

**Fishery Manuscript No. 95-1**

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**Recruitment to Lingcod Populations Near Seward,  
Alaska, During 1993 and 1994**

by

**Doug Vincent-Lang**

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February 1995

Alaska Department of Fish and Game

Division of Sport Fish



## Symbols and Abbreviations

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<b>Weights and measures (metric)</b>		<b>General</b>		<b>Mathematics, statistics, fisheries</b>
centimeter	cm	All commonly accepted abbreviations.	e.g., Mr., Mrs., a.m., p.m., etc.	All standard mathematical signs, symbols, and abbreviations
deciliter	dL			
gram	g	All commonly accepted professional titles.	e.g., Dr., Ph.D., R.N., etc.	Alternate hypothesis $H_A$
hectare	ha	and	&	base of natural logarithm $e$
kilogram	kg	at	@	catch per unit effort CPUE
kilometer	km	Compass directions:		coefficient of variation CV
liter	L			common test statistics $F, t, \chi^2$ , etc.
meter	m		east E	confidence interval C.I.
metric ton	mt		north N	correlation coefficient $R$ (multiple)
milliliter	ml		south S	correlation coefficient $r$ (simple)
millimeter	mm		west W	covariance cov
		Copyright	©	degree (angular or temperature)
		Corporate suffixes:		degrees of freedom df
		Company	Co.	divided by $\div$ or / (in equations)
		Corporation	Corp.	equals =
		Incorporated	Inc.	expected value E
		Limited	Ltd.	fork length FL
		et alii (and other people)	et al.	greater than >
		et cetera (and so forth)	etc.	greater than or equal to $\geq$
		exempli gratia (for example)	e.g.,	harvest per unit effort HPUE
		id est (that is)	i.e.,	less than <
		latitude or longitude	lat. or long.	less than or equal to $\leq$
		monetary symbols (U.S.)	\$, ¢	logarithm (natural) ln
		months (tables and figures): first three letters	Jan,...,Dec	logarithm (base 10) log
		number (before a number)	# (e.g., #10)	logarithm (specify base) $\log_2$ , etc.
		pounds (after a number)	# (e.g., 10#)	mid-eye-to-fork MEF
		registered trademark	®	minute (angular) '
		trademark	™	multiplied by x
		United States (adjective)	U.S.	not significant NS
		United States of America (noun)	USA	null hypothesis $H_0$
		U.S. state and District of Columbia abbreviations	use two-letter abbreviations (e.g., AK, DC)	percent %
				probability P
				probability of a type I error (rejection of the null hypothesis when true) $\alpha$
				probability of a type II error (acceptance of the null hypothesis when false) $\beta$
				second (angular) "
				standard deviation SD
				standard error SE
				standard length SL
				total length TL
				variance Var
<b>Weights and measures (English)</b>				
cubic feet per second	ft <sup>3</sup> /s			
foot	ft			
gallon	gal			
inch	in			
mile	mi			
ounce	oz			
pound	lb			
quart	qt			
yard	yd			
Spell out acre and ton.				
<b>Time and temperature</b>				
day	d			
degrees Celsius	°C			
degrees Fahrenheit	°F			
hour (spell out for 24-hour clock)	h			
minute	min			
second	s			
Spell out year, month, and week.				
<b>Physics and chemistry</b>				
all atomic symbols				
alternating current	AC			
ampere	A			
calorie	cal			
direct current	DC			
hertz	Hz			
horsepower	hp			
hydrogen ion activity	pH			
parts per million	ppm			
parts per thousand	ppt, ‰			
volts	V			
watts	W			

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ALASKA, DURING 1993 AND 1994**

by

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February 1995

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**RECRUITMENT TO LINGCOD POPULATIONS NEAR SEWARD, ALASKA  
DURING 1994 AND 1995.**

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**ABSTRACT**

Vincent-Lang, D. 1995. Recruitment to lingcod populations near Seward, Alaska during 1993 and 1994. Alaska Department of Fish and Game, Fishery Manuscript No. 95-XX, Anchorage.

Lingcod were collected from marine waters near Seward, Alaska during 1993 and 1994 to assess recruitment. To make data comparable to past information, lingcod were collected using hook and line jig gear fished in a similar manner and at similar depths as the sport fishery. For each captured lingcod, the location, depth, and date of capture was recorded. Captured lingcod were measured to the nearest 0.5 cm total length and sexed based on external characteristics. Ten lingcod were collected from within Resurrection Bay during 1993 and 13 from within Resurrection Bay during 1994. The small number of lingcod caught suggests a relatively low abundance of lingcod continues within Resurrection Bay. No lingcod under 75 cm were sampled during 1993, suggesting recruitment had yet to occur. During 1994, two lingcod under 75 cm were collected, suggesting that some recruitment may be occurring; however, sample sizes are small. One hundred forty-eight and 153 lingcod were collected from waters in the vicinity of the Chiswell Islands, outside Resurrection Bay during 1993 and 1994, respectively. Two lingcod under 75 cm were collected during 1993 and none under this length were collected during 1994. This continues the decline observed since 1987 in the proportion of lingcod under 75 cm, suggesting recruitment has yet to occur in the vicinity of the Chiswell Islands. Ninety-five lingcod were weighed to the nearest 0.5 kg and a length-weight relationship ( $\ln WT_{kg} = -12.29 + 3.17[\ln TL_{cm}]$ ) was calculated.

## *INTRODUCTION*

The status of lingcod *Ophiodon elongatus* in the Central Gulf of Alaska (*Figure 1*) has historically been monitored through evaluation of fishery-based, time-series statistics. Trends in these statistics have indicated that "fishing-out" and declines in recruitment have occurred since 1987, most notably for marine waters accessible from Seward (Vincent-Lang and Bechtol 1992; Meyer 1993). To conserve depressed lingcod populations and to allow the populations to rebuild to levels capable of supporting a sustained harvest, new regulations governing the prosecution of commercial and sport lingcod fisheries in the Central Gulf of Alaska were implemented in 1993. The new regulations include a complete closure of Resurrection Bay to the commercial and sport harvest of lingcod, a reduced sport bag and possession limit for waters outside Resurrection Bay (from 2 per day and 2 in possession to 1 and 1, respectively), a spawning and nest guarding season closure (from January 1 through June 30), and a minimum size limit of 35 inches or 89 cm total length (established to assure that lingcod have an opportunity to spawn prior to their availability to the fishery).

The adoption of the complete fishery closure within Resurrection Bay and the minimum size limits area-wide has altered the age and length compositions of the harvest and has therefore compromised our ability to utilize age and length based harvest statistics to monitor population status and recruitment. To evaluate the status and recovery of depressed stocks it has therefore become necessary to conduct fishery-independent sampling. This approach is currently being used to monitor population status and recruitment of lingcod off the coast of Washington (Tom Jageilo, Washington Department of Fisheries, Olympia WA, *personal communication*). Other statistics to assess and monitor population status and recruitment, including estimation of abundance through tagging or cohort analyses and catch-per-unit-effort, were evaluated; however, were not chosen due to the high cost necessary to guarantee success.

This report summarizes findings of fishery-independent lingcod sampling conducted near Seward during 1993 and 1994. The primary objective of this sampling was to monitor recruitment to the population at large prior to their availability to the fishery at 35 inches (89 cm). Research has indicated that recruitment within lingcod populations both within Resurrection Bay and in the vicinity of the Chiswell Islands (*Figure 2*) has decreased since 1987 (Meyer 1993). Bargmann (1985) has shown recruitment of lingcod to be highly variable, with strong surges in recruitment occurring only every 7 to 10 years. If recruitment to the population at large is not observed in the near future, further restrictions to the lingcod fisheries in the vicinity of the Chiswell Islands may be necessary to protect lingcod from overfishing.

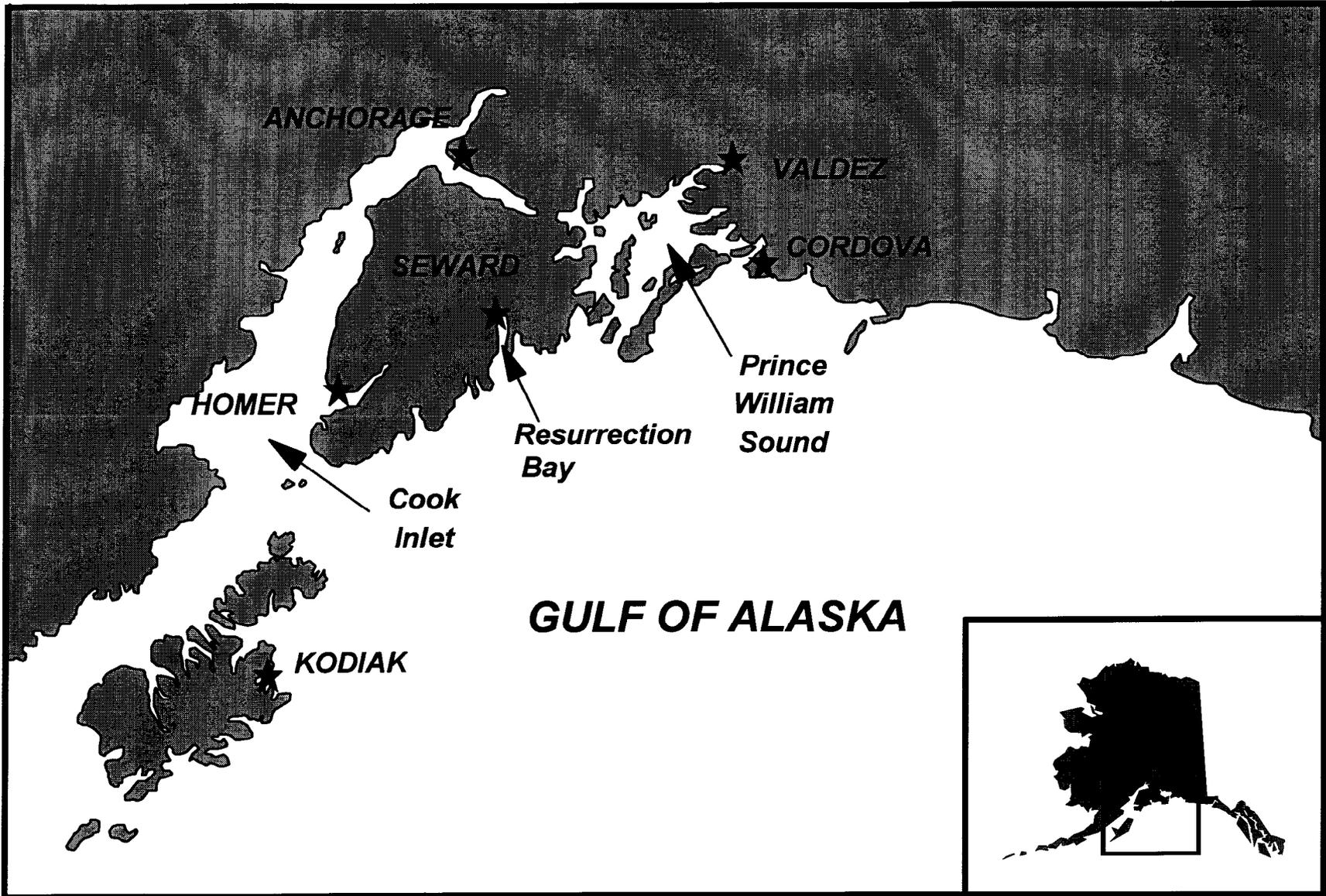


Figure 1. The central Gulf of Alaska.

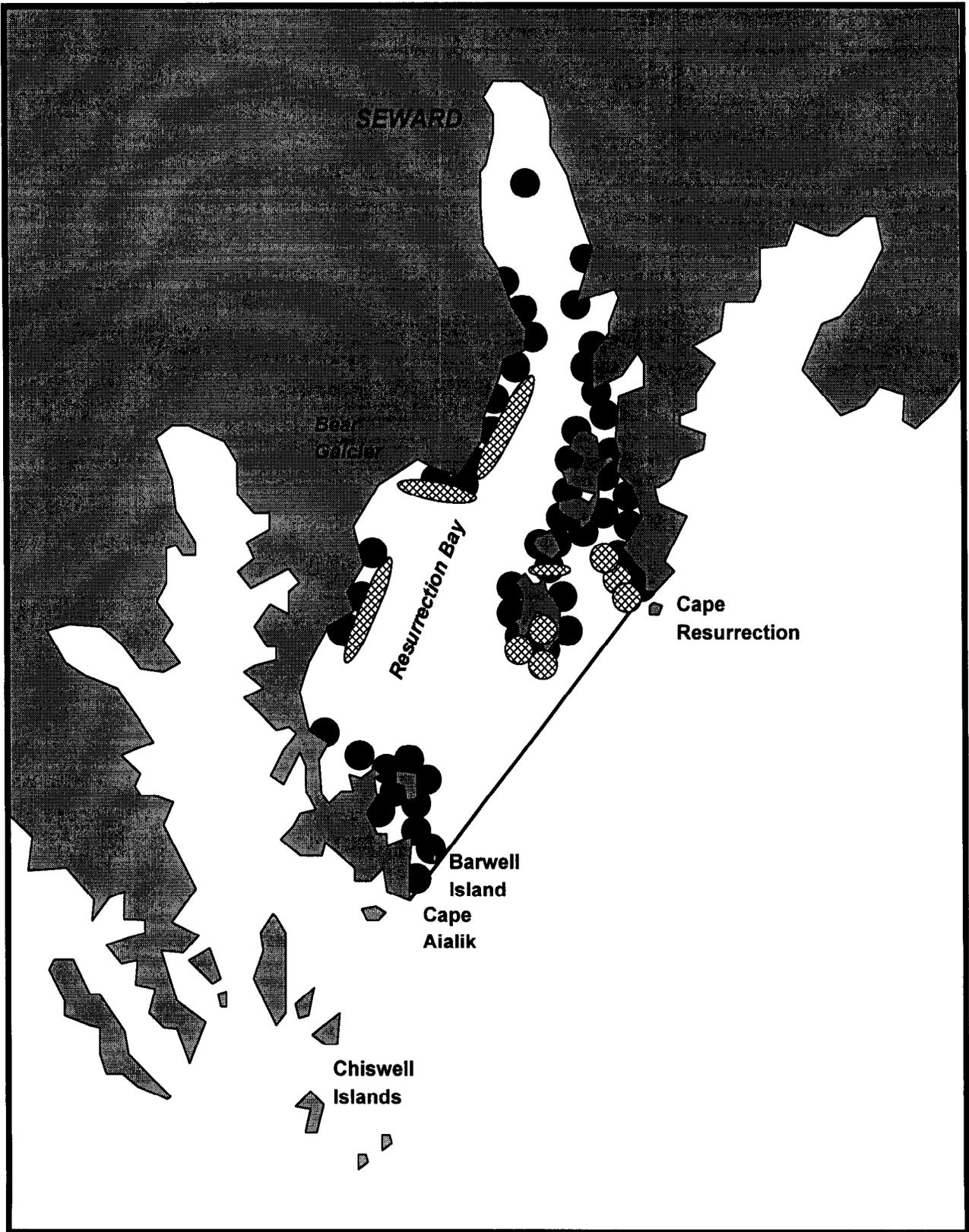


Figure 2. Areas sampled within Resurrection Bay during 1993 (solid circles) and 1994 (hatched circles).

## ***METHODS***

During 1993, lingcod were sampled during August and early September inside Resurrection Bay using a department-owned 22 foot Seasport. A commercial charter was used to collect lingcod during September, 1993 in the vicinity of the Chiswell Islands. During 1994, a commercial charter was used to collect lingcod during September both in the vicinity of the Chiswell Islands and from within Resurrection Bay.

To make data comparable to past information, lingcod were collected using hook and line jig gear fished in a similar manner and at similar depths as the sport fishery. The location (GPS coordinates), depth (nearest 6 feet), and date of capture was noted for each captured lingcod. During 1994, the jig size used to collect lingcod was also recorded over concern that large jigs were not capturing smaller lingcod. All captured lingcod were measured to the nearest 0.5 cm total length and sexed based on the presence or absence of anal papilla. After sampling, lingcod were returned to the water near their capture location. A record was kept of the areas, and depths fished regardless of the number of fish caught. In addition, the number of angler-days of effort expended to collect lingcod from within Resurrection Bay and in the vicinity of the Chiswell Islands was kept. An angler-day is defined as one angler fishing for one day regardless of the hours fished.

Scatter plots were used to determine if there were any relationships between sex or length as a function of depth of capture or jig size. A binomial probability distribution was used to detect whether at least 3% recruitment (determined as lingcod under 70 cm) had occurred in populations in the vicinity of the Chiswell Islands. Seventy-five cm was determined to be the length of recruitment as this length represents the length of 50% maturity (Vincent-Lang and Bechtol 1992).

During 1993, 95 lingcod were weighed to the nearest 0.5 kg and a length-weight relationship was calculated based on the linear relationship between the natural logs of weights as a function of lengths.

## ***FINDINGS***

### ***Within Resurrection Bay:***

Thirty-two angler-days during August and early September 1993 and 12 angler-days during September, 1994 were expended within Resurrection Bay to collect lingcod. Many areas throughout the bay which historically supported lingcod were sampled (*Figure 2*). In spite of this relatively extensive fishing effort, only 10 lingcod were sampled during 1993 and 13 lingcod during 1994 (*Appendix Table 1*). The sex ratio of the sampled lingcod varied by year: 40% males: 60% females during 1993 (n=10) and 69% males: 31% females during 1994 (n=13). There appeared to be no relationship between the depth at which female

lingcod were caught versus their size during either 1993 or 1994 (*Figure 3*). There did appear to be a relationship between the depth at which male lingcod were caught versus their size during 1993, however sample sizes were small and this relationship did not hold during 1994 when sample sizes were larger (*Figure 3*). During 1993, no lingcod under 75 cm were sampled, suggesting recruitment had yet to occur. During 1994, two lingcod under 75 cm were collected, suggesting that some recruitment (15%, SE=10%) may have occurred; however, sample sizes were small.

***Outside Resurrection Bay:***

Twelve and ten angler-days were expended from September 22-23, 1993 and September 20-21, 1994, respectively, to collect lingcod in the vicinity of the Chiswell Islands. Many areas in the vicinity of the Chiswell Islands which support lingcod harvest were sampled (*Figure 4*). One hundred forty-eight lingcod were collected during 1993 and 153 lingcod were collected during 1994 (*Appendix Table 2*). There appeared to be no relationship between the depth at which lingcod were caught versus their size during either 1993 or 1994 (*Figure 5*). The sex ratio of the sampled lingcod was 29% males: 71% females during 1993 (n=143) and 37% males: 63% females during 1994 (n=153). Females were captured throughout the depth range sampled, while males were caught only from depths shallower than 180 feet during 1993; however, this did not prove to be the case during 1994 (*Figure 5*). Large jigs caught both large and small lingcod while small jigs caught predominately small lingcod (*Figure 6*), indicating that large jigs can capture small lingcod.

Two lingcod under 75 cm were sampled during 1993 and no lingcod under this length were sampled during 1994 (*Figure 7*). This continues the decline observed since 1987 in the proportion of fish under 75 cm (*Table 1*). Also, the mode of length frequency distribution (95 cm in 1993 and 105 cm in 1994) continues to shift to the right as compared to previous years harvest sampling efforts (*Figure 8*). In combination, this indicates that recruitment has yet to occur in the vicinity of the Chiswell Islands.

The mode of the length frequencies continues a shift to the right unabated from 1992 through 1993 (*Figure 8*). Based on this, it appears that the fishery-independent sampling is representative of the population previously sampled and has not comprimized our time-series of data used to evaluate recruitment.

***Length-Weight Relationship:***

Ninety-five lingcod were both weighed and measured during 1993. The length-weight relationship for these fish is shown in *Figure 9* and is defined by the following equation:

$$\ln WT_{kg} = -12.29 + 3.17[\ln TL_{cm}].$$

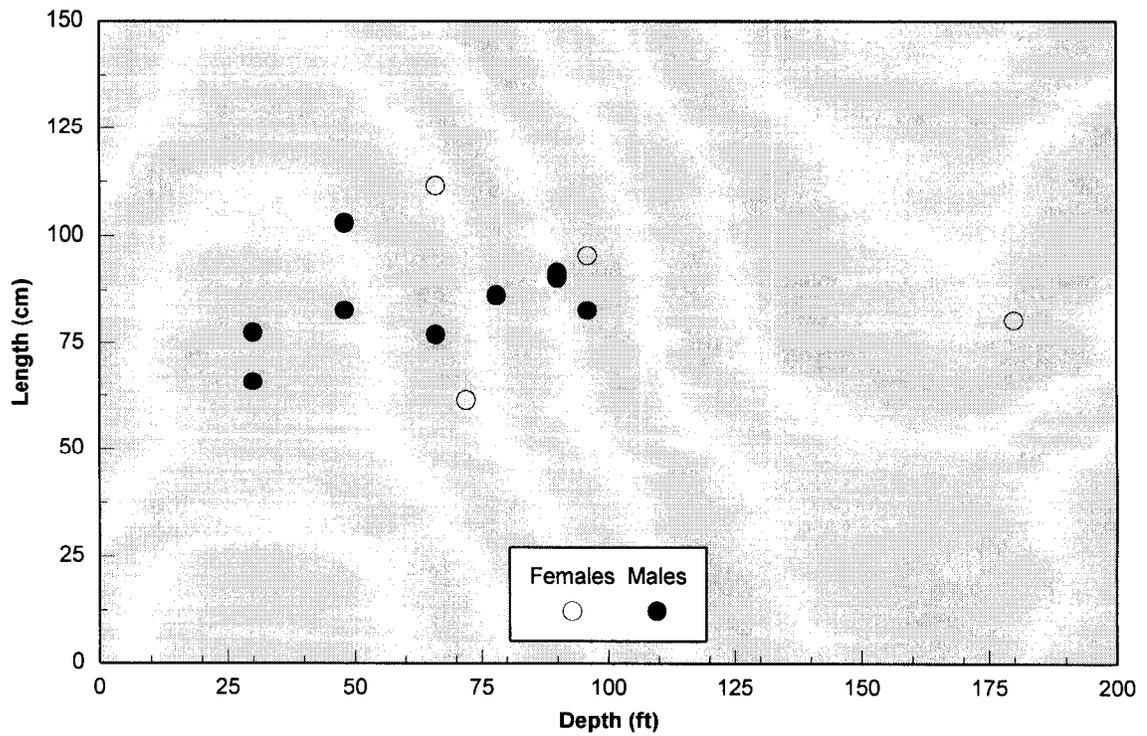
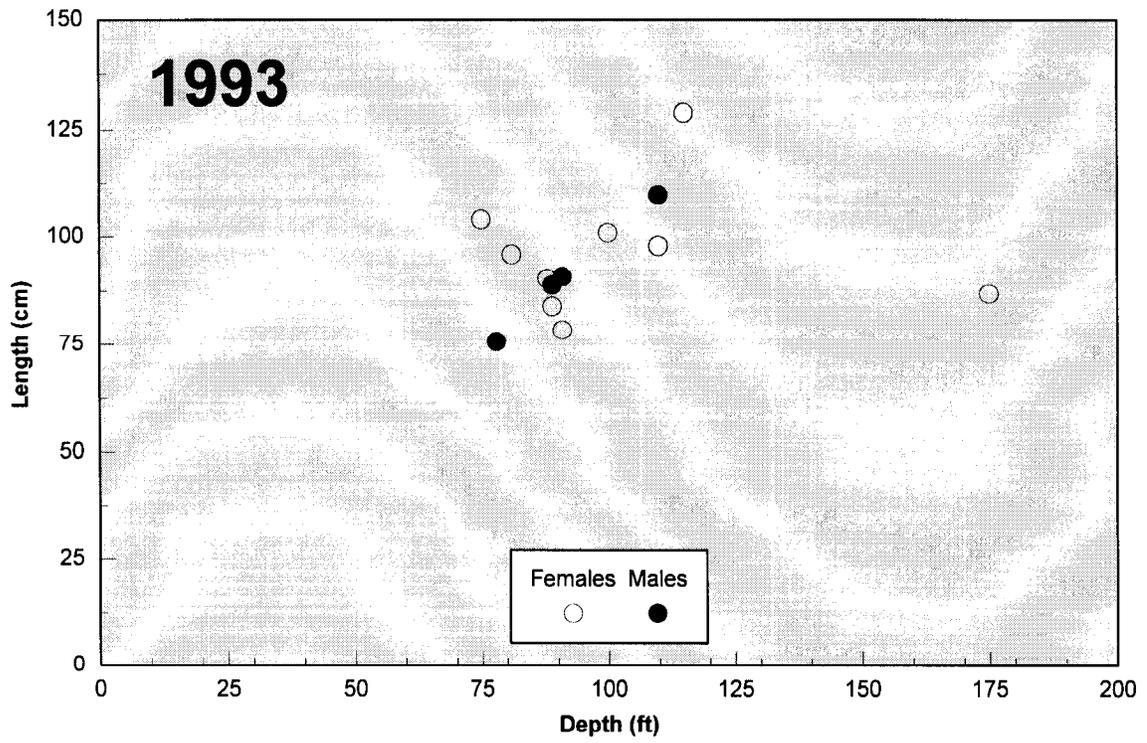


Figure 3. Length, by sex, as a function of depth of capture for lingcod caught within Resurrection Bay during 1993 and 1994.

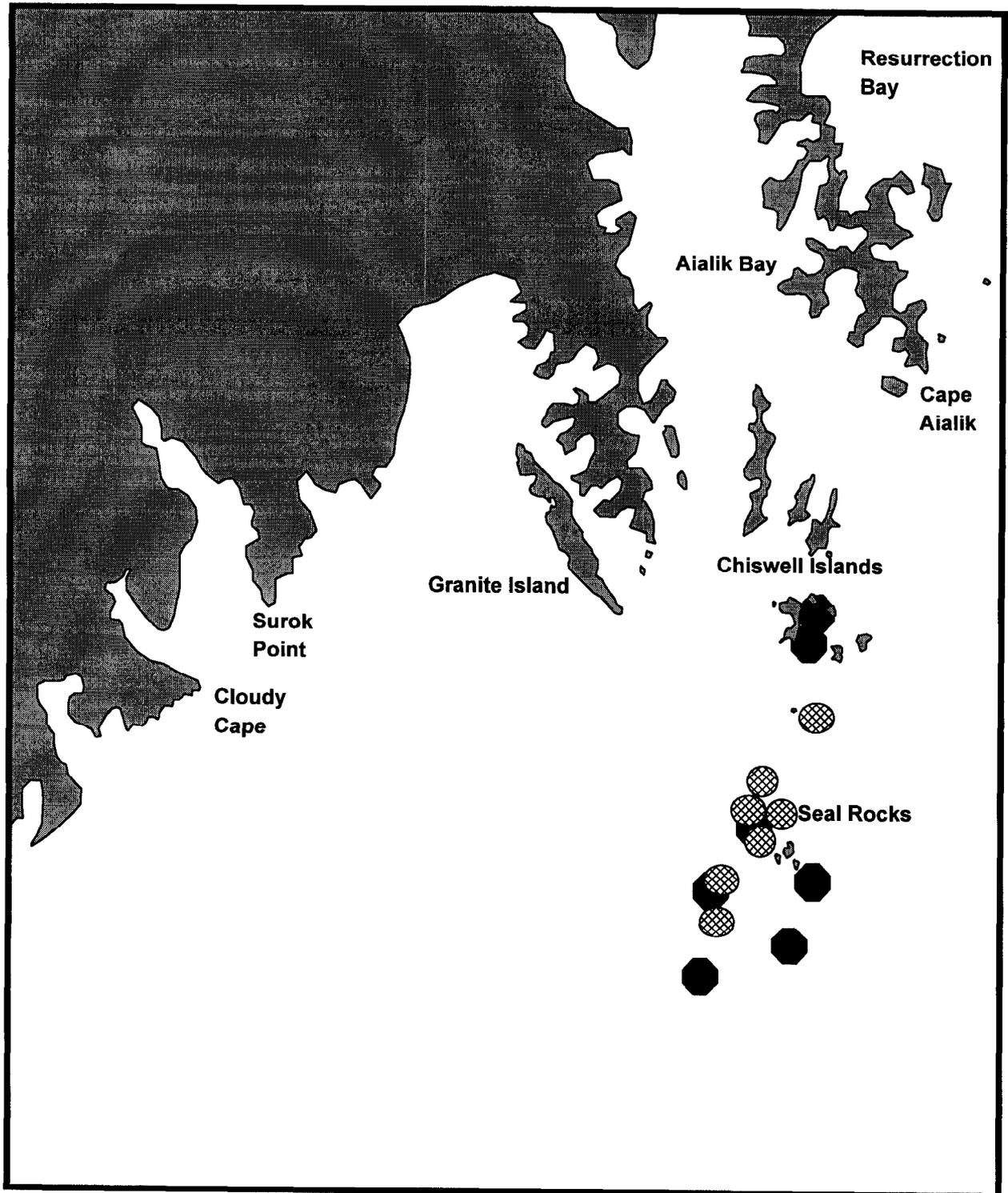


Figure 4. Areas sampled outside Resurrection Bay, in the vicinity of the Chiswell Islands, during 1993 (solid circles) and 1994 (hatched circles).

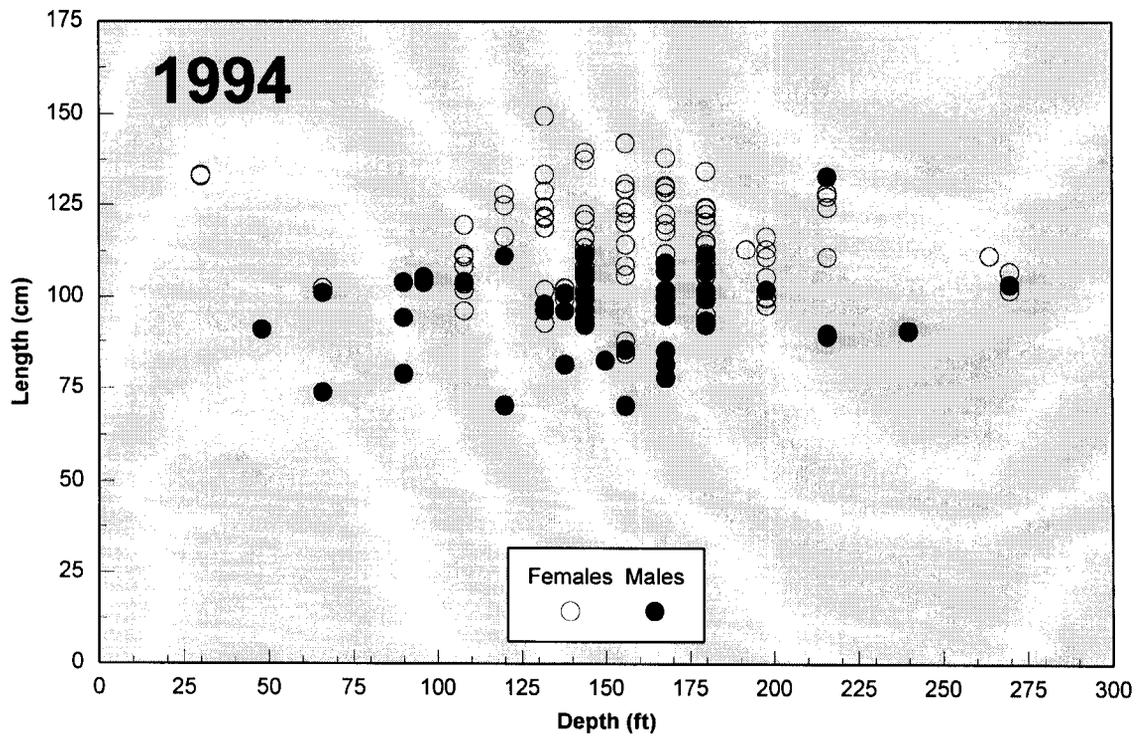
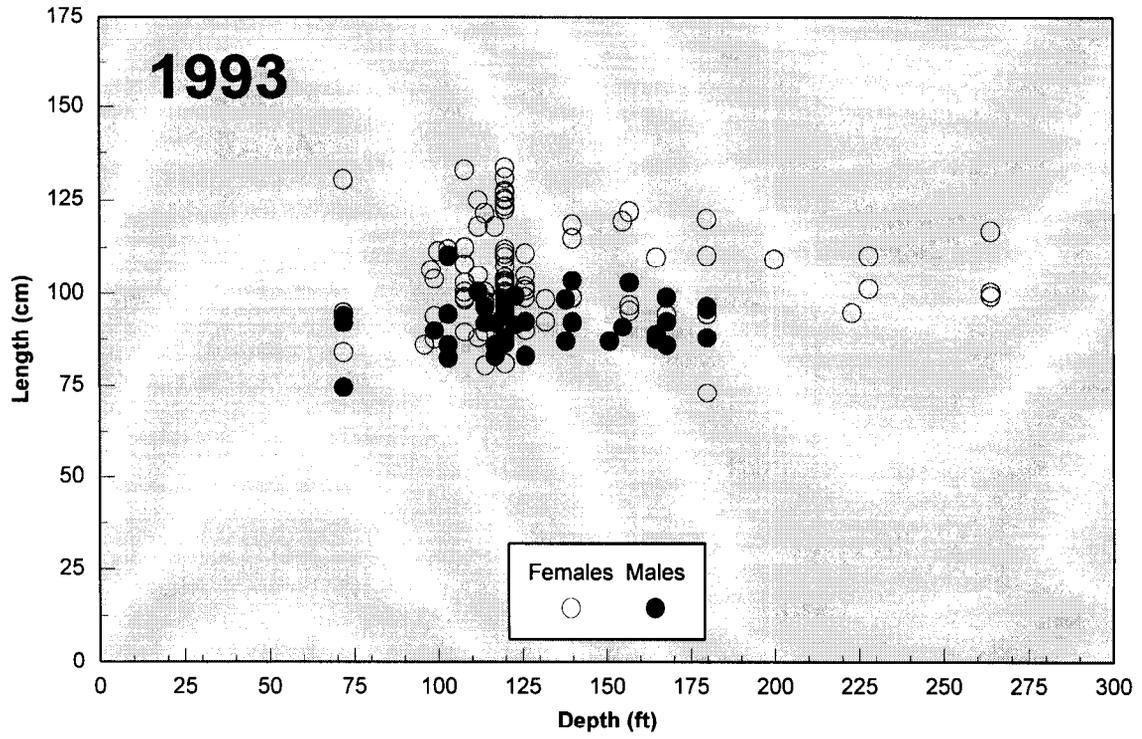


Figure 5. Length, by sex, as a function of depth of capture for lingcod caught outside Resurrection Bay, in the vicinity of the Chiswell Islands, during 1993 and 1994.

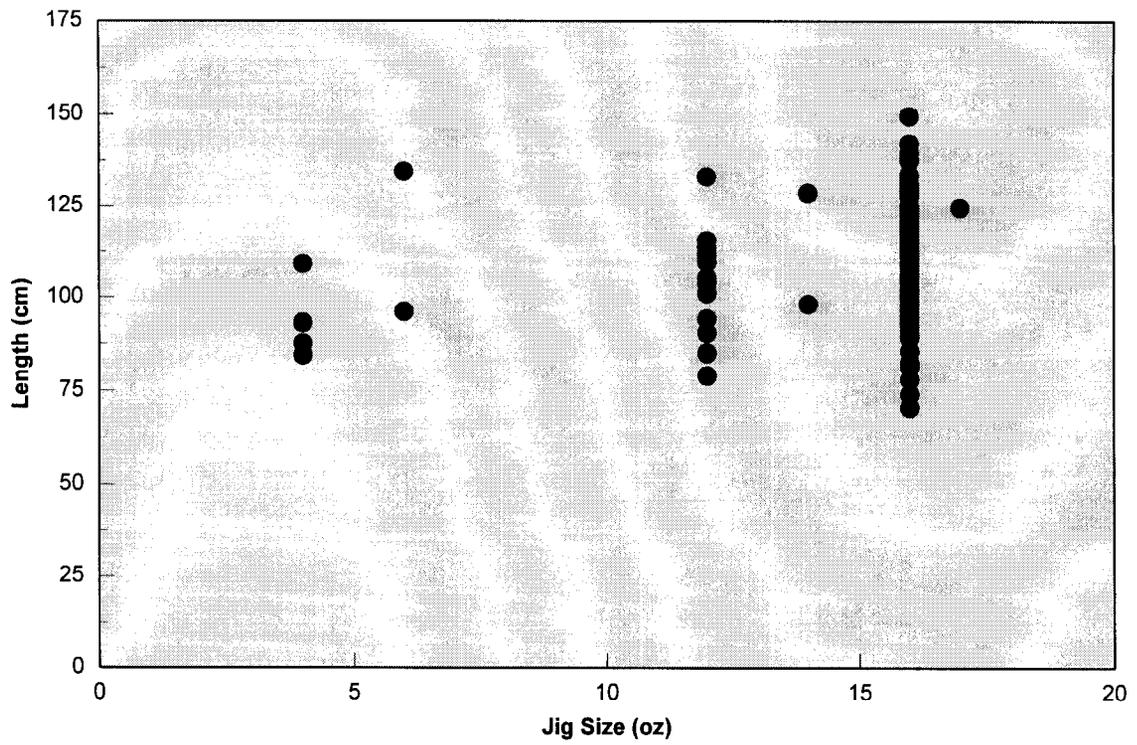


Figure 6. Length as a function of jig size for lingcod caught outside Resurrection Bay, in the vicinity of the Chiswell Islands, during 1994.

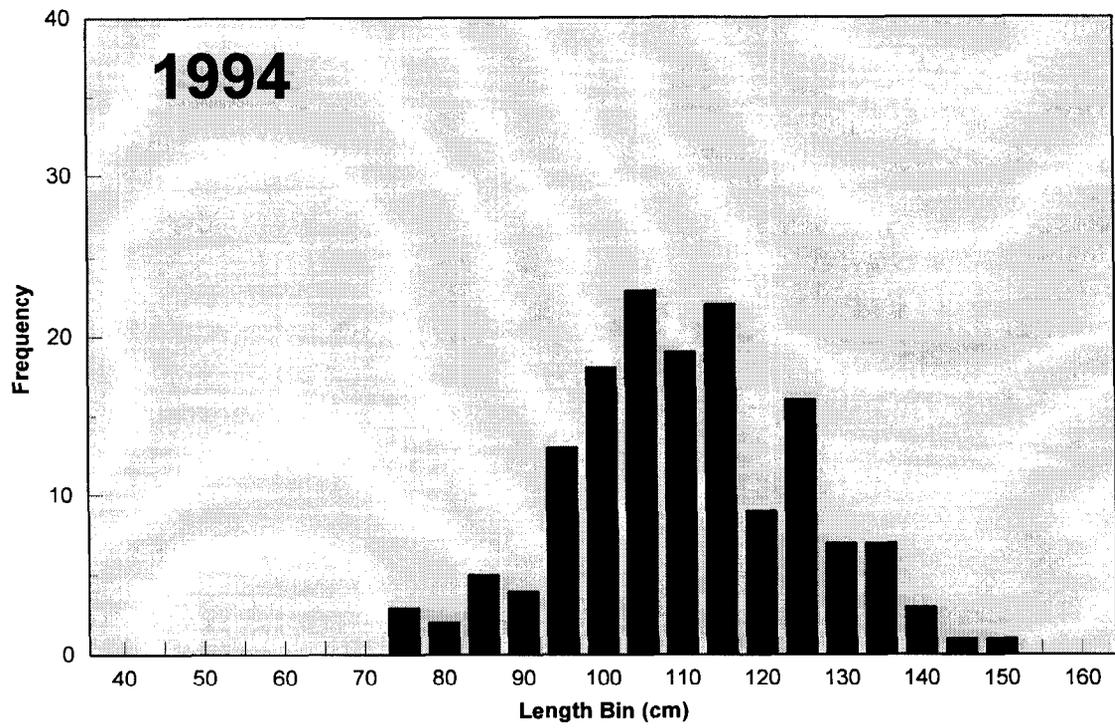
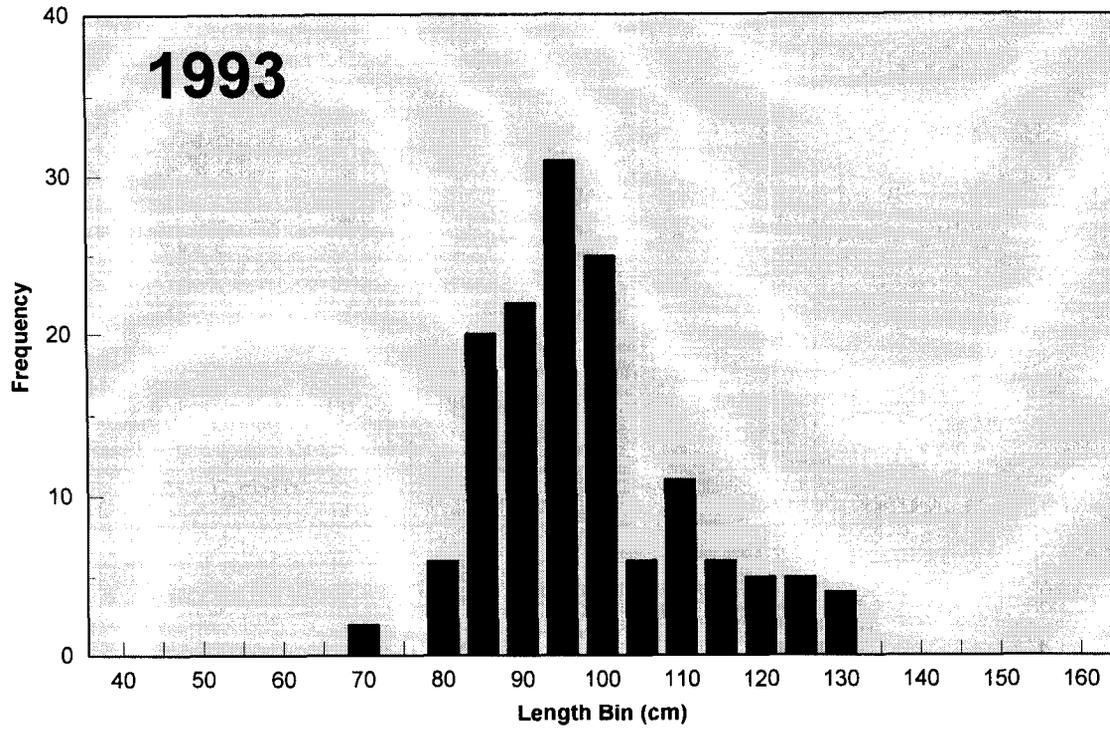


Figure 7. Length frequency of lingcod caught outside Resurrection Bay, in the vicinity of the Chiswell Islands, during 1993 and 1994.

Table 1. Percent of lingcod sampled from waters accessible from Seward which were under 75 cm, 1987-1994.

Year	Percent under 75 cm	Sample Size
1987	31.5	168
1988	13.5	57
1989	20.7	405
1990	11.5	361
1991	4.6	609
1992	2.2	471
1993	1.4	143
1994	0.0	153

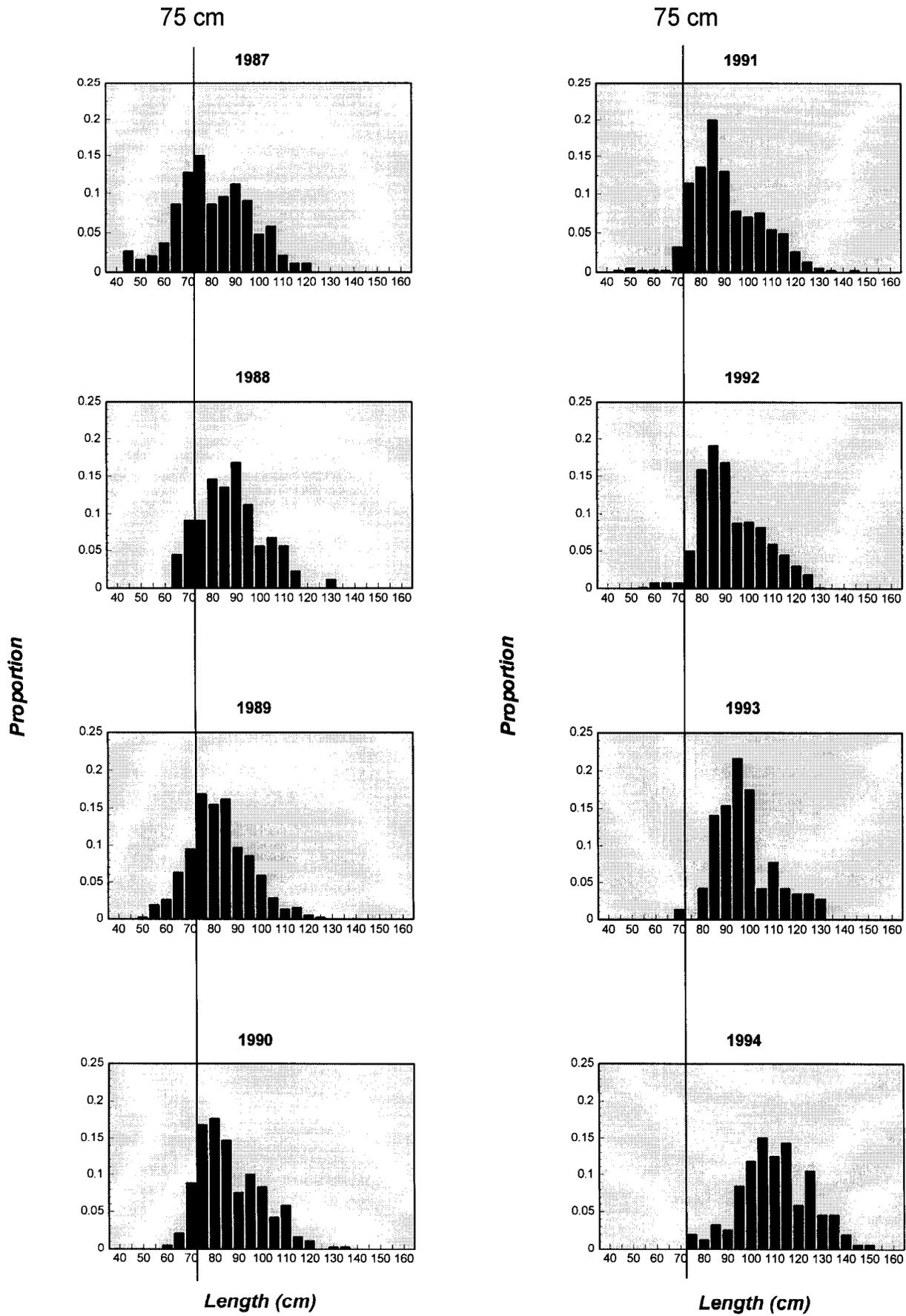


Figure 8. Length frequencies of lingcod sampled near Seward, 1987-1994.

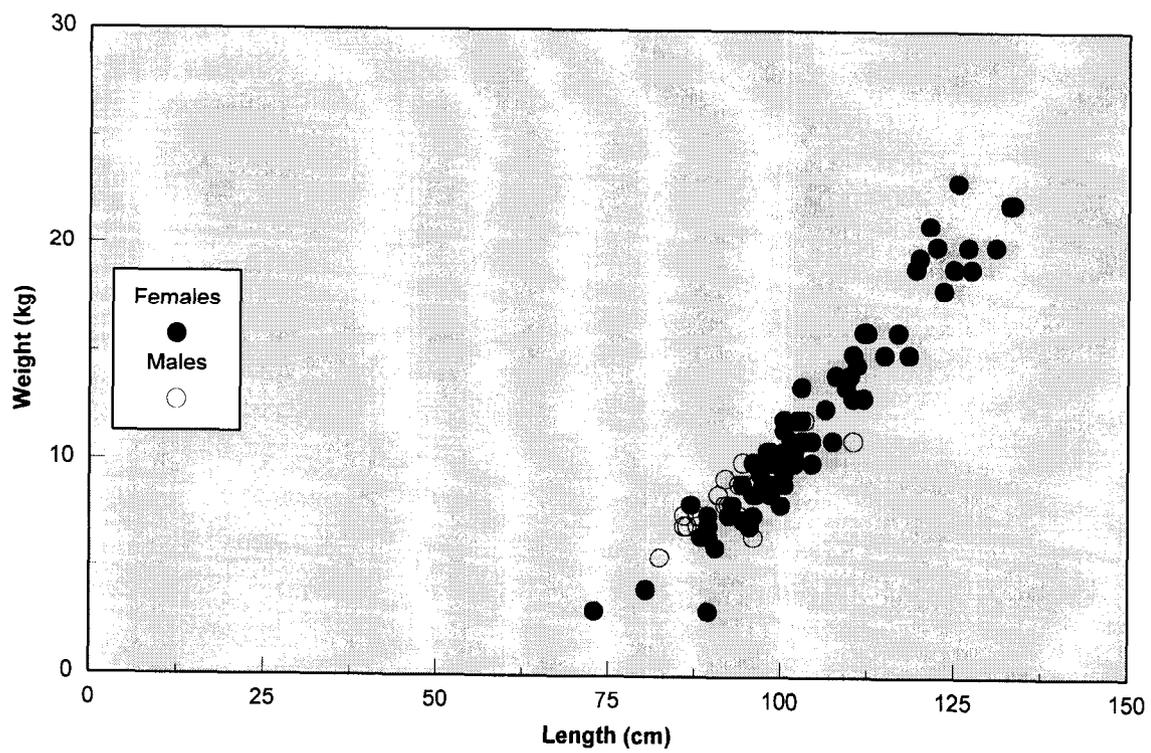


Figure 9. Weight, by sex, as a function of length for lingcod caught outside Resurrection Bay, in the vicinity of the Chiswell Islands, during 1993.

## ***RECOMMENDATIONS***

### ***Within Resurrection Bay:***

The small number of lingcod caught suggests a relatively low abundance of lingcod continues within Resurrection Bay. Length data indicate that some recruitment may have occurred within Resurrection Bay; however, sample sizes are small. Based on the apparent low abundance, I recommend that Resurrection Bay remain closed to recreational and commercial lingcod fishing until sufficient lingcod are present to sustain a harvest, likely many years.

### ***Outside Resurrection Bay:***

The continuing decline in the proportion of lingcod under 75 cm in the vicinity of the Chiswell Islands since 1987 suggests that little recruitment has occurred in lingcod management units near Resurrection Bay. Based on this, I recommend that the restrictive bag and possession limits currently in place for this area remain in effect. If recruitment to this management unit is not observed in the near future, further restrictions to the lingcod fisheries near Resurrection Bay may be necessary to assure populations are not over-fished. I recommend continuing the collection of fishery-independent length sampling during 1995.

## ***ACKNOWLEDGEMENTS***

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- Meyer, S. C. 1993. Assessment of the recreational harvest and fishery for lingcod in southcentral Alaska. Alaska Department of Fish and Game, Fishery Data Series N0. 93-33. Anchorage, Alaska.

Vincent-Lang, D. and W. Bechtol. 1992. Current status and recommendations for the future management of lingcod stocks of the central Gulf of Alaska. A report to the Alaska Board of Fisheries. Alaska Department of Fish and Game, Division of Sport Fish, Anchorage, Alaska.

***APPENDICES***

Appendix Table 1. Data on lingcod sampled within Resurrection Bay during 1993 and 1994.

TAG	DATE	LAT	LONG	DEPTH	WEIGHT	LENGTH	SEX	
NUMBER		(°)	(MIN)	(°)	(MIN)	(g)	(cm)	
a	930802	59	47.19	149	31.46	115	129.0	F
a	930803	59	50.66	149	24.22	75	104.0	F
a	930803	59	50.03	149	23.13	110	98.0	M
a	930803	59	52.75	149	21.56	175	87.0	F
a	930804	59	52.93	149	223	100	101.0	F
a	930804	59	52.67	149	21.84	88	90.5	F
a	930811	59	52.93	149	32.86	81	96.0	F
a	930827	59	51.13	149	23.07	78	75.8	M
a	930827	59	51.13	149	23.07	91	78.5	M
a	930827	59	51.13	149	23.07	89	84.0	M
a	940929	59	50.15	149	23.37	180	80.5	F
a	940929	59	52.69	149	21.87	90	91.5	M
a	940929	59	52.69	149	21.87	90	90.5	M
a	940929	59	52.60	149	33.41	48	83.0	M
a	940929	59	52.60	149	33.41	66	77.0	M
a	940929	59	52.60	149	33.41	96	83.0	M
a	940929	59	52.86	149	33.02	48	103.0	M
a	940929	59	53.03	149	32.96	78	86.5	M
a	940929	59	53.03	149	32.96	96	95.5	F
a	940929	59	53.03	149	32.96	72	61.5	F
a	940929	59	55.09	149	28.18	30	77.5	M
a	940929	59	55.09	149	28.18	30	66.0	M
a	940929	59	55.09	149	28.18	66	111.5	F

<sup>a</sup> Not tagged.

Appendix Table 2. Data on lingcod sampled outside Resurrection Bay, in the vicinity of the Chiswell Islands, during 1993 and 1994 (1 of 8).

TAG NUMBER	DATE	LAT (°N)	LONG (°W)	DEPTH (m)	WEIGHT (kg)	LENGTH (cm)	SEX		
a	930922	59	36.86	149	36.66	155	19.0	119.5	F
a	930922	59	36.86	149	36.66	155	8.5	91.0	M
a	930922	59	36.91	149	36.59	117	7.5	86.0	M
a	930922	59	36.95	149	36.69	98	12.5	106.5	F
a	930922	59	36.48	149	37.69	103	10.0	94.5	M
a	930922	59	36.48	149	37.69	103	16.0	112.0	F
a	930922	59	36.48	149	37.69	103	7.0	86.0	M
a	930922	59	36.48	149	37.69	103	5.5	82.5	M
a	930922	59	36.48	149	37.69	103	11.0	110.5	M
a	930922	59	32.36	149	39.02	120	13.0	112.0	F
a	930922	59	32.36	149	39.02	120	7.3	94.5	F
a	930922	59	32.36	149	39.02	120	20.0	127.0	F
a	930922	59	32.36	149	39.02	120	7.5	96.0	F
a	930922	59	32.36	149	39.02	120	9.5	100.5	F
a	930922	59	32.36	149	39.02	120	9.5	98.0	M
a	930922	59	32.36	149	39.02	120	14.5	111.0	F
a	930922	59	32.36	149	39.02	120	9.0	95.5	M
a	930922	59	32.36	149	39.13	120	6.0	90.5	F
a	930922	59	32.36	149	39.13	120	10.0	97.0	F
a	930922	59	32.41	149	39.13	114	6.5	89.5	F
a	930922	59	32.41	149	39.13	114	9.5	100.5	F
a	930922	59	32.41	149	39.13	114	9.0	96.5	M
a	930922	59	32.41	149	39.13	114	9.0	100.5	F
a	930922	59	32.41	149	39.13	114	9.0	97.5	F
a	930922	59	32.41	149	39.13	114	9.25	92.0	M
a	930922	59	32.41	149	39.13	114	4.0	80.5	F
a	930922	59	32.41	149	39.13	114	10.5	98.0	F
a	930922	59	32.41	149	39.13	114	3.0	89.5	F
a	930922	59	32.41	149	39.13	114	21.0	121.5	F
a	930922	59	27.93	149	40.81	108	8.5	98.5	F
a	930922	59	27.93	149	40.81	108	7.5	89.5	F
a	930922	59	27.93	149	40.81	108	9.0	99.0	F
a	930922	59	27.93	149	40.81	108	14.0	108.0	F
a	930922	59	27.93	149	40.81	108	11.0	103.0	F
a	930922	59	27.93	149	40.81	108	16.0	112.5	F
a	930922	59	27.93	149	40.81	108	12.0	103.0	F
a	930922	59	27.93	149	40.81	108	11.5	100.5	F
a	930922	59	27.93	149	40.81	108	7.5		
a	930922	59	27.93	149	40.81	108	13.0		
a	930922	59	27.93	149	40.81	108	8.5		
a	930922	59	27.93	149	40.81	108	12.0		
a	930922	59	27.93	149	40.81	108	10.0	100.5	F
a	930922	59	27.93	149	40.81	108	22.0	133.0	F

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Appendix Table 2. Data on lingcod sampled outside Resurrection Bay, in the vicinity of the Chiswell Islands, during 1993 and 1994 (2 of 8).

TAG	DATE	LAT	LONG	DEPTH	WEIGHT	LENGTH	SEX
		(°)	(MIN)	(°)	(MIN)	(CM)	
a	930922	59	27.93	149	40.81	108	
a	930922	59	27.93	149	40.84	140	15.0
a	930922	59	27.93	149	40.84	140	8.0
a	930922	59	27.93	149	40.84	140	8.0
a	930922	59	27.93	149	40.84	140	15.0
a	930922	59	27.93	149	40.84	140	10.0
a	930922	59	27.93	149	40.84	140	12.0
a	930923	59	27.96	149	40.69	200	13.5
a	930922	59	27.91	149	40.97	120	7.0
a	930922	59	27.91	149	40.97	120	11.0
a	930922	59	27.91	149	40.97	120	20.0
a	930922	59	27.91	149	40.97	120	20.0
a	930922	59	27.91	149	40.97	120	10.0
a	930922	59	27.91	149	40.97	120	9.0
a	930922	59	27.91	149	40.97	120	8.0
a	930922	59	27.91	149	40.97	120	7.0
a	930922	59	27.91	149	40.97	120	8.0
a	930922	59	27.91	149	40.97	120	11.0
a	930922	59	27.91	149	40.97	120	14.0
a	930922	59	27.91	149	40.97	120	18.0
a	930922	59	27.91	149	40.97	120	6.5
a	930922	59	27.91	149	40.97	120	10.5
a	930922	59	27.91	149	40.97	120	23.0
a	930922	59	27.91	149	40.97	120	12.0
a	930922	59	27.91	149	40.97	120	8.5
a	930922	59	27.91	149	40.97	120	12.0
a	930922	59	27.91	149	40.97	120	7.0
a	930922	59	27.91	149	40.97	120	9.5
a	930922	59	27.91	149	40.97	120	11.0
a	930922	59	27.91	149	40.97	120	7.5
a	930922	59	27.91	149	40.97	120	8.5
a	930922	59	27.91	149	40.97	120	19.0
a	930922	59	27.91	149	40.97	120	8.0
a	930922	59	27.91	149	40.97	120	9.0
a	930922	59	27.91	149	40.97	120	7.0
a	930922	59	27.91	149	40.97	120	8.5
a	930922	59	27.91	149	40.97	120	6.5
a	930922	59	27.91	149	40.97	120	19.0
a	930922	59	27.91	149	40.97	120	10.5
a	930922	59	27.91	149	40.97	120	22.0
a	930922	59	27.91	149	40.97	120	13.5
a	930923	59	31.03	149	40.68	228	13.0

-continued-

Appendix Table 2. Data on lingcod sampled outside Resurrection Bay, in the vicinity of the Chiswell Islands, during 1993 and 1994 (3 of 8).

TAG	DATE	LAT		LONG		DEPTH	WEIGHT	LENGTH	SEX
		(°)	(MIN)	(°)	(MIN)				
a	930923	59	31.03	149	40.68	228	11.0	101.5	F
a	930923	59	31.10	149	40.60	180	19.5	120.0	F
a	930923	59	31.10	149	40.60	180	3.0	73.0	F
a	930923	59	31.00	149	40.71	264	16.0	117.0	F
a	930923	59	31.00	149	40.71	264	9.0	99.5	F
a	930923	59	31.00	149	40.71	264	12.0	100.5	F
a	930923	59	27.97	149	40.55	126	10.0	102.0	F
a	930923	59	29.86	149	37.48	132	7.5	92.5	F
a	930923	59	29.86	149	37.48	132	10.5	98.5	F
a	930923	59	27.54	149	40.73	180	9.0	94.5	F
a	930923	59	27.54	149	40.73	180	7.5	88.0	M
a	930923	59	27.54	149	40.73	180	9.0	96.5	M
a	930923	59	27.54	149	40.73	180	8.5	96.0	F
a	930923	59	27.54	149	40.73	180	10.0	96.0	F
a	930923	59	27.54	149	40.73	180	15.0	110.5	F
a	930923	59	27.97	149	40.55	126		92.5	M
00578	930923	59	27.97	149	40.70	72		94.0	M
00588	930923	59	27.97	149	40.70	72		95.0	F
00580	930923	59	27.97	149	40.70	72		130.5	F
00582	930923	59	27.97	149	40.70	72		92.0	M
00581	930923	59	27.97	149	40.70	72		84.0	F
00589	930923	59	27.97	149	40.70	72		74.5	M
00584	930923	59	28.10	149	40.68	112		88.0	F
00583	930923	59	28.10	149	40.68	112		118.0	F
00586	930923	59	28.10	149	40.68	112		105.0	F
00587	930923	59	28.10	149	40.68	112		100.5	M
00590	930923	59	28.10	149	40.68	112		125.0	F
00591	930923	59	27.92	149	40.90	168		99.0	M
00592	930923	59	27.92	149	40.90	168		94.5	F
00593	930923	59	27.92	149	40.90	168		92.5	M
00594	930923	59	27.92	149	40.90	168		86.0	M
00595	930923	59	27.96	149	40.58	117		92.0	M
00596	930923	59	27.96	149	40.58	117		83.0	M
00597	930923	59	27.93	149	40.64	117		97.5	F
00598	930923	59	27.93	149	40.64	117		118.0	F
00599	930923	59	27.85	149	40.89	223		95.0	F
00650	930923	59	32.41	149	39.03	100		111.5	F
00651	930923	59	32.40	149	39.09	126		83.0	M
00652	930923	59	32.40	149	39.09	126		90.0	F
00653	930923	59	32.40	149	39.09	126		101.0	F
00654	930923	59	32.37	149	39.34	165		89.0	M

-continued-

Appendix Table 2. Data on lingcod sampled outside Resurrection Bay, in the vicinity of the Chiswell Islands, during 1993 and 1994 (4 of 8).

TAG	DATE	LAT	LONG	DEPTH	WEIGHT	LENGTH	SEX	
NUMBER		(°)	(MIN)	(°)	(MIN)	(ft)	(cm)	
00655	930923	59	32.37	149	39.34	165	110.0	F
00656	930923	59	32.37	149	39.34	165	87.5	M
00657	930923	59	32.55	149	38.98	157	97.0	F
00660	930923	59	32.55	149	38.98	157	122.0	F
00661	930923	59	32.55	149	38.98	157	95.5	F
00662	930923	59	32.55	149	38.98	157	103.0	M
00663	930923	59	32.30	149	38.92	123	91.5	M
00664	930923	59	32.30	149	38.92	123	99.5	M
00665	930923	59	32.32	149	39.05	151	87.0	M
00666	930923	59	31.08	149	36.61	138	87.0	M
00670	930923	59	31.08	149	36.61	138	98.5	M
00671	930923	59	31.04	149	36.77	99	90.0	M
00672	930923	59	31.04	149	36.77	99	104.0	F
00673	930923	59	31.04	149	36.77	99	94.0	F
00674	930923	59	31.04	149	36.77	99	87.5	F
00675	930923	59	31.04	149	36.77	99	87.5	F
00676	930923	59	30.94	149	36.80	96	86.0	F
00677	930923	59	31.04	149	36.74	126	99.0	F
00680	930923	59	31.04	149	36.74	126	105.0	F
00681	930923	59	31.04	149	36.74	126	111.0	F
00682	930923	59	30.99	149	36.87	120	103.5	F
00690	930923	59	30.99	149	36.87	120	81.0	F
b	940927	59	33.14	149	38.82	132	120.0	F
b	940927	59	33.14	149	38.82	192	113.0	F
b	940927	59	33.14	149	38.82	180	109.0	F
b	940927	59	33.14	149	38.82	180	107.0	M
b	940927	59	33.14	149	38.82	180	93.0	M
b	940927	59	33.14	149	38.82	180	110.5	F
b	940927	59	33.14	149	38.82	180	95.0	F
b	940927	59	33.14	149	38.82	180	102.0	F
b	940927	59	33.14	149	38.82	180	122.5	F
b	940927	59	33.14	149	38.82	180	99.5	F
b	940927	59	33.14	149	38.82	180	109.0	F
b	940927	59	33.14	149	38.82	180	99.2	M
b	940927	59	33.14	149	38.82	180	120.5	F
b	940927	59	33.14	149	38.82	156	120.5	F
b	940927	59	33.14	149	38.82	156	124.5	F
b	940927	59	33.14	149	38.82	156	129.5	F
b	940927	59	33.14	149	38.82	156	84.5	F
b	940927	59	33.14	149	38.82	156	70.5	M
b	940927	59	32.97	149	38.96	156	114.5	F
b	940927	59	32.97	149	38.96	156	106.0	F
b	940927	59	32.97	149	38.96	156	131.0	F

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Appendix Table 2. Data on lingcod sampled outside Resurrection Bay, in the vicinity of the Chiswell Islands, during 1993 and 1994 (5 of 8).

TAG	DATE	LAT	LONG	DEPTH	WEIGHT	LENGTH	SEX	
NUMBER		(°)	(MIN)	(°)	(FT)	(Gm)		
b	940927	59	32.97	149	38.96	156	108.5	F
b	940927	59	32.97	149	38.96	156	123.0	F
b	940927	59	32.97	149	38.96	156	87.5	F
b	940927	59	32.97	149	38.96	198	99.5	F
b	940927	59	32.97	149	38.96	198	113.0	F
b	940927	59	32.97	149	38.96	198	105.5	F
b	940927	59	32.97	149	38.96	198	102.0	M
b	940927	59	32.97	149	38.96	198	100.0	F
b	940927	59	32.97	149	38.96	198	97.5	F
b	940927	59	32.97	149	38.96	198	111.0	F
b	940927	59	32.97	149	38.96	216	116.5	F
b	940927	59	32.97	149	38.96	216	127.5	F
b	940927	59	32.97	149	38.96	216	89.0	M
b	940927	59	32.97	149	38.96	216	111.0	F
b	940927	59	32.97	149	38.96	216	89.5	M
b	940927	59	32.97	149	38.96	216	128.5	F
b	940927	59	30.38	149	37.89	168	124.5	F
b	940927	59	30.38	149	37.89	168	99.5	M
b	940927	59	30.38	149	37.89	168	94.5	M
b	940927	59	30.38	149	37.89	168	118.1	F
b	940927	59	30.38	149	37.89	138	97.2	M
b	940927	59	30.38	149	37.89	138	102.4	F
b	940927	59	30.38	149	37.89	150	99.5	F
b	940927	59	32.97	149	38.96	192	82.5	M
b	940927	59	32.97	149	38.96	132	113.0	F
b	940927	59	32.97	149	38.96	132	119.0	F
b	940927	59	32.97	149	38.96	132	129.0	M
b	940927	59	32.97	149	38.96	132	98.0	M
b	940927	59	32.97	149	38.96	132	98.0	M
b	940927	59	32.97	149	38.96	168	109.0	F
b	940927	59	32.97	149	38.96	168	70.5	M
b	940927	59	30.38	149	37.89	168	130.5	F
b	940927	59	30.38	149	37.89	168	78.0	M
b	940927	59	30.38	149	37.89	180	112.0	F
b	940927	59	30.38	149	37.89	180	124.0	F
b	940927	59	30.38	149	37.89	180	93.3	M
b	940927	59	30.38	149	37.89	180	122.5	F
b	940927	59	30.38	149	37.89	180	114.5	F
b	940927	59	32.97	149	38.96	168	96.5	M
b	940927	59	32.97	149	38.96	168	81.5	M
b	940927	59	32.97	149	38.96	168	130.0	F
b	940927	59	32.97	149	38.96	168	102.0	M

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Appendix Table 2. Data on lingcod sampled outside Resurrection Bay, in the vicinity of the Chiswell Islands, during 1993 and 1994 (6 of 8).

TAG	DATE	LAT	LONG	DEPTH	WEIGHT	LENGTH		
NUMBER	DATE	(°)	(MIN)	(°)	(MIN)	(°)		
b	940927	59	28.02	149	40.35	144	101.2	M
b	940927	59	28.02	149	40.35	120	111.2	M
b	940927	59	28.02	149	40.35	120	128.0	F
b	940927	59	28.02	149	40.35	144	116.0	F
b	940927	59	28.02	149	40.35	144	113.5	F
b	940927	59	28.02	149	40.35	144	105.5	M
b	940927	59	28.02	149	40.35	120	125.0	F
b	940927	59	28.02	149	40.35	120	116.5	F
b	940927	59	28.02	149	40.35	138	81.5	M
b	940927	59	28.02	149	40.35	144	96.5	F
b	940927	59	28.02	149	40.35	144	101.0	M
b	940927	59	28.02	149	40.35	144	122.5	F
b	940927	59	28.02	149	40.35	144	139.5	F
b	940927	59	28.02	149	40.35	144	102.1	F
b	940927	59	28.02	149	40.35	144	121.0	F
b	940927	59	28.02	149	40.35	144	113.5	F
b	940927	59	28.02	149	40.35	144	137.5	F
b	940927	59	28.02	149	40.35	144	116.3	F
b	940927	59	28.02	149	40.35	144	105.0	F
b	940927	59	28.02	149	40.35	144	107.0	M
b	940927	59	28.02	149	40.35	144	112.0	F
b	940927	59	28.02	149	40.35	156	85.5	M
b	940927	59	28.02	149	40.35	144	99.5	M
b	940927	59	28.02	149	40.35	144	93.0	M
b	940927	59	28.02	149	40.35	144	105.4	F
b	940927	59	28.02	149	40.35	144	111.4	F
b	940927	59	28.02	149	40.35	144	105.2	M
b	940927	59	28.02	149	40.35	144	108.2	F
b	940927	59	28.02	149	40.35	144	94.0	M
b	940927	59	28.02	149	40.35	144	92.0	M
b	940927	59	28.02	149	40.35	144	111.0	M
b	940927	59	28.02	149	40.35	144	111.5	F
b	940927	59	28.02	149	40.35	144	96.0	M
b	940927	59	28.02	149	40.35	156	142.0	F
b	940927	59	34.87	149	37.54	132	92.5	F
b	940927	59	34.87	149	37.54	132	133.5	F
b	940927	59	34.87	149	37.54	132	122.0	F
b	940927	59	34.87	149	37.54	132	124.5	F
b	940927	59	34.87	149	37.54	132	96.0	M
b	940927	59	34.87	149	37.54	132	121.5	F
b	940927	59	34.87	149	37.54	132	149.5	F
b	940927	59	34.87	149	37.54	48	90.8	M

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Appendix Table 2. Data on lingcod sampled outside Resurrection Bay, in the vicinity of the Chiswell Islands, during 1993 and 1994 (7 of 8).

PAG NUMBER	DATE	LAT (°)	LONG (MIN)	LONG (°)	DEPTH (ft)	WEIGHT (kg)	LENGTH (mm)	SEX
b	940927	59	34.87	149	37.54	30	133.0	F
b	940927	59	34.87	149	37.54	30	133.4	F
b	940927	59	34.87	149	37.54	264	111.4	F
b	940927	59	34.87	149	37.54	240	90.4	M
b	940927	59	34.87	149	37.54	90	104.0	M
b	940927	59	34.87	149	37.54	90	94.0	M
b	940927	59	34.87	149	37.54	90	79.0	M
b	940927	59	34.87	149	37.54	138	101.0	M
b	940927	59	34.87	149	37.54	138	96.0	M
b	940927	59	34.87	149	37.54	96	104.0	M
b	940927	59	34.87	149	37.54	96	105.5	M
b	940927	59	34.87	149	37.54	168	85.0	M
b	940927	59	34.87	149	37.54	168	97.0	M
b	940927	59	34.87	149	37.54	168	109.5	M
b	940927	59	35.43	149	37.74	66	101.2	M
b	940927	59	34.87	149	37.54	66	102.4	F
b	940927	59	34.87	149	37.54	66	74.0	M
b	940927	59	35.43	149	37.74	108	96.1	F
b	940927	59	28.02	149	40.35	108	104.2	M
b	940927	59	28.02	149	40.35	108	119.7	F
b	940927	59	28.02	149	40.35	108	104.1	F
b	940927	59	28.02	149	40.35	270	103.5	M
b	940927	59	28.02	149	40.35	270	107.0	F
b	940927	59	28.02	149	40.35	270	102.0	F
b	940927	59	28.02	149	40.35	108	102.0	F
b	940927	59	28.02	149	40.35	108	111.0	F
b	940927	59	28.02	149	40.35	108	111.6	F
b	940927	59	28.02	149	40.35	108	108.4	F
b	940927	59	28.02	149	40.35	108	103.6	F
b	940927	59	28.02	149	40.35	180	111.4	M
b	940927	59	28.02	149	40.35	180	133.0	M
b	940927	59	28.02	149	40.35	180	92.0	M
b	940927	59	28.02	149	40.35	180	106.0	F
b	940927	59	28.02	149	40.35	180	115.5	F
b	940927	59	28.02	149	40.35	180	124.5	F
b	940927	59	28.02	149	40.35	180	101.0	F
b	940927	59	28.02	149	40.35	180	102.0	M
b	940927	59	28.02	149	40.35	180	134.4	F
b	940927	59	28.02	149	40.35	180	114.5	F
b	940927	59	28.02	149	40.35	180	128.5	F
b	940927	59	28.02	149	40.35	180	109.5	F
b	940927	59	28.02	149	40.35	180	122.5	F

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Appendix Table 2. Data on lingcod sampled outside Resurrection Bay, in the vicinity of the Chiswell Islands, during 1993 and 1994 (8 of 8).

TAG	DATE	LAT	LONG	DEPTH	WEIGHT	LENGTH	SEX	
NUMBER		(°)	(MIN)	(°)	(MIN)	(lb)	(cm)	
b	940927	59	28.02	149	40.35	180	138.0	F
b	940927	59	28.02	149	40.35	180	100.5	M
b	940927	59	28.02	149	40.35	180	95.0	M
b	940927	59	28.02	149	40.35	180	120.0	F
587 <sup>c</sup>	940927	59	28.02	149	40.35	180	107.0	M
b	940927	59	28.02	149	40.35	180	112.0	F

<sup>a</sup> Sacrificed for genetic sampling, not tagged.

<sup>b</sup> Not tagged.

<sup>c</sup> Recapture.