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Southeast Alaska Tanner Crab Soak Time Experiment

by

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November 2008

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

Symbols and Abbreviations

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Weights and measures (metric)

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

Weights and measures (English)

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

Time and temperature

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

Physics and chemistry

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

General

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

Measures (fisheries)

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

Mathematics, statistics

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

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ABSTRACT

Reduced seasons with pot soak times as short as 3–8 hours have become common in the Southeast Alaska commercial Tanner crab fishery. Short soak times can increase handling of discarded crabs, resulting in injury, leg loss and mortality. Information on catch-at-time is necessary both to evaluate management options that may influence hauling frequency and to evaluate the necessity of standardizing annual Tanner crab pot survey CPUE.

Conical Tanner pots, with and without four 12 cm (4 ¾-in) diameter escape rings, were soaked for 3, 9, 18, or 24 hours in Icy Strait and Stephens Passage in 2004 and Icy Strait and Excursion Inlet in 2005. Soak time and escape ring treatments were randomly assigned to six 8-pot clusters in good Tanner crab habitat within each year/area combination.

Two-way ANOVA of escape rings and soak time and linear regression of catch versus soak time were conducted to test for statistically significant differences.

The CPUE of sublegal male and female Tanner crabs was greater in pots without escape rings, but soak time had no effect. In contrast, there was no effect of escape rings, but a positive effect of soak time, on the CPUE of legal-sized males. However, when only 9–24 h soak times (the range employed during the survey) were considered, there was no effect on CPUE.

Thus, non-legal crabs were able to escape from pots with escape rings even when soak times were short. However, long soaks decreased the number of non-legals handled per constant number of legals. Tanner crab fishermen in Southeast Alaska use short soaks, even though long soaks will increase their CPUE, because the best economic returns over a short fishery are achieved by maximizing cumulative catch, not CPUE. Finally, Tanner crab survey CPUE should not be standardized for soak times from 9–24 hours.

Keywords: Tanner crab, *Chionoecetes bairdi*, Southeast Alaska, management, pot survey methods, escape ring, CPUE standardization, Icy Strait, Stephens Passage, Excursion Inlet, handling effects

INTRODUCTION

Reduced stocks and increased fishing efficiency has resulted in an intense Southeast Alaska Tanner crab (*Chionoecetes bairdi)* fishery. The season length of the fishery has been reduced from a month in the mid-1980's to four or five days recently in the core areas (Hebert et al. 2005). This has affected the fishing strategies of Tanner crab fishermen including a reduction in pot soak times, with soak times currently as short as 3–8 h during the first few days of the season (Hebert et al. 2005).

Short soak times have the potential for increasing handling of sublegal males and females if escape rings are ineffective over short time periods. Capturing and handling crabs can result in injury, leg loss and mortality of crabs that are returned to the sea (Murphy and Kruse 1995). Crab leg loss and other injury can reduce growth (Bennett 1973) and cause egg loss (Carls and O'Clair 1990). Thus, handling can have negative consequences on the long-term sustainability of crab populations and prevent maximizing fishery production.

During the February Tanner crab fishery in Southeast Alaska, temperatures are often close to or below freezing. Exposure to cold temperatures increases the frequency of leg loss in Tanner crab (Carls and O'Clair 1990). Legal male Tanner crab leg loss averaged 33% for all areas during the Southeast Alaska preseason Tanner crab stock assessment survey from 1997–2006, and 30% for commercial port sampling for all areas averaged over the period 2001–2006.

To reduce handling and injury of non-legal Tanner crabs, current regulations require escape rings on all commercial Tanner crab pots in Alaskan fisheries [Title 5 Alaska Administrative Code, Chapter 35]. These effectively allow sublegal males and females to escape for soak times of 24 h or more (Pengilly 2000). Escape rings have also been found effective in the fishery for grooved Tanner crabs *Chionoecetes tanneri*.[1] However, it is unclear if the soak times of less than 24 h that are common in the current Southeast Alaska Tanner crab fishery give these smaller crabs sufficient time to escape.

Understanding the interaction between escape ring effectiveness and soak time will allow managers to better evaluate the effectiveness of such management measures as reduced season length, hauling hours, and pot limit reductions on the capture and handling of non-legal crabs.

Besides management implications, the question of the catch relative to soak time of Tanner crabs has an important research application as well. Tanner crab stock assessment in Southeast Alaska is currently conducted with an annual pot survey (Clark et al. 2001). Pot catch-per-unit-effort (CPUE) data is difficult to interpret and hence standardization of survey methods is essential. Soak times in the Southeast Alaska survey have been standardized but due to logistical constraints, still vary from 16–20 h (Clark et al. 2001). Historically, the CPUE in terms of number per pot has been adjusted by the soak time relative to a 24-h soak as,

$$CPUE = \frac{no.crabs\ captured}{soak\ time, h} \times 24\,h$$

This adjustment of CPUE data assumes a linear relationship between soak time and catch and could bias estimates of relative abundance and size/age composition if the relation between CPUE and soak time were actually non-linear. Thus, information on the effect of soak time on sublegal male, female and legal male CPUEs will allow the department to determine the necessity of standardizing CPUE data from the preseason Tanner crab stock assessment survey for soak time and to develop a model if it is necessary. Hence, results of this project will help the department to more accurately interpret survey and commercial catch data, and to refine pre-season catch-survey analyses used to set GHLs for the commercial Tanner crab fishery. Although the effect of soak time on Tanner or snow crab catch has been previously investigated (Somerton and Merritt 1986; Zhou and Shirley 1997; Pengilly 2000; van Tamelen 2001), gear types and soak periods differed from those employed here.

In summary, this project was designed to determine how pot soak time effects the catch rate of Tanner crab in conical pots and to determine the effectiveness of escape rings by deploying crab pots for various soak times, focusing on periods less than 24 h. The objectives of this experiment were to: 1) determine whether escape rings are effective in releasing females and sublegal males over soak times of 3, 9, 18, and 24 h; 2) determine when females and sublegal males begin to exit a conical pot with escape rings; 3) determine the ratio of non-legal to legal crabs caught commercially under various soak time scenarios; 4) determine whether to standardize survey CPUE by soak time and model the relationship if it proves necessary.

METHODS

FIELD

In 2004, the experiment was conducted from November 16–21 aboard the *F/V Perseverance*, a contracted commercial vessel, in Icy Strait (Statistical Area 114-23) and Stephens Passage

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[1] Barnard, D. Unpublished report. The Effectiveness of Escape Mechanisms on Bycatch Reduction in the Bering Sea *Chionoecetes tanneri* fishery,. 2005 document, Alaska Department of Fish and Game, Juneau. 10 pp.

(Statistical Areas 111-40, 41, and 50) (Figure 1). These areas were chosen because they are the two highest commercial producers of Tanner crab in the Southeast Alaska region. However, the results from the 2004 work showed very low CPUEs and highly variable experimental results from the Stephens Passage area. Thus, in order to increase the sample size and decrease variability, the experiment was extended for a second year. In 2005, work was conducted in Icy Strait again but Excursion Inlet (Statistical Area 114-80) was substituted for Stephens Passage. The experiment was conducted from November 9–14, aboard the *R/V Medeia*, a department vessel.

To minimize crab catchability issues, work was conducted during neap tides to the degree possible. Standard bait of two 1.89 liter (2 qt.) containers of chopped herring (about 1kg (2.25 lb) per bait jar) and hanging bait of ½ a round pink salmon was used. ADF&G crab survey pots were used for this experiment. These pots have a bottom ring diameter of 2.25 m (7 ft 4 in), are 0.75m (~30 in) high, with a top ring diameter of 0.72 m (28.5 in) and weigh 159 kg (350 lbs). They have body webbing of 9cm (3.5-in) mesh and purse webbing of 11.5 cm (4.5-in) mesh. This is a smaller mesh than what is used in commercial pots and its purpose is to retain prerecruit male and female crabs. For this experiment, escape rings were installed in half of these pots to mimic the regulatory requirement for commercial gear in Southeast Alaska. Pots with escape rings had 4 escape rings with 12 cm (4 ¾-in) inside diameter on opposing sides no higher than 20 cm (8 in) from the bottom ring bar of the pot. The remainder of the pots had no escape rings.

Within each experimental area, a single site of high Tanner crab abundance was identified using the time series of preseason stock assessment survey data. Within each area, site, and year, six groups of 8 pots each were set (Table 1). Pot locations were chosen in a systematic fashion (Thompson 1992) using ArcGIS. Each group had one pot of each treatment (Table 1) and was set in a grid with about 500 m between adjacent pots to minimize pot competition, and no more than 1,000 m between groups. The treatment for each pot within the group was randomly determined. Twenty-four pots were set twice daily and pulled according to their predetermined soak time treatment. Set and pull time and date were recorded along with substrate type, bycatch, and escape ring treatment.

For each pot, all or a subsample of each commercial crab species (Tanner, red and golden king and Dungeness) were measured: for Tanner crabs, the biological carapace width (Jadamec et al. 1999); for Dungeness crabs, notch to notch carapace width immediately anterior to the 10th anterolateral spine; and for king crabs, biological carapace length (Donaldson and Byersdorfer 2005). Shell condition (Jadamec et al. 1999) and sex were also determined and recorded. For females, the presence of eggs, clutch percent fullness in 10% increments, and egg development and condition were also noted (Jadamec et al. 1999).

Three categories of Tanner crab were the focus of this experiment: 1) sublegal male, 2) legal male and 3) female crab. A legal male Tanner crab is defined in regulation [Title 5 Alaska Administrative Code 35.060] as “five and one-half in (140 mm) or greater in width of shell.” The legal measurement includes spines while the biological measurement does not, therefore sublegal male Tanner crabs from the experiment are defined as less than 138 mm and legal male Tanner crabs are 138 mm and greater. For each pot, crabs were binned into their appropriate group by carapace length and sex.

ANALYSES

A two-way ANOVA was utilized to test the effects of escape rings (open or closed) and soak time (3, 9, 18, and 24 h) on the catch rate of female, sublegal male, and legal male Tanner crabs (Zar 1996). Separate analyses were done for each of the four area/year combinations.

Linear regression analyses of catch versus soak time were conducted to determine an appropriate correction factor for different soak time durations during ADF&G surveys (Zar 1996). Although non-linear analyses are typically used to examine soak time data (e.g., Zhou and Shirley 1997), preliminary analyses suggested no benefit from this approach. Only data from pots with closed escape rings and soak times of 9, 18, and 24 h were used to best approximate the sampling design used during a typical survey. The total number of Tanner crabs (legal males, sublegal males, and females) was used as the response variable and separate analyses were done for each of the four area/year combinations.

RESULTS

AREA DIFFERENCES

The overall CPUE of Tanner crabs in Icy Strait was 3–5 times that of either northern Stephens Passage or Excursion Inlet (Table 2). While bycatch of other crab species was generally low, the CPUE of red king crabs in Excursion Inlet was significantly greater than at other areas ($F_{3,190}=19.26$, $p<0.0001$; post-hoc test $p<0.05$) and exceeded that of Tanner crabs (Table 2). However, there was no significant correlation between the catch of Tanner and red king crabs ($p > 0.05$).

EFFECT OF ESCAPE RINGS AND SOAK TIME ON TANNER CRAB CATCH

In general, for sublegal males and females, pots with closed escape rings had a greater CPUE than those with open escape rings and soak time had no effect on CPUE. For legal-sized males, there was no effect of escape rings and some evidence that longer soak times lead to a greater CPUE. However, these general results varied from area to area.

In 2004, Icy Strait had significantly more sublegal males caught in pots with closed escape rings, but not females or legal males. In addition, there was no effect of soak time on any of the size/sex classes (Figure 2, Table 3a). In contrast, at the same area (Icy Strait) in 2005, there was no significant effect of escape rings, but a significant effect of soak time (Figure 2, Table 3b). Post-hoc analyses showed that significantly more legal males were caught after 20 h than after 3 h (Tukey HSD, $p<0.05$; Figure 2f).

Results from Stephens Passage in 2004 showed a significant effect of escape rings for both sublegal males and females, but no effect of soak time on any of the size/sex classes (Table 3c, Figure 3a,b,c). In Excursion Inlet, 2005 there was a significant effect of escape rings for females and a significant effect of soak time for the legal males (Table 3d, Figure 3d,f). Post-hoc analyses showed that significantly more males were caught after 18 and 24 h than after 3 h (Tukey HSD, $p < 0.05$). Means and standard errors for all treatment levels can be found in Appendix A.

ADF&G SURVEY CORRECTION

Linear regression analyses of catch versus soak were conducted in order to determine an appropriate correction factor for different soak time lengths during ADF&G surveys. However, there was no relationship between CPUE and soak time for soak times from 9 to 24 h at any of the four areas (Figure 4).

DISCUSSION

The CPUE in Stephens Passage was so low in 2004 that it affected our ability to compare treatments. Thus, in 2005 we substituted Excursion Inlet, an area with higher recent Tanner crab CPUEs. However, the red king crab CPUE was so high in Excursion Inlet that the interaction between the two species may have confounded our ability to detect treatment effects on the CPUE of Tanner crabs. In Icy Strait, where CPUE was uniformly high and Tanner crabs comprised almost all of the catch, treatment effects were clearer than at the other two areas. The somewhat erratic results for females obtained in the current study may be a result of greater spatial variability in their distribution masking treatment effects. Any future experiments should focus on setting an increased number of pots in one high abundance area only. Also, the effect of spatial variability could be largely removed by checking individual pots consecutively without re-baiting or significantly moving the pots over a range of soak times.

Escape rings were effective at reducing the capture of the non-legal crabs and longer soak times may further reduce the ratio of non-legal to legal crabs in the pot and hence the cumulative number of non-legal crabs—particularly sublegal males—that are handled for a given number of legal crabs caught and retained. This result is consistent with that of another experiment where similarly-placed but larger escape rings (5-in inside diameter) effectively allowed the escape of female and sublegal male Tanner crabs for soak times of 24–72 h with the ratio of non-legal to legal crabs decreasing with soak time (Pengilly 2000).

For legal-sized males, there was no effect of escape rings, but some evidence that longer soak times led to a greater catch. This is consistent with the findings of other investigations on crab catch over soak time (Somerton and Merritt 1986; Smith and Jamieson 1989; Zhou and Shirley 1997; Pengilly 2000; van Tamelen 2001). The absence of escape rings did not increase the catch of legal males, suggesting that gear was not saturated over the soak periods and catch rates studied here. The fact that Tanner crab fishermen in Southeast Alaska currently use short soaks, although they are certainly aware that long soaks will increase their catch per pot, is likely because the only management tool currently available to restrict harvest is season length. Over a very short fishery, the best economic returns are achieved by maximizing catch per day, not, catch per pot.

This experiment provides evidence that survey CPUE should not be standardized using a linear function of time. Historically, catch has been corrected by dividing crab captured by the soak time for each pot to obtain a CPUE with units of number crab per soak day. The results of this experiment indicate that legal male, sublegal male and female CPUEs are not linear functions of time for soak times from 9–24 h. In fact, it is likely that CPUE is overestimated by using this method (since soak times are less than 24 hours). Previous investigators (Somerton and Merritt 1986; Zhou and Shirley 1997; van Tamelen 2001) have used non-linear models to describe the relationship between catch and soak time but they employed much longer soak times than the current study. Somerton and Merritt (1986) have noted that the relationship between pot catch and time differs with crab density, as there are likely to be interactions between crabs already caught in the pot and those potentially entering the pot. Thus, the relationship between catch and time is likely to be a family of curvilinear relationships which depend upon crab density. Our results support this hypothesis in that the ratio of non-legal to legal crabs captured declined more rapidly with soak time in areas with higher legal crab density.

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TABLES AND FIGURES

Table 1.–Number of pots set by soak time, area, and escape ring treatment.

Soak duration, h	Escape ring	Icy Strait 2004	Icy Strait 2005	Stephens Passage 2004	Excursion Inlet 2005
3	With	6	6	6	6
	Without	6	6	6	6
9	With	6	6	6	6
	Without	6	6	6	6
18	With	6	6	6	6
	Without	6	6	6	6
24	With	6	6	6	6
	Without	6	6	6	6
TOTAL	With	24	24	24	24
	Without	24	24	24	24
GRAND TOTAL		48	48	48	48

Table 2.–Comparison of mean (±SE) CPUE of total (all males and females) Tanner and red king crabs captured at each of the four area/year combinations (n = 48).

Area/year	Tanner crab	Red king crab
Icy Strait 2004	113.6 (11.92)	0.1 (0.04)
Icy Strait 2005	76.0 (7.59)	0.0 (0.00)
Stephens Passage 2004	22.9 (3.50)	0.8 (0.34)
Excursion Inlet 2005	17.2 (2.59)	23.9 (5.35)

Table 3.–ANOVA results for the effects of escape rings and soak time for female, sublegal male, and legal male Tanner crabs at each of the four area/year combinations. Escape ring treatment was either closed or open and the soak time treatments were 3, 9, 18, or 24 h. Bold values indicate significance at the p<0.05 level.

A) Icy Strait 2004

		Female			**Sublegal male**			**Legal Male**		
Source	**df**	**MS**	**F**	**p**	**MS**	**F**	**p**	**MS**	**F**	**p**
Escape ring	1	56.33	0.02	0.89	2552.08	5.62	**0.02**	990.08	0.89	0.35
Soak time	3	1109.47	0.41	0.74	996.75	2.19	0.10	2892.08	2.59	0.07
E x S	3	2207.06	0.81	0.49	171.19	0.38	0.77	546.53	0.49	0.69
Error	40	2710.73			454.13			1118.63		

B) Icy Strait 2005

		Female			**Sublegal male**			**Legal Male**		
Source	**df**	**MS**	**F**	**p**	**MS**	**F**	**p**	**MS**	**F**	**p**
Escape ring	1	468.75	1.03	0.32	784.08	3.17	0.08	1220.08	1.63	0.21
Soak time	3	196.33	0.63	0.60	444.25	1.80	0.16	2466.22	3.29	**0.03**
E x S	3	358.31	0.79	0.51	383.47	1.55	0.22	307.42	0.41	0.75
Error	40	454.8			246.97			749.34		

C) Stephens Passage 2004

		Female			**Sublegal male**			**Legal Male**		
Source	**df**	**MS**	**F**	**p**	**MS**	**F**	**p**	**MS**	**F**	**p**
Escape ring	1	25.47	4.00	**0.05**	891.23	6.04	**0.02**	11.90	0.08	0.77
Soak time	3	4.24	0.67	0.58	70.18	0.48	0.70	326.60	2.29	0.09
E x S	3	3.49	0.55	0.65	62.40	0.42	0.74	102.19	0.72	0.54
Error	39	6.36			147.63			142.38		

D) Excursion Inlet 2005

		Female			**Sublegal male**			**Legal Male**		
Source	**df**	**MS**	**F**	**p**	**MS**	**F**	**p**	**MS**	**F**	**p**
Escape ring	1	180.19	4.07	**0.05**	85.33	1.94	0.17	75.00	1.03	0.32
Soak time	3	3.41	0.08	0.97	24.94	0.57	0.64	320.69	4.40	**0.01**
E x S	3	9.41	0.21	0.89	7.06	0.16	0.92	24.50	0.33	0.80
Error	40	44.25			44.07			72.93		

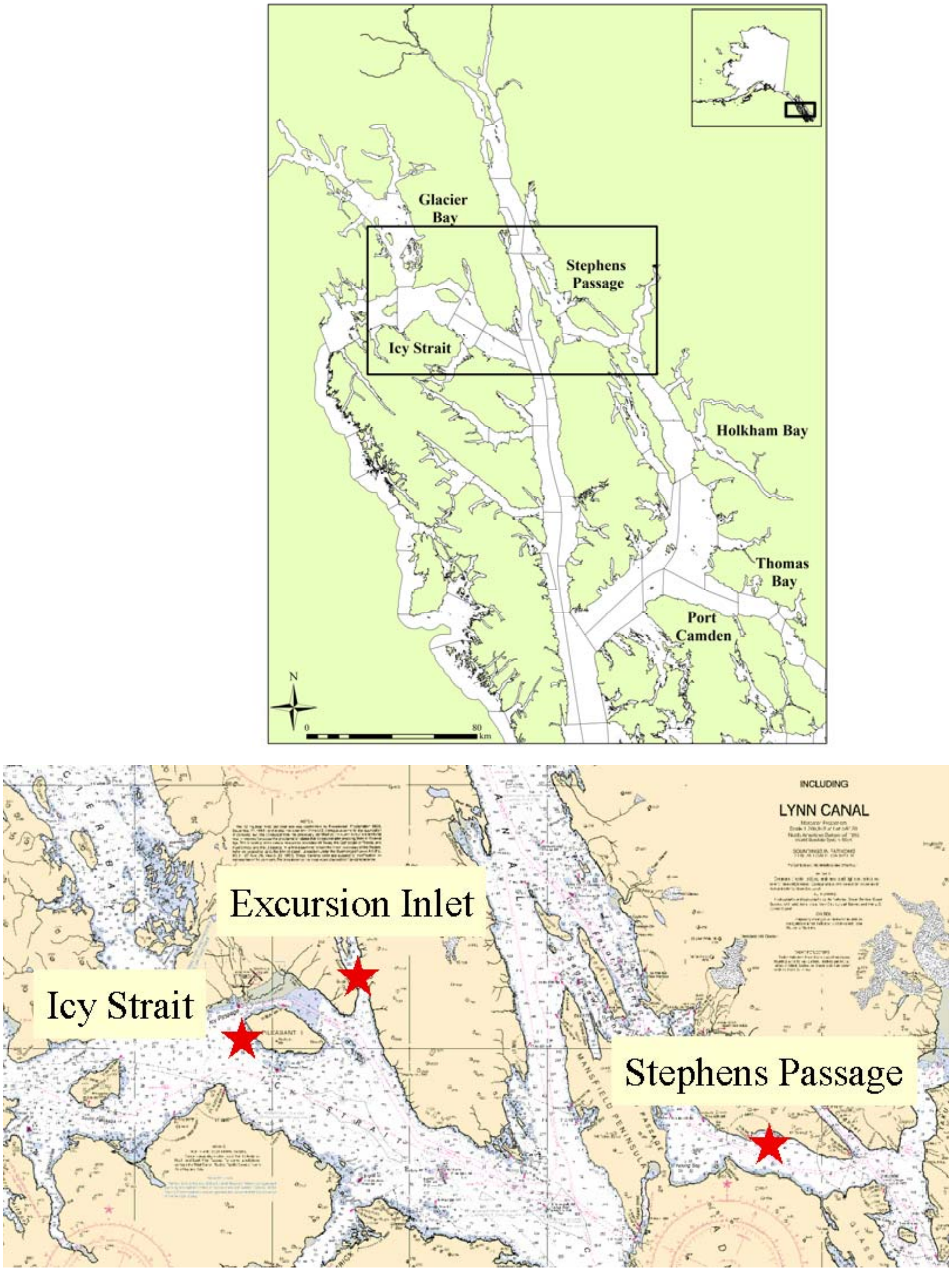

Figure 1.–Location of Tanner crab soak time experimental areas; Icy Strait (2004 and 2005), Stephens Passage (2004) and Excursion Inlet (2005), in Northern Southeast Alaska.

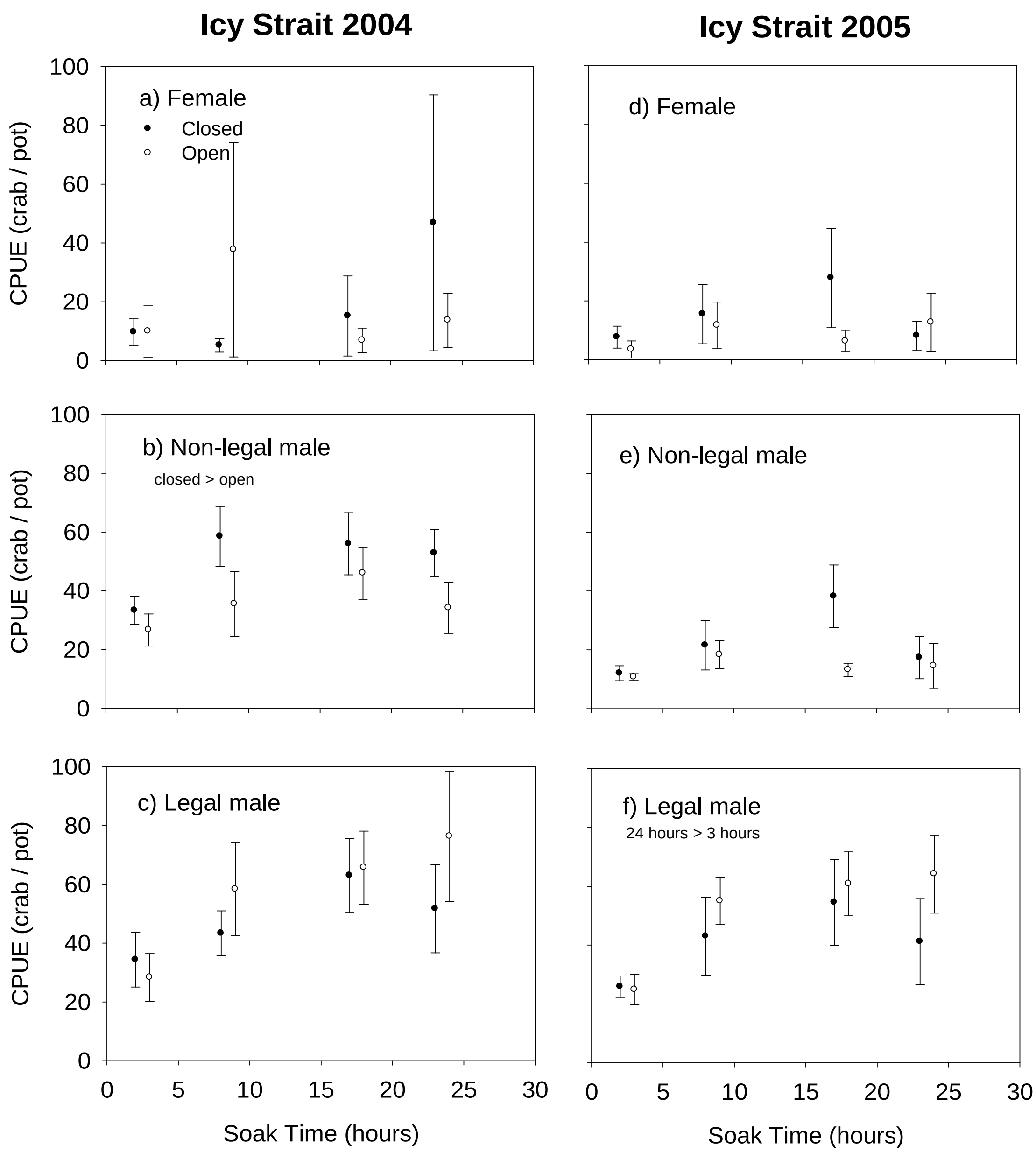

Figure 2.–Mean (±SE) CPUE of females, non-legal males, and legal males at 3, 9, 18, and 24- h soak times with closed and open escape rings at Icy Strait in 2004 and 2005. N = 6 for each treatment level combination. Significant effects from two-way ANOVAs are shown; see Table 3 and text for details.

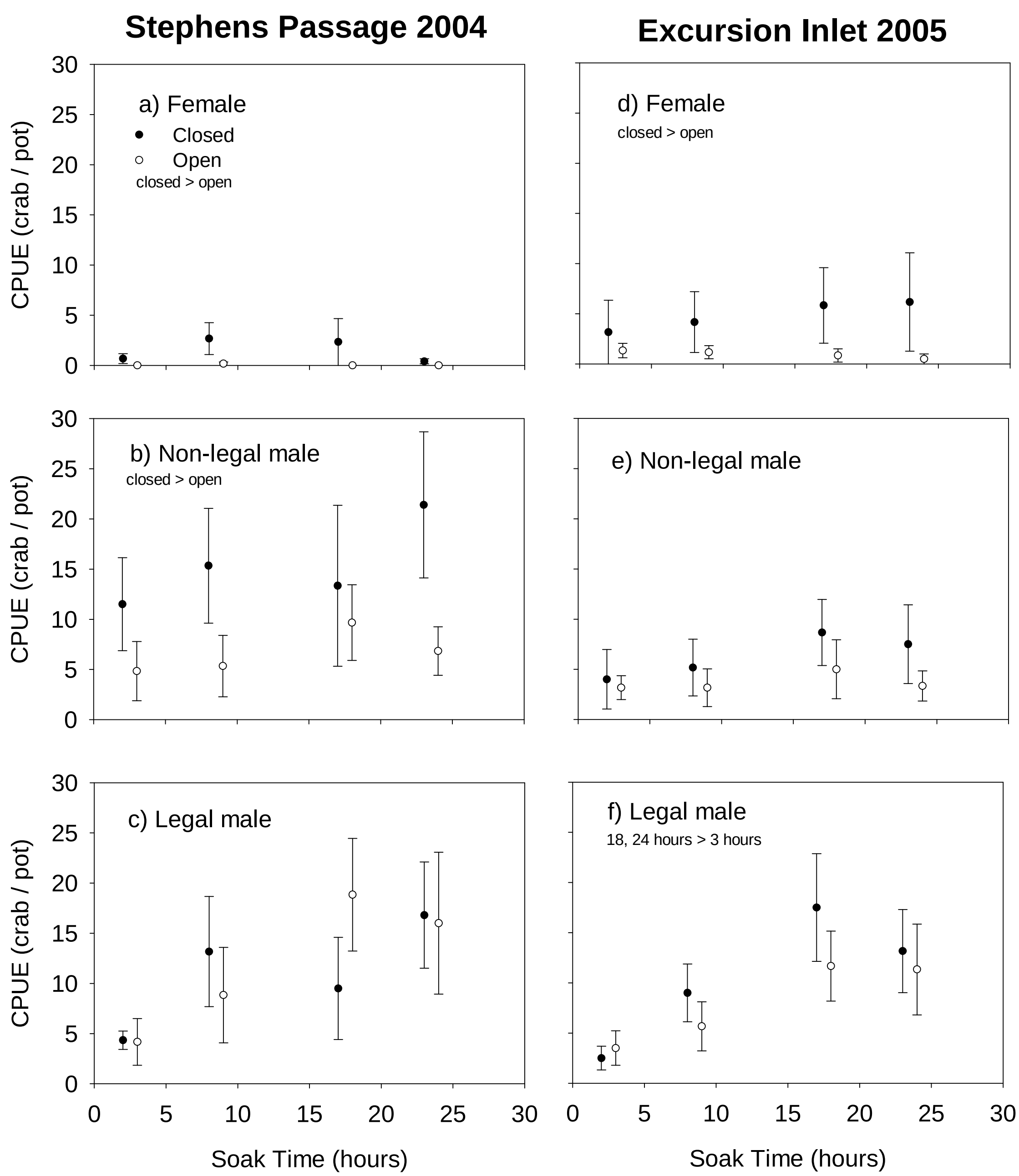

Figure 3.–Mean (±SE) CPUE of females, non-legal males, and legal males at 3, 9, 18, and 24-h soak times with closed and open escape rings at Stephens Passage and Excursion Inlet. N = 6 for each treatment level combination except N = 5 for the Stephens Passage, 24 h, closed escape ring. Significant effects from two-way ANOVAs for each area are shown; see Table 3 and text for details.

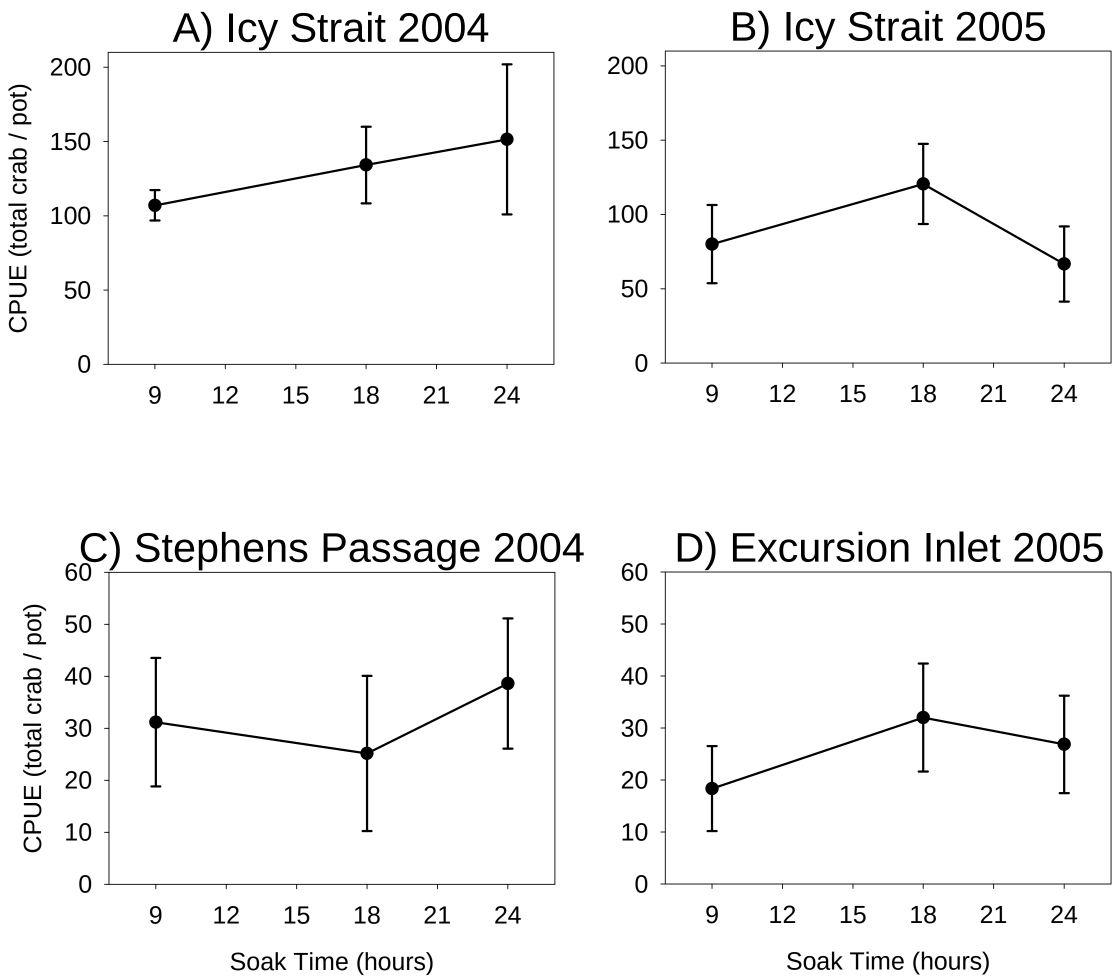

Figure 4.–Mean (± SE) CPUE with closed escape rings at 9, 18, and 24-h soak times at each area/year combination. Data was selected to most closely correspond with ADF&G Tanner crab survey methods. Results of linear regression analyses for each area showed no significant relationship between the CPUE and soak time (all p-values > 0.47). Data from the Icy Strait 2004 area was ln (x +1) transformed prior to analysis to help meet model assumptions.

APPENDIX

Appendix A.–Mean and (±SE) CPUE (crab per pot) of three categories of Tanner crab, with open or closed escape rings, and various soak times for each area/year.

Soak Time (h)	**Open**			**Closed**		
	Females	**Sublegal males**	**Legal males**	**Females**	**Sublegal males**	**Legal males**
Icy Strait 2004						
3	10.00 (8.85)	26.67 (5.48)	28.33 (8.11)	9.67 (4.48)	33.33 (4.79)	34.33 (9.28)
9	37.67 (36.47)	35.50 (11.00)	58.33 (15.88)	5.17 (2.33)	58.50 (10.17)	43.33 (7.66)
18	6.83 (4.18)	46.00 (8.86)	65.67 (12.44)	15.17 (13.61)	56.00 (10.54)	63.00 (12.58)
24	13.67 (9.18)	34.17 (8.67)	76.33 (22.17)	46.83 (43.51)	52.83 (7.96)	51.67 (14.98)
Icy Strait 2005						
3	3.50 (2.92)	10.67 (1.17)	24.83 (5.14)	7.67 (3.73)	12.00 (2.57)	25.83 (3.63)
9	11.67 (7.94)	18.33 (4.75)	55.00 (8.03)	15.50 (10.11)	21.50 (8.37)	43.00 (13.23)
18	6.33 (3.67)	13.17 (2.23)	60.83 (10.85)	27.83 (16.78)	38.17 (10.67)	54.50 (14.55)
24	12.67 (9.98)	14.50 (7.63)	64.17 (13.31)	8.17 (4.91)	17.33 (7.19)	41.17 (14.61)
Stephens Passage 2004						
3	0	4.83 (2.95)	4.17 (2.33)	0.67 (0.49)	11.50 (4.64)	4.33 (0.92)
9	0.17 (0.17)	5.33 (3.06)	8.83 (4.76)	2.67 (1.58)	15.33 (5.72)	13.17 (5.49)
18	0	9.67 (3.77)	18.83 (5.62)	2.33 (2.33)	13.33 (8.02)	9.50 (5.09)
24	0	6.83 (2.41)	16.00 (7.07)	0.40 (0.24)	21.40 (7.28)	16.80 (5.29)
Excursion Inlet 2005						
3	1.33 (0.71)	3.17 (1.19)	3.50 (1.73)	3.17 (3.17)	4.00 (2.97)	2.50 (1.18)
9	1.17 (0.65)	3.17 (1.87)	5.67 (2.44)	4.17 (3.03)	5.17 (2.82)	9.00 (2.88)
18	0.83 (0.65)	5.00 (2.93)	11.67 (3.49)	5.83 (3.76)	8.67 (3.29)	17.50 (5.37)
24	0.50 (0.50)	3.33 (1.50)	11.33 (4.52)	6.17 (4.90)	7.50 (3.92)	13.17 (4.14)