

## Regional Information Report 4K09-05

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# Project Operational Plan for the Kodiak District Tanner Crab *Chionoectes bairdi* Tagging Program

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Nicholas Sagalkin

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Lynn Mattes

June 2009

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Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries





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TANNER CRAB *CHIONOECETES BAIRDI* TAGGING PROGRAM**

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June 2009

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## ABSTRACT

This report describes the objectives and methods for the Kodiak District Tanner crab *Chionoecetes bairdi* tagging program. Tanner crab will be tagged by Alaska Department of Fish and Game (ADF&G) biologists aboard the R/V *Resolution* during the annual large-mesh trawl survey. Legal-sized ( $\geq 140$ -mm carapace width) male crabs will be tagged at select stations in sections of the Kodiak District that are anticipated to have a commercial Tanner crab fishery the following winter. Recovery information will help determine Tanner crab movement between the summer survey and the winter fishery. Recovered tagged crabs will also assist in the evaluation of Tanner crab shell condition metrics.

*Keywords:* Tanner crab; *Chionoecetes bairdi*; Kodiak; tagging; movement; Westward Region

## INTRODUCTION

The Kodiak District Tanner crab *Chionoecetes bairdi* fishery began in 1967 when 110,961 pounds were landed (Sagalkin 2008a; Mattes and Spalinger 2005). In comparison to the king crab fishery, the Tanner crab fishery was slower to develop. Development was slowed because consumers did not accept Tanner crab as readily as king crab and processing facilities had yet to develop effective meat extraction techniques. Commercial harvest peaked in 1977/78 when over 33 million pounds were harvested from the Kodiak District (Sagalkin 2008a). Harvests declined from that year through 1993/94, when just over 500,000 pounds were harvested. The commercial fishery was closed from the 1994/95 season through the 1999/2000 season. During the six-year closure period a harvest strategy was developed by Alaska Department of Fish and Game (ADF&G) that was adopted by the Alaska Board of Fisheries (BOF) in 1999 (Urban et al. 1999). This harvest strategy specified minimum population levels (biological thresholds) and minimum guideline harvest levels (GHLs) to open a commercial fishery. The fishery re-opened in 2000/01 (Sagalkin 2008a).

In the early 1980s, when Tanner crab stocks and commercial harvest began to decline, concerns about using the pot survey to predict Tanner crab recruitment prompted the ADF&G to test trawl gear as a viable assessment tool. In 1988, trawl surveys replaced pot surveys for Tanner crab stock assessment because they are faster and sample a wider range of crab sizes (Jackson 1990). The trawl survey is conducted annually between June and September, covering the Kodiak, Chignik, and Alaska Peninsula districts, and the Eastern Aleutian District around Akutan and Unalaska Island (Spalinger 2008; Figure 1).

Results from the survey are used to set annual GHLs for the Kodiak District (Spalinger 2007 and 2008). GHLs are established using rules outlined in the Tanner crab harvest strategy. Separate GHLs are established for each section of the Kodiak District. Since the reopening of the Kodiak District Tanner crab season in 2000/01, ADF&G has managed portions of sections relative to the survey distribution (e.g., Sagalkin 2008b). At times this has resulted in closing bays or closing a portion of a section prior to the entire section closure.

There has been concern that crab migrate between the time of the summer stock assessment trawl survey and the winter commercial fishery. If ADF&G manages harvest based on survey distribution of biomass, but crabs move between the survey and the fishery, portions of the population could be overharvested relative to other portions of the population. Donaldson (1983) found that legal-sized male crab tagged in bays tended to move offshore, while legal-sized male crab tagged offshore tended to remain in the same general area. Even for the crab that moved offshore, movement was not extensive. Mean net movement was 24 km (15 mi).

Shell condition of legal-sized male crabs are evaluated during the survey and used to help set GHs. ADF&G samples commercial Tanner crab harvest during the fishery and assesses shell condition. In 2007, ADF&G staff began re-evaluating diagnostics used for determining shell condition to make sure standards were consistent among surveys and biological samples collected from the commercial fishery.

In 2004, ADF&G staff began tagging legal-sized male Tanner crabs captured during the trawl survey in the Northeast, Eastside, Southeast, and Southwest sections of the Kodiak District (Spalinger 2007; Figure 2). Crab chosen for tagging were located in sections anticipated to have a commercial fishery based on population estimates from the previous year's survey data.

From 2004-2006 Tanner crabs were tagged with the general concept of understanding crab movement. In 2007, it was realized that recovered tagged crabs could also be used to evaluate shell condition data collected during the survey and subsequent commercial harvest. So in 2007 and 2008, Tanner crabs were tagged with two objectives. Beginning in 2009, tagging will be more defined in attempt to answer the following objectives.

## **OBJECTIVES**

The goal of this project is to determine if crabs captured during the summer trawl survey, which are used to determine harvest levels are located in the same general area during the winter commercial fishery. Objectives toward this goal include

1. Determine whether the harvest rate is constant across tagging areas (e.g., inner Marmot versus outer Marmot);
2. Determine if harvested crabs are more or less likely to be harvested in the same area where they were located during the survey.

A secondary goal of the project is to evaluate differences in recorded shell condition between the survey and the winter fishery.

## **METHODS**

The R/V *Resolution* conducts annual trawl surveys in areas of known Tanner crab habitat throughout the Kodiak, Chignik, South Peninsula, and Eastern Aleutian districts of the Westward Region (Spalinger and Cavin 2004). Tanner crab will be tagged during these surveys.

### **LOCATION**

Beginning in 2009, crabs will be tagged in select stations within the Northeast and Eastside sections of the Kodiak District. Crabs will be tagged from stations in the Northeast Section: inner Marmot Bay and outer Marmot Bay (Figure 3). In the Eastside Section, crabs will be tagged from inner Ugak Bay, outer Ugak Bay, and Barnabas Gully (Figure 4). Stations from each area are listed in Table 1. Tagging may also occur in the Eastern Aleutian District; however, those methods will be described elsewhere.

### **CRAB TAGGING**

Once the trawl net is brought aboard the vessel, the total catch will be weighed. Crabs from the entire catch will be sorted by species and sex, then weighed and measured. Legal-sized male Tanner crabs ( $\geq 140$  mm carapace width) captured from the subsections will be examined to determine if they are suitable for tagging. Crabs that are obviously dead or dying or that have

fresh injuries, such as broken or crushed appendages, broken rostrum, or broken or crushed carapace, will not be tagged. Crabs that have more than two walking legs missing will not be tagged. Crabs that are active and appear to be in good shape as indicated by ramp reflex indicators will be tagged with a Floy® vinyl disc tag<sup>1</sup>. The goal is to tag up to 25 crabs per station. These tagging goals are per station, rather than a total goal for the area or percentage of the catch.

The proper procedure to tag a crab with a disc tag is as follows:

1. Make a small hole above the lower, left corner of the brachial lobe (Figure 5). The hole can be made using a handmade punch with a short nail attached; however, make sure that the nail will not penetrate deeply into the body cavity;
2. Once the hole is made, insert a plastic dart with a numbered disc into the hole;
3. Record the tag number on the Tanner crab tagging form (Figure 6), along with the date, haul number, carapace width, shell condition, and latitude and longitude of release;
4. Photograph tagged crab. Photos should be of ventral and dorsal surfaces with a label visible in the photo indicating the tag number.

## **TAG RECOVERY**

Tag recovery will occur primarily during the subsequent winter commercial Tanner crab season. There is the potential for some tag recoveries from other commercial fisheries, subsistence harvesters, subsequent years' trawl surveys, or beachcombers. Prior to the subsistence and commercial fisheries, ADF&G will distribute information explaining the tagging program and offer a reward for returned tags (Figure 7). Harvesters are asked to leave the tag in the crab so that carapace width, shell condition, and a photo of the shell condition may be obtained (Figure 8). Harvesters returning a tag with complete recovery location information will be given a reward hat or mug.

## **DATA ANALYSIS**

Tag recoveries from inner and outer Marmot and Barnabas Gully and inner and outer Ugak will be analyzed to determine whether harvest rates are constant on crabs across tagging areas using the following:

Tag Recovery Probability =  $\alpha$  \* (harvest rate);

Where

$\alpha$  = a constant used for all tagged crabs. This makes the assumption that factors affecting recovery are the same for all tagged crab; for example, rate of mortality of tagged crab is equal among areas.

Therefore if

Recovery Rate A < Recovery Rate B then harvest rate is higher on B crabs,

Recovery Rate A > Recovery Rate B then harvest rate is higher on A crabs,

---

<sup>1</sup> Use of trade name does not constitute an endorsement by ADF&G.

Recovery Rate A = Recovery Rate B then harvest rate is constant.

Note that recovery rates could be equal if fishing is uniform across areas and crabs do not move or if fishing is concentrated in area A and there is uniform mixing prior to the season. To determine which scenario is taking place, the next analysis looks at movement.

To test whether harvested crabs are more or less likely to be harvested in the area they were tagged, we will compare the following proportions:

1. Tagged crabs from Area A (e.g., inner Marmot Bay) that were recovered in Area A
2. Tagged crabs from Area A that were recovered in Area B (e.g., outer Marmot Bay)
3. Tagged crabs from Area A recovered outside Area A or Area B.

To help assist with evaluating shell conditions and how shell wear may change with time at liberty, the shell condition at the time of harvest will be compared to the shell condition during the survey. A photo of the recovered crab will be archived along with the photo of the crab from release to help train future biologists and dockside samplers.

## **SOURCES OF BIAS**

This project has several sources of bias. The release location is the surface of the water. There is currently no information on how long it takes a crab to drift to the bottom, and this would vary depending on depth. The vessel is often moving during the time of crab release, and this is not corrected for in the release location. Likewise, speed and direction of currents are not measured and will affect where the crab contact the bottom.

The second source of bias is that recovery is primarily from the commercial fishing fleet. The fleet does not fish in all areas that crabs are tagged. If there is no fishing in areas, there is reduced possibility of tag recovery. The concentrations of tag recoveries may be an artifact of the behavior of the fishing fleet rather than migration of the crab. The third source of error is that the distance between release and recovery locations can only be measured as a straight line. There is no method to determine the path that crab traveled from the release location to the recovery location.

## **ACKNOWLEDGMENTS**

The following Alaska Department of Fish and Game Westward Region employees are acknowledged for their contributions: Doug Pengilly for project guidance and review of this operational plan, R/V Resolution staff and cruise leaders for tagging crab, and dockside staff for assisting in tag recoveries. Lisa Marcato formatted and distributed this operational plan report.

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## **TABLES AND FIGURES**

Table 1.–List of station names by section within the Kodiak District from which Tanner crabs will be tagged.

Northeast Section		Eastside Section		
Inner Marmot	Outer Marmot	Inner Ugak	Outer Ugak	Barnabas Gully
MONX	255X	UGAC	UGG	559
MOEX	283X	UGAB	UGI	560
MOT	255	UGAA	UGJ	561
MOPX	256	UGB	UGM	586
MOX	257	UGC	510B	587
MOXX	283	UGD	486A	588
MOLX	284	UGE	486B	589
MOQ	285	UGF	511A	585X
MOGX	313		511B	618A
	314		510C	619
			534B	620
			535A	621
			535B	654
			534D	655
			535C	6566
			535D	

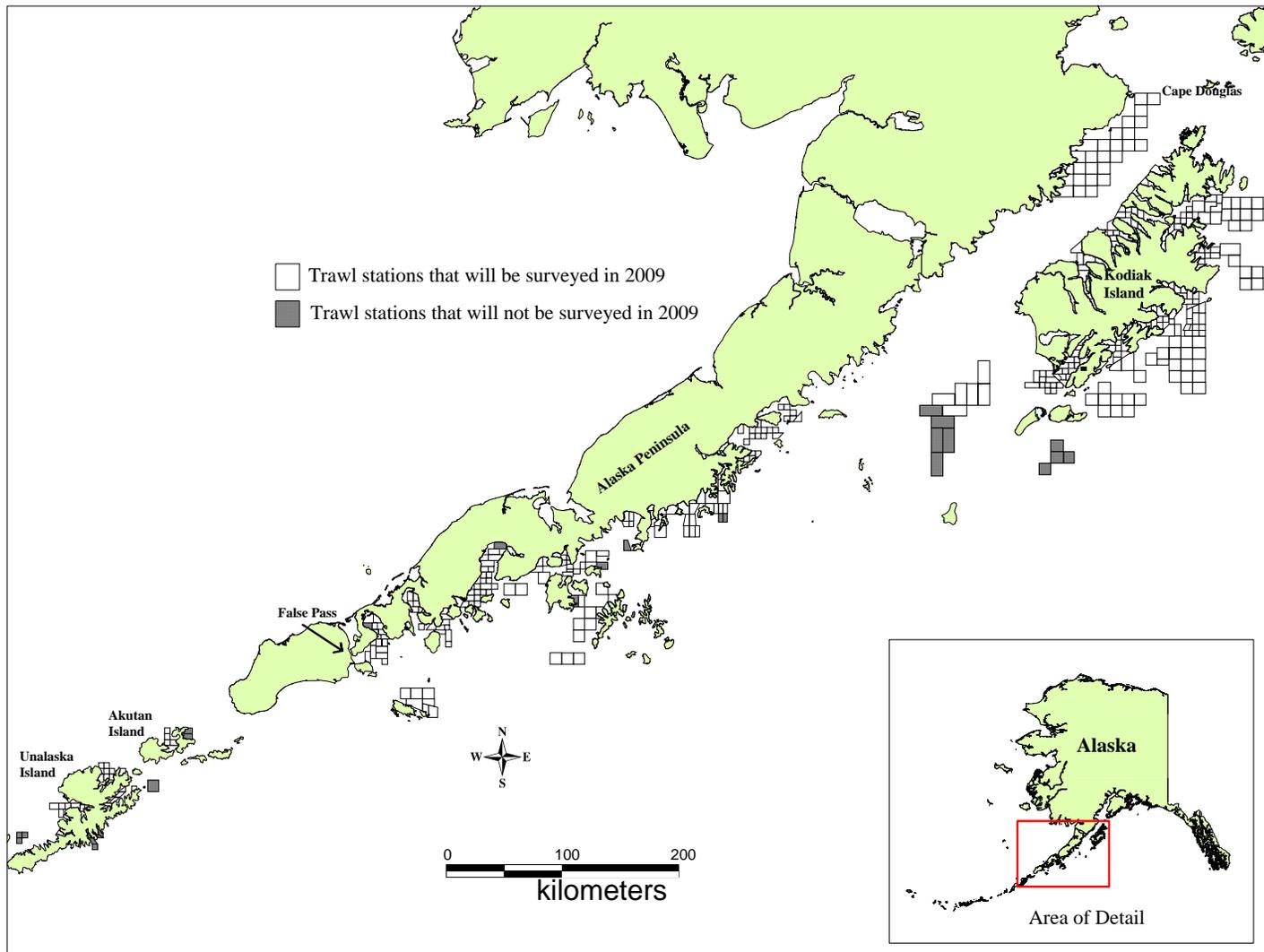


Figure 1.—ADF&G Westward Region trawl survey stations.

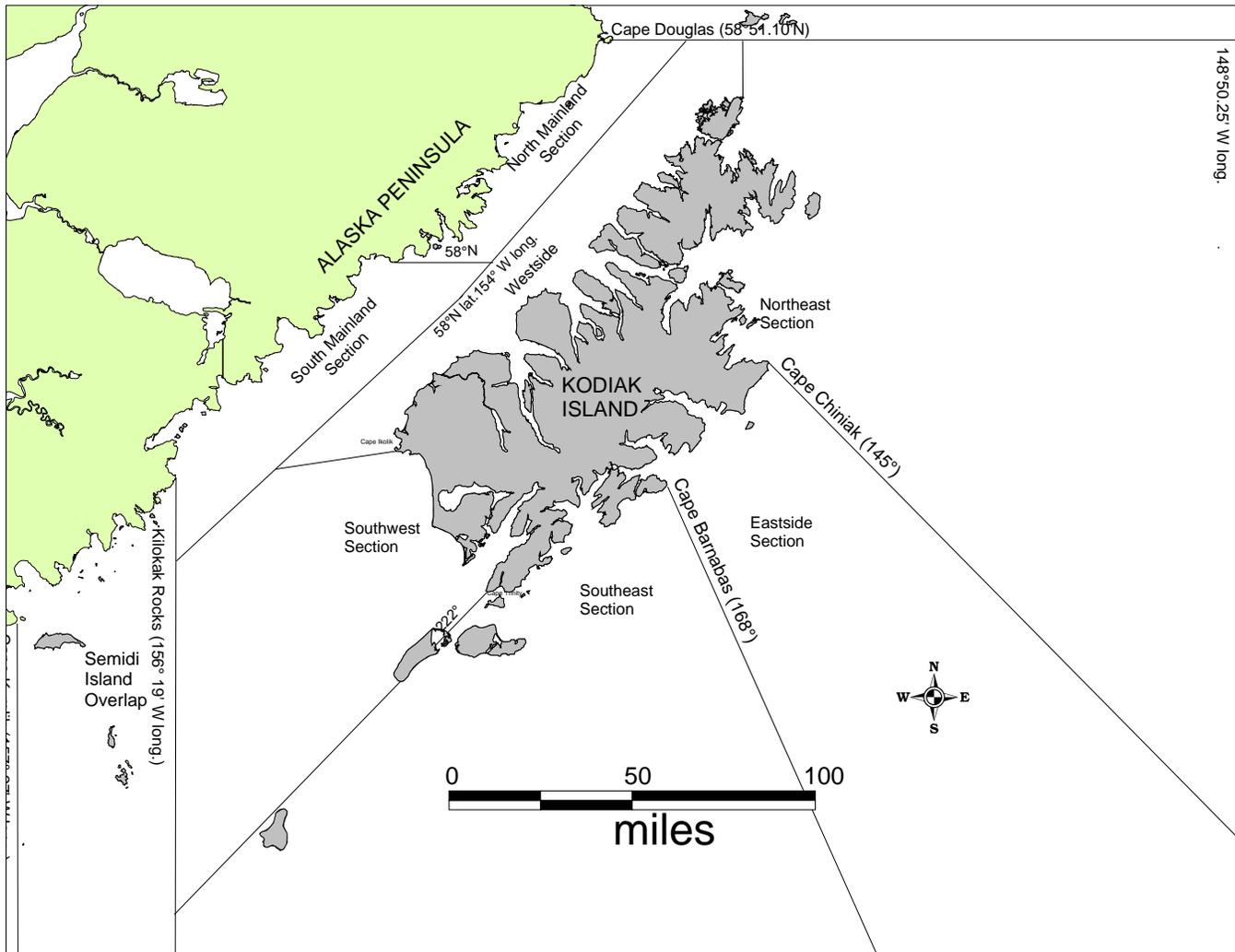


Figure 2.—ADF&G Kodiak District Tanner crab management sections.

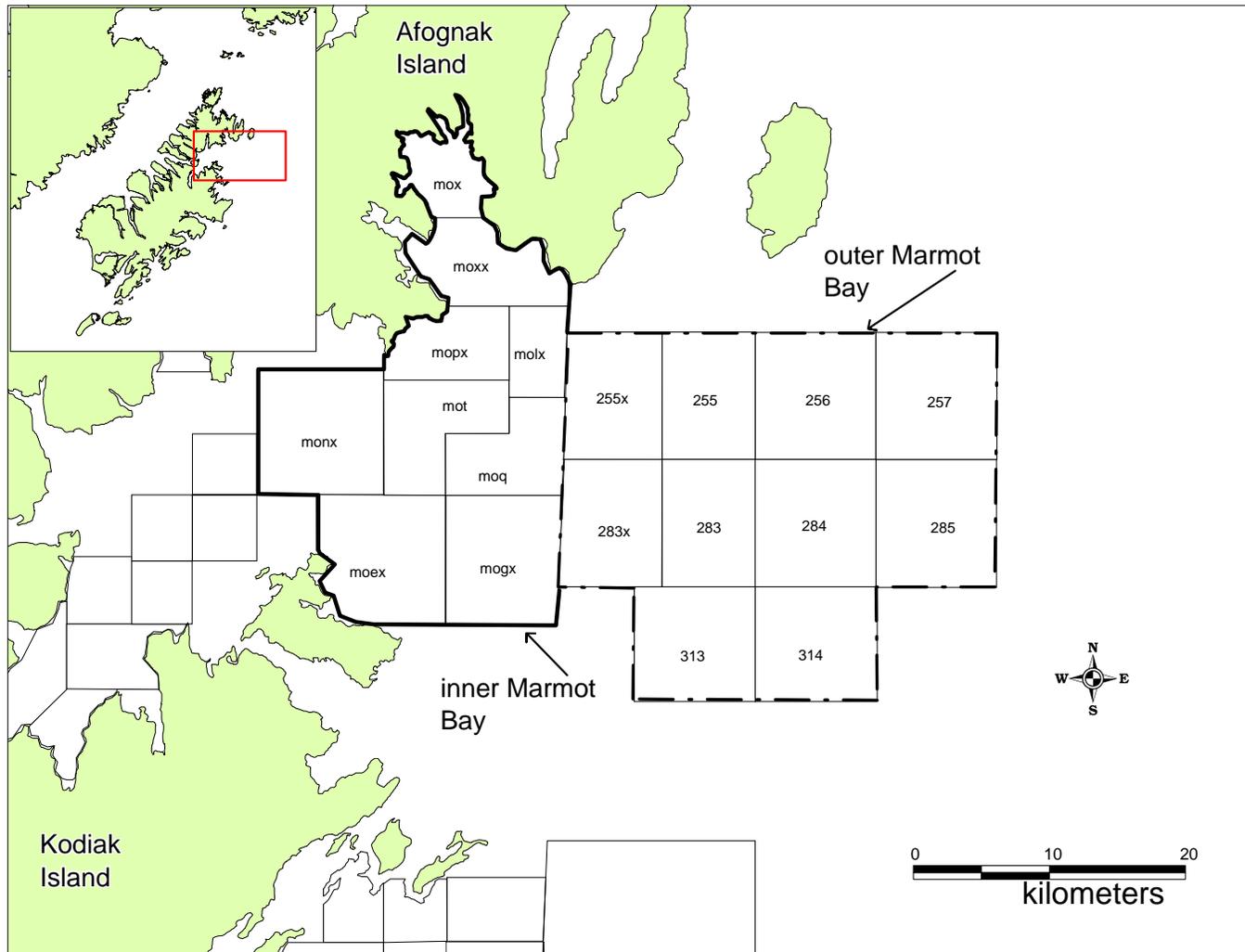


Figure 3.—Map of stations where Tanner crab will be tagged within inner Marmot Bay and outer Marmot Bay of the Northeast Section of the Kodiak District.

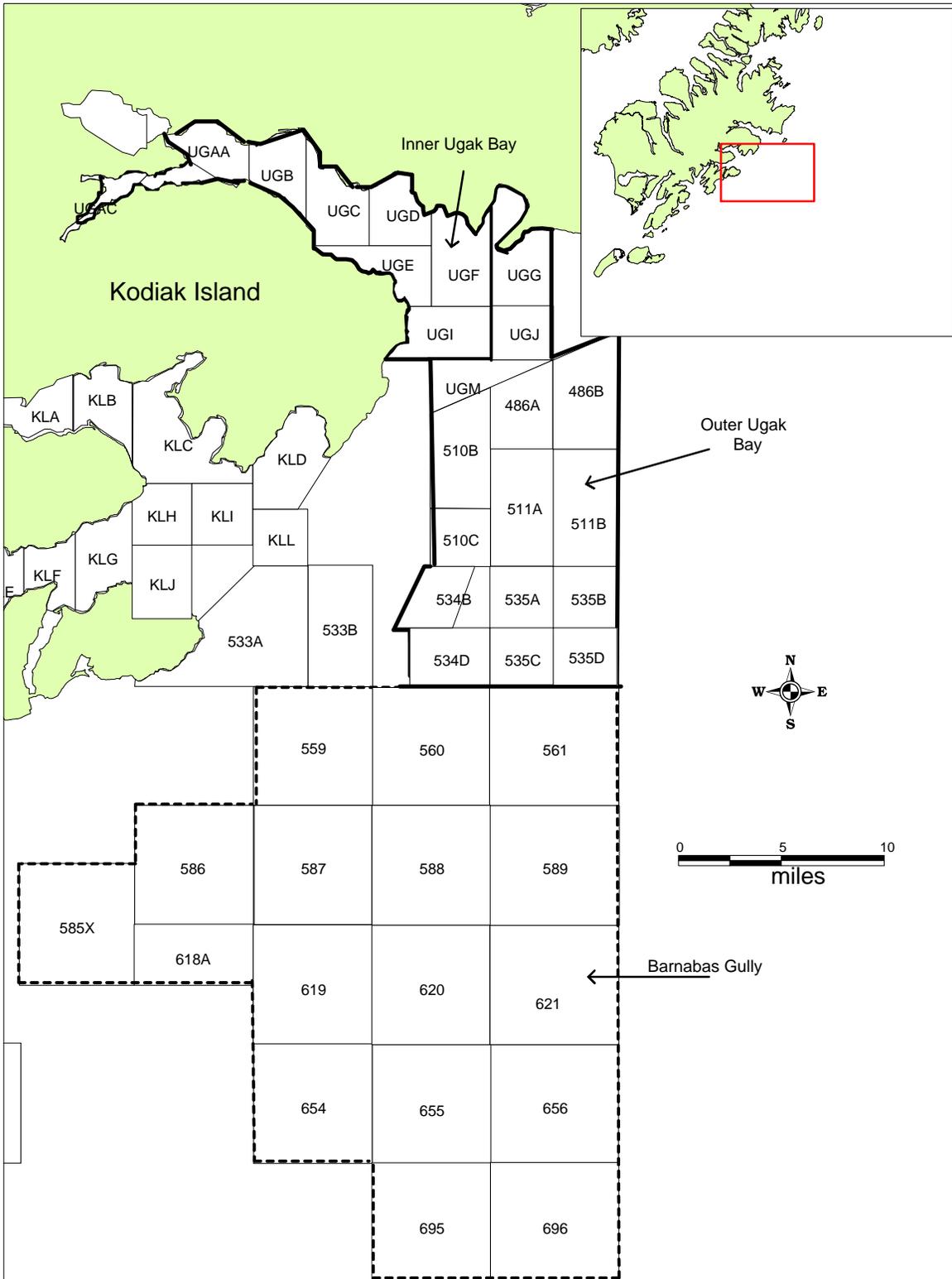


Figure 4.—Map of stations where Tanner crab will be tagged within the inner Ugak Bay, outer Ugak Bay, and Barnabas Gully of the Eastside Section of the Kodiak District.

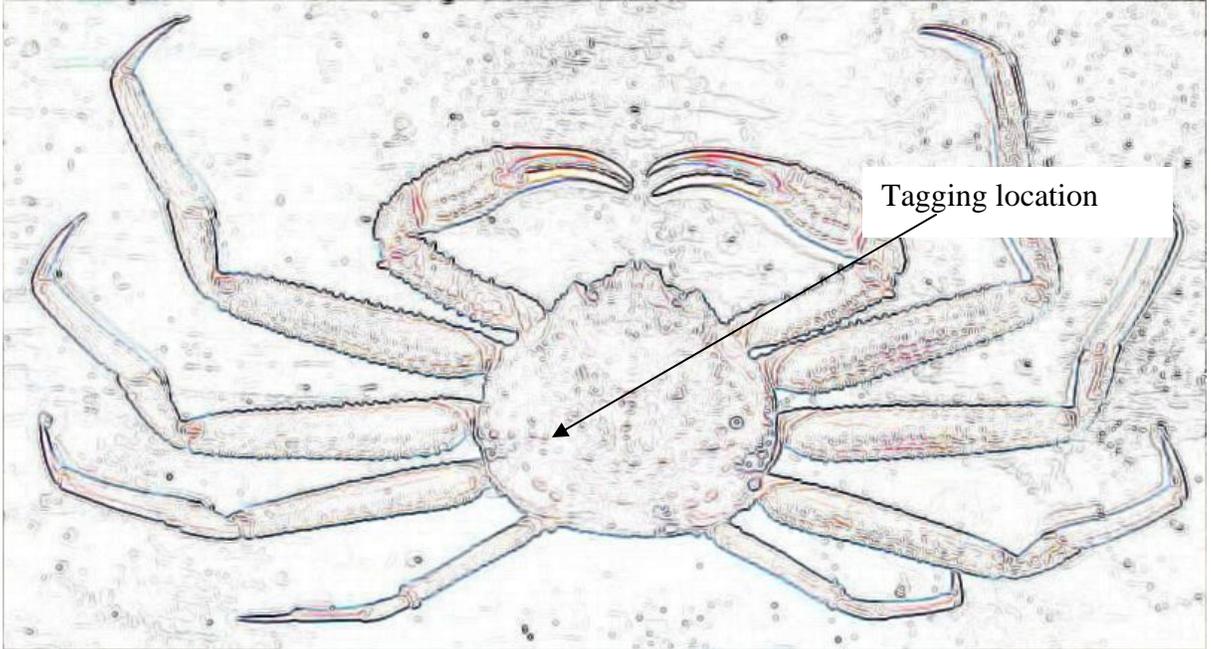


Figure 5.–Diagram of tagging location on Tanner crab.

Tanner Crab Tagging Form 2009 - Legals											
Beginning tag number = T 0											
TAG #	DATE	HAUL	CARAPACE WIDTH	SHELL CONDITION	RELEASE LOCATION	TAG #	DATE	HAUL	CARAPACE WIDTH	SHELL CONDITION	RELEASE LOCATION
01						26					
02						27					
03						28					
04						29					
05						30					
06						31					
07						32					
08						33					
09						34					
10						35					
11						36					
12						37					
13						38					
14						39					
15						40					
16						41					
17						42					
18						43					
19						44					
20						45					
21						46					
22						47					
23						48					
24						49					
25						50					

Figure 6.–Tanner crab tagging release form.

*Notes:*

Beginning tag number

Write in the thousand and hundred digit from the tag series to keep the sheets from becoming confused.

The tag numbers listed on the sheet only refer to the last two digits of the tag, so it is important to fill in this line.

Date

Month and day.

Haul

Fill in the haul number where the crabs were captured.

Carapace Width

Distance across the carapace between spines, in mm.

Shell Condition

1=soft

2=new

3=old

4=very old

If the crabs are returned to the water at a location away from the haul site, please record the latitude/longitude of the release location



# RETURN TANNER CRAB TAGS



Reward hat or mug

•The ADF&G in Kodiak is asking for your assistance in returning tags from legal-sized male Tanner crab in the Kodiak and Eastern Aleutian Districts. *Commercial fishers will be provided with recovery forms at registration.*

-If you recover a tagged crab, record tag number and:

- Record the latitude, longitude, and depth of capture.
- Record the vessel name and date.
- Leave tag attached** and retain crab for measurement by ADF&G staff. Kodiak dockside sampler cell phone: 539-5954.

•Return tag info to: **ADF&G Kodiak** (486-1840), or **Dutch Harbor** (581-1239)

•Receive: a custom printed Tanner crab tag reward mug or hat.



\*Crabs were tagged on the right side of the carapace.

Return tags and information to:

**ADF&G Shellfish**  
211 Mission Road  
Kodiak, AK 99615

-OR-

**P.O. Box 920587**  
**Dutch Harbor, AK 99692**

For details call: **907-486-1840.**

### Tag Types



-OR-



Figure 7.-Tanner crab tag reward poster.

Photos of released crab (6/29/08); classified oldshell at release



Photos of recovered crab (1/25/09); classified oldshell



Figure 8.—Photographs of tagged crab at time of release and recovery with date, carapace width, and shell condition.