

Fishery Management Report No. 17-55

**Annual Management Report for the 2016/2017
Southeast Alaska/Yakutat Dungeness Crab Fisheries**

by

Joe Stratman

Kellii Wood

and

Adam Messmer

December 2017

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)		General		Mathematics, statistics	
centimeter	cm	Alaska Administrative Code	AAC	<i>all standard mathematical signs, symbols and abbreviations</i>	
deciliter	dL	all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.	alternate hypothesis	H_A
gram	g	all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.	base of natural logarithm	e
hectare	ha	at	@	catch per unit effort	CPUE
kilogram	kg	compass directions:		coefficient of variation	CV
kilometer	km	east	E	common test statistics	(F, t, χ^2 , etc.)
liter	L	north	N	confidence interval	CI
meter	m	south	S	correlation coefficient	
milliliter	mL	west	W	(multiple)	R
millimeter	mm	copyright	©	correlation coefficient (simple)	r
		corporate suffixes:		covariance	cov
Weights and measures (English)		Company	Co.	degree (angular)	$^\circ$
cubic feet per second	ft ³ /s	Corporation	Corp.	degrees of freedom	df
foot	ft	Incorporated	Inc.	expected value	E
gallon	gal	Limited	Ltd.	greater than	>
inch	in	District of Columbia	D.C.	greater than or equal to	≥
mile	mi	et alii (and others)	et al.	harvest per unit effort	HPUE
nautical mile	nmi	et cetera (and so forth)	etc.	less than	<
ounce	oz	exempli gratia	e.g.	less than or equal to	≤
pound	lb	(for example)		logarithm (natural)	ln
quart	qt	Federal Information Code	FIC	logarithm (base 10)	log
yard	yd	id est (that is)	i.e.	logarithm (specify base)	log ₂ , etc.
		latitude or longitude	lat or long	minute (angular)	'
Time and temperature		monetary symbols (U.S.)	\$, ¢	not significant	NS
day	d	months (tables and figures): first three letters	Jan, ..., Dec	null hypothesis	H_0
degrees Celsius	°C	registered trademark	®	percent	%
degrees Fahrenheit	°F	trademark	™	probability	P
degrees kelvin	K	United States (adjective)	U.S.	probability of a type I error (rejection of the null hypothesis when true)	α
hour	h	United States of America (noun)	USA	probability of a type II error (acceptance of the null hypothesis when false)	β
minute	min	U.S.C.	United States Code	second (angular)	"
second	s	U.S. state	use two-letter abbreviations (e.g., AK, WA)	standard deviation	SD
Physics and chemistry				standard error	SE
all atomic symbols				variance	
alternating current	AC			population sample	Var
ampere	A			sample	var
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				

FISHERY MANAGEMENT REPORT NO. 17-55

**ANNUAL MANAGEMENT REPORT FOR THE 2016/2017 SOUTHEAST
ALASKA/YAKUTAT DUNGENESS CRAB FISHERIES**

by

Joe Stratman and Kellii Wood

Alaska Department of Fish and Game, Division of Commercial Fisheries, Petersburg

and

Adam Messmer

Alaska Department of Fish and Game, Division of Commercial Fisheries, Douglas

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

December 2017

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.

Joe Stratman and Kellii Wood
Alaska Department of Fish and Game, Division of Commercial Fisheries,
16 Sing Lee Alley, Petersburg AK 99833

and

Adam Messmer
Alaska Department of Fish and Game, Division of Commercial Fisheries,
802 3rd St, Douglas AK 99824

This document should be cited as follows:

Stratman, J., K. Wood., and A. Messmer. 2017. Annual Management Report for the 2016/2017 Southeast Alaska/Yakutat Dungeness crab fisheries. Alaska Department of Fish and Game, Fishery Management Report No. 17-55, Anchorage.

The Alaska Department of Fish and Game (ADF&G) administers all programs and activities free from discrimination based on race, color, national origin, age, sex, religion, marital status, pregnancy, parenthood, or disability. The department administers all programs and activities in compliance with Title VI of the Civil Rights Act of 1964, Section 504 of the Rehabilitation Act of 1973, Title II of the Americans with Disabilities Act (ADA) of 1990, the Age Discrimination Act of 1975, and Title IX of the Education Amendments of 1972.

If you believe you have been discriminated against in any program, activity, or facility please write:

ADF&G ADA Coordinator, P.O. Box 115526, Juneau, AK 99811-5526

U.S. Fish and Wildlife Service, 4401 N. Fairfax Drive, MS 2042, Arlington, VA 22203

Office of Equal Opportunity, U.S. Department of the Interior, 1849 C Street NW MS 5230, Washington DC 20240

The department's ADA Coordinator can be reached via phone at the following numbers:

(VOICE) 907-465-6077, (Statewide Telecommunication Device for the Deaf) 1-800-478-3648,

(Juneau TDD) 907-465-3646, or (FAX) 907-465-6078

For information on alternative formats and questions on this publication, please contact:

ADF&G Division of Sport Fish, Research and Technical Services, 333 Raspberry Road, Anchorage AK 99518 (907) 267-2375

TABLE OF CONTENTS

	Page
LIST OF TABLES.....	ii
LIST OF FIGURES.....	ii
ABSTRACT.....	1
<u>CHAPTER 1: SOUTHEAST ALASKA DUNGENESS CRAB FISHERY</u>	<u>3</u>
INTRODUCTION.....	3
FISHERY DEVELOPMENT AND HISTORY.....	4
REGULATION DEVELOPMENT.....	5
Fishing Seasons and Periods.....	5
Size Restrictions.....	6
Gear Definitions and Specifications.....	6
Other Regulatory Changes.....	7
MANAGEMENT CONCERNS.....	7
Season Timing.....	7
Interpretation of Port Sampling Data.....	7
High Effort Levels Relative to Available Grounds.....	8
Lack of Regionwide Life History Information.....	8
RESEARCH.....	8
Surveys.....	9
Icy Strait Survey.....	9
Stikine River Flats Survey.....	9
Kittiwake Survey.....	9
Onboard Observer Sampling.....	10
On-the-Grounds Sampling.....	10
Dockside Sampling.....	10
RECENT SEASONS.....	11
2014/2015 Season Summary.....	11
2015/2016 Season Summary.....	11
2016/2017 Season Summary.....	11
2017/2018 Season Outlook.....	12
CHAPTER 1—TABLES AND FIGURES.....	13
<u>CHAPTER 2: YAKUTAT DUNGENESS CRAB FISHERY</u>	<u>23</u>
INTRODUCTION.....	23
FISHERY DEVELOPMENT AND HISTORY.....	24
REGULATION DEVELOPMENT.....	24
Fishing Seasons and Periods.....	25
Size Restrictions.....	25
Gear Restrictions.....	26
Other Regulations.....	26

TABLE OF CONTENTS (Continued)

	Page
MANAGEMENT CONCERNS	26
RESEARCH	26
Surveys	26
Dockside Sampling.....	27
CHAPTER 2—TABLES	29
REFERENCES CITED	35

LIST OF TABLES

Table	Page
1.1 Registration Area A (Southeast Alaska) commercial Dungeness crab fishery catch, effort, and value, 1960 to present.	14
1.2 Summary of commercial Dungeness crab size frequency and shell condition data collected during dockside sampling in Registration Area A, 1975/1976 to present.	16
1.3 Dungeness crab catch rate and weights in Registration Area A, 1975/1976 to present. Data were collected during dockside sampling and interviews	17
1.4 Catch and effort by district for the commercial Dungeness crab fishery in Registration Area A, 2007/2008 season to present.....	18
1.5 Registration Area A (Southeast) commercial Dungeness crab fishery catch by month from 1969/1970 season to present in pounds.	19
2.1 Registration Area D commercial Dungeness crab fishery catch, effort, and value, 1960 to present.....	30
2.2 Registration Area D (Yakutat) commercial Dungeness crab fishery catch by month from 1969/1970 to present in pounds.....	31
2.3 Number of pots sampled and number of crab caught in the 2004, 2012, and 2013 surveys of commercial Dungeness crab grounds in Yakutat, Registration Area D.	32
2.4 Summary of commercial Dungeness crab size frequency and shell condition data collected during dockside sampling in Registration Area D, 1975/1976 to 1999/2000.	33
2.5 Dungeness crab catch rate and weights in Registration Area D, 1977/1978 to 1999/2000. Data were collected during dockside sampling and interviews	34

LIST OF FIGURES

Figure	Page
1.1 Registration Area A (Southeast Alaska) and Registration Area D (Yakutat).....	21
1.2 Dungeness crab survey locations in Southeast Alaska.	22

ABSTRACT

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

Dungeness crab harvests in Region I totaled 2,358,645 lb valued at \$7.17 million during the last completed season. The average dock price per pound for Dungeness crab during the 2016/2017 season was \$3.09.

The Dungeness crab fishery in Region I is fully developed. The first commercial harvest of Dungeness crab from Southeast Alaska occurred in the 1930s.

Limited Dungeness crab stock assessment surveys were conducted from 1996 through 1997, and again from 2000 through 2004. Dungeness crab management is by sex, size, and season. In addition to sex, size, and season, a management plan has been implemented for the Southeast Alaska Dungeness crab 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 thresholds described in the management plan, season length is reduced. Dockside sampling and skipper interviews also are routinely conducted in Southeast Alaska.

Surveys for Yakutat Dungeness crab were conducted in 2004, 2012, and 2013. Yakutat stocks of Dungeness crab 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 is developed to provide sustainable harvest.

Key words: Dungeness crab, *Metacarcinus magister*, Southeast Alaska, Yakutat, fisheries management, crab, Region I, harvest statistics, Alaska Board of Fisheries

CHAPTER 1: SOUTHEAST ALASKA DUNGENESS CRAB FISHERY

INTRODUCTION

Dungeness crab *Metacarcinus 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 crab are found throughout Registration Area A (Southeast Alaska), 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, Area A (Figure 1.1), has produced a long-term average of about 2.64 million lb of Dungeness crab per season. Ten-year average harvests for the 1970s, 1980s, 1990s, and 2000s have been 0.61, 2.45, 3.40, and 4.55 million lb, respectively. The 2016/17 season harvest was 2.36 million lb.

Although the Southeast Alaska Dungeness crab fishery is under limited entry, and there are 277 active permanent and interim Dungeness crab limited entry permits, actual participation varies. During the most recent five seasons, an average of 183 permit holders have registered and fished (Table 1.1). 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 inches in diameter and 18 inches 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. *unpublished data*; Lehman and Osborn 1970; Shirley and Shirley 1988); this is followed by a female molt period in August and September (Bishop et al. *unpublished data*; 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) because Dungeness crab females only mate in the soft shell condition (Hartnoll 1969). After molting and mating, females take approximately a month to harden, extruding 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, 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. 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, because it appears that females at this latitude extrude eggs only on a biannual basis (Swiney et al. 2003). As female Dungeness crab grow to a large size, they 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).

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. In order to conserve reproductive potential, only male crab with a minimum carapace width (CW) of 6.5 inches notch to notch may be harvested. There are three different commercial Dungeness crab fishing seasons in regulation. For Districts 1 and 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 to February 28. The portion of Section 13-B that is in the Sitka Sound Special Use area and a portion of Whale Passage has a fall season, from October 1–November 30. The remainder of Southeast Alaska has a summer (June 15–August 15) and fall (October 1–November 30) season. The Southeast Alaska Dungeness Crab Management Plan (5 AAC 32.146) directs the department to predict the entire season's harvest by June 29 each season. If the predicted harvest is 1.5 million lb or less, the summer season closes no sooner than 21 days after the season opened, and the fall Dungeness crab fishing season specified in regulation does not open. If the predicted harvest is greater than 1.5 million lb but less than 2.25 million lb, the summer season ends no sooner than 28 days after the season opened with a curtailed fall season of 30 days. If the department determines that harvest projections fail to meet this threshold due to soft-shell crab early in the summer Dungeness crab fishing season, the department may open a full fall Dungeness crab fishing season as specified in regulation.

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 it acts as an Annual Management Report for this fishery to provide transparent fishery management.

FISHERY DEVELOPMENT AND HISTORY

The first commercial harvest of Dungeness crab 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 crab harvests from Southeast Alaska have averaged 2.69 million lb per season (Table 1.1).

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 low so the need for formal regulations and other restrictions was minimal. The 1960s were characterized by a few larger vessels in a directed fishery harvesting an average of 2.2 million lb per year. This harvest was fueled by high market demand due to 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. Only a few dozen small vessels in the 30- to 45-foot range fished, primarily during the summer. Harvests for this period averaged 0.61 million lb by 31 permit holders.

Between the 1981/82 and 1990/91 seasons, the fishery underwent sweeping change. Declining crab harvests in Pacific Coast states and changing markets increased demand for Alaska frozen sections, whole cooked crab, and air-freighted live crab. More processors began purchasing crab and supporting the fishery through the entire summer season. Harvests during the 1980s increased, averaging 2.45 million lb 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. These changes resulted in shift from a primary fishery for a relatively small number of single-species participants to a secondary fishery for a larger number of new and often transitory entrants.

Increased participation 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 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. The tiered permit system is structured to provide a maximum of 48,750 pots to the fishery. To date, there are 277 active permanent and interim Dungeness crab limited entry permits. Of these limited entry permits, 49 are 300-pot permits, 43 are 225-pot permits, 83 are 150-pot permits, 98 are 75-pot permits, two are ring net permits, and two are diving gear permits.

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.

From 1960 to 1969 there was no closed season for the Southeast Alaska commercial Dungeness crab fishery. The first seasonal closures after statehood were adopted in 1970 when portions of Districts 5 and 6 were closed April 1–June 30. In 1975 the first regionwide season was adopted; Dungeness crab could be taken from May 16 to March 31, and the District 5 and 6 closures remained in effect. In 1976 the regional open season was changed to June 1–February 28. That regional season remained in effect through 1982 (however, the specific closures in Districts 5 and 6 were repealed in 1978). In 1983 and 1984, the regional open season was July 1–February 28, and a shortened season was adopted for part of Sitka Sound. Beginning in 1985, the commercial fishery was open June 15–August 15 and October 1–February 28 because field studies indicated that the major period when females molted and were mated was late August–September. Conclusions of research done later in Southeast Alaska supported those field studies, and other research indicated that peak timing of the female molt and mating is late summer through early fall. The first split season for Districts 1 and 2 was adopted in 1986. In that year the season for Districts 1 and 2 was changed to October 1–February 28. The season for the northern and central portions of the region remained June 15–August 15 and October 1–February 28. In 1989, in response to increasingly high effort levels and high harvest rates, the

season in the northern and central portions of the region was further shortened by three months and the fall/winter season was limited to October 1–November 30. Districts 1 and 2 and Section 13-B remained open from October 1 to February 28. In 2000 the board adopted a separate 2-month season of October 1–November 30 for waters of Section 13-B in the Sitka Sound Special Use area to provide additional harvest opportunity for the Sitka subsistence fishery.

The season remained October 1–February 28 in Districts 1 and 2 and a portion of Section 13-B until 2009, when the board adopted a proposal that made the commercial Dungeness crab season in Districts 1 and 2 the same as the northern and central portions of the region. That regulation change had a sunset clause that stipulated both Districts 1 and 2 would revert back to a fall/winter season beginning February 29, 2012, unless other action was taken. In 2010, the board considered an agenda change request from the Organized Village of Kasaan and revised the season description for District 2, changing it back to a fall/winter season. No action was taken on the sunset clause that remained in place for District 1, so the season in that area reverted back to the fall/winter season in 2012. In 2015 the board adopted a change in the start times for the summer, fall, and fall/winter season descriptions from 12:00 noon to 8:00 a.m.

SIZE RESTRICTIONS

From 1924 to 1935, legal harvest of Dungeness crab was restricted to males over 6.5 inches in greatest width. From 1936 to 1962, only males over 7 inches in greatest width were legal. Since 1963, the legal size has been 6.5 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 Dungeness crab, and is used because the large tenth anterolateral spines are often broken or eroded in older-shelled crab. Although size at maturity varies somewhat throughout its range, the 6.5-inch (inside the points) legal size limit in Alaska for the commercial Dungeness crab fishery is currently the largest legal size limit on the Pacific coast.

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 1.5 inches in height, in numerals at least ¼-inch wide that contrasted with the color or texture of the buoy.

In 1977, two escape rings 4³/₈ 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 1.5 inches high and ¼ inch wide 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 2001/02 season. Dungeness crab pots and ring nets used in Southeast Alaska must all be buoyed and marked identically. In 2012, an amended proposal was carried by the board that

changed the requirement from buoys that had to be marked identically to buoys of essentially the same color, shape, size, and markings.

Dungeness gear development 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 crab 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 implemented prior to the 2001/02 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 2001/02 season. The plan calls for early closure of the Southeast Alaska Dungeness crab season when regional catch is projected to be below one of two threshold levels. Changes to the Dungeness crab fishery made at the 2009 board meeting included the following: the Dungeness crab management plan was modified to allow management flexibility if harvest projections fail to meet the threshold for a full season due to soft-shell crabs early in the summer fishing season; clarification of permit stacking requirements; and revocation of closed areas in Chaik Bay and Whale Pass. In 2015 the board carried amended proposals to close waters to commercial Dungeness crab fishing near the communities of Angoon and Hoonah.

MANAGEMENT CONCERNS

SEASON TIMING

The summer season overlaps with a portion of the male molt period, and legal males are harvested prior to mating, shifting the burden of reproduction onto smaller males. Harvesting legal males prior to reproducing has the potential of creating genetic pressure for crab to grow more slowly to avoid harvest. The prevalence of soft-shell crab 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, which has been documented as being higher for soft-shell Dungeness crab (Kruse et al. 1994).

INTERPRETATION OF PORT SAMPLING DATA

Aside from fish ticket data, port sampling data make up the longest time series dataset used to manage the fishery. Port sampling data are invaluable, showing the mean and range of carapace widths and individual weights, recruit class composition, and mean and range of catch per unit effort (CPUE) from sampled landings (Tables 1.2 and 1.3). Information obtained during the dockside interview includes the percentage of legal male crab not retained due to being soft or light. A high percentage of recruit crab in the harvest is indicative of annual recruitment into the fishery; however, in recruit-driven fisheries a smaller proportion of strong year classes are carried over to buffer the fishery against the effects of a poor year class. Trends in recruit composition of the harvest indicate that the fishery has historically been dependent on annual recruitment, with postrecruit crab making up a smaller percentage of the harvest since 2000 (Table 1.2). High variability in sample size, from a low of 303 crab in the 1984/85 season to a

high of 24,704 crab in the 2001/02 season (Table 1.2), and inherent subjectivity in regards to shell ageing, make it difficult to interpret data and make comparisons between certain seasons.

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 noncommercial fishermen. This has resulted in commercial closed areas in numerous small areas around many communities in Southeast Alaska, including Juneau, Tenakee Springs, Elfin Cove, Point Baker, Thorne Bay, Gustavus, Ketchikan, Haines, Sitka, Hollis, Angoon, and Hoonah. There are continuing requests to the board 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 crab. 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, 9, and 10.

LACK OF REGIONWIDE LIFE HISTORY INFORMATION

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 crab in Southeast Alaska and trends in abundance in support of a move toward 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. Questions regarding life history timing throughout the region remain and continue to affect management of the fishery. Fishery independent surveys would be one way to continue to gather regionwide life history information, such as molt timing and growth increment.

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), 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 harvest. Using a random transect experimental survey design and commercially configured pots with smaller mesh, the department collected size, sex, and shell hardness data during late May, prior to the commercial fishery opening on June 15. After the season opened, staff conducted onboard 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 undersized and legal-sized soft-shell male crab 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:

- Investigate the utility of abundance-based management tools in this fishery:
 - develop pre- and postseason indices of abundance for legal and prerecruit males and determine their utility as predictors of harvest;
 - use a ratio estimator (Dawe et al. 1993) to model the results of pre- and postseason 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.
- Describe Dungeness crab life history and ecology:
 - describe timing of life history events;
 - describe interannual variation in crab size and shell age composition by sex;
 - describe species composition of invertebrates and fish captured in Dungeness crab pots.
- Refine pot survey methods for Dungeness crab to describe the relationship between crab catch by size and sex and soak time in pots with open and closed escape rings.
- Describe growth of Dungeness crab in Southeast Alaska.

From 2000 to 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 (Figure 1.2). 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 meters. Clusters had alternately open then closed escape rings, and cluster locations were selected using a systematic sampling design with random start (Bishop et al. *unpublished data*).

Survey findings are summarized as follows:

- June legal CPUE was a useful index of population size only for Duncan Canal; for other survey areas it had little predictive power because crab 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. *unpublished data*).
- 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, which makes their assessment very difficult (Bishop et al. 2010).
- Crab 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 premolt size for the adult male size range considered. Previous work done in Southeast Alaska identified male crab as being functionally mature (observed in mating embraces) at 120 mm CW (Shirley and Sturdevant 1988). The growth increment and molt probability work from the 2000–2003 surveys predicted that functionally mature crab would be under legal size for over one year (Bishop et al. 2007). Thus, the current size limit protects males to reproduce at least once before harvest. Molt probability at the legal size limit of 165 mm CW was 48%, declining to near zero for crab of 172 mm CW. Although information on the growth of smaller instars is needed, the age at first harvest is probably at least 4 years (Bishop et al. 2007).

ONBOARD OBSERVER SAMPLING

During the 1998/99 season, two onboard observing trips were conducted in the Stikine River Flats area.

ON-THE-GROUNDS SAMPLING

During the 1999/00 commercial season, 20 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 crab 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 1.2 and 1.3).

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 crab was measured with durometers during the 2009/10 and 2010/11 commercial seasons (Bishop 2013).

RECENT SEASONS

2014/2015 SEASON SUMMARY

The predicted harvest for the 2014/15 season was above the Dungeness crab management plan thresholds, so the season length was not curtailed. Districts 8, 6, 9, and 10 had the largest harvests when compared to the other districts (Table 1.4). A total of 4,061,800 lb were harvested during the summer fishery (80%), the largest summer season harvest since 2002. The fall fishery harvest totaled 561,457 lb (20%) for a total harvest of 5,063,854 lb by 192 permit holders, making the 2014/15 season the third largest on record (Table 1.1). Harvest in June and July combined made up 73% of the full season harvest (Table 1.5). Port sampling data show 86% recruit class crab, down from the previous season (Table 1.2). For the entire 2014/15 season, 0.4% of the commercial harvest was sampled. Landed crab averaged 2.0 lb (Table 1.3). Strong prices, an average of \$2.99 per lb (Table 1.1), and harvest yielded a total fishery value of \$15,117,159; one of the most lucrative seasons ever.

2015/2016 SEASON SUMMARY

The predicted harvest for the 2015/16 season was above the Dungeness crab management plan threshold, so the season length was not curtailed. During the 2015/16 fishery, 205 permit holders, the most since the 2008/09 season, harvested a total of 3,259,362 lb of Dungeness crab (Table 1.1). The summer fishery made up 82% of the harvest, or 2,688,849 lb, and the remaining 18%, or 570,513 lb, was taken during the fall fishery. District 8 was again a large producer, with 22% of the overall harvest, and 16% of the harvest came from District 11 (Table 1.4). Harvest in June and July combined made up 76% of the full season harvest (Table 1.5). Port sampling data show 82% recruit class crab (Table 1.2). Harvested crab sold for an average of \$2.99 per lb (Table 1.1) and averaged 2.1 lb each (Table 1.3). Total exvessel value of the 2015/16 fishery was \$9,730,921.

2016/2017 SEASON SUMMARY

The predicted harvest for the 2016/17 season was above the Dungeness crab management plan threshold, so the season length was not curtailed. During the 2016/17 fishery, 208 permit holders harvested a total of 2,358,645 lb of Dungeness crab (Table 1.1). The summer fishery made up 82% of the harvest, or 1,933,956 lb, and the remaining 18%, or 424,689 lb, was taken during the fall fishery. District 8 was again a large producer, with 25% of the overall harvest, and 12% of the harvest came from District 6 (Table 1.4). Harvest in June and July combined made up 76% of the full season harvest (Table 1.5). Port sampling data show 87% recruit class crab (Table 1.2). Harvested crab sold for an average of \$3.04 per lb (Table 1.1) and averaged 2.1 lb each (Table 1.3). Total exvessel value of the 2016/17 fishery was \$7,168,785.

2017/2018 SEASON OUTLOOK

The department projected total season harvest based on landings and effort data from the first full week of fishing. The projection indicated that total season harvest would not exceed 2.25 million lb but fell near the lower end of the range described in 5 AAC 32.146(2) (B) (1.5 million to 2.25 million lb) at 1.68 million lb. According to the management plan, the department must close the commercial Dungeness crab summer fishing season no sooner than 28 days after the season opens when the projected full season harvest falls within this range. It was announced on June 29, 2017 that the commercial Dungeness crab summer fishing season in Southeast Alaska would close at 11:59 p.m. Tuesday, July 25, 2017, a three-week reduction in fishing time from the maximum allowed. Shortening the 2017/18 commercial Dungeness crab summer fishing season in Southeast Alaska to a 40-day season was commensurate with the estimate falling near the lower end of the 1.5 million lb to 2.25 million lb range.

The Dungeness crab management plan also stipulates a 30-day fall fishing season when the full season projection falls between 2.25 million and 1.5 million lb. However, 5 AAC 32.146(3) states that if the department determines that harvest projections fail to meet threshold due to soft-shell crab early in the commercial Dungeness crab summer fishing season, the department may open the commercial Dungeness crab fishery for the full fall/winter fishing season. During the first week of the 2017/18 summer fishing season (landings made 6/15/17 through 6/22/17), dockside interviews noted a 14% average per landing of soft-shelled legal crab not retained. However, some amount of soft-shelled crab is normally caught in the first week. In an effort to determine an average amount of soft-shelled crab caught in the first week, the previous three-year average of 10% was used as a proxy for a “normal” amount of soft-shelled crab. Since the 14% soft-shelled crab from the 2017/18 season exceeded the three-year average of 10%, the difference of 4% (24,217 lb) was applied to the first week’s harvest to estimate what amount of poundage, in excess of the norm, was not retained. Based on the regression model used to produce the full season harvest estimate, adding this poundage to the total for the first week was not enough to produce a harvest estimate that exceeded the 2.25 million lb threshold in regulation. Adding the additional soft-shelled crab increased the estimate from 1.68 to 1.81 million lb.

The department also examined the total amount of harvest from the first week graded as soft-shelled by the buyers. In the first week of the 2017/18 season, 449 lb were graded as soft regionwide. This amount is far below the recent three-year average of 2,424 lb. While market considerations do play into grading from year to year, the decrease in the total amount of harvest from the first week given a soft-shell delivery code by the buyers did not indicate an above average amount of soft-shelled crab encountered by the fleet in the first week of the fishery.

Based on the data from port sampling and fish tickets, the department assessed that soft-shelled crab not retained during the first week of the season were not a contributing factor in failing to meet threshold, unlike the decision made in 2013/14, and therefore a 30-day fall fishing season was established for the entire region. Since the management plan was put into regulation in 2000, the 2017/18 season is the second season (along with the 2013/14 season) that the threshold for a normal season described in regulation was not met. The 2017/18 season is the first season with a 30-day fall season since the management plan was implemented.

CHAPTER 1—TABLES AND FIGURES

Table 1.1—Registration Area A (Southeast Alaska) commercial Dungeness crab fishery catch, effort, and value, 1960 to present.

Year/Season	Number				Lb per permit	Pots lifted	CPUE ^a	Mean weight	Price per lb
	Permits	Landings	Crab	Lb					
1960	ND	ND	ND	1,449,405	ND	ND	ND	ND	ND
1961	ND	ND	ND	671,455	ND	ND	ND	ND	ND
1962	ND	ND	ND	2,985,939	ND	ND	ND	ND	ND
1963	ND	ND	ND	3,296,362	ND	ND	ND	ND	ND
1964	ND	ND	ND	3,996,100	ND	ND	ND	ND	ND
1965	ND	ND	ND	2,392,395	ND	ND	ND	ND	ND
1966	ND	ND	ND	1,968,117	ND	ND	ND	ND	ND
1967	ND	ND	ND	2,033,156	ND	ND	ND	ND	ND
1968	ND	ND	ND	1,900,690	ND	ND	ND	ND	ND
1969/1970	24	392	501,011	1,149,111	47,880	ND	ND	2.3	ND
1970/1971	21	380	349,045	776,617	36,982	ND	ND	2.2	ND
1971/1972	22	315	205,359	452,681	20,576	ND	ND	2.2	ND
1972/1973	31	316	ND	599,487	19,338	ND	ND	ND	ND
1973/1974	41	483	ND	748,519	18,257	ND	ND	ND	ND
1974/1975	55	453	ND	715,249	13,005	ND	ND	ND	ND
1975/1976	36	344	285,459	611,621	16,989	ND	ND	2.1	ND
1976/1977	25	173	225,217	515,378	20,615	ND	ND	2.3	ND
1977/1978	12	87	58,046	127,345	10,612	ND	ND	2.2	ND
1978/1979	25	208	345,379	754,759	30,190	ND	ND	2.2	ND
1979/1980	37	313	371,670	801,753	21,669	ND	ND	2.2	ND
1980/1981	26	227	236,630	521,247	20,048	ND	ND	2.2	ND
1981/1982	75	749	1,266,271	2,932,427	39,099	ND	ND	2.3	\$0.83
1982/1983	129	1,298	1,551,520	3,662,112	28,388	ND	ND	2.4	\$0.77
1983/1984	132	1,536	942,477	2,155,849	16,332	ND	ND	2.3	\$1.15
1984/1985	183	1,593	847,824	1,843,521	10,074	ND	ND	2.2	\$0.90
1985/1986	216	2,077	1,059,717	2,316,994	10,727	159,300	2.8	2.2	\$1.22
1986/1987	224	2,330	1,184,771	2,453,055	10,951	232,328	3.9	2.1	\$1.02
1987/1988	240	2,745	1,610,707	3,390,832	14,128	278,944	4.6	2.1	\$1.08
1988/1989	264	2,683	1,517,105	3,321,734	12,582	248,755	4.8	2.2	\$0.91
1989/1990	245	2,096	875,861	1,918,880	7,832	194,239	3.4	2.2	\$1.06
1990/1991	243	2,339	1,293,500	2,662,151	10,955	329,916	3.9	2.1	\$1.44
1991/1992	318	3,386	2,260,678	4,707,106	14,802	462,425	4.2	2.1	\$1.21
1992/1993	245	2,497	1,424,742	3,095,419	12,634	313,522	3.7	2.2	\$0.84
1993/1994	198	1,956	1,167,481	2,536,701	12,812	271,474	3.6	2.2	\$0.92
1994/1995	184	1,787	927,878	1,921,739	10,444	230,595	4.0	2.1	\$1.10
1995/1996	200	2,737	2,176,200	4,404,519	22,023	460,378	4.2	2.0	\$1.62
1996/1997	203	2,896	2,406,434	5,005,840	24,659	399,472	4.9	2.1	\$0.96
1997/1998	232	4,043	1,921,545	4,062,543	17,511	616,608	2.8	2.1	\$2.18
1998/1999	244	3,134	1,132,885	2,329,499	9,547	481,214	2.2	2.1	\$1.47
1999/2000	197	2,862	1,611,136	3,280,503	16,652	474,986	2.8	2.0	\$1.64

-continued-

Table 1.1–Page 2 of 2.

Year/Season	Number			Lb per permit	Pots lifted	CPUE	Mean weight	Price per lb	
	Permits	Landings	Crab Lb						
2000/2001	199	2,380	1,254,573	2,565,410	12,892	400,616	2.7	2.0	\$1.50
2001/2002	209	3,059	2,099,643	4,104,128	19,637	539,636	3.9	2.0	\$1.73
2002/2003	220	3,561	3,512,242	7,332,665	33,330	785,936	4.5	2.1	\$1.07
2003/2004	209	2,931	2,184,724	4,537,049	21,708	609,085	3.6	2.1	\$1.32
2004/2005	198	2,412	2,239,892	4,587,631	23,170	564,417	4	2.0	\$1.36
2005/2006	189	2,203	2,039,101	4,205,480	22,251	468,400	4.4	2.1	\$1.21
2006/2007	171	2,074	2,228,852	4,503,970	26,339	468,426	4.8	2.0	\$1.38
2007/2008	193	2,841	2,657,986	5,408,355	28,023	647,401	4.2	2.0	\$2.13
2008/2009	207	2,816	2,351,764	4,731,668	22,858	647,204	3.6	2.0	\$2.18
2009/2010	195	2,441	1,770,701	3,569,697	18,306	535,292	3.3	2.0	\$1.72
2010/2011	176	2,208	1,588,622	3,245,265	18,439	445,348	3.6	2.0	\$1.78
2011/2012	162	2,014	1,252,387	2,594,897	16,018	377,162	3.3	2.1	\$2.22
2012/2013	160	2,199	1,144,095	2,359,309	14,746	398,172	2.9	2.1	\$2.50
2013/2014	150	2,226	1,288,223	2,590,022	17,267	393,377	3.3	2.0	\$2.49
2014/2015	192	3,306	2,504,931	5,063,854	26,374	623,948	4.0	2.0	\$2.99
2015/2016	205	3,001	1,545,614	3,259,362	15,899	545,458	2.8	2.1	\$2.99
2016/2017	208	2,545	1,135,953	2,358,645	11,340	464,519	2.4	2.1	\$3.04
5-year average	183	2,655	1,523,763	3,126,238	17,125	485,095	3.1	2.1	\$2.80
Total average ^b	158	1,930	1,390,130	2,692,741	19,311	439,642	3.7	2.1	\$1.55

Note: ND = not available.

^a CPUE values for 1985/1986 through 2009/2010 seasons estimated using only landings with associated pot lift data.

^b Total averages calculated using all seasons with available data.

Table 1.2–Summary of commercial Dungeness crab size frequency and shell condition data collected during dockside sampling in Registration Area A, 1975/1976 to present.

Season	Number sampled		Carapace width (mm)		Recruitment	
	Boats	Crab	Mean	Range	% Recruit ^a	% Postrecruit ^b
1975/1976	19	1,930	180.4	154–217	75.9	19.8
1976/1977	3	304	177.5	159–204	76.2	20.5
1977/1978	6	624	178.7	159–211	47.0	50.0
1978/1979	11	1,130	180.0	161–213	75.1	24.0
1979/1980	4	422	181.3	160–217	78.2	21.5
1980/1981	5	447	179.8	161–207	83.2	16.1
1981/1982	12	1,263	182.6	160–215	66.0	33.9
1982/1983	9	849	187.2	164–218	63.5	36.2
1983/1984	11	1,205	185.7	159–225	65.8	33.2
1984/1985	3	303	175.9	164–205	88.4	10.6
1985/1986	26	2,650	177.7	157–228	87.1	9.9
1986/1987	29	2,872	177.3	156–228	75.8	19.7
1987/1988	63	6,226	178.5	160–213	76.1	21.3
1988/1989	81	7,595	182.1	157–225	65.9	32.0
1989/1990	75	7,123	181.0	157–220	61.1	36.1
1990/1991	166	16,399	174.9	156–223	83.8	11.3
1991/1992	172	16,897	178.6	153–230	85.5	12.0
1992/1993	146	14,262	180.2	157–215	77.2	21.0
1993/1994	81	7,628	181.8	155–226	77.9	20.7
1994/1995	79	7,832	176.2	160–222	84.1	12.2
1995/1996	136	13,621	175.6	158–228	89.0	8.7
1996/1997	222	11,196	178.5	154–215	80.9	16.7
1997/1998	200	10,263	179.2	156–220	80.1	17.5
1998/1999	196	10,145	176.9	101–216	74.0	22.0
1999/2000	262	13,257	176.2	110–212	76.8	19.2
2000/2001	338	16,913	176.9	87–213	81.7	14.9
2001/2002	494	24,704	174.7	153–219	87.6	6.3
2002/2003	424	21,331	178.9	140–225	89.2	8.6
2003/2004	425	21,590	178.5	93–224	85.8	11.5
2004/2005	433	21,876	178.0	140–215	88.7	8.0
2005/2006	397	19,910	177.8	90–233	90.2	6.8
2006/2007	455	22,771	176.8	157–230	93.7	4.1
2007/2008	400	20,948	177.4	123–229	88.9	8.1
2008/2009	354	18,926	177.7	160–225	89.3	7.8
2009/2010	376	20,214	177.1	140–223	88.5	8.3
2010/2011	354	18,912	178.8	159–216	89.6	8.2
2011/2012	366	20,012	178.4	93–219	86.9	9.9
2012/2013	346	18,614	177.9	154–219	87.6	9.1
2013/2014	292	16,133	175.4	157–219	88.5	7.3
2014/2015	163	10,405	177.3	153–216	85.5	12.0
2015/2016	177	10,787	178.9	158–228	82.4	15.4
2016/2017	140	8,413	177.6	161–227	86.8	10.2

^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 1.3–Dungeness crab catch rate and weights in Registration Area A, 1975/1976 to present. 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 interviewed	Pots lifted	Crab captured			Mean	Range		
1975/1976	-	-	-	-	-	-	-	-	-
1976/1977	-	-	-	-	-	-	-	-	-
1977/1978	-	-	-	-	-	-	-	-	-
1978/1979	5	ND	ND	ND	ND	2.2	2.0–2.5	343,072	0.3
1979/1980	-	-	-	-	-	-	-	-	-
1980/1981	-	-	-	-	-	-	-	-	-
1981/1982	-	-	-	-	-	-	-	-	-
1982/1983	4	2,475	13,000	5.3	4.3–7.3	2.7	2.7–2.7	1,356,337	0.1
1983/1984	7	1,680	1,540	0.9	2.6–6.3	2.3	2.0–2.7	937,325	0.1
1984/1985	-	-	-	-	-	-	-	-	-
1985/1986	23	675	4,881	7.2	4.6–14.4	2.1	1.7–2.6	1,103,330	0.2
1986/1987	28	3,888	20,603	5.3	2.7–11.5	2.0	1.7–2.3	1,226,528	0.2
1987/1988	61	9,597	44,812	4.7	1.1–11.6	2.1	1.7–2.6	1,614,682	0.4
1988/1989	81	16,342	86,143	5.3	0.4–15.0	2.3	1.6–2.6	1,444,232	0.5
1989/1990	113	20,681	68,537	3.3	0.2–9.6	2.1	1.6–2.7	913,752	0.8
1990/1991	166	40,802	173,431	4.3	0.5–11.3	2.0	1.6–2.2	1,331,076	1.2
1991/1992	177	54,269	270,611	5.0	1.0–13.9	2.1	1.7–2.6	2,241,479	0.8
1992/1993	146	34,288	152,641	4.5	0.9–14.0	2.2	1.9–2.7	1,407,009	1.0
1993/1994	81	16,616	59,540	3.6	0.6–12.5	2.3	1.7–2.8	1,102,913	0.7
1994/1995	79	17,448	62,640	3.6	0.8–8.6	2.0	1.8–2.6	960,870	0.8
1995/1996	136	40,967	231,165	5.6	0.3–18.7	2.0	1.7–2.3	2,202,260	0.6
1996/1997	222	54,835	303,170	5.5	0.6–26.5	2.1	1.7–2.8	2,383,733	0.5
1997/1998	195	52,778	151,957	2.9	0.7–10.0	2.1	1.3–2.9	1,934,544	0.5
1998/1999	194	49,340	144,884	2.9	0.6–35.3	2.1	1.7–2.5	1,109,285	0.9
1999/2000	261	66,992	254,327	3.8	0.5–32.3	2.0	1.7–2.3	1,640,252	0.8
2000/2001	339	99,052	322,024	3.3	0.2–8.8	2.1	1.3–4.9	1,221,624	1.4
2001/2002	494	160,978	743,736	4.6	0.8–18.8	2.0	1.5–2.5	2,052,064	1.2
2002/2003	423	160,698	761,474	4.7	0.1–53.3	2.1	1.7–6.3	3,491,745	0.6
2003/2004	422	143,519	606,003	4.2	0.1–15.7	2.1	1.5–6.2	2,160,500	1.0
2004/2005	433	181,955	725,892	4.0	0.1–18.1	2.1	1.8–2.5	2,184,586	1.0
2005/2006	395	129,471	618,833	4.8	0.6–14.5	2.1	1.7–2.8	2,002,610	1.0
2006/2007	455	144,864	759,336	5.2	1.0–19.7	2.0	1.7–2.4	2,251,985	1.0
2007/2008	400	136,926	606,900	4.4	0.7–16.8	2.0	1.7–2.5	2,704,178	0.8
2008/2009	353	130,617	513,144	3.9	0.5–27.5	2.1	1.8–2.6	2,253,175	0.8
2009/2010	376	139,095	486,999	3.5	0.5–14.6	2.0	1.7–2.4	1,784,849	1.1
2010/2011	354	109,371	396,471	3.6	0.7–14.3	2.1	1.4–2.5	1,545,364	1.2
2011/2012	365	103,796	355,477	3.4	0.7–12.4	2.1	1.6–2.7	1,235,665	1.6
2012/2013	346	101,231	299,359	3.0	0.7–14.4	2.1	1.6–2.7	1,123,480	1.7
2013/2014	293	83,685	352,878	4.2	0.5–15.8	2.0	1.5–4.8	1,295,011	1.2
2014/2015	163	65,762	300,282	4.6	0.9–30.5	2.0	1.4–2.6	2,531,927	0.4
2015/2016	177	55,026	198,676	3.6	0.5–12.4	2.1	1.7–2.8	1,552,077	0.7
2016/2017	140	48,885	138,936	2.8	0.5–12.1	2.1	1.8–3.0	1,123,640	0.7

Note: ND = not available.

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

^b Calculated by dividing fish ticket weight data from Table 1.1 by dockside sampling data on average weight per crab.

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

- Data confidential because fewer than three permits fished.

Table 1.4–Catch and effort by district for the commercial Dungeness crab fishery in Registration Area A, 2007/2008 season to present.

District	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017
1	120,826	117,108	104,856	127,484	173,501	155,735	130,508
2	85,338	75,580	42,137	83,072	132,368	54,909	74,477
3	-	-	-	-	-	-	-
4	-	-	0	0	0	-	0
5	77,066	-	-	-	43,932	2,599	0
6	542,259	506,615	423,218	359,841	743,498	391,520	272,295
7	172,434	108,528	93,693	164,471	279,524	144,961	147,310
8	641,618	480,356	737,887	447,720	1,175,973	716,317	583,958
9	132,734	129,909	53,429	184,663	586,610	232,350	117,392
10	225,245	262,717	180,024	265,740	516,160	312,331	165,182
11	581,629	304,591	159,608	127,911	204,842	515,626	217,783
12	109,049	189,197	98,134	152,450	277,935	151,509	200,946
13	104,179	152,427	162,184	300,425	446,825	193,533	77,578
14	184,786	90,835	75,501	182,022	214,284	120,610	103,776
15	259,680	156,583	218,867	162,435	265,572	262,883	261,035
16 ^a	0	0	0	0	0	0	0
Total	3,245,265	2,594,897	2,359,309	2,590,022	5,063,854	3,259,362	2,358,645

- Data confidential because fewer than three permits fished.

^a District 16 reopened to commercial fishing in 2009.

Table 1.5—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
1969/1970	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
1970/1971	122,623	68,644	35,867	9,312	5,567	4,563	-	11,123	37,045	168,485	150,383	157,067	776,617
1971/1972	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
1972/1973	83,561	49,466	31,516	16,746	3,532	1,447	-	4,237	30,461	38,606	167,156	169,569	599,487
1973/1974	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
1974/1975	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
1975/1976	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
1976/1977	46,068	32,006	13,826	11,070	4,128	6,060	0	-	0	105,864	206,112	89,889	515,378
1977/1978	31,376	15,915	24,956	6,291	-	7,997	0	0	0	-	-	29,570	127,345
1978/1979	104,639	70,406	43,321	23,033	18,229	-	-	0	0	126,420	206,929	152,721	754,759
1979/1980	137,494	75,079	52,076	30,098	12,670	-	0	0	0	165,728	184,630	137,043	801,753
1980/1981	69,865	36,342	30,249	15,064	8,599	-	0	0	0	62,684	166,140	122,220	521,247
1981/1982	427,076	292,859	164,235	67,699	28,413	34,251	0	0	0	460,619	896,944	560,331	2,932,427
1982/1983	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
1983/1984	267,566	146,550	84,479	45,845	30,897	14,702	0	0	0	775,324	453,526	336,960	2,155,849
1984/1985	279,568	157,009	137,374	59,151	27,024	15,466	0	0	0	0	677,982	489,947	1,843,521
1985/1986	-	380,060	178,215	55,702	29,746	20,111	0	0	0	362,973	849,615	440,463	2,316,994
1986/1987	0	455,224	274,451	100,322	57,950	48,885	0	0	0	272,989	796,367	446,867	2,453,055
1987/1988	0	479,320	280,735	109,622	63,054	54,324	-	0	0	572,329	1,185,935	639,662	3,390,832
1988/1989	0	312,008	178,232	43,786	17,382	19,950	0	0	0	775,398	1,401,800	573,178	3,321,734
1989/1990	0	207,015	96,004	15,179	-	-	0	0	0	500,788	820,896	267,394	1,918,880
1990/1991	0	499,302	281,647	8,551	1,053	2,778	-	0	0	582,141	925,769	360,416	2,662,151
1991/1992	0	717,506	324,070	17,086	7,561	4,422	0	0	0	987,389	1,821,479	827,593	4,707,106
1992/1993	0	177,194	101,101	12,403	-	3,627	-	0	0	935,175	1,360,389	503,792	3,095,419
1993/1994	0	232,813	116,882	11,727	4,734	5,806	0	0	0	660,473	1,106,117	398,149	2,536,701
1994/1995	0	242,047	97,299	38,076	-	-	0	0	0	523,740	716,277	302,939	1,921,739
1995/1996	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
1996/1997	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
1997/1998	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
1998/1999	0	383,335	178,943	33,544	19,080	5,345	0	0	0	853,216	672,988	183,048	2,329,499

-continued-

Table 1.5–Page 2 of 2.

Season	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Total
1999/2000	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
2000/2001	0	299,645	136,807	7,524	9,692	2,846	0	0	0	975,841	884,852	248,203	2,565,410
2001/2002	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
2002/2003	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
2003/2004	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
2004/2005	0	607,852	234,475	36,010	7,408	11,352	0	0	0	1,829,607	1,454,980	405,947	4,587,631
2005/2006	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
2006/2007	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
2007/2008	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
2008/2009	0	801,375	168,098	4,620	1,122	-	0	0	0	1,546,315	1,645,744	563,497	4,731,668
2009/2010	0	739,398	210,216	0	0	0	0	0	0	1,101,310	1,112,933	405,840	3,569,697
2010/2011	0	453,422	114,467	-	-	0	0	0	0	1,431,374	1,008,528	232,935	3,245,265
2011/2012	0	444,606	116,091	-	0	0	0	0	0	968,601	813,612	251,227	2,594,897
2012/2013	0	416,132	90,183	6,712	-	-	0	0	0	996,658	657,716	189,958	2,359,309
2013/2014	0	768,734	232,607	5,743	-	-	0	0	0	821,825	649,475	109,346	2,590,022
2014/2015	0	777,452	199,238	17,248	5,305	-	0	0	0	2,117,601	1,555,974	388,225	5,063,854
2015/2016	0	442,237	111,003	5,239	7,250	4,784	0	0	0	1,591,523	894,198	203,128	3,259,362
2016/2017	0	340,299	74,967	7,172	-	-	0	0	0	1,295,651	507,407	130,898	2,358,645

- Data confidential because fewer than three permits fished.

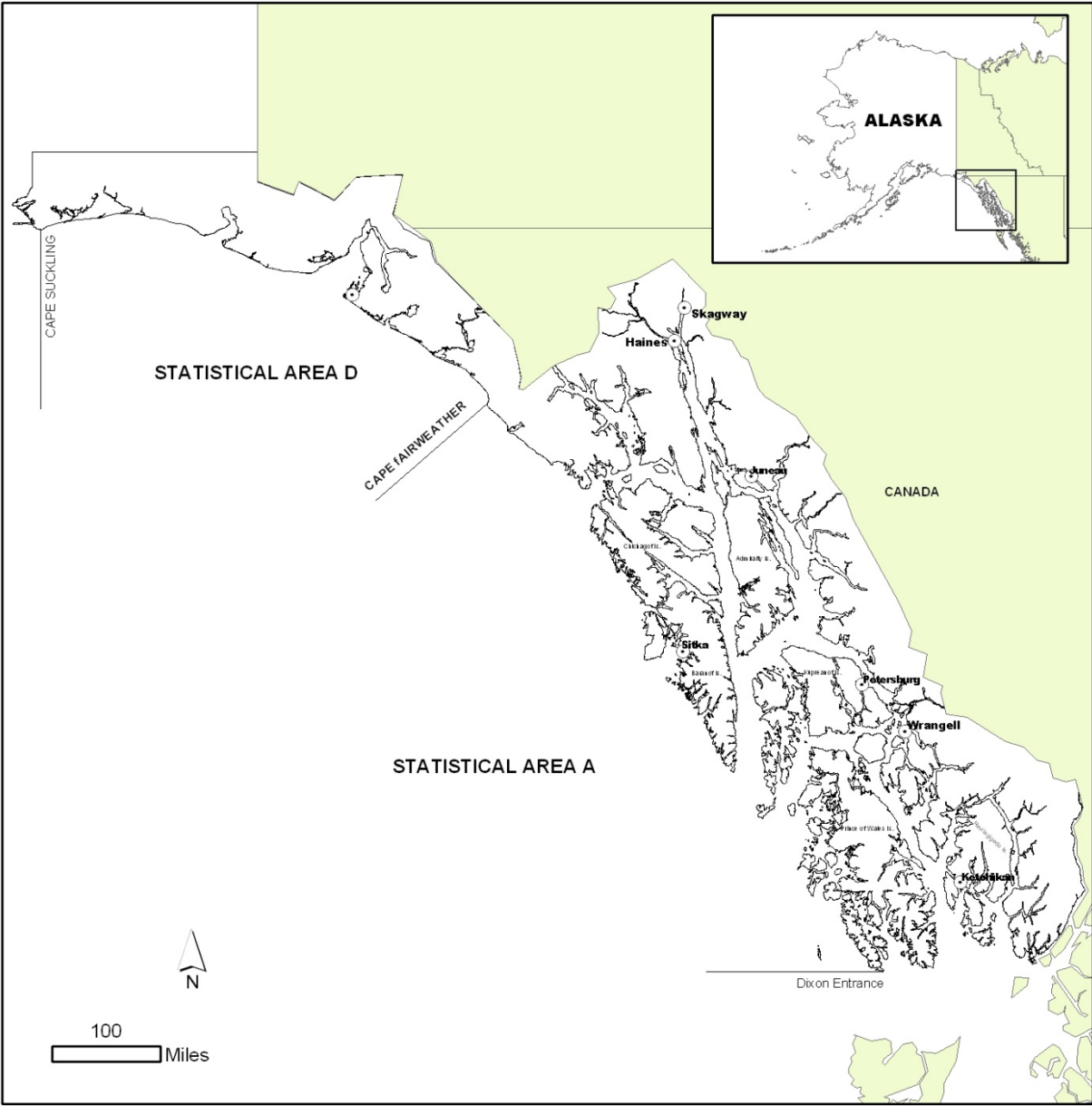


Figure 1.1—Registration Area A (Southeast Alaska) and Registration Area D (Yakutat).

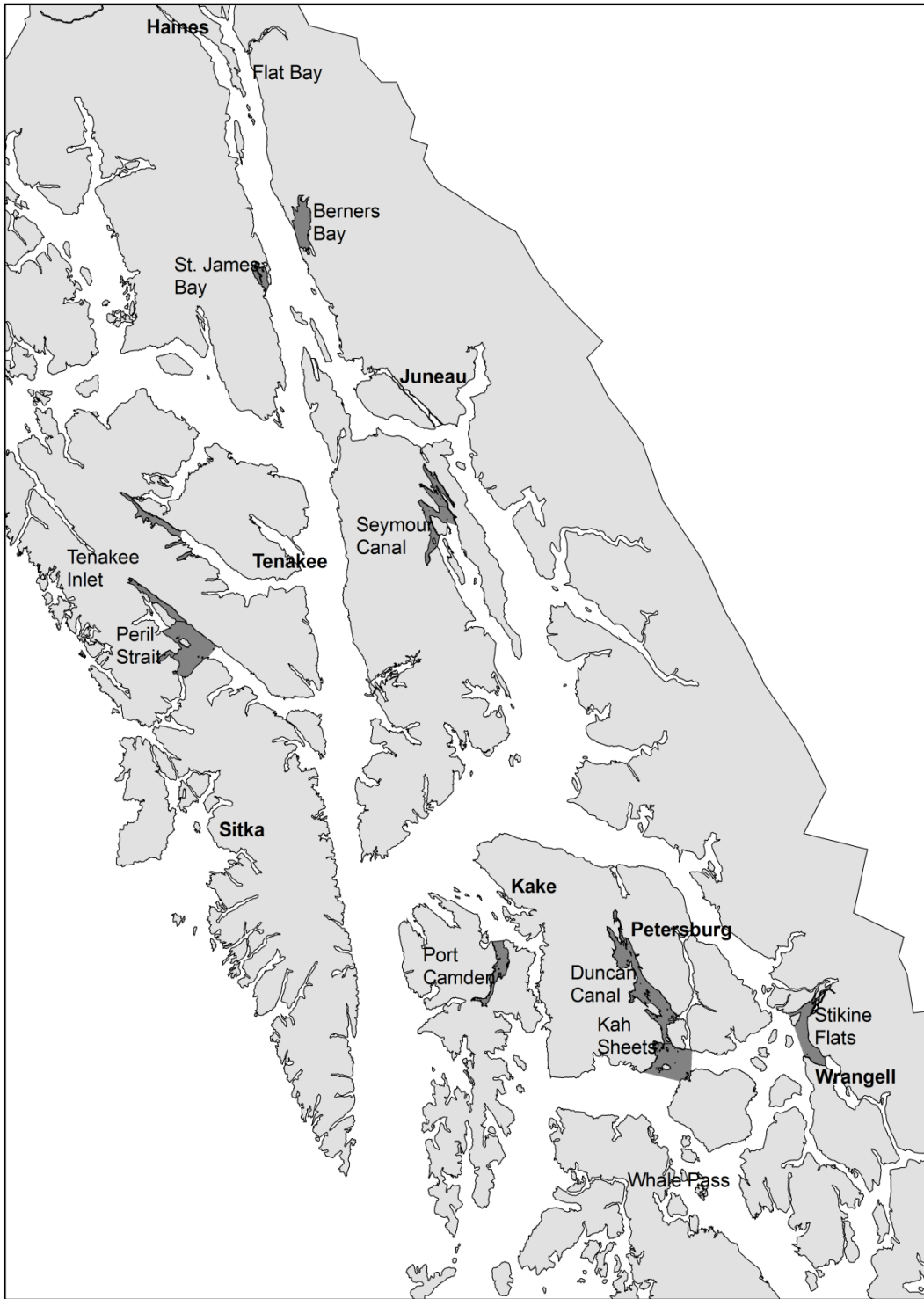


Figure 1.2—Dungeness crab survey locations in Southeast Alaska.

CHAPTER 2: YAKUTAT DUNGENESS CRAB FISHERY

INTRODUCTION

Registration Area D (Yakutat) Dungeness crab management is by sex, size, and season. In order to conserve reproductive potential, only male crab with a minimum CW of 6.5 inches notch to notch may be harvested. The season is from May 15 to July 14 and November 1 to 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 are near to the northern limit of Dungeness crab distribution. Within Yakutat waters, Dungeness crab 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 1960/61 to 1999/00, Yakutat produced a long-term average harvest of about 1.37 million lb per season, but a downward trend began in 1992/93 (Table 2.1). Historically, the product was marketed as canned or frozen meat, sections, and whole cooked or live crab. In later years the majority of the harvest took place in May and June (Table 2.2), and whole cooked or live crab entered the summer tourist markets in Washington, Oregon, and California.

This Yakutat Dungeness crab fishery was closed beginning with the 2000/01 season. Fish ticket and dockside sampling data provided the first indications of low stock abundance, and the 1997/98, 1998/99, and 1999/00 fishing seasons were closed early. Dungeness crab surveys to evaluate stock status in Yakutat were conducted in 2004, 2012, and 2013. These surveys showed no evidence of stock recovery. 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, as many as 67 permits fished annually in the Yakutat area (Table 2.1). 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 Yakutat 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. The fishery can be divided into three distinct periods.

In the 1960s and the 1970s, participation was low and harvests were relatively stable (Table 2.1), averaging 1.13 million lb per season in the 1960s and 1.26 million lb per season in the 1970s. At that time, 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.

In the 1980s, effort and harvest generally increased (Table 2.1). Harvest in the 1980s averaged 2.18 million lb. The 1980s saw the largest individual season harvests in the history of the fishery, with 5.16 million lb taken in the 1982/83 season and 3.49 million lb taken in the 1988/89 season (Table 2.1). 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 were 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.

In the 1990s, harvest and effort gradually declined each season. Fish ticket and dockside sampling data provided the first indications of low stock abundance, and the 1997/98, 1998/99, and 1999/00 fishing seasons were closed early. In the 1999/00 season, 10 permits fished for a harvest of less than 66,000 lb (Table 2.1). The fishery was closed beginning in the 2000/01 season and has remained closed since that time.

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 because the summer season overlaps with a portion of time males are molting. The current May 15–July 14 and November 1–February 28 season description 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.

Traditional 3-S management has been used for many decades to manage Dungeness crab fisheries from California to Kodiak. However, concerns remain regarding its efficacy in intensive, highly competitive, open access fisheries. Further work in Yakutat is needed to structure harvest to protect weak stock segments or soft-shell crab while optimizing exploitation rates and product quality. The department will reopen the Yakutat commercial Dungeness crab

fishery when fishery independent survey data show stock recovery and additional management measures are implemented.

FISHING SEASONS AND PERIODS

For most years and seasons before 1975/76, 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 lb and a rapid rise in the number of fishing vessels, the season was shortened to May 16–February 28, 1976. It was then closed in the summer by emergency order because large numbers of soft-shell crab were observed in the landed harvest. The 1976/77 season started on June 1, with a scheduled closure on February 28, 1977. The season opening and closing dates remained the same through the 1981/82 season, although several intervening seasons were closed by emergency order when large numbers of soft-shell crab were sampled at the dock. The season changed again in 1982, to May 1 through February 28, 1983. Each season from 1982/83 through 1984/85 was closed by emergency order at some point in the summer due to increasing numbers of soft-shelled crab in the landed harvest. In 1985, a split season was implemented from May 1 to July 14, and November 1 to 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 1997/98 season, a large portion of the harvest was recruit size crab and low abundance was observed which is 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 1998/99 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 that time.

SIZE RESTRICTIONS

From 1924 to 1935, the legal size of male crab was 6.5 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 6.5 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 because damage to the tips of the tenth anterolateral spines is common, particularly in older-shell crab. 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. Two escape rings with a minimum inside diameter of $4\frac{3}{8}$ inches were first required in 1976. The intent of escape rings is to permit the escape of undersized males and females, which are usually smaller than legal males. In 1977, a Dungeness pot was defined as a pot with tunnel eye openings that 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-count thread, it was reduced in 1990 to 30-count thread, and then increased in 1991 to 60-count thread. In 2012, the pot limit was reduced substantially from 400 to 60 pots per vessel.

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 nonexclusive area. The partial nonexclusive area was difficult to enforce, so this 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 reopening of collapsed fisheries, this process will likely be stepwise. The first step is to demonstrate stock recovery through a fishery independent survey.

Once recovery is demonstrated, full reopening of the fishery must be contingent upon funding of a management and research program designed to provide sustained yields. This could include a pot survey, inseason dockside sampling based in Yakutat, and a management program with associated biometric support if necessary. Concerns with potential fishing effort in the open access fishery in Yakutat remain. However, these concerns have been alleviated somewhat by the substantial pot reduction from 400 to 60 that occurred in 2012.

RESEARCH

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

SURVEYS

Surveys of Yakutat Dungeness crab grounds were conducted in 2004, 2012, and 2013. The primary objective of these surveys was to determine the catch rate of legal male Dungeness crab simulating commercial fishing methods. Secondary objectives were to collect size and sex data

from Dungeness crab captured using standard department survey sampling protocols, and to quantify shell hardness in male crab.

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.

In 2004, the contractor set 605 pots in five statistical areas, 181-10, 181-40, 181-50, 181-60, and 183-10. A department biologist onboard enumerated and sampled the catch and recorded pot locations. A total of 53 legal male crab were captured (Table 2.3).

A request for quotations 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 rerelease a new RFQ, and the survey was cancelled.

In 2012, the survey was again put out to bid. The contractor set 600 pots in late May/early June in the same five statistical areas sampled in 2004. Two department biologists sampled the catch and recorded pot locations. Durometers were also used in 2012 to quantify shell hardness in male crab. A total of 188 legal male crab were captured (Table 2.3). In addition to the legal male catch, 446 sublegal males were caught (Table 2.3). A majority of these sublegal males were prerecruit class crab.

In 2013, the survey was again put out to bid. The contractor set 600 pots in late-May/early-June in the same five statistical areas sampled in 2012. Like the previous year, two department biologists sampled the catch, took shell hardness readings, and recorded pot locations. The distribution of pots within the five statistical areas was very similar to the previous year's survey. Only 21 legal male crab were caught (Table 2.3).

A request for quotations to conduct a Yakutat Dungeness crab survey in June 2014 was announced by news release on April 4, 2014. There were no bidders and the survey was not conducted. Funding for the Yakutat Dungeness survey was eliminated from the FY 15 budget and to date has not been restored.

DOCKSIDE SAMPLING

Sporadic dockside sampling of the landed harvest in Yakutat was conducted from the 1975/76 season until the fishery was closed (Tables 2.4 and 2.5). Goals of 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.

CHAPTER 2—TABLES

Table 2.1—Registration Area D (Yakutat) commercial Dungeness crab fishery catch, effort, and value, 1960 to present.

Year/Season	Number				Lb per permit	Pots lifted	CPUE	Mean weight
	Permits	Landings	Crab	Lb				
1960	ND	ND	ND	543,762	ND	ND	ND	ND
1961	ND	ND	ND	1,023,545	ND	ND	ND	ND
1962	ND	ND	ND	937,051	ND	ND	ND	ND
1963	ND	ND	ND	1,383,298	ND	ND	ND	ND
1964	ND	ND	ND	637,140	ND	ND	ND	ND
1965	ND	ND	ND	910,278	ND	ND	ND	ND
1966	ND	ND	ND	528,060	ND	ND	ND	ND
1967	ND	ND	ND	2,031,460	ND	ND	ND	ND
1968	ND	ND	ND	2,096,119	ND	ND	ND	ND
1969/1970	11	107	522,840	1,223,240	111,204	ND	ND	2.3
1970/1971	10	83	661,629	1,508,561	150,856	ND	ND	2.3
1971/1972	7	88	524,208	1,212,198	173,171	ND	ND	2.3
1972/1973	9	85	NA	1,992,574	221,397	ND	ND	ND
1973/1974	27	236	NA	2,347,752	86,954	ND	ND	ND
1974/1975	22	154	NA	1,031,573	46,890	ND	ND	ND
1975/1976	17	113	264,426	579,908	34,112	ND	ND	2.2
1976/1977	7	32	230,886	537,543	76,792	ND	ND	2.3
1977/1978	3	12	54,449	131,052	43,684	ND	ND	2.4
1978/1979	12	122	796,823	1,799,403	149,950	ND	ND	2.3
1979/1980	21	87	613,725	1,436,923	68,425	ND	ND	2.3
1980/1981	10	73	411,293	895,220	89,522	ND	ND	2.2
1981/1982	28	169	1,323,791	3,228,301	115,296	ND	ND	2.4
1982/1983	35	346	2,046,436	5,160,135	147,432	ND	ND	2.5
1983/1984	67	511	1,110,413	2,666,383	39,797	ND	ND	2.4
1984/1985	39	236	325,420	774,828	19,867	ND	ND	2.4
1985/1986	32	175	172,166	371,237	11,601	66,258	2.6	2.2
1986/1987	22	116	363,764	755,912	34,360	49,248	7.4	2.1
1987/1988	28	220	1,257,033	2,725,040	97,323	135,919	9.2	2.2
1988/1989	32	253	1,549,275	3,494,368	109,199	186,574	8.3	2.3
1989/1990	29	227	712,424	1,701,859	58,685	124,857	5.7	2.4
1990/1991	36	327	867,031	2,101,676	58,380	177,984	4.9	2.4
1991/1992	67	506	1,133,583	2,853,322	42,587	252,606	4.5	2.5
1992/1993	49	265	541,961	1,392,700	28,422	176,345	3.1	2.6
1993/1994	44	253	352,151	815,969	18,545	119,496	2.9	2.3
1994/1995	47	251	393,371	915,523	19,479	108,923	3.6	2.3
1995/1996	46	277	239,602	557,528	12,120	95,419	2.5	2.3
1996/1997	27	155	111,930	244,825	9,068	42,362	2.6	2.2
1997/1998	30	87	74,810	156,072	5,202	34,177	2.2	2.1
1998/1999	29	92	62,525	121,478	4,189	26,178	2.4	1.9
1999/2000	10	52	31,966	65,386	6,539	14,630	2.2	2.0
2000/2001- 2016/2017 ^a	0	0	0	0	0	0	0	0

Note: ND = not available.

^a Fishery closed by emergency order.

Table 2.2–Registration Area D (Yakutat) commercial Dungeness crab fishery catch by month from 1969/1970 to present in pounds.

Season	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Total
1969/1970	0	0	0	0	0	0	0	0	103,529	254,663	528,992	336,056	1,223,240
1970/1971	-	0	0	0	0	0	0	0	40,322	386,645	426,131	511,856	1,508,561
1971/1972	0	0	0	0	0	0	0	0	-	407,771	572,408	223,406	1,212,198
1972/1973	-	0	0	0	0	0	0	0	-	653,684	842,083	392,705	1,992,574
1973/1974	80,860	0	0	0	0	-	0	-	205,354	679,692	1,079,498	195,187	2,259,469
1974/1975	37,430	-	0	0	0	0	0	16,274	140,999	475,964	213,265	113,346	1,031,573
1975/1976	0	0	0	0	0	0	0	4,095	80,190	239,468	251,345	-	579,908
1976/1977	0	0	0	0	0	0	0	0	0	136,024	238,516	163,003	537,543
1977/1978	-	-	-	-	0	0	0	0	0	0	0	33,705	131,052
1978/1979	0	0	0	0	0	0	0	0	0	738,083	816,293	245,027	1,799,403
1979/1980	0	0	0	0	0	0	0	0	0	840,102	563,873	32,948	1,436,923
1980/1981	-	-	0	-	-	-	0	0	0	404,436	328,334	141,180	895,220
1981/1982	-	0	0	0	0	0	0	0	0	2,467,710	634,913	111,793	3,228,301
1982/1983	0	0	0	0	0	0	0	0	0	3,092,078	1,857,371	210,686	516,135
1983/1984	183,798	55,867	-	5,572	-	2,961	0	0	970,737	1,197,775	201,830	42,667	2,666,383
1984/1985	0	0	0	0	0	0	0	0	404,286	316,460	54,082	0	774,828
1985/1986	0	0	-	-	-	-	0	0	158,232	160,459	49,203	0	371,237
1986/1987	0	0	24,944	16,582	-	-	0	0	195,237	393,867	122,987	0	755,912
1987/1988	0	0	41,755	44,308	8,474	22,478	-	0	846,605	1,279,970	474,553	0	2,725,040
1988/1989	0	0	-	14,467	-	0	0	0	1,003,658	1,856,524	590,290	0	3,494,368
1989/1990	0	0	0	-	-	-	0	0	647,224	860,857	191,351	0	1,701,859
1990/1991	0	0	49,133	25,628	27,968	12,897	-	0	668,300	1,057,943	256,446	0	2,101,676
1991/1992	0	0	22,941	18,802	8,056	9,274	0	0	866,372	1,598,073	329,804	0	2,853,322
1992/1993	0	0	0	5,222	4,423	-	-	0	665,462	655,327	59,021	0	1,392,700
1993/1994	0	0	28,254	14,015	4,705	2,531	0	0	434,904	299,740	31,820	0	815,969
1994/1995	0	0	109,603	27,329	-	-	0	0	333,656	426,246	17,786	0	915,523
1995/1996	0	0	46,059	7,427	2,104	-	0	0	263,382	209,841	27,832	0	557,528
1996/1997	0	0	-	-	-	-	0	0	109,390	94,113	24,818	0	244,825
1997/1998	0	0	0	0	0	0	0	0	102,905	53,167	0	0	156,072
1998/1999	0	0	0	0	0	0	0	0	93,632	27,846	0	0	121,478
1999/2000	0	0	0	0	0	0	0	0	47,727	17,659	0	0	65,386
2000/2001–2016/2017 ^a	0	0	0	0	0	0	0	0	0	0	0	0	0

- Data confidential because fewer than three permits fished.

^a Fishery closed by emergency order.

Table 2.3–Number of pots sampled and number of crab caught in the 2004, 2012, and 2013 surveys of commercial Dungeness crab grounds in Yakutat, Registration Area D.

Years surveyed	Number of pots		Number of crab in sampled pots			
	Set	Sampled	Sublegal males	Legal males	Females	Legal males per pot
2004	605	425	31	53	33	0.12
2012	600	600	446	188	155	0.31
2013	600	599	147	21	76	0.04

Table 2.4—Summary of commercial Dungeness crab size frequency and shell condition data collected during dockside sampling in Registration Area D, 1975/1976 to 1999/2000.

Season	Number sampled		Carapace width (mm)		Recruitment	
	Boats	Crab	Mean	Range	% Recruit ^a	% Postrecruit ^b
1975/1976	12	1,500	180.1	157–210	81.1	18.9
1976/1977	-	-	-	-	-	-
1977/1978	-	-	-	-	-	-
1978/1979	27	4,503	183.9	156–221	75.4	24.6
1979/1980	4	605	187.4	166–221	67.8	32.2
1980/1981	-	-	-	-	-	-
1981/1982	11	1,215	182.2	160–218	84.7	15.3
1982/1983	16	1,695	186.3	158–222	74.8	25.2
1983/1984	27	2,491	193.9	163–227	44.3	55.7
1984/1985	41	4,191	190.7	162–233	51.1	48.9
1985/1986	61	6,526	180.1	156–226	70.2	29.8
1986/1987	29	3,545	176.0	158–225	70.2	29.8
1987/1988	33	4,726	182.6	159–224	74.7	25.3
1988/1989	46	5,448	184.3	153–222	66.0	34.0
1989/1990	17	1,702	185.2	159–223	60.2	39.8
1990/1991	19	1,901	183.8	161–217	75.7	24.3
1991/1992	26	2,596	185.2	157–220	68.3	31.7
1992/1993	9	1,013	185.3	163–221	61.1	38.9
1993/1994	17	1,758	179.7	158–220	77.3	22.7
1994/1995	9	1,023	178.4	161–215	87.3	12.7
1995/1996	16	1,675	175.3	157–210	90.0	10
1996/1997	16	2,134	177.0	155–209	85.5	14.5
1997/1998	21	3,114	176.2	159–207	92.6	7.4
1998/1999	17	1,072	176.8	161–207	38.1	61.9
1999/2000	16	1,435	174.0	159–204	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.

- Data confidential because fewer than three permits fished.

Table 2.5–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 interviewed	Pots lifted	Crab captured			Mean	Range		
1977/1978	-	-	-	-	-	-	-	-	-
1978/1979	22	10,830	105,020	9.7	6.2–15.7	2.5	2.0–3.0	731,465	0.62
1979/1980	3	ND	ND	ND	ND	2.5	2.4–2.8	574,769	0.11
1980/1981	-	-	-	-	-	-	-	-	-
1981/1982	7	ND	ND	ND	ND	2.3	2.0–2.5	1,409,738	0.09
1982/1983	14	440	ND	ND	ND	2.4	1.9–2.7	2,141,135	0.08
1983/1984	27	1,850	17,085	9.2	8.3–13.1	2.7	1.9–3.0	1,006,182	0.25
1984/1985	37	3,945	6,680	1.7	0.9–2.5	2.6	2.1–3.0	299,161	1.4
1985/1986	59	22,883	28,997	1.3	0.3–9.2	2.2	1.8–2.5	172,668	3.78
1986/1987	20	7,710	47,226	6.1	3.5–9.2	2.1	1.9–2.5	366,948	0.97
1987/1988	31	13,465	65,176	4.8	3.0–11.7	2.2	1.9–2.5	1,244,311	0.38
1988/1989	44	43,351	283,640	6.5	3.9–23.0	2.4	2.1–2.7	1,468,222	0.37
1989/1990	17	13,639	71,125	5.2	2.8–9.6	2.4	2.2–2.6	709,108	0.24
1990/1991	19	19,575	99,912	5.1	2.3–10.3	2.4	2.1–2.6	890,489	0.21
1991/1992	26	14,939	75,621	5.1	1.3–18.7	2.5	2.2–2.7	1,164,621	0.22
1992/1993	9	3,180	13,416	4.2	1.8–6.5	2.5	2.1–2.8	559,317	0.18
1993/1994	17	17,905	50,118	2.8	0.8–4.6	2.2	2.0–2.5	365,905	0.48
1994/1995	9	8,200	26,400	3.2	1.6–7.5	2.3	2.0–2.5	405,099	0.25
1995/1996	16	8,460	22,143	2.6	0.5–4.8	2.0	1.8–2.4	277,377	0.6
1996/1997	15	9,575	20,421	2.1	0.6–6.2	2.0	1.8–2.3	124,911	1.71
1997/1998	20	20,563	49,828	2.4	0.8–4.6	2.1	1.9–2.4	75,397	4.13
1998/1999	16	7,075	14,215	2.0	1.2–3.0	2.1	1.8–2.3	58,123	1.84
1999/2000	16	13,182	27,796	2.1	6.6–2.0	2.0	1.7–3.5	32,210	4.46

^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.

- Data confidential because fewer than three permits fished.

Note: ND = no data available.

REFERENCES CITED

- Bishop, G. 2013. Summary of Dungeness crab dockside sampling in Southeast Alaska with an emphasis on 2001/2002 through 2010/2011 commercial fishing seasons. Alaska Department of Fish and Game, Regional Report Series No. 1J13-06, Douglas, Alaska.
- Bishop, G. H., J. M. Rumble, and C. Siddon. *Unpublished data*. Southeast Alaska Dungeness crab stock assessment survey from 2000 to 2004. Alaska Department of Fish and Game, Douglas.
- Bishop, G. H., J. M. Rumble, and C. E. Siddon. 2010. Change-in-ratio and index-removal population estimation of Dungeness crab in Southeastern Alaska. Pages 517-536 [In] G. H. Kruse et al., editors. 25th Lowell Wakefield Fisheries Symposium: Biology and Management of Exploited Crab Populations under Climate Change, doi:10.4027/bmecpcc.2010.16. Alaska Sea Grant College Program, University of Alaska, Fairbanks.
- Bishop, G. H., M. S. M. Siddeek, and J. M. Rumble. 2007. Growth of male Dungeness crab in Southeastern Alaska. Pages 1339-1342 [In] J. Nielsen et al., editors. Reconciling Fisheries with Conservation: Proceedings of the Fourth World Fisheries Congress, Symposium 49. American Fisheries Society, Vancouver.
- Butler, T. H. 1960. Maturity and breeding of the Pacific edible crab, *Cancer magister* Dana. Journal of the Fisheries Research Board of Canada 17(5):641-646.
- Dawe, E. G., J. M. Hoenig, and X. Xucai. 1993. Change-in-ratio and index-removal methods for population assessment and their application to snow crab (*Chionoecetes opilio*). Canadian Journal of Fisheries and Aquatic Sciences 50:1456-1476.
- Hankin, D. G., N. Diamond, M. S. Mohr, and J. Ianelli. 1985. Molt increments, annual molting probabilities, fecundity and survival rates of adult female Dungeness crab in Northern California. Pages 189-206 [In] B. Melteff, editor. Proceedings of the Symposium on Dungeness Crab Biology and Management. University of Alaska Fairbanks, Alaska Sea Grant College Program, AK-SG-85-03, Anchorage.
- Hankin, D. G., N. Diamond, M. S. Mohr, and J. Ianelli. 1989. Growth and reproductive dynamics of adult female Dungeness crab (*Cancer magister*) in Northern California. Journal du Conseil, Conseil International Pour l'Exploration de la Mer 46:94-108.
- Hartnoll, R. G. 1969. Mating in the Brachyura. Crustaceana 16:161-181.
- Jensen, G. C. 1995. Pacific coast crab and shrimps. Sea Challengers, Monterey.
- Jensen, P. C., J. M. Orensanz, and D. A. Armstrong. 1996. Structure of the female reproductive tract in the Dungeness crab *Cancer magister* and implications for the mating system. Biological Bulletin 190:336-349.
- Kruse, G. H., D. Hicks, and M.C. Murphy. 1994. Handling increases mortality of softshell Dungeness crabs returned to the sea. Alaska Fishery Research Bulletin. 1(1):1-9.
- Lehman, C., and O. Osborn. 1970. Dungeness crab research. Alaska Department of Fish and Game, Commercial Fisheries Research and Development Act Completion Report 5-10-R and 5-21-R, Juneau.
- Pitcher, K. W., and K. K. Imamura. 1990. Impacts of sea otter predation on Dungeness crab abundance in Cross Sound, Icy Strait, Southeastern Alaska. Alaska Department of Fish and Game, United States Fish and Wildlife Service Cooperative Agreement #14-16-009-954.
- Shirley, S. M., and T. C. Shirley. 1988. Appendage injury in Dungeness crab, *Cancer magister*, in Southeastern Alaska. Fishery Bulletin 86(1):156-160.
- Shirley, S. M., T. C. Shirley, and S. D. Rice. 1987. Latitudinal variation in the Dungeness crab, *Cancer magister*: Zoel morphology explained by incubation temperature. Marine Biology 95:371-376.
- Shirley, T. C., and M. Sturdevant. 1988. Dungeness crab mating study. University of Alaska Southeast, School of Fisheries and Science, Annual Report to the Alaska Department of Fish and Game UASE 87-20, Juneau.
- Stone, R. P. and C. E. O Clair. 2001. Seasonal movements and distribution of Dungeness crab *Cancer magister* in a glacial southeastern Alaska estuary. Marine Ecology Progress Series 214:167-176.
- Swiney, K. M., D. T. C. Shirley, S. J. Taggart, and C. E. O'Clair. 2003. Dungeness crab, *Cancer magister*, do not extrude eggs annually in Southeastern Alaska: An in situ study. Journal of Crustacean Biology 23(2):280-288.