Fishery Management Report No. 11-62

2012 Report to the Board of Fisheries on Southeast Alaska/Yakutat Dungeness Crab Fisheries

by

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and

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November 2011

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)

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

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2012 REPORT TO THE BOARD OF FISHERIES ON SOUTHEAST ALASKA/YAKUTAT DUNGENESS CRAB FISHERIES

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November 2011

The Fishery Management Reports series was established in 1989 by the Division of Sport Fish for the publication of an overview of management activities and goals in a specific geographic area, and became a joint divisional series in 2004 with the Division of Commercial Fisheries. Fishery Management Reports are intended for fishery and other technical professionals, as well as lay persons. Fishery Management Reports are available through the Alaska State Library and on the Internet: http://www.adfg.alaska.gov/sf/publications/. This publication has undergone regional peer review.

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This document should be cited as:
Messmer, A., G. Bishop, C. Siddon, J. Stratman. 2011. 2012 Report to the Alaska Board of Fisheries on Southeast Alaska/Yakutat Dungeness crab fisheries. Alaska Department of Fish and Game, Fishery Management Report No. 11-62, Anchorage.

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ABSTRACT

This report reviews the commercial fishery for Dungeness crabs in Region I, which includes Southeast Alaska (Registration Area A) and Yakutat (Registration Area D).

Dungeness crab harvests in Region I totaled 3,245,265 pounds valued at $5.53 million during the last completed season. The average exvessel price per pound for Dungeness crabs during the 2010/2011 season was $1.78.

Most of the shellfish fisheries in Region I are fully developed. The first commercial harvest of Dungeness crabs from Southeast Alaska occurred in the 1930s. Dungeness crab management is by sex, size and season with the added caveat of a provision to close the fishery early if the predicted harvest does not meet one of several thresholds. A survey for the Yakutat Dungeness crab stock was conducted in 2004 and the department is planning a survey for 2012. Yakutat stocks of Dungeness crabs are at very low levels and have been designated as collapsed and recovering. The Yakutat Dungeness crab fishery will remain closed until signs of recovery are apparent, and until a management and stock assessment plan are developed to provide sustainable harvest.

The ability of the department to manage for sustained yields varies among the fisheries due to different levels of development of stock assessment programs and management plans. Some limited Dungeness stock assessment surveys were conducted from 1996 through 1997, and again from 2000 through 2004. A management plan has been implemented for the Southeast Alaska Dungeness fishery, mandating the department to conduct a full season harvest estimate two weeks into the summer season. If this full season harvest estimate falls below two different thresholds described in the management plan, the department is required to reduce season length. Dockside sampling and skipper interviews also are routinely conducted in Southeast Alaska.

Key words: Dungeness crab, *Cancer magister*, Southeast Alaska, Yakutat, Fisheries management, Crab, Invertebrate fisheries, Region I, Harvest statistics, Alaska Board of Fisheries

CHAPTER 1: INTRODUCTION TO SOUTHEAST ALASKA/YAKUTAT DUNGENESS CRAB FISHERIES

INTRODUCTION

This report reviews the commercial fisheries for Dungeness crab in Region I, which includes Southeast Alaska (Registration Area A) and Yakutat (Registration Area D). Registration Area A encompasses all waters within the Alexander Archipelago and offshore waters from Dixon Entrance to Cape Fairweather, divided into Districts 1 through 16 (Figure 1.1). Registration Area D encompasses state waters from Cape Fairweather to Cape Suckling, divided into Districts 81 through 91. Shellfish fisheries in these areas are primarily in state waters.

This is the second Alaska Board of Fisheries (board) meeting where proposals for all Region I shellfish fisheries are considered in one meeting. Previously, proposals for Dungeness crab, shrimp, and scallops were combined into one meeting held in Southeast Alaska, while king and Tanner crab proposals were considered separately during the statewide king and Tanner crab meeting. The reason for including the Southeast king and Tanner crab meeting in the Southeast meeting is to allow for increased participation of stakeholders.

The Dungeness crab fishery in Southeast Alaska is prosecuted under limited entry, and is managed by size, sex and season. The Dungeness crab fishery in Yakutat, prosecuted as an open access fishery, has been closed since the 1999/2000 season due to poor stock status. There has only been one Alaska Department of Fish and Game (department) survey for Yakutat Dungeness crabs (2004). Yakutat Dungeness stocks have been designated collapsed and recovering.

The Dungeness crab harvest in Southeast Alaska totaled 3,245,265 lbs valued at $5.53 million during the last completed season (Table 1.1). Ranking by value based on the last season when a fishery was conducted, the top five shellfish fisheries in Region I were Southeast Alaska Dungeness crab, Southeast Alaska golden king crab, Southeast Alaska Tanner crab, Southeast Alaska shrimp pot, and Southeast Alaska red and blue king crab. Ranking by landed poundage, the top five fisheries in Region I were Southeast Alaska Dungeness crab, Southeast Alaska Tanner crab, Southeast Alaska golden king crab, Southeast Alaska shrimp pot, and Southeast Alaska red and blue king crab.

SHELLFISH RESEARCH AND MANAGEMENT

Dungeness crab management is by sex, size and season with the added caveat of a provision to close the fishery early if the predicted harvest does not meet one of two thresholds. If the predicted harvest is 1.5 million lbs or less, the entire season closes no sooner than 21 days after the season opened; if the predicted harvest is greater than 1.5 million lbs but less than 2.25 million lbs, the summer season ends no sooner than 28 days after the season opened with a curtailed fall season of 30 days. Currently, there is no stock assessment program for Southeast Alaska and Yakutat Dungeness crabs and there is no harvest strategy or management plan in place for Yakutat Dungeness.

Dockside sampling and skipper interviews are routinely conducted in the Southeast Dungeness fishery. The objectives of dockside sampling are to gather data and information on size frequency, shell condition, average weight, fishing location, effort levels, and estimates of average catch per unit of effort (CPUE). The collected information allows assessment of the relative strength of various components (e.g. size, recruits) of the commercially exploited component of the population, and a qualitative estimate of stock condition. However, for Yakutat Dungeness fisheries even basic port sampling has not been systematically conducted. Harvest

and effort data is also collected through the fish ticket system for both Southeast and Yakutat Dungeness fisheries.

TASK FORCE STATUS

The Southeast Alaska Dungeness Crab Task Force was formed through a charge from the board in 2000. This task force is currently inactive and the department has not met with a Dungeness crab stakeholder group since 2009.

STAFF

All Region I crab, beam trawl shrimp, and scallop fisheries are managed by the regional shellfish management staff. All Region I shellfish stock assessment and research programs are managed by the regional shellfish research staff. The shrimp pot fishery is the only shellfish fishery managed individually by area offices within the region. These fisheries are managed by Area Management Biologists under the supervision of Bill Davidson, Regional Management Coordinator, stationed in Sitka. All other marine fisheries research (non-salmon) and management is under the supervision of Forrest Bowers, regional Goundfish and Shellfish Fisheries Program Supervisor, stationed in Douglas. The regional stock biology staff conducts dockside sampling and skipper interviews with assistance from the shellfish and area management staffs.

SHELLFISH PROJECT STAFF

Name	Title	Job Class	Location
Forrest Bowers	Region I Groundfish and Shellfish Fisheries Program Supervisor	Fishery Biologist IV	Douglas
Bill Davidson	Region I Management Coordinator	Fishery Biologist IV	Sitka
Joe Stratman	Region I Shellfish Management Project Leader	Fishery Biologist III	Petersburg
Gretchen Bishop	Region I Crab Research Project Leader	Fishery Biologist III	Douglas
Chris Siddon	Shellfish Biometrician	Biometrician III	Douglas
Adam Messmer	Shellfish Management Biologist	Fishery Biologist II	Douglas
Quinn Smith	Southeast Regional Shrimp Biologist	Fishery Biologist II	Douglas
Andrew Olson	Shellfish Research Biologist	Fishery Biologist II	Douglas
Kellii Wood	Shellfish Technician	Fish and Wildlife Technician IV	Petersburg

CHAPTER 1—TABLES AND FIGURES

Table 1. 1–Registration Area A (Southeast Alaska) and Registration Area D (Yakutat) list of shellfish fisheries, harvest, and approximate exvessel values from the last completed season or calendar year.

Area Season	Fishery	Harvest (lbs)	Approximate exvessel Value
Southeast			
2005/2006	Red and blue king crab	209,799	$1,099,000
2010/2011	Tanner crab (*C. bairdi*)	891,344	$2,425,059
2010/2011	Golden king crab	687,505	$4,656,267
2010/2011	Dungeness crab	3,245,265	$5,525,404
2010/2011	Pot shrimp	556,574	$1,519,447[a]
2010/2011	Beam trawl shrimp	132,383	$107,813
	Subtotal	**5,722,870**	**$15,332,990**
Yakutat			
2000/2001	Red and blue king crab	391	$2,960
1999/2000	Tanner crab	[b]	[b]
1999/2000	Dungeness crab	65,386	$133,145
2010/2011	Pot shrimp	[b]	[b]
2004/2005	Otter trawl shrimp	[b]	[b]
2010/2011	Weathervane scallop	160,340	$1,282,720[c]
	Subtotal	**230,499**	**$1,427,272**
	Grand Total	**5,953,369**	**$16,760,262**

[a] Value estimate based on 2010 exvessel price data from Commercial Fisheries Entry Commission.

[b] Confidential data, fewer than three permits fished.

[c] Value estimate based on 2009 exvessel price data

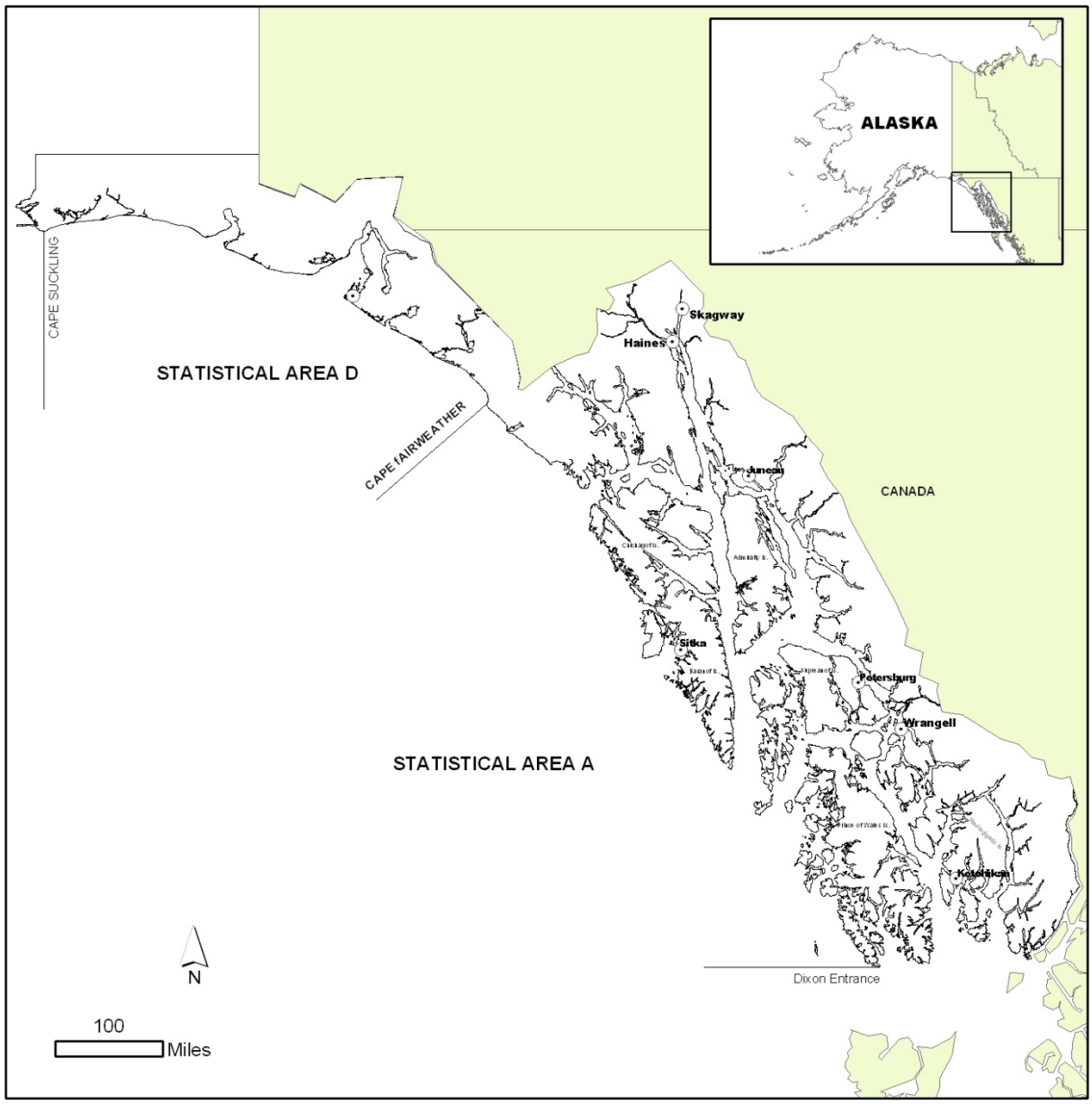

Figure 1. 1–Registration Area A (Dixon Entrance to Cape Fairweather) and Registration Area D (Cape Fairweather to Cape Suckling).

CHAPTER 2: SOUTHEAST ALASKA DUNGENESS CRAB FISHERY

INTRODUCTION

Dungeness crabs, *Cancer magister*, are members of the highly evolved brachyuran (true crab) infraorder of the subphylum Crustacea. They are commercially significant and widely distributed in coastal waters of the eastern Pacific Ocean from Santa Barbara, California to the Pribilof Islands (Jensen 1995). Dungeness crabs are found throughout Southeast Alaska (Registration Area A), which is near the northern limit of their range, in areas with mud and sand substrate at depths between two and 50 fathoms.

Southeast Alaska has produced a long-term average of about 2.65 million lbs of Dungeness crabs per season. Ten-year average harvests for the 1970s, 1980s, and 1990s, and 2000s have been respectively 0.65, 2.34, 3.26 and 4.56 million lbs. The 2010/11 season harvest was 3.25 million lbs.

Although the Southeast Alaska Dungeness crab fishery is under limited entry, and there are 287 current Dungeness crab limited entry permit holders, actual participation is variable. During the most recent five seasons, an average of 192 permit holders have registered and fished in Southeast Alaska (Table 2.1). Most vessels are below limit seiner length (58 ft overall length), although they range in size from small skiffs to over 90 ft overall length. Almost all participants use standard, hatbox-shaped pots constructed with steel frames and webbed with stainless-steel wire, maximum pot size is 50 in diameter and 18 in high. The maximum legal vessel gear limit is 300 pots per vessel.

Dungeness crab life history timing is less synchronous than for other commercially important northern crab species. The peak male molt period in Southeast Alaska extends from February through July (Bishop et al. *In Prep*.; Lehman and Osborn 1970; Shirley and Shirley 1988); this is followed by a female molt period in August and September (Bishop et al. *In Prep*.; Shirley and Shirley 1988) which coincides with peak mating timing in late summer through early fall (Shirley and Shirley 1988; Stone and O'Clair 2001), as Dungeness crab females mate only in the soft shell condition (Hartnoll 1969). After molting and mating, females take approximately a month to harden, and extrude eggs soon thereafter, from October through December (Shirley et al. 1987).

Because Dungeness crab females can store sperm for up to two years (Jensen et al. 1996), mating is not a prerequisite for oviposition and old shell females also extrude eggs, however their clutch sizes decline with each successive oviposition without new sperm reserves (Hankin et al. 1989). Dungeness female fecundity increases with body size up to a maximum of about 2.5 million eggs, however; the high potential fecundity of large females is tempered by a decrease in molt frequency with size, which results in a reduction in relative fecundity (Hankin et al. 1985, 1989). There is evidence for reduced population productivity for this species in Southeast Alaska, as it appears that females at this latitude extrude eggs only on a biannual basis (Swiney et al. 2003). As female Dungeness crabs grow to a large size and exhibit assortative mating behavior (i.e. females are mated only by males one or more molts larger in body size) (Butler 1960; Shirley and Sturdevant 1988), the male-only fishery with a minimum size limit also has the potential of decreasing the relative reproductive contribution of large females. However, analyses conducted in California designed specifically to test the hypothesis that the male-only fishery was resulting in sperm depletion of females found no supporting evidence (Hankin et al. 1997).

Dungeness crab management is by sex, size and season with the added caveat of a provision to close the fishery early if the predicted harvest does not meet one of several thresholds. In order to

conserve reproductive potential, only male crabs with a minimum carapace width (CW) of 6 ½ inches notch to notch may be harvested. There are three different commercial Dungeness crab fishing seasons depending upon the area. For District 2 and the portion of Section 13-B not in the Sitka Sound Special use area, there is a fall/winter season from October 1 through February 28; while the portion of Section 13-B that is in the Sitka Sound Special Use area and Whale Passage has a fall season, from October 1 through November 30. The remainder of Southeast Alaska has a split summer (June 15 through August 15) and fall (October 1 through November 30) season. The Southeast Alaska Dungeness Crab Management Plan (5 AAC 32.146) directs the department to predict the entire season's harvest on June 29 each season. If the predicted harvest is 1.5 million lbs or less, the entire season closes no sooner than 21 days after the season opened; if the predicted harvest is greater than 1.5 million lbs but less than 2.25 million lbs, the summer season ends no sooner than 28 days after the season opened with a curtailed fall season of 30 days.

This report will describe Southeast Alaska Dungeness crab fishery history, regulation development, management concerns, research, and summaries of recent seasons. It is intended to provide a comprehensive overview to brief the board on the Southeast Alaska Dungeness crab fishery to facilitate promulgation of regulations. It is also intended to inform the public about the Southeast Alaska Dungeness crab fishery, and acts as an Annual Management Report for this fishery to provide transparent fishery management.

FISHERY DEVELOPMENT AND HISTORY

The first commercial harvest of Dungeness crabs from Southeast Alaska occurred in the 1930s. Harvest statistics prior to 1960 were combined into a single total for much of the Gulf of Alaska, so harvest information for Southeast Alaska is not available. Since 1960, commercial Dungeness harvests from Southeast Alaska have averaged 2.47 million lbs per season (Table 2.1).

The Dungeness crab fishery in Southeast Alaska has evolved through four distinct periods since the early 1960s. From the early 1960s through the early 1980s, participation was so low that need for formal regulations and other restrictions were minimal. The 1960s were characterized by a few larger vessels in a directed fishery harvesting 2.2 million lbs per year on average. This harvest was fueled by high market demand caused by low harvests in Washington, Oregon, and California. The principal product was canned crabmeat.

During the 1970s, production in Washington and Oregon rebounded and demand for crab from Southeast Alaska declined. With little or no processor support, fishermen had to either sell over the dock to the public or make complicated and risky arrangements to airfreight live crab out of state. Although the summer closure was rescinded, only a few dozen small vessels in the 30-foot to 45-foot range fished primarily during the summer. Harvests for this period averaged 0.61 million lbs by 30 permit holders.

Between 1981/1982 and 1990/1991 seasons, the fishery underwent sweeping change. Declining crab harvests in Pacific Coast states and changing markets increased demand for Alaskan frozen sections, whole cooked crabs, and air freighted live crabs. More processors began purchasing crab and supporting the fishery through the entire summer season. Harvests during the 1980s increased, averaging 2.5 million lbs per season, and the numbers of participants increased, averaging 173 permit holders. The fishery grew from a small group of 30 to 45-foot vessels to a larger fleet that included skiff-sized vessels up to 30 ft in length. This resulted in the fishery going from being primary for a relatively small number of single-species participants to being a secondary fishery for a larger number of new and often transitory entrants.

Increasing numbers of participants led to a permit moratorium imposed by the Commercial Fisheries Entry Commission (CFEC) in 1991. During the four years of the moratorium, CFEC conducted numerous studies and public meetings to evaluate the need for limited entry into this fishery. Subsequently, CFEC requested that the legislature authorize use of tiered pot limits to accommodate the large number of qualifying participants while limiting the effort to acceptable effort levels. In January 1996, the moratorium period ended and a tiered pot limit form of limited entry was adopted for implementation by June 15, 1997. To date 251 transferable and 46 nontransferable permits have been issued, 16 additional permit holders are vying for the remaining 11 permits to be issued to achieve the maximum of 308 total permits to be issued (B6410P-C State of Alaska 2008-11-11 Commercial Fisheries Entry Commission Limited Fisheries Status Report). The tiered permit system is structured to provide a maximum of 48,750 pots to the fishery.

REGULATION DEVELOPMENT

FISHING SEASONS AND PERIODS

From the early 1930s through 1955, regulations included a prohibition on the taking of females, a minimum size limit for males, and a closed season on the most important grounds for two to four months between May 1 and September 1. Available documentation from that period indicates that molting was thought to occur during the summer. The summer closure was generally acceptable to fishermen because of other fishing opportunities in the salmon and halibut fisheries. The summer closure was repealed in the late 1950s.

Since the late 1960s, fishing season closures have been introduced, and then modified, to reduce fishing pressure during sensitive periods in the life history of the species. An example was the closure from March through May in 1976/1977 to protect male crabs during their primary molting period. In the 1980s, the department explored methods and means to further avoid sensitive life history periods to accommodate the increasing effort as the fleet slowly utilized more of the known habitat and range of the crabs. Department staff felt that as more of the available grounds were exploited, there would be fewer unfished stocks to act as reproductive buffers against local depletion in adjacent fishing grounds. Beginning in 1985, the commercial fishery was closed between August 16 and September 30 because field observations suggested that it was the major period when females molted and were mated. These field observations were later supported by research done in Southeast Alaska (Shirley and Shirley 1988, Stone and O'Clair 2001). In response to increasingly high effort levels and high harvest rates, the season was further shortened in 1989 by reducing the winter season in northern and central districts to October 1 through November 30. The season remained October 1 through February 28 in southern Districts 1, 2, and Section 13-B. In 2009 the board adopted a proposal that changed the season description for Dungeness crabs in Districts 1 and 2 to match the other waters in Registration Area A. A sunset date of February 29, 2012 was adopted for this regulation. In 2010 the board revised its 2009 decision for District 2 specifically and reverted back to a fall/winter season description.

SIZE RESTRICTIONS

From 1924 to 1935, legal harvest of Dungeness crabs was restricted to males over 6 ½-inches in greatest width. From 1936 to 1962, only males over seven inches in greatest width were legal. Since 1963, the legal size has been 6 ½-inches in shoulder width, measured across the carapace

immediately anterior to the tenth anterolateral spines. This measuring point is most often used in jurisdictions throughout the range of this crab, and is used because the large tenth anterolateral spines are often broken or eroded in older shelled crabs.

GEAR DEFINITIONS AND SPECIFICATIONS

Since 1934, trawls have been prohibited in the Southeast Alaska Dungeness crab fishery. Gear was further limited to pots or ring nets in 1954. A pot limit of 300 pots or ring nets was implemented in 1963. Diving gear was included as legal gear in 1966. Nearly all of the commercial harvest is currently taken with pots.

Starting in 1963, Dungeness crab pot buoys were required to display the registration number of the vessel fishing the gear. In 1988, the minimum size of buoy markings was set at 1 ½- inches in height, in numerals at least 1/4-inch wide that contrasted with the color or texture of the buoy.

In 1977, two escape rings 4 3/8-inches in diameter were required in each pot, and a Dungeness pot was defined by its tunnel eye openings, which individually could not exceed 30 inches in perimeter. In 1978, an escape panel secured by a maximum of 120-thread cotton twine was required. A minimum size for buoy numbers of 1 ½- inch high and ¼-inch wide numbers was implemented in 1989. In 1991, the breaking strap or biodegradable twine for the lid retainers was changed from 120-thread to 60-thread. The intent of this change was to minimize untended ghost fishing of lost or derelict pots. In order to facilitate the enforcement of pot limits, identification tags were required to be attached to every buoy connected to a Dungeness crab pot beginning with the 2001/2002 season. Dungeness crab pots and ring nets used in Southeast Alaska must all be buoyed and marked identically.

Dungeness gear development has remained static for many years, with little change in configuration, materials, size, and weight to significantly affect pot efficiency. However, trigger devices that minimize escapement of crabs through entrance tunnels have been developed and are being installed on commercial gear and some fishermen have begun using larger pots. In order to prevent further increases in pot size, a maximum pot size of 50-inches in diameter was established effective during the 2001/2002 season.

OTHER REGULATORY CHANGES

Vessel registration and hold inspection requirements started in 1974. Southeast Alaska was designated a superexclusive registration area in 1983. Hold inspections were rescinded in 1984. A Dungeness crab management plan became effective beginning with the 2001/2002 season. The plan calls for early closure of the Southeast Alaska Dungeness crab season when regional catch is projected to be below one of several threshold levels. Changes to the Dungeness fishery made at the 2009 board meeting include: an adjustment to the Dungeness management plan to allow management flexibility if unlanded softshell crab contribute to a full season harvest estimate below threshold; clarification of permit stacking requirements; and revocation of closed areas in Chaik bay and Whale Pass.

MANAGEMENT CONCERNS

SEASON TIMING

The summer season overlaps with a portion of the male molt period, and legal males are harvested prior to mating, putting the burden of reproduction on small males. The prevalence of

soft-shelled crabs in the catch and harvest during the summer fishery continues to be high in some areas and seasons. This suggests that production is being lost due to handling mortality. Harvesting legal males prior to reproducing has the potential of creating genetic pressure for crabs to grow more slowly to avoid harvest.

HARVEST RATE

Trends in recruit composition of the harvest indicate that the fishery is increasingly dependent on annual recruitment. A smaller portion of strong year classes are carried over to buffer the fishery against the effects of a poor year class.

HIGH EFFORT LEVELS RELATIVE TO AVAILABLE GROUNDS

Conflict between user groups is rising as competitive pressure and gear saturation crowds commercial gear onto grounds traditionally used by non-commercial fishermen. This has resulted in commercial closed areas in numerous small areas around many communities in Southeast Alaska, including (in the order in which they appear in the Commercial Shellfish Fishing Regulations) Juneau, Tenakee Springs, Elfin Cove, Point Baker, Thorne Bay, Gustavus, Ketchikan, Haines, Sitka, and Hollis. There are continuing requests to the BOF for additional commercial closed areas.

In accordance with a federal law that was passed in 1998, commercial Dungeness crabbing was closed in designated wilderness areas in the Glacier Bay National Park and Preserve beginning June 15, 1999. Non-wilderness portions of the bay closed to Dungeness crabbing on September 30, 1999. Permit holders were given compensatory pay if they fished in either the Beardslee Islands or Dundas Bay wilderness areas for at least six of the years between 1987 and 1998. Processors were eligible for compensatory pay to offset losses if they purchased crab from these areas during the same time frame.

Lastly, sea otter populations are expanding their range in Southeast Alaska. With their reintroduction to Southeast Alaska in 1965, their expansion has been accompanied by drastic declines in the availability of many economically important invertebrate species, including Dungeness crabs. The decline in Dungeness crab harvest in Districts 3, 4, and 14 is attributed to sea otters, whose populations began to rapidly increase in 1987 (Pitcher and Imamura 1990). Sea otters are currently expanding their range into important Dungeness crab fishing Districts 5, 6, 8, and 9 as well.

LACK OF FISHERY INDEPENDENT STOCK ASSESSMENT PROGRAM

In response to the department's concerns over fishery timing excessive fishery capacity and harvest levels, a program of stock assessment pot surveys was initiated. The survey objectives were to describe life history timing of Dungeness crabs in Southeast Alaska and trends in abundance in support of a move towards more abundance-based management. Surveys were conducted in important fishery areas of central and northern Southeast Alaska from 2000 to 2004. However, the survey program was eliminated due to insufficient resources in 2005. To this date there is still no fishery-independent stock assessment program for Dungeness crabs Southeast Alaska. Questions regarding life history timing throughout the region remain and continue to affect management of the fishery.

RESEARCH

In addition to comprehensive fish ticket reporting (by regulation processors are required to submit reports of effort, location and lbs of harvest for each commercial landing), three surveys, occasional onboard observer sampling, occasional on the grounds sampling, and regular dockside sampling have been conducted for the Southeast Alaska Dungeness crab fishery.

SURVEYS

Icy Strait Survey

In July 1987 and May 1988, the department conducted a survey to provide baseline data for an assessment of the effects of sea otters on Dungeness crab populations in the Icy Strait area (Pitcher and Imamura 1990).

Stikine River Flats Survey

In the spring of 1996 and 1997, the department conducted preseason assessment surveys of the Dungeness crab stocks in the Stikine River Flats area (Statistical Areas 108-40 and 108-41) of central Southeast Alaska. This stock is a consistently important contributor to the overall Southeast Alaska harvests. Using a random transect experimental survey design and commercially-configured pots with smaller than usual mesh, the department collected size, sex, and shell hardness data over a period of several days during late May, preceding the commercial fishery which began on June 15. After the season opened, staff conducted on-board field observations of commercial fishing operations in the same general area. The goal of these initial projects was to develop a method for estimating the prevalence of sub-legal and legal-sized soft-shelled male crabs that would be vulnerable to handling by the commercial fleet early in the summer season.

Kittiwake Survey

A Dungeness crab pot survey was conducted from April 2000 to June 2004, with four major objectives:

1. Investigate the utility of abundance-based management tools in this fishery:
    a. develop pre- and postseason indices of abundance for legal and prerecruit males and determine their utility as predictors of harvest;
    b. use a ratio estimator (Dawe et al. 1993) to model the results of pre and post-season surveys and estimate the population size of Dungeness crab in Stikine Flats, Duncan Canal, Port Camden, Berners Bay, Peril Strait, Tenakee Inlet, and St. James Bay;
2. Describe Dungeness crab life history and ecology:
    a. describe timing of life history events;
    b. describe interannual variation in crab size and shell age composition by sex;
    c. describe species composition of invertebrates and fish captured in Dungeness crab pots.
3. Refine pot survey methods for Dungeness crabs:
    a. describe the relationship between crab catch by size and sex and soak time in pots with open and closed escape rings.
4. Describe growth of Dungeness crabs in Southeast Alaska:

Survey findings are summarized as follows.

- From 2000 through 2004, 3,309 commercial pots were set during March/April, June, August/September, and November/December survey periods in nine survey areas: Stikine Flats, Duncan Canal, Kah Sheets Bay, Port Camden, Berners Bay, Peril Strait, Tenakee Inlet, St. James Bay, and Seymour Canal. Not all survey areas were sampled during each survey period and year. Depth-stratified clusters of three or four pots were set in depths from 5.5 to 73.2 m. Clusters had alternately open then closed escape rings, and cluster locations were selected using a systematic sampling design with random start (Bishop et al. *In Prep*.).
- June legal CPUE was a useful index of population size only for Duncan Canal; for other survey areas it had little predictive power as crabs were either not completely catchable or had not yet molted into the fishery in June. Soft shell prevalence peaked in March/April through August/September for males and in August/September for females (Bishop et al. *In Prep*.).
- Data were modeled using Change-in-Ratio and Index-Removal methods to estimate legal population size, catchability, and exploitation rates. Change-in-Ratio population estimation yielded exploitation rates averaging 93% and 99% respectively, for Stikine Flats and Duncan Canal open escape ring pots and 83% and 83% for Peril Strait and Tenakee Inlet closed escape ring pots. In Port Camden, St. James Bay, and Berners Bay, low, variable and even negative exploitation rates were estimated, probably as a result of an inseason recruitment molt, which violates the assumption of a closed population. The Index-Removal method produced exploitation rate estimates that were biased low due to catchability increasing between the two survey periods. The variable success of the two methods demonstrates a high level of spatial and temporal variability in Dungeness crab life history timing, and makes their assessment very difficult (Bishop et al. 2010).
- Crabs were tagged in seven areas from 2000 to 2003. Tag-recapture data was analyzed to determine molt increment and molt probability. The molt increment of 29.9 mm CW was independent of pre-molt size for the adult male size range considered. Thus, the current size limit protects males to reproduce once before harvest. Molt probability at the legal size limit of 165 mm CW was 48%, declining to near zero for crabs of 172 mm CW. Although information on the growth of smaller instars is needed, the age at first harvest is likely at least 4 years (Bishop et al. 2007).

ONBOARD OBSERVER SAMPLING

During the 1998/1999 season, two onboard observing trips were conducted in the Stikine River Flats area.

ON THE GROUNDS SAMPLING

During the 1999/2000 commercial season, twenty separate commercial Dungeness crab vessels were sampled on the grounds during two separate fishing periods (June and October) in three areas, Stikine River Flats, Thomas Bay, and Duncan Canal, aboard the department research vessel *Kittiwake*.

DOCKSIDE SAMPLING

Since 1985, commercial Dungeness crab landings in Southeast Alaska have been sampled in the ports of Petersburg, Wrangell, Sitka, Juneau, Ketchikan, and Haines. Goals of the dockside sampling program are to describe the size and shell age composition, average weight, and catch rates of Dungeness crabs in the commercial fishery. Port samplers measure the crab, determine shell condition, and check for damage to the carapace and legs. By analyzing these data and knowledge of Dungeness crab growth rates the department can determine the recruit class composition of the harvest (Tables 2.4 and 2.5).

In order to gain a better understanding of spatial and interannual variability in shell condition and of market limits, shell hardness of delivered and discarded crabs was measured with durometers during 2009/2010 and 2010/2011 commercial seasons (Bishop and Reynolds *In Prep*.).

RECENT SEASONS

2008/2009 SEASON SUMMARY

The predicted harvest for the 2008/2009 season was above the Dungeness crab management plan threshold so the season length was not curtailed. A total of 3,755,556 lbs were harvested during the summer fishery (79%) and 976,112 lbs were harvested during the fall fishery (21%) for a total harvest of 4,731,668 lbs by 207 permit holders (Table 2.1). Districts 6, 8, 9, and 11 had the largest harvests when compared to the other Districts (Table 2.2). Harvest in June and July combined made up 67% of the full season harvest (Table 2.3). Landed crabs were 92% recruits, similar to the 2007/2008 season (Table 2.4). For the entire 2008/2009 season, 0.8% of the commercial harvest was sampled. Landed crabs averaged 2.1 lbs (Table 2.5) and were purchased for an average of $2.18 per pound (Table 2.1). Total exvessel value of the 2008/2009 fishery was $10,281,485.

2009/2010 SEASON SUMMARY

The predicted harvest for the 2009/2010 season was above the Dungeness crab management plan threshold so the season length was not curtailed. During the 2009/2010 fishery 194 permit holders harvested a total of 3,569,697 lbs of Dungeness crabs during the full season (Table 2.1). Seventy-three percent of the harvest, or 2,620,083 lbs were taken during the summer fishery and the remaining 27%, or 949,614 lbs were taken during the fall fishery. District 8 was again a large producer, with 17%of the overall harvest, 13% of the harvest came from District 11 (Table 2.2). Harvest in June and July combined made up 62% of the full season harvest (Table 2.3). Landed crabs were 92% recruits, same as the 2008/2009 season (Table 2.4). Harvested crabs were sold for an average of $1.72 per lb (Table 2.1) and averaged 2.0 lbs each (Table 2.5). Total exvessel value of the 2009/2010 fishery was $5,972,981.

2010/2011 SEASON SUMMARY

The harvest estimate from the first weeks catch was above the Dungeness crab management plan threshold and the 2010/2011 fishery was not curtailed. The overall harvest was 3,245,265 lbs taken by 176 permit holders (Table 2.1). Summer season landings totaled 2,672,837 lbs, which was 82% of the total harvest. The fall/winter season landings totaled 572,428 lbs, or 18% of the total harvest. Districts 8 and 11 saw the largest harvests with 20% and 18% of the total harvest, respectively (Table 2.2). Harvest in June and July combined made up 75% of the full season

harvest (Table 2.3), up from the previous two seasons. Landed crabs were 92% recruits, the same as the last several seasons (Table 2.4) and the average weight was 2.1 lbs (Table 2.5). Dungeness crabs sold for an average of $1.78 per lb for a total fishery exvessel value of $5,525,404.

2011/2012 SEASON OUTLOOK

Preliminary harvest figures indicate that approximately 2.0 million lbs of Dungeness crabs were harvested during the 2011/2012 summer season which is below the ten-year average for summer seasons of 3.3 million lbs. The number of permits reporting harvest for the summer season was 142, the ten-year average for summer seasons of 191 permits. One possible reason for the low effort this last summer could be due to the high salmon prices and Dungeness crab permit holders opting to participate in the various salmon fisheries rather than the Dungeness crab fishery. Another potential factor reducing effort this season is sea otter expansion into major fishing grounds, namely the waters around Kake. The average price per pound for the summer season was $2.25.

CHAPTER 2—TABLES AND FIGURES

Table 2. 1–Registration Area A (Southeast Alaska) commercial Dungeness crab fishery catch, effort, and value, 1960 to present.

Year/Season	Number				Pounds per permit	Pots lifted	CPUE	Mean weight	Price per pound
	Permits	Landings	Crabs	Pounds					
1960	NA	NA	NA	1,449,405	NA	NA	NA	NA	NA
1961	NA	NA	NA	671,455	NA	NA	NA	NA	NA
1962	NA	NA	NA	2,985,939	NA	NA	NA	NA	NA
1963	NA	NA	NA	3,296,362	NA	NA	NA	NA	NA
1964	NA	NA	NA	3,996,100	NA	NA	NA	NA	NA
1965	NA	NA	NA	2,392,395	NA	NA	NA	NA	NA
1966	NA	NA	NA	1,968,117	NA	NA	NA	NA	NA
1967	NA	NA	NA	2,033,156	NA	NA	NA	NA	NA
1968	NA	NA	NA	1,900,690	NA	NA	NA	NA	NA
1969/70	24	392	NA	1,149,111	47,880	NA	NA	NA	NA
1970/71	21	380	NA	770,679	36,982	NA	NA	NA	NA
1971/72	22	315	NA	452,681	20,576	NA	NA	NA	NA
1972/73	31	316	NA	596,297	19,338	NA	NA	NA	NA
1973/74	41	483	NA	748,519	18,257	NA	NA	NA	NA
1974/75	55	453	NA	715,249	13,005	NA	NA	NA	NA
1975/76	36	344	285,459	611,621	16,989	NA	NA	2.1	NA
1976/77	25	173	225,217	515,023	20,615	NA	NA	2.3	NA
1977/78	12	87	58,046	116,105	10,612	NA	NA	2.2	NA
1978/79	25	208	345,379	754,698	30,190	NA	NA	2.2	NA
1979/80	37	313	371,670	794,818	21,669	NA	NA	2.2	NA
1980/81	26	227	236,630	511,163	20,048	NA	NA	2.2	NA
1981/82	75	749	1,266,271	2,932,427	39,099	NA	NA	2.3	NA
1982/83	129	1,298	1,551,520	3,662,112	28,388	NA	NA	2.4	NA
1983/84	132	1,536	942,477	2,155,849	16,332	NA	NA	2.3	NA
1984/85	183	1,593	847,824	1,843,521	10,074	NA	NA	2.2	$0.90
1985/86	216	2,077	1,059,747	2,316,885	10,727	159,300	7	2.2	$1.22
1986/87	224	2,330	1,184,771	2,453,055	10,951	232,328	5	2.1	$1.02
1987/88	241	2,746	1,611,101	3,391,699	14,073	279,244	6	2.1	$1.08
1988/89	264	2,683	1,517,105	3,321,734	12,582	248,755	6	2.2	$0.91
1989/90	245	2,096	875,861	1,907,276	7,832	194,239	5	2.2	$1.06
1990/91	243	2,342	1,293,809	2,662,792	10,958	329,916	4	2.1	$1.44
1991/92	318	3,386	2,260,678	4,707,106	14,802	462,425	5	2.1	$1.21
1992/93	245	2,497	1,424,742	3,094,079	12,634	313,522	5	2.2	$0.84
1993/94	198	1,956	1,167,481	2,536,701	12,812	271,474	4	2.2	$0.92
1994/95	184	1,787	927,878	1,920,378	10,444	230,595	4	2.1	$1.10
1995/96	201	2,737	2,176,200	4,404,519	21,913	460,378	5	2.0	$1.62
1996/97	203	2,896	2,406,434	5,005,840	24,659	399,472	6	2.1	$0.96
1997/98	232	4,043	1,921,545	4,062,543	17,511	616,608	3	2.1	$2.18
1998/99	244	3,134	1,132,885	2,329,499	9,547	481,214	2	2.1	$1.47
1999/00	198	2,862	1,611,136	3,280,503	16,568	474,986	3	2.0	$1.64

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Table 2.1–Page 2 of 2.

Year/Season	Number				Pounds per permit	Pots lifted	CPUE	Mean weight	Price per pound
	Permits	Landings	Crabs	Pounds					
2000/01	199	2,380	1,254,573	2,565,410	12,892	400,616	3	2.0	$1.50
2001/02	209	3,059	2,099,643	4,104,128	19,637	539,636	4	2.0	$1.73
2002/03	220	3,561	3,512,242	7,332,665	33,330	785,936	4	2.1	$1.07
2003/04	209	2,931	2,184,724	4,537,049	21,708	609,085	4	2.1	$1.32
2004/05	199	2,409	2,239,558	4,589,001	23,060	564,558	4	2.0	$1.36
2005/06	189	2,203	2,039,101	4,205,480	22,251	468,400	4	2.1	$1.21
2006/07	171	2,074	2,228,852	4,503,970	26,339	468,426	5	2.0	$1.38
2007/08	193	2,841	2,657,986	5,408,355	28,023	647,401	4	2.0	$2.13
2008/09	207	2,816	2,327,846	4,730,711	22,858	646,811	4	2.0	$2.18
2009/10	194	2,441	1,747,512	3,569,697	18,401	535,685	4	2.0	$1.72
2010/11	176	2,208	1,578,047	3,245,265	18,439	445,348	4	2.1	$1.78
5-year average	188	2,476	2,108,048	4,291,791	22,812	548,734	4	2	$1.85

Note: NA= not available.

Table 2.2–Catch and effort by district for the commercial Dungeness crab fishery in Registration Area A, 2004/2005 season to present.

District	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	Totals
1	197,842	118,796	73,614	47,781	65,274	85,509	120,826	107,517
2	85,253	63,768	68,114	138,147	67,006	116,964	85,338	89,516
3	25,472	39,704	44,342	40,441	[a]	15,489	[a]	34,020
4	0	0	0	0	0	[a]	[a]	[a]
5	85,171	56,731	114,851	204,713	360,651	130,014	77,066	215,685
6	826,111	708,441	509,390	696,243	592,223	405,392	542,259	824,115
7	248,544	190,936	152,375	184,092	154,903	90,916	172,434	205,092
8	652,588	948,483	1,011,573	1,017,894	844,572	607,202	641,618	931,438
9	473,614	316,497	545,360	908,960	612,171	339,981	132,734	617,422
10	357,632	209,763	309,884	549,674	378,122	315,785	225,245	304,199
11	570,564	567,509	865,895	484,202	637,676	489,839	581,629	547,887
12	448,333	380,441	305,700	284,288	293,955	220,526	109,049	293,081
13	181,038	181,384	251,305	194,512	161,767	308,514	104,179	175,714
14	336,717	269,926	113,207	282,391	229,345	185,834	184,786	181,916
15	100,122	153,101	138,360	375,017	325,792	254,847	259,680	127,770
Total	4,589,001	4,205,480	4,503,970	5,408,355	4,731,668	3,569,697	3,245,265	4,655,371

[a] Fewer than 3 permits were fished; information is confidential.

Table 2.3– Registration Area A (Southeast) commercial Dungeness crab fishery catch by month from 1969/1970 season to present in pounds.

Season	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Total
1969/70	210,941	106,248	47,305	14,167	5,008	7,084	8,068	21,348	84,909	201,026	217,524	225,483	1,149,111
1970/71	122,623	68,644	35,867	9,312	5,567	4,563	[a]	11,123	37,045	168,485	150,383	157,067	770,679
1971/72	88,861	63,283	23,306	10,912	6,955	1,755	2,183	7,366	27,392	43,563	97,816	79,289	452,681
1972/73	83,561	49,466	31,516	16,746	3,532	1,447	[a]	4,237	30,461	38,606	167,156	169,569	596,297
1973/74	87,311	71,607	27,469	8,764	3,459	4,745	9,869	16,884	40,893	142,395	205,799	129,324	748,519
1974/75	84,977	53,947	27,885	26,478	6,298	13,717	18,056	24,762	21,464	135,529	167,131	135,005	715,249
1975/76	82,751	49,676	25,868	11,725	6,855	3,005	9,886	18,101	35,906	110,226	136,819	120,803	611,621
1976/77	46,068	32,006	13,826	11,070	4,128	6,060	0	[a]	0	105,864	206,112	89,889	515,023
1977/78	31,376	15,915	24,956	6,291	[a]	7,997	0	0	0	[a]	[a]	29,570	116,105
1978/79	104,639	70,406	43,321	23,033	18,229	[a]	0	0	0	126,420	206,929	152,721	745,698
1979/80	137,494	75,079	52,076	30,098	12,670	[a]	0	0	0	165,728	184,630	137,043	794,818
1980/81	69,865	36,342	30,249	15,064	8,599	[a]	0	0	0	62,684	166,140	122,220	511,163
1981/82	427,076	292,859	164,235	67,699	28,413	34,251	0	0	0	460,619	896,944	560,331	2,932,427
1982/83	450,388	218,577	144,551	83,744	16,250	22,883	0	0	0	941,641	1,048,742	735,336	3,662,112
1983/84	267,566	146,550	84,479	45,845	30,897	14,702	0	0	0	775,324	453,526	336,960	2,155,849
1984/85	279,568	157,009	137,374	59,151	27,024	15,466	0	0	0	0	677,982	489,947	1,843,521
1985/86	[a]	380,060	178,215	55,702	29,746	20,111	0	0	0	362,973	849,615	440,463	2,316,885
1986/87	0	455,224	274,451	100,322	57,950	48,885	0	0	0	272,989	796,367	446,867	2,453,055
1987/88	0	479,320	281,602	109,622	63,054	60,175	0	0	0	572,329	1,185,935	639,662	3,391,699
1988/89	0	312,008	178,232	43,786	17,382	19,950	0	0	0	775,398	1,401,800	573,178	3,321,734
1989/90	0	207,015	96,004	15,179	[a]	[a]	0	0	0	500,788	820,896	267,394	1,907,276
1990/91	0	499,302	281,647	8,551	1,053	3,272	0	0	0	582,317	926,234	360,416	2,662,792
1991/92	0	717,506	324,070	17,086	7,561	4,422	0	0	0	987,389	1,821,479	827,593	4,707,106
1992/93	0	177,194	101,101	12,403	[a]	4,025	0	0	0	935,175	1,360,389	503,792	3,094,079
1993/94	0	232,813	116,882	11,727	4,734	5,806	0	0	0	660,473	1,106,117	398,149	2,536,701
1994/95	0	242,047	97,299	38,076	[a]	[a]	0	0	0	523,740	716,277	302,939	1,920,378
1995/96	0	627,671	229,009	35,131	16,780	25,555	0	0	0	1,193,222	1,630,576	646,575	4,404,519
1996/97	0	686,308	314,634	35,442	19,408	30,821	0	0	0	1,197,906	1,925,600	795,721	5,005,840
1997/98	0	524,626	219,601	65,279	64,055	37,457	0	0	0	1,128,616	1,568,198	454,711	4,062,543
1998/99	0	383,335	178,943	33,544	19,080	5,345	0	0	0	853,216	672,988	183,048	2,329,499

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Table 2.3–Page 2 of 2.

Season	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Total
1999/00	0	370,194	166,974	23,788	12,290	2,317	0	0	0	1,331,925	1,050,893	322,122	3,280,503
2000/01	0	299,645	136,807	7,524	9,692	2,846	0	0	0	975,841	884,852	248,203	2,565,410
2001/02	0	693,816	263,849	35,115	14,127	1,777	0	0	0	1,541,443	1,166,262	387,739	4,104,128
2002/03	0	977,240	355,447	36,871	21,451	4,800	0	0	0	2,169,951	2,885,891	881,014	7,332,665
2003/04	0	836,212	290,595	34,967	15,949	12,550	0	0	0	1,628,596	1,339,496	378,684	4,537,049
2004/05	0	607,852	236,475	36,010	7,408	11,352	0	0	0	1,829,607	1,454,980	405,947	4,589,631
2005/06	0	720,388	238,024	26,301	13,107	2,470	0	0	0	1,785,128	1,084,237	335,825	4,205,480
2006/07	0	783,691	204,913	14,046	2,704	1,665	0	0	0	1,741,957	1,254,440	500,554	4,503,970
2007/08	0	1,357,627	415,923	30,735	5,695	1,327	0	0	0	1,204,153	1,504,129	888,766	5,408,355
2008/09	0	801,375	168,098	4,620	1,122	[a]	0	0	0	1,546,315	1,645,744	563,497	4,730,771
2009/10	0	739,398	210,216	0	0	0	0	0	0	1,101,310	1,112,933	405,840	3,569,697
2010/11	0	453,422	114,467	[a]	[a]	0	0	0	0	1,431,374	1,008,528	232,935	3,245,265

[a] Fewer than 3 permits were fished; information is confidential.

Table 2.4–Summary of commercial Dungeness crab size frequency and shell condition data collected during dockside sampling in Registration Area A, 1975/1976 to present.

	Number sampled		Carapace width (mm)		Recruitment	
Season	Boats	Crab	Mean	Range	% Recruit[a]	% Postrecruit[b]
1975/76	19	1,930	180.4	154–217	79.0	21.0
1976/77	3	304	177.5	159–204	80.3	19.7
1977/78	6	624	178.7	159–211	45.4	54.6
1978/79	11	1,130	180.0	161–213	75.4	24.6
1979/80	4	422	181.3	160–217	77.7	22.3
1980/81	5	447	179.8	161–207	82.4	17.6
1981/82	12	1263	182.6	160–215	62.9	37.1
1982/83	9	849	187.2	164–218	65.3	34.7
1983/84	11	1205	185.7	159–225	61.7	38.3
1984/85	3	303	175.9	164–205	89.0	11.0
1985/86	26	2650	177.7	157–228	88.3	11.7
1986/87	29	2872	177.3	156–228	82.6	17.4
1987/88	63	6226	178.5	160–213	75.2	24.8
1988/89	81	7595	182.1	157–225	65.1	34.9
1989/90	75	7123	181.0	157–220	56.8	43.2
1990/91	166	16,399	174.9	156–223	86.8	13.2
1991/92	172	16,897	178.6	153–230	87.0	13.0
1992/93	146	14,262	180.2	157–215	78.0	22.0
1993/94	81	7,628	181.8	155–226	77.7	22.3
1994/95	79	7,832	176.2	160–222	86.7	13.3
1995/96	136	13,621	175.6	158–228	90.0	10.0
1996/97	222	11,196	178.5	154–215	81.7	18.3
1997/98	200	10,263	179.2	156–220	81.2	18.8
1998/99	196	10,145	176.9	101–216	74.4	25.6
1999/00	262	13,257	176.2	110–212	66.1	33.9
2000/01	337	16,863	176.9	87–213	81.8	18.2
2001/02	494	24,704	174.7	153–219	93.0	7.0
2002/03	424	21,331	178.9	140–225	90.8	9.2
2003/04	425	21,590	178.5	93–224	89.9	10.1
2004/05	433	21,876	178.0	140–215	90.5	9.5
2005/06	397	19,910	177.8	90–233	93.1	6.9
2006/07	455	22,771	176.8	157–230	95.7	4.3
2007/08	400	20,948	177.4	123–229	91.8	8.2
2008/09	354	18,926	177.7	160–225	92.0	8.0
2009/10	376	20,214	177.1	140–223	91.9	8.1
2010/11	354	18,912	178.8	159–216	91.6	8.4

[a] Recruit = all new and soft shell crab ≥165 mm and ≤194 mm carapace width excluding spines.

[b] Postrecruit = all new and soft shell crab >194 mm and old and very old shell crab ≥165 mm carapace width.

Table 2.5–Dungeness crab catch rate and weights in Registration Area A, 1975/1976 to present. Data were collected during dockside sampling and interviews.[a]

	Number					Weight (lb)			
Season	Boats inter-viewed	Pots lifted	Crab captured	Mean no./ pot	Range no./pot	Mean	Range	Estimated no. crab harvested [b]	Percent harvest sampled [c]
1975/76	[d]	-	-	-	-	-	- -		-
1976/77	[d]	-	-	-	-	-	- -		-
1977/78	[d]	-	-	-	-	-	- -		-
1978/79	5	-	-	-	-	2.2	2.0–2.5	343,072	0.3
1979/80		-	-	-	-	-	-	-	-
1980/81	[d]	-	-	-	-	-	-	-	-
1981/82	[d]	-	-	-	-	-	-	-	-
1982/83	4	2,475	13,000	5.3	4.3–7.3	2.7	2.7–2.7	1,355,487	0.1
1983/84	7	1,680	1,540	0.9	2.6–6.3	2.3	2.0–2.7	937,131	0.1
1984/85	[d]	-	-	-	-	-	-	-	-
1985/86	23	675	4,881	7.2	4.6–14.4	2.1	1.7–2.6	1,092,120	0.2
1986/87	28	3,888	20,603	5.3	2.7–11.5	2.0	1.7–2.3	1,207,400	0.2
1987/88	61	9,597	44,812	4.7	1.1–11.6	2.1	1.7–2.6	1,634,112	0.4
1988/89	81	16,342	86,143	5.3	0.4–15.0	2.3	1.6–2.6	1,473,599	0.5
1989/90	113	20,681	68,537	3.3	0.2– 9.6	2.1	1.6–2.7	901,388	0.8
1990/91	166	40,802	173,431	4.3	0.5–11.3	2.0	1.6–2.2	1,357,030	1.2
1991/92	177	54,269	270,611	5.0	1.0–13.9	2.1	1.7–2.6	2,208,700	0.8
1992/93	146	34,288	152,641	4.5	0.9–14.0	2.2	1.9–2.7	1,406,209	1.0
1993/94	81	16,616	59,540	3.6	0.6–12.5	2.3	1.7–2.8	1,107,730	0.7
1994/95	79	17,448	62,640	3.6	0.8–8.6	2.0	1.8–2.6	941,835	0.8
1995/96	136	40,967	231,165	5.6	0.3–18.7	2.0	1.7–2.3	2,235,177	0.6
1996/97	222	54,835	303,170	5.5	0.6–26.5	2.1	1.7–2.8	2,406,275	0.5
1997/98	195	52,778	151,957	2.9	0.7–10.0	2.1	1.3–2.9	1,905,850	0.5
1998/99	194	49,340	144,884	2.9	0.6–35.3	2.1	1.7–2.5	1,136,341	0.9
1999/00	261	66,992	254,327	3.8	0.5–32.3	2.0	1.7–2.3	1,623,284	0.8
2000/01	339	99,052	322,024	3.3	0.2–8.8	2.1	1.3–4.9	1,212,583	1.4
2001/02	494	160,978	743,736	4.6	0.8–18.8	2.0	1.5–2.5	2,069,081	1.2
2002/03	423	160,698	761,474	4.7	0.1–53.3	2.1	1.7–6.3	3,473,886	0.6
2003/04	422	143,519	606,003	4.2	0.1–15.7	2.1	1.5–6.2	2,147,049	1.0
2004/05	433	181,955	725,892	4.0	0.1–18.1	2.1	1.8–2.5	2,204,509	1.0
2005/06	395	129,471	618,833	4.8	0.6–14.5	2.1	1.7–2.8	2,031,544	1.0
2006/07	455	144,864	759,336	5.2	1.0–19.7	2.0	1.7–2.4	2,229,688	1.0
2007/08	400	136,926	606,900	4.4	0.7–16.8	2.0	1.7–2.5	2,651,154	0.8
2008/09	353	130,617	513,144	3.9	0.5–27.5	2.1	1.8–2.6	2,308,131	0.8
2009/10	376	139,095	486,999	3.5	0.5–14.6	2.0	1.7–2.4	1,749,851	1.2
2010/11	354	109,371	396,471	3.6	0.7–14.3	2.1	1.4–2.5	1,530,785	1.2

[a] Includes data collected that could not be assigned to a fishing area.

[b] Calculated by dividing fish ticket weight data from Table 2.1 by dockside sampling average weight per crab data.

[c] Calculated by dividing number of crab sampled for size frequency by estimated number of crab caught.

[d] Where fewer than 3 permits were fished the information is confidential.

Figure 2.1–Dungeness crab survey locations in Southeast Alaska.

CHAPTER 3: YAKUTAT DUNGENESS CRAB FISHERY

INTRODUCTION

Dungeness crabs, *Cancer magister*, are members of the highly evolved brachyuran (true crab) infraorder of the subphylum Crustacea. They are commercially significant and widely distributed in coastal waters of the eastern Pacific Ocean from Santa Barbara, California to the Pribilof Islands (Jensen 1995).

Yakutat Dungeness crab management is by sex, size and season. In order to conserve reproductive potential, only male crabs with a minimum CW of 6 ½ inches notch to notch may be harvested. The season is from May 15 through July 14 and from November 1 through February 28. Although the Yakutat Dungeness crab fishery is under open entry, Yakutat is a superexclusive registration area for Dungeness crab; a vessel registered to fish in this area cannot register or fish in any other area in Alaska during the same calendar year.

Fishing grounds in Yakutat (Registration Area D) are close to the northern limit of Dungeness crab distribution. Within Yakutat waters Dungeness crabs are widely distributed, but tend to concentrate off ocean beaches in two to 10 fathoms. Some of the most productive summer fishing occurs in the shore break of exposed beaches. Although the fishery extends along the entire coast, much of the total harvest is taken from four or five distinct, localized fishing grounds. During the 40 seasons from 1960/1961 to 1999/2000, Yakutat produced a long-term average harvest of about 1.37 million lbs per season but with a downward trend occurring since 1992/1993–1993/1994 (Table 3.1). Historically, the product was marketed as canned or frozen meat, sections, and whole-cooked or live crab. In later years, whole cooked or live crab entered the summer tourist markets in Washington, Oregon, and California.

This Yakutat Area Dungeness crab fishery was closed beginning with the 2000/2001 season. Fish ticket and dockside sampling data provided the first indications of low stock abundance and 1989/1990 and 1999/2000 fishing seasons were closed early. A survey was conducted in 2004 to evaluate stock status. The Yakutat Area Dungeness crab fishery will remain closed until stock status improves and a management and research program designed to provide sustained yields is implemented.

Anyone with a permit and license could register a vessel to crab in this area if the fishery were open. Historically, up to 67 permits fished in the Yakutat area. For three seasons preceding the closure of the fishery, an average 23 permits were fished. Most participating vessels are 50 ft overall length or larger, with some vessels up to 90 ft in overall length. Almost all fishery participants have used standard, hatbox-shaped pots constructed with steel frames and webbed with stainless steel wire.

This report will describe the Yakutat Area Dungeness crab fishery development and history, regulation development, management concerns, and research. It is intended to provide a comprehensive overview to the board on the Yakutat Area Dungeness crab fishery to facilitate promulgation of regulations. It is also intended to inform the public about the Yakutat Area Dungeness crab fishery, and acts as an Annual Management Report for this fishery to provide transparent fishery management.

FISHERY DEVELOPMENT AND HISTORY

Through much of its history, from the mid-1920s to the mid-1960s, Southeast Alaska and Yakutat were managed as a single unit. Prior to the 1960s, harvests from much of the Gulf of

Alaska were combined into a single total; Yakutat contributions were significant, but the exact percentages are unavailable.

Since the early 1960s, the fishery in the Yakutat area has evolved through two major periods. Between the early 1960s and the 1981/1982 season, landings and participants fluctuated widely (Table 7.1). Until the early 1980s, demand for Dungeness crab from Yakutat was generally inversely related to the availability of crab from Washington, Oregon, and California and highly dependent on the willingness of one or two major processors to purchase crab during the summer. The fishery was market driven.

Between the 1981/1982 and 1995/1996 seasons, effort and participation generally increased. As the preferred product form changed from frozen or canned meat to air-freighted live crab, there was increasing interest from processors to handle Dungeness crab. For many crabbers from the Pacific Northwest, the Yakutat summer fishery was attractive because their home waters are closed during the summer. The rising demand in the early 1980s coincided with the entry of a large recruit class into the fishery and a decline in harvests from Washington, Oregon, and California. The recruit year class supported increasing fishing effort through the next two seasons and set the pattern for development of the fishery, which is driven by stock abundance.

REGULATION DEVELOPMENT

The documented regulatory history of the Yakutat Area Dungeness crab fishery started in 1924. Most management jurisdictions within the range of this species employ passive management measures such as size limits, restricting harvest to males, and specifying a season that avoids known sensitive molting and mating periods. In Yakutat, this management triad, called 3-S management (size, sex, and season), is compromised somewhat since the summer season overlaps with a portion of time males and females are molting and mating. The current May 15 to July 15 opening is a compromise developed over many years to avoid the major molts to the extent possible, while maximizing economic returns. There are few alternatives to a summer season in Yakutat because the most productive grounds are exposed to extreme weather conditions in the winter. Classical 3-S management usually is not effective to manage intensive, highly competitive fisheries.

Alternatives to 3-S management including harvest rates or guideline harvest levels based on stock assessment surveys, could structure harvest to protect weak stock segments or soft-shell crabs while optimizing exploitation rates and product quality. The department is unlikely to reopen the Yakutat Area commercial Dungeness crab fishery without additional management measures.

FISHING SEASONS AND PERIODS

For most years and seasons before 1975/1976, the fishery was open all year. The accounting period started on January 1 and ended on December 31. In 1975, following eight consecutive years of harvests between one and two million lbs and a rapid rise in the number of fishing vessels; the season was shortened to May 16 through February 28, 1976. It was then closed in the summer by emergency order because large numbers of soft-shelled crab were observed in the landed harvest. The 1976/1977 season started on June 1, with a scheduled closure on February 28, 1977. The season opening and closing dates remained the same through the 1981/1982 season, although several intervening seasons were closed by emergency order when large numbers of soft-shells were sampled at the dock. The season changed again in 1982, to May 1

through February 28, 1983. Each season from 1982/1983 through 1984/1985 was closed by emergency order at some point in the summer due to increasing numbers of soft shells in the landed harvest. In 1985, a split season was implemented from May 1 through July 14, and November 1 through February 28, 1986. Management of the summer fishery focused on avoiding major male molts, which frequently start on the western grounds around Icy Bay and move eastward through the summer. The summer season was generally tailored to start after the major molt on the western grounds, and end before the major molt in the Yakutat Bay stocks. By 1986, it was evident that the May 1 opening was too early and the season was shortened to start on May 15. For each season since, the summer segment of the season has started on May 15 and ended on July 14, and the winter segment has started on November 1 and ended on February 28. The timing of the winter segment was intended to provide a fishery for local residents fishing in Yakutat Bay.

Although there were no specific proposals addressing Yakutat stock status before the board in 1997, the board directed the department to take steps to conserve the Yakutat Area Dungeness crab stock. In the first three weeks of the 1997/1998 season, a large portion of the harvest was recruit size crab, which coupled with low abundance, was indicative of poor stock condition. An emergency order closure was issued for June 13, 1997 to foster recovery of the stock. The winter portion of the fishery was closed to allow an accrual of benefits from the summer closure; however, the 1998/1999 fishery indicated further recruitment failure and overall low stock abundance. On June 9, 1998 the fishery was closed early for the second consecutive season and on June 15, 1999, the fishery was closed by emergency order for a third season. In 2000 the board designated the Yakutat Area Dungeness crab fishery as a collapsed and recovering fishery and the fishery has been closed since then.

SIZE RESTRICTIONS

From 1924 to 1935, the legal size of male crabs was 6 ½-inches in greatest width of carapace or "tip to tip" width. This changed in 1936 to 7 inches and remained unchanged until 1963, when the measurement was redefined as 6 ½ inches in width, measured immediately anterior to the tenth anterolateral spines. This was essentially the equivalent of a 7-inch total shell width measurement but more consistent since damage to the tips of the tenth anterolateral spines is common, particularly in older shell crabs. This measurement standard, termed "shoulder width," or "notch to notch" width has been in effect since then.

GEAR RESTRICTIONS

In 1934, trawls were prohibited. Only pots or ring nets were allowed from 1954 to 1965. A gear limit of 300 pots or ring nets was implemented in 1963. In 1966, diving gear was legalized. The legal limit for pots and ring nets was raised to 600 pots in 1968. In 1995 the legal limit for pots was reduced to 400. This limit continues to the present. Two escape rings with a minimum inside diameter of 4 3/8-inches were first required in 1976. The intent of escape rings is to permit the escape of sublegal males and females, which are usually smaller than legal males. In 1977, a Dungeness pot was defined as a pot with tunnel eye openings, which individually do not exceed 30 inches in perimeter. A biodegradable natural fiber-breaking strap for the pot tiedown has been required since 1978. Originally specified for a maximum of 120-thread, it was reduced in 1990 to 30-thread, then increased in 1991 to 60-thread.

OTHER REGULATIONS

Registration and hold inspections were required starting in 1974. In midsummer 1983, Yakutat was designated a superexclusive registration area and vessels registering to fish in the Yakutat Area were prohibited from fishing in any other area in Alaska for the calendar year. The hold inspection requirement was repealed in 1984, although registration was still required. In the same year, the area between Sitkagi Bluffs and Cape Yakataga, the western half of the Yakutat fishing district, was designated a non-exclusive area. The partial non-exclusive area was difficult to enforce and other problems led to redesignation of the entire Yakutat fishing district as a superexclusive registration area in 1985. In 1986, Yakutat was designated as Registration Area D, distinct and separate from Southeast Alaska (Registration Area A).

MANAGEMENT CONCERNS

The Yakutat Dungeness crab fishery was designated as collapsed in 2000. Although the department has not established a policy on re-opening of collapsed fisheries, this process will likely be stepwise. The first step is to demonstrate stock recovery.

Once recovery is demonstrated full re-opening of the fishery must be contingent upon funding of a well-developed management and research program designed to provide sustained yields. This would include a preseason pot survey, inseason dockside sampling based in Yakutat, and a management program with associated biometric support. This program would require significant long-term funding. Additionally, the department is concerned about its ability to manage the fishery with the 400 pot limit allowed in regulation.

RESEARCH

In addition to comprehensive fish ticket reporting (by regulation processors are required to submit reports of effort, location and pounds of harvest for each commercial landing), a single survey and sporadic dockside sampling have been conducted for the Yakutat Dungeness crab fishery.

SURVEYS

A survey of Yakutat Dungeness crab grounds was conducted in 2004. The primary objective of this survey was to determine the catch rate of legal male Dungeness crabs, simulating commercial fishing methods. The secondary objective was to collect size and sex data from Dungeness crabs captured using standard department survey sampling protocols.

In order to simulate commercial fishing methods, the survey contractor selection criteria stipulated that the captain must have experience commercial fishing for Dungeness crab in the Yakutat area. The contractor was required to simulate commercial fishing techniques as close as possible so pot locations and soak times were not predetermined, but pot pulls were required to be distributed by subdistrict approximately proportional to the historic harvest distribution.

From May 19 to 25, the contractor set 605 pots in five statistical areas, 181-10, 181-40, 181-50, 181-60, and 183-10 (Table 3.2, Figure 3.1). A department biologist onboard enumerated and sampled the catch and recorded pot locations. A total of 95 legal male crabs were captured.

A request for quotations (RFQ) to conduct a Yakutat Dungeness crab survey in June 2011 was announced by news release on March 21, 2011. The single respondent was awarded the contract,

but was subsequently forced to retract his bid due to unforeseen circumstances. There was insufficient time remaining to re-release a new RFQ and the survey was cancelled.

The department plans to issue a news release in March 2012 announcing the availability of an RFQ to conduct a survey in June 2012.

DOCKSIDE SAMPLING

Sporadic dockside sampling of the landed harvest in Registration Area D has been conducted since the 1975/1976 season (Tables 3.3 and 3.4). Goals of the dockside sampling are to describe the size and shell age composition, average weight, and catch rates of Dungeness crab in the commercial fishery. Port samplers measure the crab, determine shell condition, and check for damage to the carapace and legs. From this and knowledge of crab growth, the department can determine the recruit or year-class composition of the harvest. For the Yakutat fishery, the wide range of landing ports (as far away as Cordova) and very sporadic deliveries make it difficult to schedule dockside sampling of deliveries.

Table 3.1– Registration Area D (Yakutat) commercial Dungeness crab fishery catch, effort, and value, 1960 to present.

	Number				Pounds per	Pots		Mean
Year/Season	Permits	Landings	Crabs	Pounds	permit	lifted	CPUE	weight
1960	NA	NA	NA	543,762	NA	NA	NA	NA
1961	NA	NA	NA	1,023,545	NA	NA	NA	NA
1962	NA	NA	NA	937,051	NA	NA	NA	NA
1963	NA	NA	NA	1,383,298	NA	NA	NA	NA
1964	NA	NA	NA	637,140	NA	NA	NA	NA
1965	NA	NA	NA	910,278	NA	NA	NA	NA
1966	NA	NA	NA	528,060	NA	NA	NA	NA
1967	NA	NA	NA	2,031,460	NA	NA	NA	NA
1968	NA	NA	NA	2,096,119	NA	NA	NA	NA
1969/70	11	107	522,840	1,223,240	111,204	NA	NA	2.3
1970/71	10	83	661,629	1,508,561	150,856	NA	NA	2.3
1971/72	7	88	524,208	1,212,198	173,171	NA	NA	2.3
1972/73	9	85	NA	1,992,574	221,397	NA	NA	NA
1973/74	27	236	NA	2,347,752	86,954	NA	NA	NA
1974/75	22	154	NA	1,031,573	46,890	NA	NA	NA
1975/76	17	113	264,426	579,908	34,112	NA	NA	2.2
1976/77	7	32	230,886	537,543	76,792	NA	NA	2.3
1977/78	3	12	54,449	131,052	43,684	NA	NA	2.4
1978/79	12	122	796,823	1,799,403	149,950	NA	NA	2.3
1979/80	21	87	613,725	1,436,923	68,425	NA	NA	2.3
1980/81	10	73	411,293	895,220	89,522	NA	NA	2.2
1981/82	28	169	1,323,791	3,228,301	115,296	NA	NA	2.4
1982/83	35	346	2,046,436	5,160,135	147,432	NA	NA	2.5
1983/84	67	511	1,110,413	2,666,383	39,797	NA	NA	2.4
1984/85	39	236	325,420	774,828	19,867	NA	NA	2.4
1985/86	32	175	172,166	371,237	11,601	66,258	2.6	2.2
1986/87	22	116	363,764	755,912	34,360	49,248	7.4	2.1
1987/88	28	220	1,257,033	2,725,040	97,323	135,919	9.2	2.2
1988/89	32	253	1,549,275	3,494,368	109,199	186,574	8.3	2.3
1989/90	29	227	712,424	1,701,859	58,685	124,857	5.7	2.4
1990/91	36	327	867,031	2,101,676	58,380	177,984	4.9	2.4
1991/92	67	506	1,133,583	2,853,322	42,587	252,606	4.5	2.5
1992/93	49	265	541,961	1,392,700	28,422	176,345	3.1	2.6
1993/94	44	253	352,151	815,969	18,545	119,496	2.9	2.3
1994/95	47	251	393,371	915,523	19,479	108,923	3.6	2.3
1995/96	46	277	239,602	557,528	12,120	95,419	2.5	2.3
1996/97	27	155	111,930	244,825	9,068	42,362	2.6	2.2
1997/98	30	87	74,810	156,072	5,202	34,177	2.2	2.1
1998/99	29	92	62,525	121,478	4,189	26,178	2.4	1.9
1999/00	10	52	31,966	65,386	6,539	14,630	2.2	2.0
2000-2011	FISHERY CLOSED							

Note: NA = not available.

Table 3.2–Distribution of pot lifts, number of pots sampled, and number of crabs caught in the 2004 survey of commercial Dungeness crab grounds in Yakutat, Registration Area D.

			Number of pots		Number of crabs in sampled pots			
Statistical area name	**Statistical area**	**Dates surveyed**	**Set**	**Sampled**	**Sublegal males**	**Legal males**	**Females**	**Legal males per pot**
N. of Cape Fairweather	181-10	5/–5/21	191	48	5	1	1	0.02
N. of Alsek River to N. of Yakutat Bay	181-60	5/–5/22	252	215	10	16	31	0.07
Yakutat Bay	183-10	5/24–5/25	31	31	0	0	0	0.00
Between Icy Bay and N. of Yakutat Bay	181-50	5/23	70	70	1	46	0	0.66
Icy Bay	181-40	5/23	81	81	16	32	1	0.40
Total			**605**	**425**	**32**	**95**	**33**	**0.22**

Table 3. 3–Registration Area D (Yakutat) commercial Dungeness crab fishery catch by month from 1967 to present in pounds.

Season	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Total
1969/70	0	0	0	0	0	0	0	0	103,529	254,663	528,992	336,056	1,223,240
1970/71	[a]	0	0	0	0	0	0	0	40,322	386,645	426,131	511,856	1,508,561
1971/72	0	0	0	0	0	0	0	0	[a]	407,771	572,408	223,406	1,212,198
1972/73	[a]	0	0	0	0	0	0		[a]	653,684	842,083	392,705	1,992,574
1973/74	80,860	0	0	0	0	[a]	0	[a]	205,354	679,692	1,079,498	195,187	2,259,469
1974/75	37,430	[a]	0	0	0	0	0	16,274	140,999	475,964	213,265	113,346	1,031,573
1975/76	0	0	0	0	0	0	0	4,095	80,190	239,468	251,345	[a]	579,908
1976/77	0	0	0	0	0	0	0	0	0	136,024	238,516	163,003	537,543
1977/78	[a]	[a]	[a]	[a]	0	0	0	0	0	0	0	33,705	131,052
1978/79	0	0	0	0	0	0	0	0	0	738,083	816,293	245,027	1,799,403
1979/80	0	0	0	0	0	0	0	0	0	840,102	563,873	32,948	1,436,923
1980/81	[a]	[a]		[a]	[a]	[a]	0	0	0	404,436	328,334	141,180	895,220
1981/82	[a]	0	0	0	0	0	0	0	0	2,467,710	634,913	111,793	3,228,301
1982/83	0	0	0	0	0	0	0	0	0	3,092,078	1,857,371	210,686	516,135
1983/84	183,798	55,867	[a]	5,572	[a]	2,961	0	0	970,737	1,197,775	201,830	42,667	2,666,383
1984/85	0	0	0	0	0	0	0	0	404,286	316,460	54,082	0	774,828
1985/86	0	0	[a]	[a]	[a]	[a]	0	0	158,232	160,459	49,203	0	371,237
1986/87	0	0	24,944	16,582	[a]	[a]	0	0	195,237	393,867	122,987	0	755,912
1987/88	0	0	41,755	44,308	8,474	22,478	[a]	0	846,605	1,279,970	474,553	0	2,725,040
1988/89	0	0	[a]	14,467	[a]	0	0	0	1,003,658	1,856,524	590,290	0	3,494,368
1989/90	0	0		[a]	[a]	[a]	0	0	647,224	860,857	191,351	0	1,701,859
1990/91	0	0	49,133	25,628	27,968	12,897	[a]	0	668,300	1,057,943	256,446	0	2,101,676
1991/92	0	0	22,941	18,802	8,056	9,274	0	0	866,372	1,598,073	329,804	0	2,853,322
1992/93	0	0		5,222	4,423	[a]	[a]	0	665,462	655,327	59,021	0	1,392,700
1993/94	0	0	28,254	14,015	4,705	2,531	0	0	434,904	299,740	31,820	0	815,969
1994/95	0	0	109,603	27,329	[a]	[a]	0	0	333,656	426,246	17,786	0	915,523
1995/96	0	0	46,059	7,427	2,104	[a]	0	0	263,382	209,841	27,832	0	557,528
1996/97	0	0	[a]	[a]	[a]	[a]	0	0	109,390	94,113	24,818	0	244,825
1997/98	0	0	0	0	0	0	0	0	102,905	53,167	0	0	156,072
1998/99	0	0	0	0	0	0	0	0	93,632	27,846	0	0	121,478
2000-2011	FISHERY CLOSED	0	0	0	0	0	0	0	47,727	17,659	0	0	65,386

[a] Fewer than 3 permits were fished; information is confidential.

Table 3.4–Summary of commercial Dungeness crab size frequency and shell condition data collected during dockside sampling in Registration Area D, 1975/1976 to 1999/2000.

	Number sampled		Carapace width (mm)		Recruitment	
Season	Boats	Crab	Mean	Range	% Recruit[a]	% Postrecruit[b]
1975/76	12	1,500	180.1	157–210	81.1	18.9
1976/77	[c]					
1977/78	[c]					
1978/79	27	4,503	183.9	156-221	75.4	24.6
1979/80	4	605	187.4	166-221	67.8	32.2
1980/81	[c]					
1981/82	11	1,215	182.2	160-218	84.7	15.3
1982/83	16	1,695	186.3	158-222	74.8	25.2
1983/84	27	2,491	193.9	163-227	44.3	55.7
1984/85	41	4,191	190.7	162-233	51.1	48.9
1985/86	61	6,526	180.1	156-226	70.2	29.8
1986/87	29	3,545	176.0	158-225	70.2	29.8
1987/88	33	4,726	182.6	159-224	74.7	25.3
1988/89	46	5,448	184.3	153-222	66.0	34.0
1989/90	17	1,702	185.2	159-223	60.2	39.8
1990/91	19	1,901	183.8	161-217	75.7	24.3
1991/92	26	2,596	185.2	157-220	68.3	31.7
1992/93	9	1,013	185.3	163-221	61.1	38.9
1993/94	17	1,758	179.7	158-220	77.3	22.7
1994/95	9	1,023	178.4	161-215	87.3	12.7
1995/96	16	1,675	175.3	157-210	90.0	10
1996/97	16	2,134	177.0	155-209	85.5	14.5
1997/98	21	3,114	176.2	159-207	92.6	7.4
1998/99	17	1,072	176.8	161-207	38.1	61.9
1999/00	16	1,435	174.0		87.0	13.0

[a] Recruit = all new and soft shell crab ≥165 mm and ≤194 mm carapace width excluding spines.

[b] Postrecruit = all new and soft shell crab >194 mm and old and very old shell crab ≥165 mm carapace width.

[c] Fewer than 3 permits were fished; information is confidential.

Table 3. 5– Dungeness crab catch rate and weights in Registration Area D, 1977/1978 to 1999/2000. Data were collected during dockside sampling and interviews.[a]

Season	Number			Mean no./ pot	Range no./pot	Weight (lb)		Estimated no. crab harvested [b]	Percent harvest sampled [c]
	Boats inter-viewed	Pots lifted	Crab captured			Mean	Range		
1977/78	*								[d]
1978/79	22	10,830	105,020	9.7	6.2-15.7	2.5	2.0-3.0	731,465	0.62
1979/80	3					2.5		574,769	0.11
1980/81	[d]								[d]
1981/82	7					2.3		1,409,738	0.09
1982/83	14	440				2.4		2,141,135	0.08
1983/84	27	1,850	17,085	9.2	8.3-13.1	2.7	1.9-3.0	1,006,182	0.25
1984/85	37	3,945	6,680	1.7	0.9-2.5	2.6	2.1-3.0	299,161	1.4
1985/86	59	22,883	28,997	1.3	0.3-9.2	2.2	1.8-2.5	172,668	3.78
1986/87	20	7,710	47,226	6.1	3.5-9.2	2.1	1.9-2.5	366,948	0.97
1987/88	31	13,465	65,176	4.8	3.0-11.7	2.2	1.9-2.5	1,244,311	0.38
1988/89	44	43,351	283,640	6.5	3.9-23.0	2.4	2.1-2.7	1,468,222	0.37
1989/90	17	13,639	71,125	5.2	2.8-9.6	2.4	2.2-2.6	709,108	0.24
1990/91	19	19,575	99,912	5.1	2.3-10.3	2.4	2.1-2.6	890,489	0.21
1991/92	26	14,939	75,621	5.1	1.3-18.7	2.5	2.2-2.7	1,164,621	0.22
1992/93	9	3,180	13,416	4.2	1.8-6.5	2.5	2.1-2.8	559,317	0.18
1993/94	17	17,905	50,118	2.8	0.8-4.6	2.2	2.0-2.5	365,905	0.48
1994/95	9	8,200	26,400	3.2	1.6-7.5	2.3	2.0-2.5	405,099	0.25
1995/96	16	8,460	22,143	2.6	0.5-4.8	2.0	1.8-2.4	277,377	0.6
1996/97	15	9,575	20,421	2.1	0.6-6.2	2.0	1.8-2.3	124,911	1.71
1997/98	20	20,563	49,828	2.4	0.8-4.6	2.1	1.9-2.4	75,397	4.13
1998/99	16	7,075	14,215	2.0	1.2-3.0	2.1	1.8-2.3	58,123	1.84
1999/00	16	13,182	27,796	2.1	6.6-2.0	1.7			

[a] Includes data collected that could not be assigned to a fishing area.

[b] Calculated by dividing fish ticket weight data from Table 2.1 by dockside sampling average weight per crab data.

[c] Calculated by dividing number of crab sampled for size frequency by estimated number of crab caught.

[d] Fewer than 3 permits were fished; information is confidential.

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