's unloading destination to the department prior to leaving the designated registration area or district. There are no additional regulations specifically defining tender operations for the Kodiak District or Registration Area J.

WHAT WOULD BE THE EFFECT IF THE PROPOSAL WERE ADOPTED? If adopted, this proposal will allow smaller vessels with limited hold capacity or vessels operating in remote locations the opportunity to deliver their Dungeness crab catch to a larger catcher/tender and remain on the fishing grounds for longer periods of time. Additional directed fishing time may decrease operating expenses for some fishers and potentially increase harvests of Dungeness crab in some areas of the Kodiak District. This proposal may also improve safety conditions for smaller vessels by allowing them to deliver their catch to larger vessels for final transport to processors during periods of poor weather.

Dungeness crab would transfer from the CFEC permit holder to the tender operator/fisherman at the time of delivery (5 AAC 39.130 (k)(6)). The tender operator would be the first purchaser of raw fish. The delivery would be recorded on a fish ticket. The tender operator may act as an independent buyer (5 AAC 39.130 (k)(10)).

BACKGROUND: The Kodiak District Dungeness crab fishery is an open access fishery. Currently, ADF&G does not have a stock assessment program for Dungeness crab in the Westward Region. Due to the lack of assessment and stock specific data, there are no guideline harvest levels (GHL) or other harvest thresholds established for the Dungeness crab fishery. The fishery is managed by regulating sex, size, and season ('3-S' management). Dungeness crab may be taken from May 1 to January 1 in most of the Kodiak District. South of the line from the southernmost tips of Boot Point (Eastside Kodiak Island) and Cape Ikolik (Westside Kodiak Island), Dungeness crab may only be taken from June 15 through January 1 (Figure 1). Only male crab 6.5' carapace width (CW) or larger may be retained during the open fishing

season. There are no vessel size restrictions or pot limits in the Kodiak District Dungeness crab fishery. During 2008, vessels registered for Dungeness crab in the Kodiak District ranged from 24 to 95 feet in total length with a district wide average of 48 feet. The number of pots fished by Dungeness crab vessels during 2008 ranged from 100 to 1650 pots per vessel with a district wide average of 650 pots per vessel. Participants must hold a valid CFEC interim use permit card and obtain a registration and tank inspection from ADF&G prior to fishing.

Dungeness crabs were first commercially harvested in Kodiak District in 1962. Commercial harvests peaked in the late 1960s, then slowly declined through the late 1970s. This trend was reversed starting in the early 1980s when declines of other commercially harvested Alaskan shellfish created renewed interest in Kodiak Dungeness crab. As a result, effort and harvest rebounded considerably and remained relatively stable through the late-1980s. Beginning in 1991, Dungeness crab harvests declined sharply and continue to remain at comparatively low levels (Table 1). This decline likely reflected the unavailability of legal crab due to fluctuations in recruitment. In recent years, the Kodiak District fishery has been prosecuted primarily on crabs newly recruited to legal size. An additional factor limiting the fishery is the documented occurrence of paralytic shellfish poisoning (PSP) in Kodiak District Dungeness crabs. The Alaska Department of Environmental Conservation (ADEC) placed restrictions on the sale of live and whole cooked crabs in 1992, which remain in effect through today. In recent years, the majority of Kodiak District Dungeness crab harvests have occurred around Sitkinak and Tugidak Islands (Figure 1).

Figure 1. Map of the Kodiak District and Dungeness crab fishery seasons.

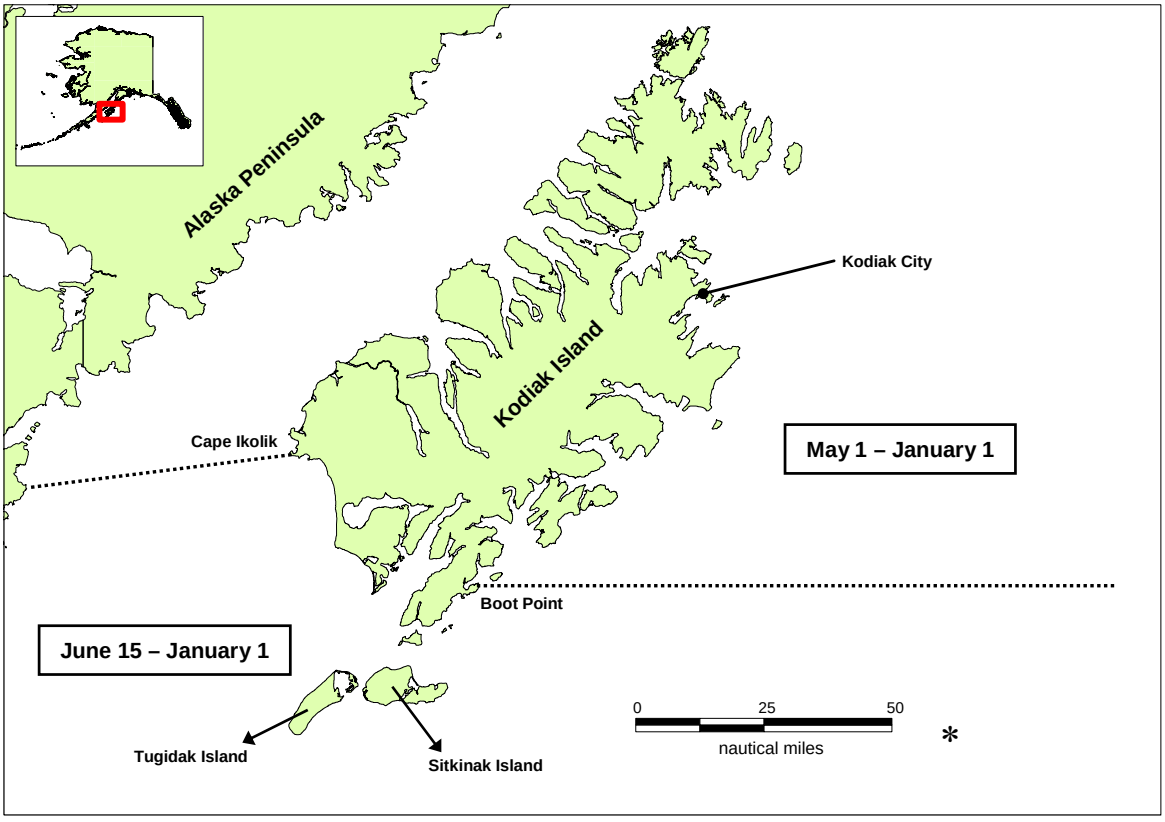


Table 1. Dungeness crab commercial catch, effort, and value in the Kodiak District 1988-2008.

	Number				Pots	Avg. Lbs	Avg.	Avg. Price	Exvessel
Year	Vessels	Landings	Crab	Pounds[a]	Lifted	Per Landing	CPUE	Per Lb ($)	Value ($)
1988/89	50	363	1,064,387	2,125,114	203,217	5,854	5	1.06	2,253,000
1989/90	47	359	1,428,973	3,077,937	185,242	8,574	8	1.10	3,385,730
1990/91	62	519	1,301,465	2,937,433	296,168	5,660	4	1.54	4,435,000
1991/92	62	732	695,470	1,414,499	279,872	1,932	1	1.37	1,938,000
1992/93	46	501	805,215	1,656,793	218,602	3,306	3	0.86	1,425,000
1993/94	42	263	647,736	1,369,889	180,534	5,209	5	0.92	1,260,000
1994/95	31	162	426,848	948,461	151,888	5,855	5	1.20	1,138,000
1995/96	24	106	257,677	527,434	107,506	4,976	4	1.72	907,000
1996/97	21	113	334,237	668,772	88,682	4,223	4	1.01	675,460
1997/98	21	123	257,697	529,550	95,066	4,305	3	2.04	1,080,282
1998/99	12	60	185,249	371,241	63,926	6,187	3	1.45	538,299
1999/00	13	72	269,277	551,183	65,721	7,655	4	1.57	849,555
2000/01	12	69	114,038	238,955	57,037	3,463	2	1.65	394,276
2001/02	21	57	101,371	208,265	41,760	3,654	2	1.95	392,080
2002/03	18	74	181,698	353,849	71,096	4,782	3	1.46	520,493
2003/04	17	89	228,309	467,623	48,715	5,254	5	1.50	695,000
2004/05	11	59	169,807	351,986	42,136	5,966	4	1.48	518,000
2005/06	14	75	185,165	390,547	63,170	5,207	6	1.25	485,519
2006/07	12	62	74,033	148,502	31,570	2,395	2	1.45	215,328
2007/08	12	86	323,489	663,077	65,071	7,710	10	2.07	1,372,569
2008/09	17	87	522,559	1,031,603	94,265	5,824	5	2.20	2,186,964
Averages									
20-year	27	192	455,938	953,939	116,726	5,142	4	1.47	1,269,788
10-year	15	73	216,975	440,559	58,054	5,191	4	1.66	762,978
5-year	13	74	255,011	517,143	59,242	5,421	5	1.69	955,676

[a] Includes deadloss

DEPARTMENT COMMENTS: ADF&G is **NEUTRAL** on this proposal. If adopted, ADF&G does not anticipate significant changes in management of Dungeness crab in the Kodiak District as the fishery is likely to be managed using the '3-S' management strategy for the foreseeable future. Given the complexity of Dungeness crab fisheries in other areas of the state, such as Southeast Alaska, this proposal should not be used as a basis for adopting similar regulations in those areas.

COST ANALYSIS: Adoption of this proposal is not expected to result in additional direct costs for private individuals to participate in this fishery.

Statewide Dungeness

PROPOSAL 357 - 5 AAC 39.145 (1). Escape mechanism for shellfish and bottomfish pots.

PROPOSED BY: Dick Gregg.

WHAT WILL THE PROPOSAL DO? This proposal seeks to change the statewide biodegradable twine requirement in commercial, personal use, subsistence, and sport Dungeness crab pots from 60 thread to 90 thread.

WHAT ARE THE CURRENT REGULATIONS? The statewide biodegradable escape mechanism regulation applies to commercial, personal use, subsistence, and sport Dungeness crab pots. The regulation specifies that all shellfish and bottomfish pot gear must have an 18-inch opening laced with 100 percent cotton twine of no more than 30 thread, except Dungeness crab pots may instead have the lid tie-down straps secured to the pot at one end by a single loop of untreated 100 percent cotton twine no larger than 60 thread secured so that when the twine degrades the lid will no longer be securely closed. Alternatively, the regulation permits the use of a length of 36-thread treated or untreated twine in conjunction with a 30-day galvanic timed release (GTR) device to lace close an opening 18 inches in length.

WHAT WILL BE THE EFFECT IF THE PROPOSAL IS ADOPTED? If this proposal is adopted commercial, personal use, subsistence, and sport fishermen could use 90 thread instead of 60 thread twine to secure the lid of Dungeness crab pots. Dungeness crab fishermen would presumably change their biodegradable twine less often. Lost or not actively worked pots would hold crabs for a longer period before the biodegradable twine failed.

BACKGROUND: Commercial Dungeness crab fishing has occurred in the following management areas and districts: Southeastern Alaska, Yakutat, Prince William Sound, Cook Inlet, Kodiak, Chignik, Alaska Peninsula, North Peninsula, and Aleutian Islands. Most of the currently active Dungeness crab fisheries last 3 to 4 months.

The current biodegradable twine requirement for Dungeness crab pots, 60 thread, was not intended to remain intact for an entire fishing season. The current biodegradable requirement was based on the premise that crabs should not be held for more than 30 days. This is reflected in the current regulation where the Alaska Board of Fisheries (board) allowed for a 30-day GTR device as an alternative to the biodegradable twine. Recent anecdotal information from Kodiak Dungeness crab fishermen indicates that the current 60-thread cotton twine lasts from 4 to 6 weeks. A brief summary of regulations governing requirements on biodegradable twine follows.

In 1978, the board required an opening laced with 120-thread 100 percent cotton twine in shellfish pots. During the 1988 Cook Inlet Tanner crab fishery, delinquent pots left in the

water for 60 days following the fishery were found to have their 120-thread cotton twine intact and the pots killed a large number of Tanner crabs through ghost fishing. In response, in 1989 a study of cotton-twine degradation rates was conducted in Cook Inlet. Average degradation times of 74, 79, and 80 days respectively for 30, 42, and 60 thread 100 percent cotton twine were found when pots were operated by hooking and unhooking three times per week.

ADF&G used these results to propose to the board in 1990 that the cotton twine requirement be changed from 120 to 30 thread. The board adopted a change to 30-thread twine. Subsequently, the 30-thread twine was found by Dungeness crab fishermen to break in as short a time as 37 days when actively used in fishing during summer in Duncan Canal of Southeast Alaska. As a result, the board in 1991 raised the size of twine allowed in Dungeness crab pots to 60 thread. For the remaining pot fisheries, however, the twine size remained at 30 thread. Also in 1991, the board heard testimony from a member of the public regarding the use of GTR devices. Recognizing their potential to provide a more accurately timed escape mechanism, the board directed the department to conduct a study on their use and report back via a proposal to change the existing regulation or a report detailing why the GTR would not be a suitable alternative. This resulted in a cooperative study between ADF&G, the University of Alaska, and commercial pot fishers that showed GTRs of various thicknesses could be used to accurately target biodegradation periods. Subsequently, in 1993, the results of the study were presented to the board and the regulation was amended to provide for optional use of a 30-day GTR in combination with 36-thread treated or untreated cotton twine.

Lost Dungeness crab pots will ghost fish before the biodegradable twine releases. Studies show lethal and sublethal effects of confinement on crabs in as short as 30 days or less. These effects can range from weight loss, leg loss, carapace damage, and death depending on the shell condition of the crab, the time period of confinement and the density of crabs in the pot.

The department acknowledges that biodegradable twine needs to be replaced at specific intervals during the fishing season or it will fail. Changing biodegradable twine on Dungeness crab pots is a quick process that can be accomplished throughout the fishing season. ADF&G believes that fishermen who are conscientious in checking their pots throughout the season can comply with the existing biodegradable mechanism with little impact to fishing operations. If fishermen are not actively checking pots, there could be lost harvest opportunity as the twine will degrade.

DEPARTMENT COMMENTS: The department **OPPOSES** this proposal as information from the fishing grounds indicates that the 60-thread twine lasts at least 30 to 40 days. Switching to a larger thread size would mean that pots would likely remain intact for 50 to 60 days, or longer. ADF&G believes that holding Dungeness crabs, as well as other crab species captured in Dungeness pots, for this length of time will result in direct and indirect mortality and injury.

COST ANALYSIS: Adoption of this proposal is not expected to result in additional direct costs for private individuals to participate in this fishery.

Kodiak Scallops

PROPOSAL 358 – 5 AAC 38.425. Closed waters for scallops in registration area J.

PROPOSED BY: Alaska Scallop Association.

WHAT WOULD THE PROPOSAL DO? This proposal would open an area currently closed to scallop fishing near the south end of Kodiak Island. In the proposed area, fishing would be authorized under an exploratory fishing permit issued by ADF&G. This proposal would also increase the Kodiak Area (Area K) weathervane scallop guideline harvest range (GHR) of zero to 300,000 pounds of shucked meats to a GHR of zero to 400,000 pounds of shucked meats.

Proposed Regulatory Language:

5 AAC 38.430 (1) would be amended to:
In waters of Scallop Registration Area K, the guideline harvest range is zero to 400,000 pounds of shucked meat; except that for the open area described in 5 AAC 38.425 (1), a person may take weathervane scallops only if the department issues the person a permit under 5 AAC 38.076 (e) for exploratory fishing for new scallop beds.

5 AAC 38.425 (1) would be amended to:
Except for the area contained within a line from 57º 00 N 156º 19 W, then to 57º 00 N 155º 00 W, then to 55º 57 N 155º 00 W, then to 55º 57 N 156º 19 W, then back to 57º 00 N 156º 19 W which would be open from the period July 1 through February 15.

WHAT ARE THE CURRENT REGULATIONS? Waters south and west of Kodiak Island are closed to weathervane scallop fishing (Figure 1). The current GHR for scallops in Registration Area K is zero to 300,000 pounds of shucked meats. Scallops may be taken in the Kodiak Area from July 1 through February 15 unless superseded by emergency order (EO).

WHAT WOULD BE THE EFFECT IF THE PROPOSAL WERE ADOPTED? If adopted, this proposal would allow for additional fishing opportunities for weathervane scallops in the Kodiak Area. Given the lack of scallop population assessment data in the proposed area, the extent of scallop harvest and crab bycatch is unknown.

BACKGROUND: Weathervane scallops in waters of the Exclusive Economic Zone (EEZ) off Alaska are managed by the State of Alaska and the federal government. The scallop Fishery Management Plan (FMP) developed by the North Pacific Fishery Management Council (NPFMC) defers most management to the state although a License Limitation Program (LLP) is implemented by the federal government to restrict fleet size. The statewide fishery is limited to a total of nine vessels: seven vessels using two 15-foot dredges and two vessels using a single six-foot dredge. With the exception of scallop vessels operating in Cook Inlet, all vessels are required to carry an independent onboard observer while fishing. A crab bycatch cap of one percent of the surveyed crab population is used in areas where a directed commercial crab fishery occurs during the same year. If an area has not opened to commercial crab fishing during the most recent season, a cap of one-half of one percent is applied. An area is closed to scallop fishing when the GHL is attained or crab bycatch exceeds the established limit.

The statewide optimum yield (OY) for weathervane scallops as established in the FMP is capped at 1.24 million pounds of shucked meats annually. The GHR for each registration area in the state is based on historical harvest levels in those areas. The GHRs for all registration areas combined may not exceed the OY of 1.24 million pounds of shucked meats (Table 1).

Table 1. Statewide weathervane scallop guideline harvest ranges (GHR) by registration area.

Area	GHR Upper Limit
Yakutat	250,000
District 16	35,000
PWS	50,000
Cook Inlet	20,000
Kodiak	**300,000**
Alaska Peninsula	100,000
Bering Sea	300,000
Dutch Harbor	110,000
Adak	75,000
Total	**1,240,000**

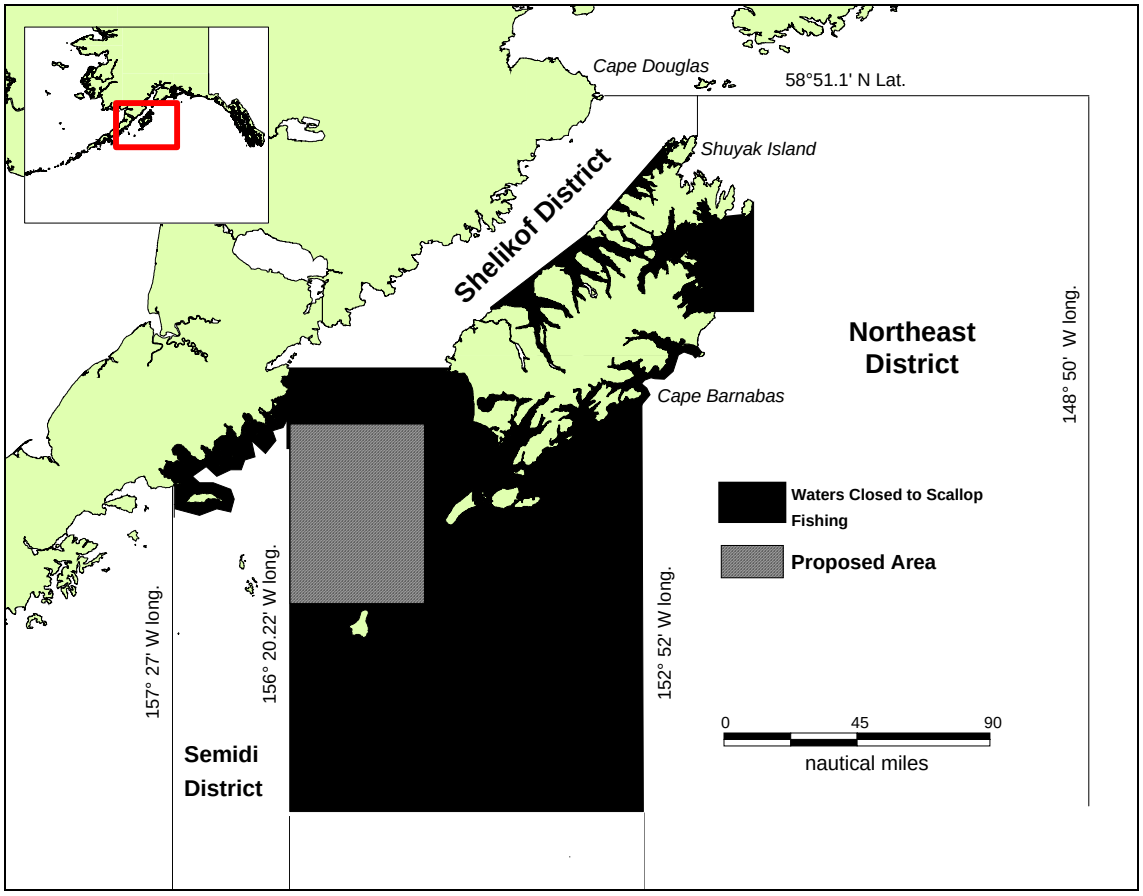
The proposed fishing area has been closed to scallop fishing since 1969 due to crab bycatch concerns in the area. Approximately 140,000 pounds of shucked meats were landed during the two years prior to the closure. A permit authorizing exploratory scallop dredging in the proposed area was issued to the C/P Provider in 1993. An ADF&G biologist and observer trainer from the University of Alaska were on board the vessel and sampled 40 tows for catch composition and crab bycatch. Scallop catches were relatively high at 85 pounds of shucked meats per tow. No commercial crab species were present in the 40 tows sampled.

Substantial populations of red king crab and Tanner crab were present in the proposed area during the 1970s and early 1980s. Data from ADF&G pot surveys indicate king crab abundance peaked in 1974, while Tanner crab abundance peaked in 1978. However,

populations of both species declined dramatically throughout the 1980s and 1990s. Based on ADF&G trawl survey tows conducted in the proposed area from 1995-1999, a total of one king crab was captured and an average of 19 Tanner crabs were caught per kilometer towed. As a precautionary note, ADF&G trawl survey information in the proposed area is limited. Only three survey stations are consistently monitored, typically every three years. These survey stations are located on the eastern most boundary of the proposed area. ADF&G trawl surveys during 2002, 2005, and 2008 in the same approximate areas as the 1995-1999 surveys indicate Tanner crab abundance has increased slightly in the proposed area. However, crab numbers south and west of Kodiak Island remain below threshold for a commercial king or Tanner crab fishery. From 2002-2008, zero king crab and an average of 119 Tanner crabs were caught per kilometer towed in the proposed area.

Commercial bottom trawl vessels target groundfish in the proposed area, typically from January through April. During the 2008 season, 23 bottom trawl vessels made 51 deliveries from waters within the proposed area. Pacific cod, arrowtooth flounder, rock sole, and pollock were the primary species harvested.

Figure 1. Map of the proposed area and waters currently closed to scallop fishing in the Kodiak Area.



DEPARTMENT COMMENTS: ADF&G **OPPOSES** this proposal. A similar proposal was addressed at the March 2000 board meeting. At that time, the board concluded there was inadequate scallop stock information to prosecute a fishery. Although ADF&G has since established, and is in the process of refining a fishery-independent survey program using underwater video sampling, the proposed area has not been assessed due to budget constraints and its relative importance to other known and commercially exploited scallop grounds in the Kodiak Area. In the absence of directed scallop assessment surveys, data collected from federal groundfish observer reports, and ADF&G crab and groundfish trawl surveys, limits ADF&G's ability to prosecute a fishery that is consistent with sustainable scallop fisheries practices.

Currently the weathervane scallop GHR in the Kodiak Area is capped at 300,000 pounds of shucked meats. If adopted, this proposal would increase the annual GHR by 100,000 pounds. Since the statewide OY (1.24 million pounds) is fully allocated, 100,000 pounds of shucked meats would need to be reallocated to Kodiak from a different registration area in the state (Table 1). The department would need guidance from the board to determine how the proposed 100,000 pound increase would be allocated within the Kodiak Area if the proposal is approved.

COST ANALYSIS: Adoption of this proposal is not expected to result in additional direct costs for private individuals to participate in this fishery.

Statewide Scallops

PROPOSAL 359 - 5 AAC 38.076. Alaska Scallop Fishery Management Plan.

PROPOSED BY: Alaska Department of Fish and Game.

WHAT WOULD THE PROPOSAL DO? This statewide proposal seeks to place those management elements typically listed on the scallop vessel area registration into regulation. These include registration area check-in and check-out, catch reporting requirements, logbook requirements, completion of weekly fish tickets, and providing all king crab to the onboard observer.

WHAT ARE THE CURRENT REGULATIONS? Current regulation (**5 AAC 38.076**) requires scallop vessel operators to register and restricts participation in more than one registration area at a time.

WHAT WOULD BE THE EFFECT IF THE PROPOSAL WERE ADOPTED? There would be no effective change to current management practices if the proposal were adopted. A scallop CFEC permit holder would still have to obtain a vessel registration.

BACKGROUND: Since adoption of 5 AAC 38.076. Alaska Scallop Fishery Management Plan, the elements listed in the proposal has been implemented via the area registration. However, the listed elements have not changed and as they address information critical to scallop fishery management, should be available in regulation to both agency personnel and the public.

DEPARTMENT COMMENTS: The department submitted and **SUPPORTS** this housekeeping proposal.

COST ANALYSIS: Adoption of this proposal is not expected to result in additional direct costs for private individuals to participate in this fishery.

Cook Inlet Scallops

PROPOSAL 360 - 5 AAC 38.325. Permits for Scallops.

PROPOSED BY: Alaska Department of Fish and Game.

WHAT WOULD THE PROPOSAL DO? The proposal seeks repeal 5 AAC 38.325(a), the commissioner's permit requirement for scallop fishing in the Kamishak District of the Cook Inlet Area and to place into regulation those management elements listed as permit stipulations.

WHAT ARE THE CURRENT REGULATIONS? Regulation **5 AAC 38.325** requires a commissioner's permit and lists those management elements that the department may stipulate on.

WHAT WOULD BE THE EFFECT IF THE PROPOSAL WERE ADOPTED? Adoption of the proposal would result in no change to current management practices but would require only a scallop area registration rather than a commissioner's permit.

BACKGROUND: The Kamishak District commissioner's permit requirement for scallop fishing has been in regulation for more than ten years. However, the permit stipulations have been unchanged and, as they address information critical to scallop fishery management, should be available in regulation to both agency personnel and the public.

DEPARTMENT COMMENTS: The department submitted and **SUPPORTS** this housekeeping proposal.

COST ANALYSIS: Adoption of this proposal is not expected to result in additional direct costs for private individuals to participate in this fishery.

Alaska Peninsula Subsistence Shellfish

PROPOSAL 361 - 5 AAC 02.011 (D)(1) Subsistence fishing by proxy.

PROPOSED BY: Melanie Ludvick Rotter.

WHAT WOULD THE PROPOSAL DO? This proposal would allow a proxy to harvest subsistence shellfish on behalf of multiple beneficiaries in Bering Sea waters north of the Alaska Peninsula and east of Scotch Cap Light (166^{o} 44' W long.).

WHAT ARE THE CURRENT REGULATIONS? Currently, a proxy may subsistence fish for themselves and a beneficiary and may not take more than twice the legal bag limit, and may not possess more than twice the possession limit of a shellfish species in the waters where the fishing occurs (**5 AAC 02.011**).

WHAT WOULD BE THE EFFECT IF THE PROPOSAL WERE ADOPTED? The proposal did not specify a specific number of beneficiaries that a proxy would be allowed to fish for, thus the potential effect of this proposal is unknown. Presumably subsistence shellfish harvest and effort would increase by some unknown extent if this proposal were adopted.

BACKGROUND: Staff contacted the person who submitted this proposal because the specific goal of the proposal was not clear. The proposer indicates the intention of the proposal is to modify the subsistence shellfish proxy regulation to allow a proxy to fish for multiple beneficiaries to obtain king crab from Bering Sea waters north of the Alaska Peninsula. The daily subsistence bag and possession limit for king crab in the area addressed by this proposal is six per person (**5 AAC 02.620 (1)**). The daily subsistence bag and possession limit for Tanner crab in this area is 12 per person (**5 AAC 02.625**). No permit is required to participate in the subsistence fishery in this area, thus fishing effort and harvest are not well described, but are believed to be relatively limited.

DEPARTMENT COMMENTS: Given the lack of specifics contained in this proposal the department is **OPPOSED**. It is unknown to what degree subsistence fishing activities in this area would be impacted by this proposal. If the board were to adopt this proposal, the department requests that the board implement a subsistence shellfish permit and harvest reporting requirement for this area to allow for accurate tracking of harvest and effort. Potential increased harvests of king or Tanner crab that could occur if this proposal were adopted may need to be considered when setting the federal overfishing level for these crab stocks. Since the intent of this proposal is to address the subsistence king crab fishery in the Bering Sea Area, the board may want to consider if this proposal meets the regulatory call for proposals for this meeting cycle.

As noted in the Subsistence Regulation Review, below, the board has not made a finding regarding the amount reasonably necessary to provide subsistence fishing opportunities for king or Tanner crab in the Bering Sea Area (an ANS finding). Presently, data are not adequate to support such a finding for the area addressed in this proposal. If the board

were to adopt the proposal, the department recommends postponing an ANS determination for at least 3 years until data from subsistence permits are available upon which to base an ANS finding.

COST ANALYSIS: Adoption of this proposal is not expected to result in additional direct costs for private individuals to participate in this fishery.

SUBSISTENCE REGULATION REVIEW:

1. Is this stock in a non-subsistence area? No.
2. Is the stock customarily and traditionally taken or used for subsistence? Yes (5 AAC 02.608).
3. Can a portion of the stock be harvested consistent with sustained yield? Yes.
4. What amount is reasonable necessary for subsistence use? The Board of Fisheries has not made this determination.
5. Do the regulations provide a reasonable opportunity for subsistence use? This is a Board of Fisheries decision.
6. Is it necessary to reduce or eliminate other uses to provide a reasonable opportunity for subsistence use? This is a Board of Fisheries decision.

PROPOSAL 362 - 5 AAC 02.520. Subsistence king crab fishery.

PROPOSED BY: Melanie Ludvick Rotter.

WHAT WOULD THE PROPOSAL DO? This proposal seeks to increase the pot limit for the subsistence king crab fishery in Bering Sea waters north of the Alaska Peninsula and east of Scotch Cap Light (166^{o} 44' W long.).

WHAT ARE THE CURRENT REGULATIONS? Subsistence shellfish pot limits are specified in **5 AAC 02.010 (i)(1).** Except in the Kotzebue Sound Section and when fishing through the ice in the Norton Sound Section, no more than five pots per person and 10 pots per vessel may be used to take shellfish.

WHAT WOULD BE THE EFFECT IF THE PROPOSAL WERE ADOPTED? The proposal does not request a specific pot limit, but if increased pot limits were adopted for the subsistence king crab fishery in the Bering Sea Area, it is assumed that there would be a corresponding increase in fishing effort and harvest.

BACKGROUND: Staff contacted the person who submitted this proposal because the specific goal of the proposal was not clear. The proposer indicates that this proposal would work in conjunction with proposal 361. The proposer states that the intention of this proposal is to modify the subsistence shellfish pot limits for Bering Sea waters north

of the Alaska Peninsula. Current pot limits for the subsistence shellfish fishery in this area are five per person and 10 per vessel (5 AAC 02.010 (i)(1))**.** No permit is required to participate in the subsistence fishery in this area, thus fishing effort and harvest are not well described, but are believed to be relatively limited.

DEPARTMENT COMMENTS: Given the lack of specifics contained in this proposal the department is **OPPOSED**. It is unknown to what degree subsistence fishing activities in this area would be impacted by this proposal. If the board were to adopt this proposal, the department requests that the board implement a subsistence shellfish permit and harvest reporting requirement for this area to allow for accurate tracking of harvest and effort. Potential increased harvests that could occur if this proposal were adopted may need to be considered when setting the federal overfishing level for the Bristol Bay red king crab stock. Since the intent of this proposal is to address the subsistence king crab fishery in the Bering Sea Area, the board may want to consider if this proposal meets the regulatory call for proposals for this meeting cycle.

As noted in the Subsistence Regulation Review, below, the board has not made a finding regarding the amount reasonably necessary to provide subsistence fishing opportunities for king or Tanner crab in the Bering Sea Area (an ANS finding). Presently, data are not adequate to support such a finding for the area addressed in this proposal. If the board were to adopt the proposal, the department recommends postponing an ANS determination for at least 3 years until data from subsistence permits are available upon which to base an ANS finding.

COST ANALYSIS: Adoption of this proposal is not expected to result in additional direct costs for private individuals to participate in this fishery.

SUBSISTENCE REGULATION REVIEW:

1. Is this stock in a non-subsistence area? No.
2. Is the stock customarily and traditionally taken or used for subsistence? Yes (5 AAC 02.608).
3. Can a portion of the stock be harvested consistent with sustained yield? Yes.
4. What amount is reasonable necessary for subsistence use? The Board of Fisheries has not made this determination.
5. Do the regulations provide a reasonable opportunity for subsistence use? This is a Board of Fisheries decision.
6. Is it necessary to reduce or eliminate other uses to provide a reasonable opportunity for subsistence use? This is a Board of Fisheries decision.

Statewide Groundfish

PROPOSAL 375 - 5 AAC 28.070. Groundfish possession and landing requirements.

PROPOSED BY: Alaska Department of Fish and Game.

WHAT WOULD THE PROPOSAL DO? This proposal seeks to amend this regulation to require that all groundfish taken in a commercial fishery be reported on a fish ticket.

WHAT ARE THE CURRENT REGULATIONS? The current regulations (**5 AAC 28.070 Groundfish possession and landing requirements**) require accountability of all retained pollock and Pacific cod in directed and non-directed fisheries.

WHAT WOULD BE THE EFFECT IF THE PROPOSAL WERE ADOPTED? If adopted, all groundfish retained by a vessel would have to be documented on fish tickets. Managers must be aware of all fish removals. Complete harvest data will provide better management precision.

The regulation would read:

5 AAC 28.070. Groundfish possession and landing requirements. (a) Unless otherwise provided in this chapter,

(1) in a groundfish fishery, a CFEC permit holder may not have on board a vessel operated by that permit holder, bycatch of any other species or species group of groundfish;

(2) in a halibut fishery, a CFEC permit holder may not have on board a vessel operated by that permit holder, bycatch of any species or species group of groundfish.

(b) Notwithstanding (a) of this section or any other provision of this chapter, during times when the commissioner determines it necessary for conservation of the resource, to avoid waste of a bycatch species, to prevent overharvest of a bycatch species, [OR TO FACILITATE CONSISTENCY OF THE REGULATIONS IN AN AREA WHERE STATE AND FEDERAL JURISDICTION OVERLAP], **or to facilitate consistency of state and federal regulations for a species,** the commissioner may close and reopen fishing seasons to provide for changes to groundfish bycatch levels, as provided in this subsection. The commissioner, by emergency order, may close a directed groundfish season and immediately reopen a season during which a CFEC permit holder may have on board a bycatch level of another groundfish species, established by the commissioner and stated in the emergency order, of up to 20 percent, by weight, of the directed groundfish species on board the vessel. Regarding a directed halibut fishery, the commissioner, by emergency order, may close and immediately reopen the fishing season for a bycatch groundfish species during which a CFEC halibut permit holder may have on board a bycatch level of that groundfish species, established by the commissioner and stated in the emergency order, of up to 20 percent, by weight, of the halibut on board the vessel. If a CFEC permit holder has on board the permit holder's vessel fish taken in more than one directed fishery for which a bycatch level has been established under this subsection, each applicable bycatch level percentage is applied to the weight of the fish taken in the applicable directed fishery and the resulting amounts are added together to determine the total weight of the bycatch species that may be on board the vessel.

(c) In the waters of Alaska,

(1) a CFEC permit holder who has a groundfish species on board the permit holder's vessel may not operate groundfish gear in an area in which the taking of that species of groundfish is prohibited;

(2) a CFEC permit holder, while taking fish in an area or having taken fish in an area during the same trip, may not have on board the permit holder's vessel an aggregate amount of a groundfish species that exceeds the amount allowed by regulation for that area, regardless of where the groundfish were taken.

(d) Notwithstanding any other provision of this chapter, if the operator of a catcher/processor vessel has written authorization from the department, the operator may retain on board the vessel an amount of processed fish that exceeds a limit set by this chapter. The department will issue the written authorization if completed fish tickets for all fish on board the vessel have been submitted to the department or an authorized department representative before the beginning of the next fishing period in which the operator intends to fish.

(e) A CFEC permit holder operating a vessel fishing for groundfish shall retain

(1) all pollock and Pacific cod taken when a directed fishery for pollock or Pacific cod is open; or

(2) the maximum retainable bycatch of pollock and Pacific cod taken, specified in 50 C.F.R. 679.20, revised as of October 1, 1996 and amended through January 23, 2009, when a directed fishery for pollock or Pacific cod is closed.

(f) a person delivering groundfish shall notify the processor if any groundfish remain onboard the vessel after the delivery. A processor shall report a landing as a partial delivery if any groundfish remain aboard the delivering vessel.

(1) except where a delivery is reported as a partial delivery within the eLandings system or on an ADF&G fish ticket form, a person delivering groundfish to a processor shall land all groundfish aboard the vessel.

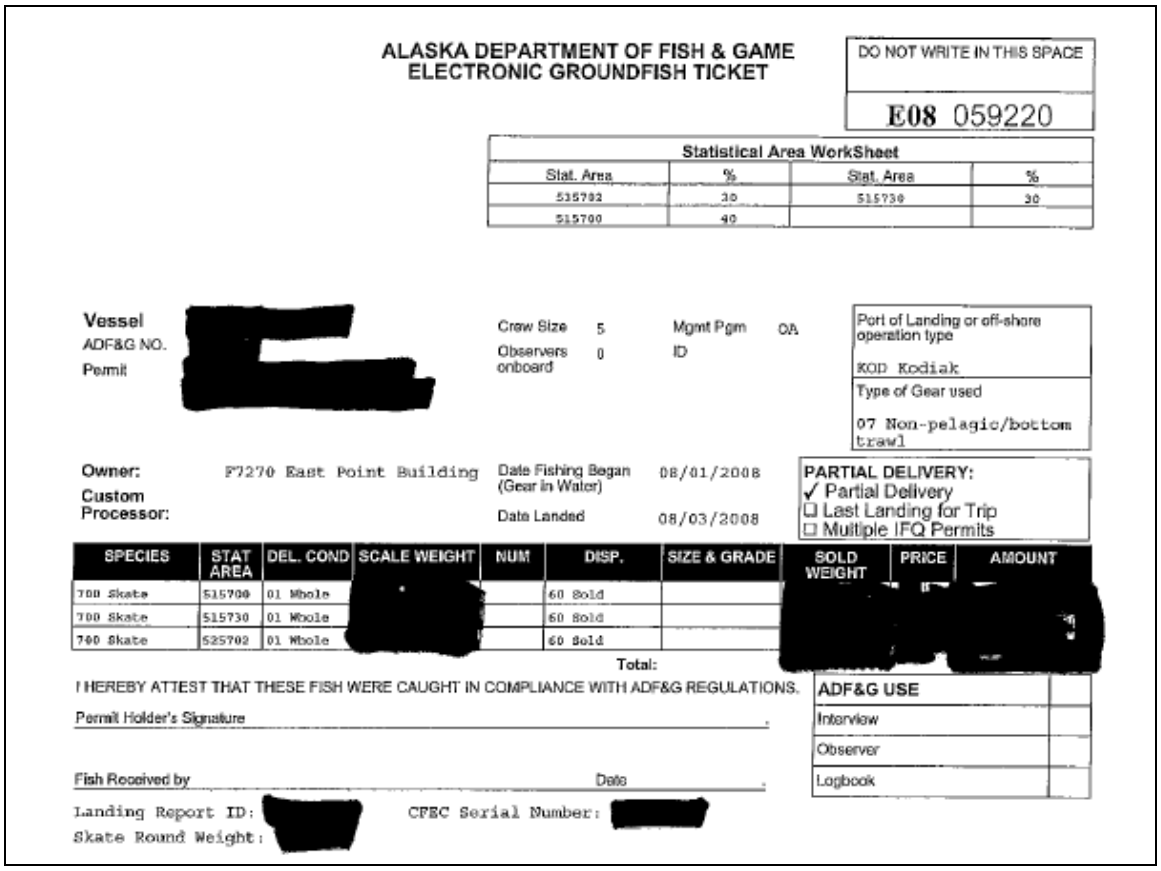
(2) a processor or processor's agent that accepts delivery of or purchases groundfish from a vessel shall sort and weigh by species all groundfish landed by a vessel. Groundfish may be returned to a vessel only after the landing is reported as specified in 5 AAC 39.130.

(3) groundfish present on board a vessel at any landing may not be considered discarded at sea for eLanding or ADF&G fish ticket reporting purposes.

(4) after making a partial delivery from a vessel, and prior to making a final delivery, a person may not offload any groundfish remaining onboard the vessel unless making a final delivery and landing all groundfish aboard the vessel.

BACKGROUND: This issue was brought to the department's attention by NOAA Office of Law Enforcement. Their concern dealt with overages of bycaught species. At this time, groundfish not offloaded by a fishing vessel are not required to be accounted for on a fish ticket, thereby avoiding overage penalties. In order to better manage groundfish, and to enforce regulations dealing with bycatch levels onboard, all groundfish harvested during a commercial fishery must be accounted for. A concern develops however, with proposed

language because vessels currently may deliver to multiple processors. A vessel may elect to off-load all or a portion of their harvest to one or more processors, or may retain a portion of their harvest for dockside sales. Some groundfish, such as skates, have specific markets that not all processors supply. The processor involved in the first off-load does not want to 'carry' on their books the vessel's total retained poundage, as it is a potential tax obligation, even though it was not purchased. To create a second landing report without a subtraction of the poundage from the first purchaser would create double counting of the same fish. However, by design, fish tickets are able to record partial (split) deliveries, or indicate that the delivery is the last landing for a trip.



ALASKA DEPARTMENT OF FISH & GAME
ELECTRONIC GROUNDFISH TICKET

DO NOT WRITE IN THIS SPACE
E08 059220

Statistical Area WorkSheet

Stat. Area	%	Stat. Area	%
535702	30	515730	30
515700	40		

Vessel ADF&G NO. Permit [redacted]

Crew Size 5 Mgmt Pgm OA
Observers onboard 0 ID

Port of Landing or off-shore operation type: KOD Kodiak

Type of Gear used: 07 Non-pelagic/bottom trawl

Owner: F7270 East Point Building
Custom Processor:

Date Fishing Began (Gear in Water) 08/01/2008
Date Landed 08/03/2008

PARTIAL DELIVERY:
✓ Partial Delivery
☐ Last Landing for Trip
☐ Multiple IFQ Permits

SPECIES	STAT AREA	DEL. COND	SCALE WEIGHT	NUM	DISP.	SIZE & GRADE	SOLD WEIGHT	PRICE	AMOUNT
700 Skate	515700	01 Whole	[redacted]		60 Sold		[redacted]		
700 Skate	515730	01 Whole			60 Sold				
700 Skate	525702	01 Whole			60 Sold				

Total:

I HEREBY ATTEST THAT THESE FISH WERE CAUGHT IN COMPLIANCE WITH ADF&G REGULATIONS.

Permit Holder's Signature

Fish Received by Date

Landing Report ID: [redacted] CFEC Serial Number: [redacted]
Skate Round Weight:

ADF&G USE	
Interview	
Observer	
Logbook	

The eLandings System auto-assigns trip number based upon the following logic: Year, Vessel ADF&G, overlapping month/day. The system easily allows agency staff to review the landing report records for both deliveries, and even print out a fish ticket. This eLandings System feature can facilitate the disposition of product placed back on-board a vessel.

DEPARTMENT COMMENTS: The department **SUPPORTS** this proposal.

COST ANALYSIS: Adoption of this proposal is not expected to result in additional direct costs for private individuals to participate in this fishery.

Statewide – Prohibition on blocking channels

PROPOSAL 378 - 5 AAC 01.010. Methods, means, and general provisions; and **5 AAC 77.010. Methods, means, and general provisions.**

PROPOSED BY: Alaska Department of Fish and Game.

WHAT WOULD THE PROPOSAL DO? This proposal would clarify subsistence and personal use regulations that prohibit the obstruction of more than one-half or two- thirds of a stream or channel. If adopted, these regulations would apply to the width of a stream or any channel or braid of any stream.

WHAT ARE THE CURRENT REGULATIONS? Seven areas allow one-half of a stream to be blocked in the existing subsistence regulations: Kotzebue (**5 AAC 01.120(c)**), Norton Sound-Port Clarence (**5 AAC 01.170(c)**), Yukon-Northern (**5 AAC 01.220(f)(4)**), Kuskokwim (**5 AAC 01.270(f)**), Bristol Bay (**5 AAC 01.320(e)**), Chignik (**5 AAC 01.470(a)**), and Kodiak (**5 AAC 01.520(b)**).

The Yukon-Northern area (**5 AAC 77.171(a)(4)**) has the only personal use regulation allowing one-half of a stream to be blocked.

The Yakutat Area (**5 AAC 01.670 (d)**) subsistence regulations allow two-thirds of a stream to be blocked.

There is currently no specific regulation on the amount of a stream width that can be blocked by fishing gear in the statewide regulations and in the Aleutian Islands (**5 AAC 01.350**), Alaska Peninsula (**5 AAC 01.400**), Cook Inlet (**5 AAC 01.550**), Prince William Sound (**5 AAC 01.600**), and Southeast Alaska (**5 AAC 01.700**).

WHAT WOULD BE THE EFFECT IF THE PROPOSAL WERE ADOPTED? If adopted, this proposal would ensure fish passage and improve the enforcement of regulations prohibiting the obstruction of an individual stream or channel, which may be the primary migration route for fish in a braided stream.

BACKGROUND: Current subsistence and personal use fishery regulations that prohibit blocking of more than half or two-thirds of a stream have proven largely unenforceable in areas with braided streams or multiple channels. ADF&G and enforcement officers, and some of the public, have previously assumed that the board's prohibition on stream obstruction would apply to side channels as well as full streams. In 2008, a subsistence salmon permit holder was issued a citation for blocking the only channel that salmon could pass upstream through in a multi-braided stream (Figure 378-1). Because regulations in the Norton Sound-Port Clarence Area stated that not more than one-half the width of a fish stream could be blocked, rather than one-half of any channel or braid of any stream, the citation was withdrawn.

DEPARTMENT COMMENTS: The department submitted and **SUPPORTS** this proposal. It is clear that the intent of these regulations was to prevent fishing gear from entirely obstructing fish passage and to ensure escapement. Using the term "stream" instead of "any channel or braid of any stream" appears to be an error that prevents existing regulations from being effective in some areas. This proposal would eliminate confusion with the regulations and allow salmon to continue moving upriver for other users and ensure access for salmon to reach the spawning grounds. Since this proposal only serves to expand the regulatory language of "stream" to include "any channel or braid of any stream," this clarification would likely result in only a small overall affect on subsistence and personal use fishing.

One method of addressing this issue is to adopt a statewide regulation to include wording such as "When a portion of a stream width is restricted for fishing with a gillnet or stationary fishing device, the restriction also applies to any individual channel or braid within the stream." However, area regulations would still be unclear.

Another possible solution, if the board agrees that this is a housekeeping issue, would be for the board to adopt a delegation to the commissioner to identify all the area subsistence and personal use regulations restricting stream obstruction and adopt a housekeeping edit to each area's regulations to extend the area restrictions to channels and side channels. This option would present less possibility of public confusion because the restrictions on stream obstruction in each area could be understood without referring back to statewide regulations and because it would make area restrictions more consistent (i.e., if the stream restriction is one-half, the channel restriction would also be one-half, and if the stream restriction is two-thirds, the channel restriction would also be two-thirds). The department **SUPPORTS** this housekeeping option.

COST ANALYSIS: Adoption of this proposal is not expected to result in additional direct costs for private individuals to participate in this fishery.

Figure 378-1.–Pilgrim River, Norton Sound-Port Clarence area, 2008.

Committee B: COOK INLET RAZOR CLAMS, MISC. SHELLFISH, SUPPLEMENTAL ISSUES, AND DEFERRED PROPOSALS

Prince William Sound commercial shrimp pot fishery

PROPOSAL 44A - 5 AAC 31.260 Prince William Sound Pot Shrimp Fishery Management Plan.

PROPOSED BY: Alaska Department of Fish and Game.
WHAT WOULD THE PROPOSAL DO? This proposal would describe the conditions under which a commercial shrimp pot fishery in Prince William Sound may occur.

WHAT ARE THE CURRENT REGULATIONS? 5 AAC 31.210 Shrimp pot season in Registration Area E specifies there is no open season for shrimp fishing with pot gear in the Prince William Sound Area.

WHAT WOULD BE THE EFFECTS IF THE PROPOSAL WERE ADOPTED? If adopted, the proposal would specify the regulations under which a commercial shrimp pot fishery in Prince William Sound may occur. Effects would be dependent on the structure of a commercial shrimp pot fishery.

BACKGROUND: Commercial shrimp landings from Prince William Sound date to 1960 when approximately 5,000 pounds were harvested. Historically, 97% of the harvest has been spot shrimp and the fishery has been managed for this species although other species such as coonstripe shrimp are also harvested. From 1960 through 1977, catch varied from no harvest in 1961 and 1966, to approximately 25,000 pounds in 1974. The shrimp pot fishery expanded rapidly during 1978 to 1982 as local markets were established and the major harvest areas located. During 1982 to 1984, the open season was reduced to April 1 through November 30 with a guideline harvest range of 75,000 to 145,000 pounds. This season was intended to reduce harvests during the egg bearing and hatch periods. Despite the shortened season, catch increased to approximately 214,000 pounds in 1982 and effort increased to 79 vessels in 1984. In 1985, the board established a split season of March 15 through June 30 and August 15 through December 5, with a guideline harvest range (GHR) of 75,000–100,000 pounds each season, and an experimental harvest area with no closed season. Due to poor catch reporting, coupled with harvest from the experimental fishing area, total harvest substantially exceeded the GHR over the next few years. Harvest peaked at approximately 290,600 pounds in 1986 and effort increased to 86 vessels in 1987. Harvest declines beginning in 1988 indicated stock conservation problems. In 1991, a limited commercial fishery with a conservative guideline harvest range of 10,000 to 40,000 pounds was closed after 46 days of fishing had yielded only 17,580 pounds taken by 15 vessels in 45 landings. Fishery performance data from the 1991 fishery indicated that the stock was at a very low level. Although the commercial spot shrimp season was closed by emergency order beginning in 1992, noncommercial fisheries remained open. In 2000, the Board of Fisheries adopted a regulation closing the commercial shrimp pot fishery due to low stock abundance. The

board also made a customary and traditional use determination that 9,000–15,000 pounds of useable shrimp are reasonably necessary for subsistence in the Prince William Sound area, and restructured the subsistence, personal use, and sport fisheries. The new regulations established a fishing season of April 15 to September 15, limits of 5 pots per person and 5 pots per vessel, and a harvest permit requirement. The seasonal closure was implemented to protect female shrimp during the egg-bearing period.

Since 1998, results from the department's standardized index survey for spot shrimp have demonstrated a slow, but steady increase in abundance from 0.29 pounds/pot to 2.40 pounds/pot for all shrimp in 2007. Similarly, survey results for commercially marketable shrimp with a carapace length of 32mm or greater have also increased from 0.14 pounds/pot to 1.0 pounds/pot in 2007.

DEPARTMENT COMMENTS: The department submitted and **SUPPORTS** this proposal. The department looks to the board process to refine a fishery management plan that addresses the above issues and provides the structure necessary for the redevelopment of the resource while maintaining the sustainability of all the shrimp fisheries. The department recommends a rationale for shrimp pot fishery management that includes; year-class maintenance, avoidance of fishing biologically sensitive times such as the egg bearing period, reduction of mortality of small shrimp, and brood stock maintenance. The following regulatory structure provides a basis for consideration of a commercial fishery.

DRAFT PWS COMMERCIAL POT SHRIMP MANAGEMENT PLAN

5 AAC 31.260. Prince William Sound Pot Shrimp Fishery Management Plan. (a) The Prince William Sound pot shrimp fishery expanded dramatically from 1979 to 1987, then declined between 1988-1991 and ultimately remained closed from 1992-2008. Two species of shrimp are harvested in this fishery; spot shrimp *Pandalus platyceros* and coonstripe shrimp *Pandalus hypsinotus.* Spot shrimp historically comprised greater than 95 percent of the harvest. Therefore, it is necessary to base management of this fishery on spot shrimp.

(b) The Alaska Board of Fisheries recognizes the need for conservative management of shrimp fisheries in the established fishing area of western of Prince William Sound. Management of the fisheries in this area are described in 5 AAC 31.200-260.

5 AAC 31.206. Area E registration. (is amended to read).

a) Registration Area E is a nonexclusive registration area for vessels fishing for shrimp with trawl gear.

c) Registration Area E is a superexclusive registration area for vessels fishing for shrimp with pot gear.

d) A vessel participating in the Area E shrimp pot fishery must obtain an area registration by close of business April 1.

5 AAC 31.210. Shrimp pot fishing seasons for Registration Area E.

a) Shrimp may be taken in those waters of the Inside District west of a line from Middle Point at 60° 20.00' N. lat., 147° 00.00' W. long. north to a point at 60° 40.00' N. lat., 147° 00.00' W. long., then northeast to the Coast Guard marker light on Goose Island to Knowles Head from April 15 to September 15 unless closed by emergency order. Fishing within this area will be rotated on an annual basis between the following areas:

(1) waters north of 60° 40.00' N. lat. and east of 148° 00.00' W. long.

(2) waters south of those described in (1) above and north of 60° 25.00' N. lat.

(3) waters south of 60° 25.00' N. lat.

(b) In all other waters of Registration Area E, shrimp may be harvested only under the terms of a commissioner's permit. The permit may restrict gear, fishing areas, fishing periods, allowable harvest, and other conditions the commissioner determines necessary for the conservation and management of the resource.

5 AAC 31.215. Shrimp pot guideline harvest ranges for Registration Area E.

(a) The guideline harvest for shrimp harvested from the area described in 5 AAC 31.210 (a) by pot gear will be calculated as 40% of the total allowable harvest for the area.

5 AAC 31.224. Lawful shrimp pot gear for Registration Area E.

(a) Shrimp may be taken with pots in Registration Area E only as specified in this section.

(b) A shrimp pot may not have

(1) more than one bottom;

(2) a vertical height of more than 24 inches;

(3) more than four tunnel eye openings, which individually do not exceed 15" in perimeter;

(4) a bottom perimeter exceeding 124"

(c) The sides of a shrimp pot may only be

(1) at a right angle to the plane of the bottom of the pot; or

(2) slanted inward toward the center of the pot in a straight line from the bottom of the pot to the top of the pot.

(d) A shrimp pot must be entirely covered with net webbing or rigid mesh. At least two adjacent sides or 50 percent of the vertical or near-vertical sides must be covered with net webbing or rigid mesh that allows the passage of a seven-eighths inch diameter by 12 inch long wooden dowel, which upon insertion into the web, must drop completely through by its own weight, without force.

(e) Shrimp pots may be operated as follows

(1) the maximum number of shrimp pots that may be operated from a vessel is 50.

(2) the department will announce annually, prior to the start of the commercial fishery, the number of pots per vessel that may be operated in the commercial fishery for that season. In determining the annual pot limit, the department will consider the

total number of registered vessels, estimated catch per unit of effort, and the magnitude of the GHL.

(3) a vessel operator may have only shrimp pot gear owned by that person on board the vessel at any time.

(4) shrimp pot gear may be deployed or retrieved only from 8:00 am until 4:00 pm each day; the commissioner may close, by emergency order, the fishing season in a district or portion of a district and immediately reopen the season during which the time period allowed to deploy and retrieve shrimp pot gear may be increased or decreased to achieve the guideline harvest level.

(5) all shrimp pots left in saltwater unattended longer than a two-week period must have all bait containers removed and all doors secured fully open.

(f) A registered shrimp vessel may not have, at any time in the aggregate, more than the legal limit of pot gear on board the vessel, in the waters in fishing condition, and in the water in non-fishing condition.

5 AAC 31.226. Shrimp pot marking requirements for Registration Area E. (a) if required by the department, in addition to the requirements of 5 AAC 31.051, each shrimp pot must have one identification tag issued by the department attached to the pot. If required by the department under this section, identification tags will be issued before the fishing season, uniquely numbered for that registration year, and issued at the time of vessel registration for that vessel only. The vessel owner, or the owner's agent, shall apply for identification tags at a department office designated to issue tags. Replacement of tags lost during the season is permitted if the vessel operator submits a sworn statement or affidavit describing how the tags were lost and listing the numbers of the lost tags.

(b) All shrimp pots on board a registered shrimp vessel must be marked as specified in (a) of this section.

(c) Shrimp pots deployed on a longline, consisting of more than five pots, must have at least one buoy attached to each end of the longline. The buoys must be properly marked as specified in 5 AAC 31.051 and the pots must be marked as required in (a) of this section.

5 AAC 31.235. Closed waters in Registration Area E. (See maps in RC informational packet. The board will have to decide intent for individual closures and ADF&G would provide location information)

5 AAC 31.240. Registration Area E shrimp vessel inspection and inspection points. (is amended to read)

(b) Unless required under (c) of this section, a vessel fishing for shrimp in Registration Area E is not required to undergo an inspection, as specified in 5 AAC 31.030

(c) The commissioner, by announcement, may require that vessels fishing for shrimp in Registration Area E be inspected as specified in 5 AAC 31.030.

(d) If the commissioner requires a vessel inspection under (c) of this section, the inspection points for Registration Area E are described in (a) of this section.

5 AAC 31.243 Reporting requirements for Registration Area E.

(a) An operator of a vessel participating in the Prince William Sound shrimp pot fishery shall obtain and complete a logbook provided by the department. The vessel operator must have the logbook on board the vessel at all times and must submit to the department, each logbook page that corresponds with each ADF&G fish ticket.

(b) The owner or operator of a catcher-seller vessel registered to take shrimp in Registration Area E shall complete a fish ticket indicating the weight of the shrimp on board by species before any shrimp are removed from the vessel.

(c) Prior to landing shrimp, the owner or operator of a catcher-seller vessel registered to take shrimp in Registration Area E shall contact the Cordova office at a telephone number specified by the department at the time of registration and provide:

(A) the permit holder's name;

(B) the name and ADF&G number of the registered vessel;

(C) the following information for each ADF&G fish ticket that pertains to that trip;

(i) the preprinted fish ticket number;

(ii) the date of landing;

(iii) the statistical areas fished;

(iv) the number of pot lifts for each statistical area;

(v) the round weight of all shrimp taken by species and statistical area.

COST ANALYSIS: Adoption of this proposal is expected to result in additional direct costs for private individuals to participate in this fishery because of the necessities to purchase gear.

PROPOSAL 49 - 5 AAC 55.022. General provisions for seasons, bag, possession, and size limits, and methods and means for the Prince William Sound Area; and 5 AAC 31.206. Area E registration.

PROPOSED BY: Gordon Scott.

WHAT WOULD THE PROPOSAL DO? This proposal would prohibit persons or vessels from participating in the both commercial and sport fish pot shrimp fisheries.

WHAT ARE THE CURRENT REGULATIONS? Regulation 5 AAC 31.020 Shrimp area registration and 5 AAC 39.120 Registration of commercial fishing vessels, both require a commercial vessel to be validly registered to participate in a commercial fishery. Regulation 5 AAC 31.053 Operation of Other Pot Gear restricts participation in a commercial fishery by a person or vessel that has operated sport, personal use, or subsistence shrimp pots during the 14 days before the commercial shrimp season and also restricts the operation of shrimp pot gear in a commercial, sport, subsistence, or personal use shrimp fishery by a vessel or person that has participated in a commercial fishery in

that area unless the commercial gear is out of the water or in storage (5 AAC 31.052) and cancels the vessel's area registration.

WHAT WOULD BE THE EFFECTS IF THE PROPOSAL WERE ADOPTED? If adopted, the proposal would limit effort in the Prince William Sound commercial and noncommercial shrimp fisheries by restricting an individual's participation to either a commercial or a noncommercial fishery.

BACKGROUND: The Board of Fisheries may adopt regulations aimed at controlling effort and allocating resources such as exclusive or superexclusive area registration, gear limits, and fishery harvest allocations. Numerous commercial fisheries have an exclusive or super exclusive registration requirement. These designations limit effort by restricting participation by vessels that have fished in another exclusive or any superexclusive registration area.

DEPARTMENT COMMENTS: The department is **NEUTRAL** on this allocative proposal. The department recognizes that temporal or spatial separation between fisheries may help to avoid gear conflicts and provide for an orderly fishery. The department is uncertain if the proposed restriction is needed for the conservation and development of the fishery. Before adopting this proposal the board might explore whether less restrictive temporal restrictions on participation could accomplish the desired objectives.

COST ANALYSIS: Adoption of this proposal is not expected to result in additional direct costs for private individuals to participate in this fishery.

Cook Inlet Clams

PROPOSAL 363: 5 AAC 77.518. Personal use clam fishery.

PROPOSED BY: John McCombs.

WHAT WOULD THE PROPOSAL DO? This proposal would reduce the razor clam personal use daily bag limit in the area from the mouth of the Kenai River to the southernmost tip of the Homer Spit from the first 60 clams dug to the first 30 clams dug.

WHAT ARE THE CURRENT REGULATIONS? Shellfish may be taken for sport and personal use. Sport and personal use razor clam regulations are identical except that only Alaskan residents may participate in personal use fisheries. Razor clams may be taken from January 1 – December 31 from the mouth of the Kenai River south to the tip of the Homer Spit. The bag limit is the first 60 clams dug per day and the possession limit is 120 clams. Clams may be taken only with rakes, shovels, manually operated clam guns, or by hand.

WHAT WOULD BE THE EFFECT IF THE PROPOSAL WERE ADOPTED? This proposal would reduce the personal use razor clam bag limit by 50%. The possession limit would remain 120 clams. The sport bag and possession limits would remain at 60 per day and 120 in possession. Enforcement may be problematic due to differing limits between user groups harvesting in the same area. The change could result in some unknown decrease in the harvest of razor clams. The change would have little impact on the sustainability of the razor clam population because exploitation rates over most of the beach area are low. Diggers traveling to harvest clams may be required to stay longer or make more trips to achieve their desired harvest amount.

BACKGROUND: The razor clam fishery along the 50 miles of eastern Cook Inlet is a sustainable fishery based upon consistent harvests, low harvest rates, the presence of many age classes on the beaches, and regular recruitment of young clams into the population. Participation in the razor clam fishery on the east side of Cook Inlet was 12,000 digger-days when it was first estimated in 1969. Effort for razor clams peaked at 47,000 digger days in 1994 and has since stabilized at an average of 30,000 digger-days annually. Harvests peaked in 1994 at 1.3 million razor clams. Annual harvests since 1994 averaged approximately 700,000 razor clams until 2005 when a natural die-off of older, larger-sized clams occurred and a period of slow growth was observed along approximately 15 miles of beach including the popular Clam Gulch area. As a result, the average annual harvest of razor clams was approximately 400,000 during 2005-2007.

Digger behavior continues to follow historical patterns where the diggers shift effort to where the largest-sized, most abundant clams are found and away from where there were fewer or smaller clams. Until the late 1970's the primary destination was Clam Gulch. From 1986-1995, diggers shifted to Ninilchik to harvest large clams. Diggers shifted back to Clam Gulch during 1996-2004 when a large number of young clams were found at Ninilchik and more abundant large clams could be found at Clam Gulch. The die-off of older, larger-sized clams between 2004 and 2005 and slow growth of clams on the beaches from the Clam Gulch area between 2005 and 2007 resulted in diggers shifting back to Ninilchik, which currently supports 68% of the harvest compared to 13% from Clam Gulch.

Razor clam abundance has been periodically estimated since 1988 at the two most heavily harvested eastside beach areas located on portions of Clam Gulch and Ninilchik beaches. The abundance of clams was last estimated at Clam Gulch in 2008 and Ninilchik in 2005. The abundance of clams of a size easily encountered by diggers (approximately 3 inches in length or larger) at Clam Gulch in 2008 was 1.4 million and abundance of all-sized clams was 3.6 million. Razor clam abundance at Clam Gulch in 2008 was about half the average of previous estimates, but percent of clams harvested is as low as previous estimates: approximately 3% of harvestable-sized clams and 1% of all-sized clams. The time series of abundance estimates from Ninilchik, where harvest has been focused since the mid 1980s, has no overall negative trend to indicate that exploitation rates might be negatively affecting recruitment or abundance in the immediate vicinity.

Although the proportion of the harvest from Ninilchik increased from 2004-2008, this was offset by a decrease in the overall harvest, resulting in the maintenance of fairly stable harvests from Ninilchik between 2004 and 2008. Sustainable harvest rates have not been determined for razor clams in Alaska, but harvest rates along most of eastern Cook Inlet beaches are below sustainable levels determined for other razor clam fisheries. Washington Department of Fish and Wildlife and the tribal co-managers found that harvest rates above 25.4% of the razor clam standing stock are not sustainable. British Columbia Department of Fisheries and Oceans (DFO) and their tribal co-managers restrict British Columbia's only commercial razor clam fishery at North Beach to 12% of clams over 3.5 inches.

DEPARTMENT COMMENTS: The department **OPPOSES** this proposal. There is no biological reason to lower the razor clam bag limit on the Eastside beaches. Razor clam populations fluctuate, as they have in the past, independent of harvest levels. Increased harvest and effort has been documented on only a few miles of beach near Ninilchik and Clam Gulch, while most beach areas receive little digging pressure. Surveys indicate new age classes regularly recruit into the population all along the Eastside beaches. Clam growth in 2008 in the Clam Gulch area returned to historical growth rates. The department monitors razor clam abundance on a rotating schedule and annually estimates harvest and length and age composition and will respond appropriately if conservation concerns are identified.

The department is **NEUTRAL** to the allocative aspects of this proposal.

COST ANALYSIS: Adoption of this proposal is not expected to result in additional direct costs for private individuals to participate in this fishery.

PROPOSAL 364: 5 AAC 58.022 (a)(15). Waters; seasons; bag, possession and size limits; and special provisions for Cook Inlet – Resurrection Bay Saltwater Area.

PROPOSED BY: Gary Simmons.

WHAT WOULD THE PROPOSAL DO? This proposal would reduce the razor clam sport fishery daily bag limit in the area from the mouth of the Kenai River to the southernmost tip of the Homer Spit from the first 60 clams dug to the first 15 clams dug.

WHAT ARE THE CURRENT REGULATIONS? Shellfish may be taken for sport and personal use. Sport and personal use razor clam regulations are identical except that only Alaskan residents may participate in personal use fisheries. Razor clams may be taken from January 1 – December 31 from the mouth of the Kenai River south to the tip of the Homer Spit. The bag limit is the first 60 clams dug per day and the possession limit is 120 clams. Clams may be taken only with rakes, shovels, manually operated clam guns, or by hand.
WHAT WOULD BE THE EFFECT IF THE PROPOSAL WERE ADOPTED? This proposal would reduce the sport razor clam bag limit by 75% at Clam Gulch. The

possession limit would remain 120 clams. The personal use bag and possession limits would remain 60 and 120. Enforcement may be problematic due to differing limits between user groups harvesting in the same area. The change could result in a significant decrease in the harvest of razor clams at Clam Gulch. The change would have little impact on the razor clam population at Clam Gulch because exploitation rates in the Clam Gulch beach area are low. It could impact the beach area as a whole because restriction of the bag limit on the popular Clam Gulch beach could send diggers to other beaches that can sustain less harvest. Diggers who chose to dig at Clam Gulch would be required to stay longer in the area or make more trips to the area to achieve their desired harvest amount. The proposer does not specify the boundaries of the Clam Gulch area.

BACKGROUND: The razor clam fishery along the 50 miles of eastern Cook Inlet is a sustainable fishery based upon consistent harvests, low harvest rates, the presence of many age classes on the beaches, and regular recruitment of young clams into the population. Participation in the razor clam fishery on the east side of Cook Inlet was 12,000 digger-days when it was first estimated in 1969. Effort for razor clams peaked at 47,000 digger days in 1994 and has since stabilized at an average of 30,000 digger-days annually. Harvests peaked in 1994 at 1.3 million razor clams. Annual harvests since 1994 averaged approximately 700,000 razor clams until 2005 when a natural die-off of older, larger-sized clams occurred and a period of slow growth was observed along approximately 15 miles of beach including the popular Clam Gulch area. As a result the average annual harvest of razor clams was approximately 400,000 during 2005-2007.

Digger behavior continues to follow historical patterns where the diggers shift effort to where the largest-sized, most abundant clams are found and away from where there were fewer or smaller clams. Until the late 1970's the primary destination was Clam Gulch. From 1986-1995, diggers shifted to Ninilchik to harvest large clams. Diggers shifted back to Clam Gulch during 1996-2004 when a large number of young clams were found at Ninilchik and more abundant large clams could be found at Clam Gulch. The die-off of older, larger-sized clams between 2004 and 2005 and slow growth of clams on the beaches from the Clam Gulch area between 2005 and 2007 resulted in diggers shifting back to Ninilchik, which currently supports 68% of the harvest compared to 13% from Clam Gulch.

Razor clam abundance has been periodically estimated since 1988 at the two most heavily harvested eastside beach areas located on portions of Clam Gulch and Ninilchik beaches. The abundance of clams was last estimated at Clam Gulch in 2008 and Ninilchik in 2005. The abundance of clams of a size easily encountered by diggers (approximately 3 inches in length or larger) at Clam Gulch in 2008 was 1.4 million and abundance of all-sized clams was 3.6 million. Razor clam abundance at Clam Gulch in 2008 was about half the average of previous estimates, but percent of clams harvested is as low as previous estimates: approximately 3% of harvestable-sized clams and 1% of all-sized clams. The time series of abundance estimates from Ninilchik, where harvest has been focused since the mid 1980s, has no overall negative trend to indicate that exploitation rates might be negatively affecting recruitment or abundance in the immediate vicinity.

Although the proportion of the harvest from Ninilchik increased from 2004-2008, this was offset by a decrease in the overall harvest, resulting in the maintenance of fairly stable harvests from Ninilchik between 2004 and 2008. Sustainable harvest rates have not been determined for razor clams in Alaska, but harvest rates along most of eastern Cook Inlet beaches are below sustainable levels determined for other razor clam fisheries. Washington Department of Fish and Wildlife and the tribal co-managers found that harvest rates above 25.4% of the razor clam standing stock are not sustainable. British Columbia Department of Fisheries and Oceans (DFO) and their tribal co-managers restrict British Columbia's only commercial razor clam fishery at North Beach to 12% of clams over 3.5 inches.

DEPARTMENT COMMENTS: The department **OPPOSES** this proposal. There is no biological reason to lower the razor clam bag limit on the Eastside beaches. Razor clam populations fluctuate, as they have in the past, independent of harvest levels. Increased harvest and effort has been documented on only a few miles of beach near Ninilchik and Clam Gulch, while most beach areas receive little digging pressure. Surveys indicate new age classes regularly recruit into the population all along the Eastside beaches. Clam growth in 2008 in the Clam Gulch area returned to historical growth rates. The department monitors razor clam abundance on a rotating schedule and annually estimates harvest and length and age composition and will respond appropriately if conservation concerns are identified.

The department is **NEUTRAL** to the allocative aspects of this proposal.

COST ANALYSIS: Adoption of this proposal is not expected to result in additional direct costs for private individuals to participate in this fishery.

PROPOSAL 365: 5 AAC 58.022 (a)(15). Waters; seasons; bag, possession and size limits; and special provisions for Cook Inlet – Resurrection Bay Saltwater Area.

PROPOSED BY: John McCombs.

WHAT WOULD THE PROPOSAL DO? This proposal would reduce the razor clam sport fishery daily bag limit in the area from the mouth of the Kenai River to the southernmost tip of the Homer Spit from the first 60 clams dug to the first 25 clams dug.

WHAT ARE THE CURRENT REGULATIONS? Shellfish may be taken for sport and personal use. Sport and personal use razor clam regulations are identical except that only Alaskan residents may participate in personal use fisheries. Razor clams may be taken from January 1 – December 31 from the mouth of the Kenai River south to the tip of the Homer Spit. The bag limit is the first 60 clams dug per day and the possession limit is 120 clams. Clams may be taken only with rakes, shovels, manually operated clam guns, or by hand.

WHAT WOULD BE THE EFFECT IF THE PROPOSAL WERE ADOPTED? This proposal would reduce the sport razor clam bag limit from 60 to 25. The sport possession

limit would remain 120. The personal use bag and possession limits would remain at 60 per day and 120 in possession. Enforcement may be problematic due to differing limits between user groups harvesting in the same area. The change could result in some unknown decrease in the harvest of razor clams. The change would have little impact on the sustainability of the razor clam population because exploitation rates over most of the beach area are low. Diggers traveling to harvest clams may be required to stay longer or make more trips to achieve their desired harvest amount.

BACKGROUND: The razor clam fishery along the 50 miles of eastern Cook Inlet is a sustainable fishery based upon consistent harvests, low harvest rates, the presence of many age classes on the beaches, and regular recruitment of young clams into the population. Participation in the razor clam fishery on the east side of Cook Inlet was 12,000 digger-days when it was first estimated in 1969. Effort for razor clams peaked at 47,000 digger days in 1994 and has since stabilized at an average of 30,000 digger-days annually. Harvests peaked in 1994 at 1.3 million razor clams. Annual harvests since 1994 averaged approximately 700,000 razor clams until 2005 when a natural die-off of older, larger-sized clams occurred and a period of slow growth was observed along approximately 15 miles of beach including the popular Clam Gulch area. As a result the average annual harvest of razor clams was approximately 400,000 during 2005-2007.

Digger behavior continues to follow historical patterns where the diggers shift effort to where the largest-sized, most abundant clams are found and away from where there were fewer or smaller clams. Until the late 1970's the primary destination was Clam Gulch. From 1986-1995, diggers shifted to Ninilchik to harvest large clams. Diggers shifted back to Clam Gulch during 1996-2004 when a large number of young clams were found at Ninilchik and more abundant large clams could be found at Clam Gulch. The die-off of older, larger-sized clams between 2004 and 2005 and slow growth of clams on the beaches from the Clam Gulch area between 2005 and 2007 resulted in diggers shifting back to Ninilchik, which currently supports 68% of the harvest compared to 13% from Clam Gulch.

Razor clam abundance has been periodically estimated since 1988 at the two most heavily harvested eastside beach areas located on portions of Clam Gulch and Ninilchik beaches. The abundance of clams was last estimated at Clam Gulch in 2008 and Ninilchik in 2005. The abundance of clams of a size easily encountered by diggers (approximately 3 inches in length or larger) at Clam Gulch in 2008 was 1.4 million and abundance of all-sized clams was 3.6 million. Razor clam abundance at Clam Gulch in 2008 was about half the average of previous estimates, but percent of clams harvested is as low as previous estimates: approximately 3% of harvestable-sized clams and 1% of all-sized clams. The time series of abundance estimates from Ninilchik, where harvest has been focused since the mid 1980s, has no overall negative trend to indicate that exploitation rates might be negatively affecting recruitment or abundance in the immediate vicinity.

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Department of Fish and Wildlife and the tribal co-managers found that harvest rates above 25.4% of the razor clam standing stock are not sustainable. British Columbia Department of Fisheries and Oceans (DFO) and their tribal co-managers restrict British Columbia's only commercial razor clam fishery at North Beach to 12% of clams over 3.5 inches.

DEPARTMENT COMMENTS: The department **OPPOSES** this proposal. There is no biological reason to lower the razor clam bag limit on the Eastside beaches. Razor clam populations fluctuate, as they have in the past, independent of harvest levels. Increased harvest and effort has been documented on only a few miles of beach near Ninilchik and Clam Gulch, while most beach areas receive little digging pressure. Surveys indicate new age classes regularly recruit into the population all along the Eastside beaches. Clam growth in 2008 in the Clam Gulch area returned to historical growth rates. The department monitors razor clam abundance on a rotating schedule and annually estimates harvest and length and age composition and will respond appropriately if conservation concerns are identified.

The department is **NEUTRAL** to the allocative aspects of this proposal.

COST ANALYSIS: Adoption of this proposal is not expected to result in additional direct costs for private individuals to participate in this fishery.

Cook Inlet Miscellaneous Shellfish

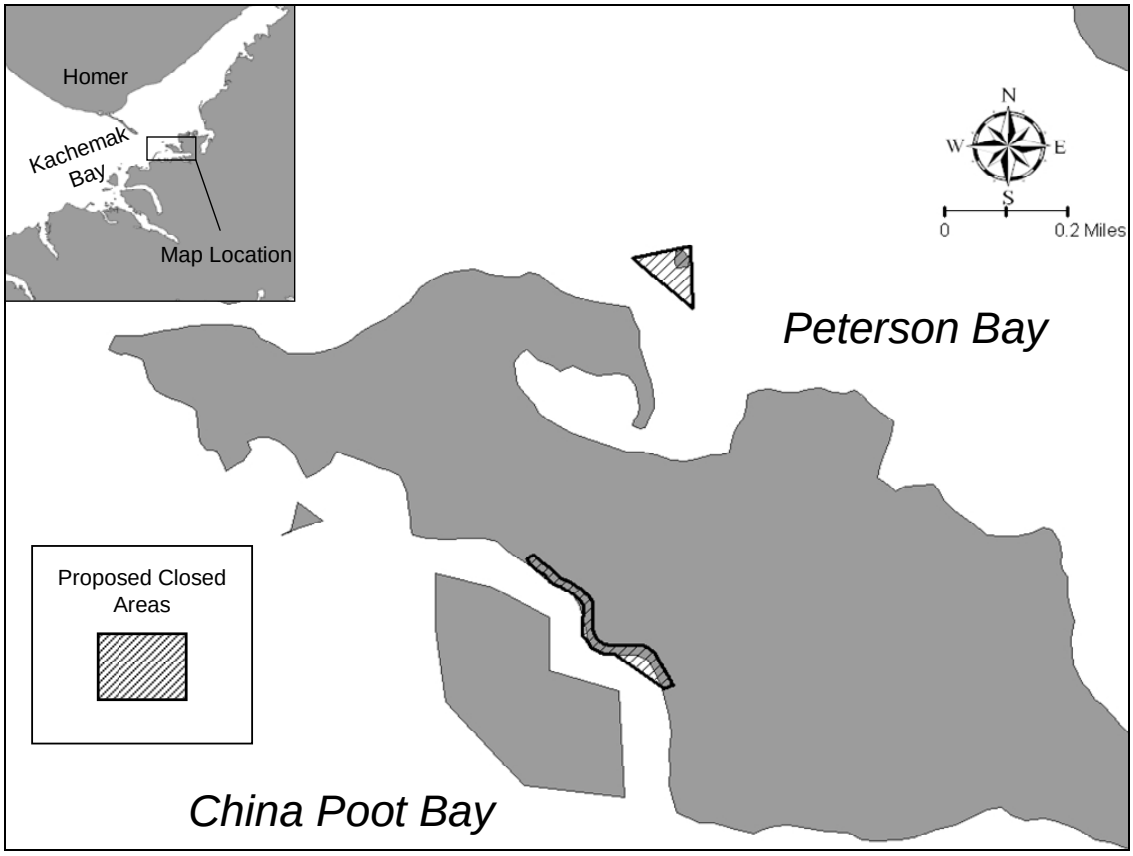
PROPOSAL 366: 5 AAC 38.314. Closed waters for clams and mussels in Registration H; 5 AAC 38.XXX. New section; 5 AAC 58.022. Waters; seasons; bag, possession, and size limits; and special provisions for Cook Inlet – Resurrection Bay Saltwater Area; and **5 AAC 77.XXX New section.**

PROPOSED BY: Center for Alaskan Coastal Studies, Inc.

WHAT WOULD THE PROPOSAL DO? This proposal would close approximately 2,100 feet of intertidal shoreline in China Poot Bay and a three acre intertidal area in Peterson Bay to the harvest of shellfish in sport, personal use, and commercial fisheries.
WHAT ARE THE CURRENT REGULATIONS? The proposed closure areas are currently open all year to the sport and personal use harvest of all shellfish except Dungeness crab, king crab, and shrimp. Tanner crab may be taken from July 15 to December 31 and January 15 through March 15. The areas are also located within Registration Area H Subdistrict 2 (**5 AAC 38.305**), which is open to the commercial harvest of hardshell clams and mussels from March 16 through October 31 on even-numbered calendar years with harvest restricted to weekdays during May 15 through September 15. The allowable commercial harvest from Peterson Bay during open years between 2002 and 2008 ranged between 1,000 and 2,000 pounds and from zero to 500 pounds from China Poot Bay. No other commercial shellfish fisheries are open in the area of the proposed closure. Octopus may be taken only as bycatch in other commercial fisheries.

WHAT WOULD BE THE EFFECT IF THE PROPOSAL WERE ADOPTED? The proposal would eliminate the sport, personal use and commercial harvest of commonly harvested species found on or in the substrate in the proposed closure areas. The amount of non-commercial harvest currently occurring in the two locations is unknown, but thought to be minimal based upon aerial clam digger counts conducted regularly since 2004. It is unlikely that any commercial harvest occurs in the Peterson Bay proposed closed area. Beach access and exploration by the public would not be restricted by this proposal.

BACKGROUND: The proposed closure in China Poot Bay is located adjacent to one of the most popular locations for non-commercial harvest of hardshell clams in Kachemak Bay. However, minimal effort has been observed in either proposed area. Since 2004, 8-10 aerial surveys have been conducted annually during April through August to determine the location and number of non-commercial diggers. During the flights, four diggers have been observed within the proposed closed area in China Poot Bay. No diggers have been observed within the proposed closed area in Peterson Bay. Commercial clam management has provided for harvest on even numbered years in both Peterson and China Poot bays. From 2002-2008, commercial hardshell clam harvest totaled 1,060 pounds from Peterson Bay and 1,021 pounds from China Poot Bay for all years combined.



DEPARTMENT COMMENTS: The department is **NEUTRAL** on this allocative proposal. It may be difficult to maintain regulatory markers at these locations due to strong currents and erosion of beach gravel.

COST ANALYSIS: Adoption of this proposal is not expected to result in additional direct costs for private individuals to participate in this fishery.

Statewide personal use

PROPOSAL 367: 5 AAC 77.019. Prohibitions on shellfish pot gear.

PROPOSED BY: Lawrence Hirai.

WHAT WOULD THE PROPOSAL DO? This proposal would require written and dated permission, valid for one year, for operating another person's shrimp/crab gear for personal use statewide.

WHAT ARE THE CURRENT REGULATIONS? A person may not disturb, tamper with, or retrieve another person's shellfish pot gear that is being fished for personal use, sport, or subsistence purposes without prior permission of the owner of that pot gear (**5AAC 02.019**, **5AAC 75.069,** and **5AAC 77.019**).

WHAT WOULD BE THE EFFECT IF THE PROPOSAL WERE ADOPTED? Apprehending pot thieves may be improved by this proposed regulation change because fishers contacted while pulling pots would be required to show proof of permission to use any gear with buoy markings that do not match their personal and boat identification. The proposal indicates that permission for the entire year is given with such written permission; this would preclude persons from giving permission for a specific day or time frame. Companion regulations for sport and subsistence pot fisheries will be necessary for enforceability if this proposal is adopted.

BACKGROUND: Reports of pot theft in non-commercial shellfish fisheries have been received periodically by fisheries enforcement, research, and management personnel throughout Alaska. The frequency of both unauthorized removal of shellfish from pots and theft of pots themselves is unknown. During the 2006 Statewide Dungeness Crab, Shrimp, and Misc. Shellfish meeting, the board adopted the current statewide regulation which had been in place only in the Southeast region. Enforcement of pot thievery remains difficult because pots are often dispersed in remote locations and it is difficult to predict when fishers will retrieve pots so enforcement personnel can contact them in the retrieval process.

DEPARTMENT COMMENTS: The department is **NEUTRAL** on this proposal. Requiring that fishers pull only their own pots and not those belonging to others could improve enforcement of pot thievery and the pulling of other's gear. Input from the

Department of Public Safety, Division of Alaska Wildlife Troopers indicates there are widely differing enforcement needs between coastal areas of the state for such a proposal. In some areas of the state, enforcement Troopers feel this may be beneficial, while in others, the opinion is that such a regulation would actually create a new class of violator and be counterproductive. The department will look to the DPS enforcement representative at the board meeting for further input on this issue.

COST ANALYSIS: Adoption of this proposal is not expected to result in additional direct costs for private individuals to participate in this fishery.

Bristol Bay – Naknek River

PROPOSAL 377 - 5AAC 06.360(d). Naknek River Sockeye Salmon Special Harvest Area Management Plan. Amend the regulation as follows:

(d)(1) no more than [25] **35** fathoms of set gillnet may be used to take salmon.

WHAT WOULD THE PROPOSAL DO? The proposal would increase the current allowable length of set gillnet gear from 25 fathoms to 35 fathoms when fishing in the Naknek River Special Harvest Area (NRSHA).

WHAT ARE THE CURRENT REGULATIONS? Current regulations (**5 AAC 06.360(d)(1)**) allow no more than 25 fathoms of set gillnet to be used to take salmon in the NRSHA.

WHAT WOULD BE THE EFFECT IF THE PROPOSAL WERE ADOPTED? If adopted, the proposal would allow set gillnet permit holders the option of fishing with up to 35 fathoms of set gillnet. The additional gear may help to limit sockeye salmon escapement into the Naknek River when fishing is restricted to the NRSHA.

BACKGROUND: The NRSHA has been open to set gillnet fishing for some portion of each season from 2000 to 2007. In six of those years, sockeye salmon escapement to the Naknek River exceeded the upper end of the sustainable escapement goal (SEG).

Year	Escapement	
2000	1,375,488	
2001	1,830,360	
2002	1,263,918	
2003	1,831,170	
2004	1,939,374	
2005	2,744,622	
2006	1,953,228	
2007	2,945,304	
2008	2,416,782	The NRSHA remained closed in 2008.

The sockeye salmon SEG range for the Naknek River is 800,000 to 1,400,000. However, when the NRSHA is open, an optimum escapement goal (OEG) established at the January, 2001, board meeting, raises the upper limit to 2,000,000 sockeye salmon. The recent large runs to the Naknek River have resulted in the upper end of the OEG being exceeded in two of the last four years, despite nearly continuous fishing. This is partially a result of the fishery being restricted to the much reduced area of the NRSHA for the majority of those fishing seasons. During the 2005 and 2007 seasons, processor harvest restrictions to both set and drift gillnet gear also contributed to the large escapements. The OEG was not in place in 2008 because the NRSHA remained closed for the entire season.

The current allocation plan for the NRSHA is based on a ratio of fishing periods (three drift to one set gillnet period), rather than percent of harvest.

The allowable length of a drift gillnet in the NRSHA was increased from 50 fathoms to 75 fathoms at the March, 2006 BOF meeting.

DEPARTMENT COMMENTS: The department **SUPPORTS** the use of additional gear in the NRSHA, which may limit sockeye salmon escapement to the Naknek River to some extent. The department is NEUTRAL on the possible allocative aspects of the proposal.

COST ANALYSIS: Adoption of this proposal is not expected to result in additional direct costs for private individuals to participate in this fishery.

Westward Region Proposals

Mark Stichert

Oral Report to the Alaska Board of Fisheries

March 2009

RC-3

Oral Report: Tab 2

Staff Comments: Tab 1

Westward Region Proposals

Proposal 356: Tenders for Dungeness Crab (Neutral)

Proposal 357: Escape Mechanism for Dungeness Pot Gear (Opposed)

Proposal 358: Closed Waters for Scallops in Registration Area J (Opposed)

Proposal 361: Subsistence Fishing by Proxy (Opposed)

Proposal 362: Subsistence King Crab Fishery (Opposed)

Proposal 356 – Dungeness Crab Tenders

Allow vessels to harvest and tender Dungeness crab in the Kodiak District

Current Regulations: (5 AAC 32.033)

- Tenders may not have Dungeness crab gear onboard
- Tenders may not be used to fish for Dungeness crab
- Registration and reporting requirements

If Adopted: (Kodiak Area)

- Vessels may simultaneously harvest and tender Dungeness crab
- Crab ownership transfers from catcher to tender at time of delivery

Proposal 356 – Dungeness Management

Open Access Fishery:

- CFEC Permit
- ADF&G Registration
- No vessel size limits
- No pot limits

3 'S' Management Strategy:

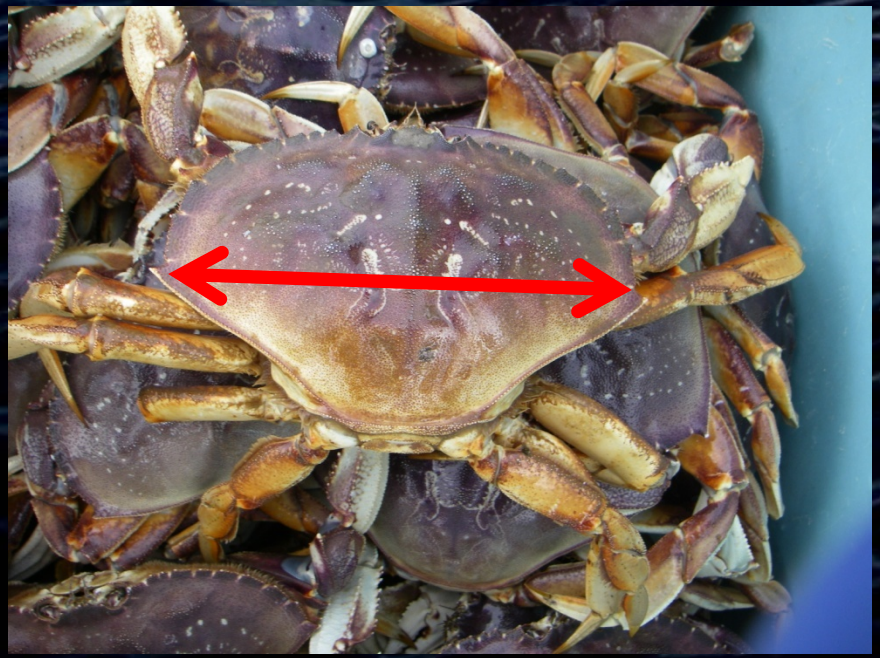
(Sex / Size / Season)

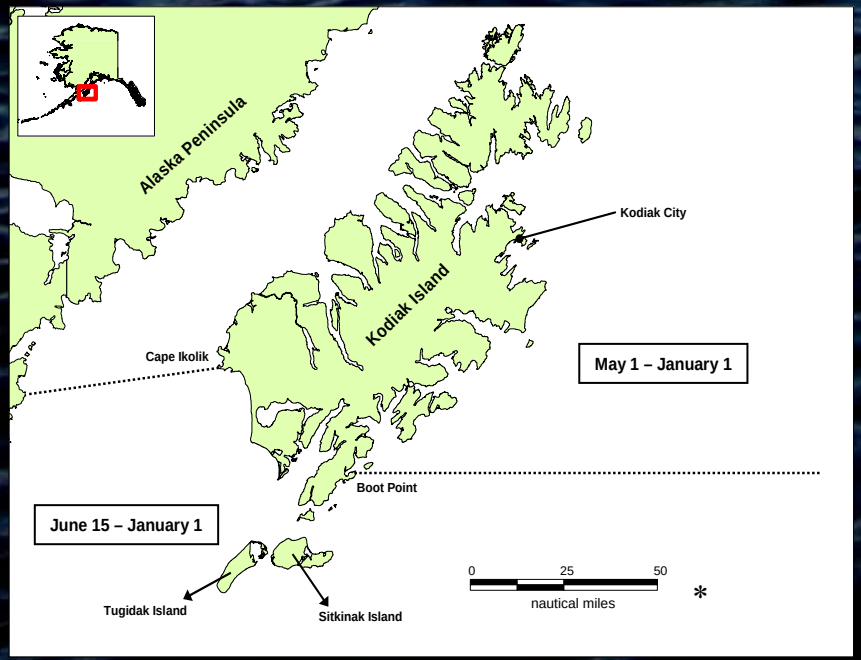
Sex: Male Crab

Size: 6.5" Minimum CW

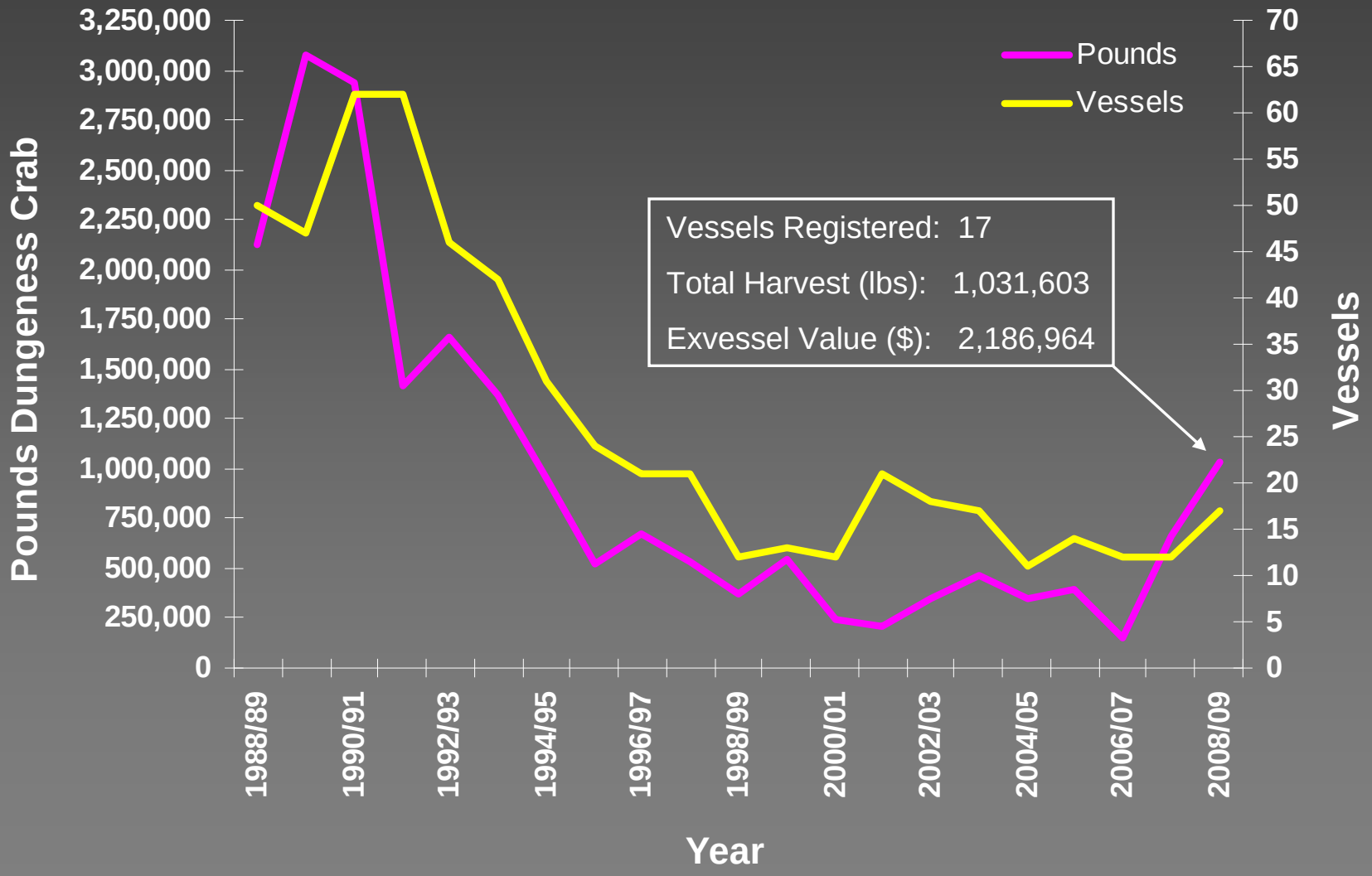
Season: May 1 – January 1

June 15 – January 1





Kodiak District Dungeness Crab Harvest and Effort



Proposal 356 – Department Comments

Neutral:

- No significant changes
  - Management
- Potential increases
  - Harvest
  - Effort
- Statewide regulation
  - Kodiak District

Proposal 357 – Dungeness Escape Mechanisms

Increase biodegradable twine requirement from 60 thread to 90 thread for Dungeness pots

Current Regulations: (5 AAC 39.145 (1))

- 18-inch Opening (30 Thread)
- Lid Tie-Down Strap (60 Thread)
- 30-day Galvanic Timed Release

If Adopted: (Statewide)

- Lid Tie-Down Strap (90 Thread)

Proposal 357 – Background

1978 – Opening laced with 120-thread in shellfish pots

1988 – Cook Inlet pots found after 60 days after the fishery closed showed 120-thread intact and high ghost fishing mortality

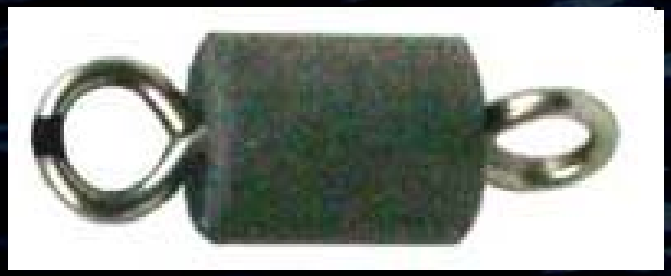
1989 – Study demonstrated 30, 42, & 60 thread twine had avg. degradation time of 74, 79, & 80 days (3X per week)

1990 – Regulation amended from 120 to 30 thread

1991 – Regulation amended from 30 to 60 thread for tie down straps (GTR)

1992 – ADF&G study found GTRs effective

1993 – Regulation amended to include 30 day GTR



Galvanic Time Release (GTR)

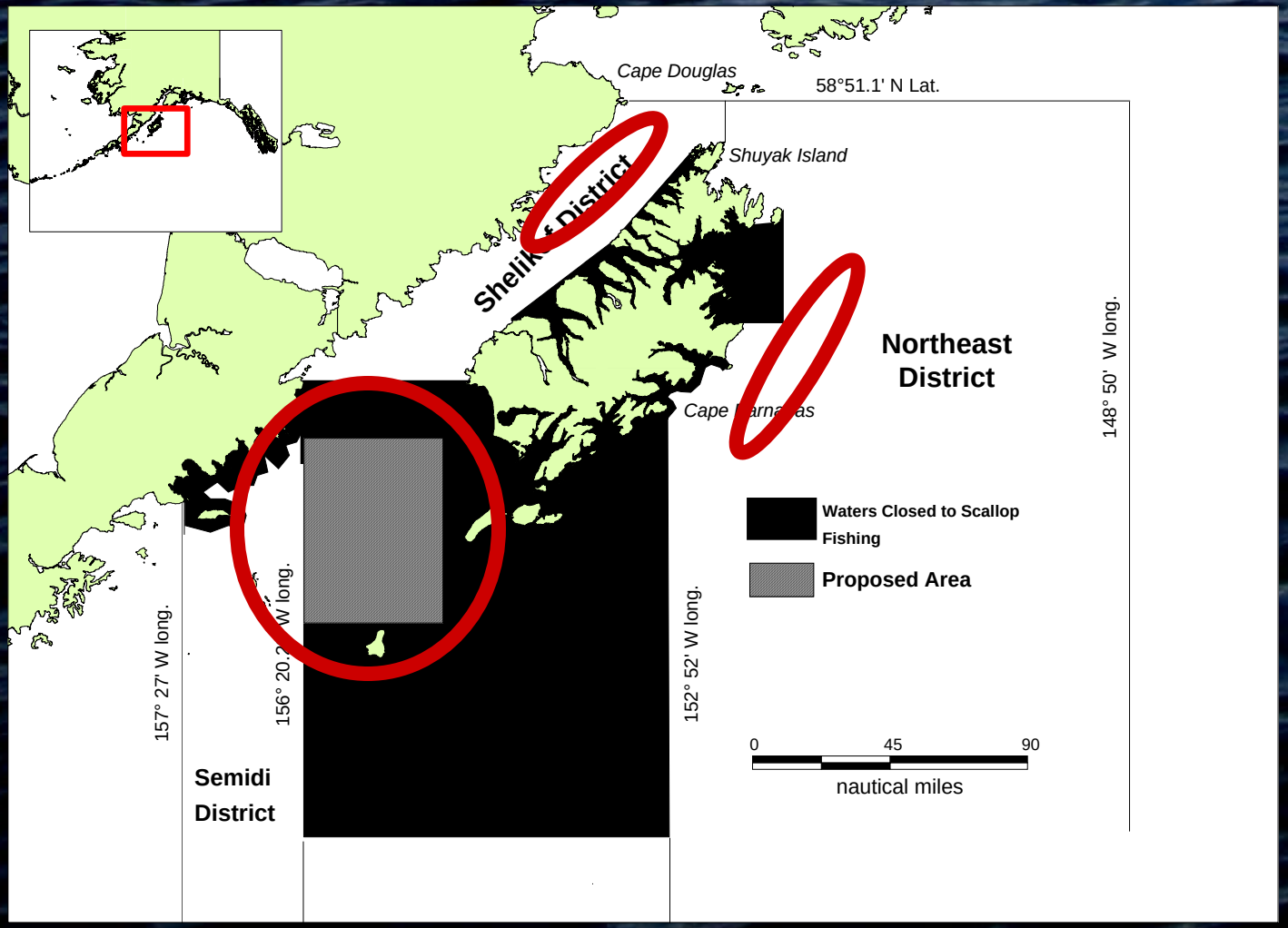
Proposal 357 – Department Comments

Opposed:

- Industry feedback indicates 60-thread remains intact for 30 to 40 days
- Crab confined for 30 days show physical damage and mortality
- Increasing thread size will result in additional direct or indirect injury and mortality due to extended confinement
- Biodegradable twine must be replaced during the season
  - Most current Dungeness fisheries last 3 to 4 months
  - Biodegradable twine replaced 2 or 3 times during season

Proposal 358 – Closed Waters for Scallops

Open an area currently closed to scallop fishing and increase the Kodiak Area harvest cap



Proposal 358 – Background

- State and federal management
- Limited to 9 vessels (LLP)
- 100% onboard observer coverage
- Crab bycatch caps (Kodiak):

  - During years when a directed crab fishery occurs in the same area a 1% crab bycatch cap based the total surveyed crab population implemented

  - During years when a directed crab fishery does not occur in the same area a 0.5% crab bycatch cap based the total surveyed crab population implemented

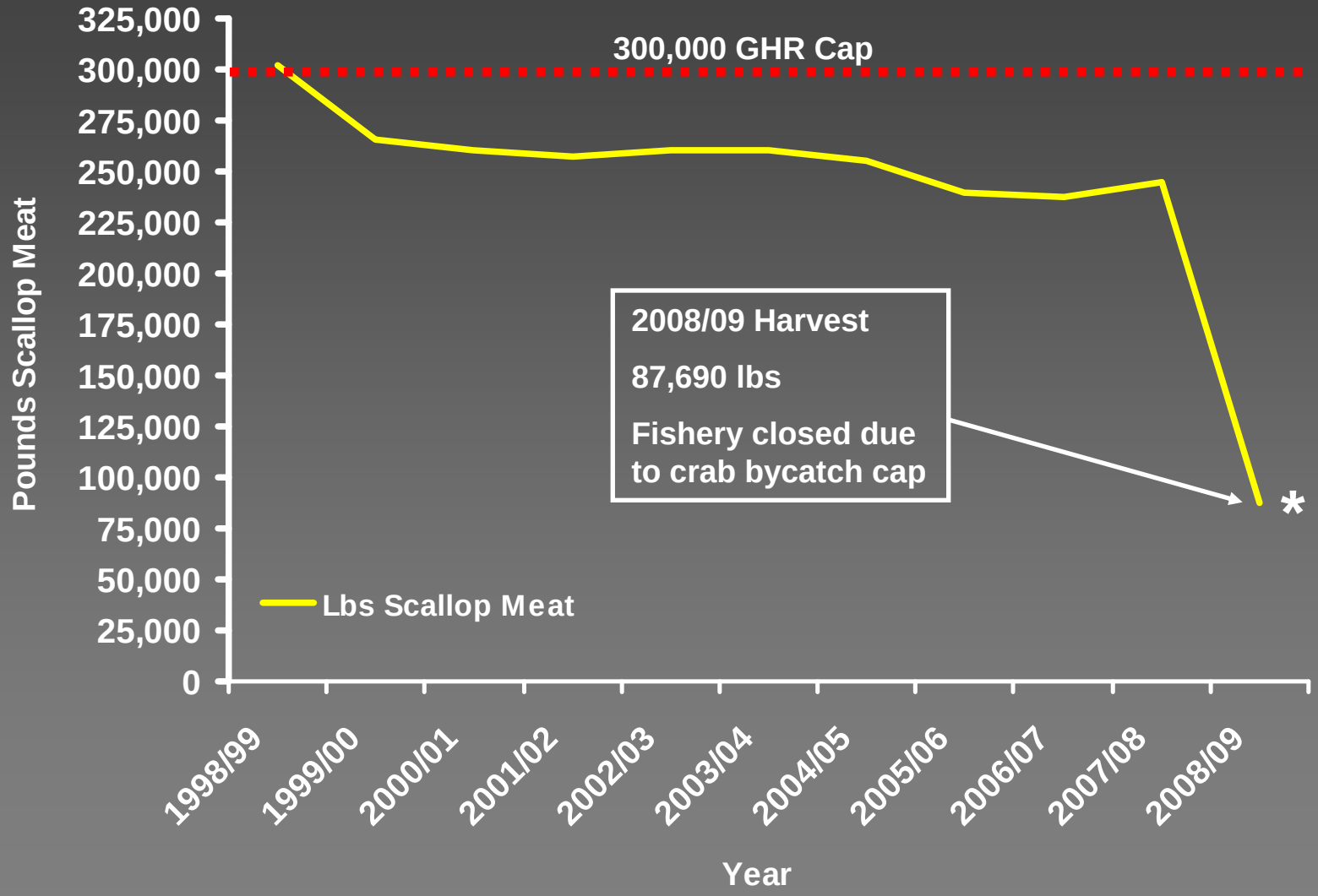
Proposal 358 – Guideline Harvest Range

- Statewide Optimum Yield (OY) of 1.24 million pounds
- Area GHRs

Area	GHR Upper Limit
Yakutat	250,000
District 16	35,000
PWS	50,000
Cook Inlet	20,000
Kodiak	300,000
Alaska Peninsula	100,000
Bering Sea	300,000
Dutch Harbor	110,000
Adak	75,000
Total	1,240,000

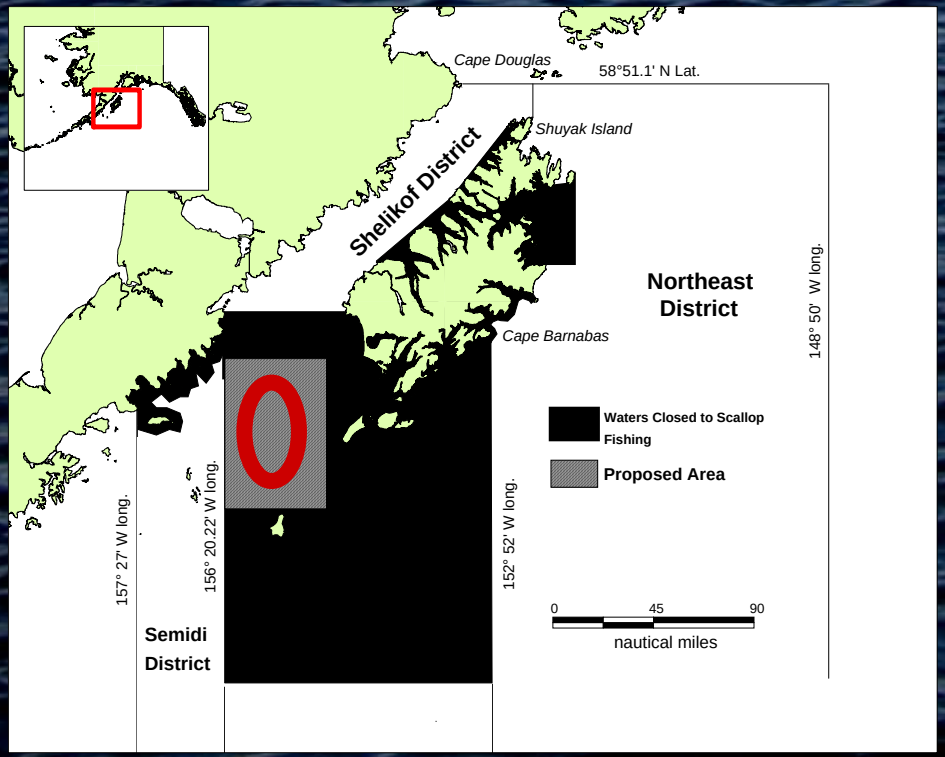
- Annual Guideline Harvest Level (GHL)
  - Fishery performance data / biological parameters

Kodiak Management Area Scallop Harvest



Proposal 358 – Background

- **Closed since 1969**
  - Crab bycatch
  - Scallop harvest 140,000 lbs
- **Crab Populations**
  - High abundance (1970s – Early 1980s)
  - Significant declines (1980s – Present)



- **1993 Exploratory Permit (*C/P Provider*)**
  - High scallop harvest rates / No crab bycatch (in sampled tows)
- **Area currently open to federal groundfish bottom trawl fisheries**

Proposal 358 – Department Comments

Opposed:

- Inadequate scallop stock information
- Anticipated surveys (2009)
- Crab bycatch unknown
- GHR uncertainty
  - Kodiak GHR 300,000 lbs
  - Reallocate 100,000 lbs from outside of the Kodiak Area

Proposal 361 – Subsistence Proxy

Allow proxy to harvest subsistence shellfish for multiple beneficiaries in Bering Sea waters north of the Alaska Peninsula

Current Regulations: (5 AAC 02.011 (D)(1))

- Proxy may subsistence harvest for themselves and one beneficiary
- May not take/possess twice the legal harvest limit

If Adopted:

- Undefined increase in proxy fishing opportunities
- Unknown increase harvest and effort

Opposed:

Proposal 362 – Subsistence King Crab

Increase the pot limit for the subsistence king crab fishery in Bering Sea waters north of the Alaska Peninsula and east of Scotch Cap Light

Current Regulations: (5 AAC 02.520)

- No more than 5 pots per person and 10 pots per vessel (Except in Kotzebue Sound Section)

If Adopted:

- Undefined increase in the legal pot limit
- Unknown increase in harvest and effort

Opposed: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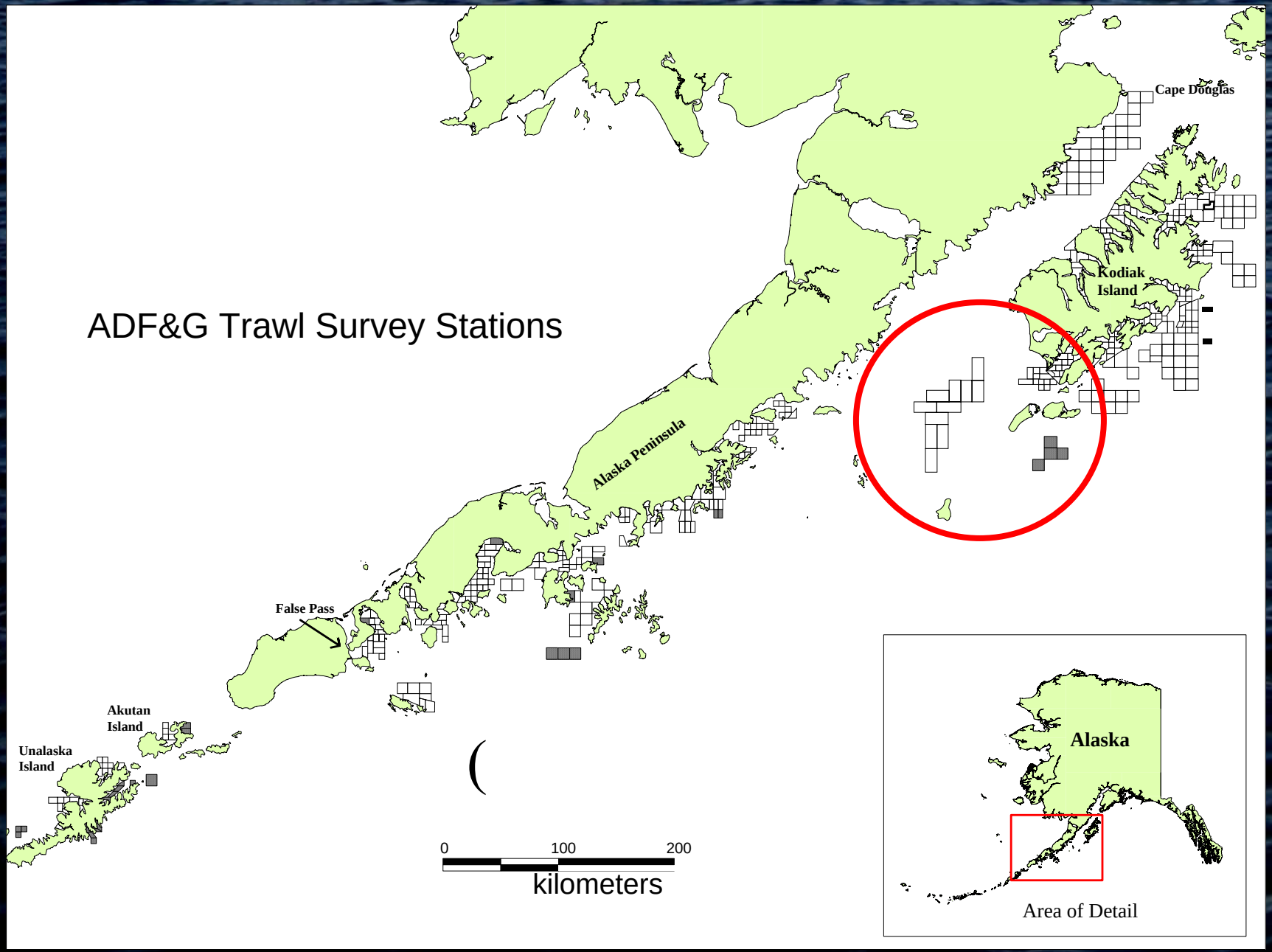
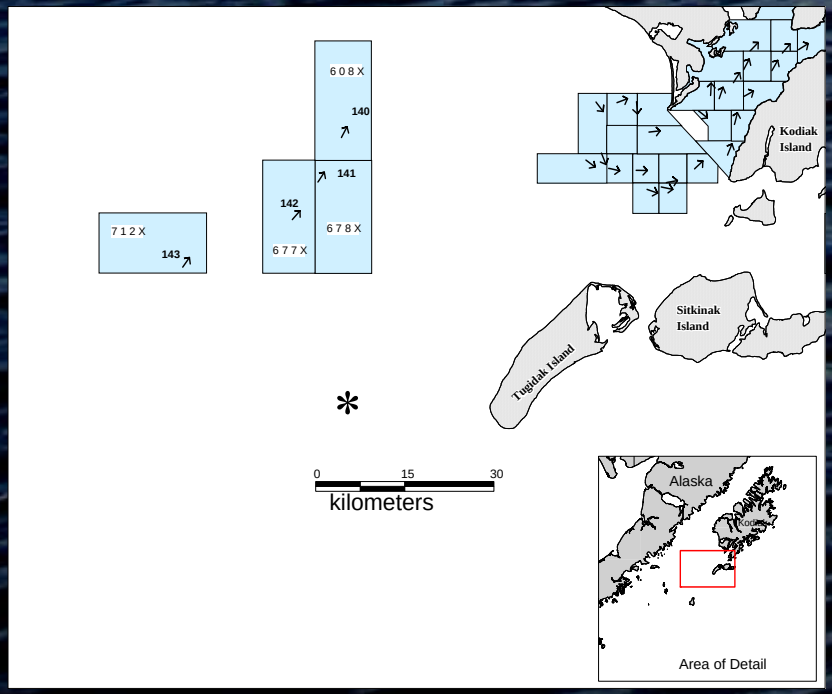
DEPARTMENT OF FISH AND GAME

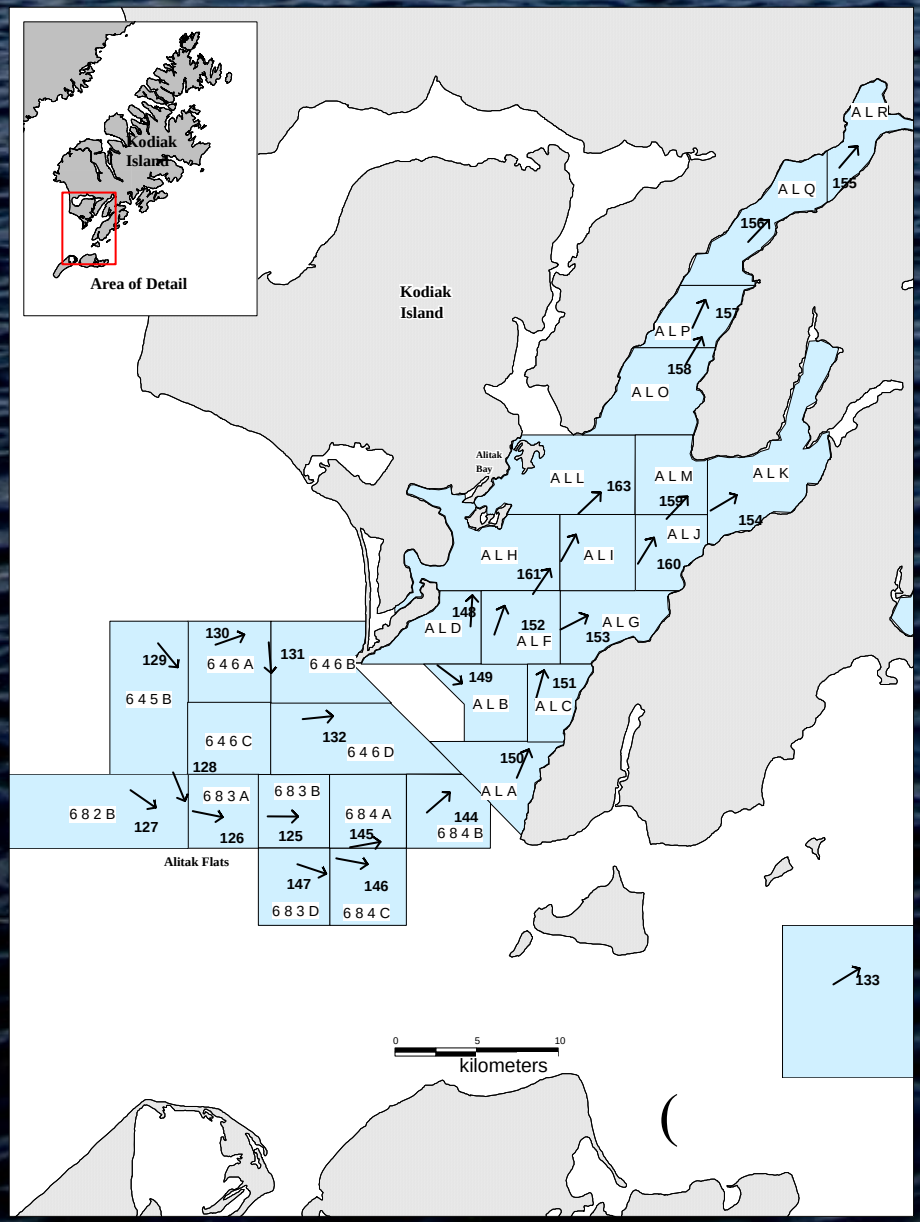
Kodiak District Dungeness Harvest

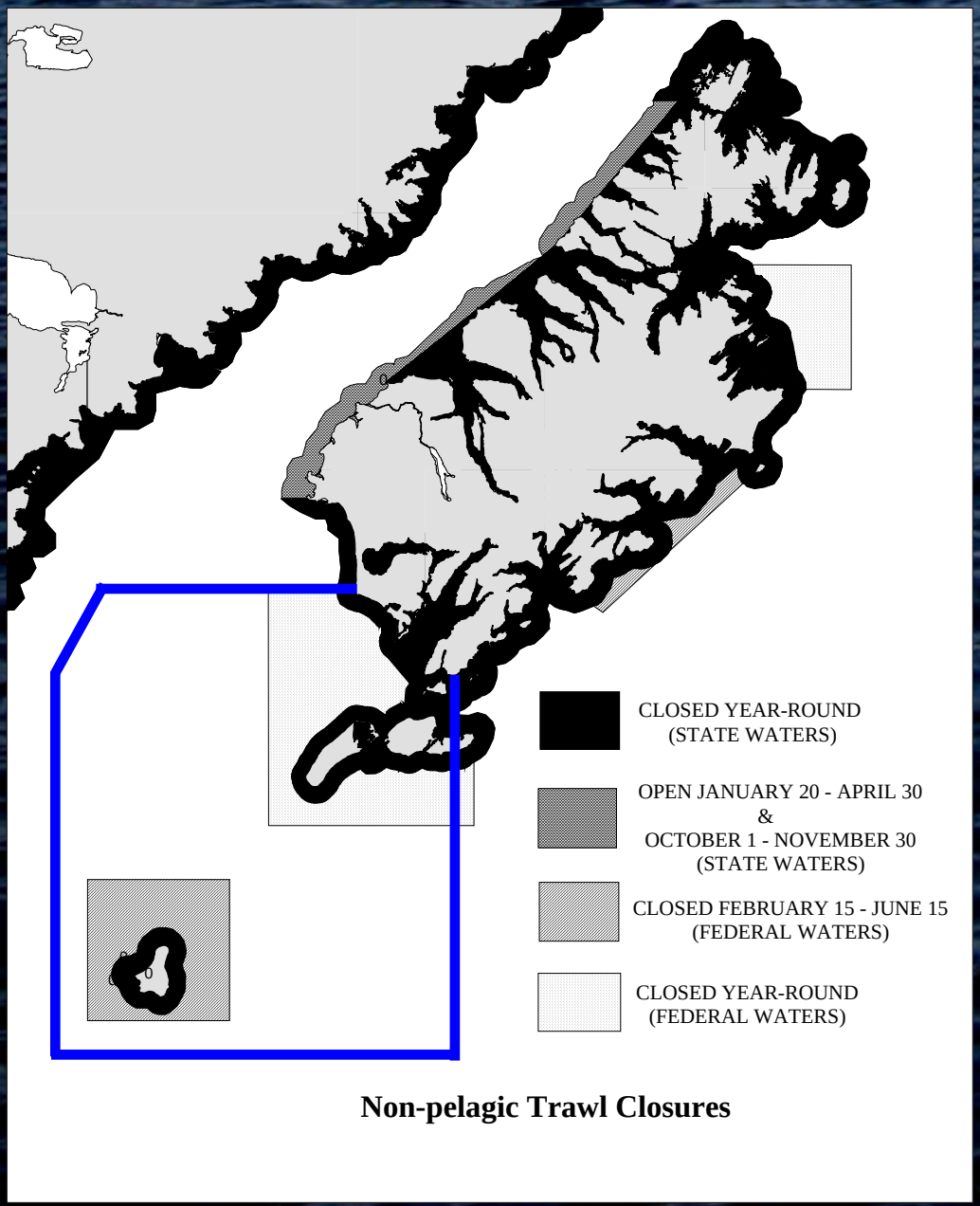
Year	Number				Pots Lifted	Avg. Lbs Per Landing	Avg. CPUE	Avg. Price Per Lb ($)	Exvessel Value ($)
	Vessels	Landings	Crab	Pounds[a]					
1988/89	50	363	1,064,387	2,125,114	203,217	5,854	5	1.06	2,253,000
1989/90	47	359	1,428,973	3,077,937	185,242	8,574	8	1.10	3,385,730
1990/91	62	519	1,301,465	2,937,433	296,168	5,660	4	1.54	4,435,000
1991/92	62	732	695,470	1,414,499	279,872	1,932	1	1.37	1,938,000
1992/93	46	501	805,215	1,656,793	218,602	3,306	3	0.86	1,425,000
1993/94	42	263	647,736	1,369,889	180,534	5,209	5	0.92	1,260,000
1994/95	31	162	426,848	948,461	151,888	5,855	5	1.20	1,138,000
1995/96	24	106	257,677	527,434	107,506	4,976	4	1.72	907,000
1996/97	21	113	334,237	668,772	88,682	4,223	4	1.01	675,460
1997/98	21	123	257,697	529,550	95,066	4,305	3	2.04	1,080,282
1998/99	12	60	185,249	371,241	63,926	6,187	3	1.45	538,299
1999/00	13	72	269,277	551,183	65,721	7,655	4	1.57	849,555
2000/01	12	69	114,038	238,955	57,037	3,463	2	1.65	394,276
2001/02	21	57	101,371	208,265	41,760	3,654	2	1.95	392,080
2002/03	18	74	181,698	353,849	71,096	4,782	3	1.46	520,493
2003/04	17	89	228,309	467,623	48,715	5,254	5	1.50	695,000
2004/05	11	59	169,807	351,986	42,136	5,966	4	1.48	518,000
2005/06	14	75	185,165	390,547	63,170	5,207	6	1.25	485,519
2006/07	12	62	74,033	148,502	31,570	2,395	2	1.45	215,328
2007/08	12	86	323,489	663,077	65,071	7,710	10	2.07	1,372,569
2008/09	17	87	522,559	1,031,603	94,265	5,824	5	2.20	2,186,964
Averages									
20-year	27	192	455,938	953,939	116,726	5,142	4	1.47	1,269,788
10-year	15	73	216,975	440,559	58,054	5,191	4	1.66	762,978
5-year	13	74	255,011	517,143	59,242	5,421	5	1.69	955,676

[a] Includes deadloss


ADF&G Trawl Survey Stations
Cape Douglas
Kodiak Island
Alaska Peninsula
False Pass
Akutan Island
Unalaska Island
0
100
200
kilometers
Alaska
Area of Detail

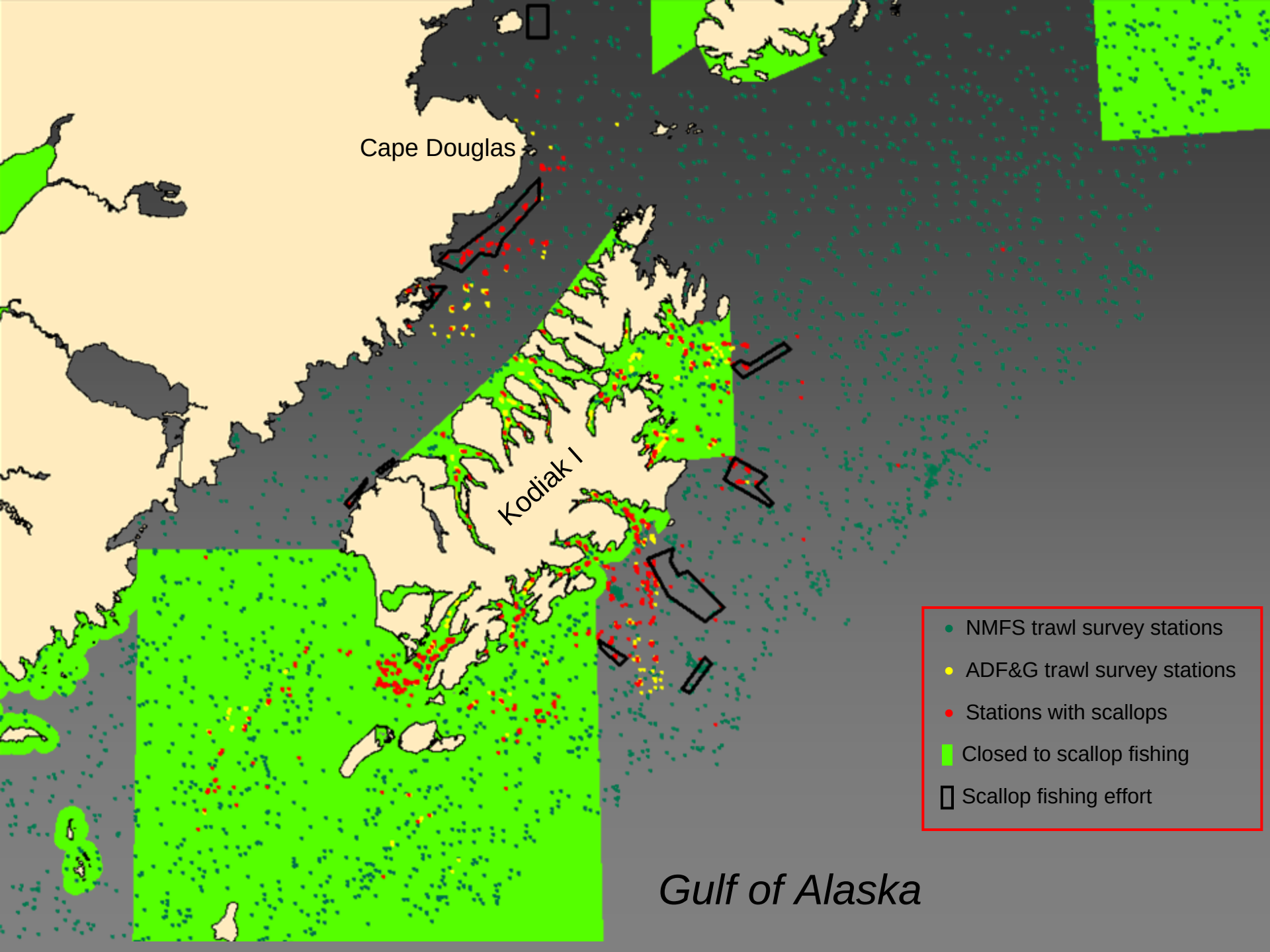

608X
140
141
142
678X
677X
712X
143
Kodiak Island
Sitkinak Island
Tugidak Island
0
15
30
kilometers
Alaska
Area of Detail

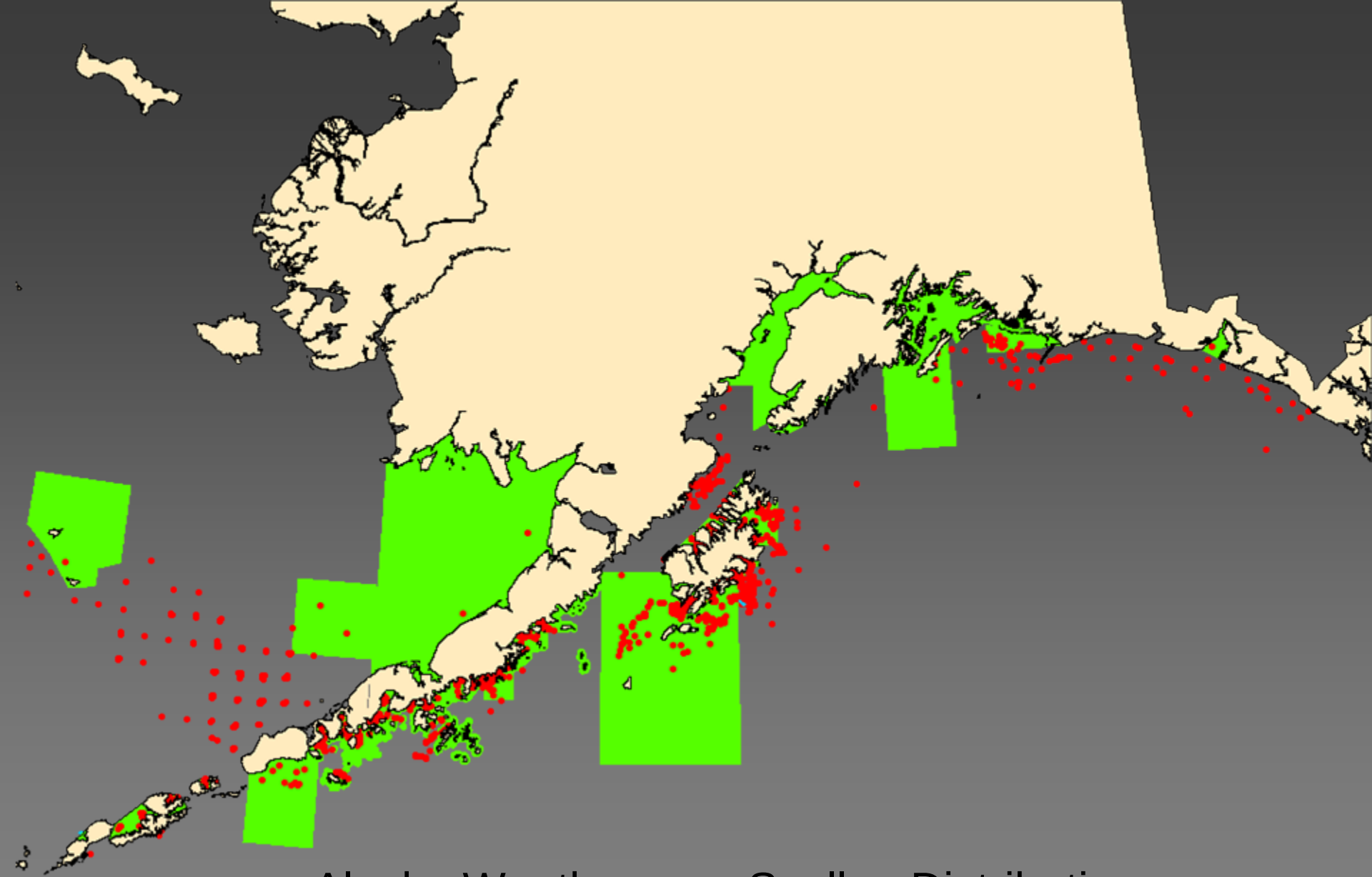

Kodiak Island
Area of Detail
Kodiak Island
ALR
155
ALQ
156
157
ALP
158
ALO
Alitak Bay
ALL
163
ALM
159
ALK
154
ALJ
160
ALH
161
ALI
148
ALD
152
ALF
153
ALG
129
130
646A
131
646B
645B
149
ALB
151
ALC
646C
132
646D
150
128
ALA
682B
127
683A
126
683B
125
684A
145
144
684B
Alitak Flats
147
683D
146
684C
133
0
5
10
kilometers



Non-pelagic Trawl Closures

Season	Crab Bycatch Limits		Bycatch		Scallop Harvest (lbs)	Tanner Crab/Lb Scallop Meat
	Tanner	King	Tanner	King		
1993/94	NA	NA	33,511	9	105,017	0.32
1994/95	143,000	123	2,054	190	320,111	0.01
1996/97	130,000	66	27,722	0	219,305	0.13
1997/98	91,600	50	11,914	0	258,346	0.05
1998/99	46,500	21	13,887	1	179,870	0.08
1999/00	66,500	150	13,886	0	187,963	0.07
2000/01	81,000	200	13,311	0	180,087	0.07
2001/02	425,000	15	20,362	0	179,198	0.11
2002/03	1,100,000	15	22,821	0	179,957	0.13
2003/04	606,991	17	18,230	0	179,679	0.10
2004/05	527,388	40	30,717	1	174,622	0.18
2005/06	449,403	45	29,264	0	159,879	0.18
2006/07	302,000	24	16,899	0	161,253	0.10
2007/08	66,132	1,200	16,189	0	170,224	0.10
2008/09	16,900	3	17,197	0	12,660	1.36
						Average: 0.20


Cape Douglas
Kodiak I
NMFS trawl survey stations
ADF&G trawl survey stations
Stations with scallops
Closed to scallop fishing
Scallop fishing effort
Gulf of Alaska



Alaska Weathervane Scallop Distribution
from Trawl Survey Data

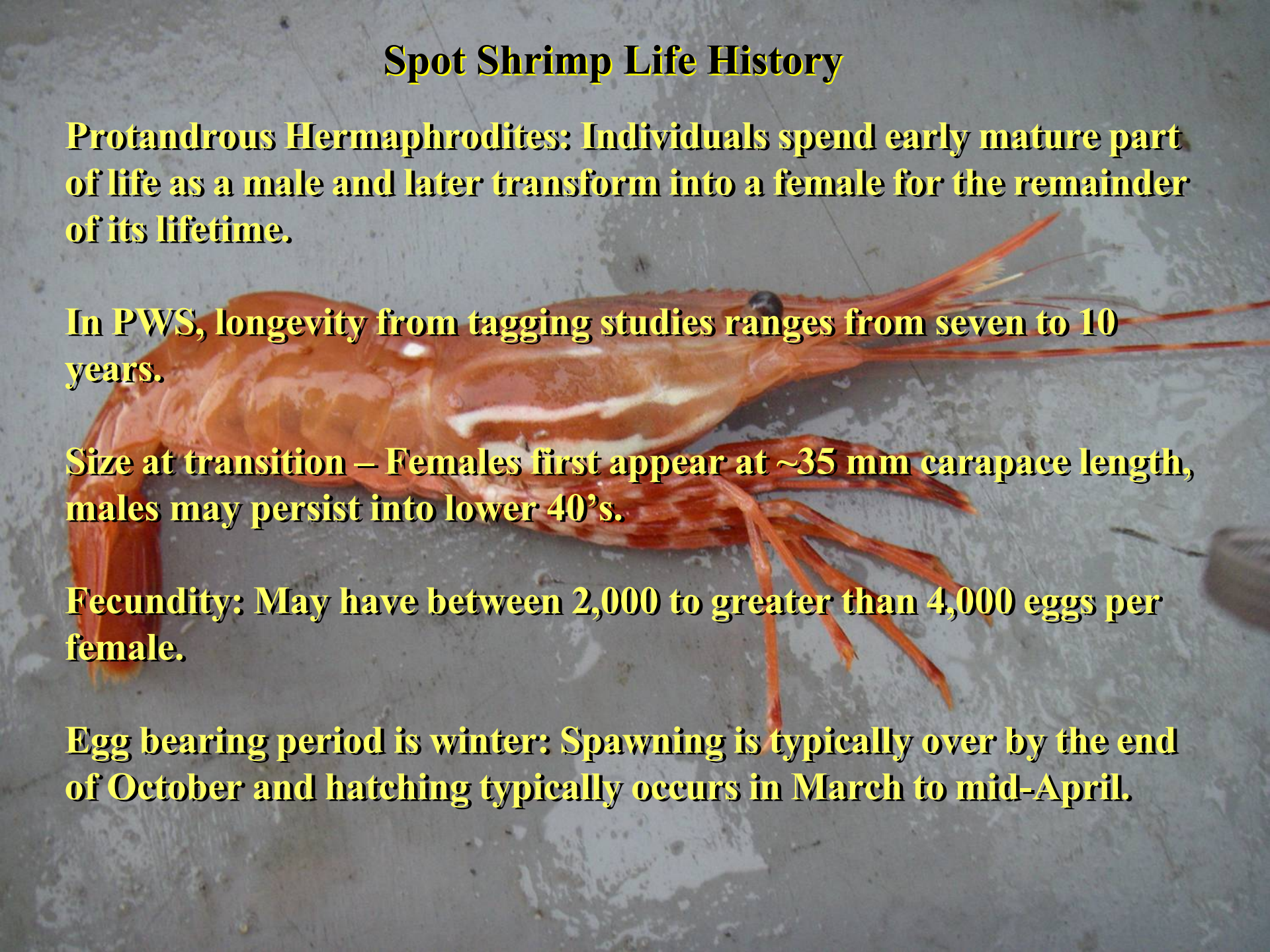
Central Region Shellfish & Groundfish

By:

Kenneth J. Goldman Ph.D., Charles E. Trowbridge,
Robert Berceli, Mike Byerly, Margaret Spahn and Xinxian Zhang
Alaska Department of Fish and Game

RC 3; Tab 3

Spot Shrimp Life History



Protandrous Hermaphrodites: Individuals spend early mature part of life as a male and later transform into a female for the remainder of its lifetime.

In PWS, longevity from tagging studies ranges from seven to 10 years.

Size at transition – Females first appear at ~35 mm carapace length, males may persist into lower 40's.

Fecundity: May have between 2,000 to greater than 4,000 eggs per female.

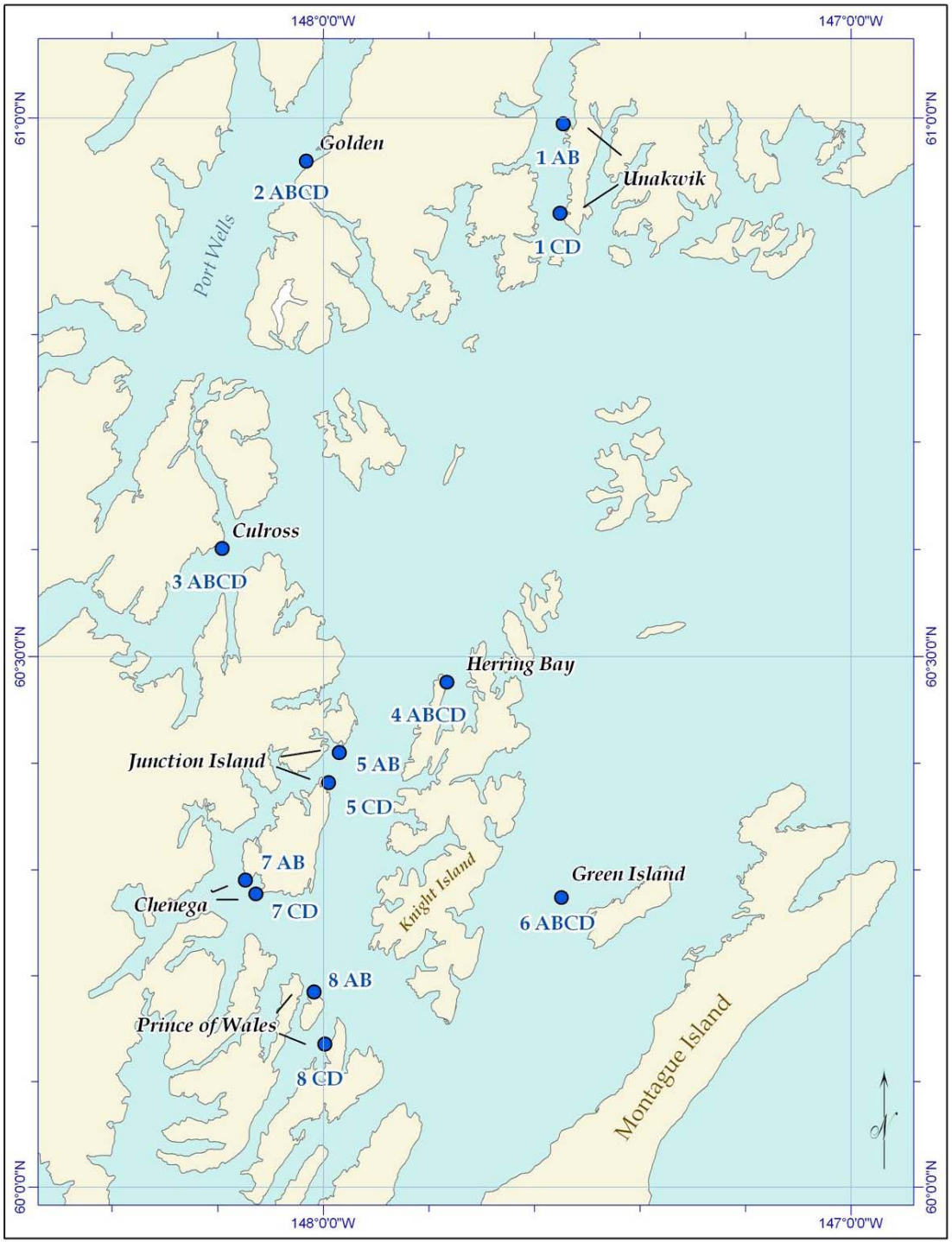
Egg bearing period is winter: Spawning is typically over by the end of October and hatching typically occurs in March to mid-April.

Harvest, estimated price per pound, value and adjusted value in 2008 dollars of Prince William Sound spot shrimp, 1980-1991

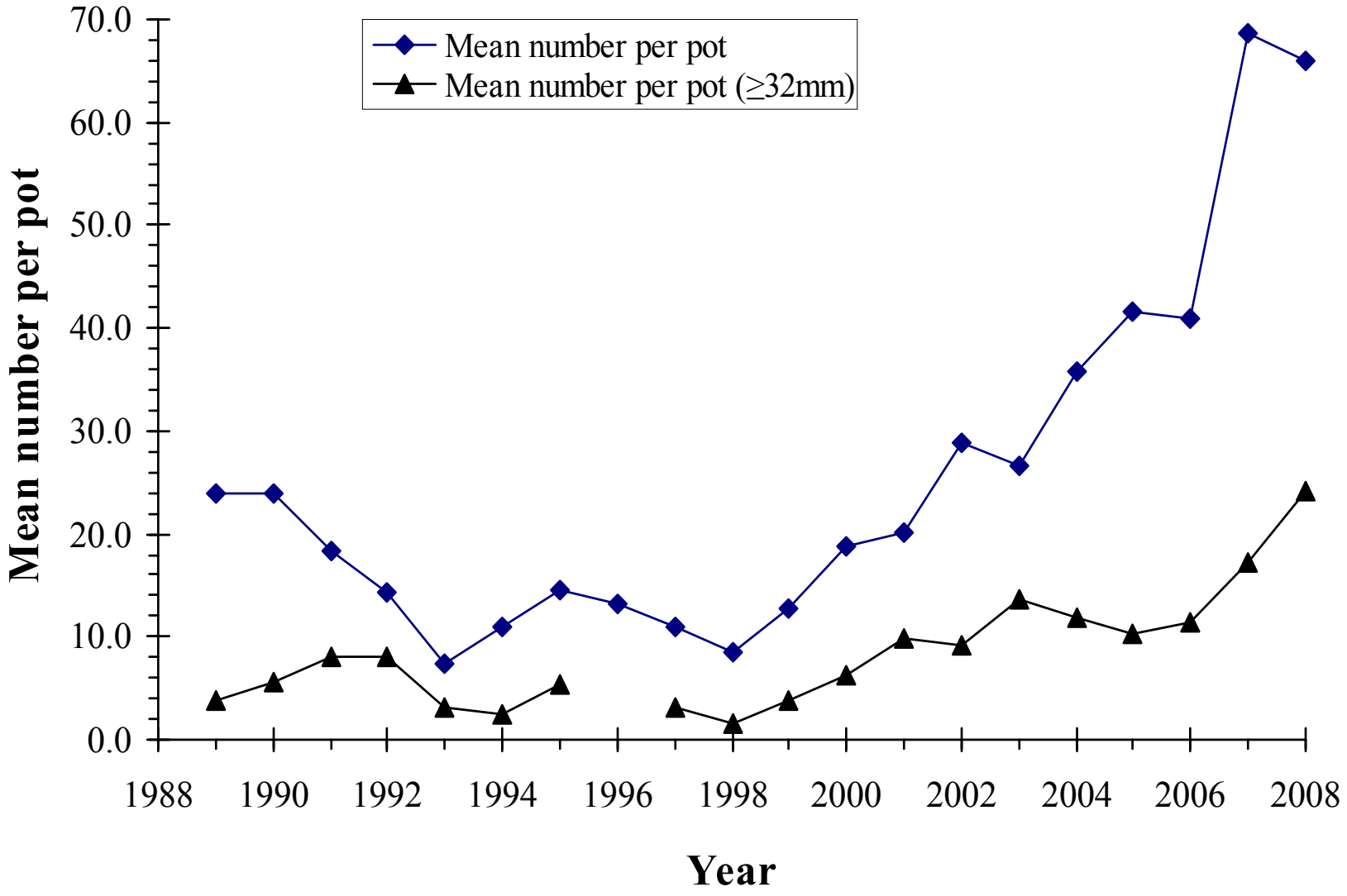
Year	Estimated price/lb	Harvest (lb) whole shrimp	Value	CPI [a]	Value in 2008 dollars
1980	$3.12	84,787	$264,535	2.20	$580,740
1981	$4.00	153,017	$612,068	2.03	$1,243,346
1982	$3.00	205,746	$617,238	1.93	$1,189,482
1983	$3.04	198,719	$604,106	1.89	$1,143,051
1984	$3.75	198,729	$745,234	1.82	$1,354,118
1985	$3.12	271,928	$848,415	1.77	$1,505,175
1986	$3.30	286,105	$944,147	1.74	$1,643,936
1987	$3.27	265,707	$868,862	1.73	$1,507,259
1988	$3.16	191,630	$605,551	1.73	$1,046,610
1989	$3.64	28,884	$105,138	1.68	$176,673
1990	$4.45	36,378	$161,882	1.58	$256,200
1991	$3.24	17,302	$56,058	1.51	$84,856

a = Anchorage Consumer Price Index

Currently: 10,000 lbs harvest ≈ $30,000

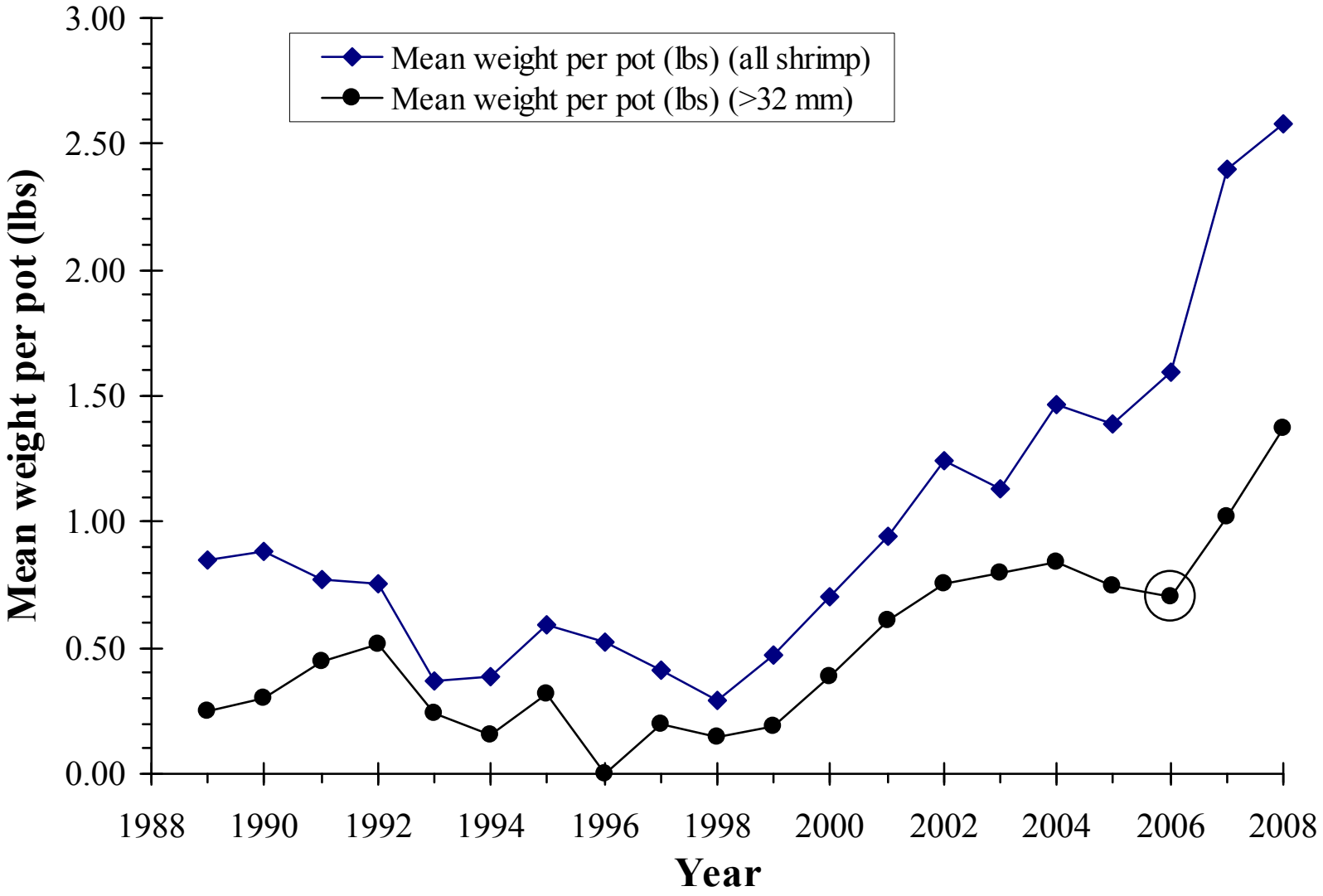

148°0'0"W
147°0'0"W
61°0'0"N
60°30'0"N
60°0'0"N
Golden
2 ABCD
Port Wells
1 AB
Unakwik
1 CD
Culross
3 ABCD
Herring Bay
4 ABCD
Junction Island
5 AB
5 CD
7 AB
Chenega
7 CD
Knight Island
Green Island
6 ABCD
8 AB
Prince of Wales
8 CD
Montague Island

Mean number of spot shrimp per pot and mean number of commercially marketable shrimp per pot (≥ 32mm carapace length)



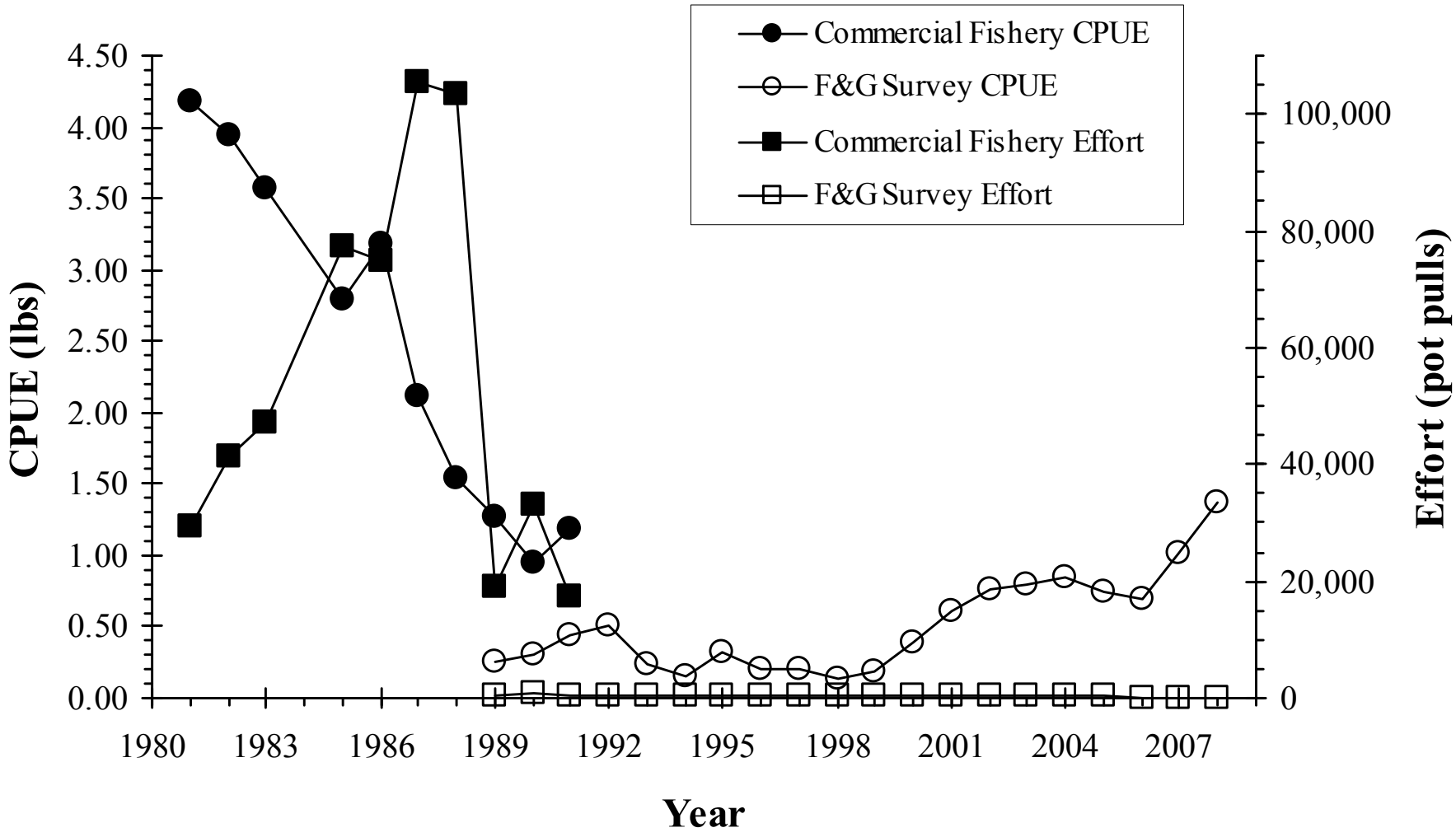
Note: Data for spot shrimp ≥ 32mm not available for 1996.

Mean weight of spot shrimp per pot and mean weight of commercially marketable shrimp per pot (≥ 32mm in carapace length)

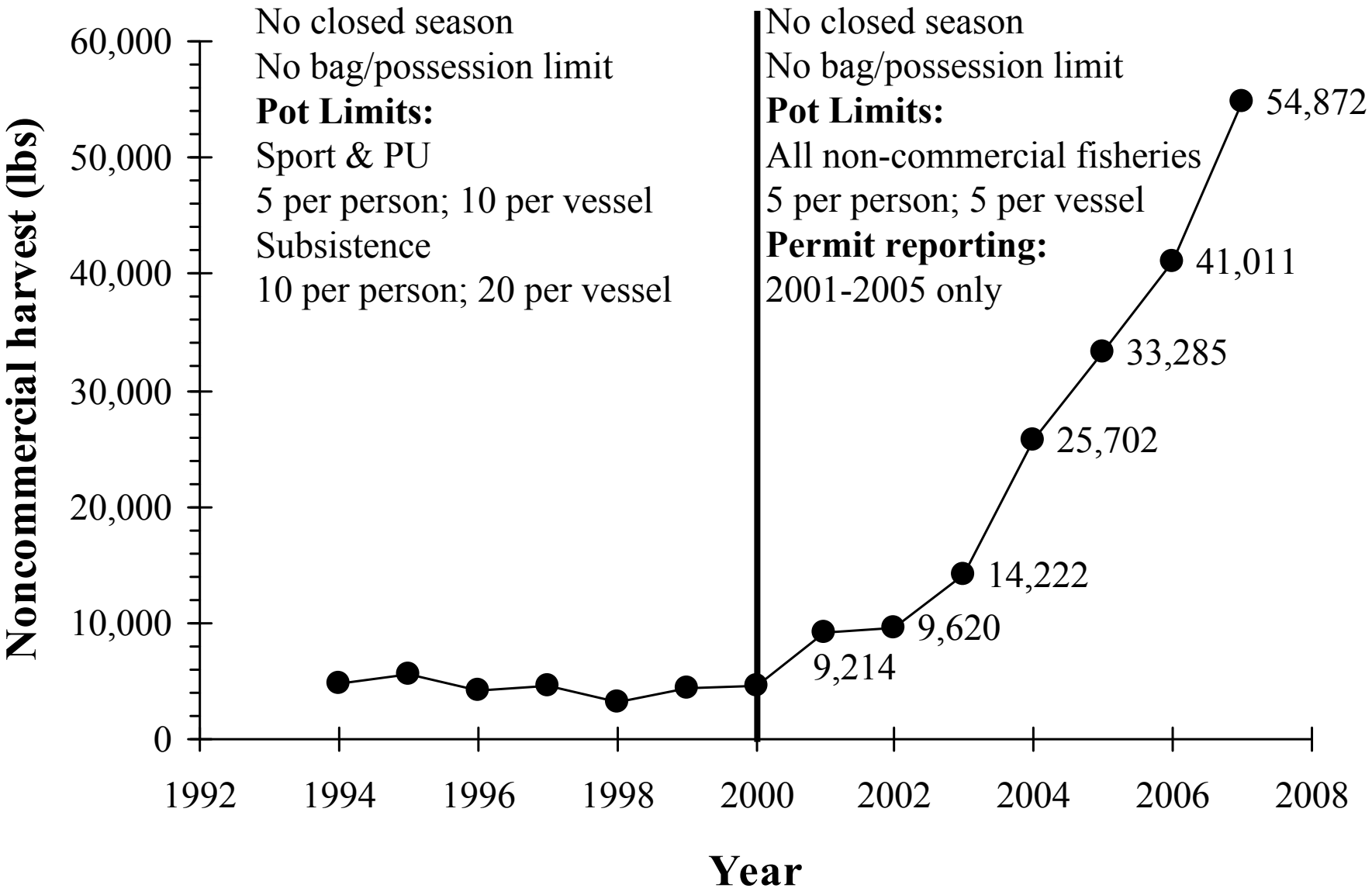


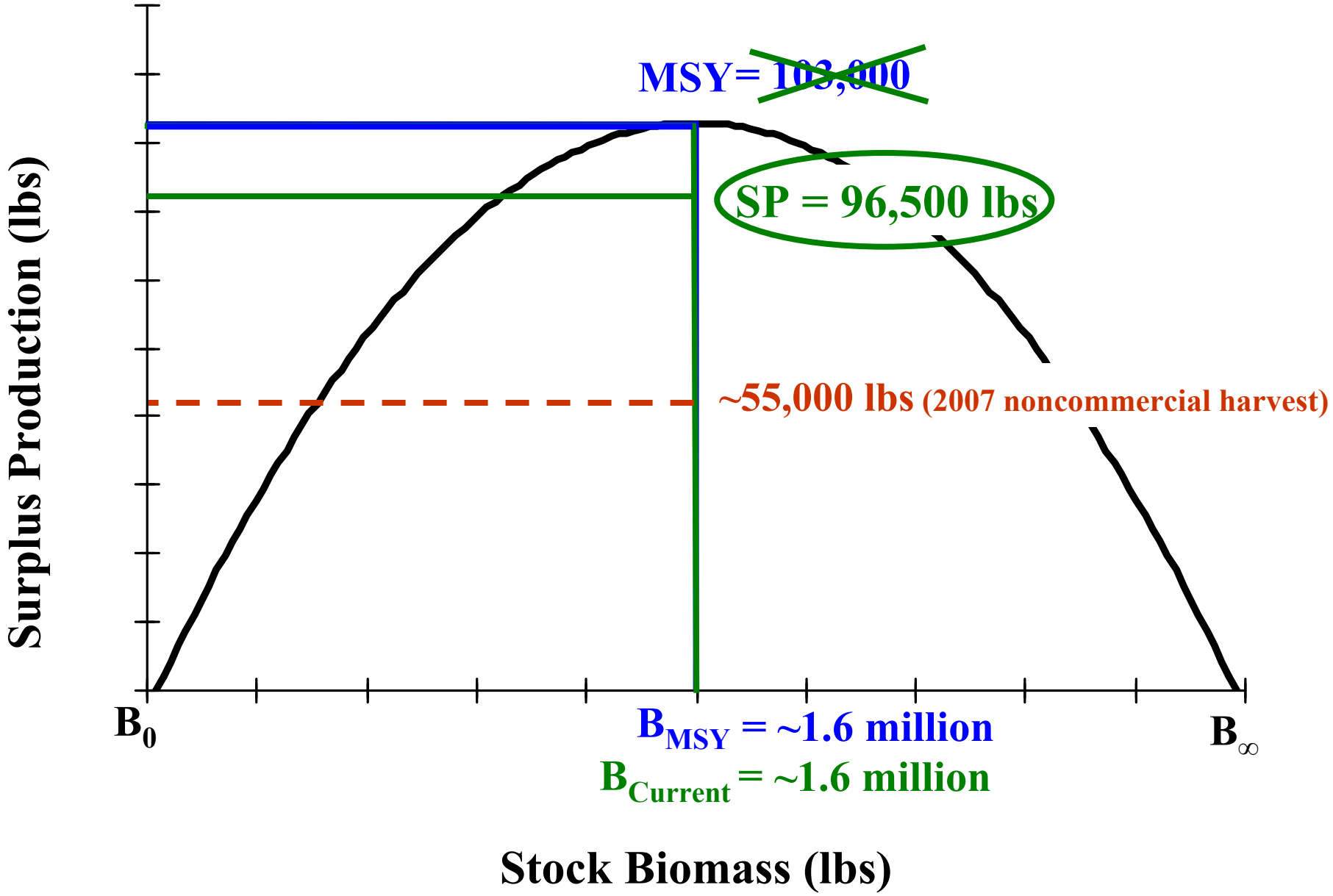
Note: Mean weights (per pot) of shrimp ≥ 32mm for all years were estimated from the 2006 weight-length data (large open circle). Data for spot shrimp ≥ 32mm not available for 1996.

Commercial Fishery and Fish and Game Survey Data Showing Catch per Unit Effort (CPUE) and Effort



Noncommercial Fishery Harvest Data




MSY= 103,000
SP = 96,500 lbs
~55,000 lbs (2007 noncommercial harvest)
Surplus Production (lbs)
B0
BMSY = ~1.6 million
BCurrent = ~1.6 million
B∞
Stock Biomass (lbs)

Board of Fisheries Management Element Considerations
(from Proposal 44A)

Registration Deadline: April 1; Superexclusive registration area.

Season Dates: April 15 through September 15; fishery would be rotated annually between three areas in PWS.

Harvestable Surplus (GHL): IF the Board implements a 60% noncommercial – 40% commercial allocation scheme, the guideline harvest level for shrimp would be calculated at 40% of the total allowable harvest for the area. Current estimate of harvestable surplus = 96,500 lbs for 2009.

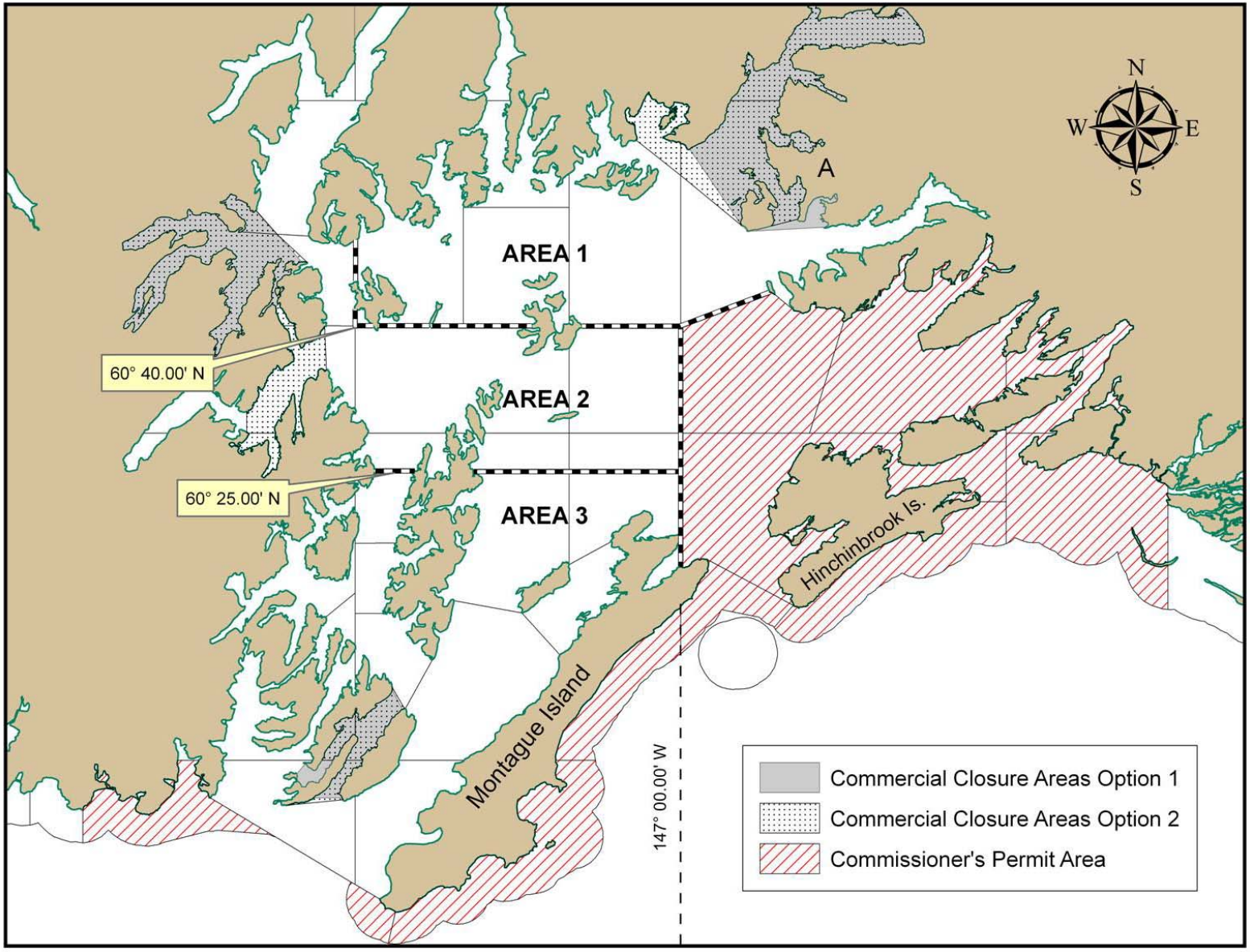
Lawful Gear: As defined in 5 AAC 31.224 (refer to text in Proposal #44). Identical to small pot definition in SE AK shrimp fishery.

Gear Limits: Maximum number of pots per vessel = 50. The Department will announce annually the number of pots per vessel that may be operated in the commercial fishery for that season. Annual pot limit will be based on number of registered vessels, estimated CPUE and the magnitude of the GHL.

Fishing Hours: Pot may be set or pulled between 8 a.m. to 4 p.m.; pots unchecked longer than 2 weeks must be unbaited and open.

Catch Reporting: Logbooks, inseason catch reporting, prior notice of landing.

Fishing Areas and Closed Waters



ADF&G believes the estimate of total allowable harvest of spot shrimp and the associated management plan to be conservative

Potential Management Issues

Noncommercial Reporting:

Statewide Harvest Survey (SWHS) used:

2008 data not available until September 2009

Restrictions would not be implemented until 2010

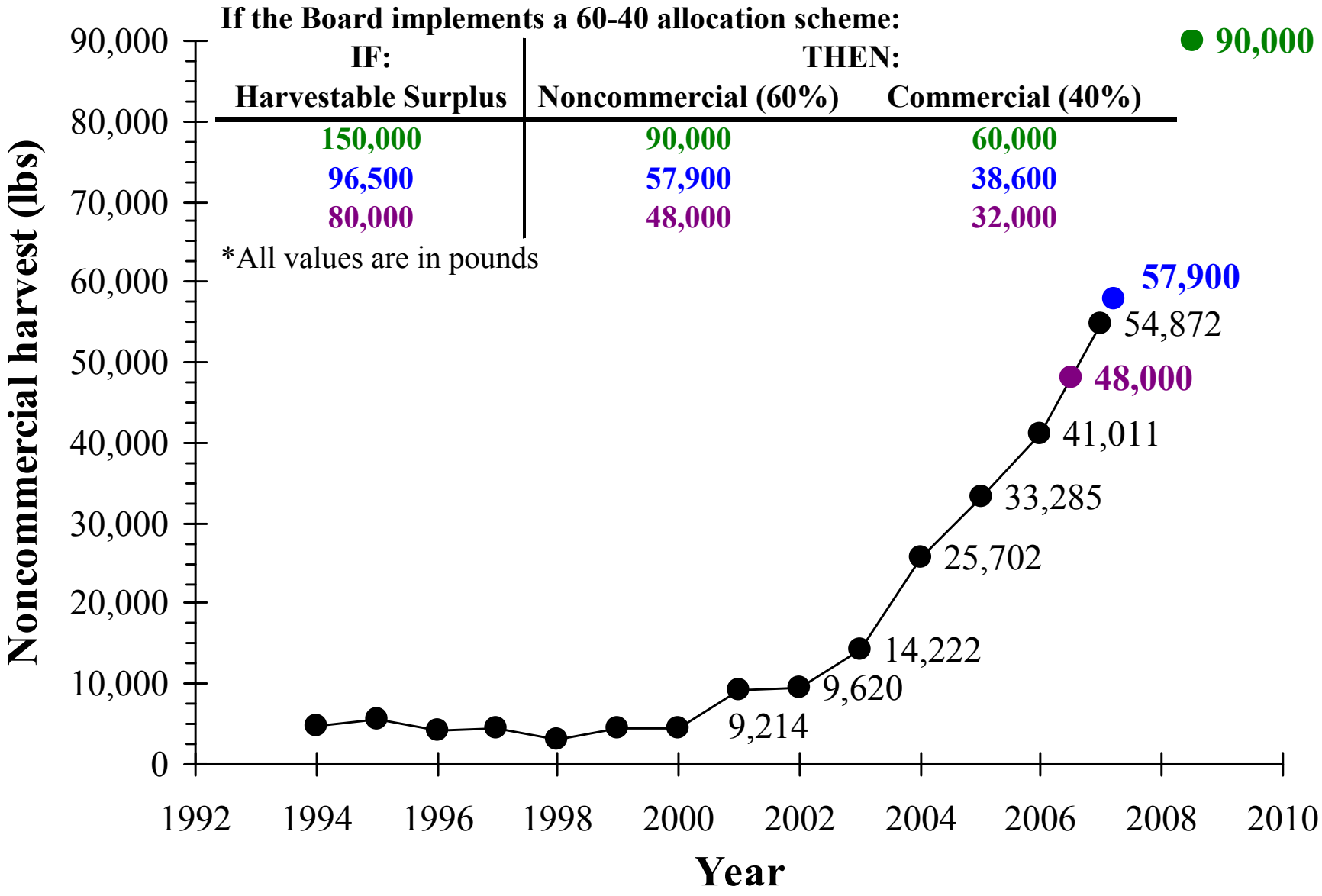
More timely data would require a permit for noncommercial users.

If the Board implements the proposed allocation of

60% noncommercial and 40% commercial,

And the harvestable surplus is less than 100,000 pounds,

Then restrictions to the noncommercial fisheries would likely be warranted.


If the Board implements a 60-40 allocation scheme:
IF:
Harvestable Surplus
THEN:
Noncommercial (60%)
Commercial (40%)
150,000
90,000
60,000
96,500
57,900
38,600
80,000
48,000
32,000
*All values are in pounds
90,000
57,900
54,872
48,000
41,011
33,285
25,702
14,222
9,620
9,214
Noncommercial harvest (lbs)
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
Year

Implementation of Restrictions

Unl[illegible] liberalizing the fishery, the Department has the ability to use Emergency Order to shorten the noncommercial season (currently April 15 – September 15) or implement pot/gear restrictions. The management plan does not currently allow the Department to liberalize the noncommercial fishery.

Implementing restrictions on the noncommercial fisheries may be problematic due to the fact that Alaska residents who participate in this fishery and are currently accounted for in the sport harvest numbers are also eligible to subsistence fish.

ACKNOWLEDGEMENTS

We thank the Alaska Board of Fisheries and members of the audience for their time and attention to this presentation.

We are happy to address any questions you may have.

Yukon River Chinook and Summer Chum

Alaska Department of Fish and Game

Board of Fisheries, March 2009

Oral Report – RC-3, Tab 4

2008 Preseason Outlook Chinook

Below average run:

- 2008 Chinook salmon run was anticipated to be similar to 2007 run.
- Anticipated enough fish available to provide for:

  - Escapement
  - Subsistence Priority
  - Canadian Border Obligations
  - 5,000 to 30,000 commercial harvest

Management Strategies

- Continue the regulatory subsistence salmon fishing schedule
- Delay directed Chinook commercial until mid-point of run
- Actions based on the evaluation of inseason indicators of run strength

YRDFA Teleconferences

- Run assessment provided by managers
- Potential management strategies discussed
- Subsistence fishers encouraged to provide input

Subsistence Fishing Reductions

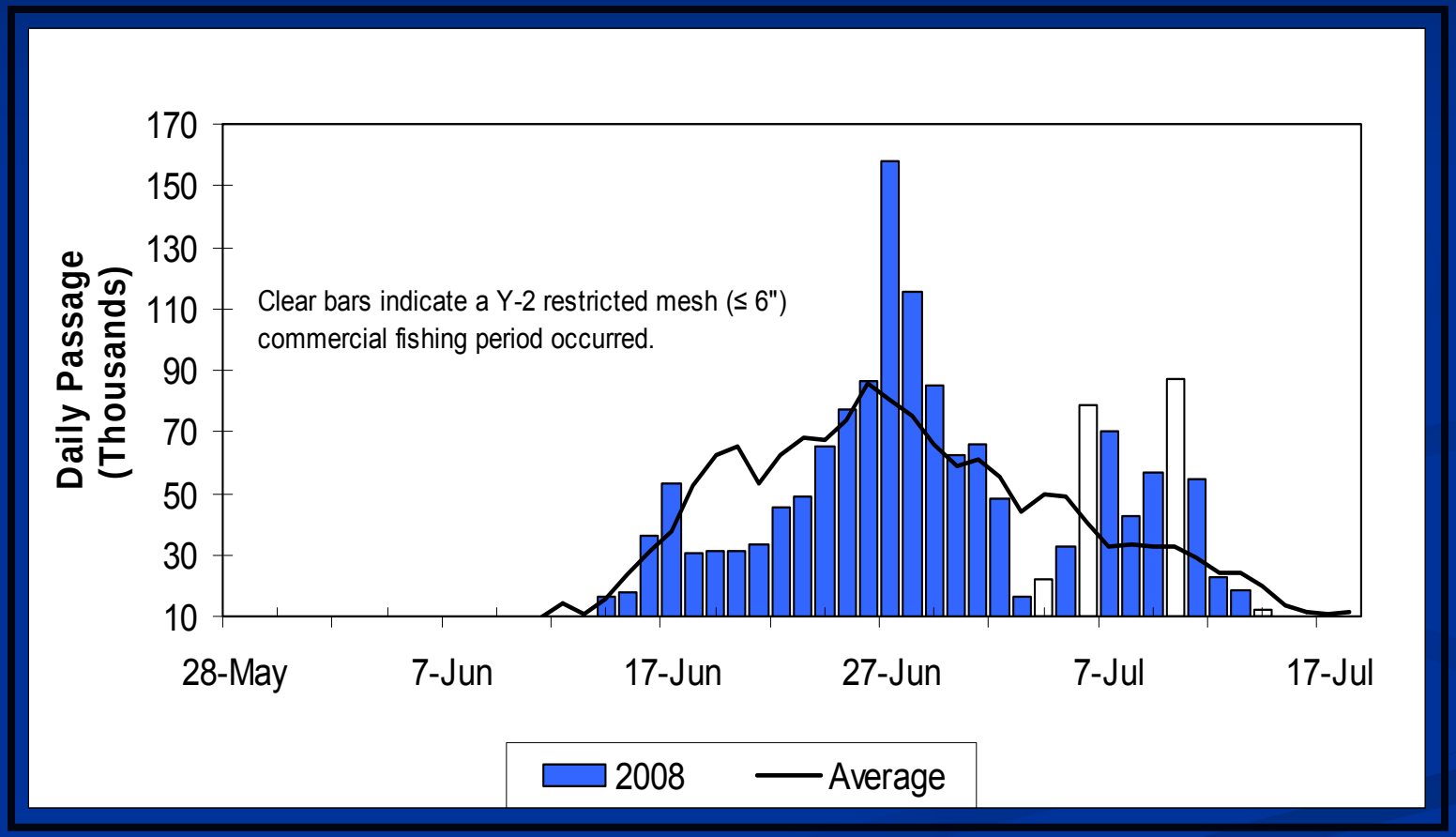
		Coastal Disrict [a]	District 1	District 2	District 3 [b]	Subd 4A	Subd 4B / 4C	Subd 5A / 5B / 5C	Subd 5D [d]
Mon.	23-Jun	18-hour Period	18-hour Period	open	closed	open	open	closed	open
Tues.	24-Jun	6"mesh restrict	6"mesh restrict	close @ 8 a.m.	open @ 8 a.m.	close @ 6 p.m.	close @ 6 p.m.	open @ 6 p.m.	open
Weds.	25-Jun	closed	closed	18-hour Period	close @ 8 p.m.	open @ 6 p.m.	open @ 6 p.m.	open	open
Thurs.	26-Jun	18-hour Period	18-hour Period	6"mesh restrict	closed	open	open	close @ 6 p.m.	open
Fri.	27-Jun	6"mesh restrict	6"mesh restrict	closed	18-hour Period	close @ 6 p.m.	close @ 6 p.m.	open @ 6 p.m.	open
Sat.	28-Jun	closed	closed	closed	6"mesh restrict	closed	closed	open	open
Sun.	**29-Jun**	closed	closed	18-hour Period	closed	open @ 6 p.m.	open @ 6 p.m.	close @ 6 p.m.	open
Mon.	30-Jun	18-hour Period	18-hour Period	6"mesh restrict	closed	open	open	closed	open
Tues.	1-Jul	6"mesh restrict	6"mesh restrict	closed	18-hour Period	close @ 6 p.m.	close @ 6 p.m.	open @ 6 p.m.	open
Weds.	2-Jul			18-hour Period	6"mesh restrict	24-hour Period	open @ 6 p.m.	open	open
Thurs.	3-Jul			6"mesh restrict	closed	No mesh/FW restric	open	close @ 6 p.m.	open
Fri.	4-Jul				18-hour Period	closed	close @ 6 p.m.	open @ 6 p.m.	open
Sat.	5-Jul				6"mesh restrict	closed	closed	open	open
Sun.	**6-Jul**					24-hour Period	24-hour Period	close @ 6 p.m.	open
Mon.	7-Jul					No mesh/FW restric	No mesh/FW restri	closed	open
Tues.	8-Jul					closed	closed	24-hour Period	open
Weds.	9-Jul					24-hour Period	24-hour Period	No mesh/FW restric	open
Thurs.	10-Jul					6"mesh/FW restrict	No mesh/FW restri	closed	open
Fri.	11-Jul						closed	closed	open
Sat.	12-Jul						closed	24-hour Period	open
Sun.	**13-Jul**						24-hour Period	No mesh/FW restric	open
Mon.	14-Jul						6"mesh/FW restric	closed	open
Tues.	15-Jul							closed	close @ 6 p.m.
Weds.	16-Jul							closed	closed
Thurs.	17-Jul							24-hour Period	open @ 6 p.m.
Fri.	18-Jul							No mesh/FW restric	open
Sat.	19-Jul								open
Sun.	**20-Jul**								open
Mon.	21-Jul								close @ 6 a.m.
Tues.	22-Jul								3.5 day Restrict
Weds.	23-Jul								No mesh/FW restrict
Thurs.	24-Jul								open @ 6 p.m.
Fri.	25-Jul								open
Sat.	26-Jul								open
Sun.	**27-Jul**								open
Mon.	28-Jul								close @ 6 a.m.
Tue	29-Jul								3.5 day Restrict
Wed	30-Jul								No mesh/FW restrict
Thu	31-Jul								open @ 6 p.m.
Fri	1-Aug								open
Sat	2-Aug								close @ 6 p.m.
Sun	3-Aug								No mesh/FW restrict
Mon	4-Aug								open @ 6 p.m.

2008 Summer Chum Management

Preseason outlook was:

- 500,000-900,000 surplus
  - Commercial harvest levels potentially affected by a poor Chinook run
- Inseason management delayed commercial fishery

Pilot Station Sonar Summer Chum Passage



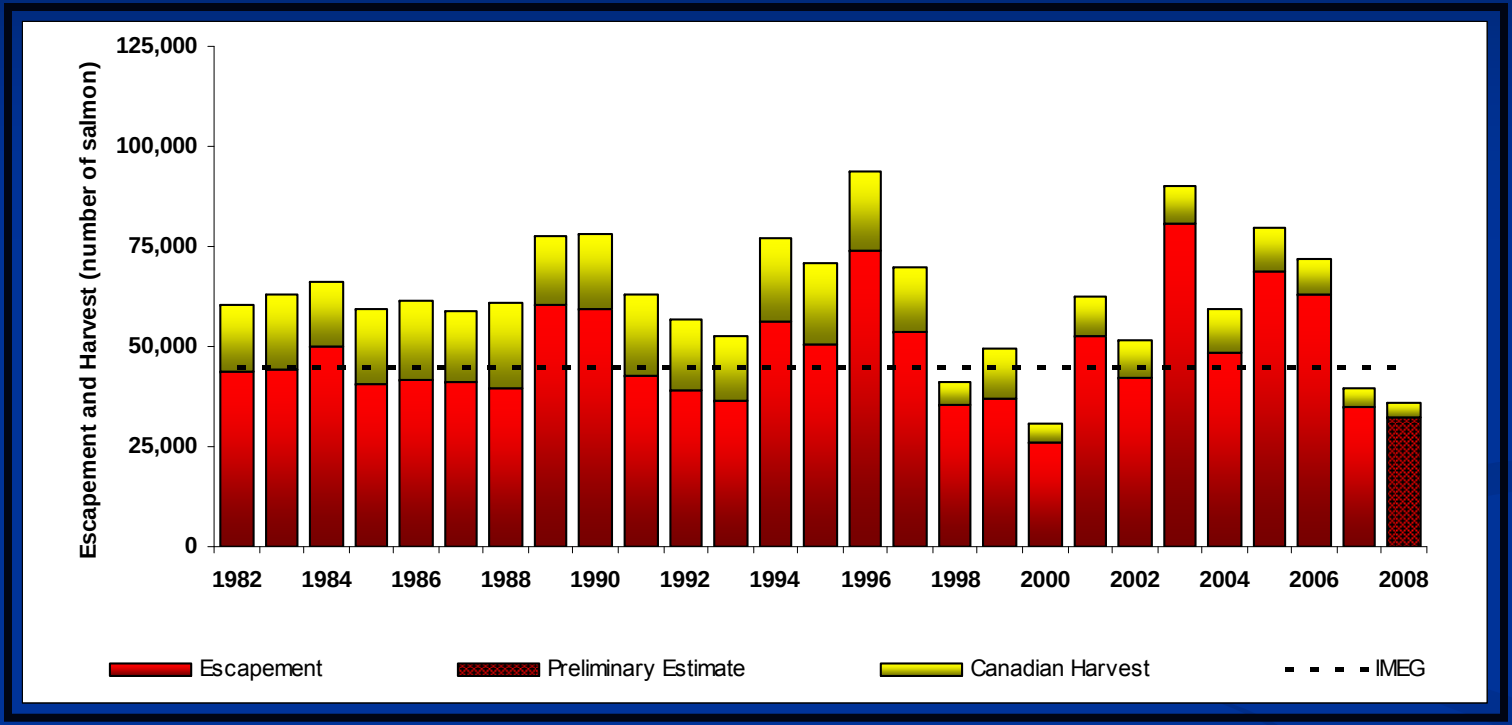
US Commercial Harvest

	Chinook	S. Chum
District 1	2,530	67,459
District 2	2,111	58,139
Subdistrict 4-A	0	24,346
District 6	0	1,842
Total	4,641	151,786

US Chinook Escapement Summary

- Tributaries with SEGs: Most escapements could not be assessed
- Tributaries with BEGs: Lower end of escapements were met

Canadian Origin Chinook Escapement



- Total Canadian run: ~55,000
- Canadian escapement: 34,008
- IMEG: > 45,000

Summer Chum Escapement Summary

- Total run passed Pilot Station sonar =1.65 M
- Exceeded drainage wide threshold of 1 million fish
- Escapements:

  Andreafsky – 52,259 (Goal 65,000-135,000)

  Anvik – 374,929 (Goal 350,000-700,000)

2009 Preseason Outlook

Chinook:

- Below average to poor run
- Subsistence conservation measures likely required
- Directed commercial fishery unlikely

Summer Chum:

- 500,000-900,000 surplus available
  - Commercial harvest dependent on potentially poor Chinook run

Challenges on the Horizon

A poor Chinook run is projected.

- How can escapement to both Alaska and Canada be ensured?
- How can conservation measures be applied equitably?
- What is best way to communicate this to user groups?
- How can harvestable surplus of summer chum be maximized while conserving Chinook?

2009 Preseason Planning

- YRDFA hosted teleconferences and meetings
  - Forum for providing input to managers
  - How to reduce subsistence harvest of Chinook
  - How to allow directed commercial fishery for summer chum
- Draft 2009 Outlook

Potential New Assessment Projects

- Hooper Bay / Dall Point Offshore Salmon Test Fish Feasibility Study
- Lower Yukon Summer Chum Drift Test Fishing Project
- Inseason Genetic Stock ID

Board of Fish 01/10

- Stock Status & Action Plan
- Chinook Management Plan
- Review of escapement goals
- Mesh Size Study
- Joint Fed/State analysis of Chinook size issue

Economic Contributions & Impact of Sportfishing in Alaska -- 2007

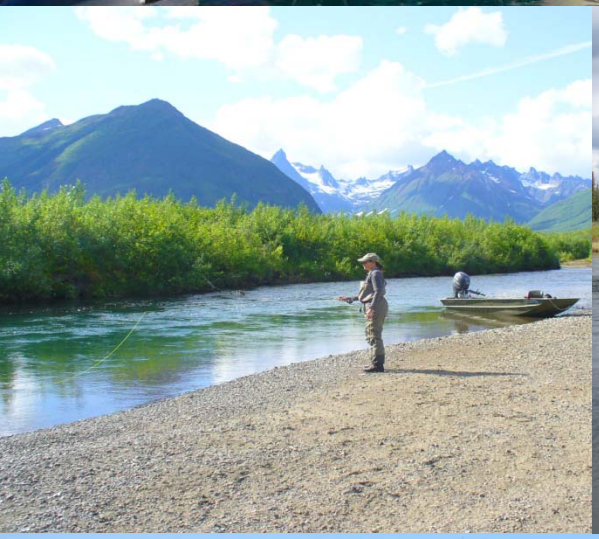
ADF&G, Div. of Sport Fish

Southwick Associates Inc

RC#3 Tab 5


HUNTRESS
(c) Ken Marsh


YAMAHA
FENTON BROS
110



Previous Economic Studies

Statewide Assessments:

- Jones and Stokes, 1986-87
- UAA-ISER, 1993
- FHWAR—every 5 yrs, statewide only

Regional/Fishery-based assessments:

- ADF&G: (Duffield & Merrit, 1995-98 Interior fisheries; Stocked waters, 2003)
- NMFS: (NMFS saltwater expenditures,2006; Kenai Pen./Cook Inlet_1997)
- NGO/University: (Sitka charter industry, 2005, Copper R., Henderson et al, 1999)

Project Need

- Last Assessment—1993
- Demand by Legislature, Board & stakeholders for current economic data on sportfishing in Alaska
- Useful for Division and strategic planning
- ADF&G required to provide annual performance measures to OMB

Project Genesis & Process

- Funding from Legislature, May 2006
  - $229K F&G Fund increment
  - $200K CIP
- RFP competitive bid --Southwick Assoc.
- Development of Research Plan
- Examination of Past AK Studies

Project Scope

(1) Economic impact & contributions

a) economic impact: new $ from outside state/region (nonresident spending)

b) economic contribution: total $ spent within state/region (e.g., resident + nonresident spending)

(2) Provide economic estimates for:

- Statewide
- 3 Primary fisheries management regions (Interior, Southcentral, Southeast)
- 2 sub-regions (Cook Inlet, Southeast marine fishing)

Project Goals

1) Estimate total angler expenditures and economic impacts statewide & within key regions by:
   - Residency (AK residents, visitors to AK)
   - Water type (freshwater, saltwater)
   - Fishing type (guided, unguided fishing)

2) Establish a repeatable methodology that can provide updated economic estimates on a regular basis and allow for trend analyses

Angler Surveys -- Expenditures

- Survey of 7,500 resident and nonresident licensed anglers in 2007
- Most recent trip" within defined time periods

  Jan 1 - Apr 30

  May 1 - Jun 30

  Jul 1 - Oct 30
- 41% overall response rate

  (1,163 residents, 1,807 nonresidents)

Expenditures Counted

****only $ spent in Alaska in 2007****

Trip costs: fuel, food, guide fees, processing, ice, boat launch, lodging, etc.

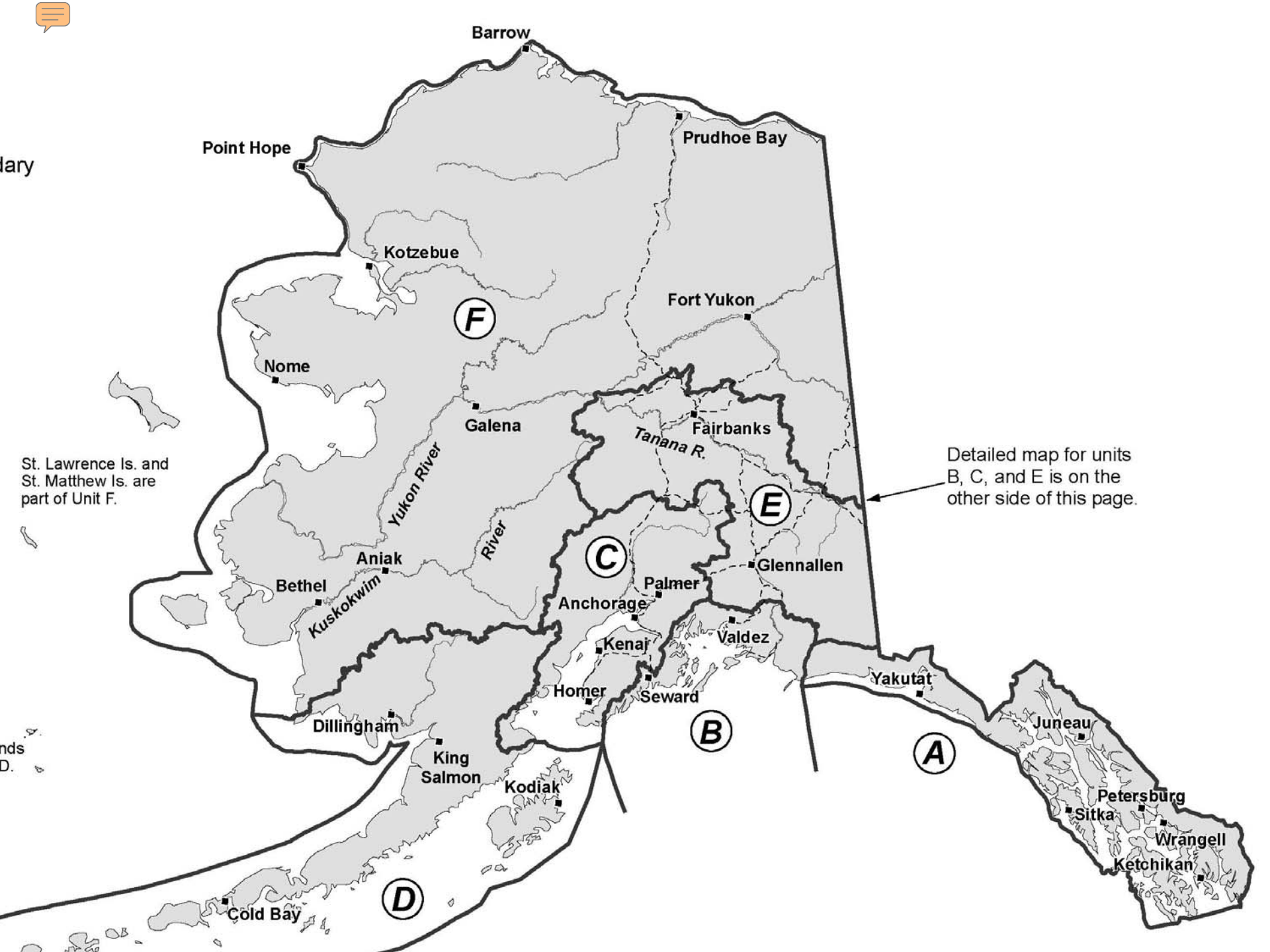
Fishing Packages: nonresidents only

Fishing Equipment Purchases:

1) rod/reel, lures, tackle, etc.

2) equipment used for fishing (boats, coolers, knives, camping, etc.

Fishing Real Estate: development/maintenance (dock construction, boat slip, cabin maintenance)


Barrow
Point Hope
Prudhoe Bay
Kotzebue
Fort Yukon
F
Nome
Galena
Fairbanks
Tanana R.
Yukon River
River
St. Lawrence Is. and
St. Matthew Is. are
part of Unit F.
Detailed map for units
B, C, and E is on the
other side of this page.
E
C
Aniak
Bethel
Kuskokwim
Glennallen
Palmer
Anchorage
Valdez
Kenai
Yakutat
Homer
Seward
B
A
Juneau
Dillingham
King
Salmon
Kodiak
Petersburg
Sitka
Wrangell
Ketchikan
D
Cold Bay

Economic Effects – IMPLAN

- Standardized input/output model
- Economic impacts of spending:
  - Indirect & induced spending
  - Jobs supported
  - Tax revenues generated
- Model for each geographic region
- Customized by Alaska Guide Business Survey (500 surveyed in 2007)

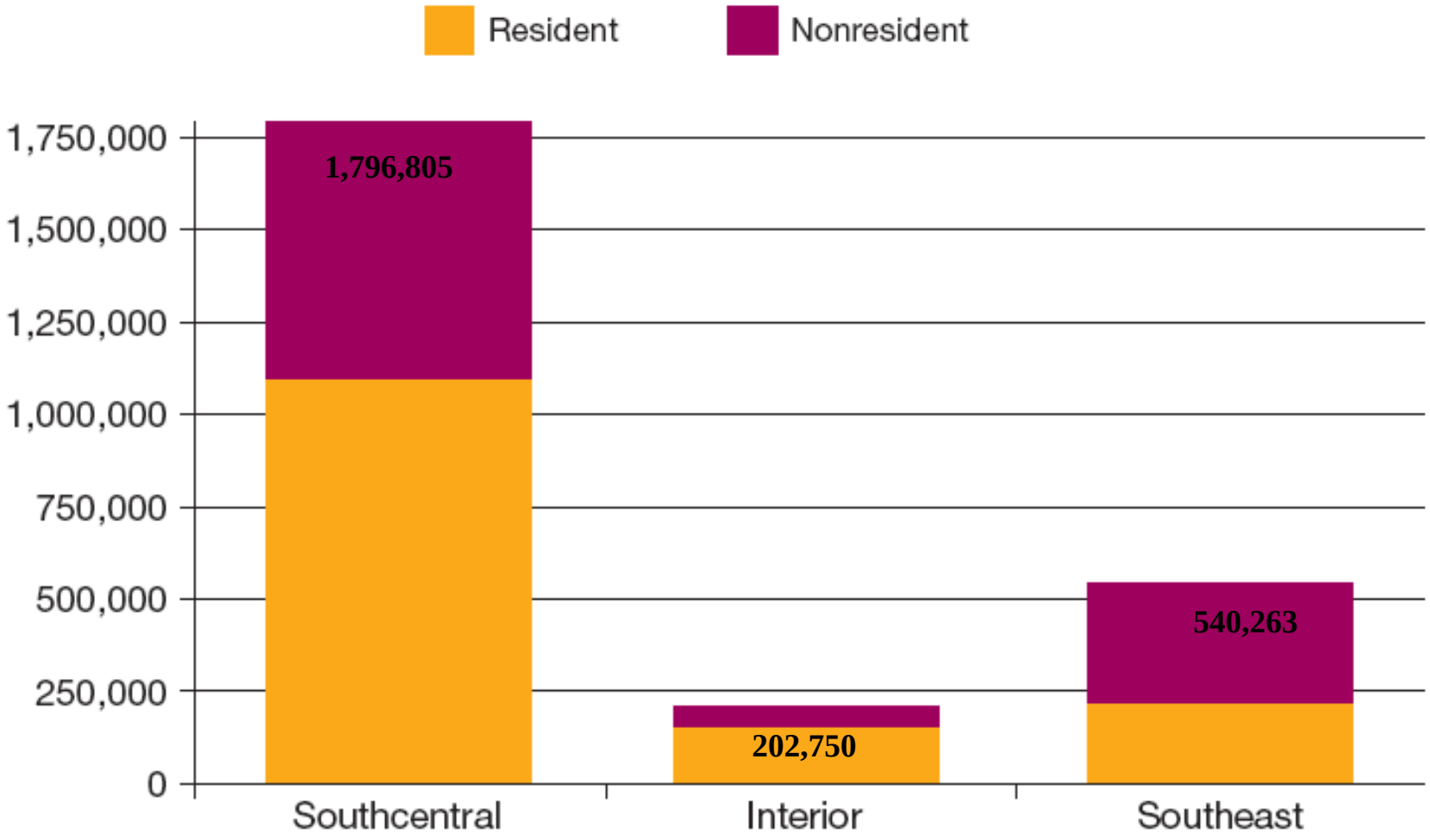
Sportfishing in 2007

- 475,534 Licensed Anglers
  - Resident: 190,644
  - Nonresident: 284,890
- 2.5 Million angler days
  - Resident: 1.4 Million days (56%)
    - Guided: 9%
    - Unguided: 91%
  - Nonresident: 1.1 Million days (44%)
    - Guided: 43%
    - Unguided: 57%

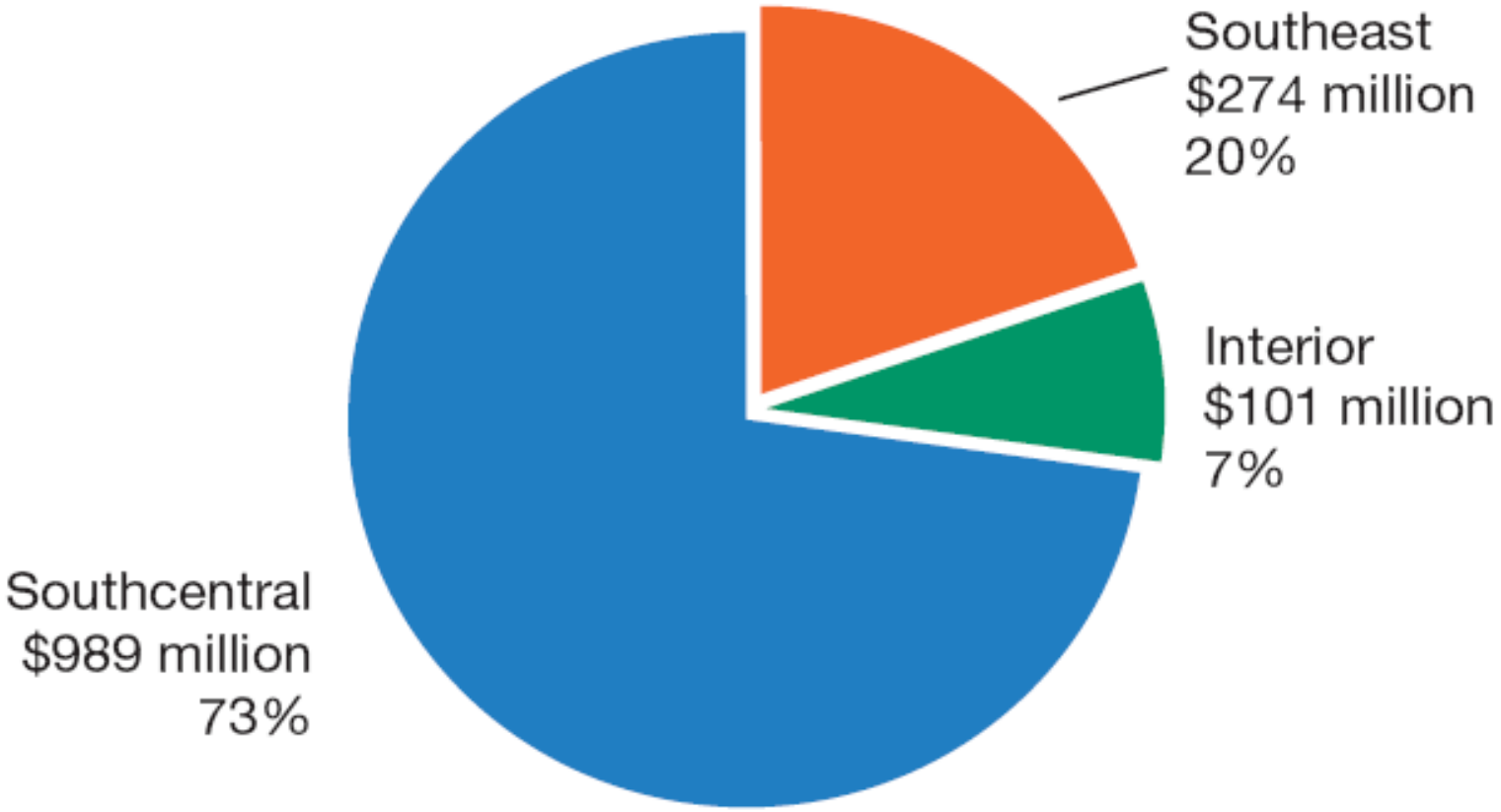
TOTAL SPORTFISHING EXPENDITURES, All ANGLERS

$1.4 billion

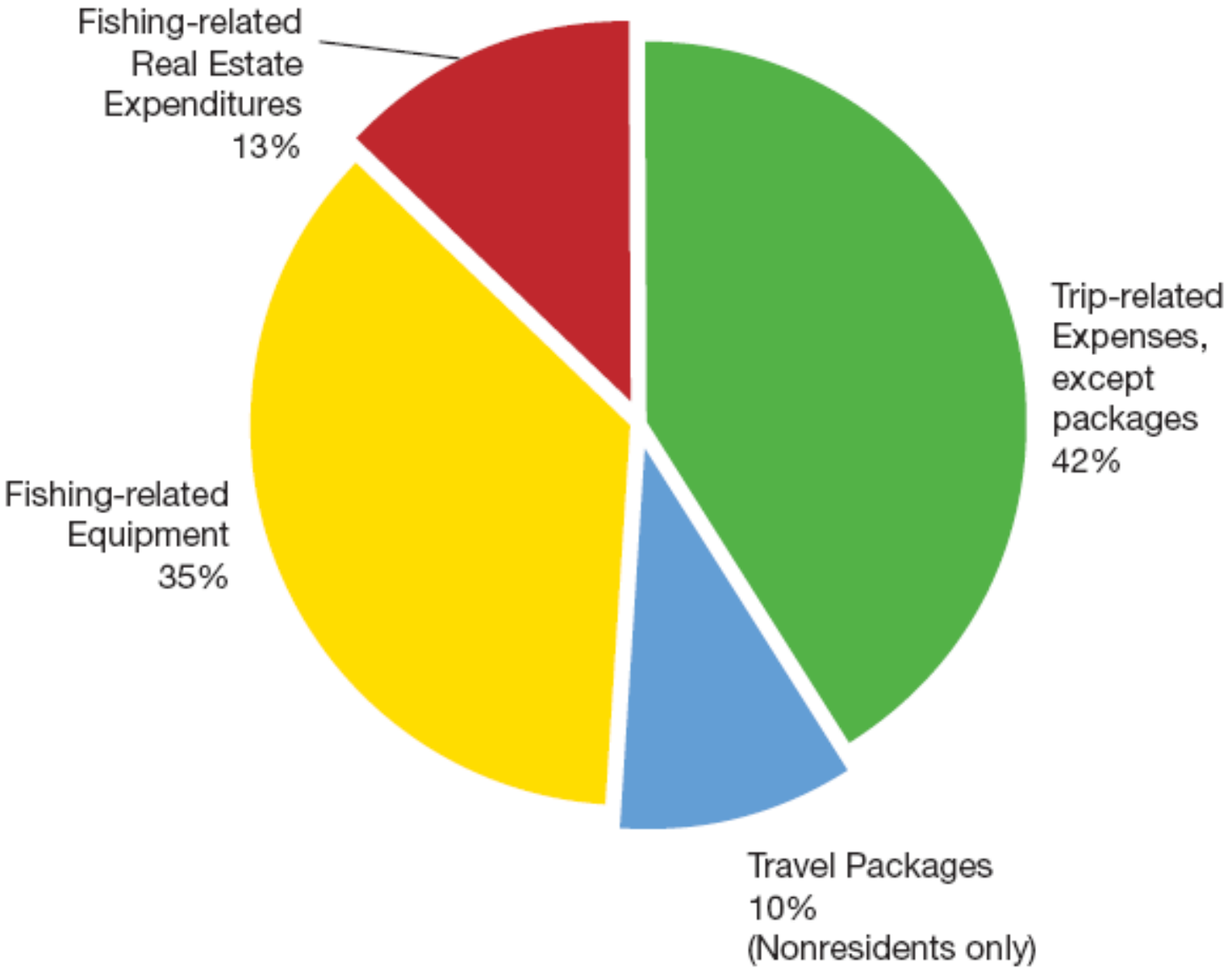
DAYS OF SPORTFISHING IN ALASKA BY REGIONS AND RESIDENCY, 2007



SPORTFISHING EXPENDITURES BY REGION, ALL ANGLERS



TOTAL ANGLER SPENDING BY CATEGORY



Average Per Day Expenditure for Trip-Related Items Only, Including Package Trips

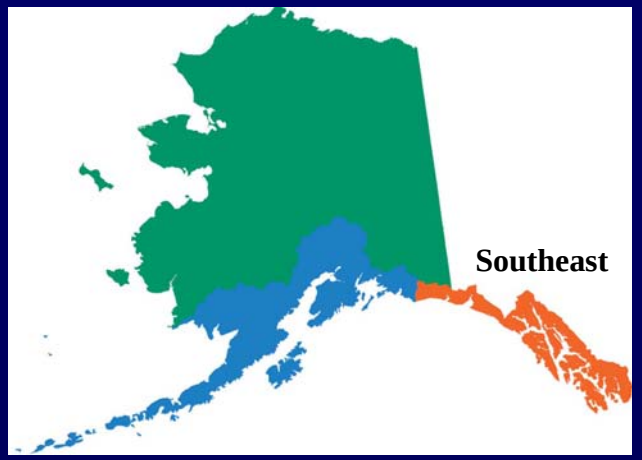
(Lodging, fuel, food, travel packages, etc.)

	Per Day
All Alaska Fishing Combined	**$277.46**
Residents Only	$150.63
Non-Residents Only	$448.78
Saltwater	
Residents, Unguided	$162.81
Residents, Guided	$466.53
Non-Residents, Unguided	$209.40
Non-Residents, Guided	$744.03
Freshwater	
Residents, Unguided	$91.73
Residents, Guided	$509.56
Non-Residents, Unguided	$213.24
Non-Residents, Guided	$790.41

Statewide

- 2.5 Million angler days
- Total spending: $1.39 Billion
- Supported 15,879 full & part-time jobs
- $123 M in state/local tax revenues

Southeast

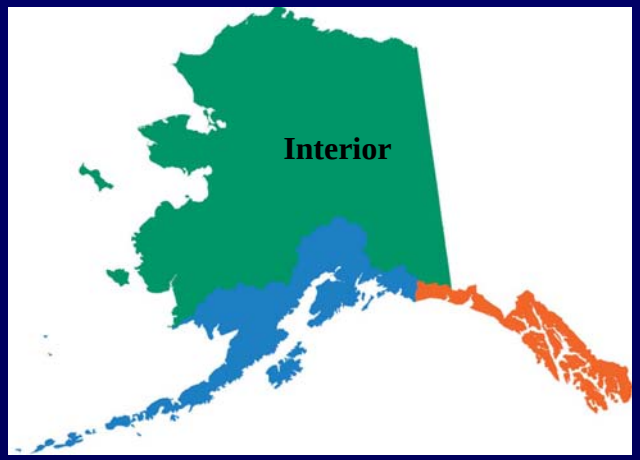


- 540,000 angler days
- Total spending: $274 Million

  Resident: $99 M (36%)

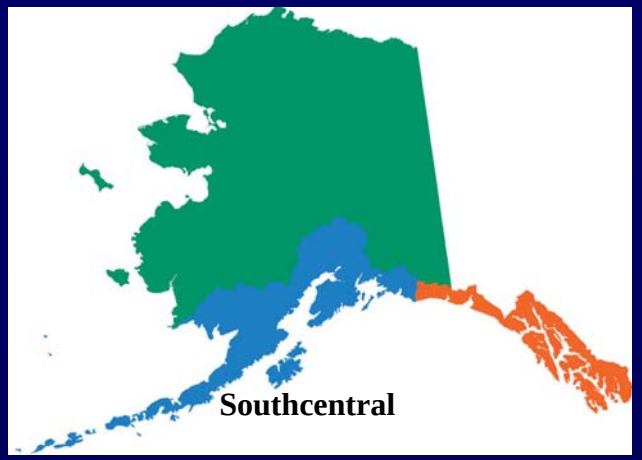
  Nonresident: $175 M (64%)
- 3,063 full- and part-time jobs
- $44 M in state/local tax revenues

Interior



- 203,000 angler days
- Total spending: $101 Million
  - Resident: $67 M (66%)
  - Nonresident: $34 M (34%)
- 923 full- and part-time jobs
- $7 M in state/local tax revenues

Southcentral



- 1.8 Million angler days
- Total spending: $989 Million

  Resident: $561 M (57%)

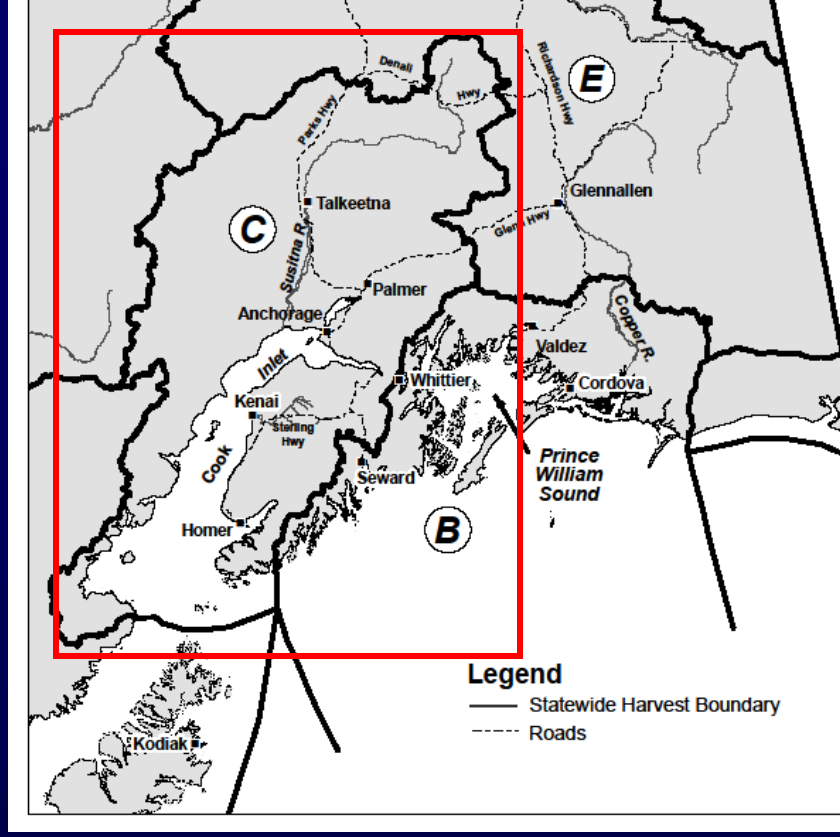
  Nonresident: $428 M (43%)
- Supported 11,535 full- and part-time jobs
- $91 M in state/local tax revenues

Cook Inlet

- 1.2 Million angler days
- Total spending: $733 M

  Resident: $458 M (63%)

  Nonresident: $275 M (37%)
- Supported 8,056 full- and part-time jobs
- $55 M in state/local tax revenues

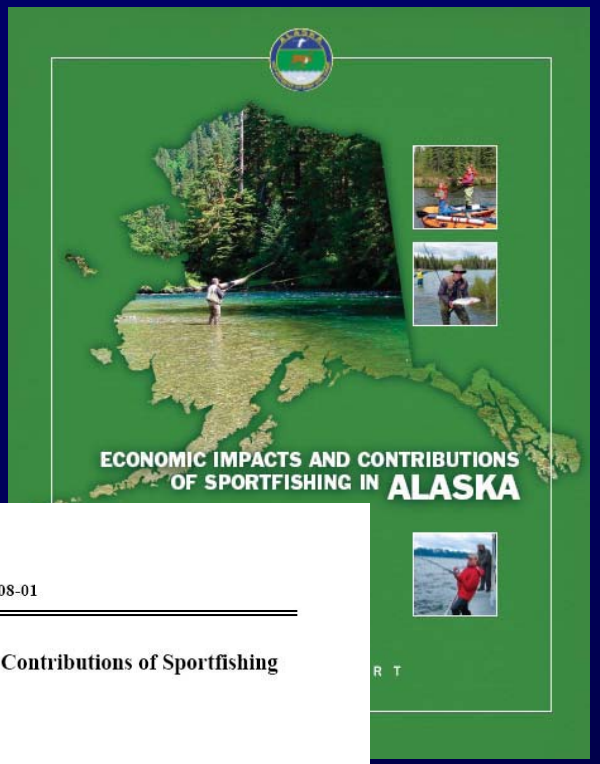


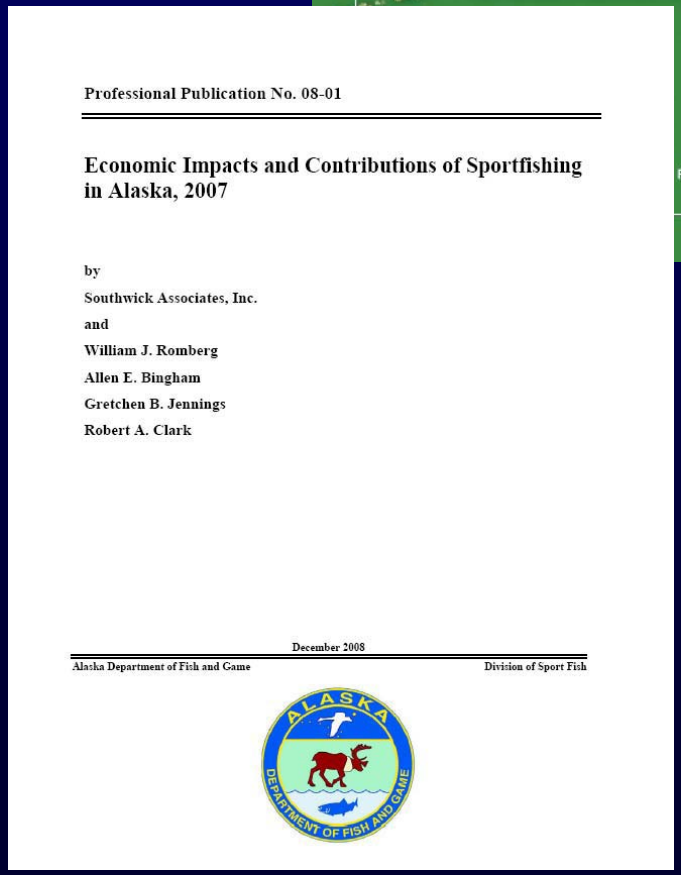
Available Reports

www.sf.adfg.state.ak.us/Statewide/economics/

- 12-page Summary
- 289-page Technical Report

- FAQ
- RFP
- Links to past assessments





Professional Publication No. 08-01

Economic Impacts and Contributions of Sportfishing in Alaska, 2007

by
Southwick Associates, Inc.
and
William J. Romberg
Allen E. Bingham
Gretchen B. Jennings
Robert A. Clark

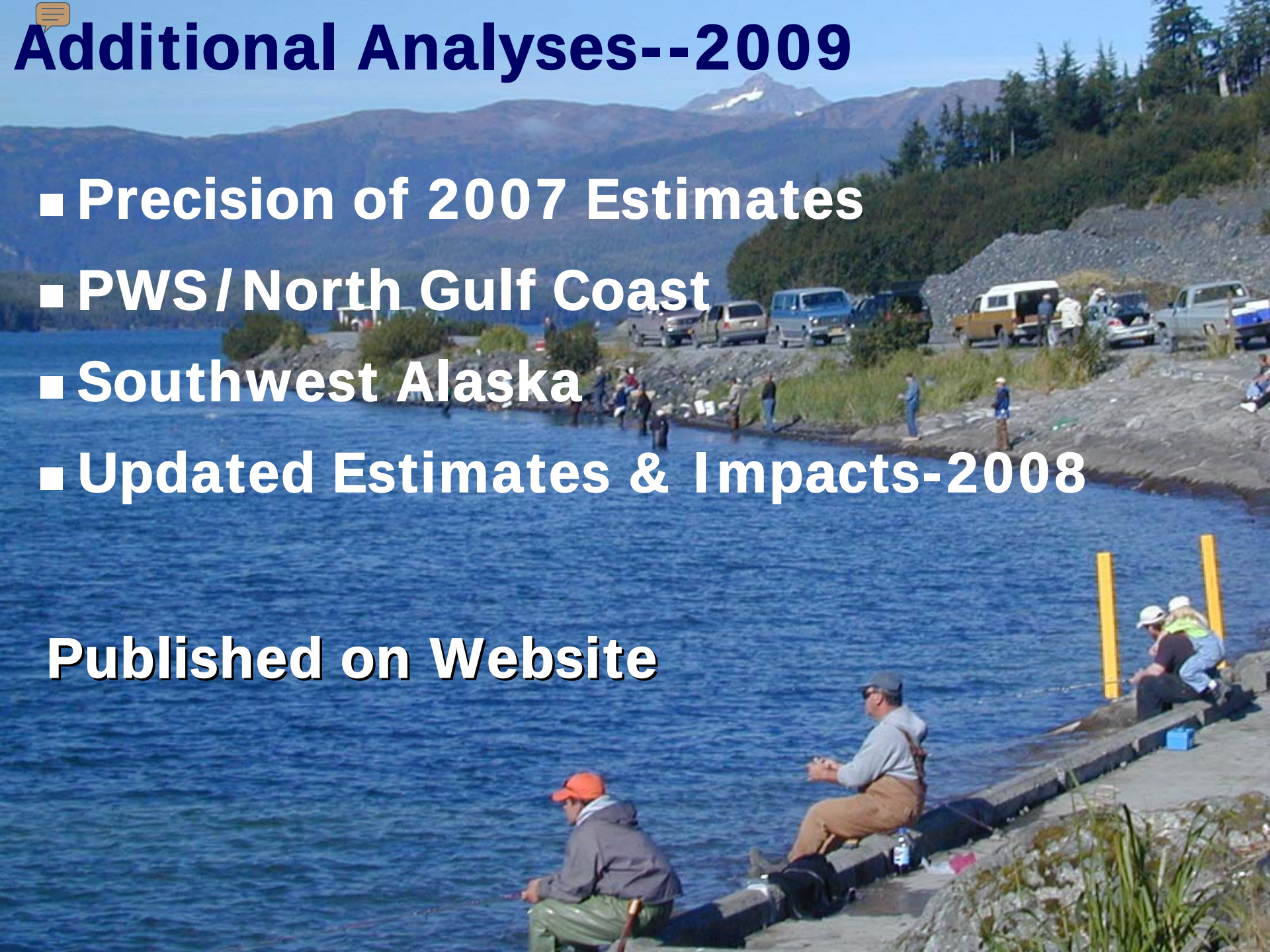
December 2008

Alaska Department of Fish and Game — Division of Sport Fish

Study Doesn't Provide:

- **Estimates of total "economic value" of sport fishing or sport-caught fish**
  (only captures $ actually spent in AK in 2007)
- **Estimates of spending and impact for specific fisheries**
- **Comparisons to commercial fishing economic impacts**

Additional Analyses--2009



- Precision of 2007 Estimates
- PWS/North Gulf Coast
- Southwest Alaska
- Updated Estimates & Impacts-2008

Published on Website

Contact Information

Bill Romberg
Project Coordinator
907- 267-2366
william.romberg@alaska.gov

Lisa Evans
Assistant Director
907-267-2330
lisa.evans@alaska.gov

Questions?

Fishery Data Series No. 09-03

Harvest, Abundance, Age and Length Characteristics of Razor Clams from Eastern Cook Inlet Beaches, 2004-2008

by

Nicole J. Szarzi

and

Patricia A. Hansen

February 2009

Alaska Department of Fish and Game **Divisions of Sport Fish and Commercial Fisheries**

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the following reports by the Divisions of Sport Fish and of Commercial Fisheries: Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Measures (fisheries)

fork length	FL
mideye to fork	MEF
mideye to tail fork	METF
standard length	SL
total length	TL

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

FISHERY DATA SERIES NO. 09-03

HARVEST, ABUNDANCE, AGE AND LENGTH CHARACTERISTICS OF RAZOR CLAMS FROM EASTERN COOK INLET BEACHES, 2004-2008

by
Nicole J. Szarzi
Alaska Department of Fish and Game,
Division of Sport Fish, Homer
and
Patricia A. Hansen
Alaska Department of Fish and Game,
Division of Sport Fish, Research and Technical Services, Anchorage

Alaska Department of Fish and Game
Division of Sport Fish, Research and Technical Services
333 Raspberry Road, Anchorage, Alaska, 99518-1565

February 2009

ADF&G Fishery Data Series was established in 1987 for the publication of Division of Sport Fish technically oriented results for a single project or group of closely related projects, and in 2004 became a joint divisional series with the Division of Commercial Fisheries. Fishery Data Series reports are intended for fishery and other technical professionals and are available through the Alaska State Library and on the Internet: http://www.sf.adfg.state.ak.us/statewide/divreports/html/intersearch.cfm This publication has undergone editorial and peer review.

Nicole J. Szarzi
Alaska Department of Fish and Game, Division of Sport Fish,
3298 Douglas Place, Homer AK 99603-8027, USA

Patricia A. Hansen
Alaska Department of Fish and Game, Division of Sport Fish
333 Raspberry Road, Anchorage, AK 99518-1599, USA

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ABSTRACT

Pacific razor clam *Siliqua patula* studies along eastern Cook Inlet were conducted from 2004 to 2008 to estimate clam digger distribution, clam harvest by beach, age and length composition of the harvest, and periodically, clam abundance at Ninilchik and Clam Gulch beaches. In 2004-2008, 59.4% of the average annual harvest came from Ninilchik Beach and 20.0% from Clam Gulch Beach. The highest percentage of annual harvest ever recorded from Ninilchik peaked at 68.1% in 2007, whereas clams harvested from Clam Gulch declined to the lowest level ever recorded at 12.2%. The proportion of the harvest taken at Happy Valley in 2008 was 10.6%, the highest from that location since 1988. The estimated abundance of harvestable-sized (≥80 mm) clams along 5.8 km of Ninilchik, where diggers concentrate, was 1,376,166 clams (SE = 347,580) in 2005. The abundance of harvestable-sized clams along 6.1 km of Clam Gulch, where diggers concentrate, was 1,391,378 clams (SE = 192,506) in 2008. The estimated exploitation rate of clams at Ninilchik in 2005 was 17.7% (SE = 0.04%). An unprecedented disappearance of clams, age-7 and older, occurred in 2005 on the northern portion of the eastside beaches from Cohoe south to Set Net Access, including Clam Gulch. Clams grew more slowly in 2005-2007 on the northern beaches between Cohoe and Set Net Access than in 2004. There was a strong 2001 year class present in all areas sampled.

Key words: Cook Inlet, razor clam, *Siliqua patula*, harvest, participation, abundance, exploitation, age, size-at-age

INTRODUCTION

Pacific razor clams *Siliqua patula* are found in exposed fine to medium grain sandy beaches along the west coast of North America from Pismo Beach, California, to the Bering Sea (Weymouth and McMillan 1931). On eastside Cook Inlet beaches razor clams are usually found between +4.6 and –4.3 ft tides (Szarzi 1991). Growth rates decrease with latitude while maximum size and age increase (Weymouth et al. 1925). Maximum age is generally 5 years on the southern end of their range while the oldest clam aged in Alaska was 18 years (Nickerson 1975). Sexual maturity is related more to size than age and razor clams mature at approximately 100 mm (between their fourth and sixth growing season in Alaska) (Nickerson 1975; Nelson *Unpublished*). Spawning is triggered primarily by temperature (Nelson *Unpublished;* Nickerson 1975). Male and female sexes are separate. Females broadcast 6-10 million eggs into the water where they are fertilized randomly by sperm broadcast from males. Razor clams spawn primarily in July and August in Cook Inlet, but some may spawn earlier in the summer (Nelson *Unpublished*). Larvae drift from 6 weeks to 2 months or more as they metamorphose and then settle to the substrate as juveniles (Szarzi et al. *In prep*).

Beaches on the east side of Cook Inlet provide the largest sport fishery for Pacific razor clams in Alaska (Mills 1979, 1980; 1981a, b, 1982-1994; Howe et al. 1995, 1996; 2001a-d; Walker et al. 2003; Jennings et al. 2004; 2006a; 2006b, 2007; *In prep* a-c). This fishery is confined primarily to 81 km (50 mi) of beach between the Kasilof and Anchor rivers (Figure 1). The Alaska Department of Fish and Game (department) began monitoring the clam population in 1965 after the 1964 earthquake caused subsidence of beaches in the Cook Inlet area.

Initial research to estimate clam harvest included creel surveys, digger distribution surveys, and length-at-age analyses at different beaches (Nelson *Unpublished*). Harvest and participation since 1977 have been estimated in the annual Statewide Harvest Survey (Mills 1979, 1980, 1981a, b, 1982-1994; Howe et al. 1995, 1996, 2001a-d; Walker 2003; Jennings et al 2004, 2006a, b). Surveys are mailed to random households where at least one member obtained an Alaskan sport fishing license.

The razor clam sport fishery developed rapidly beginning in 1972 (Figure 2), likely the result of improved road access to the fishery in the late 1960s. The fishery was fairly stable from 1973 to

2003 with an annual clam harvest between 566,000 and 1,300,000 and digging effort ranging from 22,700 to 47,000 digger-days.

Sport fish use and clam harvest patterns have changed dramatically over the life of the fishery as diggers shift to beaches with the largest clams. Until the mid-1980s the predominant harvest came from Clam Gulch Beach (Clam Gulch) (Table 1). Beginning in 1986 and peaking in 1995, a larger percentage of the harvest was taken at Ninilchik Beach (Ninilchik) (Table 2). The percent harvest taken at Ninilchik steadily declined after 1995. Growth rates increase incrementally from the northern to the southern beaches resulting in clams that are larger at age at Ninilchik than at Clam Gulch (Nelson *Unpublished*; Szarzi et al. *In prep*). A 1995 peak in the harvest at Ninilchik occurred after diggers began shifting there in 1986 to take advantage of the larger clams (Athons 1992; Athons and Hasbrouck 1994; Szarzi et al. *In prep*). The average size of clams in department samples at Ninilchik declined after 1994 (Szarzi et al. *In prep*; Figure 3); likely the result of strong new year classes recruiting to harvestable size. The smaller average size of clams at Ninilchik resulted in diggers shifting their efforts back to Clam Gulch after 1995.

The regulations allow diggers to take the first 60 clams dug per day. This has been the limit since 1962, except from 2000 to spring 2003 when the daily bag limit was lowered to 45 clams because of concerns by local residents that the 60 clam limit encouraged the waste of clams. The possession limit was lowered from three to two daily bag limits in 2000 and is currently 120 clams. Winter conditions such as ice build-up on beaches, cold temperatures, and low tides at night preclude most clam digging from October through February. Razor clams may be encountered on any minus tide, but tides lower than -2.0 ft north of Ninilchik and -3.0 ft on beaches from Ninilchik south are preferred by diggers. On the beaches north of Ninilchik, suitable tides occur about 65 days annually while the southern beaches average about 35 days.

This report presents razor clam stock assessment information in 2004-2008 and includes estimates of clam harvest, age composition of harvested clams and clam abundance.

OBJECTIVES

The project objectives were to estimate:

1. Digger distribution and the number of razor clams harvested at Cohoe, Clam Gulch, Oil Pad Access, Ninilchik, Happy Valley and Whiskey Gulch beaches;
2. The age and length composition and age-specific harvest of razor clams at Cohoe, Clam Gulch, Oil Pad Access and Ninilchik beaches;
3. Abundance of razor clams at Ninilchik and Clam Gulch beaches periodically.

METHODS

The razor clam assessment program primarily estimates clam harvest, age composition of harvested clams, and abundance. Harvest for the entire study area, estimated from the Statewide Harvest Survey, is apportioned among the beaches based on the distribution of clam diggers from aerial counts. The age and length composition of the harvest is estimated from samples collected among four of the six study beaches. Finally, methods have been refined to estimate total abundance on two heavily dug clamming areas at Ninilchik and Clam Gulch beaches.

DIGGER DISTRIBUTION AND HARVEST BY BEACH

The eastside Cook Inlet beaches between the Anchor and Kasilof rivers were divided into six study areas based on beach morphology, razor clam population characteristics, and clam digger distribution. Digger counts were made at these six beaches: Whiskey Gulch, Happy Valley, Ninilchik, Oil Pad Access, Clam Gulch, and Cohoe (Figure 1). Whiskey Gulch includes Anchor River to Happy Creek, Happy Valley includes Happy Creek to Deep Creek, Ninilchik includes Deep Creek to Set Net Access Road, Oil Pad Access extends from Set Net Access Road to the Clam Gulch communication tower, Clam Gulch extends from the Clam Gulch communication tower to where the southern extension of Cohoe Loop Road turns inland away from the bluff. Cohoe is the remaining beach north of Clam Gulch to Cape Kasilof. Set Net Access is a beach access road, located approximately 13.7 km south of the Clam Gulch access road. The Clam Gulch communications tower is approximately 3.2 km south of Clam Gulch beach road.

Ninilchik beach is divided into three sub-beaches: Ninilchik Bar, Deep Creek to Lehman's, and Lehman's to Set Net Access. Clam Gulch is also divided into three sub-beaches: Tower to Bluff, Bluff to A-frame, and A-frame to South Extension, for a total of 10 sample sites. Ninilchik Bar is located off the main beach between Deep Creek and the Ninilchik River and is only available to diggers on foot when the tide is less than -3.0 ft. Lehman's is the first group of set net cabins and are located approximately 5.2 km north of the Ninilchik River. A beach access road is also present at this location. Bluff refers to a section of non-vegetated bluff located approximately 0.4 km south of Clam Gulch. The A-frame is a set net cabin located approximately 1.6 km north of Clam Gulch. Southern Extension of Cohoe Loop Road turns inland away from the bluff approximately 6.4 km north of Clam Gulch.

Aerial digger counts were stratified by tide height into two strata: -1.0 to -2.9 ft tides and -3.0 ft and lower. The number of days between flights was determined by dividing the total number of tides in both strata by the number of tides to be flown in those strata. The first flight was chosen randomly and subsequent surveys were chosen systematically April through mid-August when most harvesting occurred.

The aerial digger counts originated at Anchor River within 15 minutes of low water at Deep Creek/Ninilchik and proceeded north. All people associated with digging activity were included in the count, even those traveling along the beach on all-terrain vehicles. People in highway vehicles and those associated with commercial fishing activities were not included.

Digger counts were adjusted by a relative harvest success rate for each beach based on historic data (Szarzi 1991). Estimates were calculated separately for each stratum and then combined. Success rate of diggers varies by beach, so a crude adjustment for success rate was made to estimate harvest by beach. Harvest success rates (I_b) of 0.5 (Whiskey Gulch, Happy Valley, and Cohoe) or 1.0 (Ninilchik, Set Net Access and Clam Gulch) were assigned to each beach. Digger counts for each beach were multiplied by the harvest success rate to give adjusted digger counts:

$$d_{tbk} = I_b A_{tbk}\,; \tag{1}$$

where:

d_{tbk} = the adjusted digger count during flight k on beach b in tidal stratum t;

I_b = the harvest success rate for beach b; and

A_{tbk} = the number of diggers counted during flight k on beach b in tidal stratum t.

Harvest by beach was determined by apportioning the total harvest estimate from the Statewide Harvest Survey (Mills 1979, 1980, 1981a, b, 1982-1994; Howe et al. 1995, 1996, 2001a-d; Walker 2003; Jennings et al 2004, 2006 a, b, 2007; *In prep* a-c;) using the adjusted digger counts per beach. The relative harvest on beach *b* during flight *k* of tidal stratum *t* was estimated as:

$$r_{tbk} = \frac{d_{tbk}}{d_{tk}}; \tag{2}$$

where:

d_{tk} = the total adjusted digger count during flight *k* in tidal stratum *t*;

$= \sum_{b=1}^{n} d_{tbk}$; and

n = the total number of beaches.

The average relative harvest on beach *b* in tidal stratum *t* ($\bar{r}_{tb}$) was estimated, incorporating the sample weights (w_{tk}) that adjust the proportions for different total numbers of diggers during different flights:

$$\bar{r}_{tb} = \frac{\sum_{k=1}^{c_t} w_{tk} r_{tbk}}{c_t}; \tag{3}$$

where:

w_{ik} = the sample weight of flight *k* in tidal stratum *t*,

$= \frac{d_{tk}}{\bar{d}_t}$;

$\bar{d}_t = \frac{\sum_{k=1}^{c_t} d_{tk}}{c_t}$; and

$c_{i\iota}$ = the number of flights taken in tidal stratum *t*.

The number of diggers is probably related to the height of the minus tides. Because tide heights run in cycles and selection of flights was systematic and not random, numbers of diggers (sample weights) were probably cyclic. Therefore, a successive difference estimator (Wolter 1985) was used to estimate the variance of the average number of diggers ($\bar{r}_{tb}$):

$$\hat{V}\left[\bar{r}_{tb}\right] = \left\{1 - \frac{c_t}{m_t}\right\} \left\{ \frac{\sum_{k=2}^{c_t} \left(w_{tk} r_{tbk} - w_{tb(k-1)} r_{tb(k-1)}\right)^2}{2c_t^2 \left(c_t - 1\right)} \right\}; \quad (4)$$

where:

m_t = the number of tides in tidal stratum t.

The average relative harvest on beach b ($\bar{r}_b$) was then estimated by incorporating stratum weights (w_t) that adjust the proportions for different numbers of tides and different average numbers of diggers in each tidal stratum:

$$\bar{r}_b = \sum_{t=1}^{2} w_t \bar{r}_{tb} \; ; \quad (5)$$

where:

$\bar{w}_t$ = the weight for tidal stratum t,

$$= \frac{m_t \bar{d}_t}{\sum_{t=1}^{2} m_t \bar{d}_t} .$$

The estimated harvest for beach b ($\hat{H}_b$) is:

$$\hat{H}_b = \bar{r}_b \hat{H} \; ; \quad (6)$$

where $\hat{H}$ is the estimated harvest of razor clams between Anchor Point and Kasilof from the Statewide Harvest Survey (e.g., Jennings et al. *In prep*-b).

Its variance is estimated following Goodman 1960:

$$\hat{V}\left[\hat{H}_b\right] = \bar{r}_b^2 \hat{V}\left[\hat{H}\right] + \hat{H}^2 \hat{V}\left[\bar{r}_b\right] - \hat{V}\left[\hat{H}\right]\hat{V}\left[\bar{r}_b\right]; \quad (7)$$

where $\hat{V}\left[\hat{H}\right]$ is the variance of the Statewide Harvest Survey estimate, and

$$\hat{V}\left[\bar{r}_b\right] = \sum_{t=1}^{2} \hat{W}_t^2 \hat{V}\left[\bar{r}_{tb}\right].$$

AGE AND LENGTH COMPOSITION AND AGE SPECIFIC HARVEST BY BEACH

Age and length composition of the razor clam harvest has been estimated for Cohoe, Clam Gulch, Oil Pad Access, and Ninilchik beaches since 1977 (Nelson *Unpublished*). Szarzi (1991) recommended collecting 300 ageable clams per beach to estimate age composition and mean length-at-age for the major age classes. Age and length composition of the harvest was estimated from clams hand dug at these four beaches. Sampling was designed to mimic an average clam digger by collecting clams throughout the beach area, rather than sampling from a small specific area. All clams dug were retained, regardless of size or condition, in compliance with state regulation.

For age and length composition and specific harvest by beach, samples were taken at Cohoe from the southern end of the beach. Clam Gulch samples were collected between 1/4 mile south and 1/2 mile north of the Clam Gulch Beach Road (Figure 4). Oil Pad Access was sampled with half of the specimens obtained from the northern end and the other half obtained from the southern end of the beach near Set Net Access Road. Half of the Ninilchik samples were collected within 1 mile north of the Ninilchik River and the other half were collected within 1 mile south of the Ninilchik River. Additional clams were taken from Ninilchik Bar for possible future studies.

To ensure the target sample size of 300 clams was available to estimate age, total length, and length-at-age, 350 clams were collected from each beach to compensate for breakage during processing. At Ninilchik Bar, the goal was to collect 175 total clams. Clams dug on the subsections of beach were kept separate. Only one shell was required from each clam for measuring and aging. Total length was measured as closely as possible from clams that were broken and could not be aged. Clams were processed for aging by removing the body from the shell and bleaching the specimens to remove the periostracum (i.e., the shell's outermost layer). Shells were soaked in a 25% or 50% household bleach solution depending on shell size until most of the periostracum was removed, but the heavy annuli layers remained. Shells less than 80 mm TL were soaked in the 25% bleach solution to prevent over-bleaching. The bleach solution was then poured off, and the shells rinsed in water and dried for aging and measuring. Total length and length at each annulus was measured and input directly into an Excel spreadsheet using Mitutoyo Digimatic Calipers.

Shell aging followed the methods described by Nelson (*Unpublished*) and the recommendations of Coggins (1994). Agers practiced with a test set of previously aged clams until they achieved 60% agreement with the test set shell ages. Upon achieving the desired aging accuracy, aging of the current age sample commenced.

Age was determined for each shell in the sample at least twice. Each shell reading was independent: after determining age for the entire sample, the shells were rearranged and age determined a second time without knowledge of the previously assigned age. If both shell readings agreed, age composition was estimated using the assigned age. If two shell readings were different, those shells were aged again.

ABUNDANCE ESTIMATION

Razor clam abundance was estimated in areas at Ninilchik and at Clam Gulch where the most digging occurs (Figure 5). To estimate the number of clams at the Ninilchik and Clam Gulch study areas, the study area at each beach was stratified into 15.2 m (50 ft) strips parallel to the shoreline (Figures 6 and 7). Transects were established perpendicular to the shoreline across these strips, with one site on a transect in each strip starting at the gravel edge located high up on the beach and extending out to the extreme low tide line. A site is a rectangular area 5.53 m long by 0.79 m wide. Two to seven 0.5 m^2 circular plots were sampled at each site. Abundance was estimated for each stratum independently with a two-stage sampling design. The primary units were sites and the secondary units were plots within a site.

Transect locations were randomly chosen within beach sections at Ninilchik (Figure 6). The first site at Ninilchik to be sampled along the transect was also chosen randomly within the first 15.2 m (50 ft) strip and sites were chosen systematically every 15.2 m thereafter along the transect as far

as the tide allowed. The first sample site at Clam Gulch was chosen randomly and all subsequent sites were chosen systematically both parallel and perpendicular to the shoreline (Figure 7).

Sampling equipment used for the 0.5 m^2 plots consisted of a 4-cycle, 4.0 hp Honda pump with 30 m of cotton fire hose on the outlet (output) side and 7.6 m of stiff plastic hose on the inlet (intake) side (Figure 8). The outlet hose had a metal tube or "wand" attached to direct water flow into the substrate enclosed by a 0.5 m^2 sampling ring. The sampling equipment and techniques used are described in greater detail by Szarzi (1991).

Samples were collected by repeatedly inserting the wand into the substrate inside the sample ring as far as the wand would penetrate. The substrate enclosed in the sample ring was emulsified such that all clams rose to the surface. Sampling continued for 3 minutes or until the entire area within the ring had been loosened and clams no longer surfaced. A hand-held net with 2 mm mesh was used to strain the loosened substrate to capture small clams. All clams collected were measured and released. The goal was to sample seven plots on the ebb tide at each site before moving 15.2 m to the next site along a transect. If all the plots were not dug as the tide ebbed, the remaining plots at each beach site were sampled as the incoming tide flooded the beach. Distance from the gravel's edge along with the number of clams and the length of each clam from each plot was recorded.

The Ninilchik study area was divided into two areas: a 4.2 km (2.6 mi) area north of the Ninilchik River and a 1.6 km (1.0 mi) area south of the river. The southern area was further divided into three equal sections and the northern area into five equal sections. At Ninilchik, 8-10 transects were sampled. At least one transect was sampled in each section and when additional sample days were available, randomly selected northern sections were sampled with an additional transect.

Transects north of the Ninilchik River were located by measuring the distance from where the beach access road enters the beach at Lehman's Point south to a chosen random starting point for the transect using a vehicle odometer. Transects south of the Ninilchik River were located by driving south from the pilings, found at the high tide line, approximately 182 m (200 yd) south of the Ninilchik River, to a random starting point.

Transects at Ninilchik were typically a minimum of 122 m (400 ft) and a maximum of 467 m (1,500 ft) in length. Number of plots sampled per site and transect length were dependent on the tidal range, the rate at which the tide fell, and the beach substrate. The transects north of the Ninilchik River commonly extended from 122 m to 320 m (400 ft to 1,050 ft) with 6 to 19 sites sampled. The beach area north of the river has a steeper gradient than the area south of the river, and less beach area was available for sampling. The three transects south of the Ninilchik River generally extended from 305 m to 456 m (1,000 ft to 1,500 ft) with 16 to 28 sites sampled. To allow comparison among years, abundance estimates for Ninilchik included only the first 183 m (600 ft) of sections north of the river and 396 m (1,300 ft) south of the river. The total beach area was 1,399,231 m^2 (15,061,197 ft^2).

The Clam Gulch study area was approximately 10.3 km (6.4 mi) long and extended from 3.2 km (2.0 mi) north of the Clam Gulch Beach Access Road to approximately 7.1 km (4.4 mi) south of the access road. The study area was divided into 8 equal-sized sections approximately 1,287 m wide. The location of the first site was determined by the intersection of two randomly chosen points; the first being a point along a 1,280 m line parallel to the shoreline and the second being a point chosen along a 15 m line perpendicular to the shoreline. Subsequent samples were taken

systematically every 1,287.5 m along the line parallel to the beach (north to south) and every 15.24 m perpendicular to the beach (west to east). One transect was sampled each day at Clam Gulch. The one transect was located by starting where the access road enters the beach and proceeding north or south a given distance. Only transects from the A-frame south to the communications tower, in the comparable aerial survey sub-beaches, were used to estimate exploitation rates.

The beach near Clam Gulch Access Road and to the north of the access road has a slightly shallower gradient than the area to the south, and less beach area is exposed south of the access during low tide. In the past, the transects north of the Clam Gulch Access extended from 305 m to 427 m (1,000 ft to 1,400 ft) with 20 to 28 sites sampled. Most of the transects south of the Clam Gulch Access extended from 46 m to 335 m (150 ft to 1,100 ft) with 3 to 22 sites sampled. In 2008, transects north of the access extended between 213 m to 366 m (700 ft to 1,200 ft) and transects south of the access extended 121 m to 396 m (400 ft to 1,300 ft). To allow comparison among years, abundance estimates for Clam Gulch included only the first 320 m (1,050 ft) of all sections. The total beach area used for abundance estimates was approximately 1,956,963 m^2 (21,064,574 ft^2).

The abundance of clams on a beach was estimated using a two-stage design (Cochran 1977). The estimate was for clams ≥80 mm which are considered exploitable (Szarzi 1991).

The number of clams ≥80 mm in each section was estimated as:

$$\hat{N}_b = S_b \hat{\bar{N}}_b , \tag{8}$$

where:

S_b = the number of possible sites in beach stratum *b*,

$\hat{\bar{N}}_b$ = mean estimated abundance of sites in beach stratum *b,*

$$\hat{\bar{N}}_b = \frac{\sum_{i=1}^{s_b} \hat{N}_{bi}}{s_b} , \tag{9}$$

where:

s_b = the number of sites sampled in beach stratum *b,*

$\hat{N}_{bi}$ = the estimated abundance of clams in site *i,* beach stratum *b,*

$$\hat{N}_{bi} = P_{bi} \hat{\bar{N}}_{bi} , \tag{10}$$

where:

P_{bi} = the number of possible plots at site *i* in beach stratum ,*b*

$\hat{\bar{N}}_{bi}$ = mean estimated abundance of plots in site *i,* beach stratum *b,*

$$\hat{\bar{N}}_{bi} = \frac{\sum_{j=1}^{p_{bi}} \hat{N}_{bij}}{p_{bi}} , \tag{11}$$

where:

$\hat{N}_{bij}$ = the estimated abundance in plot *j*, site *i,* beach stratum *b,*

p_{bi} = the number of plots sampled at site *i* in beach stratum *b*

with the variance of clam abundance estimated as:

$$Var\left[\hat{N}_b\right] = \left(1 - f_{1b}\right)S_b^2 \frac{s_{1b}^2}{s_b} + f_{1b}^{-1}P_{bi}^2 \sum_{i=1}^{s_b}\left[\left(1 - f_{2bi}\right)\frac{s_{2bi}^2}{p_{bi}}\right], \tag{12}$$

where:

$s_{1b}^2 = \dfrac{\sum_{i=1}^{s_b}\left(\hat{N}_{bi} - \bar{\hat{N}}_b\right)^2}{s_b - 1}$ the variance among sites,

$s_{2bi}^2 = \dfrac{\sum_{j=1}^{p_{bi}}\left(\hat{N}_{bij} - \hat{N}_{bi(j-1)}\right)^2}{p_{bi} - 1}$ the variance among plots within a site,

$f_{1b} = \dfrac{s_b}{S_b}$ the number of sites sampled on a transect relative to the total possible sites, and

$f_{2bi} = \dfrac{p_{bi}}{P_{bi}}$ the number of plots sampled in a site relative to the total possible plots.

The abundance of clams on the entire beach was the sum of the number of clams in each stratum:

$$\hat{N} = \sum_{b=1}^{B}\hat{N}_b\,. \tag{13}$$

The variance of clam abundance on the entire beach was estimated as:

$$V\left(\hat{N}\right) = \sum_{b=1}^{B}V\left(\hat{N}_b\right). \tag{14}$$

For each area where abundance was estimated annual exploitation rate was calculated as:

$$Exp\ Rate = \frac{\hat{H}}{\hat{N}_{\exp}}, \text{ and} \tag{15}$$

$$V\left[Exp\ Rate\right] = V\left[\hat{H} * \frac{1}{\hat{N}_{\exp}}\right] =$$

$$V\left[\hat{H}\left(\frac{1}{\hat{N}_{\exp}}\right)^2 + \left[\frac{1}{\hat{N}_{\exp}^{\,4}}V\left[\hat{N}_{\exp}\right]\right]\hat{H}^2 - V\left[\hat{H}\left[\frac{1}{\hat{N}_{\exp}^{\,4}}V\left[\hat{N}_{\exp}\right]\right]\right] \tag{16}$$

Clam abundance at the seven northern sections of the 6.1 km (3.8 mi) Clam Gulch study area was used to estimate exploitation of all clams in each beach section because these sections encompass a portion of the beach where harvest was estimated from aerial surveys (Clam Gulch tower to Clam Gulch A-frame; Figure 1).

RESULTS

DIGGER EFFORT AND HARVEST BY BEACH

The highest combined digger count for all beaches in a single aerial survey during 2004-2008 was 2,419 on July 22, 2005, and coincided with a –5.0 ft tide (Table 3). A count of 1,367 diggers at Ninilchik on July 3, 2008, was the highest digger count on an individual beach.

The proportion of the annual harvest north of Ninilchik declined during 2004-2008, and the proportion of the harvest from Ninilchik and areas south increased (Table 4). The proportion of the annual harvest from Ninilchik increased each year until 2007, peaking at 68.1% of the annual total, and the harvest from Clam Gulch declined each year until 2007 to 12%. An increasing proportion of the harvest came from Happy Valley, peaking at 10.6% in 2008. Approximately 12% fewer clams came from Oil Pad Access in 2008 than in 2004.

The proportion of the total harvest taken at Ninilchik increased by nearly 24% between 2004 and 2007, and the estimated annual harvest from Ninilchik increased by approximately 10,000 clams (Table 5). The increase in harvest between 2004 and 2007 from Happy Valley and Whiskey Gulch was similar in magnitude to the increase in harvest from Ninilchik. Harvests from the beaches north of Ninilchik (Cohoe, Clam Gulch, and Oil Pad Access) decreased from 2004 to 2007. The largest declines occurred at Clam Gulch and Oil Pad Access. The substantial increase in the proportion of the harvest from Ninilchik was offset by a decrease in the overall harvest, resulting in the maintenance of fairly stable harvests from Ninilchik between 2004 and 2007. The decrease in the overall harvest is largely the result of fewer clams being taken from Clam Gulch and Oil Pad Access. The annual estimated percent of the harvest and harvest from each beach subsection with standard errors is reported in Table 6.

AGE AND LENGTH COMPOSITION OF THE HARVEST

The ages of razor clams in hand-dug samples from eastside Cook Inlet beaches during 2004-2008 range from 1 to 13 years (Table 7). Spawning success of eastside Cook Inlet razor clams is variable; a strong year class typically enters the harvestable-sized population every 3 to 6 years. There was a strong 2001 year class evident at all study beaches that persisted in annual age and length samples at Clam Gulch and Ninilchik through 2008 and Cohoe and Oil Pad/Set Net Access through 2007 (Table 7 and Appendix A).

Age-4 clams were relatively abundant in samples from Oil Pad/Set Net Access and Ninilchik in 2008, whereas age-3 clams were abundant in Cohoe and Clam Gulch samples. This may be from temporal and spatial variation in the recruitment of new clams or from age error (i.e., clams mistakenly aged as 1 year younger or older). Future sampling should indicate whether there were two relatively strong year classes observed in 2008 or if substantial aging error occurred.

Between 2004 and 2005, the public reported a large die-off of older, larger-sized clams at Clam Gulch. This was evident in age and length samples at Cohoe, Clam Gulch, Oil Pad Access, and Set Net Access beaches in 2005-2008 (Tables 7 and 8). Few clams older than age 7 were sampled on these more northerly beaches. Clams in samples from Cohoe south to Set Net

Access grew more slowly between 2005 and 2007 than in 2004 as evident by smaller length-at-last annulus (Table 8) and visual observation of growth on shells. Figure 9 illustrates the smaller size at age of clams dug in 2005-2007 compared to 2004.

RAZOR CLAM ABUNDANCE

Razor clam density was estimated for the heavily dug sections of Ninilchik in 2005 and Clam Gulch in 2008 (Figure 5). The abundance of exploitable-sized clams (≥80 mm) at Ninilchik in 2005 was 1,376,166 (SE = 347,580) (Table 9). The estimate of total clam abundance at Ninilchik in 2005 was 2,504,067 (SE = 481,426). The harvest rate of exploitable-sized clams from Ninilchik in 2005 was 16% and the harvest rate of all clams was 9%.

The abundance of exploitable-sized clams (≥80 mm) at Clam Gulch in 2008 was 1,391,378 (SE = 192,506) and the estimate of total clam abundance was 3,608,278 (SE = 347,627) (Table 10). The 2008 harvest of razor clams from eastside Cook Inlet beaches is not yet available, but is likely similar in magnitude to the 2007 harvest of approximately 350,000 clams. The Clam Gulch harvest in 2008 is likely similar to 2007 because the same proportion (i.e., 6% from Tower to Bluff and Bluff to A-frame) of the total harvest was taken in both 2007 and 2008 (Table 6). The 2008 estimated harvest rate of exploitable-sized clams from the Clam Gulch study area using the 2007 harvest of 40,077 clams from Tower to Bluff and Bluff to A-frame (Table 6) was 3% and the estimated harvest rate of all clams was 1%.

DISCUSSION

The razor clam fishery along the 81 km of eastern Cook Inlet is sustainable and self-regulating. Diggers continued to shift to areas where clams were larger and more abundant and away from areas where clams were fewer and smaller. In 1986-1995, diggers moved from Clam Gulch to Ninilchik to harvest larger clams and then back to Clam Gulch during 1996-2004 (Athons 1992; Athons and Hasbrouck 1994, Szarzi et al. *In prep*). The shift back to Clam Gulch in 1996 occurred when large cohorts of young clams first appeared at Ninilchik Beach. In 2004-2008, the trend reversed again as more diggers moved away from Clam Gulch and back to Ninilchik and, for the first time, moved south of Ninilchik to Whiskey Gulch and Happy Valley. This occurred as older, larger clams died-off at Clam Gulch between 2004 and 2005, and because of slower clam growth and consequently smaller clams between 2005 and 2007.

Digger effort in 2005-2007 declined, but remained within the range of annual participation recorded since the fishery first became popular in 1973 (Figure 2). Harvest also declined, likely the result of low digger success on beaches north of Ninilchik and lower success rates south of Ninilchik where razor clams are more patchily distributed and harder to find. Despite the lack of clams north of Ninilchik and the shift of diggers south, harvest at Ninilchik did not increase substantially during 2004-2007 (Tables 1 and 5). The harvest rate for exploitable-sized clams at Ninilchik in 2005 of 16% was among the lowest estimated (Table 9). Assuming the 2008 harvest was similar to 2007, the harvest rate of clams at Clam Gulch in 2008 was probably less than, or in the range of, rates previously estimated (Table 10).

A frequent response from diggers to the lack of clams or lack of large clams north of Ninilchik was a concern that the resource was overharvested and restrictions were needed. Although this response is understandable, examination of the fishery reveals that restrictions are unnecessary for conservation and would likely have little or no effect.

The exploitation rate of razor clams in most of their 81 km of habitat on eastside Cook Inlet beaches is likely low. This is based upon clam production and harvest rates estimated for the most heavily harvested beaches (Ninilchik and Clam Gulch) and compared to harvests for the other beaches. The time series of abundance estimates from Ninilchik, where harvest has been focused since the mid 1980s, is limited but there is no overall trend to indicate that exploitation rates are negatively affecting recruitment or exploitable abundance in the immediate vicinity.

Clam age compositions generally had a broad range of ages present along all eastside Cook Inlet beaches, except north of Ninilchik, when a die-off of older clams occurred in 2005-2008. New year classes continue to recruit regularly onto all eastside Cook Inlet beaches. The average size of clams in department samples is variable, but generally decreases as strong new year classes recruit into the population as happened in 1997-1999 and 2005 (Figure 10). Although the lack of large older clams and slow growth in clams from beaches north of Ninilchik was substantial, growth rates in 2008 were typical or above average including the growth of new age classes recruiting into the population in 2008.

In some years, strong year classes recruited to all of the study beaches. The synchrony of reproductive success suggests that the eastside Cook Inlet beach razor clam population is influenced by factors on a large scale. The apparent asynchronous spawning success among beaches in some years may be the result of local factors favoring survival in combination with sampling protocol that limits the area that clams are dug to estimate age composition. Little is known about nearshore water circulation patterns that influence transport or settlement patterns of larval razor clams along eastside Cook Inlet beaches. It is likely that the affect of any localized depletion of a beach on future recruitment to that beach, or the surrounding population, may be mitigated by large scale dispersal of larvae along the entire eastside Cook Inlet shoreline.

The razor clam population on eastside Cook Inlet beaches appears resilient to the perturbation that affected growth and abundance in the northern beaches from 2005 through 2007. The substantial increase in diggers on beaches south of Ninilchik highlights the need for monitoring age and length and abundance on additional southern beaches. Ninilchik continues to support a substantial proportion of the razor clam fishery. The lack of clams older than age 7 in age and length samples since 1990 may be a function of harvest pressure or an artifact of smaller sample sizes of clams collected for age determination prior to 1992. Continued monitoring of abundance on Ninilchik is essential to anticipating and responding to future fishery trends.

A graduate study designed to increase our understanding of environmental factors on razor clam recruitment and abundance, and razor clam early life history will begin in spring 2009. One anticipated outcome of this study will be to better recognize the first annulus in clams thereby resolving an important source of aging error and increasing our ability to predict future abundance.

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TABLES

Table 1.-Estimated harvest by beach from eastside Cook Inlet, 1977-2003.

Year	Beach Area						Total Harvest	Participation (Digger-Days)
	Cohoe	Clam Gulch	Oil Pad	Ninilchik	Happy Valley	Whiskey Gulch		
1977	19,072	614,943	97,684	99,545	26,979	13,025	871,247	25,393
1978	15,977	670,079	92,959	61,973	38,733	16,946	896,667	29,750
1979	24,023	745,767	71,025	72,070	45,958	7,834	966,677	30,323
1980	15,206	520,484	63,431	90,368	64,300	17,813	771,603	31,494
1981	13,864	504,833	106,130	91,788	84,617	28,206	829,436	31,298
1982	11,519	477,753	105,494	132,170	177,035	60,022	963,994	31,954
1983	16,854	474,312	125,199	154,091	146,868	61,396	978,720	31,470
1984	9,575	477,568	203,475	210,657	104,730	38,301	1,044,307	29,880
1985	9,312	374,943	187,472	332,731	135,327	28,555	1,068,340	31,195
1986	11,261	284,825	241,108	398,755	149,699	39,081	1,124,728	32,507
1987	1,664	211,890	128,687	508,092	92,632	36,055	979,020	25,427
1988	8,807	306,207	56,906	624,607	131,425	43,357	1,171,308	30,905
1989	1,809	239,697	100,401	419,696	47,487	23,065	832,155	22,658
1990	3,081	289,581	140,579	441,589	56,992	19,154	950,974	29,427
1991	6,792	326,429	158,135	586,115	72,433	16,883	1,166,787	31,899
1992	3,887	249,724	120,247	716,193	58,193	9,520	1,157,765	44,527
1993	2,497	198,993	111,823	585,751	40,877	6,508	946,450	39,927
1994	3,611	250,634	126,788	825,302	50,292	12,505	1,269,131	47,112
1995	1,602	227,924	120,438	752,350	37,051	8,508	1,147,872	41,837
1996	4,453	189,186	110,776	467,529	31,863	9,138	812,946	29,885
1997	4,658	219,530	113,210	465,680	17,932	8,831	829,841	28,343
1998	6,344	182,101	106,749	325,811	15,341	7,266	643,612	26,636
1999	9,177	203,127	100,368	401,960	29,827	6,425	750,883	36,292
2000	18,475	262,153	107,460	402,427	41,542	10,214	842,270	37,755
2001	11,364	231,888	105,152	246,299	22,716	8,308	625,727	31,915
2002	14,861	212,126	132,620	358,290	25,402	14,763	758,062	33,966
2003	7,525	192,567	104,277	226,434	24,736	10,104	565,643	25,120
Mean	9,529	338,491	119,948	370,306	65,592	20,807	924,673	32,181

Note: Harvest and digger days of participation determined by Statewide Harvest Survey (Mills 1979, 1980, 1981a, b, 1982-1994; Howe et al. 1995, 1996, 2001a-d; Walker 2003; Jennings et al. 2004, 2006a, b) . Harvest by beach is apportioned from aerial surveys and assumes a success rate of 0.5 on the Cohoe, Happy Valley, and Whiskey Gulch beach areas.

Table 2.-Percentage of razor clam harvest by beach area from eastside Cook Inlet adjusted by relative harvest success rate, 1977-2003.

Year	No. of surveys	Beach Area					
		Cohoe	Clam Gulch	Oil Pad	Ninilchik	Happy Valley	Whiskey Gulch
1977	3	2.2	70.6	11.2	11.4	3.1	1.5
1978	9	1.8	74.7	10.4	6.9	4.3	1.9
1979	8	2.5	77.1	7.3	7.5	4.8	0.8
1980	8	2.0	67.5	8.2	11.7	8.3	2.3
1981	9	1.7	60.9	12.8	11.1	10.2	3.4
1982	6	1.2	49.6	10.9	13.7	18.4	6.2
1983	6	1.7	48.5	12.8	15.7	15.0	6.3
1984	6	0.9	45.7	19.5	20.2	10.0	3.7
1985	5	0.9	35.1	17.5	31.1	12.7	2.7
1986	4	1.0	25.3	21.4	35.5	13.3	3.5
1987	3	0.2	21.6	13.1	51.9	9.5	3.7
1988	3	0.8	26.1	4.9	53.3	11.2	3.7
1989	11	0.2	28.8	12.1	50.4	5.7	2.8
1990	12	0.3	30.5	14.8	46.4	6.0	2.0
1991	10	0.6	28.0	13.6	50.2	6.2	1.5
1992	13	0.3	21.6	10.4	61.9	5.0	0.8
1993	13	0.3	21.0	11.8	61.9	4.3	0.7
1994	13	0.3	19.8	10.0	65.0	4.0	1.0
1995	13	0.1	19.9	10.5	65.5	3.2	0.7
1996	13	0.6	23.3	13.6	57.5	3.9	1.1
1997	12	0.6	26.5	13.6	56.1	2.2	1.1
1998	12	1.0	28.3	16.6	50.6	2.4	1.1
1999	14	1.2	27.1	13.4	53.5	4.0	0.9
2000	13	2.2	31.1	12.8	47.8	4.9	1.2
2001	13	1.8	37.1	16.8	39.4	3.6	1.3
2002	14	2.0	28.0	17.5	47.3	3.4	2.0
2003	13	1.3	34.2	18.8	39.6	4.3	1.7
Average	10	1.1	37.3	13.2	39.4	6.8	2.2

Note: Harvest percentage weighted by tidal height beginning in 1990.

Table 3.-Razor clam digger counts on eastside Cook Inlet beaches, 2004-2008.

2004	Date:	5/6	5/8	5/18	5/21	6/4	6/16	6/20	7/3	7/17	7/29	7/30	8/2
	Tide:	-5.0	-3.4	-1.8	-1.4	-5.5	-1.0	-1.1	-5.3	-5.3	-1.7	-3.1	-4.4
Whiskey Gulch													
Anchor River to Happy Creek		32	33	2	2	70	0	10	120	19	0	17	65
Happy Valley													
Happy Creek to Deep Creek		132	58	3	6	210	7	10	290	11	26	35	18
Ninilchik													
Deep Creek to Set Net Access		483	354	21	10	653	38	20	1,022	113	108	330	423
A. Ninilchik Bar		52	2	0	0	40	0	0	30	0	0	1	5
B. Deep Creek to Lehmans		420	328	21	10	605	38	20	990	113	108	322	415
C. Lehmans to Access		11	24	0	0	8	0	0	2	0	0	7	3
Oil Pad Access													
Set Net Access to Clam Gulch Tower		202	460	20	16	262	13	35	40	67	19	83	55
Clam Gulch													
Tower to S. extension of Cohoe Lp. Rd.		235	480	20	24	416	14	100	550	173	75	104	186
A. Tower to Bluff		140	310	16	14	200	12	65	330	91	29	56	50
B. Bluff to A frame		65	140	4	10	185	2	30	170	73	46	45	120
C. A frame to S. Ext.		30	30	0	0	31	0	5	50	9	0	3	16
Cohoe													
S. extension of Cohoe Lp. Rd to Kasilof R.		26	25	0	0	31	0	5	60	1	0	13	32
Total Diggers		**1,110**	**1,410**	**66**	**58**	**1,642**	**72**	**180**	**2,082**	**384**	**228**	**582**	**779**

-continued-

Table 3.-Page 2 of 5.

2005	Date:	4/26	4/27	5/23	5/25	5/28	6/20	6/21	6/23	7/19	7/20	7/22	8/19	8/21
	Tide:	-3.2	-2.9	-3.1	-4.3	-1.9	-1.8	-3.3	-4.0	-1.4	-3.1	-5.0	-4.0	-4.1
Whiskey Gulch														
Anchor River to Happy Creek		10	2	21	42	46	7	33	101	0	20	171	39	27
Happy Valley														
Happy Creek to Deep Creek		22	11	27	79	72	10	55	160	9	25	357	81	100
Ninilchik														
Deep Creek to Set Net Access		97	55	158	341	298	73	229	657	83	237	971	350	569
A. Ninilchik Bar		1	0	0	2	0	0	1	32	0	9	66	2	9
B. Deep Creek to Lehmans		95	55	158	323	298	71	227	620	83	228	900	348	560
C. Lehmans to Access		1	0	0	16	0	2	1	5	0	0	5	0	0
Oil Pad Access														
Set Net Access to Clam Gulch Tower		28	3	35	90	51	5	39	128	12	43	336	33	21
Clam Gulch														
Tower to S. extension of Cohoe Lp. Rd.		43	21	75	185	232	42	96	282	8	177	580	108	98
A. Tower to Bluff		29	13	49	96	94	25	54	77	4	115	345	55	71
B. Bluff to A frame		12	8	16	71	125	17	37	170	4	57	205	41	19
C. A frame to S. Ext.		2	0	10	18	13	0	5	35	0	5	30	12	8
Cohoe														
S. extension of Cohoe Lp. Rd to Kasilof R.		2	1	0	6	36	2	8	20	0	1	4	1	7
Total Diggers		**202**	**93**	**316**	**743**	**735**	**139**	**460**	**1,348**	**112**	**503**	**2,419**	**612**	**822**

-continued-

Table 3.-Page 3 of 5.

2006	Date:	4/27	5/14	5/26	5/28	5/30	6/13	6/22	6/25	6/28	7/12	7/25	8/9	8/13	9/8
	Tide:	-4.2	-2.5	-3.9	-3.9	-1.9	-3.4	-1	-3	-1.8	-4.1	-2	-3.6	-1.2	-3.3
Whiskey Gulch															
Anchor River to Happy Creek		19	11	61	232	9	63	0	69	14	97	22	21	0	30
Happy Valley															
Happy Creek to Deep Creek		54	13	82	124	7	87	7	93	35	218	61	53	15	37
Ninilchik															
Deep Creek to Set Net Access		141	74	538	927	29	358	35	512	104	793	309	248	87	46
A. Ninilchik Bar		4	0	4	1	0	0	0	5	0	16	0	0	0	0
B. Deep Creek to Lehmans		134	74	530	915	29	352	35	495	104	760	302	244	87	46
C. Lehmans to Access		3	0	4	11	0	6	0	12	0	17	7	4	0	0
Oil Pad Access															
Set Net Access to Clam Gulch Tower		58	6	55	121	0	37	0	56	0	106	40	1	20	1
Clam Gulch															
Tower to S. extension of Cohoe Lp. Rd.		19	75	93	440	4	76	3	134	31	172	65	47	26	6
A. Tower to Bluff		6	36	27	160	0	30	0	58	27	74	34	14	3	2
B. Bluff to A frame		11	32	60	255	4	46	0	72	4	78	29	28	23	4
C. A frame to S. Ext.		2	7	6	25	0	0	3	4	0	20	2	5	0	0
Cohoe															
S. extension of Cohoe Lp. Rd to Kasilof R.		1	8	8	7	0	0	0	16	3	0	0	0	0	0
Total Diggers		**292**	**187**	**837**	**1,851**	**49**	**621**	**45**	**880**	**187**	**1,386**	**497**	**370**	**148**	**120**

-continued-

Table 3.-Page 4 of 5.

2007	Date:	4/19	5/2	5/16	5/17	5/19	6/2	6/13	6/14	6/16	6/18	7/3	7/14	7/16	7/18
	Tide:	-5.3	-1.3	-4.9	-5.4	-4.2	-1.8	-3.3	-4.3	-4.5	-2.7	-2.4	-3.6	-3.2	-1
Whiskey Gulch															
Anchor River to Happy Creek		76	0	56	115	234	18	35	162	230	19	14	108	86	6
Happy Valley															
Happy Creek to Deep Creek		73	3	90	182	278	25	71	123	397	21	62	326	109	28
Ninilchik															
Deep Creek to Set Net Access		225	13	360	528	617	149	80	707	1,377	131	268	835	560	70
A. Ninilchik Bar		5	0	7	12	12	0	0	7	85	0	0	13	21	0
B. Deep Creek to Lehmans		212	13	353	560	590	141	78	700	1,292	131	268	795	537	70
C. Lehmans to Access		8	0	0	6	15	8	2	0	0	0	0	27	2	0
Oil Pad Access															
Set Net Access to Clam Gulch Tower		44	0	25	34	81	0	3	16	45	0	0	79	36	0
Clam Gulch															
Tower to S. extension of Cohoe Lp. Rd.		27	8	33	85	211	38	43	46	197	19	59	76	130	30
A. Tower to Bluff		6	1	15	53	86	19	31	30	97	11	32	44	52	0
B. Bluff to A frame		21	7	15	26	91	19	10	14	83	8	27	24	69	30
C. A frame to S. Ext.		0	0	3	0	34	0	2	2	17	0	0	8	9	0
Cohoe															
S. extension of Cohoe Lp. Rd to Kasilof R.		0	0	4	9	28	4	0	0	17	8	0	4	0	0
Total Diggers		**445**	**24**	**568**	**953**	**1,449**	**234**	**232**	**1,054**	**2,263**	**198**	**403**	**1,428**	**921**	**134**

-continued-

Table 3.-Page 5 of 5.

2008	Date:	4/7	4/20	5/4	5/5	5/9	6/2	6/5	6/7	6/19	6/21	7/3	7/6	7/19	8/2	8/17
	Tide:	-4.3	-1.7	-3.1	-4.6	-3.0	-3.5	-5.4	-3.5	-1.4	-1.3	-5.0	-3.4	-1.7	-4.4	-1.5
Whiskey Gulch																
Anchor River to Happy Creek		36	5	46	77	14	43	130	50	10	11	98	65	23	109	9
Happy Valley																
Happy Creek to Deep Creek		59	26	77	84	6	85	248	125	42	37	345	153	104	309	32
Ninilchik																
Deep Creek to Set Net Access		92	60	243	216	72	224	607	448	92	146	1,367	641	347	933	111
A. Ninilchik Bar		4	1	3	5	0	0	23	7	0	0	6	0	0	12	0
B. Deep Creek to Lehmans		88	59	240	211	72	224	580	440	92	146	1,355	635	330	895	111
C. Lehmans to Access		0	0	0	0	0	0	4	1	0	0	6	6	17	26	0
Oil Pad Access																
Set Net Access to Clam Gulch Tower		4	0	36	43	15	12	36	40	4	4	59	17	22	62	6
Clam Gulch																
Tower to S. extension of Cohoe Lp. Rd.		25	1	48	26	17	25	59	142	28	69	90	144	100	158	18
A. Tower to Bluff		9	0	24	22	15	21	42	61	6	10	44	70	10	38	3
B. Bluff to A frame		16	1	17	4	0	4	14	59	19	59	34	71	90	101	15
C. A frame to S. Ext.		0	0	7	0	2	0	3	22	3	0	12	3	0	19	0
Cohoe																
S. extension of Cohoe Lp. Rd to Kasilof R.		2	0	10	0	0	0	12	5	0	0	0	5	0	31	0
Total Diggers		**218**	**92**	**460**	**446**	**124**	**389**	**1,092**	**810**	**176**	**267**	**1,959**	**1,025**	**596**	**1,602**	**176**

Table 4.-Percentage of razor clam harvest by beach area from eastside Cook Inlet adjusted by relative harvest success rate, 2004-2008.

Year	No. of surveys	Beach Area					
		Cohoe	Clam Gulch	Oil Pad	Ninilchik	Happy Valley	Whiskey Gulch
2004	12	1.2	30.5	16.2	44.8	5.1	2.3
2005	13	0.9	26.4	10.0	53.2	6.3	3.3
2006	14	0.3	18.1	7.4	62.9	6.7	4.6
2007	14	0.5	12.2	3.5	68.1	9.8	6.0
2008	15	0.3	12.7	4.2	68.0	10.6	4.2
Average	14	0.6	20.0	8.3	59.4	7.7	4.1

Table 5.-Estimated harvests by beach area and participation in the eastside Cook Inlet razor clam fishery, 2004-2007.

Year	Beach Area						Total Harvest	Participation (Digger-Days)
	Cohoe	Clam Gulch	Oil Pad	Ninilchik	Happy Valley	Whiskey Gulch		
2004	6,046	154,646	82,032	227,467	25,768	11,664	507,624	29,258
2005	3,653	112,806	42,749	227,089	26,808	13,911	427,016	32,835
2006	1,502	79,528	32,893	276,299	28,354	19,905	438,482	24,474
2007	1,599	42,585	12,141	237,670	34,086	21,099	349,180	25,098
2008	not available							
Mean	3,200	97,391	42,454	242,131	28,754	16,645	430,576	27,916

Note: Harvest and digger days of participation determined by Statewide Harvest Survey (Jennings et al. 2007, *In prep* a-c). Harvest by beach is apportioned from aerial surveys and assumes a success rate of 0.5 on the Cohoe, Happy Valley and Whiskey Gulch beach areas.

Table 6.-Relative percentage of the harvest and estimated harvest of razor clams on eastside Cook Inlet beaches, 2004-2008.

Beach Area	Relative Percent (P_b)	SE (P_b)	Relative Success	Harvest (H)	SE (H)
2004					
Whiskey Gulch	0.02	0.001	0.5	11,664	834
Happy Valley	0.05	0.003	0.5	25,768	2,028
Ninilchik Bar	0.02	0.002	1	8,033	1,231
Deep Creek to Lehman's	0.43	0.014	1	216,037	13,971
Lehman's to Set Net Access	0.01	0.001	1	3,398	392
Oil Pad Access	0.16	0.162	1	82,032	7,691
Tower to Bluff	0.17	0.169	1	85,666	6,025
Bluff to A-Frame	0.11	0.114	1	58,062	3,806
A-Frame to S. Extension of Cohoe Loop	0.02	0.022	1	10,918	723
Cohoe	0.01	0.012	0.5	6,046	424
TOTAL	1.00			507,624	28,061
2005					
Whiskey Gulch	0.03	0.002	0.5	13,911	1,219
Happy Valley	0.06	0.003	0.5	26,808	1,989
Ninilchik Bar	0.01	0.001	1	5,413	490
Deep Creek to Lehman's	0.52	0.015	1	220,171	15,042
Lehman's to Set Net Access	0.00	0.000	1	1,505	228
Oil Pad Access	0.10	0.005	1	42,749	3,299
Tower to Bluff	0.13	0.005	1	57,424	4,076
Bluff to A-Frame	0.11	0.008	1	48,125	4,465
A-Frame to S. Extension of Cohoe Loop	0.02	0.002	1	7,256	830
Cohoe	0.01	0.002	0.5	3,653	754
TOTAL	1.00			427,016	26,315
2006					
Whiskey Gulch	0.05	0.002	0.5	19,905	1,639
Happy Valley	0.07	0.002	0.5	28,354	2,305
Ninilchik Bar	0.00	0.000	1	1,843	260
Deep Creek to Lehman's	0.62	0.009	1	270,293	19,721
Lehman's to Set Net Access	0.01	0.001	1	4,162	369
Oil Pad Access	0.07	0.004	1	32,893	3,143
Tower to Bluff	0.07	0.005	1	32,112	3,082
Bluff to A-Frame	0.10	0.004	1	42,474	3,675
A-Frame to S. Extension of Cohoe Loop	0.01	0.001	1	4,942	565
Cohoe	0.00	0.001	0.5	1,502	284
TOTAL	1.00			438,482	31,223

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Table 6.-Page 2 of 2.

Beach Area	Relative Percent (P_b)	SE (P_b)	Relative Success	Harvest (H)	SE (H)
2007					
Whiskey Gulch	0.06	0.002	0.5	21,099	1,660
Happy Valley	0.10	0.003	0.5	34,086	2,648
Ninilchik Bar	0.02	0.001	1	5,418	623
Deep Creek to Lehman's	0.66	0.008	1	229,495	16,815
Lehman's to Set Net Access	0.01	0.001	1	2,756	426
Oil Pad Access	0.03	0.001	1	12,141	981
Tower to Bluff	0.06	0.003	1	19,747	1,729
Bluff to A-Frame	0.06	0.005	1	20,329	2,244
A-Frame to S. Extension of Cohoe Loop	0.01	0.001	1	2,509	289
Cohoe	0.00	0.001	0.5	1,599	301
TOTAL	1.00			349,180	25,271
2008					
Whiskey Gulch	0.04	0.001	0.5	Not available	
Happy Valley	0.11	0.002	0.5	Not available	
Ninilchik Bar	0.01	0.001	1	Not available	
Deep Creek to Lehman's	0.67	0.006	1	Not available	
Lehman's to Set Net Access	0.01	0.001	1	Not available	
Oil Pad Access	0.04	0.002	1	Not available	
Tower to Bluff	0.04	0.003	1	Not available	
Bluff to A-Frame	0.08	0.005	1	Not available	
A-Frame to S. Extension of Cohoe Loop	0.01	0.001	1	Not available	
Cohoe	0.00	0.000	0.5	Not available	
TOTAL	1.00				

Table 7.-Percentage of razor clams by age class sampled 2004-2008.

Ninilchik	Age Class													Number
	1	2	3	4	5	6	7	8	9	10	11	12	13	Sampled
2004		1.0	**54.5**	15.7	8.4	8.7	7.4	2.3	1.3	0.3	0.3		0.3	299
2005	1.0	23.1	7.7	**49.8**	7.4	2.0	4.3	1.7	1.0	0.7	0.7	0.7		299
2006		1.3	23.3	8.5	**53.1**	7.5	3.0	2.6	0.3	0.3				305
2007		20.9	17.4	38.0	8.1	**14.2**	1.4							345
2008		8.1	42.7	19.3	18.7	1.9	**9.0**		0.3					321

Set Net and Oil Pad accesses combined	Age Class													Number
	1	2	3	4	5	6	7	8	9	10	11	12	13	Sampled
2004			**43.9**	14.5	10.2	7.9	9.6	8.6	5.3					303
2005		5.2	10.0	**70.6**	11.8	1.4	1.0							289
2006		8.4	44.0	6.4	**37.2**	3.4	0.7							298
2007		20.7	21.7	37.9	8.4	**10.4**	1.0							309
2008		8.6	40.6	22.4	24.1	1.0	**3.0**	0.3						303

Clam Gulch	Age Class													Number
	1	2	3	4	5	6	7	8	9	10	11	12	13	Sampled
2004			**1.3**	8.9	16.5	20.1	13.2	27.1	10.2	2.0	0.7			303
2005		5.7	7.7	**47.5**	20.1	4.0	6.4	3.3	5.4					299
2006		0.7	10.3	4.3	**60.9**	15.3	7.1	0.4	0.4	0.4	0.4			281
2007		1.0	14.5	21.0	4.8	**54.5**	2.3	1.6	0.3					310
2008		2.6	11.5	35.8	19.5	1.3	**25.9**	2.9	0.3	0.3				313

Cohoe	Age Class													Number
	1	2	3	4	5	6	7	8	9	10	11	12	13	Sampled
2004			**3.3**	35.5	30.9	9.9	11.2	7.2	2.0					152
2005			2.0	**80.0**	14.0	2.7	1.3							150
2006		0.6	25.9	10.1	**48.7**	14.6								158
2007			33.8	37.6	8.3	**18.5**	1.9							157
2008		2.5	20.6	56.9	16.9	0.6	**2.5**							160

Note: Bold numbers indicate 2001, a strong year class evident at all study beaches.

Table 8.-Average length at last annuli formation of clams by age class from eastside Cook Inlet beaches, 2004-2008.

	Cohoe	Age Class												
		1	2	3	4	5	6	7	8	9	10	11	12	13
2004	Number measured			5	54	47	15	17	11	3				
	Average length			**62.36**	**79.67**	**97.60**	**103.49**	**109.70**	**114.15**	**114.19**				
	SE (length)			1.96	5.31	5.62	3.82	5.63	6.69	6.67				
2005	Number measured			3	120	21	4	2						
	Average length			**49.75**	**69.06**	**85.12**	**97.37**	**109.00**						
	SE (length)			5.39	8.75	7.04	3.47	5.71						
2006	Number measured		1	41	16	77	23							
	Average length		**23.13**	**45.71**	**63.03**	**75.03**	**86.66**							
	SE (length)			3.32	3.03	6.08	5.96							
2007	Number measured			53	59	13	29	3						
	Average length			**49.42**	**65.81**	**76.48**	**80.81**	**88.08**						
	SE (length)			4.09	4.47	4.92	6.17	6.91						
2008	Number measured		4	33	91	27	1	4						
	Average length		**29.70**	**50.04**	**65.98**	**76.17**	**89.06**	**88.60**						
	SE (length)		2.58	4.99	5.93	4.41		3.68						

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Table 8.-Page 2 of 9.

Clam Gulch		Age Class												
		1	2	3	4	5	6	7	8	9	10	11	12	13
2004	Number measured			4	25	51	62	40	82	31	6	2		
	Average length			**49.87**	**77.62**	**95.76**	**103.83**	**107.12**	**113.09**	**115.86**	**118.30**	**121.02**		
	SE (length)			7.07	6.67	7.63	7.58	7.14	5.68	6.34	7.40	13.70		
2005	Number measured		17	23	142	60	12	19	10	15				
	Average length		**23.80**	**45.72**	**59.49**	**81.24**	**97.79**	**107.92**	**111.27**	**109.87**				
	SE (length)		3.67	7.38	6.88	8.81	10.56	7.97	7.94	5.27				
2006	Number measured		2	29	12	171	43	20	1	1	1	1		
	Average length		**18.63**	**43.37**	**56.73**	**68.07**	**85.36**	**98.11**	**109.65**	**113.71**	**107.58**	**104.94**		
	SE (length)		2.34	7.40	6.11	7.67	8.36	7.67						
2007	Number measured		3	45	65	15	169	7	5	1				
	Average length		**25.19**	**42.97**	**58.03**	**64.83**	**74.43**	**86.62**	**80.06**	**118.81**				
	SE (length)		7.02	4.91	6.41	6.56	8.08	6.36	6.36					
2008	Number measured		8	36	112	61	4	81	9	1	1			
	Average length		**34.76**	**49.83**	**63.73**	**71.71**	**77.79**	**83.49**	**94.48**	**98.27**	**100.83**			
	SE (length)		3.98	6.43	6.39	5.41	5.91	6.12	5.43					

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Table 8.-Page 3 of 9.

Set Net Access		Age Class												
		1	2	3	4	5	6	7	8	9	10	11	12	13
2004	Number measured			98	33	13	3	2	2	1				
	Average length			**84.87**	**102.71**	**111.94**	**113.90**	**128.79**	**128.16**	**122.88**				
	SE (length)			5.79	8.66	5.48	10.48	6.26	2.74					
2005	Number measured		7	1	119	15	1	1						
	Average length		**43.00**	**74.83**	**92.96**	**111.24**	**123.32**	**128.26**						
	SE (length)		5.34		5.44	5.70								
2006	Number measured		8	53	15	70	2							
	Average length		**47.54**	**72.40**	**86.02**	**99.48**	**109.97**							
	SE (length)		10.05	5.55	6.08	5.22	5.20							
2007	Number measured		58	23	36	17	18	3						
	Average length		**47.81**	**69.79**	**87.29**	**97.50**	**102.53**	**105.92**						
	SE (length)		4.44	5.53	4.78	4.96	6.13	7.64						
2008	Number measured		23	87	30	20	2							
	Average length		**55.04**	**81.95**	**94.35**	**103.70**	**111.74**							
	SE (length)		8.04	5.78	5.40	6.89	1.01							

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Table 8.-Page 4 of 9.

Oil Pad Access		Age Class												
		1	2	3	4	5	6	7	8	9	10	11	12	13
2004	Number measured			35	11	18	21	27	24	15				
	Average length			**65.63**	**92.18**	**101.76**	**111.92**	**116.44**	**119.37**	**122.98**				
	SE (length)			10.18	8.10	6.74	6.11	6.52	7.89	6.09				
2005	Number measured		8	28	85	19	3	2						
	Average length		**33.21**	**58.76**	**79.14**	**98.82**	**109.98**	**118.12**						
	SE (length)		4.51	6.44	6.48	7.45	3.89	0.43						
2006	Number measured		17	78	4	41	8	2						
	Average length		**35.21**	**53.56**	**67.24**	**79.78**	**89.25**	**105.13**						
	SE (length)		5.04	6.01	1.49	7.37	6.76	0.68						
2007	Number measured		6	44	81	9	15							
	Average length		**36.05**	**54.03**	**70.21**	**79.44**	**85.06**							
	SE (length)		3.55	6.10	5.66	2.97	4.78							
2008	Number measured		3	36	38	53	1	9	1					
	Average length		**44.31**	**61.27**	**74.53**	**81.76**	**87.35**	**94.55**	**101.02**					
	SE (length)		4.81	5.31	5.23	5.19		6.62						

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Table 8.-Page 5 of 9.

Set Net and Oil Pad accesses		Age Class												
		1	2	3	4	5	6	7	8	9	10	11	12	13
2004	Number measured			133	44	31	24	29	26	16				
	Average length			**79.8**	**100.1**	**106.0**	**112.2**	**117.3**	**120.0**	**123.0**				
	SE (length)			11.1	9.6	8.0	6.5	7.1	8.0	5.9				
2005	Number measured		15	29	204	34	4	3						
	Average length		**37.78**	**59.31**	**87.20**	**104.30**	**113.32**	**121.50**						
	SE (length)		6.92	6.99	9.01	9.12	7.39	5.87						
2006	Number measured		25	131	19	111	10	2						
	Average length		**39.15**	**61.18**	**82.06**	**92.20**	**93.39**	**105.13**						
	SE (length)		8.99	10.95	9.54	11.31	10.72	0.68						
2007	Number measured		64	67	117	26	32	3						
	Average length		**46.71**	**59.44**	**75.47**	**91.25**	**94.59**	**105.92**						
	SE (length)		5.55	9.55	9.57	9.77	10.39	7.64						
2008	Number measured		26	123	68	73	3	9	1					
	Average length		**53.80**	**75.90**	**83.28**	**87.77**	**103.61**	**94.55**	**101.02**					
	SE (length)		8.42	11.00	11.23	11.36	14.10	6.62						

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Ninilchik Bar		Age Class												
		1	2	3	4	5	6	7	8	9	10	11	12	13
2004	Number measured		64	20	9	4	35	5	2	11	1		1	
	Average length		**84.38**	**100.69**	**116.12**	**124.95**	**129.56**	**132.91**	**130.46**	**138.85**	**140.31**		**159.23**	
	SE (length)		6.57	4.86	7.62	4.14	5.39	4.41	6.32	6.48				
2005	Number measured		48	19	49	6	4	3	1		1			
	Average length		**49.99**	**79.71**	**103.84**	**116.55**	**118.25**	**131.93**	**130.51**		**145.10**			
	SE (length)		8.19	9.08	5.75	5.84	15.13	5.74						
2006	Number measured			87	20	33	3	1	1					
	Average length			**77.93**	**95.36**	**112.95**	**119.92**	**128.79**	**121.90**					
	SE (length)			5.81	6.82	7.48	3.48							
2007	Number measured		22	41	69	13	22	4	1					
	Average length		**48.18**	**73.42**	**101.90**	**112.80**	**122.93**	**127.78**	**139.63**					
	SE (length)		7.51	8.90	5.13	6.43	4.35	3.09						
2008	Number measured		2	60	23	51	7	27	1					
	Average length		**51.66**	**85.89**	**100.08**	**115.09**	**119.35**	**127.98**	**134.58**					
	SE (length)		12.57	6.90	6.98	7.15	3.24	5.00						

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Table 8.-Page 7 of 9.

Ninilchik North		Age Class												
		1	2	3	4	5	6	7	8	9	10	11	12	13
2004	Number measured		2	86	15	7	16	14	6	2	1			1
	Average length		**53.84**	**93.74**	**106.40**	**118.54**	**127.49**	**134.09**	**134.14**	**141.66**	**130.67**			**147.41**
	SE (length)		20.76	5.25	7.21	5.58	4.84	4.02	5.04	3.19				
2005	Number measured		17	11	94	10	4	11	3					
	Average length		**51.67**	**84.47**	**106.91**	**117.27**	**128.12**	**133.08**	**138.62**					
	SE (length)		8.18	6.69	5.64	4.69	10.38	4.42	5.22					
2006	Number measured		3	33	14	87	6	5	1					
	Average length		**50.63**	**80.25**	**86.42**	**109.60**	**120.04**	**128.76**	**132.12**					
	SE (length)		8.40	5.57	18.83	10.67	1.33	7.19						
2007	Number measured		43	37	52	17	34	2						
	Average length		**52.55**	**83.59**	**99.13**	**115.51**	**119.27**	**126.10**						
	SE (length)		4.86	6.31	5.17	5.75	5.32	3.86						
2008	Number measured		2	84	35	23	1	16						
	Average length		**55.36**	**87.40**	**103.87**	**113.32**	**117.25**	**126.36**						
	SE (length)		2.91	5.57	8.26	6.20 .		4.45						

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Table 8.-Page 8 of 9.

	Ninilchik South	Age Class												
		1	2	3	4	5	6	7	8	9	10	11	12	13
2004	Number measured		1	77	32	18	8	8	1	2				
	Average length		**55.84**	**90.81**	**106.35**	**112.48**	**128.30**	**137.28**	**143.70**	**140.61**				
	SE (length)			7.09	9.05	8.90	10.94	7.63		6.46				
2005	Number measured	3	52	12	55	12	2	2	2	3	2	2	2	
	Average length	**7.02**	**53.07**	**86.81**	**107.88**	**119.79**	**130.50**	**133.50**	**144.00**	**140.49**	**138.72**	**144.94**	**148.02**	
	SE (length)	5.09	10.49	14.97	6.81	6.23	9.01	3.56	1.06	5.98	5.00	9.10	24.94	
2006	Number measured		1	38	12	75	17	4	7	1	1			
	Average length		**49.57**	**86.10**	**103.81**	**120.28**	**128.54**	**127.12**	**129.54**	**140.18**	**129.32**			
	SE (length)			6.92	6.50	4.81	4.87	3.83	2.83					
2007	Number measured		29	23	79	11	15	3						
	Average length		**49.97**	**86.02**	**103.38**	**108.14**	**123.72**	**128.94**						
	SE (length)		8.48	7.50	6.88	10.54	8.10	3.53						
2008	Number measured		24	53	27	37	5	13		1				
	Average length		**40.98**	**83.89**	**103.73**	**116.76**	**118.20**	**127.62**		**137.54**				
	SE (length)		8.10	5.71	6.13	5.41	5.36	6.40						

-continued-

Table 8.-Page 9 of 9.

Ninilchik North and South		Age Class												
		1	2	3	4	5	6	7	8	9	10	11	12	13
2004	Number measured		3	163	47	25	26	22	7	4	1			1
	Average length		**54.51**	**92.36**	**106.36**	**114.17**	**127.80**	**135.25**	**135.51**	**141.13**	**130.67**			**147.41**
	SE (length)		14.73	6.34	8.43	8.46	7.57	5.65	5.85	4.20				
2005	Number measured	3	69	23	149	22	6	13	5	3	2	2	2	
	Average length	**7.02**	**52.73**	**85.69**	**107.26**	**118.64**	**128.92**	**133.14**	**140.77**	**140.49**	**138.72**	**144.94**	**148.02**	
	SE (length)	5.09	9.93	11.57	6.09	5.60	9.07	4.16	4.75	5.98	5.00	9.10	24.94	
2006	Number measured		4	71	26	162	23	9	8	1	1			
	Average length		**50.37**	**83.38**	**94.45**	**114.54**	**126.33**	**128.03**	**129.86**	**140.18**	**129.32**			
	SE (length)		6.88	6.94	16.77	10.00	5.68	5.67	2.77					
2007	Number measured		72	60	131	28	49	5						
	Average length		**51.51**	**84.52**	**101.69**	**112.61**	**120.63**	**127.80**						
	SE (length)		6.63	6.84	6.57	8.61	6.55	3.52						
2008	Number measured		26	137	62	60	6	29		1				
	Average length		**42.09**	**86.05**	**103.81**	**115.44**	**118.04**	**126.92**		**137.54**				
	SE (length)		8.72	5.86	7.35	5.92	4.81	5.34						

Table 9.-Estimates of total clam harvest[a] (H), exploitable clams (≥80 mm), total abundance (N), and exploitation rate (Exp) with standard errors of razor clams at Ninilchik Beach from Deep Creek to Lehman's.

Population	Year	H	SE(H)	N	SE(N)	Exp	SE(Exp)
Total	1989[a]	334,389	18,139	1,922,958	291,507	0.174	0.028
	1990	321,354	26,342	2,497,119	415,512	0.129	0.024
	1991	354,583	20,952	2,284,160	363,719	0.155	0.026
	1992	563,709	24,690	3,751,812	997,854	0.150	0.040
	1998	287,423	15,845	1,517,748	128,088	0.189	0.019
	2001	219,972	12,371	1,442,316	148,842	0.153	0.018
	2003	210,385	14,293	4,387,196	648,139	0.048	0.008
	2005	220,171	15,042	2,504,067	481,426	0.088	0.018
Exploitable	1989[a]	334,389	18,139	559,252	113,278	0.598	0.125
	1990	321,354	26,342	741,462	202,179	0.433	0.123
	1991	354,583	20,952	2,128,979	355,182	0.167	0.029
	1992	563,709	24,690	3,645,057	1,002,100	0.155	0.043
	1998	287,423	15,845	964,109	170,445	0.298	0.055
	2001	219,972	12,371	832,451	116,180	0.264	0.040
	2003	210,385	14,293	1,532,484	335,507	0.137	0.031
	2005	220,171	15,042	1,376,166	347,580	0.160	0.042

Note: Abundance and exploitation rate estimates and their standard errors are corrected from previous publications.

[a] Harvest estimated as the product of the proportion of average total beach harvest that occurred in 1990-1999 in the smaller beach area and the average harvest of the entire beach in 1990-1999.

Table 10.-Estimates of total clam harvest (H), exploitable clams (≥80 mm), total abundance (N), and exploitation rate (Exp) with standard errors of razor clams from Tower to A-frame at Clam Gulch Beach.

Beach	Year	H	SE(H)	N	SE(N)	Exp	SE(Exp)
Total	1988[a]	286,375	14,646	7,240,569	999,223	0.040	0.005814
	1989[a]	224,173	11,465	8,093,750	540,227	0.028	0.002327
	1999	185,144	10,286	9,191,769	587,435	0.020	0.001704
	2008[b]	40,077		3,608,278	347,627	0.011	
Exploitable	1988[a]	286,375	14,646	2,463,695	607,132	0.116	0.029218
	1989[a]	224,173	11,465	4,773,362	371,752	0.047	0.004372
	1999	185,144	10,286	4,052,949	217,262	0.046	0.003524
	2008[b]	40,077		1,391,378	192,506	0.029	

Note: Abundance and exploitation rate estimates and their standard errors are corrected from previous publications that contained estimates for a larger beach area.

[a] Harvest estimated as the product of the proportion of average total beach harvest that occurred in 1990-1999 in the smaller beach area and the average harvest of the entire beach in 1990-1999.

[b] Harvest estimated from 2007.

FIGURES

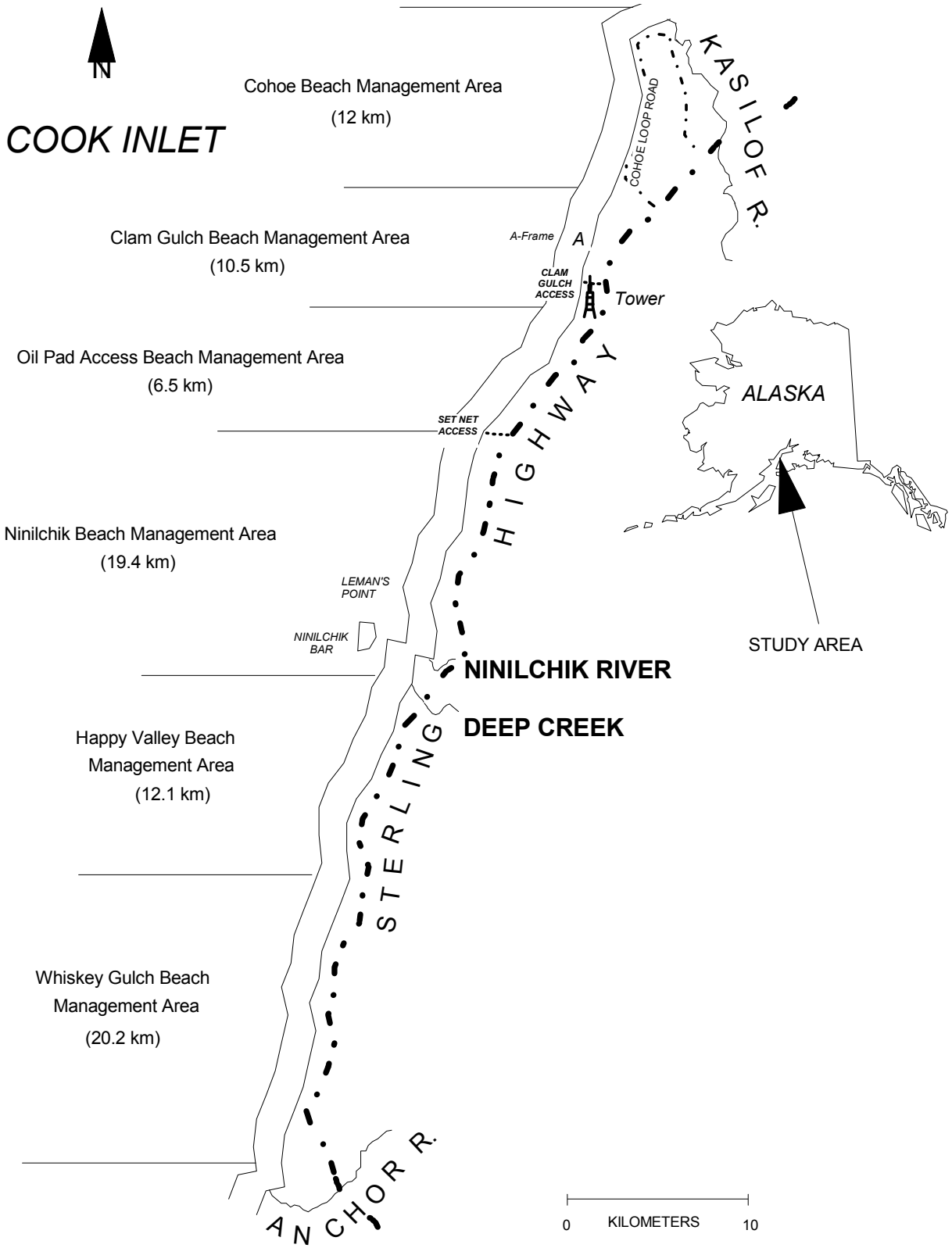

Figure 1.-Kenai Peninsula showing eastside Cook Inlet beaches.

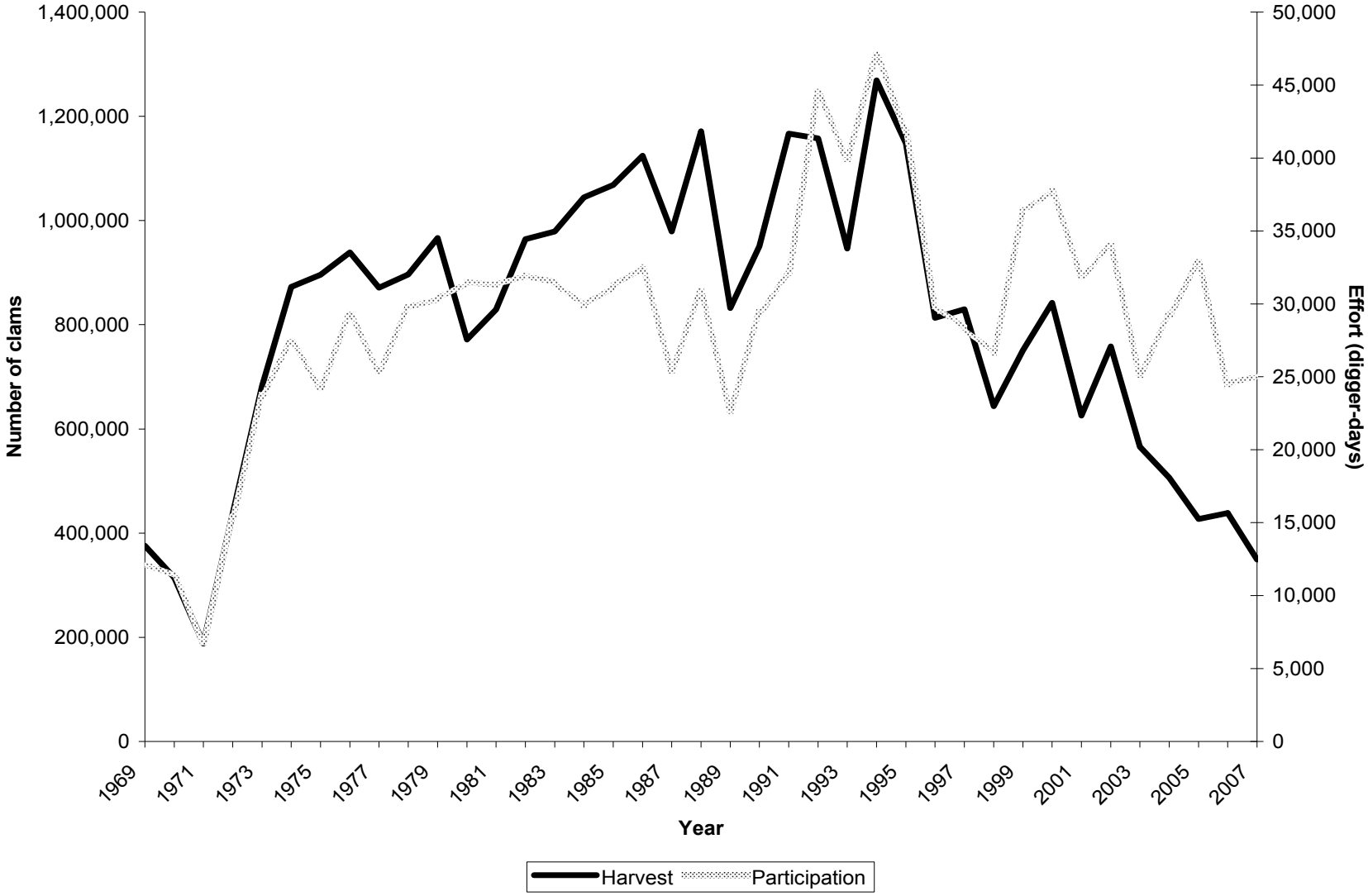

Figure 2.-Harvest and participation in the recreational razor clam fishery on eastside Cook Inlet beaches, 1969-2007.

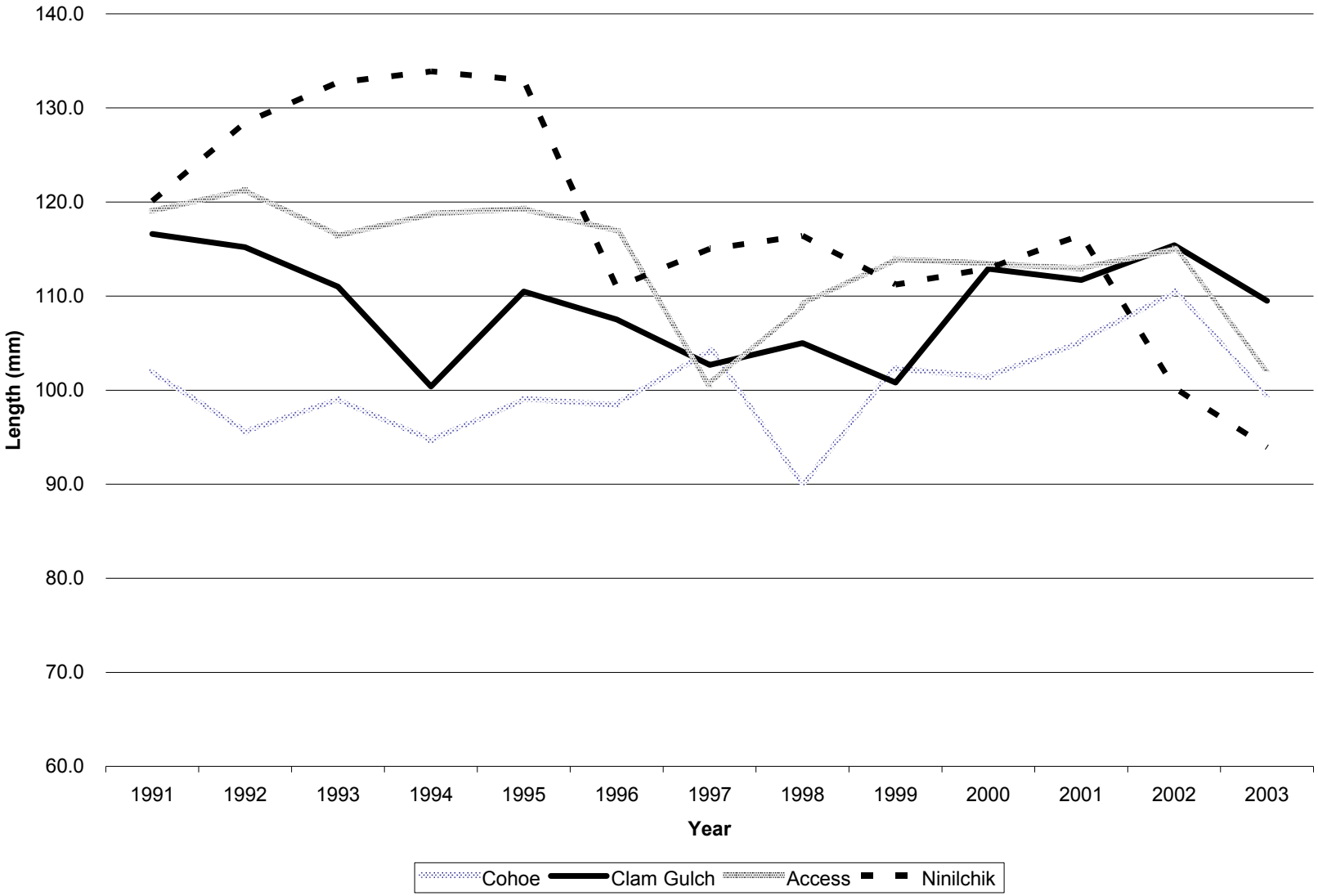

Figure 3.-Average length of razor clams from selected eastside Cook Inlet beaches, 1991-2003.

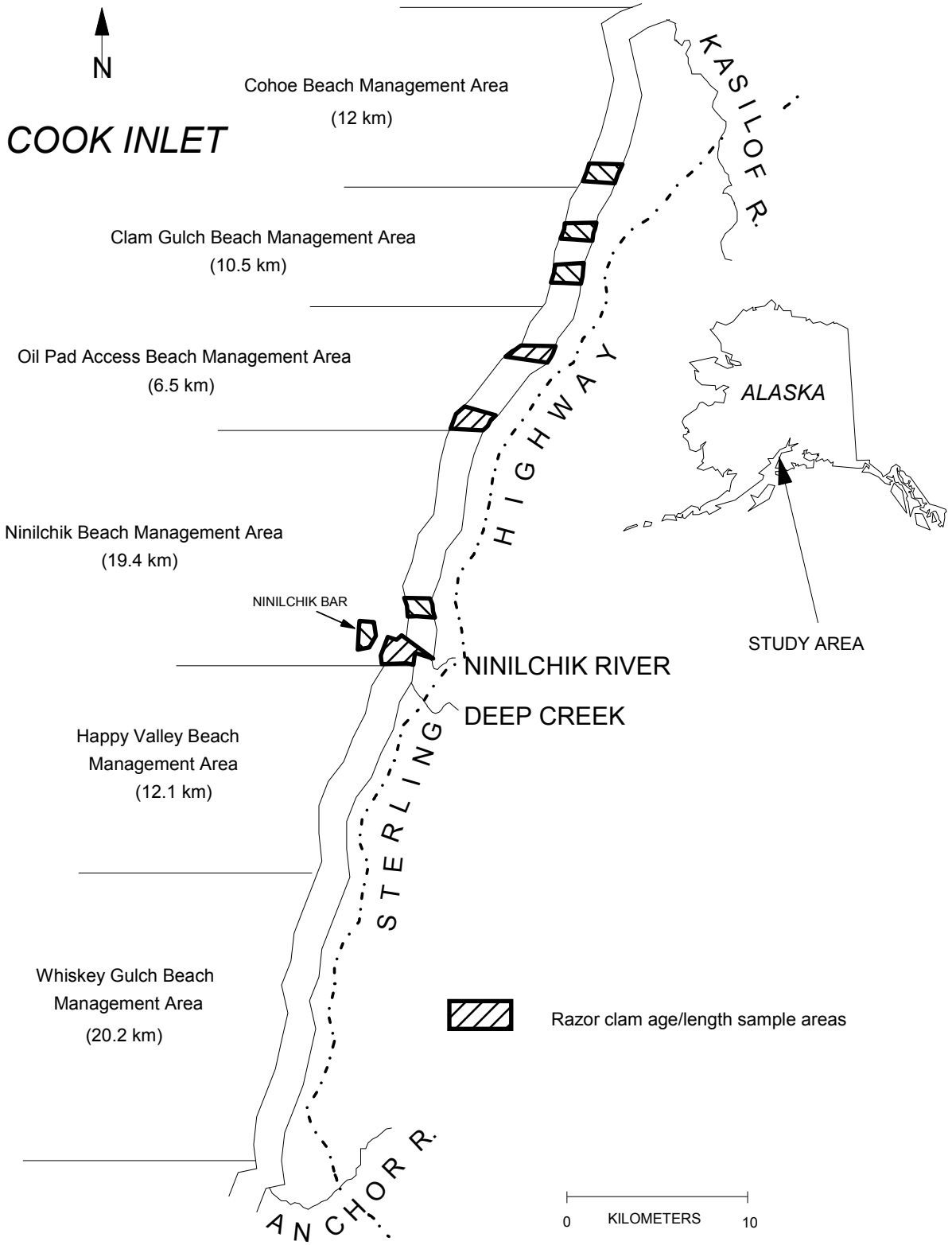

Figure 4.-Razor clam collection areas used for estimating harvest length and age composition.

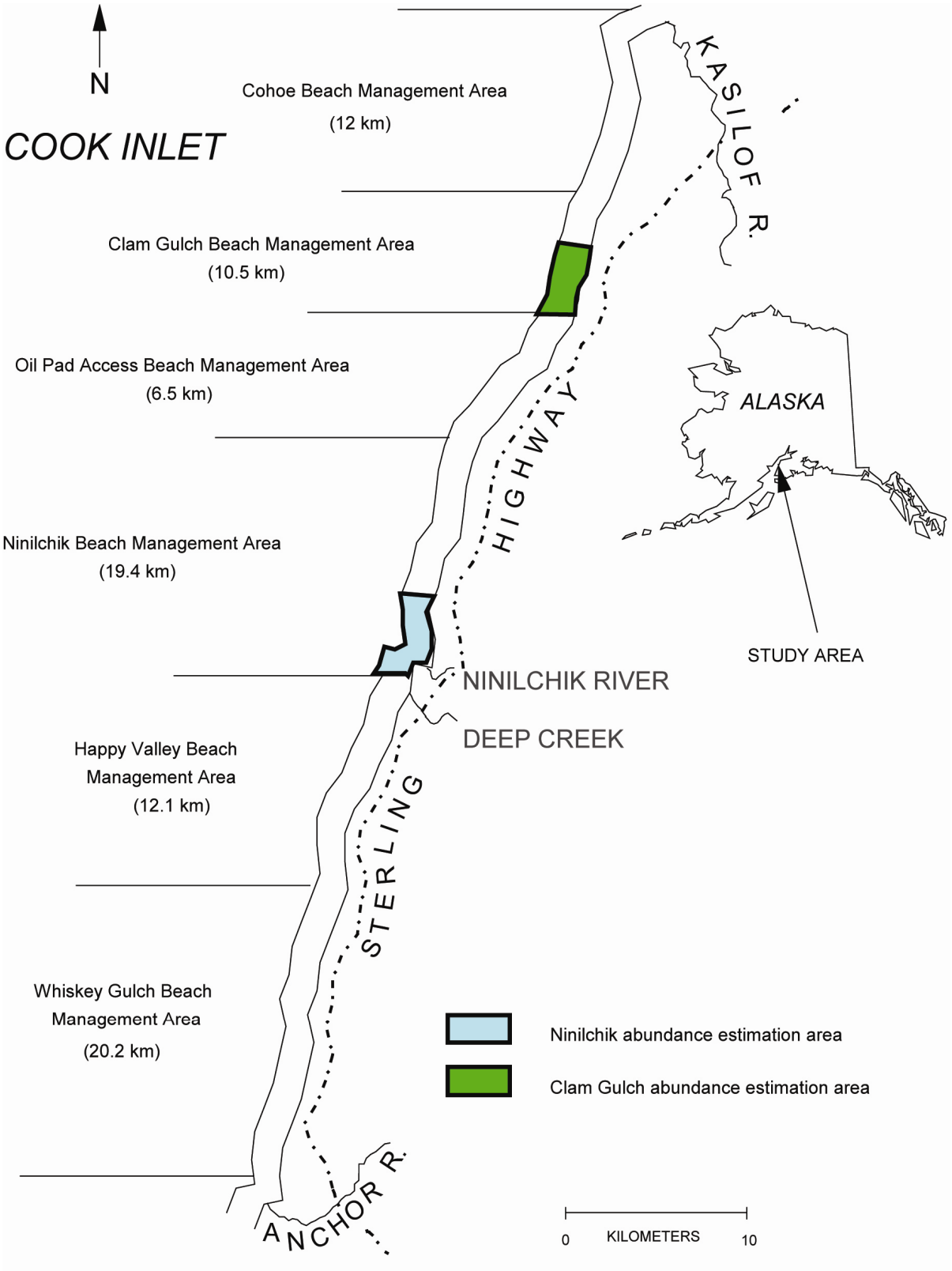

Figure 5.-Ninilchik and Clam Gulch beach locations where razor clam abundance is periodically estimated.

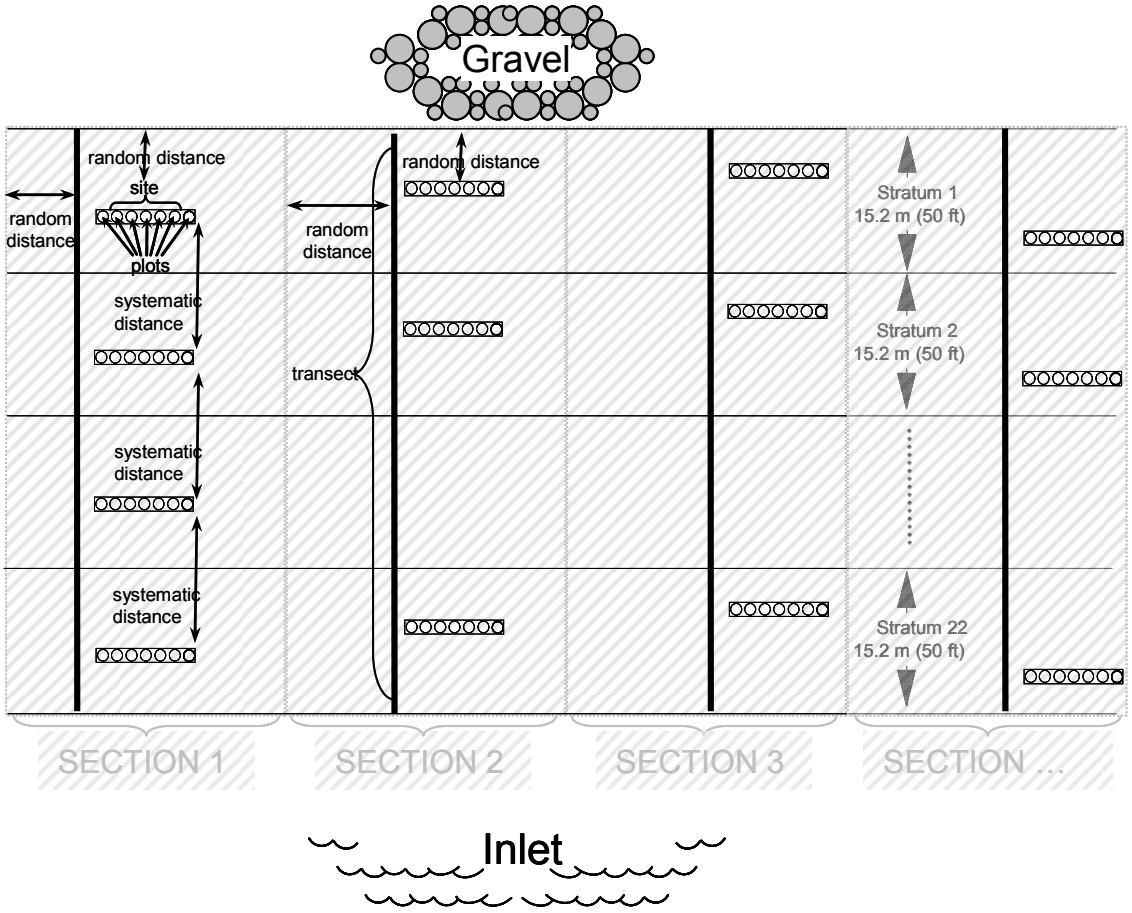

Figure 6.-Sampling diagram and layout of Ninilchik Beach used for razor clam abundance estimates.

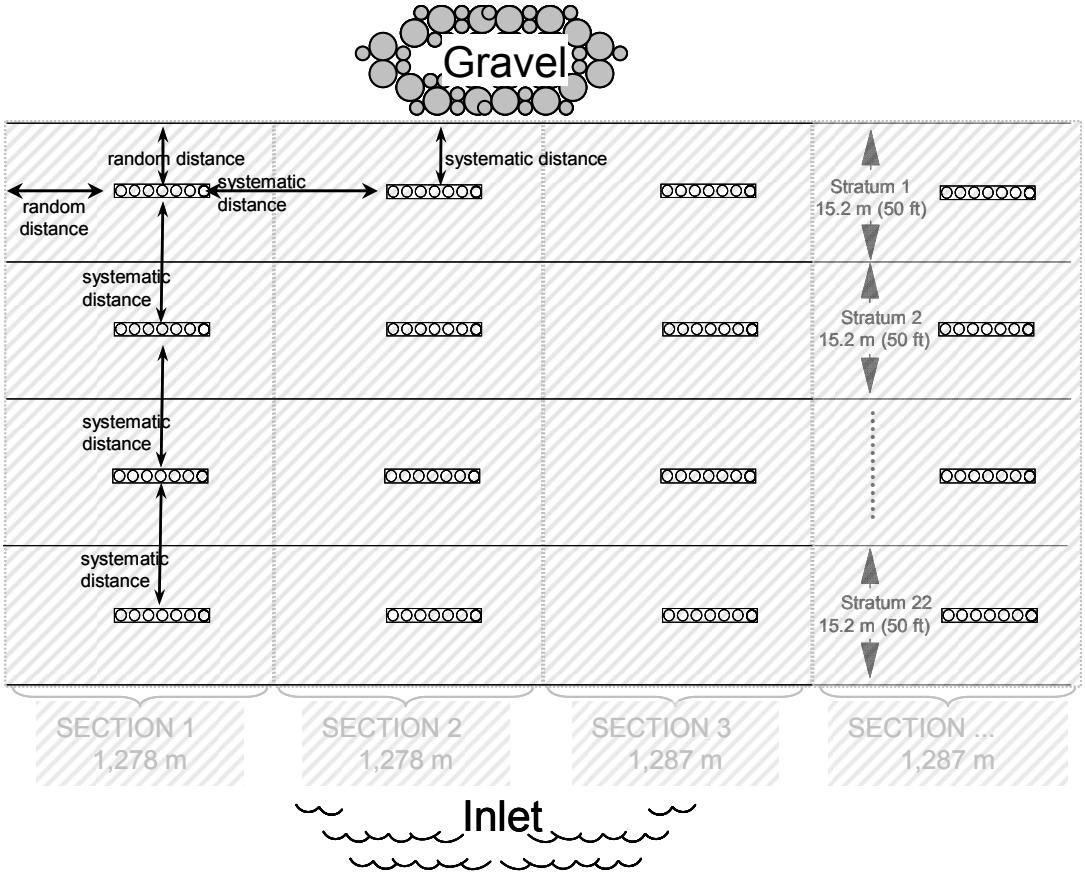

Figure 7.-Sampling diagram and layout of Clam Gulch Beach used for razor clam abundance estimates.

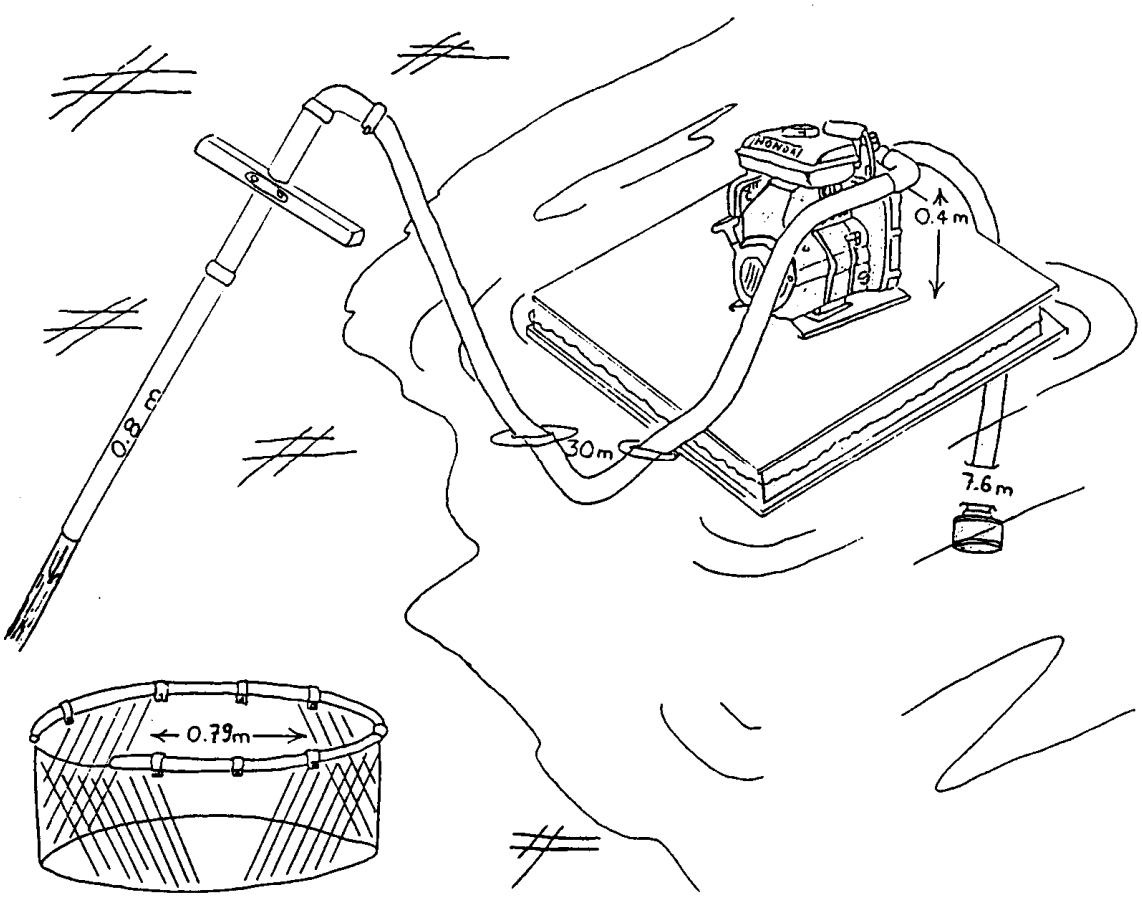

Figure 8.-Sampling ring and pumping apparatus used for razor clam density estimates.

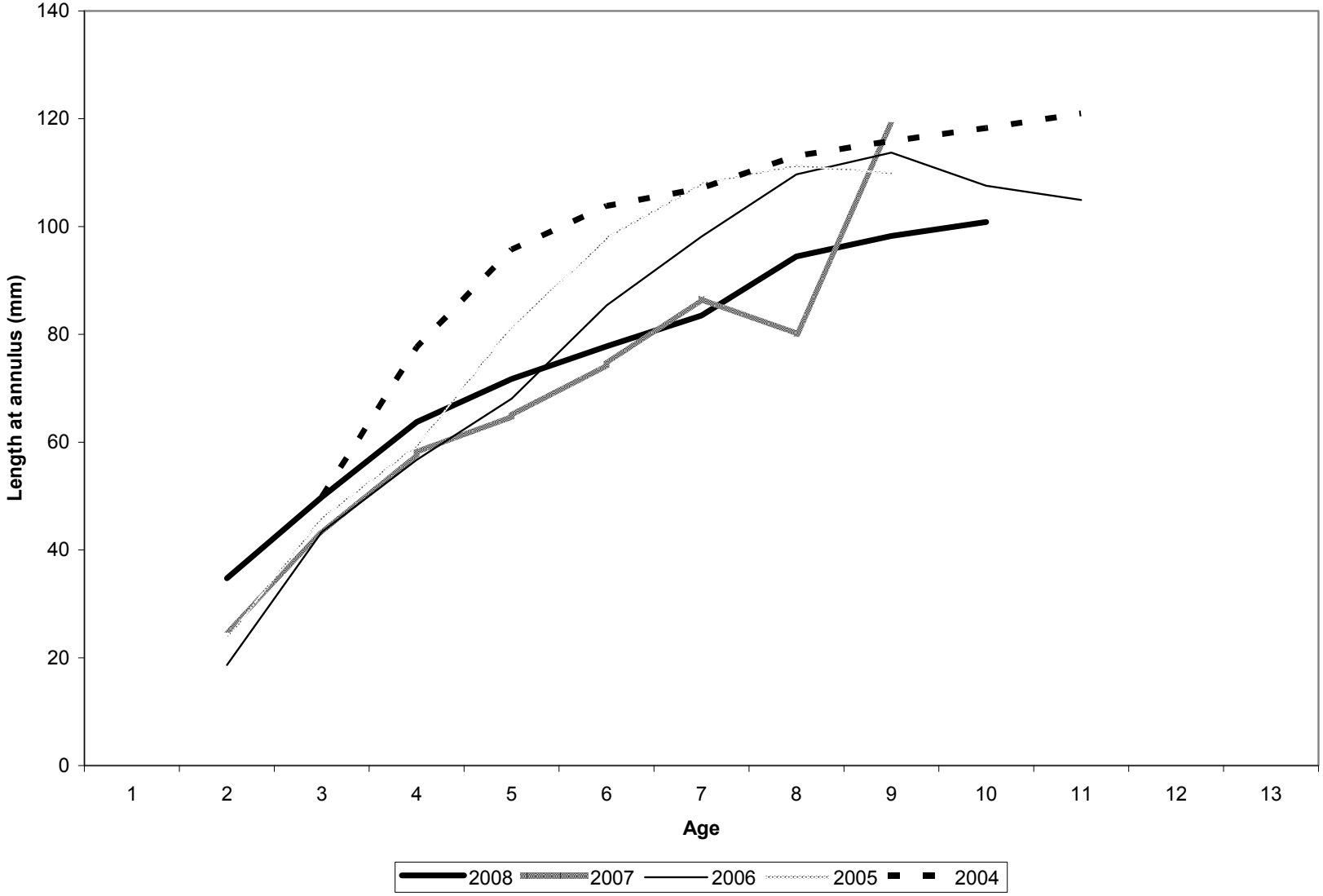

Figure 9.-Length-at-last-annulus formation for razor clams at Clam Gulch Beach, 2004-2008.

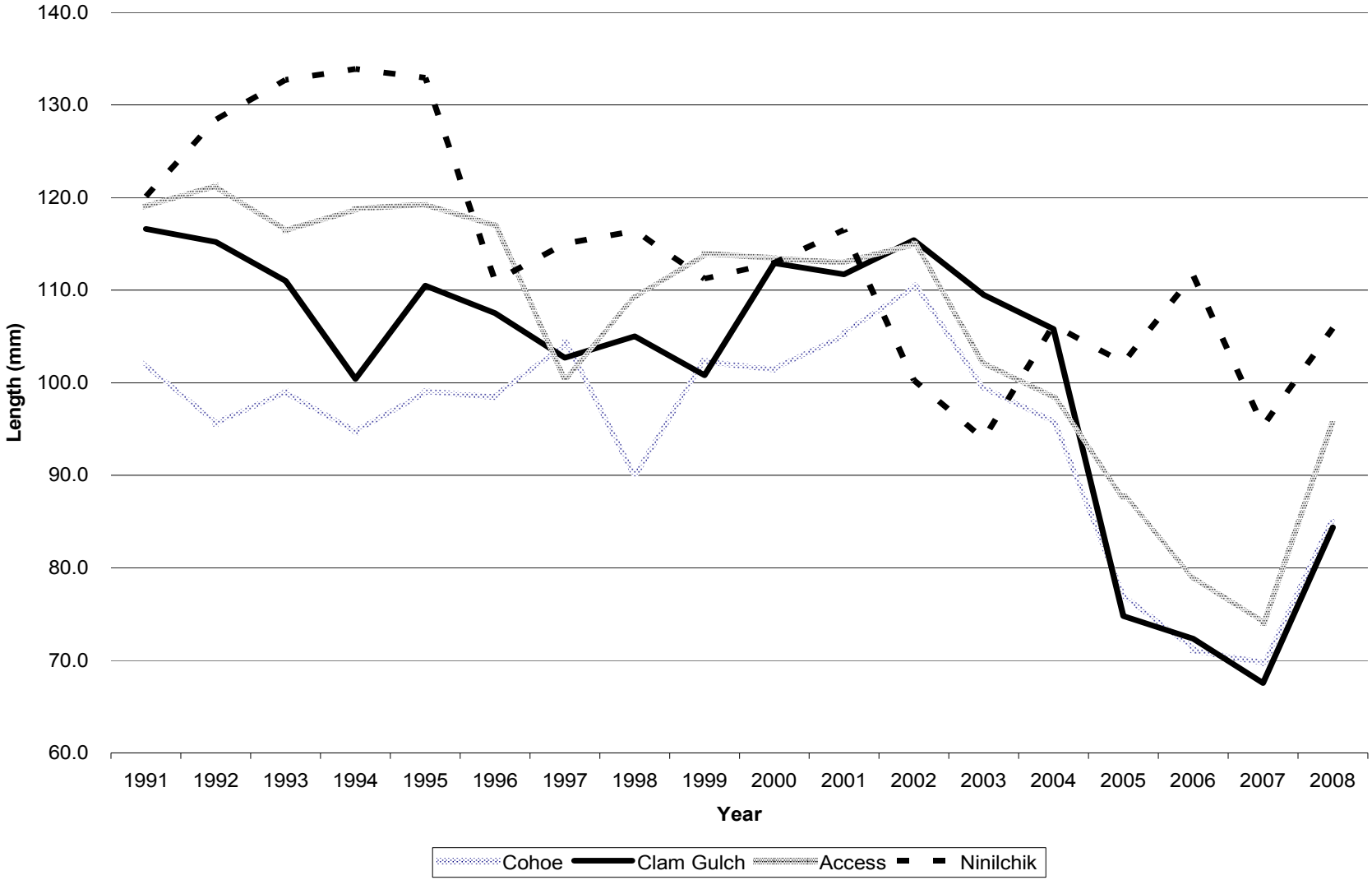

Figure 10.-Average length of razor clams from selected eastside Cook Inlet beaches, 1991-2008.

APPENDIX A. DATA FILES

Appendix A1.–Percentage of razor clams sampled at Clam Gulch Beach by age class, 1969-2008.

Year	Age Class														Number Sampled
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
1969		2.4	5.8	13.6	5.4	36.5	36.3								742
1970			4.1	17.1	15.9	30.5	32.4								655
1971			0.9	28.8	17.6	29.0	20.2	3.5							688
1972				8.4	45.9	19.8	11.5	14.4							715
1973			1.5	2.4	8.6	52.4	23.3	9.2	2.6						824
1974			0.2	1.5	2.3	12.3	43.5	28.3	10.0	1.9					480
1975			0.4	0.6	4.2	5.0	18.6	42.9	19.2	9.1					504
1976				0.4	1.0	7.4	5.9	9.8	14.1	19.9	41.5				744
1977			1.1	3.0	2.0	4.5	5.9	8.8	28.9	45.8					433
1978				1.4	6.1	6.9	8.0	9.6	28.1	39.9					492
1979			0.2	1.5	5.3	5.3	9.5	11.2	30.0	30.0	6.2	0.8			546
1980		0.3	12.4	0.9	5.7	3.4	11.8	12.6	14.9	29.9	7.2	0.9			348
1981			0.4	30.9	14.3	8.5	10.0	7.7	5.8	17.4	4.2	0.8			260
1982		1.5	1.0	23.0	25.5	14.2	10.8	5.9	7.8	8.8	1.0	0.5			204
1983			4.3	5.1	16.3	36.8	17.9	6.8	2.6	7.6	1.7	0.9			116
1984		1.3	2.8	8.7	14.6	10.0	42.6	9.3	6.0	4.0		0.7			150
1985			3.1	7.7	9.2	6.2	30.8	16.9	6.2	12.3	4.6	1.5		1.5	65
1986			4.2	3.2	41.5	8.5	9.6	29.8	2.1	1.1					94
1987			19.3	3.7	18.3	38.6	12.8	6.4	0.9						109
1988				11.6	18.2	42.1	14.9	9.9	3.3						122
1989			2.7	10.7	2.7	24.1	21.4	18.8	11.6	8.0					112
1990	7.7	1.9	5.2	3.2	7.1	5.2	18.1	36.8	11.6	3.2					155
1991			5.3	7.3	5.6	7.6	10.6	32.3	22.1	9.2					303
1992			0.6	29.8	10.2	9.1	4.4	12.3	14.3	17.3	1.5	0.6			342
1993		1.0	0.8	0.8	53.8	9.4	2.9	6.0	12.1	10.8	2.1	0.3			381
1994		4.7	1.2	8.3	52.8	13.7	3.8	4.5	5.2	4.7	0.7	0.5			424
1995			6.7	1.0	24.4	32.7	7.3	9.5	11.7	5.1	1.3	0.3			315
1996		3.2	2.3	22.2	17.8	23.7	15.5	8.8	4.4	1.8	0.3				342
1997		0.8	22.0	12.6	19.8	19.5	17.0	4.1	3.3	0.8					364
1998		3.3	7.9	47.5	6.6	12.5	11.5	5.9	4.6	0.3					305
1999			3.0	58.7	18.3	12.7	3.3	3.7	0.3						300
2000		0.6	0.3	3.8	14.6	23.1	14.9	18.0	12.0	8.9	3.2	0.6			316
2001			0.7	4.4	5.4	15.2	31.3	16.8	13.5	8.8	3.7	0.3			297
2002			0.7	6.5	5.5	11.0	15.8	34.7	11.3	8.6	5.8				291
2003			1.0	10.6	16.3	17.3	15.6	24.9	9.0	4.0	1.0	0.3			301
2004			1.3	8.9	16.5	20.1	13.2	27.1	10.2	2.0	0.7				303
2005		5.7	7.7	47.5	20.1	4.0	6.4	3.3	5.4						299
2006		0.7	10.3	4.3	60.9	15.3	7.1	0.4	0.4	0.4	0.4				281
2007		1.0	14.5	21.0	4.8	54.5	2.3	1.6	0.3						310
2008		2.6	11.5	35.8	19.5	1.3	25.9	2.9	0.3	0.3					313

Appendix A2.–Percentage of razor clams sampled at Ninilchik Beach by age class, 1974, and 1977–2008.

Year	Age Class													Number Sampled
	1	2	3	4	5	6	7	8	9	10	11	12	13	
1974			1.3	1.3	1.3	43.0	21.5	22.2	9.4					149
1977					6.4	3.2	1.6	24.2	32.3	11.3	21.0			62
1978						12.5			37.5	12.5	25.0	12.5		8
1979														
1980			90.0	7.5	2.5									80
1981														
1982			7.5	5.0	3.1	79.5	1.2			2.5		1.2		161
1983		7.9	21.2	46.3	4.0	4.0	16.6							151
1984		1.4	63.0	27.4	6.8	1.4								73
1985		0.0	5.9	69.4	11.8	4.7	3.5	2.4	2.4					85
1986		0.0	3.4	3.4	48.9	34.1	3.4	5.7		1.1				88
1987			9.9	6.6	2.2	57.1	18.7	4.4	1.1	0.0				
1988														91
1989	3.3	4.7	0.7	7.3	16.0	6.0	1.3	21.3	24.0	9.3	4.0	1.3	0.7	150
1990		10.0	27.3	9.1	0.9	0.9	12.7	19.1	8.2	8.2	3.6			110
1991		1.7	81.7	12.5				2.5		0.8	0.8			120
1992		2.1	0.8	73.2	9.2	1.3	1.3	3.8	2.9	4.2	0.8	0.4		239
1993		1.0	13.3	5.5	47.8	24.6	3.1	1.0	1.4	1.0	1.0	0.3		293
1994		0.3	2.7	17.6	12.2	55.1	8.4	0.8	1.6	0.8	0.3	0.3		370
1995		1.6	6.2	15.8	26.4	41.0	5.6	0.6	1.6	0.9	0.0	0.3		322
1996		40.2	5.6	8.5	19.9	21.7	2.1	1.5	0.3	0.3	0.0			341
1997		0.3	40.5	16.0	10.8	10.8	13.7	4.6	1.6	1.3	0.3			306
1998		5.6	8.9	57.2	5.6	8.6	7.2	5.9	1.0	0.0				304
1999		24.8	13.9	6.6	41.1	4.3	3.0	5.0	1.3	0.0				302
2000		5.0	58.8	9.4	4.4	15.4	3.8	0.9	0.9	0.6	0.3	0.3		318
2001		5.3	8.3	38.0	22.0	5.3	15.0	2.7	1.7	0.3	0.7	0.3	0.3	300
2002	11.0	36.7	12.3	3.9	25.6	3.6	1.6	2.6	1.0	0.6	0.3	0.3	0.3	308
2003		56.6	18.4	8.9	4.3	5.3	2.6	2.3	1.0	0.3	0.3			304
2004		1.0	54.5	15.7	8.4	8.7	7.4	2.3	1.3	0.3	0.3		0.3	299
2005	1.0	23.1	7.7	49.8	7.4	2.0	4.3	1.7	1.0	0.7	0.7	0.7		299
2006		1.3	23.3	8.5	53.1	7.5	3.0	2.6	0.3	0.3				305
2007		20.9	17.4	38.0	8.1	14.2	1.4							345
2008		8.1	42.7	19.3	18.7	1.9	9.0		0.3					321

Appendix A3.-Percentage of razor clams sampled at Oil Pad and Set Net accesses combined by age class, 1985-2008.

Year	Age Class 1	2	3	4	5	6	7	8	9	10	11	12	Number Sampled
1985			22.9	11.8	24.8	20.3	11.1	7.8	1.3				153
1986	1.9	6.3	16.9	23.1	26.3	12.5	6.3	4.4	2.5				160
1987			4.8	23.5	29.5	27.7	10.2	4.2					166
1988													
1989	1.8	10.0	32.7	1.8	12.7	1.8	27.3	10.0	1.8				220
1990		11.4	10.2	11.4	3.1	10.6	10.6	26.8	12.6	3.1			254
1991		0.4	9.7	21.5	14.7	4.3	9.3	19.0	11.8	6.1	2.5	0.7	279
1992		0.3	1.4	45.1	14.4	6.3	2.6	14.4	10.6	4.3	0.6		348
1993		0.2	13.5	3.9	51.3	11.4	3.4	7.1	4.3	3.6	1.1	0.2	466
1994		0.2	1.5	5.4	63.8	15.1	3.2	4.3	4.7	1.3	0.6		536
1995		1.6	8.7	3.7	35.4	37.3	5.8	4.5	1.9	0.8	0.3		378
1996		4.8	3.5	18.0	27.3	31.5	9.0	3.5	1.6	0.6			311
1997		0.3	62.1	5.5	21.0	4.7	4.7	0.9	0.9				343
1998		0.7	3.9	78.1	9.8	4.9	1.6	0.7	0.3				306
1999		0.7	9.9	62.7	13.9	9.2	3.3	0.3					303
2000		0.3	8.1	6.6	12.1	45.2	17.9	6.3	2.6	0.9	0.0		347
2001	0.6	4.9	4.5	7.8	12.3	16.9	42.5	7.8	1.6	0.6	0.3		308
2002	3.9	9.8	8.1	8.8	14.7	15.6	18.6	16.3	3.6	0.7			307
2003		12.4	25.8	15.7	6.5	15.0	8.8	9.2	5.6	1.0			306
2004			43.9	14.5	10.2	7.9	9.6	8.6	5.3				303
2005		5.2	10.0	70.6	11.8	1.4	1.0						289
2006		8.4	44.0	6.4	37.2	3.4	0.7						298
2007		20.7	21.7	37.9	8.4	10.4	1.0						309
2008		8.6	40.6	22.4	24.1	1.0	3.0	0.3					303

Appendix A4.–Percentage of razor clams sampled at Cohoe Beach by age class, 1985-2008.

Year	Age Class												Number Sampled
	1	2	3	4	5	6	7	8	9	10	11	12	
1985			15.0	32.0	36.0	7.0	8.0	2.0					100
1986			0.0	68.4	16.3	9.2		5.1	1.0				98
1987			10.1		69.7	14.1	3.0	3.0					99
1988													
1989			23.3	6.8	8.7	13.6	22.3	22.3	2.9				103
1990		8.5	5.4	69.8	2.3	1.6	9.3	0.8	0.8	0.8	0.8		129
1991		0.9	37.4	44.3	5.2	1.7	3.5	2.6	3.5	0.9			115
1992		0.7	4.4	70.8	19.7	1.5	2.2	0.7					137
1993			19.0	6.3	50.0	18.3	2.1	0.7	2.8	0.7			142
1994		0.5	1.4	30.6	59.7	7.9							216
1995		0.6	17.8	9.2	33.9	29.3	4.6	2.3	2.3				174
1996			0.6	59.4	25.5	10.9	3.6						165
1997			31.7	9.0	31.7	20.0	4.8	2.8					145
1998		24.2	5.9	46.4	7.2	7.8	5.2	3.3					153
1999			7.2	51.0	13.7	11.1	6.5	6.5	2.6	1.3			153
2000		9.9	2.5	8.7	16.1	29.8	20.5	7.5	4.3	0.6			161
2001		0.0	7.9	2.6	16.6	6.0	52.3	9.3	3.3	2.0			151
2002		0.0	0.0	6.9	9.4	5.0	19.5	12.6	34.0	7.5	4.4	0.6	159
2003		0.7	13.8	24.1	11.7	9.0	15.2	16.6	5.5	2.8	0.7		145
2004			3.3	35.5	30.9	9.9	11.2	7.2	2.0				152
2005			2.0	80.0	14.0	2.7	1.3						150
2006		0.6	25.9	10.1	48.7	14.6							158
2007			33.8	37.6	8.3	18.5	1.9						157
2008		2.5	20.6	56.9	16.9	0.6	2.5						160