Regional Information Report No. 1J10-18

Golden King Crab Observer Program Summary Report, 1999/00 through 2008/09 Seasons

by

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and

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November 2010

Alaska Department of Fish and Game Division of Commercial Fisheries
Symbols and Abbreviations

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Weights and measures (metric)
centimeter cm
decimeter 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 ft³/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.
compass directions: east E, north N, south S, west W
copyright ©
District of Columbia et alii (and others) et al.
(exempli gratia) e.g.
(Federal Information Code) FIC
id est (that is) i.e.
latitude or longitude lat. or long.
monetary symbols (U.S.) $, ¢
registered trademark @
United States Code United States of America (noun) U.S.

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 Hₐ
base of natural logarithm e
catch per unit effort CPUE
coefficient of variation CV
correlation coefficient R
confidence interval CI
degree (angular) °
degree of freedom df
deviation E
expected value 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) logₑ, etc.
minute (angular) '
not significant NS
null hypothesis H₀
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
standard deviation SD
standard error SE
variance population Var
sample var
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1999/00 THROUGH 2008/09 SEASONS

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ADF&G, Division of Sport Fish, Research and Technical Services, 333 Raspberry Road, Anchorage AK 99518 (907)267-2375.
ABSTRACT
Observing onboard commercial golden king crab vessels during the golden king crab fishery in Southeast Alaska was initiated during the 1999/00 season, with the purpose of collecting data from management areas that were not being sampled dockside. Operators of vessels with observers onboard were asked to close the escape rings, or 9-in stretch mesh panel, of up to 35 of their pots. This program currently provides the only opportunity to collect data on sublegal and female golden king crabs, and to describe precise locations and depth of capture by size and sex class. To date, a total of 40,261 crabs have been measured in 7 management areas; during the 2008/09 season, 6 trips were conducted in 5 management areas, and 5,505 crabs were measured.

Key words: Golden king crab, Lithodes aequispinus, Southeast Alaska, observer program, stock assessment

INTRODUCTION
Golden king crabs, Lithodes aequispinus, (GKC) are harvested from deep waters, between 100 and 350 fathoms, in northern Southeast Alaska (Figure 1); although lesser numbers are harvested from southern Southeast Alaska (Figure 2). GKC commercial fishing grounds are located at the confluences of large straits and sounds, and the three most important grounds are respectively, the confluences of Icy Strait, Lynn Canal, and Chatham Strait; of Chatham Strait and western Frederick Sound, and of Stephens Passage and Frederick Sound. From the fishermen’s perspective, golden king crab fishing conditions are more demanding than for red king crab, Paralithodes camtschaticus, or the Tanner crab, Chionoecetes bairdi, fisheries, because the golden king crab grounds are more exposed to adverse weather conditions, located in greater depths, and subject to stronger tidal exchanges and heavy currents.

Commercial vessels participating in the golden king crab fishery are primarily salmon tenders, salmon purse seine vessels, and a few large drift gillnet boats. Fishing gear has gradually evolved from side-loading king crab pots (7-ft x 7-ft x 30-in) to the top loading conical or pyramid-style pots, which are most commonly used at present. However, because of the challenging fishing conditions fishermen prefer heavier gear, and use different buoy line and buoy trains. Soak times are generally longer for GKC, 24–48-hrs compared to 18–24-hrs for RKC or Tanner crab fishing.

Management of the commercial GKC fishery is based on a management plan and policies that have been reviewed and approved by the Alaska Board of Fisheries. There are six primary elements of the management plan: 1) a season that opens concurrently with the Tanner crab fishery, 2) male-only harvest, 3) minimum legal carapace width of 7 inches, 4) vessel limit of 100 pots, 5) seven separate management areas, and 6) guideline harvest ranges based on historic harvest levels (Hebert et al. 2008).

There is no fishery-independent stock assessment program for golden king crab in Southeast Alaska. Stock assessment consists of a triennial evaluation of four types of fishery-dependent information: fish tickets, logbooks, dockside sampling and onboard observer sampling. Stock status is determined as a result of this evaluation. Based on stock status, guideline harvest levels within the regulatory guideline harvest range are determined and targeted inseason by managers.

OBJECTIVES
The golden king crab observer program was initially established during the 1999/2000 season, but discontinued after the 2003/04 season. The primary objectives were gathering data on the fishing grounds, specifically in areas lacking biological data. The program was reinstated beginning in the 2005/06 season with expanded objectives, which follow:

1. Describe the size and sex composition of golden king crab captured in a legal crab pot.
2. Describe the size and sex composition of golden king crab captured in a crab pot with the escape rings closed.
3. Describe the bycatch species composition in the golden king crab fishery.
4. Describe fishing methods common in the golden king crab fishery, including bait, gear, and soak times.
5. Describe the commercial fishing grounds within each management area.
6. Describe ontogenetic depth distribution of golden king crab.
7. Describe any periodicity in golden king crab life history.
8. Obtain data on chela height allometry for golden king crab to define Southeast Alaska and management area-specific size at maturity.

**METHODS**

ADF&G employees are placed onboard volunteer vessels during the commercial GKC fishery to sample crabs. Methods are detailed elsewhere (Messmer et al. 2010).

**RESULTS**

From 1999/00 through 2003/04 seasons, 24 observer trips were conducted with 18,438 crab sampled from 1,713 pots (Table 1). Beginning in the 2006/07 season, the observer program was reinstated, since then 22 trips have been conducted with 40,261 crab sampled from 3,806 pots.

During the 2006/07 season, nine observer trips were conducted over 54 days in five management areas: Frederick Sound, North Stephens Passage, Mid Chatham Strait, Northern, and Icy Strait. Observers included; Scott Kelly, Kyle Hebert, Gretchen Bishop, Julie Bednarski, Chris Siddon, Adam Messmer and Karla Bush (Table 2). A total of 11,711 crab were sampled from 828 pots in 2007 and 77% of the crabs sampled were measured for biological data.

During the 2007/08 season, seven observer trips were conducted over 48 days in six management areas: Frederick Sound, North Stephens Passage, Mid Chatham Strait, Lower Chatham Strait, Northern, and Icy Strait. Observers included; Julie Bednarski, Chris Siddon, Adam Messmer and Karla Bush (Table 2). A total of 11,598 crabs were sampled from 784 pots in 2008 and 82% of the crabs sampled were measured for biological data.

During the 2008/09 season, six observer trips were conducted over 24 days in five management areas: Mid-Chatham, North Stephens Passage, Northern, Lower Chatham and Icy Strait. Observers included; Julie Bednarski, Chris Siddon, Adam Messmer and Karla Bush (Table 2). A total of 5,505 crabs were sampled from 589 pots in 2009 and 95% of the crabs sampled were measured for biological data.

**DISCUSSION**

Data from the observer program provides the only biological information collected on sublegal, and female GKC, and with time, should provide life history insights. The size composition data collected while observing has the advantage of including prerecruit males, and as such lengthens the predictive horizon for stock assessment. In addition to size composition, chela height data is collected, which will allow determination of the size of GKC maturity, both throughout the Southeast region, and by management area. Other data collected includes pot locations, depth, bycatch, soak time, and gear configuration. Data on GKC distribution by size and sex class could be useful for determining survey strata boundaries and methods in the future. Data on fishing
methods and gear should prove useful to managers, as they assess the impacts to the fishery of proposed management measures.
REFERENCES CITED
TABLES AND FIGURES
Table 1.—Effort distribution by management area in the golden king crab onboard observer program for Southeast Alaska, 1999/00–2008/09 commercial seasons.

<table>
<thead>
<tr>
<th>Management area</th>
<th>Season</th>
<th>Observed pot pulls</th>
<th>Number in observed pot pulls</th>
<th>Crab captured</th>
<th>Crab measured</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Central</td>
<td>1999/00</td>
<td>116</td>
<td>1,360</td>
<td>1,360</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2000/01</td>
<td>48</td>
<td>561</td>
<td>555</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2001/02</td>
<td>278</td>
<td>3,168</td>
<td>3,014</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2002/03</td>
<td>92</td>
<td>2,380</td>
<td>1,259</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2003/04</td>
<td>328</td>
<td>4,297</td>
<td>3,685</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2006/07</td>
<td>303</td>
<td>6,735</td>
<td>4,824</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2007/08</td>
<td>80</td>
<td>2,183</td>
<td>1,931</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2008/09</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>1,245</strong></td>
<td><strong>20,684</strong></td>
<td><strong>16,628</strong></td>
<td></td>
</tr>
</tbody>
</table>

| Mid-Chatham     | 1999/00 | 122 | 1,089 | 1,089 |
|                 | 2000/01 | 186 | 1,004 | 1,004 |
|                 | 2001/02 | 76 | 1,189 | 1,126 |
|                 | 2002/03 | 69 | 973 | 729 |
|                 | 2006/07 | 99 | 1,948 | 1,387 |
|                 | 2007/08 | 312 | 6,227 | 5,009 |
|                 | 2008/09 | 63 | 1,563 | 1,541 |
| **Total**       |        | **927** | **13,993** | **11,885** |

| Northern        | 2000/01 | 111 | 543 | 540 |
|                 | 2003/04 | 20 | 95 | 95 |
|                 | 2006/07 | 250 | 1,395 | 1,293 |
|                 | 2007/08 | 152 | 1,639 | 1,114 |
|                 | 2008/09 | 101 | 1,393 | 1,391 |
| **Total**       |        | **634** | **5,065** | **4,433** |

| Lower Chatham   | 1999/00 | 49 | 389 | 389 |
|                 | 2000/01 | 28 | 299 | 279 |
|                 | 2007/08 | 125 | 638 | 638 |
|                 | 2008/09 | 161 | 1,778 | 1,772 |
| **Total**       |        | **418** | **4,867** | **3,298** |

| Icy Strait      | 2002/03 | 74 | 482 | 482 |
|                 | 2006/07 | 126 | 1,170 | 1,170 |
|                 | 2007/08 | 77 | 474 | 450 |
|                 | 2008/09 | 80 | 300 | 299 |
| **Total**       |        | **357** | **2,426** | **2,401** |

| North Stephens  | 2006/07 | 50 | 463 | 391 |
|                 | 2007/08 | 38 | 437 | 366 |
|                 | 2008/09 | 88 | 471 | 470 |
| **Total**       |        | **176** | **1,371** | **1,227** |

| **Region totals** |        | **3,806** | **48,795** | **40,261** |
Table 2.—Summary of onboard observer trips conducted during the Southeast Alaska golden king crab fishery during 2006/07, 2007/08, 2008/09 seasons.

<table>
<thead>
<tr>
<th>Season</th>
<th>Trip no.</th>
<th>Location</th>
<th>ADF&amp;G Observer</th>
<th>Days at sea</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006/07</td>
<td>1</td>
<td>Icy Strait/Northern</td>
<td>Chris Siddon</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Icy Strait</td>
<td>Gretchen Bishop</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>East Central</td>
<td>Julie Bednarski</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>East Central</td>
<td>Adam Messmer</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Northern</td>
<td>Scott Kelly</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Northern</td>
<td>Kyle Hebert</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Northern</td>
<td>Karla Bush</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>North Stephens</td>
<td>Adam Messmer</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>Mid-Chatham</td>
<td>Adam Messmer</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td><strong>54</strong></td>
</tr>
<tr>
<td>2007/08</td>
<td>1</td>
<td>Icy Strait/Northern</td>
<td>Chris Siddon</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>East Central</td>
<td>Adam Messmer</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Icy Strait/Northern/ Mid-Chatham</td>
<td>Julie Bednarski</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>North Stephens</td>
<td>Karla Bush</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Mid-Chatham</td>
<td>Adam Messmer</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Mid-Chatham</td>
<td>Julie Bednarski</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Lower Chatham</td>
<td>Adam Messmer</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td><strong>48</strong></td>
</tr>
<tr>
<td>2008/09</td>
<td>1</td>
<td>Icy Strait/Northern</td>
<td>Adam Messmer</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Northern</td>
<td>Julie Bednarski</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Mid-Chatham</td>
<td>Chris Siddon</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>North Stephens</td>
<td>Karla Bush</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>North Stephens</td>
<td>Karla Bush</td>
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</tr>
<tr>
<td></td>
<td>6</td>
<td>Lower Chatham</td>
<td>Adam Messmer</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td><strong>29</strong></td>
</tr>
</tbody>
</table>
Figure 1.—Management area boundaries for the golden king crab fishery in Northern Southeast Alaska.
Figure 2.—Management area boundaries for the golden king crab fishery in Southern Southeast Alaska.