



Recommended Harvest Strategy for Southeast Alaska Golden King Crab (*Lithodes aequispinus*)

by

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BACKGROUND

The Alaska Department of Fish and Game (department) golden king crab (*Lithodes aequispinus*, GKC) fishery in Southeast Alaska is a data-limited fishery that is managed based on a 3-S management system (sex, size, and season). The management system has been further developed by limiting the number of participants and gear, establishing guideline harvest levels (GHLs) that are set within guideline harvest ranges (GHRs) for each management area (Table 1), and closure of management areas if there are stock health concerns. Most of GKC harvest occurs in the commercial sector where the fishery extends across seven management areas (Northern, Icy Strait, North Stephens Passage, East Central, Mid and Lower Chatham Strait, and Southern). The department annually evaluates stock status and establishes GHLs for each management area using fishery dependent data (Stratman et al. 2017; Olson et al. 2018).

The commercial GKC fishery rapidly developed after the collapse of the red and blue king crab fisheries in the early 1980s. Harvest subsequently peaked in the late 1980s and early 2010s, experiencing a period of collapse in the 1990s. Harvest has been steadily declining since 2011 and many of the management areas are currently closed due to historically low fishery performance (Stratman et al. 2017; Olson et al. 2018; Stratman 2020).

Table 1.—Golden king crab guideline harvest ranges for Registration Area A [5 AAC 34.115].

Management Area	Guideline Harvest Range (lbs)
Northern	0–145,000
Icy Strait	0–55,000
North Stephens Passage	0–25,000
East Central	0–225,000
Mid-Chatham Strait	0–150,000
Lower Chatham Strait	0–50,000
Southern	0–25,000

BIOLOGY

Golden king crab are relatively long-lived slow growing species that have an asynchronous 20-month reproductive cycle (Somerton and Otto 1986; Long and Van Sant 2016), morphometric maturity at approximately 8 years of age (Koeneman and Buchanan 1985; Paul and Paul 2001; Hebert et al. 2008), and lecithotrophic larvae that remain at depth (Sloan 1985; Shirley and Shijie 1997; Long and Van Sant 2016). Golden king crab exhibit spatial variability in size at maturity across the North Pacific and among the seven management areas within Southeast Alaska where size at maturity increases with increases in latitude (Jewett et al. 1985; Somerton and Otto 1986; Nizyaev 2005; Olson et al. 2018). Certain aspects of this species' life history are well documented whereas other critical components such as, growth rates, age at maturity, longevity, etc. are unknown.

PURPOSE

The purpose of this document is to lay the framework for a consistent and transparent inseason and postseason approach to determine GHs and close fishery management areas when warranted. The harvest strategy described herein remains consistent with the Board of Fisheries' Policy on King and Tanner Crab Resource Management (90-04-FB, March, 1990) [5 AAC 34.080], the Southeast Alaska Golden King Crab Management Plan [5 AAC 34.114], and will be treated as a guideline for managing GKC and not a prescriptive step by step approach. Many factors and sources of information can affect determining GHs or closing of fishery management areas that cannot be captured in a prescriptive framework.

MANAGEMENT GOALS AND OBJECTIVES

The primary goal to recommend a sustainable harvest strategy for Southeast Alaska GKC to improve and stabilize fishery performance using transparent and repeatable metrics (and their rationale) to evaluate stock health and measure performance for more consistent inseason and postseason management. Objectives include minimizing and mitigating ecological risks from fishing related activities, maintaining various size and age compositions of stocks to maintain long-term reproductive viability; minimizing handling and unnecessary mortality of non-legal GKC and non-target species; and reducing dependency on annual recruitment.

Harvest strategies have been implemented for the GKC fisheries in the Aleutian Islands and Pribilof Islands to improve fisheries management and sustainability. These harvest strategies are comprised of biological, fishery dependent and independent reference points (i.e., mature male biomass, CPUE, annual recruitment, etc.) that are used in recommending the total allowable catch (TAC) or GH for a given management area and season (Daly et al. 2019; Daly and Jackson 2020; Siddeek et al. 2020).

HARVEST STRATEGY

Herein is a harvest strategy for GKC in Southeast Alaska that informs inseason and postseason management using fishery dependent performance indicators and management decision rules.

Performance Indicators

The primary performance indicator used in this harvest strategy is commercial catch rate defined as logbook entry catch of GKC per unit of effort (CPUE):

$$CPUE_{le} = \frac{catch}{effort} \quad (1)$$

where $CPUE$ is the catch of legal size male GKC per unit of effort (*pot lifts*) for each logbook entry (le). Equation (1) is then applied to all logbook entries and averaged for a given management area and season where:

$$\overline{CPUE}_{a,s} = \frac{\sum CPUE_{le}}{n} \quad (2)$$

where a is a given management area, s is a given season, and n is the total number of logbook entries. Future iterations will incorporate soak time (2020-present) in order to standardize CPUE.

Due to the GKC and Tanner crab fisheries occurring concurrently, it is difficult to differentiate between GKC that are harvested as bycatch or directly targeted. GKC that are harvested as bycatch can bias logbook CPUE and consequently trigger unwarranted management actions during and after the season. To determine if GKC were directly targeted in the fishery the department applied a 60% or greater proportion to total catch of crab (GKC and Tanner crab) to retain as much data as possible while also minimizing the effects of the Tanner crab fishery may have on informing management decisions. To evaluate this concern a proportion of $\geq 60\%$ will be applied to GKC catch from commercial logbooks:

$$catch_{le}^{\geq 0.6} = \frac{crab_{gkc}}{(total\ crab_{gkc+tc})} \quad (3)$$

where $catch$ is for a given logbook entry (le), gkc is golden king crab and tc is Tanner crab. Then subsequently Equations (1) and (2) will be applied to calculate CPUE.

Secondary performance indicators include biological, local ecological knowledge (LEK), and other anecdotal information that may not be captured quantitatively in this harvest strategy framework.

- Biological information will be evaluated by analyzing carapace length (CL) mm frequencies by area and season for recruit classes of GKC sampled during commercial landings. Size of GKC is defined as the CL measurement. Recruit class is used as an indicator of shell age and is defined as recruit (new shell and a CL of 151–166mm) and postrecruit (new or old shell and a CL ≥ 167 mm). Crab infected with *B. auratum* parasite will be excluded from length frequency analysis due to its ability to suppress crab growth and bias data.
- LEK is experiential information from fishermen and the fishing industry about the natural environment as it pertains to GKC. LEK will be evaluated and reviewed through permit holder comments in logbooks, communication with permit holders and industry representatives, and discussion at annual industry meetings (Ainsworth 2011; Beaudreau and Levin 2014). Examples of LEK include reports of plentiful crab (recruits, females, and undersized), females with full clutches, softshell, sand fleas, bad weather, large tides, and parasitized crab.

Reference Points

The primary indicator Target Reference Point (RP_{targ}) for each management area is set at the average logbook CPUE for the years 2000-2017. These years capture logbook requirements for the fishery in 2000 and represents contrasting data (highs and lows) in fishery performance. The exceptions to this include North Stephens Passage (excludes 2000) and Lower Chatham (excludes 2013) due to having substantial outliers in those given years that influenced the Target Reference Point. The Trigger Reference Point (RP_{trig}) is set between the Target and Limit Reference Point that prompts management actions and is set at 75% of the RP_{targ} . The Limit Reference Point (RP_{lim}) is set at the level at which stocks are considered in a danger zone and are no longer resilient to fishing pressure and is set at 50% of the RP_{targ} .

Decision Rules

Because the primary performance indicator is the most readily available estimate of fishery performance the following decision rules will guide inseason and postseason management decisions.

Inseason

Fishery performance will be assessed biweekly and/or with a minimum requirement of 500 pot lifts before taking management action whichever is the least restrictive under the following guidelines:

- If logbook CPUE is $\geq RP_{\text{targ}}$ manage to GHL.
- If logbook CPUE is $\geq RP_{\text{trig}}$ but $< RP_{\text{targ}}$ manage to GHL and monitor closely.
- If logbook CPUE is $\geq RP_{\text{lim}}$ and $< RP_{\text{trig}}$ close fishery early.
- If logbook CPUE is $< RP_{\text{lim}}$ close fishery early **and** subsequently close the fishery management area for a minimum of 1 year for commercial and personal use fisheries the following season, depending upon a postseason review.

GHLs will not be changed inseason and are only subject to change per postseason decision rules.

Postseason

- **Increase in a GHL**
 - **If the most recent logbook CPUE is > than the previous season the GHL will remain the same or be increased under the following conditions:**
 - If the most recent logbook CPUE is > than the most recent previous season and is $> RP_{\text{targ}}$ the GHL may increase up to a maximum of 20% the following season.
 - If the most recent logbook CPUE is > than the most recent previous season and $\leq RP_{\text{targ}}$ and $> RP_{\text{trig}}$ the GHL may increase up to a maximum of 10% the following season.
 - If the most recent logbook CPUE is > than the most recent previous season and is $\leq RP_{\text{trig}}$ and $> RP_{\text{limit}}$ the GHL may increase up to a maximum of 5% the following season.
 - New GHLs may not exceed respective management area GHRs.
- **Decrease in a GHL**
 - **If the most recent logbook CPUE is < than the previous season the GHL will remain the same or be decreased under the following conditions:**
 - If CPUE is < than the most recent previous season and is $> RP_{\text{trig}}$ and $\leq RP_{\text{targ}}$ the GHL may be decreased up to a maximum of 40% the following season.
 - If CPUE is < than the most recent previous season and is $> RP_{\text{lim}}$ and $\leq RP_{\text{trig}}$ the GHL may be decreased up to a maximum of 60% the following season.
- **Closure and Re-opening**
 - If logbook CPUE is < the RP_{lim} further management action may be required by implementing an area closure of a minimum of 1 year to reduce the risk of localized depletion.
 - Upon re-opening an area after a closure, the GHL will be 5-10% of the upper end of area respective GHRs.
- **No Change**
 - If a minimum requirement of 500 pots lifts has not occurred within a given fishery management area the GHL will not change the following season due to limited information to make an informed management decision.

Review of GHLs or Decision Rules

If and when new information becomes available indicating that the harvest strategy framework and GHL setting decision rules are not consistent with the Board's policy of managing a sustainable GKC resource, the decision rules will be reviewed and the reference points adjusted accordingly.

Other Considerations for Management and Future Recommendations

Logbook CPUE currently lacks a soak time data field and cannot be standardized for comparison across years. Soak time was introduced as a reporting field in logbooks for the 2020 fishing season and will be used to inform this harvest strategy in future iterations.

This harvest strategy may be amended in future iterations as more information and tools become available. This harvest strategy is a first step to increase transparency regarding management metrics utilized for inseason and postseason decisions.

RESPONSES TO INDUSTRY AND PUBLIC COMMENTS

In this section we list comments received from industry and the public and further discussed at the annual King and Tanner Task Force meeting in December 2020.

SECONDARY PERFORMANCE INDICATOR: FISH TICKET CPUE

The department explored ways to utilize fish ticket data to develop a CPUE metric to inform and understand past harvest history trends to present. This metric is data limited and comprised of pounds, catch dates, and management areas. Fish ticket CPUE utilized the difference between first and last catch date in a given management area in order to calculate pounds per pot day and assumes permit holders are actively fishing the entire season. However, this assumption is violated due to inability to account for permit holders participating in competing fisheries and cease fishing or moving to new management areas prior to closure. Logbook CPUE (2000–present) provides a much higher resolution metric to assess fishery performance since catch and effort data is at the logbook entry level (e.g., number of crab and pots, stat-area). In comparing the two metrics as shown in Figure 1, fish ticket CPUE shows minimal variation in data until the year 2000 when logbooks were implemented which improved the resolution of fishery dependent data. Logbook CPUE better captures the variation in effort and how stocks react to different harvest levels over time allowing the department to make informed management decisions with the best available information. Furthermore, with the implementation of capturing soak time (2020-present) this will allow for CPUE standardization over time. Fish ticket CPUE was an attempt to explore utilizing historical effort and catch data in a new way, however, it is limited in its scope, function, and less informative compared to logbook CPUE. Therefore, the department does not recommend fish ticket CPUE as a metric to be utilized in this harvest strategy and recommends logbook CPUE as the preferred metric.

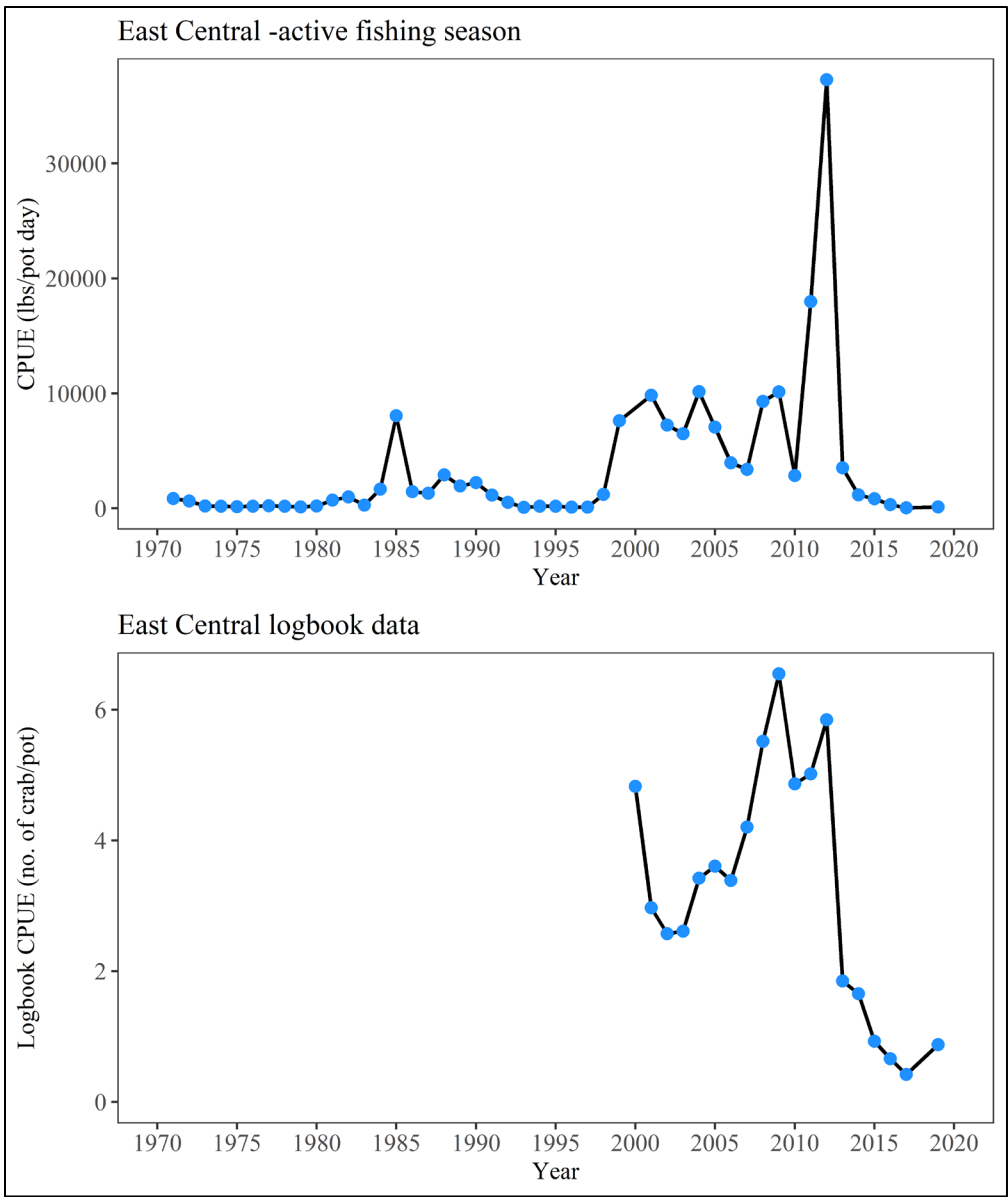


Figure 1.— East Central golden king crab fish ticket (lbs/pot day) and logbook CPUE (no. of crab/pot).

INCREASE GHRs TO MATCH HISTORICAL HARVEST

Golden king crab GHRs were reviewed beginning in 2015 due to continued declines in fishery performance and stock health concerns to improve current management practices and biological relevance of GHRs. GHRs were analyzed using historical catch and effort data to establish a biological-based maximum sustainable yield (MSY) for each management area. Results of these models indicated that MSY for the Northern, Icy Strait, and East Central areas were lower than the upper limit of their respective GHRs and subsequently reduced to promote stock rebuilding and lessen potential for episodic stock collapses in the future at the 2018 BOF meeting (RC 2 Proposal 67, <http://www.adfg.alaska.gov/index.cfm?adfg=fisheriesboard.meetinginfo&date=01-11-2018&meeting=sitka>). Therefore, the department does not recommend adjusting the upper limit for GHRs for all management areas.

REVIEW LOGBOOK CPUE REFERENCE POINTS UNDER DIFFERENT SCENARIOS

The department reviewed two different reference point (Target, Trigger, and Limit) scenarios that are based on average logbook CPUE (2000-2017) and included an industry requested adjustment and an intermediate adjustment between the industry request and department recommended reference points. Industry requested decreasing the reference

points to a level where the target reference point is 75% of the average logbook CPUE and subsequent trigger and limit reference points at 60% and 40% of the target reference point. The intermediate adjustment reduced the trigger and limit reference points at 60% and 40% of the target reference point.

Adjusting the reference points to lower levels provides more opportunity as stocks are increasing at a faster rate, however, caution should be warranted with this approach as it reduces the ability and timeliness of management intervention to curb declining trends and further hinder stock rebuilding and recovery if stocks are in a collapsed state. Therefore, the department does not recommend reducing reference points at this time as many management areas continue to be in a depressed or collapsed state.

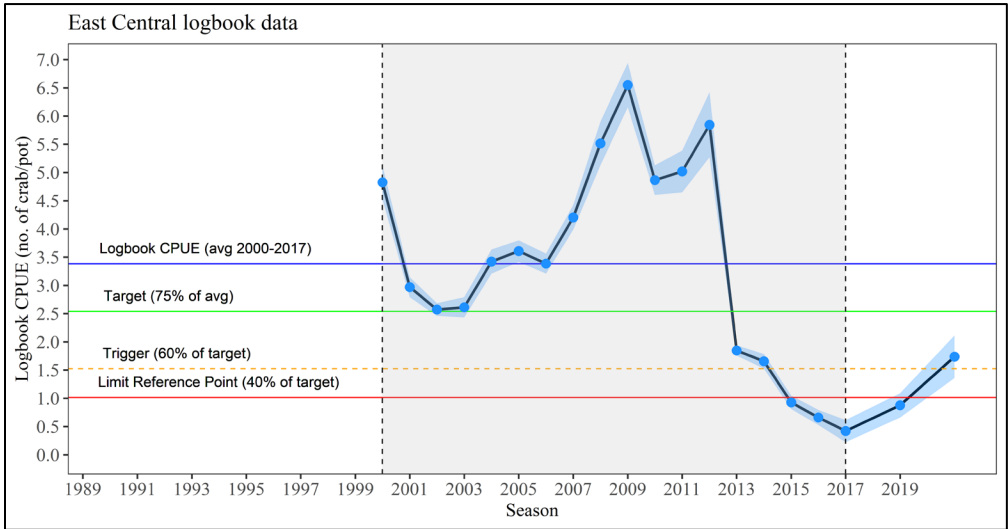


Figure 2.—East Central golden king crab industry requested reference points (Target (75%), Trigger (60%), and Limit (40%)) and fishery performance utilizing logbook CPUE.

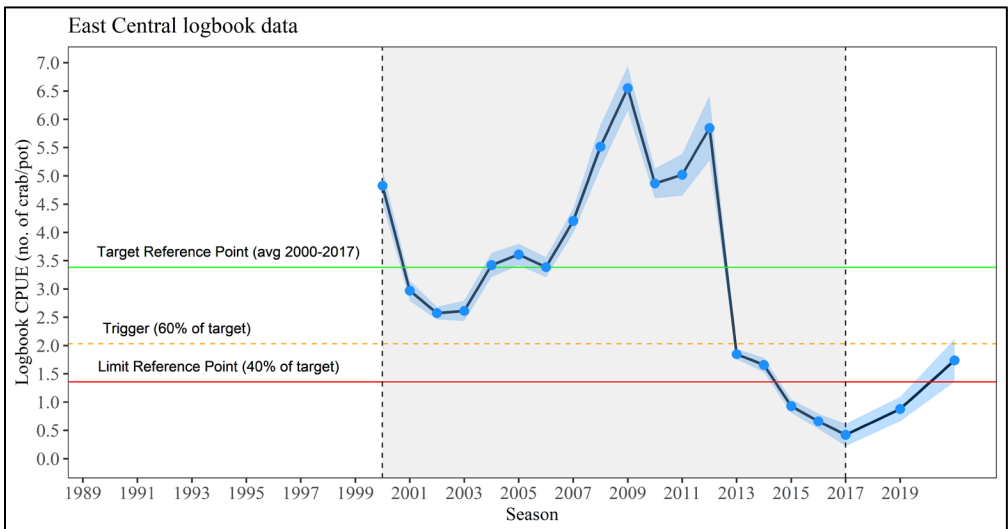


Figure 3.—East Central golden king crab adjusted reference points (Target, Trigger (60%), and Limit (40%)) and fishery performance utilizing logbook CPUE.

REVIEW MECHANISM SCENARIOS TO INCREASE GHIL INSEASON

The department reviewed mechanisms that would trigger an increase for an area GHIL based on fishery performance inseason. Mechanisms were explored at varying levels that included 150%, 175%, and 200% of the target reference point. Increasing a GHIL inseason would limit the department’s ability for informed management decisions by reducing

available data used in assessing fishery performance and stock health. The department conducts in-depth review of fishery performance data (e.g., fish ticket, logbook, port sampling, and LEK) each season prior to setting GHGs. Adjusting GHGs inseason would ignore long-term historical effort and catch data that would increase management subjectivity and introduce unnecessary risk to a data limited fishery.

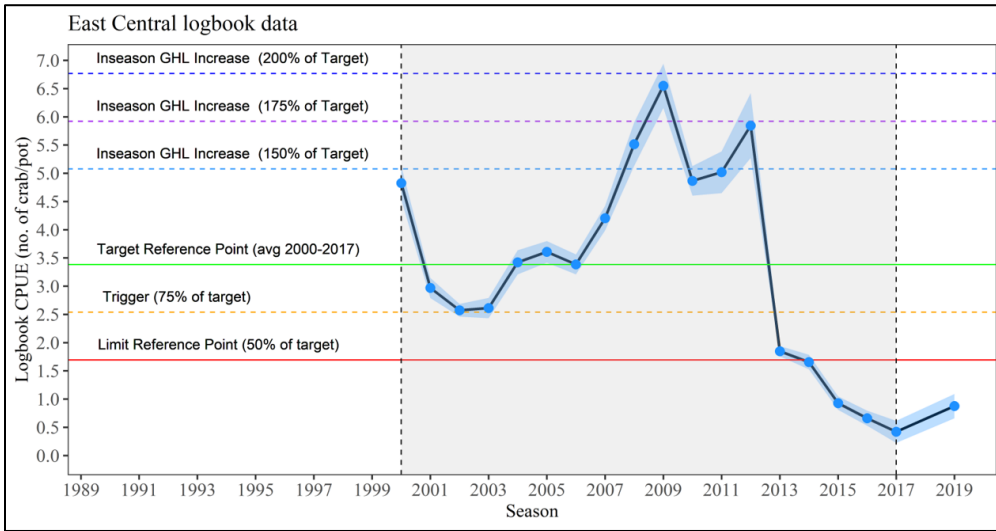


Figure 4.—East Central golden king crab inseason adjusted references points at 150%, 175%, and 200% of the target reference point utilizing logbook CPUE.

MATCH POSTSEASON DECISION RULES WHEN INCREASING/DECREASING GHGs FROM PREVIOUS SEASON

The department reviewed and revised postseason decision rules for decreasing GHGs and re-opening an area after a closure to improve clarity and consistency within the harvest strategy. The department recommends if logbook CPUE is less than the previous season and is between the limit and trigger reference point the GHG may be reduced up to a maximum of 60% the following season. This decrease rate is within range of past management decisions where East Central's and Mid-Chatham Strait's GHGs were reduced 74% and 50% for their respective GHGs from the 2015 to 2016 season due to stock health concerns.

For re-opening an area and establishing a GHG the department recommends removing the 7,500 lb minimum GHG and utilizing a percentage approach where after an area is re-opening after a seasonal closure period the GHG will be 5-10% of the upper end of a fishery management area's respective GHR. Both recommendations have been updated in the harvest strategy for 2022.

REFERENCES CITED

- Ainsworth, C. 2011. Quantifying species abundance trends in the northern Gulf of California using local ecological knowledge. *Marine and Coastal Fisheries* 3(1):190–218. Wiley Online Library.
- Beaudreau, A. H., and P. S. Levin. 2014. Advancing the use of local ecological knowledge for assessing data-poor species in coastal ecosystems. *Ecological Applications* 24(2):244–256. Wiley Online Library.
- Daly, B., and T. Jackson. 2020. Chapter 9: Pribilof Islands golden king crab. in Stock assessment and fishery evaluation report for the king and Tanner crab resources of the Bering Sea and Aleutian Islands Regions, North Pacific Fishery Management Council. Anchorage.
- Daly, B., M. A. Stichert, M. Siddeek, J. Zheng, and S. J. Martell. 2019. Recommended harvest strategy for Aleutian Islands golden king crab. Alaska Department of Fish and Game, Fishery Manuscript Series (No. 19-03). Anchorage.
- Hebert, K., W. Davidson, J. Stratman, K. Bush, G. Bishop, C. Siddon, J. Bednarski, A. Messmer, and K. Wood. 2008. 2009 report to the Alaska board of fisheries on region 1 shrimp, crab, and scallop fisheries. Alaska Department of Fish and Game, Fishery Management Report (08-62). Anchorage.
- Jewett, S., N. Sloan, and D. Somerton. 1985. Size at sexual maturity and fecundity of the fjord-dwelling golden king crab *lithodes aequispina benedict* from northern British Columbia. *Journal of Crustacean Biology* 5(3):377–385. Oxford University Press.
- Koeneman, T., and D. Buchanan. 1985. Growth of the golden king crab, *lithodes aequispina*, in southeast Alaskan waters. Pages 281–297 in B. Melteff, editor. *Proceedings of the international king crab symposium*. University of Alaska, Alaska Sea Grant, Anchorage, Alaska.
- Long, C., and S. Van Sant. 2016. Embryo development in golden king crab (*lithodes aequispinus*). *Fishery Bulletin* 114(1).
- Nizyaev, S. 2005. Biology of golden king crab (*lithodes aequispinus benedict*) along the islands of Kuril Ridge. Sakhalin Institute of Fishery and Oceanography Publication, Yuzhno-Sakhalinsk (in Russian).
- Olson, A., C. Siddon, and G. Eckert. 2018. Spatial variability in size at maturity of golden king crab (*lithodes aequispinus*) and implications for fisheries management. *Royal Society Open Science* 5(3):171802. The Royal Society Publishing.
- Paul, A., and J. Paul. 2001. Growth of juvenile golden king crabs *lithodes aequispinus* in the laboratory. *Alaska Fishery Research Bulletin* 8(2):135–135.
- Shirley, T. C., and Z. Shijie. 1997. Lecithotrophic development of the golden king crab *lithodes aequispinus* (Anomura: Lithodidae). *Journal of Crustacean Biology* 17(2):207–216. Oxford University Press.
- Siddeek, M., J. Zheng, C. Siddon, B. Daly, M. Westphal, and L. Hulbert. 2020. Chapter 8: Aleutian Islands golden king crab stock assessment. in Stock assessment and fishery evaluation report for the king and Tanner crab resources of the Bering Sea and Aleutian Islands Regions, North Pacific Fishery Management Council. Anchorage.
- Sloan, N. 1985. Life history characteristics of fjord-dwelling golden king crabs *lithodes aequispina*. *Marine ecology progress series*. *Oldendorf* 22(3):219–228.
- Somerton, D. A., and R. Otto. 1986. Distribution and reproductive biology of the golden king crab, *lithodes aequispina*, in the eastern Bering Sea. *Fishery Bulletin* 84(3):571–584. The Service.
- Stratman, J. 2020. 2019 golden king crab stock status and management plan for the 2019/2020 season. Alaska Department of Fish and Game, Regional Information Report (1J20-11). Anchorage.
- Stratman, J., T. Bergmann, K. Wood, and A. Messmer. 2017. Annual management report for the 2016/2017 Southeast Alaska/Yakutat golden king crab fisheries. Alaska Department of Fish and Game, Fishery Management Report (17-57). Anchorage.

MANAGEMENT AREA REPORTS

Each management area report will provide an overview of seasonal trends in fishery performance through the most recent season. This includes comparing harvest (lbs) to corresponding GHGs, logbook CPUE compared to reference points (i.e., target, trigger, and limit), reviewing Tanner crab harvest influence, and spatial distribution of incidental catch during the annual Tanner crab stock assessment survey in Holkham Bay. Confidential harvest and effort data have been excluded from figures if fewer than three permit holders participated in a given management area for a given year.

NORTHERN

Season Overview

The Northern management area was closed for the 2019 and 2020 seasons. For the 2021 season the Northern management area re-opened after a two-year closure at a GHG of 7,500 lbs, but closed early inseason due to continued poor fishery performance and stock health concerns.

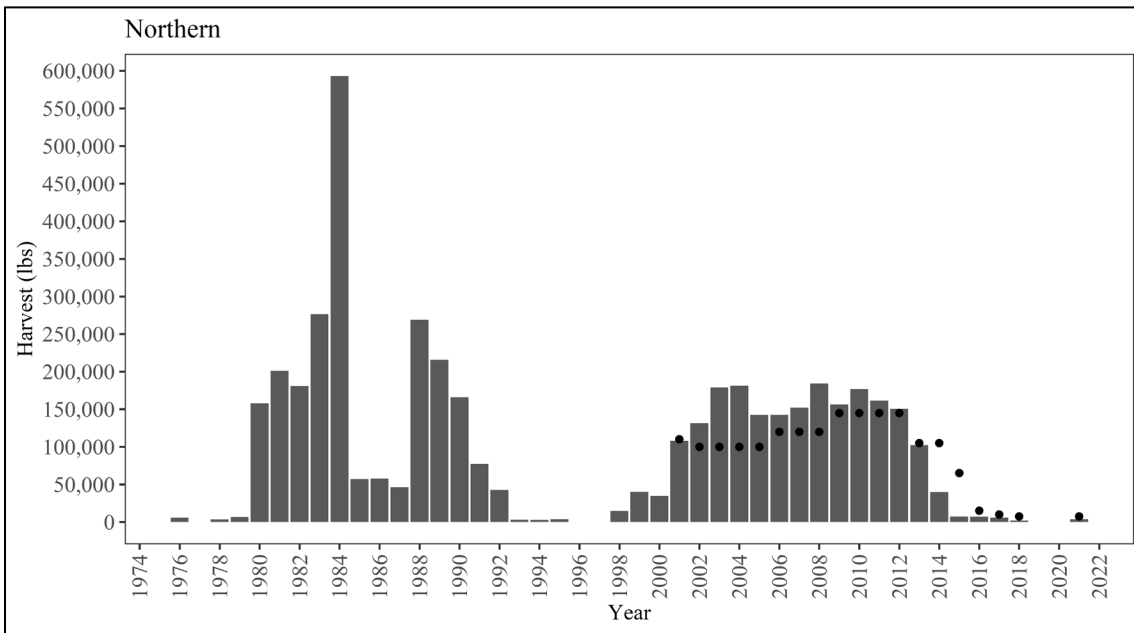


Figure 5.—Commercial GKC fishery harvest from the Northern management area. Dots represent the GHG in a given season (2001–Present).

Reference Points

Table 2.—Golden king crab logbook catch per unit of effort (CPUE) reference points.

Indicators	Reference Point	Description
Target Reference Point	2.7 crab/pot	Average Commercial Logbook CPUE from 2000–2017
Trigger Reference Point	2.0 crab/pot	75% of the Target Reference Point
Limit Reference Point	1.3 crab/pot	50% of the Target Reference Point

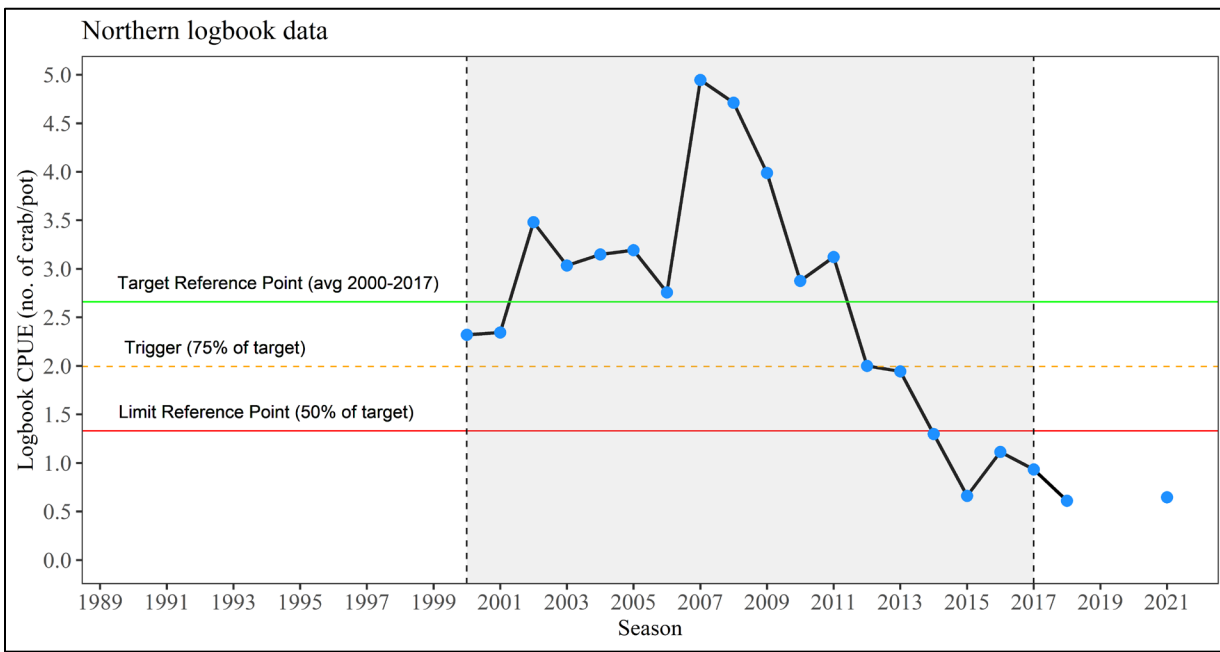


Figure 6.—Northern golden king crab reference points (Target, Trigger, and Limit) and fishery performance utilizing logbook CPUE per industry request.

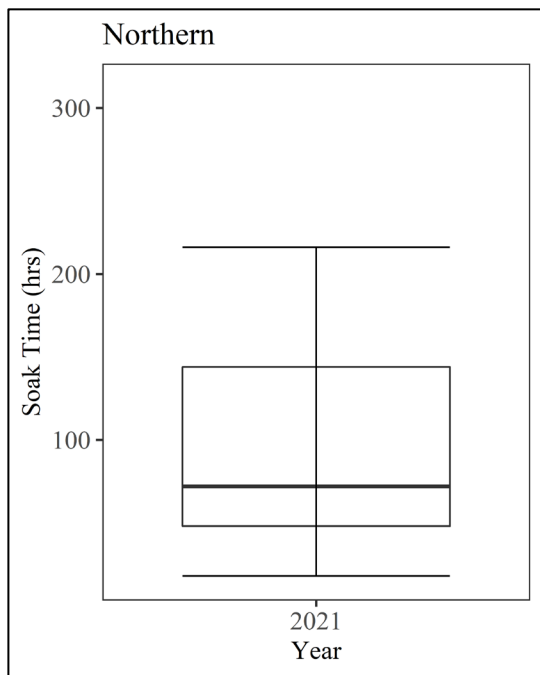


Figure 7.—Northern golden king crab soak time (hrs) utilizing fishery logbooks. The box plot depicts the distribution of soak time data where each section represents approximately 25% of the data. The line represents the median or middle value of the dataset, the box represents 50% of the data divided into an upper and lower quartile and the whiskers represent the minimum and maximum values in the data.

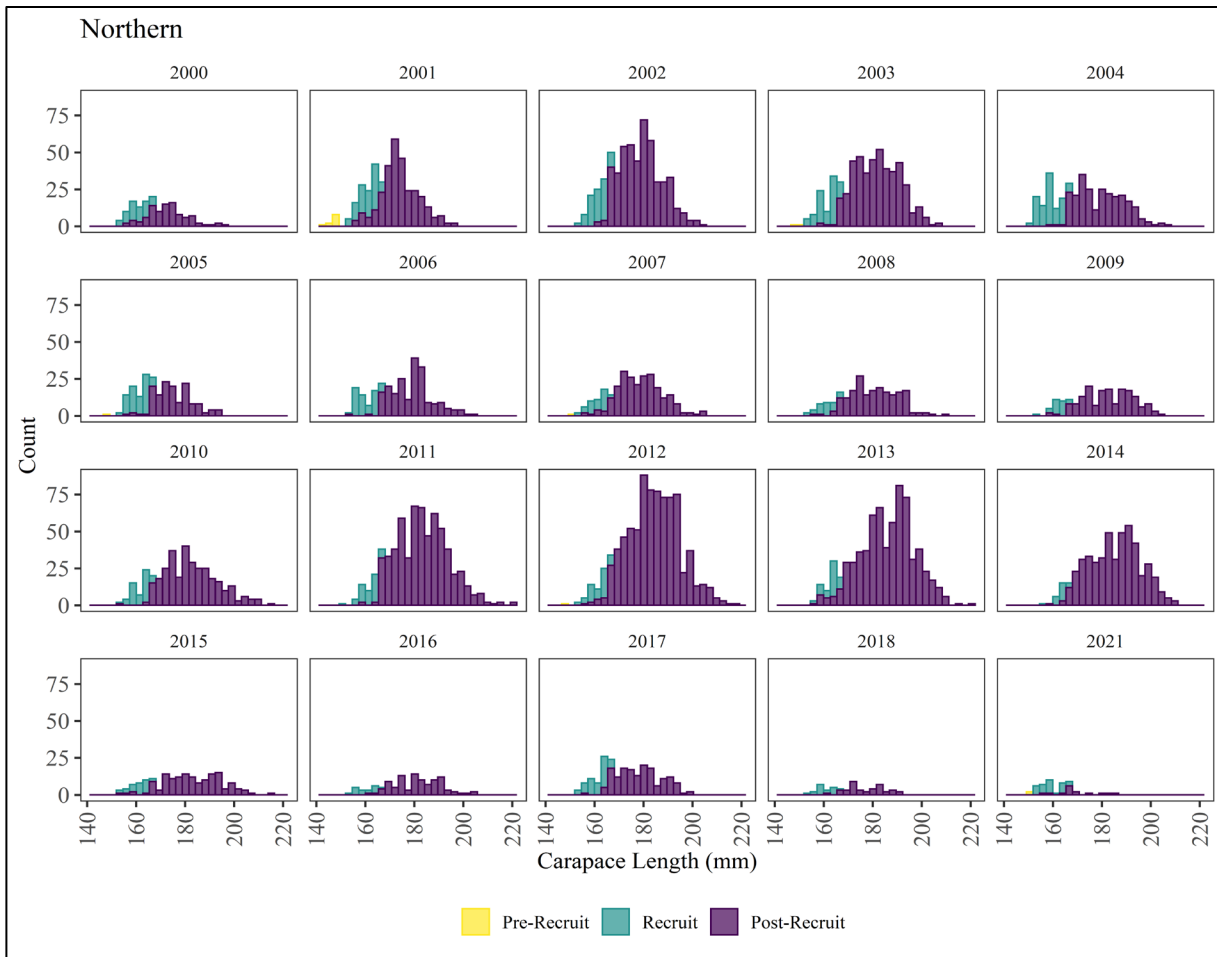


Figure 8.—Northern golden king crab length frequencies of sampled commercial catch by recruit class from 2000-Present.

ICY STRAIT

Season Overview

The Icy Strait management area’s GHL was 7,500 lbs for the 2019 and 2020 seasons. For the 2021 season the Icy Strait management area opened at a GHL 7,500 lbs.

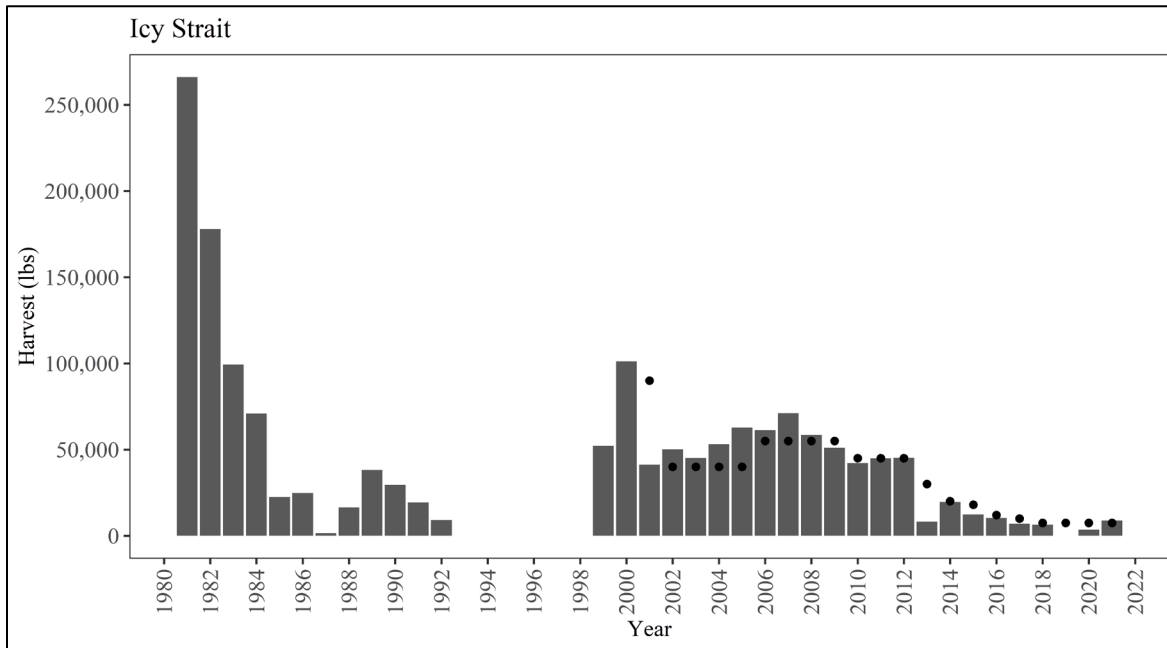


Figure 9.—Commercial GKC fishery harvest from the Icy Strait management area. Dots represent the GHL in a given season (2001–Present).

Reference Points

Table 3.—Golden king crab logbook catch per unit of effort (CPUE) reference points.

Indicators	Reference Point	Description
Target Reference Point	2.2 crab/pot	Average Commercial Logbook CPUE from 2000–2017
Trigger Reference Point	1.6 crab/pot	75% of the Target Reference Point
Limit Reference Point	1.1 crab/pot	50% of the Target Reference Point

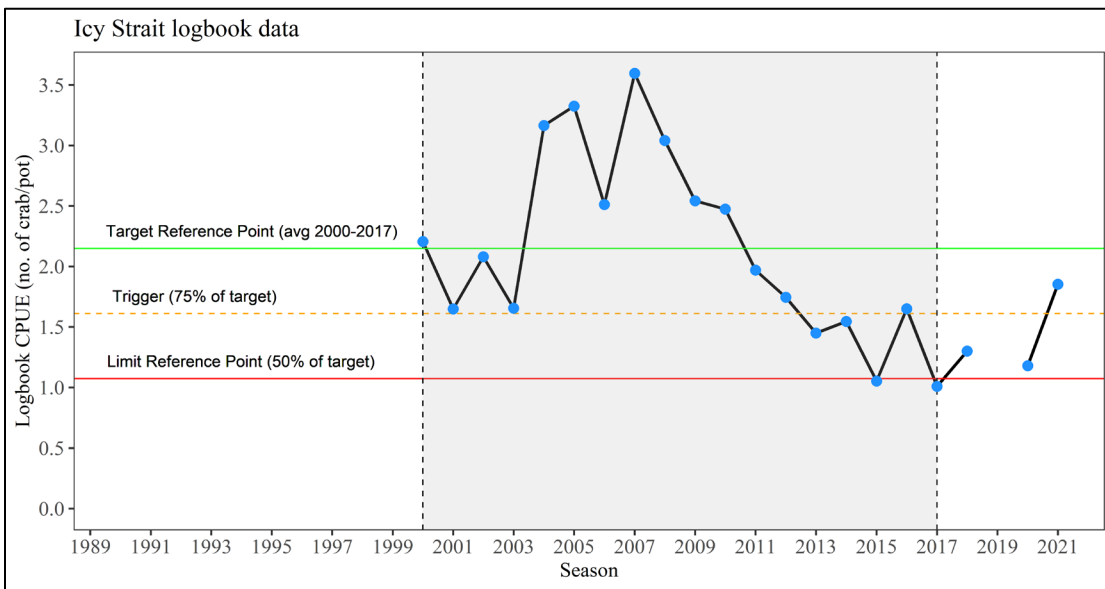


Figure 10.—Icy Strait golden king crab reference points (Target, Trigger, and Limit) and fishery performance utilizing logbook CPUE.

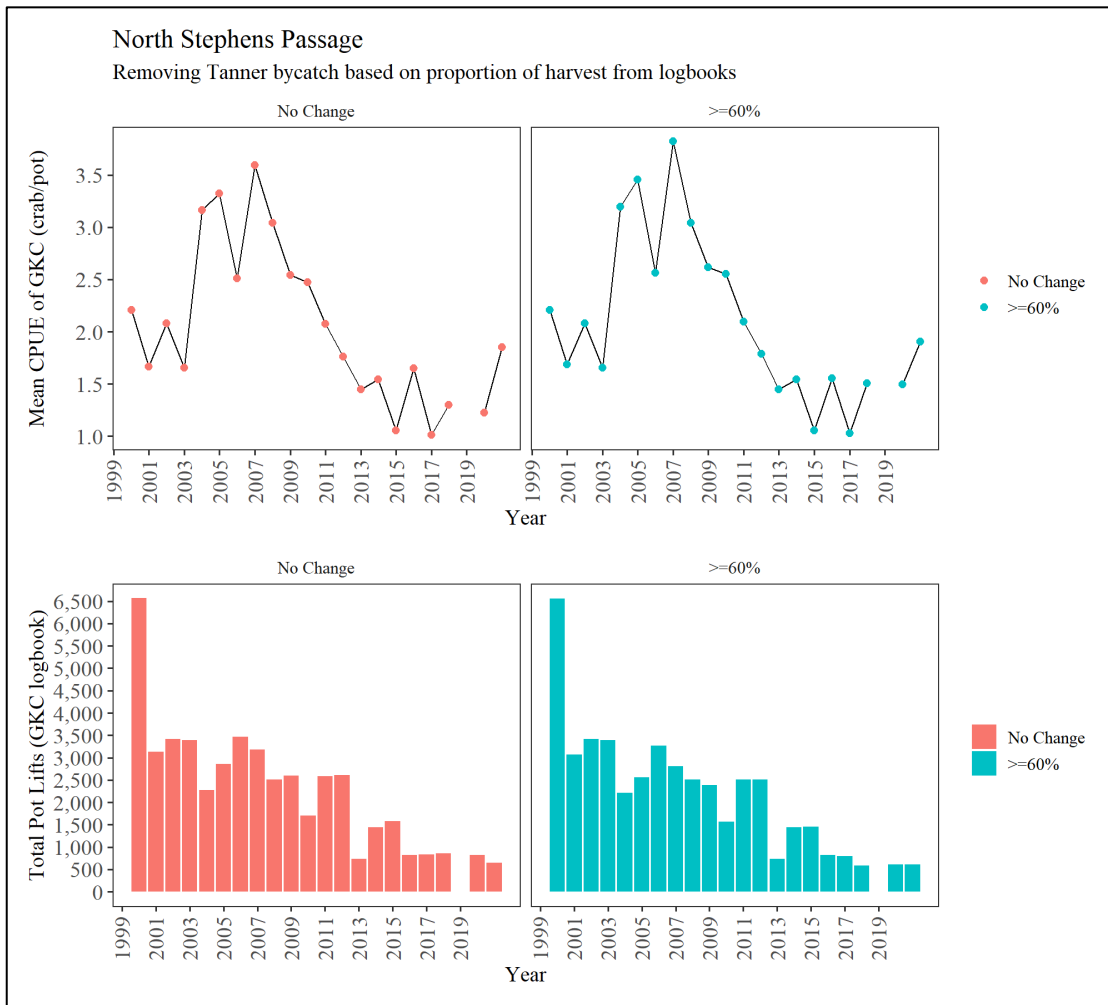


Figure 11.—Icy Strait golden king crab logbook CPUE and pot lift proportions based on reduction of Tanner crab harvest influence.

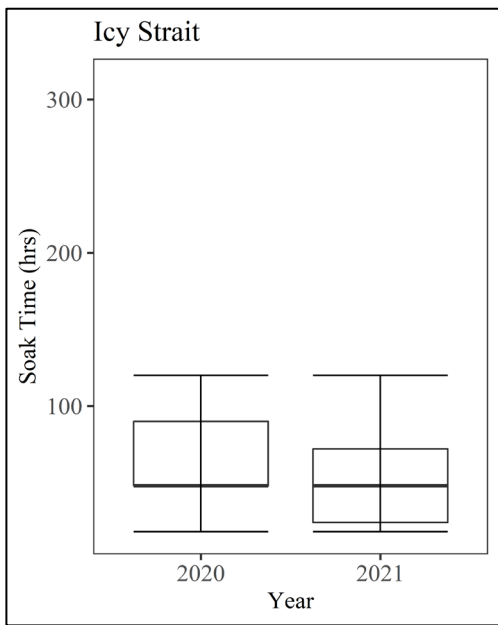


Figure 12.—Icy Strait golden king crab soak time (hrs) utilizing fishery logbooks.



Figure 13.—Icy Strait golden king crab length frequencies of sampled commercial catch by recruit class from 2000-Present.

NORTH STEPHENS PASSAGE

Season Overview

The North Stephens management area’s GHL was 11,000 lbs and 13,000 lbs for the 2019 and 2020 seasons respectively. For the 2021 season the North Stephens management area opened at a GHL of 15,000 lbs.

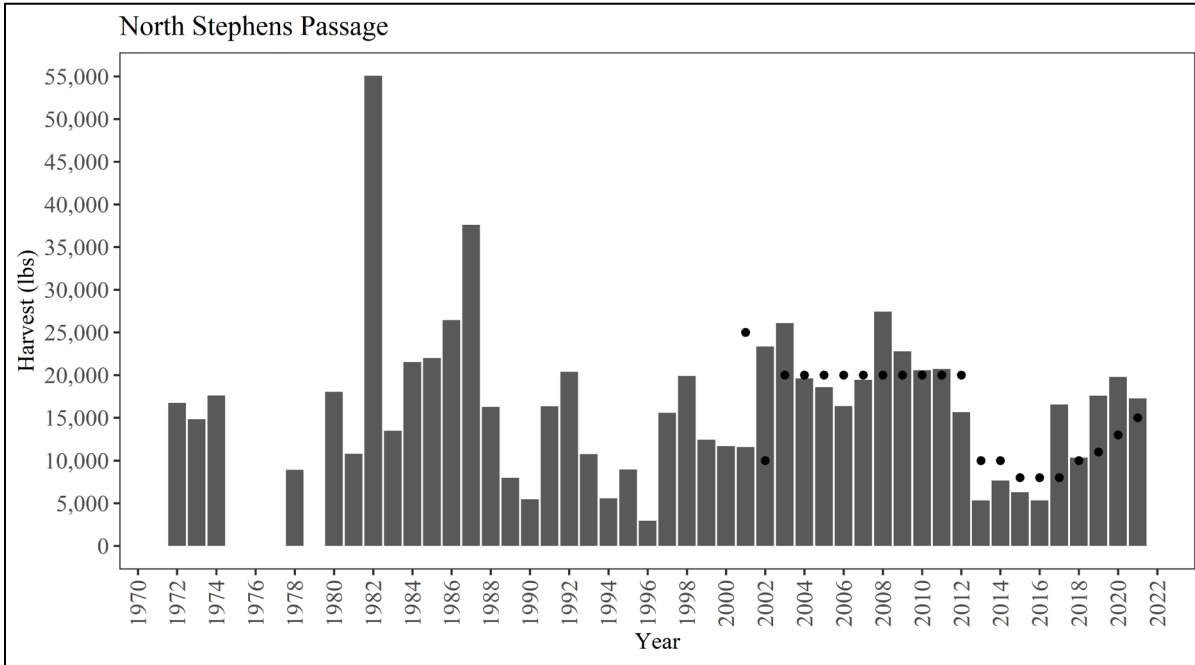


Figure 14.—Commercial GKC fishery harvest from the North Stephens Passage management area. Dots represents the GHL in a given season (2001–Present).

Reference Points

Table 4.— Golden king crab logbook catch per unit of effort (CPUE) reference points.

Indicators	Reference Point	Description
Target Reference Point	1.4 crab/pot	Average Commercial Logbook CPUE from 2001–2017 (excluding 2000)
Trigger Reference Point	1.0 crab/pot	75% of the Target Reference Point
Limit Reference Point	0.7 crab/pot	50% of the Target Reference Point

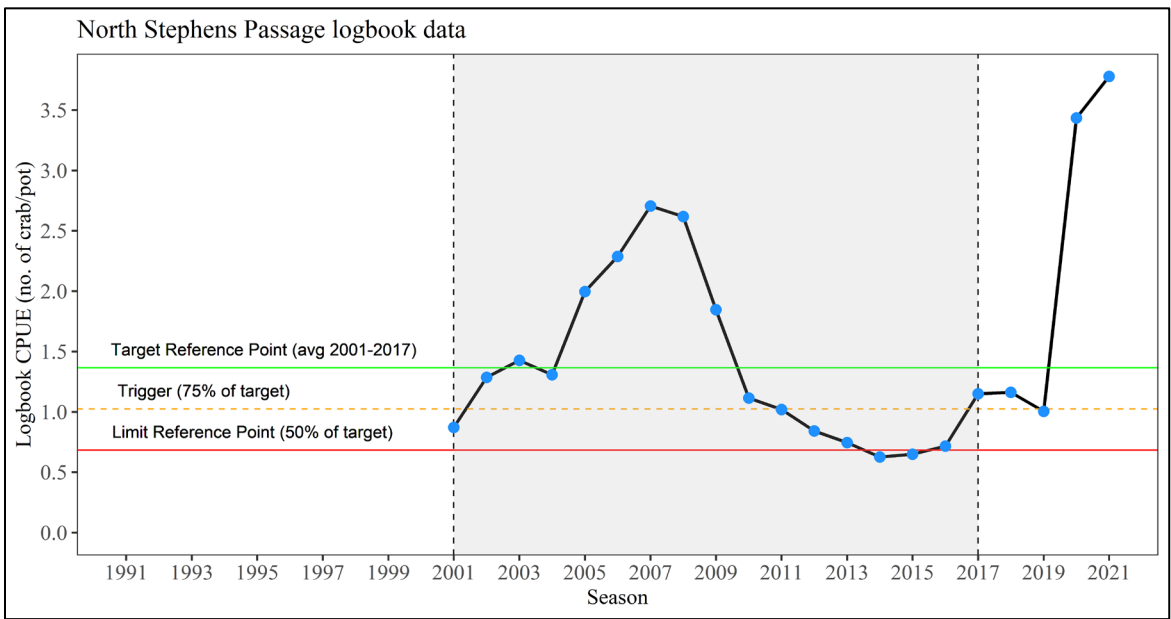


Figure 15.—North Stephens Passage golden king crab reference points (Target, Trigger, and Limit) and fishery performance utilizing logbook CPUE (excludes 2000 outlier).

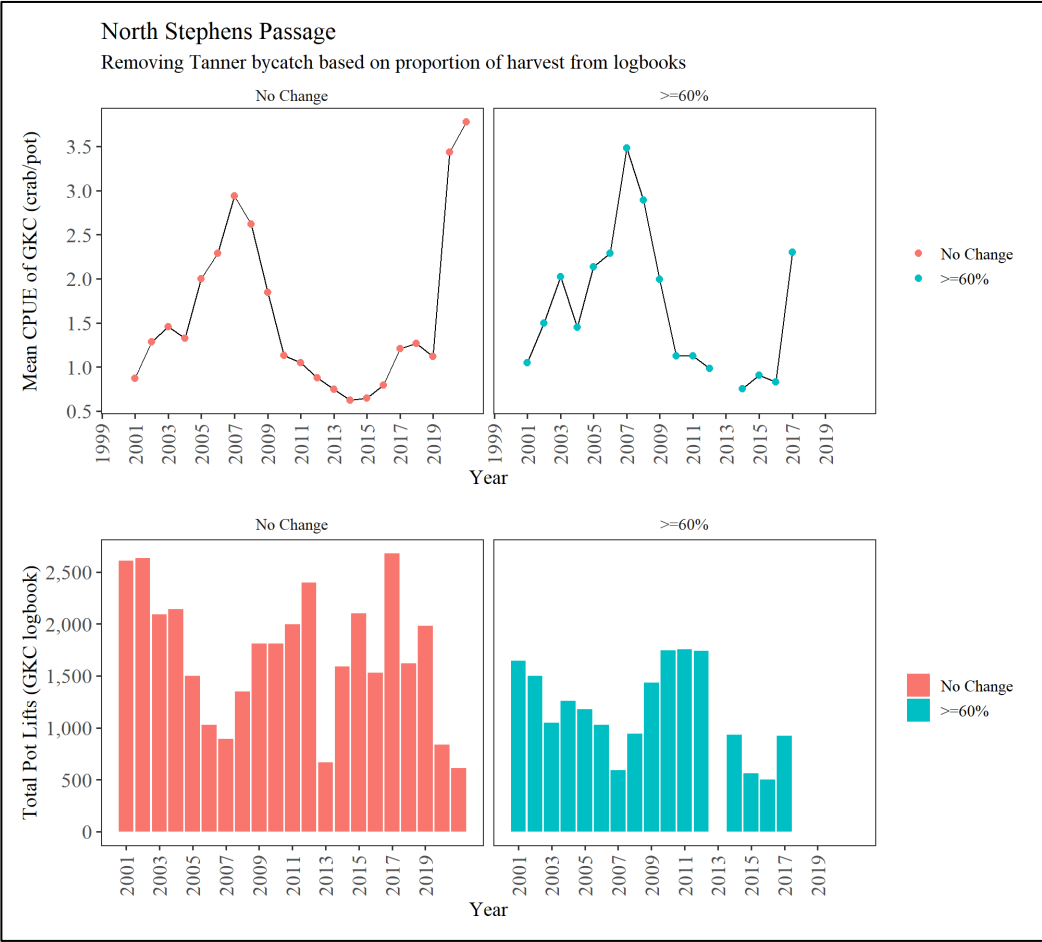


Figure 16.—North Stephens Passage golden king crab logbook CPUE and pot lift proportions based on reduction of Tanner crab harvest influence.

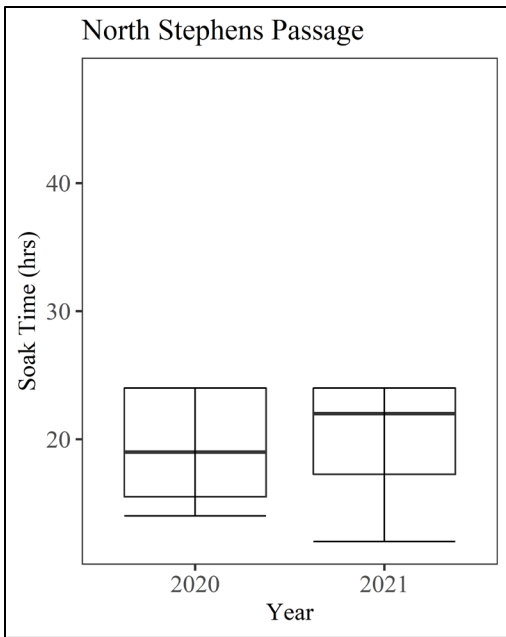


Figure 17.—North Stephens Passage golden king crab soak time (hrs) utilizing fishery logbooks.



Figure 18.—North Stephens Passage golden king crab length frequencies of sampled commercial catch by recruit class from 2000-Present.

Information from Annual Tanner Crab Stock Assessment Survey

The department conducts an annual Tanner crab stock assessment survey in Holkham Bay where GKC have been caught incidentally. Data presented here includes spatial distribution and quantity of catch and by sex and recruit status.

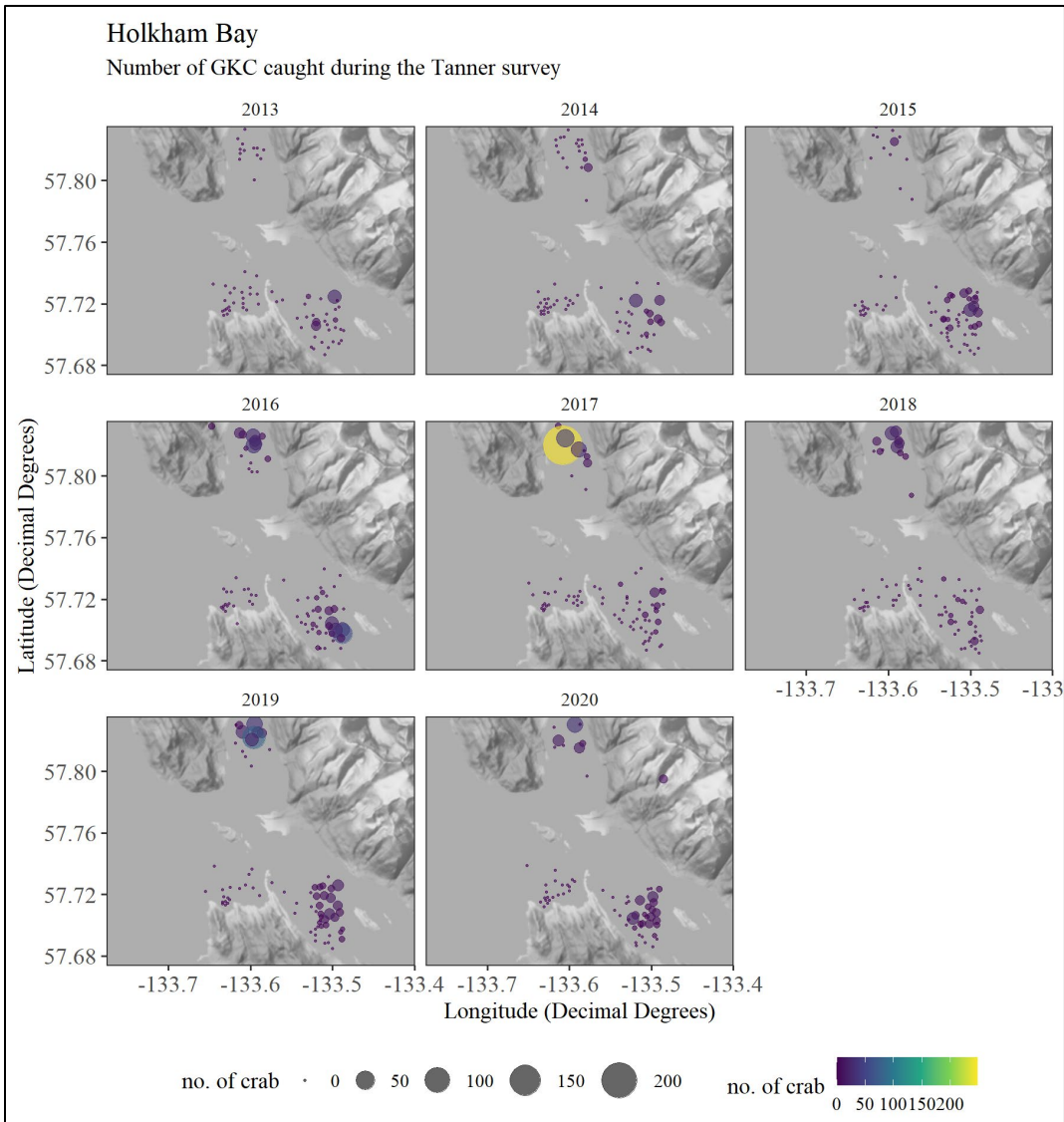


Figure 19.—Number of golden king crab caught during the annual Tanner crab stock assessment survey in Holkham Bay (2014-2020).

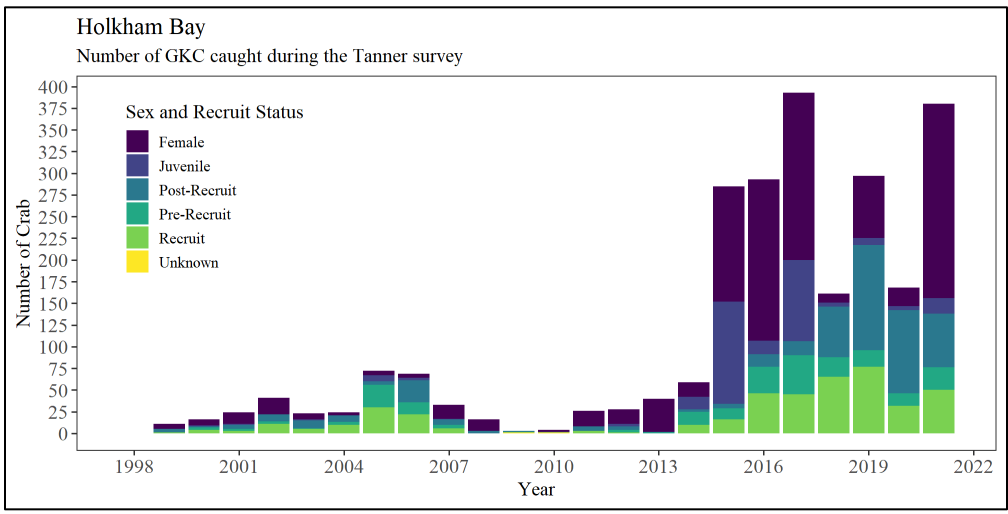


Figure 20.—Number of golden king crab caught during the annual Tanner crab stock assessment survey in Holkham Bay by sex and recruit status (1999-2021).

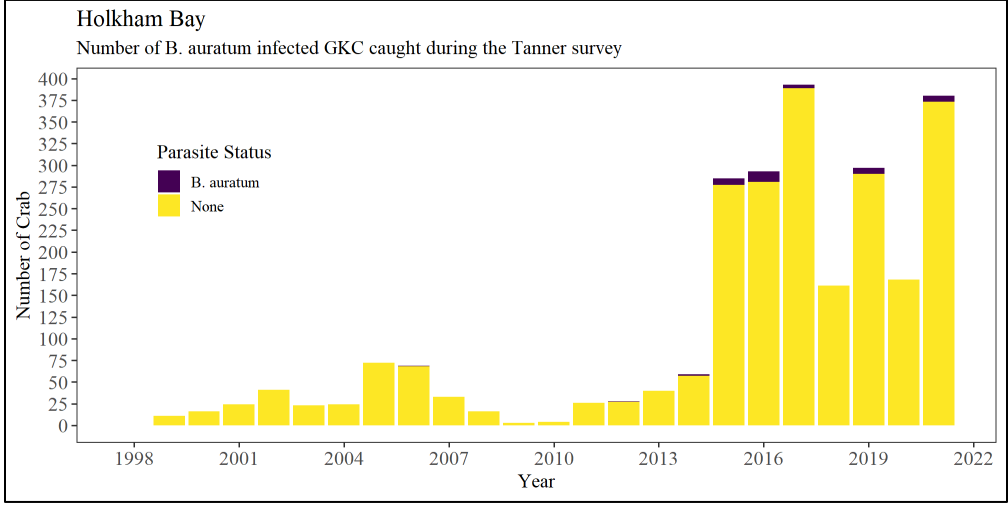


Figure 21.—Number of golden king crab caught during the annual Tanner crab stock assessment survey in Holkham Bay by parasite status (1999-2021).

EAST CENTRAL

Season Overview

The East Central management area was closed for the 2020 season and re-opened for the 2021 season at a GHL of 11,500 lbs. The fishery closed early due to poor fishery performance and stock health concerns.

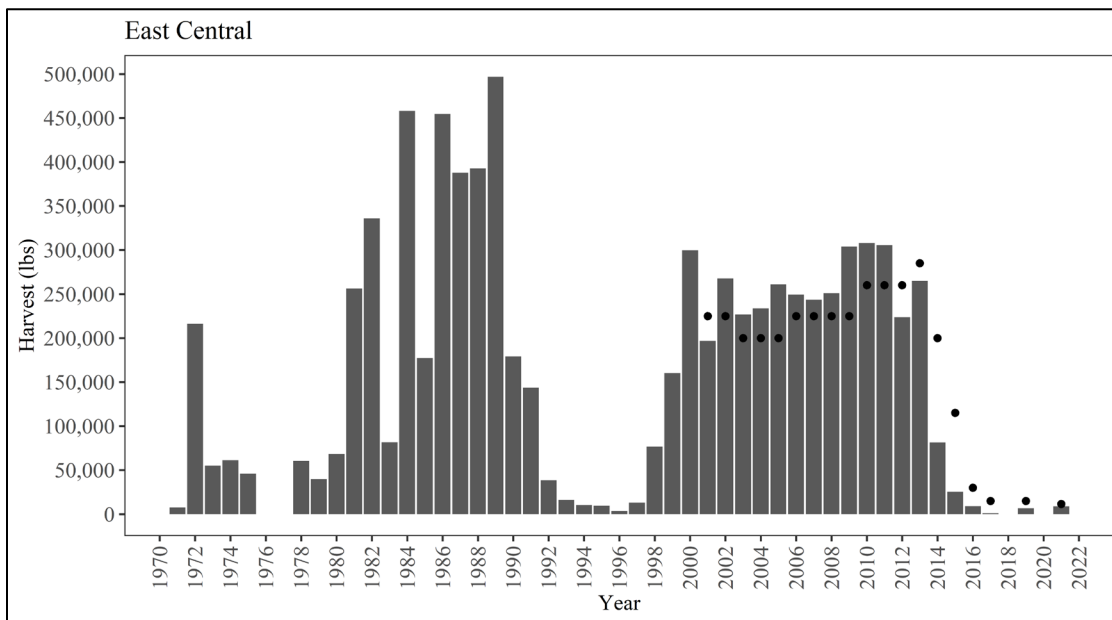


Figure 22.—Commercial GKC fishery harvest from the East Central management area. Dots represents the GHL in a given season (2001–Present).

Reference Points

Table 5.— Golden king crab logbook catch per unit of effort (CPUE) reference points.

Indicators	Reference Point	Description
Target Reference Point	3.4 crab/pot	Average Commercial Logbook CPUE from 2000–2017
Trigger Reference Point	2.5 crab/pot	75% of the Target Reference Point
Limit Reference Point	1.7 crab/pot	50% of the Target Reference Point

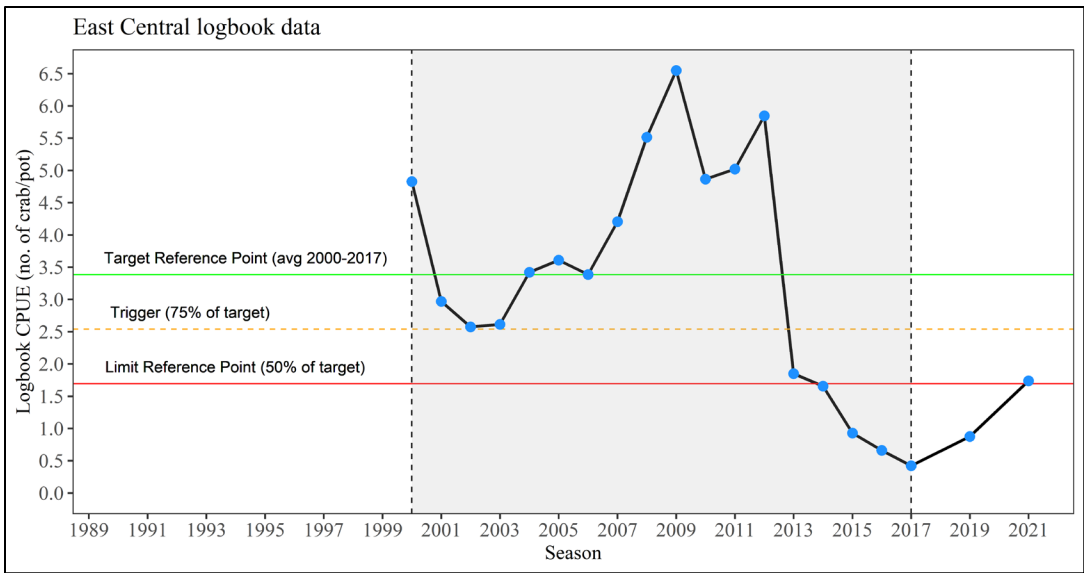


Figure 23.—East Central golden king crab reference points (Target, Trigger, and Limit) and fishery performance utilizing logbook CPUE.

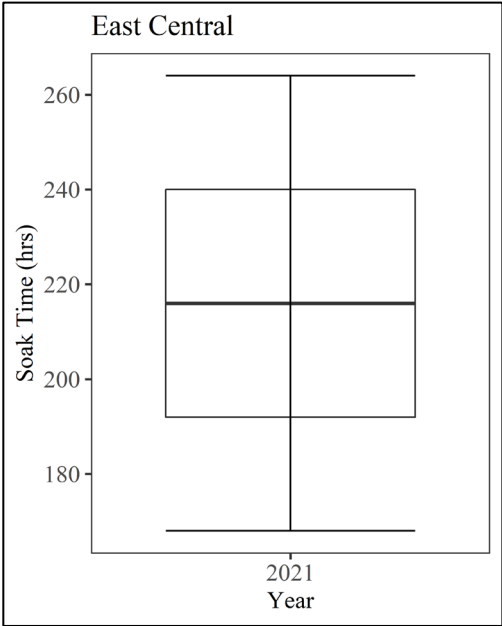


Figure 24.—East Central golden king crab soak time (hrs) utilizing fishery logbooks.

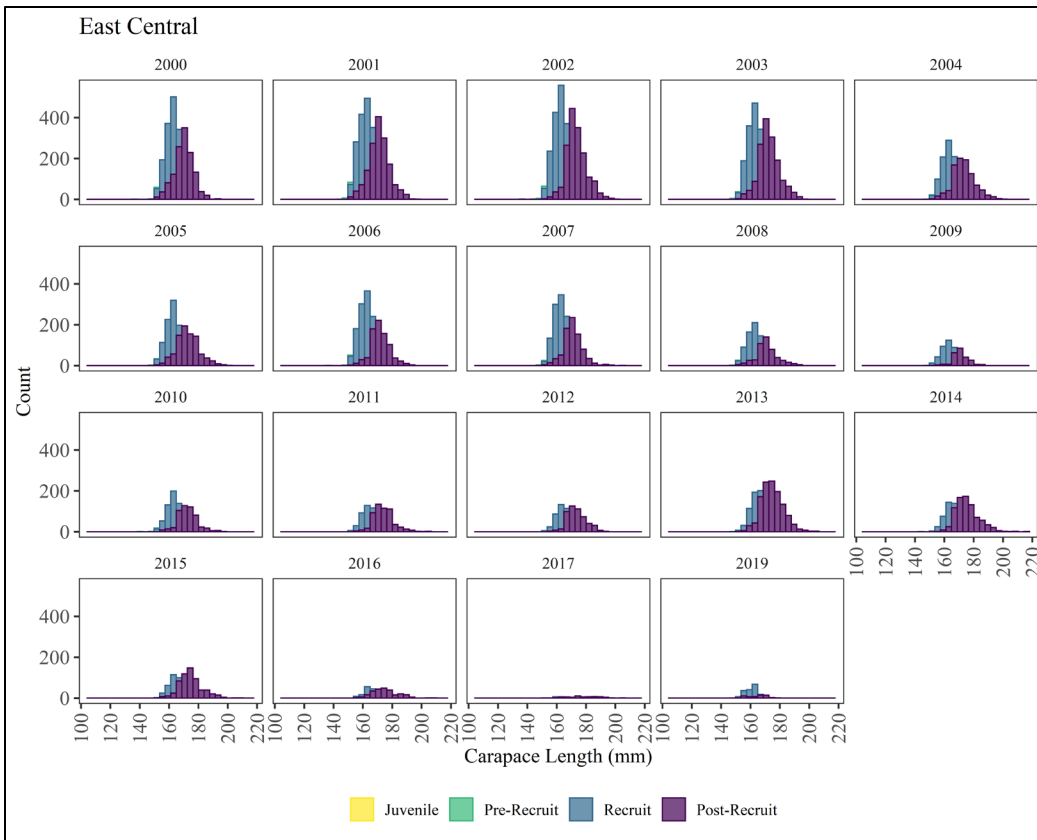


Figure 25.—East Central golden king crab length frequencies of sampled commercial catch by recruit class from 2000-Present.

MID-CHATHAM STRAIT

Season Overview

The Mid-Chatham Strait management area’s GHL was 7,500 lbs for the 2019 season, closed for the 2020 season and re-opened for the 2021 season at a GHL of 7,500 lbs. The 2021 fishery remains open to date and will close by regulation on December 1.

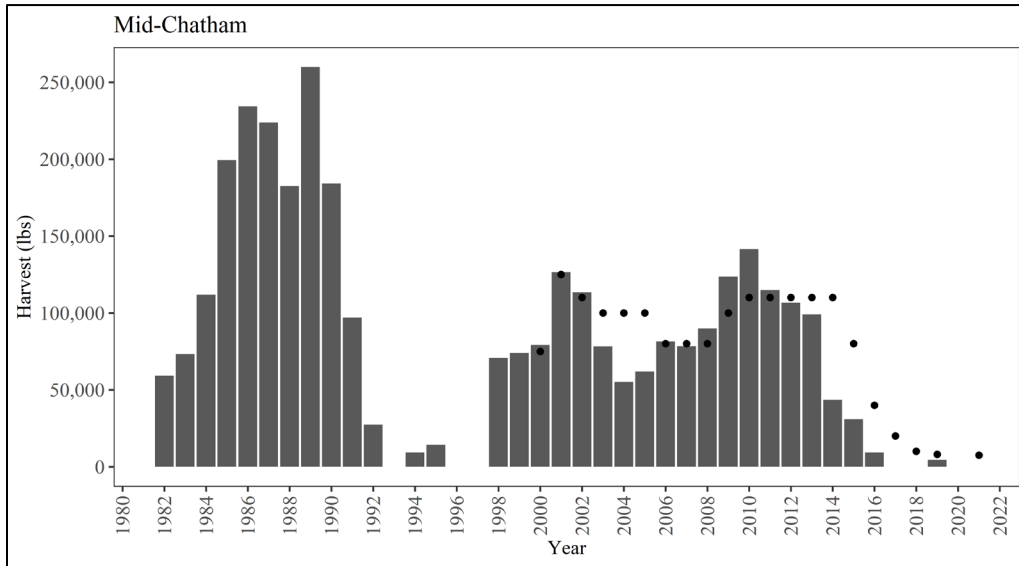


Figure 26.—Commercial GKC fishery harvest from the Mid-Chatham Strait management area. Dots represents the GHL in a given season (2001–Present).

Reference Points

Table 6.— Golden king crab logbook catch per unit of effort (CPUE) reference points.

Indicators	Reference Point	Description
Target Reference Point	3.4 crab/pot	Average Commercial Logbook CPUE from 2000–2017
Trigger Reference Point	2.5 crab/pot	75% of the Target Reference Point
Limit Reference Point	1.7 crab/pot	50% of the Target Reference Point

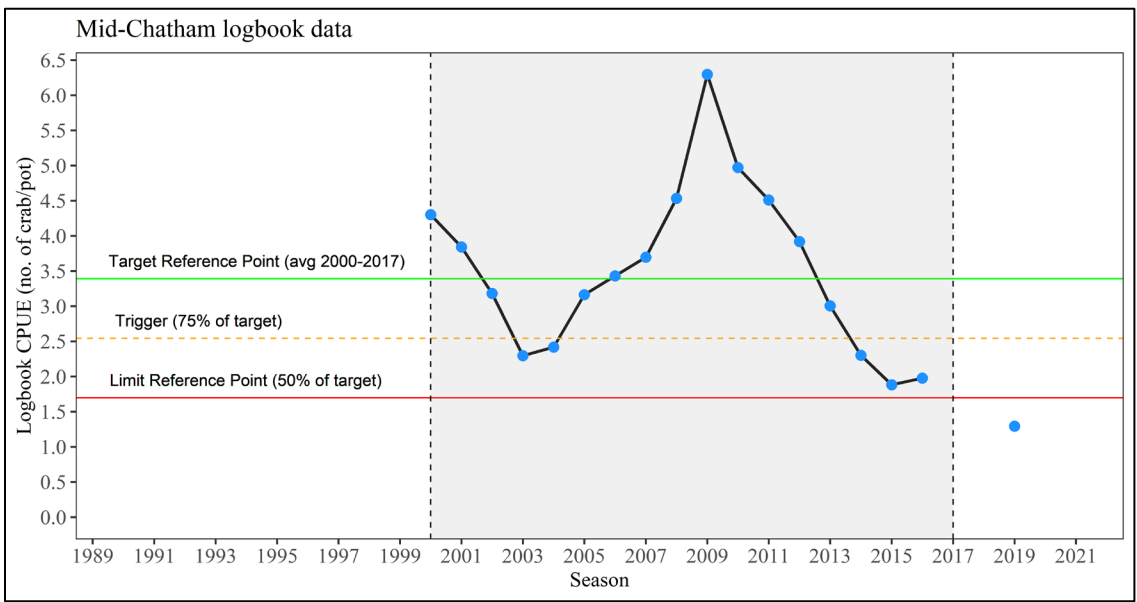


Figure 27.—Mid-Chatham Strait golden king crab reference points (Target, Trigger, and Limit) and fishery performance utilizing logbook CPUE.

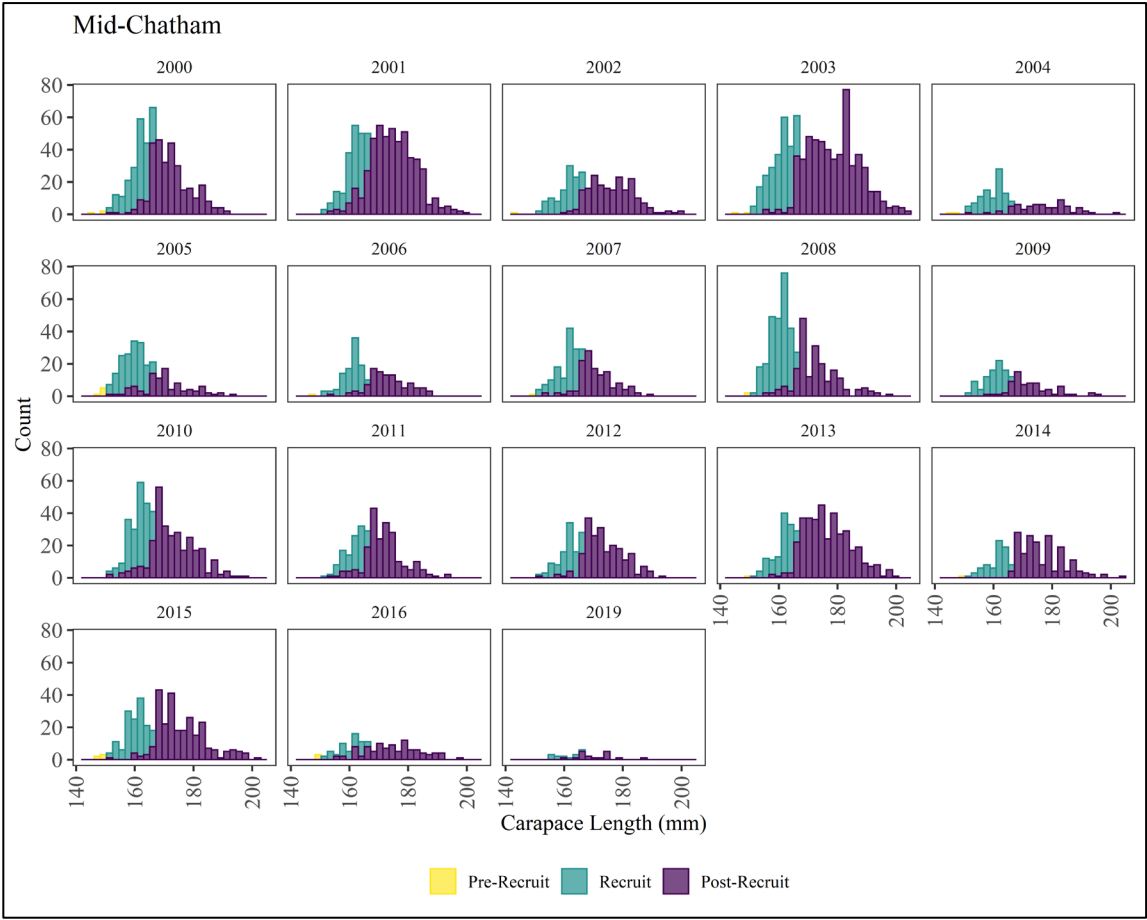


Figure 28.—Mid-Chatham Strait golden king crab length frequencies of sampled commercial catch by recruit class from 2000-Present.

LOWER CHATHAM STRAIT

Season Overview

The Lower Chatham Strait management area’s GHL was 14,000 lbs for the 2019 season, closed for the 2020 season and re-opened for the 2021 season at a GHL of 7,500 lbs. No fishing effort occurred during the 2021 season and will close by regulation on December 1

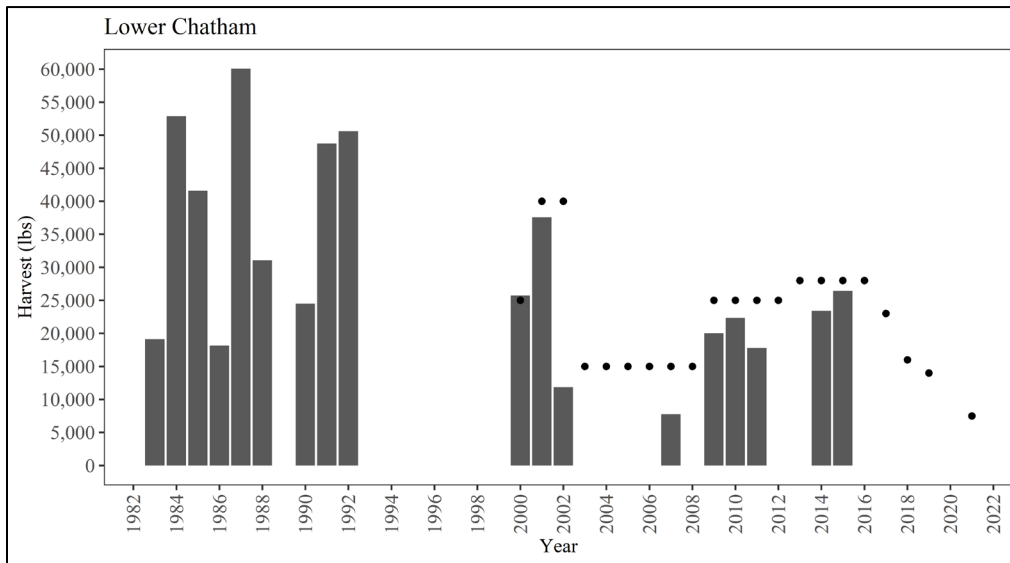


Figure 29.—Commercial GKC fishery harvest from the Lower Chatham Strait management area. Dots represents the GHL in a given season (2001–Present).

Reference Points

Table 7.— Golden king crab logbook catch per unit of effort (CPUE) reference points.

Indicators	Reference Point	Description
Target Reference Point	3.1 crab/pot	Average Commercial Logbook CPUE from 2000–2017 (excluding 2013)
Trigger Reference Point	2.3 crab/pot	75% of the Target Reference Point
Limit Reference Point	1.6 crab/pot	50% of the Target Reference Point

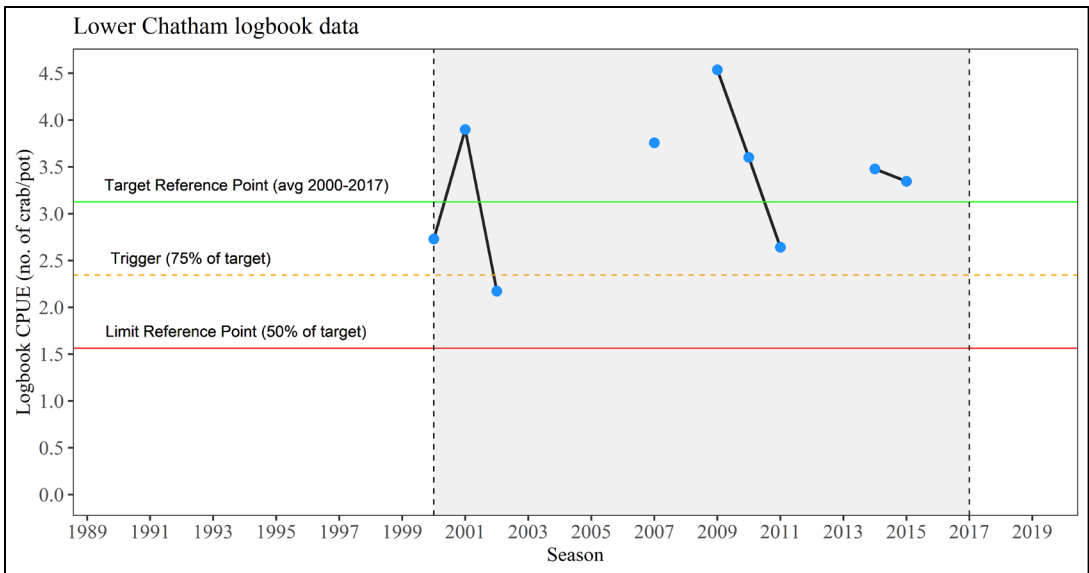


Figure 30.—Lower Chatham Strait golden king crab reference points (Target, Trigger, and Limit) and fishery performance utilizing logbook CPUE (excludes 2013 outlier).

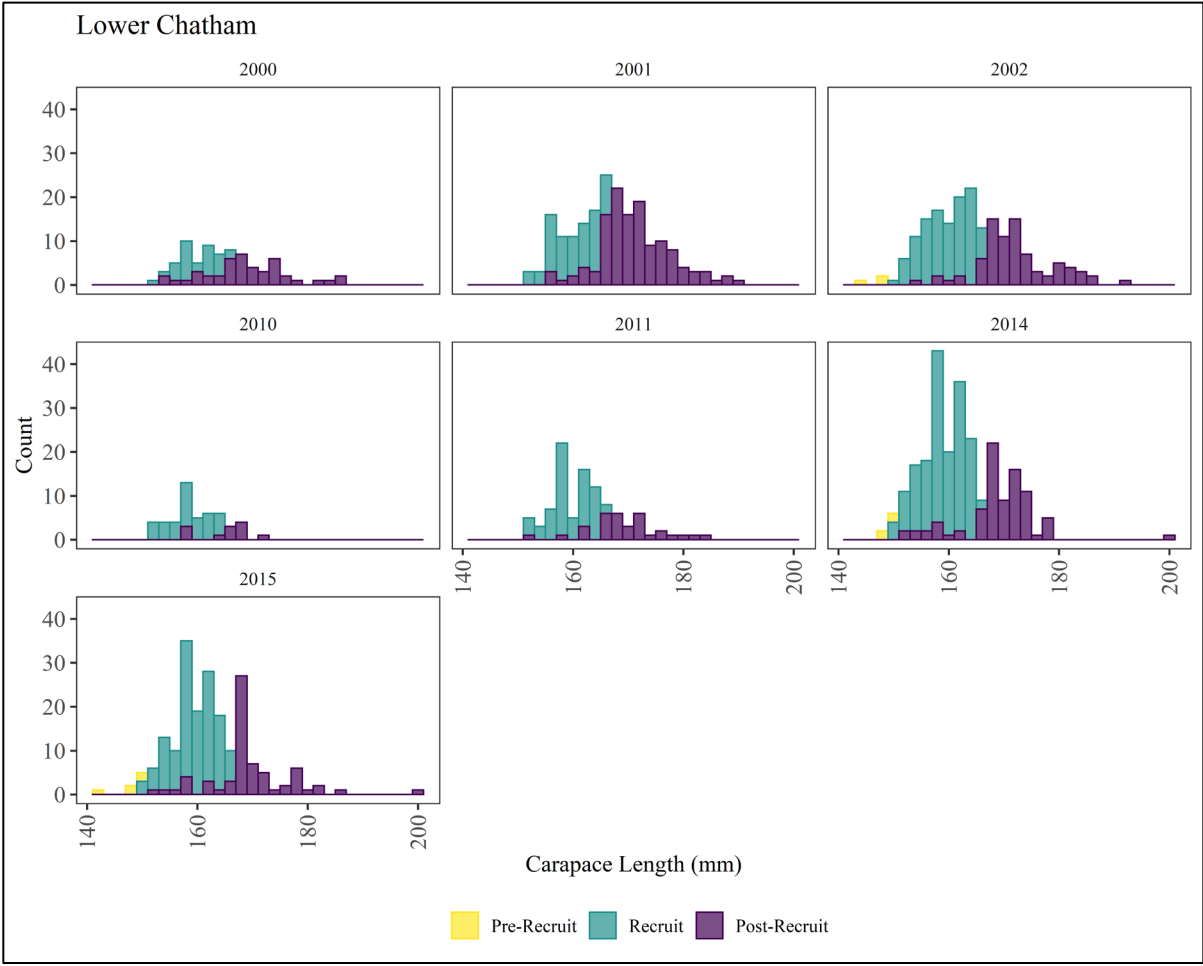


Figure 31.—Lower Chatham Strait golden king crab length frequencies of sampled commercial catch by recruit class from 2000-Present.

SOUTHERN

Season Overview

The Southern management area’s GHL was 20,500 lbs and 21,000 lbs respectively. For the 2021 season the Southern management area opened at a GHL of 20,000 lbs.

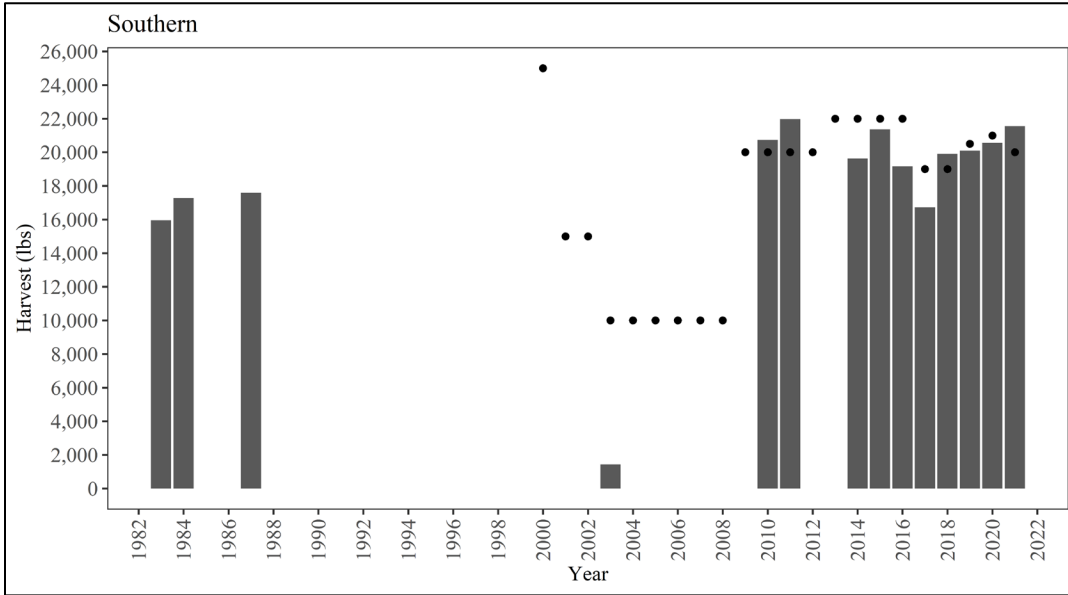


Figure 32.—Commercial GKC fishery harvest from the Southern management area. Dots represents the GHL in a given season (2001–Present).

Reference Points

Table 8.—Golden king crab logbook catch per unit of effort (CPUE) reference points.

Indicators	Reference Point	Description
Target Reference Point	3.7 crab/pot	Average Commercial Logbook CPUE from 2000-2017
Trigger Reference Point	2.8 crab/pot	75% of the Target Reference Point
Limit Reference Point	1.9 crab/pot	50% of the Target Reference Point

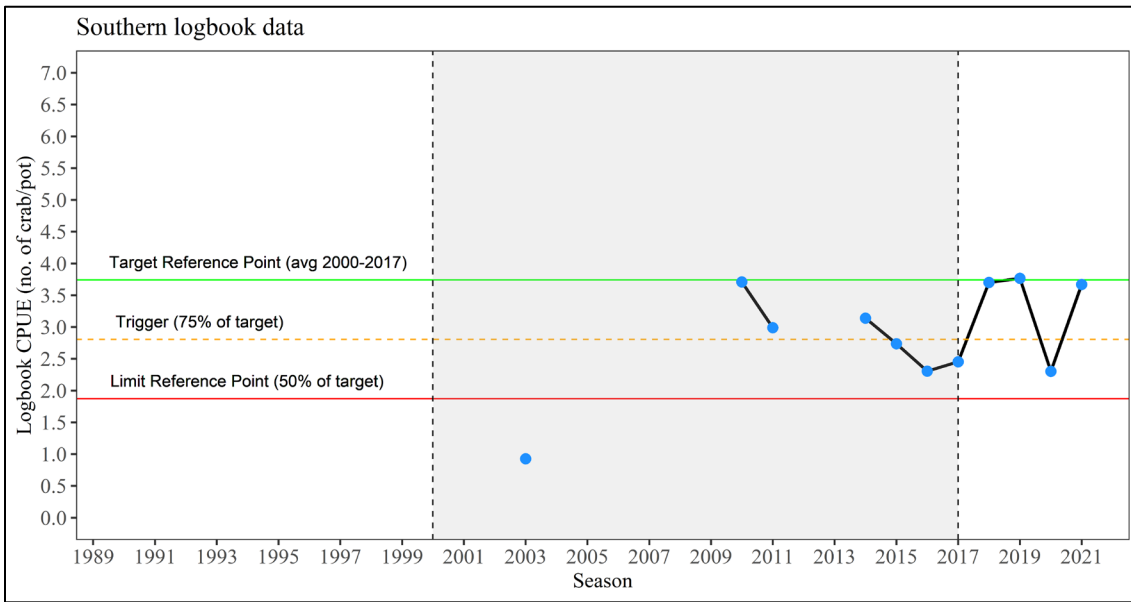


Figure 33.—Southern golden king crab reference points (Target, Trigger, and Limit) and fishery performance utilizing logbook CPUE.

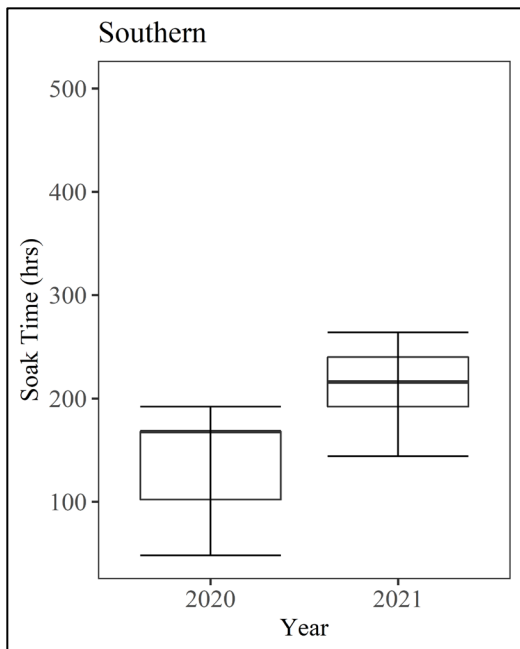


Figure 34.—Southern golden king crab soak time (hrs) utilizing fishery logbooks.

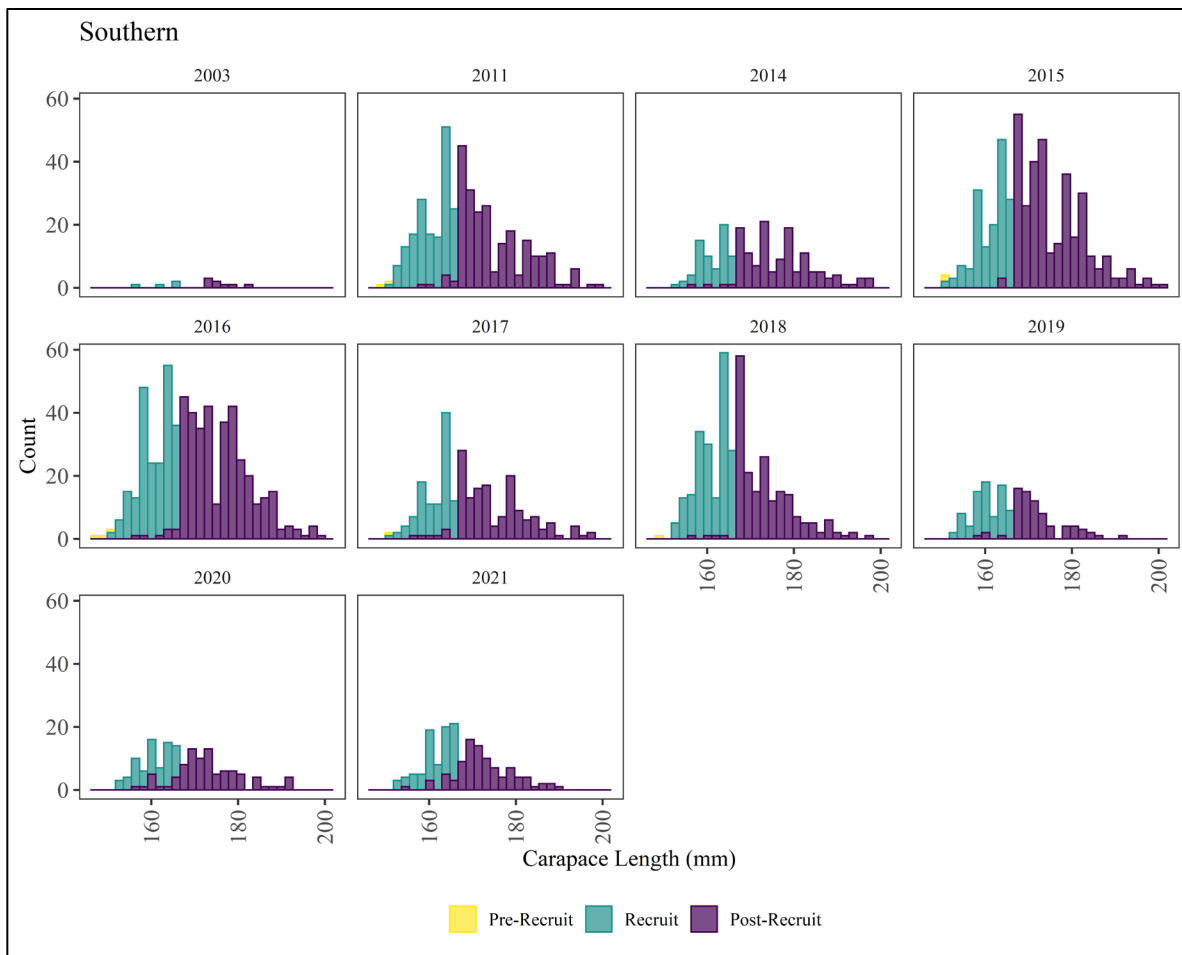


Figure 35.—Southern golden king crab length frequencies of sampled commercial catch by recruit class from 2000-Present.