Fishery Data Series No. 18-34

Southeast Pot Shrimp Stock Status Prior to the 2017/18 Season

by

Quinn Smith

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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)

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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by

Quinn Smith
Alaska Department of Fish and Game, Division of Commercial Fisheries, Douglas

Alaska Department of Fish and Game
Division of Sport Fish, Research and Technical Services
333 Raspberry Road, Anchorage, Alaska, 99518-1565

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Quinn Smith,
Alaska Department of Fish and Game, Division of Commercial Fisheries,
802 3rd Street, Douglas Alaska, USA

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TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF TABLES (Continued)

LIST OF FIGURES

LIST OF FIGURES (Continued)

Figure **Page**

LIST OF FIGURES (Continued)

Figure **Page**

LIST OF FIGURES (Continued)

LIST OF APPENDICES

ABSTRACT

Spot shrimp *Pandalus platyceros*, and to a lesser extent coonstripe shrimp *P. hypsinotis*, are targeted by a pot fishery in Southeast Alaska. Spot shrimp are protandric hermaphrodites with fairly narrow temperature and hard-bottom habitat requirements, and there is little Alaska-specific life history information. A fixed-quota harvest strategy is employed to manage the fishery; data are reviewed annually to determine stock status and guideline harvest levels (GHLs) are set within a guideline harvest range (GHR) and targeted inseason. The upper limits of GHRs were originally set based on historical harvest levels but have since been adjusted. Management is supported by a stock assessment program which includes fishery-independent pot surveys in five of 21 management units, accounting for 57% of the 10-year average annual harvest, commercial catch sampling and logbooks, and commercial catch and effort data. Data on catch rate (survey, logbook, and commercial), shrimp size, the length at which 50% are female (L_{50}), and estimates of harvest rate are analyzed annually. Data from the most current season are compared to established baselines and scored to designate a stock status of "good", "above average", "moderate", "below average", or "poor". For the 21 management units in Southeast Alaska, stock status was poor in three, below average in two, moderate in 11, and above average in four. The 'Remainder of District 12' unit was closed for the 2016/17 season, so no stock statuses were calculated.

Key words: Spot shrimp, *Pandalus platyceros*, stock assessment, Southeast Alaska, pot fishery

INTRODUCTION

LIFE HISTORY

Spot shrimp (*Pandalus platyceros*) are widely distributed within the North Pacific Ocean. They occur from the intertidal to depths of greater than 1,500 feet, from the Korea Strait to the Sea of Japan, along the Siberian east coast, and from Unalaska to San Diego, California (Butler 1964).

Larvae hatch at night, assisted by the female who moves her pleopods while swimming or clinging to something to expel them. The free-swimming larvae spend up to three months as plankton. Five larval stages are reported, with stages I–IV being zoea and stage V being a megalopa (Price and Chew 1972). Five juvenile stages are reported prior to maturation to a functional, adult male (Berkeley 1930; Haynes 1985).

All pandalid shrimp are protandric hermaphrodites; they mature and spawn first as males, and subsequently transition to females and spawn as females for the remainder of their lives. Spot shrimp are thought to mature sexually after 1.5 years, and to reproduce as males for one or two seasons in British Columbia (Butler 1964). The transition from male to female occurs during the late winter and early spring, and shrimp mature as females at three or four years of age in British Columbia (Berkeley 1930). Interannual and spatial variability in the size at which shrimp transition, quantitatively expressed as the length at which 50% are female (L_{50}), has been well described for congeneric northern shrimp *P. borealis*, and declines with increased growth rates as a function of either a substantial decrease in shrimp density or an increase in water temperature (Koeller et al. 2003; Wieland 2004). Females undergo another molt into "breeding dress," characterized by deepened abdominal pleura and elongated setae on the pleopods, in the late summer or fall, after which they extrude mature eggs from their internal ovaries. Eggs are fertilized externally as they are extruded and become attached to the pleopods, where they are carried until fully developed. Near Petersburg, Alaska, Hynes (1930) found an average count of 3,900 eggs per female. In Alaska, eggs may be held until the onset of the spring phytoplankton and zooplankton blooms during late March to mid-May.

Life history information on spot shrimp, the target species for the shrimp pot fishery in Southeast Alaska, is limited. Thus, much must be inferred from examining life history information from

Prince William Sound and British Columbia studies of *P. platyceros* and from North Atlantic studies of congeneric *P. borealis*.

Reports of the duration of the female period of spot shrimp life history vary. Females are not thought to survive long after the release of eggs in British Columbia, whereas in Alaska, multiple size classes of female shrimp have been documented during Alaska Department of Fish and Game (ADF&G) surveys (Love and Bishop 2005). This suggests either multiple spawnings of individual females or a protracted and highly variable age at transition; however, the L_{50} within a year and location of Alaska shrimp is not correspondingly variable. Two sizes of female spot shrimp have also been reported during some years in Hood Canal, Washington (Chew et al. 1974).

Similarly, there is no consensus on the maximum age of spot shrimp, and it is likely to be longer in higher latitudes with colder bottom water temperatures. A maximum age of five years has been reported in Canada (Butler 1964), while a tagging study from Prince William Sound, Alaska, estimated the maximum age at 7 or more years (Butler 1964; Kimker et al. 1996). Additionally, examinations of size frequency histograms in Prince William Sound indicated maximum age to be at least 10 years (Armstrong et al. 1995).

There is an ontogenetic change in the habitat of spot shrimp. Juvenile spot shrimp inhabit shallow water eelgrass and *Laminarium* or *Agarum spp.* kelp, but at a size of approximately 20 mm carapace length (CL) they migrate to rocky habitats including reefs, glass sponge reefs and corals (Chew et al. 1974; Marliave and Roth 1995).

Adult spot shrimp are benthic scavengers as well as predators and undergo diurnal feeding migrations, moving shoreward along the bottom into shallower waters at night and back to deeper waters during the day (Butler 1980).

Spot shrimp aggregations are likely best described as metapopulations. Although larvae are planktonic and may be widely transported by currents, juveniles and adults are relatively sedentary. Tagged adults remain within a mile or two of their release locations (Kimker et al. 1996). Larval advection into bays and fjords in Southeast Alaska may depend on prevailing wind patterns and currents, and larvae in some inshore waters may experience very small-scale entrainment patterns. Thus, depleted waters could be repopulated by a distant larval "source" if oceanographic conditions allow.

Pandalid shrimp populations are vulnerable from a number of standpoints to water temperatures outside their narrow preference (3–6ºC for *P. borealis*). First, delays may occur in both egg extrusion timing and in the number of breeding females associated with temperatures outside this range (Nunes 1984). Second, increased water temperatures result in declines in L_{50}, which causes decreased average mature female size and population fecundity. This can result in a decline in recruitment (Koeller et al. 2003).

STOCK STATUS PROGRAM DEVELOPMENT

The assessment program for spot shrimp in Southeast Alaska was initiated in 1996. It currently consists of pot surveys, commercial catch sampling both on-the-grounds and dockside, fish tickets, and logbooks. The spatial and temporal data coverage is inconsistent, as new programs have been introduced, and spatial data coverage has been increased incrementally with funding availability, and as fishery products and gear evolve.

The goals of the shrimp pot survey are to 1) estimate a useful index of abundance for spot shrimp, 2) estimate the size composition of spot shrimp captured, 3) estimate L_{50} of spot shrimp population, and 4) describe spot shrimp bycatch species composition. For a more detailed description of the development of the shrimp pot survey see Love and Bishop (2005).

The goals of sampling the commercial fishery are to 1) estimate spot shrimp CL frequency, either of the population using unsorted shrimp, or of the commercial harvest using sorted shrimp; and 2) estimate L_{50}.

Commercial catch sampling has been conducted from four different sample site types, some of which have been discontinued as the fishery and stock assessment program have evolved. The four types are: sampling of unsorted shrimp delivered to floating processors (FLT), sampling of sorted shrimp dockside (DS), sampling of unsorted shrimp onboard catcher-processors (ONBD), and sampling of unsorted shrimp on the grounds from catcher-processors (OTG). A regulation giving the department the authority to require observers onboard floating processors was promulgated by the Alaska Board of Fisheries at its 1997 meeting (5 AAC 31.144). Accordingly, commercial sampling onboard floating processors (FLT) was initiated with dual objectives of providing the department with the opportunity to sample unsorted shrimp, and of assuring that harvest was reported. Shrimp deliveries in Districts 1, 2, 3, 9, 10, and 11 were sampled during the 1997, 1998, and 1999 seasons. Subsequently, the shrimp pot fishery became short and intense, and an increasing proportion of the fleet became catcher-processors; by 1999, only 2 trips in District 3 were sampled, and by 2000 floating processors ceased to operate. Dockside sampling (DS) was also initiated in 1997 first in Districts 1, 6, 7, 14, and 16, and gradually expanded into Districts 3, 4, 8, 10, 11 and 15. However, dockside deliveries gradually dwindled as the proportion of the harvest which was processed onboard increased until 2002, when only Districts 6, 7, 8, 11, 14, and 15 were regularly being sampled dockside. By 2007, this had dwindled further to Districts 6, 7, and 8. Since 2015 dockside samples have only been available from District 7. Sampling by observers stationed onboard catcher-processors (ONBD) was conducted in Districts 1 and 2 from 2000–2003, but this work ceased due to budget reductions in 2004. These data are not analyzed herein because of the very short time series. As the fishery intensified, on-the-grounds (OTG) sampling began in 1998, with dual objectives of obtaining catch rate information to accurately target guideline harvest levels (GHLs) inseason and of collecting sampling data from unsorted shrimp. District 2, Sections 3-A, and 3-B/C, Districts 6, 7, 8, 9, 10, Tenakee, and Section 13-C have been sampled in this way; recent trips have focused on District 1, 2, Sections 3-A and 3-B/C, Districts 6, 7, 9, 10, and Section 13-C.

Fish tickets, on which are recorded harvest in pounds, effort in pot lifts, and location of harvest accurate to subdistrict, are mandatory for all commercial shrimp vessel landings. Catcher-processor vessels have been required to write daily fish tickets since 2003. Other shrimp pot fishing vessels must record each landing on a fish ticket. Fish tickets do not require shrimp harvest to be broken into size category.

A voluntary logbook program was initiated in 2005 with the objective of collecting size-specific spot shrimp catch-per-unit-effort (CPUE) data from catcher-processors. The level of voluntary logbook participation was highly varied both spatially and temporally, thus there is not an adequate time series to conduct comparisons in most areas. A regulation for mandatory catcher-processor logbooks was implemented starting with the 2015/16 season. Participating vessels provide the department with their specific size category definitions at the beginning of the season and record their harvest by shrimp size category daily.

MANAGEMENT PROGRAM

The Southeast Alaska pot shrimp fishery is managed inseason by emergency order to limit harvests in each area managed to levels as close as possible to GHLs established by the department each season. Guideline harvest ranges (GHRs) were first established in regulation in 1997 following initial implementation of separate, district-specific GHRs by emergency order for the 1995/96 season (5 AAC 31.115, Shrimp Pot Guideline Harvest Ranges for Registration Area A). The lower limit of each GHR is zero (indicating that an area may not open during a season), and the upper limits were originally set based on average harvest levels from the 1990/91–1994/95 seasons. GHRs have been adjusted by the Board of Fisheries several times for many, but not all, management units. A thorough review of the history of and rationale for GHL changes by management unit, including the timing for creation of new management units, is provided in the triennial Board of Fisheries report (Smith and Gray 2017). GHL recommendations are made annually based on stock assessment results. In 2004, decision rules were established to guide GHL determination based on stock status designation. A stock status designation of "poor" was associated with a 20% reduction in GHL, a stock status of "moderate" was associated with no GHL change, and a stock status of "healthy" was associated with a GHL increase of 20%. These guidelines were in place through 2005. For 2006–2007, "poor" stock status was changed to a 20–40% reduction, "moderate" to a 0–20% reduction, and "healthy" to a 20–40% increase. Beginning in 2010, two additional stock status classes—"above average" and "below average"—were added to bring the shrimp assessment in line with other shellfish assessment terminology. The current stock status definitions and associated GHL actions are shown in Table 1. Once established, GHLs for each management unit are targeted for a period of three years unless there are compelling, data-supported reasons to do otherwise.

OBJECTIVES

The objective of this report is to provide a stock status and the confidence in stock status for each management unit of the shrimp pot fishery in Southeast Alaska.

METHODS

A combination of fishery-independent (surveys) and fishery-dependent (logbook, fish ticket, OTG sampling, and dockside sampling [DS]) data were collected to assess the relative changes in abundance, and the overall stock condition of the spot shrimp in order to maintain a long-term sustainable harvest. The current year's stock assessment, though similar in concept to previous years, has undergone substantial improvements in the form of data source weighting so as to provide a more consistent and logical framework from which more objective determinations of stock status can be made.

ANALYSIS AREAS

Each management unit was divided into 1–7 separate analysis areas based on combining subdistricts that are spatially related and/or on the distribution of fishing effort within the management unit (Table 2). These analysis areas were then each individually weighted by a long-term average of commercial harvest. This provides a more accurate evaluation at the management unit level, because harvest varies dramatically among subdistricts.

STOCK STATUS MATRIX

Data are separated into four broad categories: catch rates, harvest rates, mean CL, and L_{50}. Catch rates can be used as a relative index of population size. However, CPUE data can be difficult to interpret with the confounding effects of changes in fishing effort, gear type, animal behavior, and population size. Three independent catch rates were used depending on the data available: survey CPUE of ≥XL (≥40 mm CL) shrimp, standardized commercial CPUE, and logbook CPUE of ≥XL shrimp. Although each method provides a relative index of shrimp abundance, none provide an ideal measure due to trade-offs in their collection methods. Survey catch rate data are by far the most standardized from year to year and provide the greatest resolution in detecting changes in population size. Survey effort and gear is consistent over years and sample sizes are standardized. Also, because shrimp are individually measured, catch rates can be separated by size class, and thus allow a focused view on large shrimp. This removes any potential bias of changes in catch rates due to changes in catchability and provides the most sensitive measure of population change. The downside to survey CPUE is the assumption that the relatively small spatial scale of the survey is representative of the entire district. The long-term baseline to which the current year's data were compared using a *t*-test was initially set as a mean of the first three years of the survey. On occasion, these baselines have been adjusted if it becomes apparent that the first three years were not an appropriate comparison. When this has been done, a 10- or 15-year mean has been substituted for the first 3-year mean. The short-term score was based on a linear regression analysis of the last four years (including the current year).

Commercial catch rate information is difficult to interpret even where standard and accurate measures of effort exist. This is because commercial fishermen are able to increase effort and efficiency in ways that are difficult to quantify in order to maintain an economically profitable harvest level even as populations decline. Specific examples of this include improved navigational plotting equipment allowing fishermen to better pinpoint habitat, improved gear efficiency, changes in bait type or volume, and changes in sorting. This problem is known to be particularly acute for fisheries on species with very limited distributions (Orensanz et al. 1998). Since the shrimp pot fishery in Southeast Alaska has had accurate units of effort only since the 1996/97 season, and the species has a limited distribution, commercial catch rate is an insensitive index and declines in catch rate are likely to be observed only after large changes in population size. Nonetheless, for many districts it is the only information available. In addition, raw commercial CPUE cannot be separated by size class and therefore lacks resolution. However, the sample size of commercial catch rates is much higher than that of survey CPUE. This often, though not always, leads to better representation of the full spatial scale of the fishing grounds, but also has the potential to introduce bias due to over-sampling due to lack of standardization and potential non-independence of data. To improve the utility of commercial CPUE data, a standardized catch rate is used to describe trends in CPUE. Commercial catch rates were standardized by effort. The season with the smallest effort (fewest pot lifts) was used as the standard and all other years' data were scaled to match this effort as closely as possible. All data were sorted by date to ensure CPUE was calculated from the first pot lifts of the season. The long-term baseline to which the current year's data were compared using a *t*-test consists of all years from the 2001/02 to the 2007/08 season (where sufficient data existed). The short-term score was based on a linear regression analysis of the last four years (including the current year).

The catch rates calculated from commercial logbooks provide a compromise between the unbiased, high resolution survey data, and the biased, lower resolution commercial data. Since

size class information is recorded on logbooks, CPUE of large shrimp can be calculated. Also, since commercial fishing occurs over a much broader scale, the spatial extent of the data should be better; however, voluntary logbook data are available for only the most recent three years. Simple analysis of variance (ANOVA) followed by a Tukey HSD (honestly significant difference) test was conducted to detect short-term trends in logbook CPUE and to identify differences between years. Declines in the 2007 season relative to either 2005 and/or 2006 were scored -1, while no difference was scored as 0, and an increase scored as +1.

The goal of harvest rate strategies is to maximize sustainable yield. Harvest rates generally correlate with growth, longevity, and reproductive rates of the exploited species (i.e., faster growing, shorter-lived, and more fecund species tend to tolerate higher harvest rates). Harvest rates calculated using harvest data provide an estimate of the overall fishing pressure on the exploited shrimp population. Harvest rates can be estimated by using a Leslie depletion model with commercial logbook data. The Leslie depletion model is used to estimate the exploitable population size of a fished area. From this estimate, the harvest rate can be estimated by dividing the total catch in an area by the estimated population size. The system for scoring harvest rates was dually based. First, we applied the work of Kimker et al. (1996), who found that the maximum age of *P. platyceros* in Prince William Sound exceeded 7 years of age; we used 8 as the maximum age, and applied the equation of Hoenig (1983) to estimate natural mortality (M) at M = 0.55. We set fishing mortality rate (F) equal to M, which yields a limit annual harvest rate of 42%. Second, we conducted a literature survey to check limit reference points for harvest rates currently in use for fisheries on North Atlantic *P. borealis* populations, which has a similar life history, maximum age, and natural mortality to *P. platyceros*. In Maine, Clarke et al. (2000) found that yield and egg-per-recruit modeling showed that F = 0.34, or an annual mortality of 29% was sustainable; they estimated the maximum age at 5 so this population could likely support a more aggressive harvest strategy than the more long-lived spot shrimp. In the past, a 35% target exploitation rate was used for *P. borealis* stocks with natural mortality in the range of M = 0.5–0.8 in eastern Canada (Mohn et al. 1992). However, this lost acceptance when it was exceeded for several stocks with no apparent ill effects, and since then, stock-specific limit reference points for F have been established. For *P. jordani* in California, F_{MSY} (F that produces maximum sustainable long-term yield), which should be considered a limit reference point, was estimated at 0.5 or 39% annually (Abramson and Tomlinson 1972). For Icelandic *P. borealis*, Skuladottir (1979) calculated an F_{MSY} of 0.4 or 33% annually with M assumed to be 0.2. A limit reference point called $F_{0.1}$ is the fishing mortality rate at which the slope of a yield-per-recruit curve is 10% of its original value. On the high side, for Norwegian populations, yield-per-recruit modeling estimated an $F_{0.1}$ of 0.76 or 53% annually, assuming an M of 0.75 (ICES 2000). Therefore, estimated harvest rates of ≥XL shrimp for Southeast Alaska are scored as follows: excessive (-1) for harvest rates exceeding 50%; moderate (0) for harvest rates ≥40% and ≤50%; or good (+1) for rates less than 40% annually. As logbook data accumulates, it may be possible to develop a limit reference F (F_{limit}) specific to Southeast Alaska using the empirical relationship between stock trends and harvest rate estimates.

The mean carapace length (CL) is an estimate of the relative population structure. Decreases in mean CL can theoretically arise from an increase in the relative proportion of small shrimp (e.g., large recruitment event) or a decrease in large shrimp (e.g., high harvest rates). Conversely, increases in mean CL can arise from an increase in large shrimp or a decrease in small shrimp. These possibilities make the interpretation of changes in mean CL difficult. However, pre- and postseason shrimp pot surveys conducted in Districts 3 and 7 showed that the removal of large

shrimp actually increases the catchability, and hence the catch rate, of small shrimp postseason (Clark and Love 2003). This suggests that a decrease in mean CL is more likely a result of decreases in larger shrimp rather than a large recruitment of small shrimp. In order to detect changes in mean CL, a *t*-test was conducted to examine the difference between the current year sample mean and the long-term baseline. Baselines for commercial samples consisted of the mean of the first three sampled years for each area having three or more trips and a sample size of 200 or more shrimp, and for survey data, the long-term baseline is based on the first three years with a sample size of 200 or more shrimp.

The unique plasticity of the size at sex change of this genus makes the L_{50}, useful as an indicator of population status. For *P. borealis*, L_{50} has been shown to decline with increased growth rates, as a function of either a substantial decrease in shrimp density or an increase in water temperature (Koeller et al. 2003; Wieland 2004). Thus, decreases in L_{50} result in decreased population fecundity, as fecundity increases with size for most pandalid shrimp species; this can lead to reductions in recruitment levels and (further) reductions in population size. Unlike the other metrics described above, L_{50} data are minimally affected by catchability issues and changes in L_{50} are more easily interpreted. However, because change in reproductive age is a population level response, changes in L_{50} data are likely to respond more slowly than other metrics. In order to detect changes in L_{50}, the confidence interval around the current year sample mean was compared with the long-term baseline value. If the lower bound of the 95% confidence interval is greater than the baseline it is scored +1, if the baseline is greater than the upper bound it is scored -1, and if it lies within the lower and upper bound it is scored 0. Baselines established for commercial samples consisted of the mean of the first three sampled years for each area having three or more trips and a sample size of 200 or more shrimp, and for survey data the long-term baseline is based on the first three years with a sample size of 200 or more shrimp.

Other information that is used in the stock assessment are qualitative data and a measure of confidence in the overall interpretation of available data. Qualitative data, although difficult to analyze, can provide useful insight into the overall stock assessment, especially in data-poor areas. Information such as changing markets, fuel prices, weather, etc. can help interpret changes in season length, overall harvest, distribution of harvest, and effort. Direct communication with fishermen can provide their impression of stock health. These “manager scores” were scored as +1, 0, or -1. The confidence level of the stock assessment for each analysis area is assessed according to the number of data pieces for the current season compared to the total possible number. This provides a metric of our ability to interpret the overall stock health of a given area. Areas with low confidence should be treated with a more precautionary approach.

The overall health of spot shrimp populations for each analysis area was assessed by statistically comparing the current year’s data to long-term baselines, and by analyzing short-term trends. This provides an objective and repeatable method for decision-making. Stock status for each area was determined through an examination of the following response variables: catch rate, harvest rate, mean carapace length, and L_{50}. In assessing stock status, each response variable was scored independently and weighted based on the historic correlation between the response variable and the standardized district score (see detail below). If the current year response was significantly above the long-term baseline it was scored +1, if no difference was found it was scored 0, and if it was significantly lower than the baseline it was scored -1. Short-term trends were scored as +0.25, 0, or -0.25 for significant increase, no change, or significant decrease, respectively.

Evaluating the influence of each index on the total score is not straightforward since they are on different scales (e.g., carapace length versus catch rate), and each index is evaluated and scored twice based on the baseline and short term tests. Therefore, it was determined that the score for each index would be evaluated for its influence on the total district/section score calculation. Pairwise multivariate correlation analyses were performed with all indices, comparing them to each other and to the districtwide total score and the districtwide standardized score. The pairwise part of this analysis allowed for a review of the indices to determine if any were redundant (highly correlated to each other and therefore not providing any unique information) or non-informative (having the same score every year and therefore not having a correlation coefficient). The correlation between each index and the standardized district score correlation was used to determine the weighting scheme. A regional weighing scheme was determined by comparing the mean, mode, median, and weighted mean of the correlation coefficients for each district. In this regional weighting scheme, survey catch rate, logbook data, and the short-term trend in carapace length from on-the-grounds samples were weighted 1. The short-term trend in standardized commercial CPUE, mean carapace length data from the surveys, L_{50} data from the surveys, and manager scores were weighted 2/3, whereas long-term comparisons of standardized commercial CPUE and L_{50} data taken on the grounds were weighted 1/3. For full details on this evaluation see Appendix A.

The total analysis area score was the weighted sum of the long- and short-term scores for each response variable for each management unit (weighted by analysis area and response variable). The possible range of scores for a given area was divided into three equal categories: “poor” for the lowest 1/5 of possible scores, “below average” for the next 1/5, “moderate” for the middle 1/5, “above average” for the next highest 1/5, and “good” for the highest 1/5 of the possible scores. For example, if the scores ranged from +5 to -5, the categories would be as follows: “poor” is less than -3, “below average” is -3 to -1, “moderate” is -1 to +1, “above average” is +1 to +3, and “good” is greater than +3. For ease of regionwide interpretation, the overall scores for each district were also standardized to range from +1 to -1.

RESULTS AND DISCUSSION

REGIONAL OVERVIEW

The regionwide stock status score increased in the 2016/17 season. The mean standardized stock health score for all districts in 2016/17 is -0.08, (on a scale of -1 to 1, with -1 representing all scores in the matrix being negative, and 1 representing all scores in the matrix being positive), which was up from -0.28 in 2015/16 (Table 3). The regionwide increase was mainly driven by increased scores in Tenakee Inlet and Districts 1, 2, 6, and 10. These increases were partially offset by declines in Districts 4 and 9, Section 13-C, the Remainder of District 11, and District 15-East. Of the total regional GHL, 0% came from areas with “good” stock status (same as in 2015/16); 25% came from areas with “above average” stock status (strong increase from 0% in 2015/16); 65% came from areas with “moderate” stock status (strong increase from 45% in 2015/16); 4% came from areas with “below average” stock status (strong decrease from 50% in 2015/16); and 6% came from areas classified as “poor” (slight increase from 4% in 2015/16). Tenakee Inlet, the Remainder of District 12, and the Auke Bay portion of District 11 have been closed since the 2015/16 fishing season to allow for stock recovery. District 16 was open in 2016/17 as part of the usual rotation to open every other year. Total 2016/17 GHL for the region

was 545,030 lb, a 3% increase from the 2015/16 season. A total of 578,020 lb (104% of the GHL) was harvested.

Survey results show mixed positive and negative indicators. District 1 showed decreases in catch rates of large (≥40.5 g) and small (<40.5 g) class shrimp in Back Behm Canal and increases in both size classes in West Behm. District 2 showed increased catch rates of large and small class shrimp in Kasaan Bay and a strong decrease in small class shrimp in Cholmondeley Sound. In District 3, Hetta Inlet showed slight decreases in catch rates of both size classes, while only small class shrimp decreased in Mid Cordova Bay. In District 7, both Lower and Upper Ernest Sound showed declines in catch rates on small class shrimp. Catch rates of both size classes continued to increase in West Tenakee Inlet. Survey operations were suspended in Hoonah Sound in 2015 due to budgetary shortfalls.

On-the-grounds (OTG) sampling was available in 13 of the 42 analysis areas that had fishing effort, one more than in the 2015/16 season. Statistical tests could only be completed for six analysis areas due to lack of long-term baseline data and insufficient sample sizes. Dockside sampling had less coverage with one analysis area covered.

A mandatory logbook requirement for catcher-processors went into effect for the 2015/16 season, and logbook data availability expanded to 17 analysis areas which now have sufficient data and model fit to conduct harvest rate estimations on ≥XL size class shrimp. Seven analysis areas had the three years of logbook data required for catch rate analysis.

Catch per unit effort (CPUE) data derived from fish tickets were significantly below the long-term baseline in 26% (14/54) of the analysis areas open to fishing, a decrease from 35% in the 2015/16 season. Commercial CPUEs were significantly above the long-term baseline in 11% (6/54) of the analysis areas, the same as in the 2015/16 season. The percentage of analysis areas with no effort this season remains at 22% (same as 2015/16), the highest level in a decade.

Manager scores, which are assigned to each analysis area by the fishery manager to represent their overall impression of stock health, were positive (+1) for four analysis areas, neutral (0) for 44, and negative (-1) for six. This gives an overall average score of -0.05, up from -0.07 during the 2015/16 season.

STOCK STATUS

A summary of stock status, stock status score, confidence level, and a standardized score by management unit is provided in Table 2. Details for each management area and its associated management units follow.

Table 1.–Stock status definitions and guideline associated actions for the pot shrimp fishery in Southeast Alaska.

Stock Status	Rationale	Range of Action
Good	Scores greater than 80% of possible maximum	0–40% harvest increase
Above Average	Scores between 60% and 80% of possible maximum	0–20% harvest increase
Moderate	Scores between 40% and 60% of possible maximum	0–20% harvest reduction
Below Average	Scores between 20% and 40% of possible maximum	0–30% harvest reduction to closure
Poor	Scores equal to and below 20% of possible maximum	0–40% harvest reduction to closure

Table 2.–Modified analysis area definitions for the shrimp pot fishery in Southeast Alaska with weights and 2016/17 manager scores.

Management unit	Analysis area	Subdistricts	Weight	2016/17 Score
District 1	Back Behm Canal	75, 77, 80	0.260	0
	East Behm	51, 53, 55, 60, 71, 73	0.200	0
	West Behm Canal	85, 90, 95	0.120	0
	Boca de Quadra	30	0.050	0
	Inner Ketchikan Inlets	27, 40, 43, 44, 45, 46, 48	0.200	0
	Portland Canal	10, 11, 13, 15	0.150	0
	Revilla Channel/Gravina Is.	21, 23, 22, 25, 29, 41	0.020	0
District 2	Lower Clarence Strait	10, 15, 20	0.040	0
	Moira Sound	30	0.170	0
	Cholmondeley Sound	40	0.290	0
	Kasaan Bay	60	0.480	-1
	Middle Clarence Strait	50, 70, 80	0.020	0
Section 3-A	Hetta Inlet	25	0.200	0
	Lower Cordova Bay	11, 15	0.200	0
	Mid Cordova Bay	21, 23	0.100	0
	Upper Cordova Bay	30, 40	0.500	0
Section 3-B/C	Craig Se	50, 60, 70, 80	0.400	0
	Sea Otter Sound	90	0.600	0
District 4	D 4	10, 20, 30, 35, 40, 50	1.000	0
District 5	Affleck/Port Beauclerc	10, 20	0.600	0
	Cape Pole to Point Baker	41, 42, 43, 50	0.050	0
	Rocky Pass	31, 32	0.350	0
District 6	Sumner Strait	41–44	0.070	0
	SW Etolin Is.	20, 22, 25	0.130	1
	Upper Clarence Strait	10, 30	0.800	1
District 7	Bradfield Canal	40, 45	0.200	1
	Lower Ernest Sound	10	0.200	0
	Upper Ernest Sound	20	0.500	1
	Zimovia Strait	30, 35	0.100	0
District 8	Eastern Sumner Strait	30, 40	0.700	0
	Frederick Sound	41, 50, 60	0.050	0
	Stikine Strait/Chichagof Pass	10, 20	0.250	0
District 9	Eliza Harbor	30	0.400	0
	Keku Strait/Port Camden	40, 41, 42, 43, 50	0.025	0
	SE Baranof Is.	10, 11, 13, 20	0.550	-1
	Western Kuiu (Saginaw to Table)	44–63	0.025	0
District 10	Farragut Bay	11, 12, 13, 14, 15, 16, 17	0.100	0
	Hobart/Windham Bays	31, 32, 33	0.350	0
	Port Houghton	34	0.400	0
	SE Admiralty (Pybus to Pt Hugh)	21–24	0.150	0
Seymour	Seymour Canal	11–14	1.000	0
Remainder District 11	Auke Bay	50, 55	0.750	Closed
	Glacier-fed Bays	20, 21, 33–35	0.250	-1
Tenakee Inlet	East Tenakee Inlet	41, 42	0.100	Closed
	West Tenakee Inlet	43, 44, 45, 46, 47, 48	0.900	Closed
Remainder District 12	Freshwater Bay	50	0.200	Closed
	Kelp Bay	11, 21, 22	0.700	Closed
	Pt. Couverden	61	0.100	Closed

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Table 2.–Page 2 of 2.

Management Unit	Analysis area	Subdistricts	Weight	2016/17 Score
Section 13-A/B	Crawfish Inlet	31, 32, 33	0.300	-1
	Larch/Branch Bays	11, 12, 13	0.000	0
	Necker Bay	34	0.300	0
	Whale Bay	22, 21	0.400	0
Section 13-C	Hoonah Sound	55, 56, 57, 58	0.800	0
	Peril Strait	51, 52, 53, 54, 59	0.200	-1
District 14	Eastern Icy Strait	25, 80	0.800	0
	Port Frederick	31–34, 27	0.200	–
District 15 East	Chilkoot Inlet	34	0.250	0
	Lutak Inlet	33	0.200	0
	Taiya Inlet	35	0.550	0
Remainder District 15	Chilkat Inlet	32	1.000	0
District 16	Lituya Bay	13	1.000	-1
	Rest of 16	11, 12, 14	0.000	–

Table 3.–Score, stock status, and confidence information summarized from Tables 4–40, and standardized score. The standardized score is used to compare among districts and ranges from +1 to -1. The standardized score is calculated as the score divided by the total possible score for a given management unit. A standardized score of ≥0.6 gives a stock status of good, 0.2 to 0.59 is above average, -0.19 to 0.19 is moderate, -0.2 to -0.59 is below average, and less than or equal to -0.6 is poor.

Management Area	Score	Stock Status	2014 Std. Score	2015 Std. Score	2016 Std. Score	Confidence	Upper End GHR	2016/17 GHL	2016/17 Harvest	% GHL Taken	2017/18 GHL
District 1	1.10	Above Average	0.05	-0.04	0.21	0.32	164,000	64,000	74,923	117%	64,000
District 2	1.06	Above Average	-0.63	-0.59	0.22	0.36	120,000	30,000	30,630	102%	30,000
Section 3A	-0.77	Moderate	-0.01	-0.33	-0.15	0.33	264,000	114,000	136,240	120%	114,000
Sections 3-B&C	0.00	Moderate	0.00	0.03	0.00	0.18	70,000	30,000	37,968	127%	30,000
District 4	0.00	Below Average	-0.11	-0.38	-0.46	0.24	28,000	20,000	12,591	63%	20,000
District 5	0.00	Moderate	-0.56	-0.82	0.00	0.13	20,000	12,000	638	5%	12,000
District 6	1.95	Above Average	-0.38	-0.17	0.44	0.42	82,000	32,000[a]	41,156	92%	42,900[a]
District 7	1.31	Moderate	-0.09	-0.12	0.16	0.65	104,000	74,300[a]	87,752	107%	74,300[a]
District 8	0.24	Moderate	-0.54	0.04	0.11	0.22	28,000	10,500	11,590	110%	10,500
District 9	-0.70	Poor	-0.80	-0.33	-0.60	0.17	18,000	11,000	12,757	116%	11,000
District 10	-0.45	Moderate	-0.31	-0.51	-0.13	0.33	58,000	29,000	41,943	145%	29,000
Seymour	-0.33	Below Average	-0.44	-0.44	-0.29	0.18	30,000	12,000	11,202	93%	12,000
Remainder of District 11	-2.17	Poor	0.00	0.00	-1.00	0.06	15,000	7,500	5,908	79%	4,000
Tenakee	2.02	Above Average	-0.41	-0.16	0.59	0.32	34,000	Closed	0	Closed	Closed
Remainder of District 12	0.00	CLOSED	NA	-1.00	NA	0.00	15,000	Closed	0	Closed	Closed
Sections 13-A/B	-0.21	Moderate	-0.38	-0.24	-0.18	0.18	15,000	15,000	19,692	131%	15,000
Section 13-C	-1.13	Poor	0.01	-0.37	-0.62	0.20	50,000	26,000	27,946	107%	16,000
District 14	0.00	Moderate	NA	NA	0.00	0.09	20,000	7,500	6,806	91%	Closed
District 15 East	-0.09	Moderate	0.00	0.15	-0.05	0.15	20,000 (all 15)	7,500	3,666	49%	7,500
Remainder of District 15	0.00	Moderate	0.44	0.00	0.00	0.06	20,000 (all 15)	7,500	0	0%	7,500
District 16	0.31	Moderate	0.50	NA	0.15	0.18	20,000	15,000	14,612	97%	Closed
Mean	0.10	Moderate	-0.19	-0.28	-0.08	0.23	1,175,000	524,800	578,020	106%	499,700

KETCHIKAN MANAGEMENT AREA

District 1

The GHL in District 1 has changed four times since the 1998/99 season. Due to changes in the estimation of tail weight to whole weight, the GHL for this district increased 13% from 145,000 to 164,000 lb for the 2000/01 fishing season. Before this time tail weight was assumed to be approximately 66% of whole weight; after a large-scale sampling effort, this was revised to 50%, which subsequently increased the GHL because tail weight is extrapolated to whole weight for the purposes of catch accounting. The GHL was kept unchanged through the 2005/06 season (Table 4). In response to poor fishery performance, the GHL was reduced 40% to 98,400 lb beginning with the 2006/07 fishing season. The GHL was further reduced 20% to 78,700 lb for the 2008/09 fishing season, and 36% to 50,000 lb beginning in the 2009/10 fishing season. Due to strengthening stock health, the GHL was increased 28% prior to the 2015/16 season to 64,000 lb. Rather than targeting a specific GHL, managers have used set closure dates to control harvest. Harvest has averaged 60,900 lb (103% of GHL) over the last 10 years. Harvest in the 2016/17 season was 74,923 lb (117% of GHL). This district is divided into seven analysis areas (Back Behm Canal, East Behm Canal, West Behm Canal, Boca de Quadra, Inner Ketchikan Inlets, Portland Canal, and Revilla Channel/Gravina).

This was the sixth season of preseason surveys in District 1. Although it is a limited data set, the standard statistical tests could be performed. In Back Behm Canal, the catch rate of large class shrimp declined sharply after two years of modest increase and is now below baseline and the lowest seen in the survey. Catch rate of large class shrimp increased slightly in West Behm and is now above baseline, neither area shows a significant 4-year trend (Figure 1). Mean survey CL is at baseline in Back Behm and above baseline in West Behm. Both areas show a significantly increasing 4-year trend, although CL dropped in West Behm this year. L_{50} is above baseline in Back Behm and at baseline in West Behm (Figure 2).

The 2016/17 season standardized districtwide commercial CPUE is up slightly from last season, and equal with the 2014/15 season (Figure 3) due to better fishery performance in West Behm and Portland Canals, although this was slightly offset by poor scores in Boca de Quadra (however, with 300 lb harvested, it is inappropriate to weight this area too heavily). Analysis of area-specific commercial CPUE is significantly above the long-term baseline in Back Behm; at baseline in East Behm, West Behm, Portland Canal, and Revilla Channel; and below baseline in the Inner Ketchikan Inlets and Portland Canal (Table 5). West Behm and the Inner Ketchikan Inlets show a significant negative 4-year trend (Table 5, Figure 4).

Analysis of commercial logbook harvest data showed no model fit in any of the District 1 analysis areas in the 2016/17 season, and thus no harvest rates could be calculated (Table 5).

On-the-grounds samples showed mean CL to be above baseline in Back Behm Canal and at baseline in West Behm. Both areas showed an increasing 4-year trend (Figure 5). L_{50} was at baseline in West Behm. Insufficient samples were collected to conduct L_{50} analyses in Back Behm (Figure 6).

Manager scores were neutral for all analysis areas (Table 5).

The overall matrix score for District 1 is 1.10 (above average), up from -0.51 (moderate) in 2015/16. Much of this increase is due to increased standardized CPUE scores and the loss of a negative logbook harvest rate score in West Behm Canal, while it was tempered by decreased

standardized CPUE in Boca de Quadra and increased survey CL in West Behm Canal. District 1 data have moderate confidence (0.32), a slight decrease from last season due to the loss of logbook model fit.

The 2016/17 season was the second after a 28% GHL increase. Matrix scores in District 1 show an increase from the last two seasons. Standardized CPUE increased in East Behm, West Behm, and Portland Canal. Revilla Channel received effort after 4 years of no harvest and showed a marked increase in CPUE. However, the sudden drop in catch rate of both large and small class shrimp in Back Behm is concerning, as is the continued and consistent decline in standardized CPUE in the Inner Ketchikan Inlets.

Table 4.–District 1 matrix, Part A. A 15-season history, including stock assessment recommendations, for the pot shrimp fishery in Southeast Alaska.

Season	2002/03	2003/04	2004/05	2005/06	2007/08	2006/07	2008/09	2009/10
Upper regulatory GHR	164,000	164,000	164,000	164,000	164,000	164,000	164,000	164,000
Actual GHL (lb spot shrimp)	164,000	164,000	164,000	164,000	98,400	98,400	78,700	50,000
Recommended GHL or stock status	–	–	Moderate	Moderate	Poor	Poor	Poor	Below Average
Season length (days)	52	49	80	75	229	47	120	38
Landings (number)	472	557	604	583	336	432	218	153
Harvest (lb spot shrimp)	152,022	170,113	159,234	160,546	87,581	141,871	53,364	46,837

Season	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Upper regulatory GHR	164,000	164,000	164,000	164,000	164,000	164,000	164,000
Actual GHL (lb spot shrimp)	50,000	50,000	50,000	50,000	50,000	64,000	64,000
Recommended GHL or stock status	Below Average	Below Average	Moderate	Moderate	Moderate	Moderate	Above Average
Season length (days)	38	26	21	14	14	19	13
Landings (number)	131	131	141	114	134	154	168
Harvest (lb spot shrimp)	37,129	54,971	70,354	54,033	68,192	61,959	74,923

Note: En dash = not available.

Table 5.–District 1 matrix, Part B. Baselines, current season values, and scores for each stock status parameter and analysis area for the pot shrimp fishery in Southeast Alaska. Data sources are from ADF&G shrimp survey, fish tickets ("fish tix"), logbooks, and on-the-grounds (OTG) and dockside (DS) sampling of commercial catch. Data are divided by type: CPUE, harvest rate, mean carapace length (CL), and L_{50}. Score for each analysis area is the sum of all individual scores.

Analysis area		Back Behm Canal			East Behm Canal			West Behm Canal		
Area weighting			0.26			0.2			0.12	
Stock status parameters	Source	Baseline	Value	Score	Baseline	Value	Score	Baseline	Value	Score
Catch rate ≥XL	survey	4.4	3.3	-1.00	–	–	–	1.9	3.2	1.00
4-yr trend in catch rate	survey	–	No trend	0.00	–	–	–		No trend	0.00
Std. Comm. CPUE	fish tix	2.6	4.3	1.00	2.8	*	*	2.9	3.4	0.00
4-yr trend in CPUE	fish tix	–	No trend	0.00	–	NA	–	–	Sig. dec.	-0.25
Catch rate ≥XL	logbook	–	–	–	–	–	–	–	–	–
Harvest rate ≥XL (2014)	logbook	–	–	–	–	19%	–	–	–	–
Harvest rate ≥XL (2015)	logbook	–	–	–	–	–	–	–	49%	
Harvest rate ≥XL (2016)	logbook	–	–	–	–	–	–	–	–	–
Mean CL	survey	38.3	38.6	0.00	–	–	–	37.5	38.6	1.00
4-yr trend in CL	survey		Sig. inc.	0.25	–	–	–	–	Sig. inc.	0.25
Mean CL	OTG	41.2	42.8	1.00	–	–	–	42.2	43.1	0.00
4-yr trend in CL	OTG	–	Sig. inc.	0.25	–	–	–	–	Sig. inc.	0.25
Mean CL	DS	–	–	–	–	–	–	–	–	–
4-yr trend in CL	DS	–	–	–	–	–	–	–	–	–
L_{50}	survey	41.2	42.1	1.00	–	–	–	42.7	42.5	0.00
L_{50}	OTG/DS	46.1	–	–	–	–	–	42.8	43.6	0.00
Manager scores		–	–	0.00	–	–	0.00	–	–	0.00
Score	–	–	–	2.50	–	–	0.00	–	–	2.25
Max. possible score	–	–	–	7.00	–	–	2.00	–	–	8.00
Stock Status	–	–	–	–	–	–	–	–	–	–
Confidence	–	–	–	0.59	–	–	0.12	–	–	0.65

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Table 5.–Page 2 of 3.

Analysis Area		Boca de Quadra			Inner Ketchikan Inlets			Portland Canal		
Area weighting			0.05			0.2			0.15	
Stock Status Parameters	Source	Baseline	Value	Score	Baseline	Value	Score	Baseline	Value	Score
Catch rate ≥XL	survey	–	–	–	–	–	–	–	–	–
4-yr trend in catch rate	survey	–	–	–	–	–	–	–	–	–
Std. Comm. CPUE	fish tix	2.8	*	*	2.9	2.2	-1.00	2.5	2.9	0.00
4-yr trend in CPUE	fish tix	–	NA	–	–	Sig. dec.	-0.25	–	No trend	0.00
Catch rate ≥XL	logbook	–	–	–	–	–	–	–	–	–
Harvest rate ≥XL (2014)	logbook	–	–	–	–	–	–	–	–	–
Harvest rate ≥XL (2015)	logbook	–	62%	–	–	–	–	–	–	–
Harvest rate ≥XL (2016)	logbook	–	–	–	–	–	–	–	–	–
Mean CL	survey	–	–	–	–	–	–	–	–	–
4-yr trend in CL	survey	–	–	–	–	–	–	–	–	–
Mean CL	OTG	–	–	–	–	–	–	–	–	–
4-yr trend in CL	OTG	–	–	–	–	–	–	–	–	–
Mean CL	DS	–	–	–	39.4	–	–	–	–	–
4-yr trend in CL	DS	–	–	–	–	–	–	–	–	–
L_{50}	survey	–	–	–	–	–	–	–	–	–
L_{50}	OTG/DS	–	–	–	44.3	–	–	–	–	–
Manager scores	–	–	–	0.00	–	–	0.00	–	–	0.00
Score	–	–	–	-1.00	–	–	-1.25	–	–	0.00
Max. possible score	–	–	–	2.00	–	–	2.25	–	–	2.25
Stock Status	–	–	–	–	–	–	–	–	–	–
Confidence	–	–	–	0.12	–	–	0.18	–	–	0.18

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Table 5.–Page 3 of 3.

Analysis Area		Revilla Channel/Gravina			
Area weighting			0.02		
Stock Status Parameters	Source	Baseline	Value	Score	Total Score
Catch rate ≥XL	survey	–	–	–	-0.37
4-yr trend in catch rate	survey	–	–	–	0.00
Std. Comm. CPUE	fish tix	3.0	*	*	0.00
4-yr trend in CPUE	fish tix	–	NA	–	-0.07
Catch rate ≥XL	logbook	–	–	–	–
Harvest rate ≥XL (2014)	logbook	–	–	–	–
Harvest rate ≥XL (2015)	logbook	–	–	–	–
Harvest rate ≥XL (2016)	logbook	–	–	–	–
Mean CL	survey	–	–	–	0.21
4-yr trend in CL	survey	–	–	–	0.17
Mean CL	OTG	–	–	–	0.46
4-yr trend in CL	OTG	–	–	–	0.25
Mean CL	DS	–	–	–	–
4-yr trend in CL	DS	–	–	–	–
L_{50}	survey	–	–	–	0.46
L_{50}	OTG/DS	–	–	–	0.00
Manager scores		–	–	0	0.00
Score		–	–	0.00	1.10
Max. possible score		–	–	2.00	5.17
Stock Status		–	–	–	Above Average
Confidence		–	–	0.12	0.32

Note: * indicates confidential data with less than three permits participating. En dashes = not available, NA = not applicable, *Sig. inc.* = significant increase, *Sig. dec.* = significant decrease, ≥XL = ≥40 mm CL.

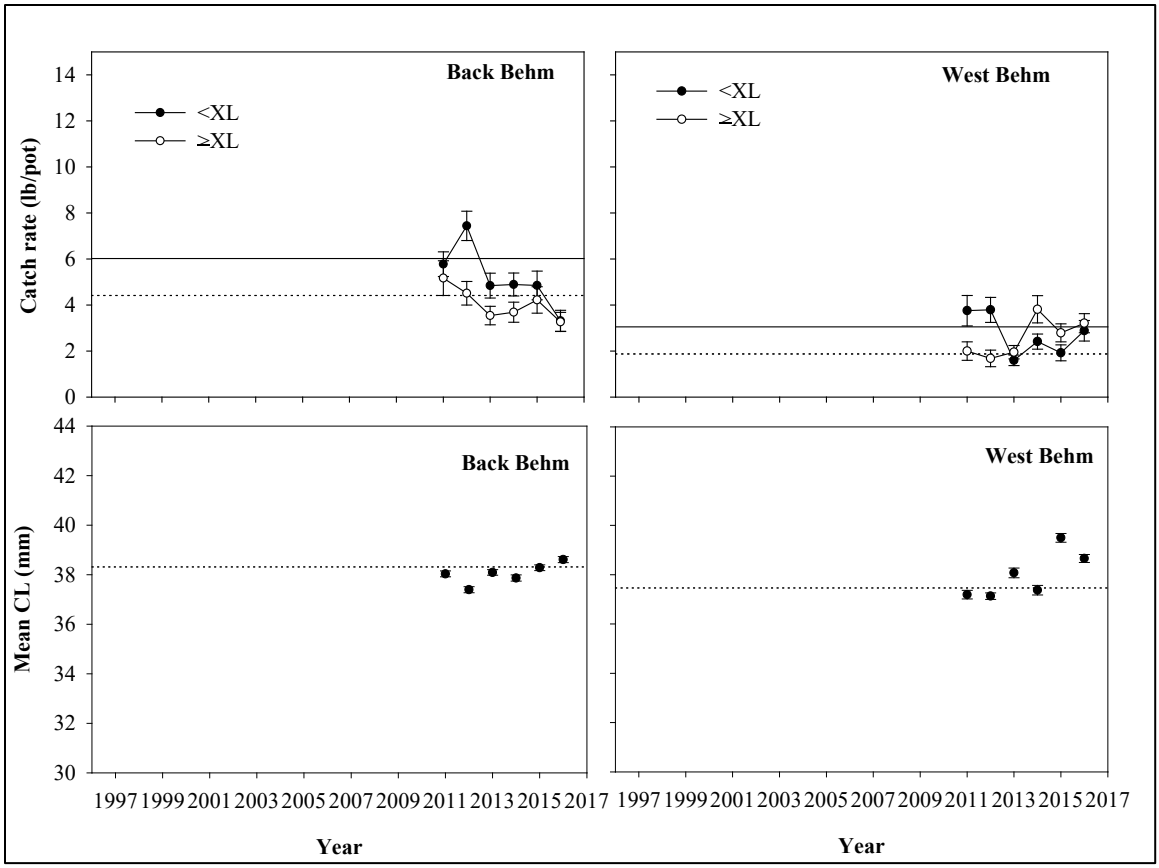

Figure 1.–Mean and standard error of spot shrimp catch rate (upper panels), and carapace length (CL) (lower panels) from preseason surveys in District 1, 2011–2016. Lines represent the long-term baselines.

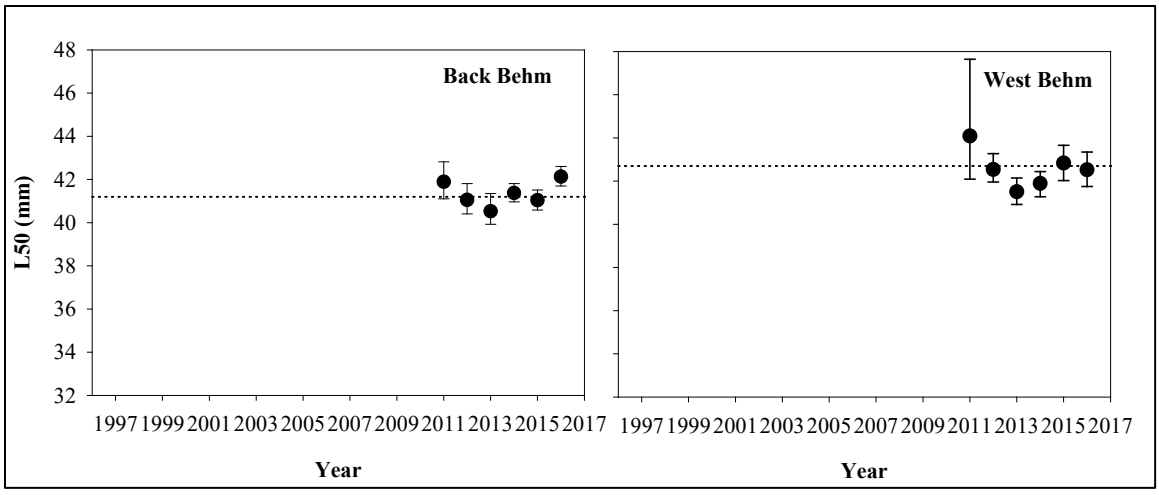

Figure 2.–L_{50} and 95% confidence intervals of spot shrimp from preseason surveys in District 1, 2011–2016. Dotted line represents the long-term baseline.

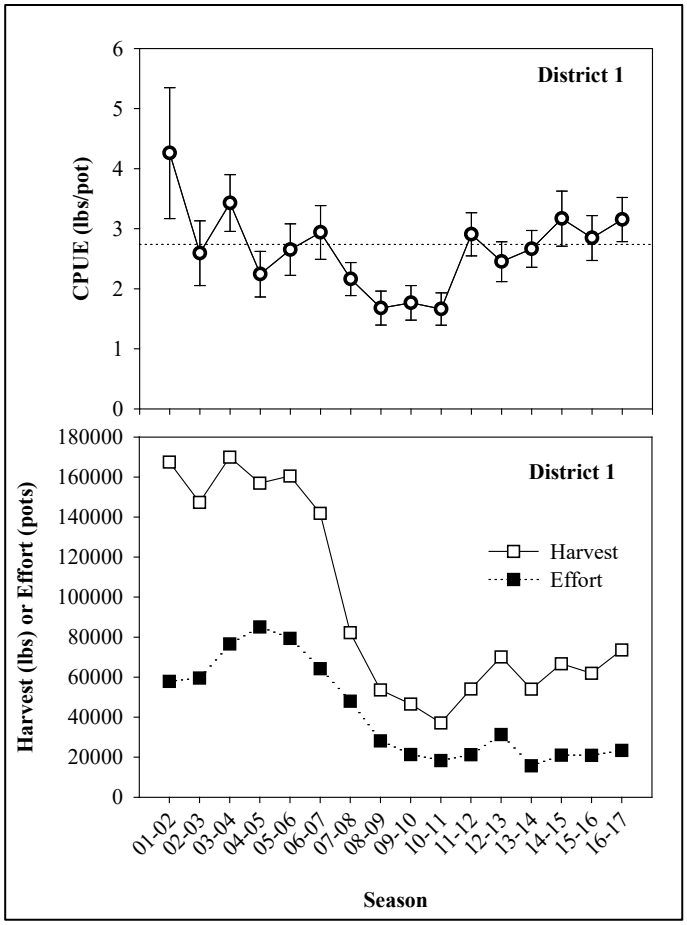

Figure 3.–Districtwide commercial CPUE and effort data for District 1, 2001/02–2016/17 seasons. CPUE is weighted by analysis area weights to allow for an overall impression of fishery performance.

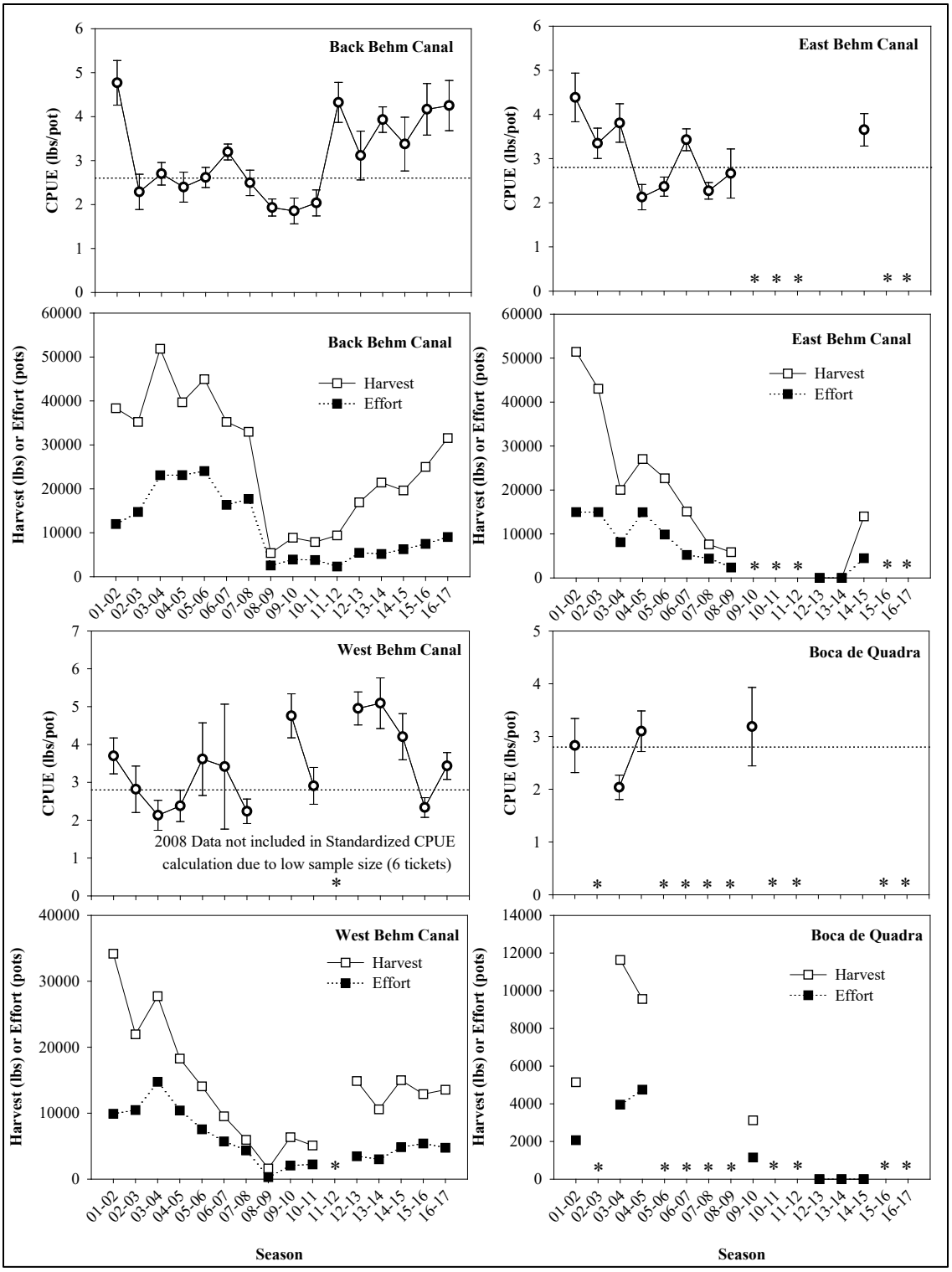

Figure 4.–Mean and standard error of spot shrimp catch rate from commercial harvest (dotted line represents the long-term baseline) and the commercial harvest and effort by analysis area in District 1, 2001/02–2016/17 seasons. * indicates confidential data with less than three permits participating.

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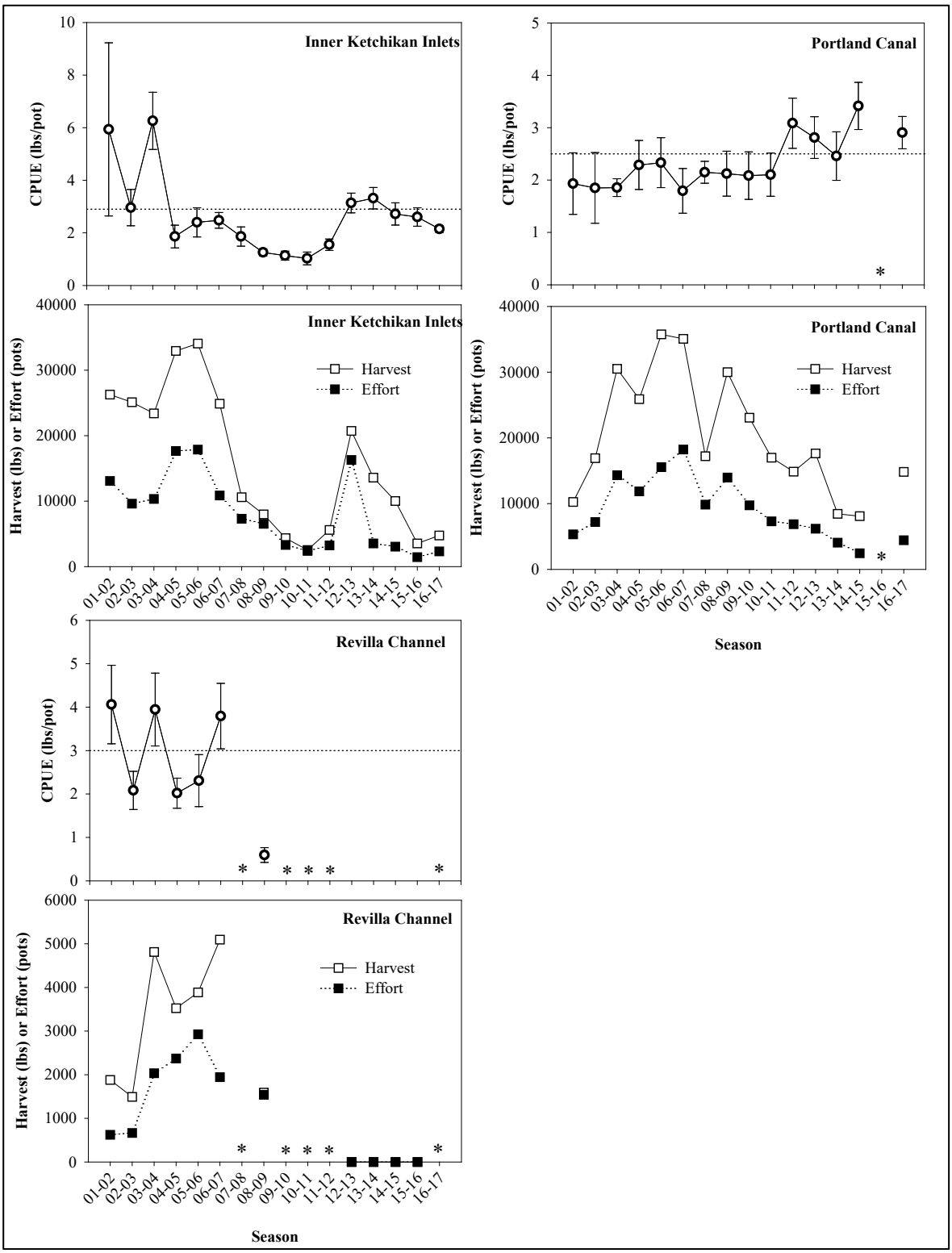
Figure 4.–Page 2 of 2.



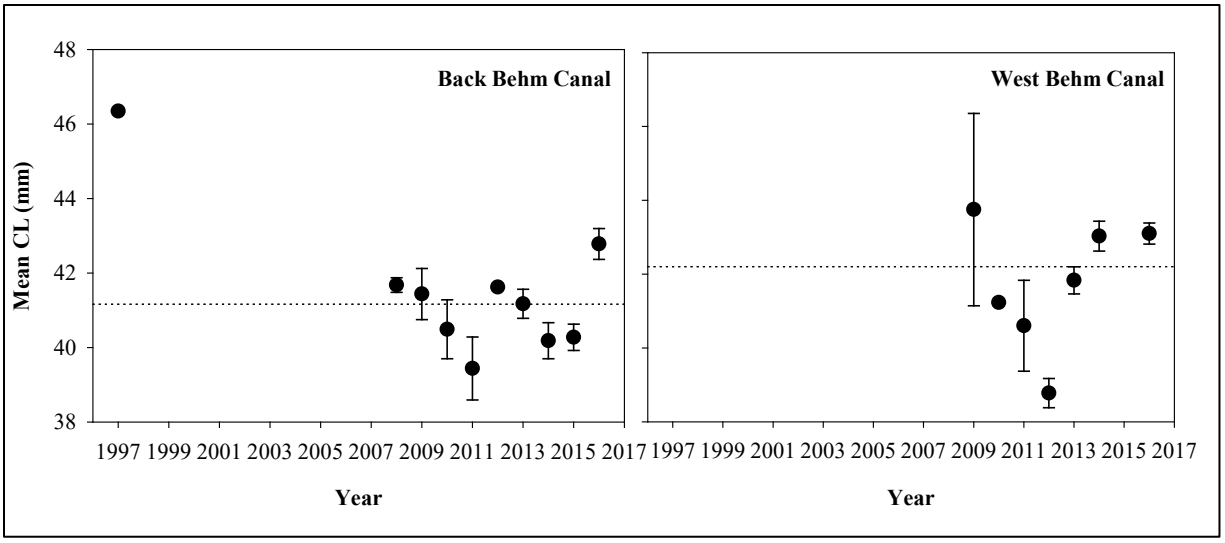


Figure 5.–Mean and standard error of spot shrimp carapace length from floating processor and on-the-grounds sampling in District 1, 1997/98–2016/17 seasons. Dotted line represents the long-term baseline. Only areas with baselines or 2016/17 season data are shown.

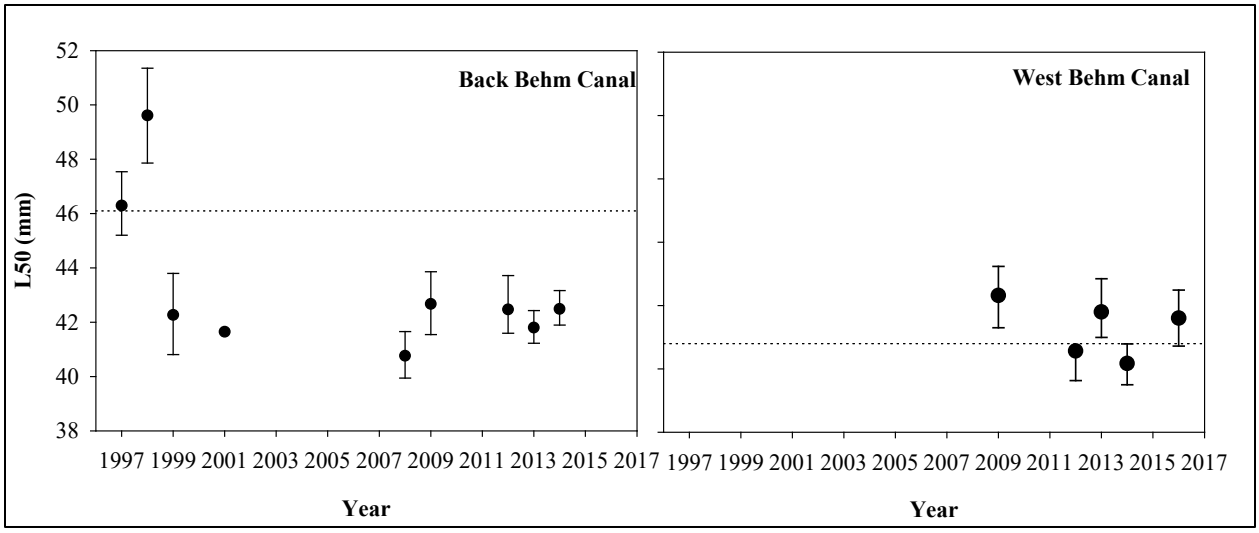


Figure 6.–L_{50} and 95% confidence intervals of spot shrimp from on-the-grounds and dockside sampling in District 1, 1997/98–2016/17 season. Dotted line represents the long-term baseline. Only analysis areas with baselines or 2016/17 season data are shown.

District 2

The GHL in District 2 has changed five times since the 1998/99 season. Due to changes in the estimation of tail weight to whole weight, the GHL for this district increased 32% from 65,000 to 86,000 lb in the 2000/01 fishing season. Before this time tail weight was assumed to be approximately 66% of whole weight; after a large-scale sampling effort this was revised to 50%, which subsequently increased the GHL because tail weight is extrapolated to whole weight for the purposes of catch accounting. The GHL was subsequently reduced 25% back to 65,000 lb for the 2009/10 fishing season (Table 6). Due to negative survey indicators the GHL was reduced 20% prior to the 2014/15 season. Due to extremely poor survey results prior to the 2015/16 season, Kasaan Bay was closed and the GHL reduced an additional 20%. Due to continuing stock declines in Kasaan Bay and in Cholmondeley sound, the GHL was reduced 30% to 30,000 lb prior to the 2016/17 season. Harvest has averaged 64,450 lb (103% of GHL) over the last 10 years. This district is divided into five analysis areas: Cholmondeley Sound, Kasaan Bay, Lower Clarence Strait, Middle Clarence Strait, and Moria Sound (Table 3).

This was the sixth season of preseason surveys in District 2. Survey indicators increased in the 2016 survey. In Kasaan Bay, the catch rate of large class shrimp and mean CL are now both above baseline and show significant 4-year increases, although the increase in CL may be due to the increased relative abundance of large class shrimp. Catch rates of large class shrimp increased slightly in Cholmondeley Sound but remain significantly below baseline. The catch rate of small class shrimp dropped sharply to the lowest level since the survey began. Mean carapace length also increased, again likely due to the change in ratio of small class to large class shrimp. L_{50} remains at baseline in Kasaan Bay and below baseline in Cholmondeley Sound (Table 7, Figures 7 and 8).

Districtwide standardized CPUE increased slightly form the historic low in 2015/16 and now is the second lowest since standardization was possible (Figure 9). This modest increase is due to standardized commercial CPUE increasing to baseline levels in Cholmondeley Sound (Table 7 and Figure 10).

On-the-grounds sampling was not conducted in District 2 in the 2016/17 season (Table 7, Figures 11 and 12).

Models for harvest rate from commercial logbook data showed no fit in Cholmondeley or Moria Sounds (the only analysis areas fished in 2016/17). Logbook derived catch rate trends in Cholmondeley Sound showed no change from the past seasons (Table 7).

Manager scores were negative for Kasaan Bay and neutral for all other areas in this district.

The overall matrix score for District 2 is 1.06 (above average), up from -5.08 (below average) in 2015/16. This precipitous increase is due to increased catch rates in Kasaan Bay, increased survey mean CL in both areas, and an increase in standardized CPUE in Cholmondeley Sound. District 2 data have moderate confidence (0.51), a slight decrease from last season due to the loss of OTG data.

All three sub areas of Kasaan Bay showed increases in large class shrimp abundance. However, only in the outer Bay (Kasaan Island area) is there any sign that small class shrimp may be starting to recover, though abundance is still depressed since the start of the survey. Both Twelvemile Arm in Kasaan Bay and Divide Head in Cholmondeley Sound show very similar trends over the past few years; in both areas, large class shrimp now have a higher CPUE than

small class shrimp (although both are low compared to other areas surveyed in District 2). This is somewhat concerning since small shrimp are the basis for future large shrimp. Interestingly, it is likely that these two areas have the most pressure from personal use fishing. One important note is that although matrix scores for Kasaan Bay show mostly positive and neutral indicators, it is clear looking at fishery performance that the survey began when the population was in decline and that the shrimp population in Kasaan Bay is in poor health compared to years past.

The increase in matrix scores in District 2 is very encouraging, especially after three years of GHL reductions without apparent stock health increases. Additionally, despite the caveats mentioned above, the Kasaan Bay portion of the stock seems to be responding after 2 years of closure. However, commercial CPUE is still at its second lowest level since standardization was possible.

Table 6.–District 2 matrix, Part A. A 15-season history, including stock assessment recommendations, for the pot shrimp fishery in Southeast Alaska.

Season	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
Upper regulatory GHR	86,000	86,000	86,000	86,000	120,000	120,000	120,000	120,000
Actual GHL (lb spot shrimp)	86,000	86,000	86,000	86,000	86,000	86,000	86,000	65,000
Recommended GHL or stock status	–	–	Moderate	Moderate	Moderate	Poor	Moderate	Below Average
Season length (days)	30	21	13	14	20	113	122	33
Landings (number)	144	187	163	150	189	175	219	140
Harvest (lb spot shrimp)	89,581	96,687	88,258	83,052	99,092	89,786	87,936	64,965

Season	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Upper regulatory GHR	120,000	120,000	120,000	120,000	120,000	120,000	120,000
Actual GHL (lb spot shrimp)	65,000	65,000	65,000	65,000	52,000	42,000	30,000
Recommended GHL or stock status	Below Average	Moderate	Below Average	Below Average	Poor	Below Average	Moderate
Season length (days)	33	20	15	19	17	26	13
Landings (number)	149	127	111	154	110	93	44
Harvest (lb spot shrimp)	68,893	75,425	74,631	62,250	50,826	39,203	30,630

Note: En dash = not available.

Table 7.–District 2 matrix, Part B. Baselines, current season values, and scores for each stock status parameter and analysis area for the pot shrimp fishery in Southeast Alaska. Data sources are from ADF&G shrimp survey, fish tickets ("fish tix"), logbooks, and on-the-grounds (OTG) and dockside (DS) sampling of commercial catch. Data are divided by type: CPUE, harvest rate, mean carapace length (CL), and L_{50}. Score for each analysis area is the sum of all individual scores.

Analysis Area		Cholmondeley Sound			Kasaan Bay			Lower Clarence		
Area weighting			0.29			0.48			0.04	
Stock Status Parameters	Source	Baseline	Value	Score	Baseline	Value	Score	Baseline	Value	Score
Catch rate ≥XL	survey	3.2	2.4	-1.00	1.4	2.3	1.00	–	–	–
4-yr trend in catch rate	survey	–	No trend	0.00		Sig. inc.	0.25	–	–	–
Std. Comm. CPUE	fish tix	5.0	4.8	0.00	5.0	Closed		3.1	No Effort	
4-yr trend in CPUE	fish tix	–	Sig. inc.	0.25	–	–	–	–	–	–
Catch rate ≥XL	logbook	–	No trend	0	–	–	–	–	–	–
Harvest rate ≥XL (2014)	logbook	–	27%	–	–	–	–	–	–	–
Harvest rate ≥XL (2015)	logbook	–	72%	–	–	–	–	–	–	–
Harvest rate ≥XL (2016)	logbook	–	–	–	–	–	–	–	–	–
Mean CL	survey	35.2	35.7	0.00	35.5	37.2	1.00	–	–	–
4-yr trend in CL	survey		Sig. inc.	0.25		Sig. inc.	0.25	–	–	–
Mean CL	OTG	37.8	–	–	39.5	–	–	–	–	–
4-yr trend in CL	OTG	–	–	–	–	–	–	–	–	–
Mean CL	DS	–	–	–	–	–	–	–	–	–
4-yr trend in CL	DS	–	–	–	–	–	–	–	–	–
L_{50}	survey	39.3	38.3	-1.00	38.2	38.1	0.00	–	–	–
L_{50}	OTG/DS	39.3	–		39.7			–	–	–
Manager scores		–	–	0.00	–	–	-1.00	–	–	0.00
Score		–	–	-1.50	–	–	1.50	–	–	0.00
Max. possible score		–	–	6.75	–	–	4.50	–	–	1.00
Stock status		–	–	–	–	–	–	–	–	–
Confidence		–	–	0.53	–	–	0.35	–	–	0.06

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Table 7.–Page 2 of 2.

Analysis Area		Middle Clarence			Moria Sound			
Area weighting			0.02			0.17		
Stock Status Parameters	Source	Baseline	Value	Score	Baseline	Value	Score	Total Score
Catch rate ≥XL	survey	–	–	–	–	–	–	0.66
4-yr trend in catch rate	survey	–	–	–	–	–	–	0.41
Std. Comm. CPUE	fish tix	2.7	No Effort		4.9	3.0	-1.00	-0.12
4-yr trend in CPUE	fish tix	–	–	–	–	No trend	0.00	0.11
Catch rate ≥XL	logbook	–	–	–	–	–	–	0.00
Harvest rate ≥XL (2014)	logbook	–	–	–	–	–	–	–
Harvest rate ≥XL (2015)	logbook	–	–	–	–	18%		–
Harvest rate ≥XL (2016)	logbook	–	–	–	–	–	–	–
Mean CL	survey	–	–	–	–	–	–	0.42
4-yr trend in CL	survey	–	–	–	–	–	–	0.17
Mean CL	OTG	–	–	–	36	–	–	–
4-yr trend in CL	OTG	–	–	–	–	–	–	–
Mean CL	DS	–	–	–	–	–	–	–
4-yr trend in CL	DS	–	–	–	–	–	–	–
L_{50}	survey	–	–	–	–	–	–	-0.25
L_{50}	OTG/DS	–	–	–	–	–	–	–
Manager scores		–	–	0	–	–	0.00	-0.32
Score		–	–	0.00	–	–	-1.00	1.16
Max. possible score		–	–	1.00	–	–	2.25	4.92
Stock Status		–	–	–	–	–	–	Above Average
Confidence		–	–	0.06	–	–	0.18	0.36

Note: * indicates confidential data with less than three permits participating. En dashes = not available, NA = not applicable, *Sig. inc.* = significant increase, *Sig. dec.* = significant decrease, ≥XL = ≥40 mm CL.

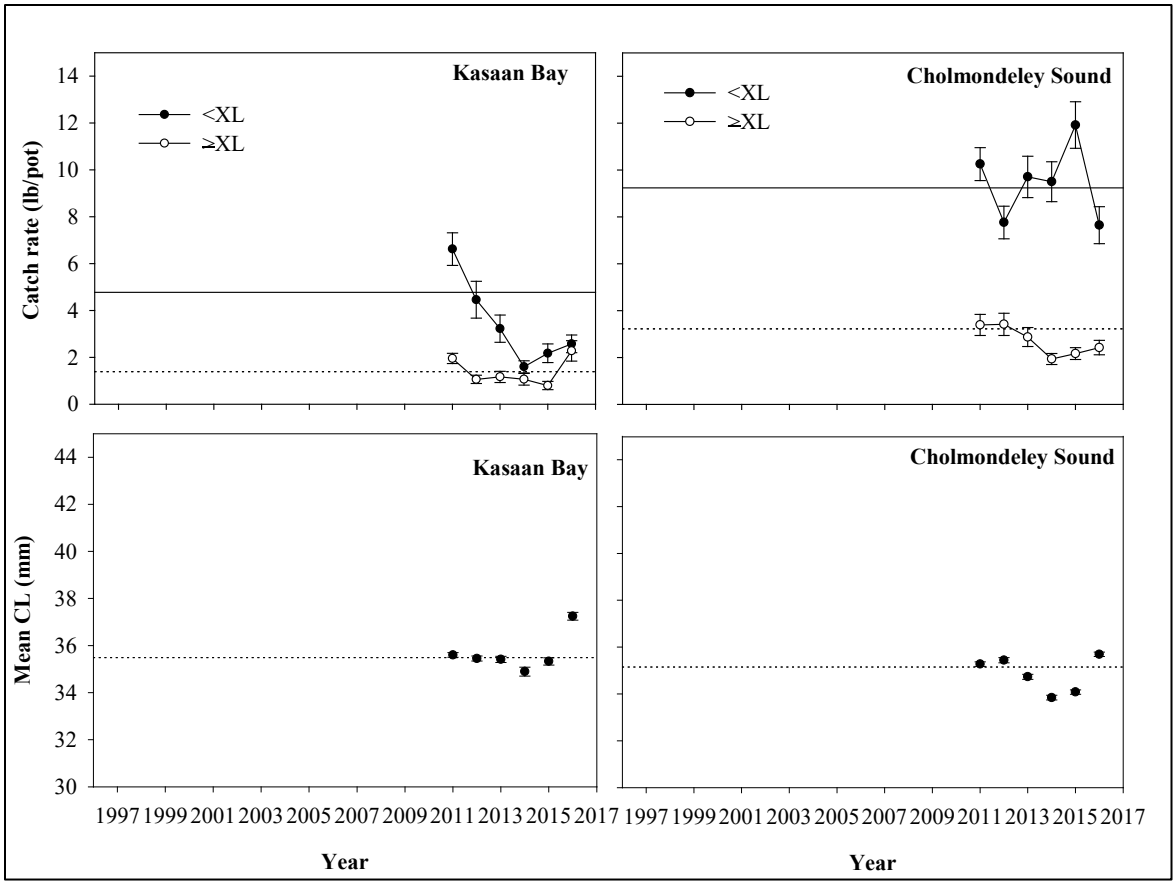

Figure 7.–Mean and standard error of spot shrimp catch rate (upper panels), and carapace length (lower panels) from preseason surveys in District 2, 2011–2016. Lines represent the long-term baselines.

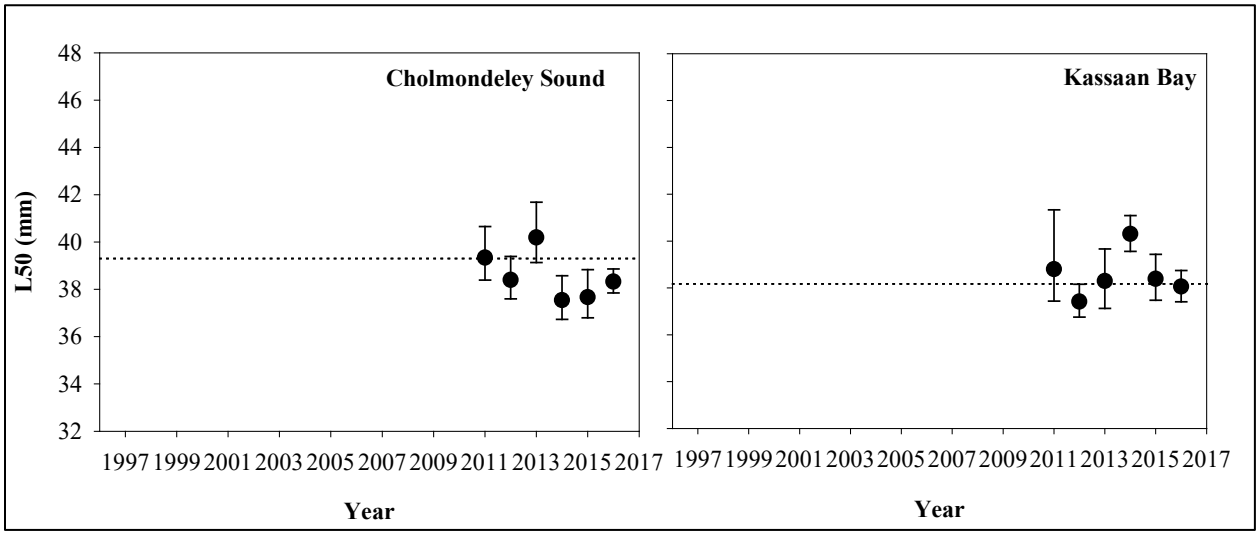

Figure 8.–L_{50} and 95% confidence intervals of spot shrimp from preseason surveys in District 2, 2011–2016. Dotted line represents the long-term baseline.

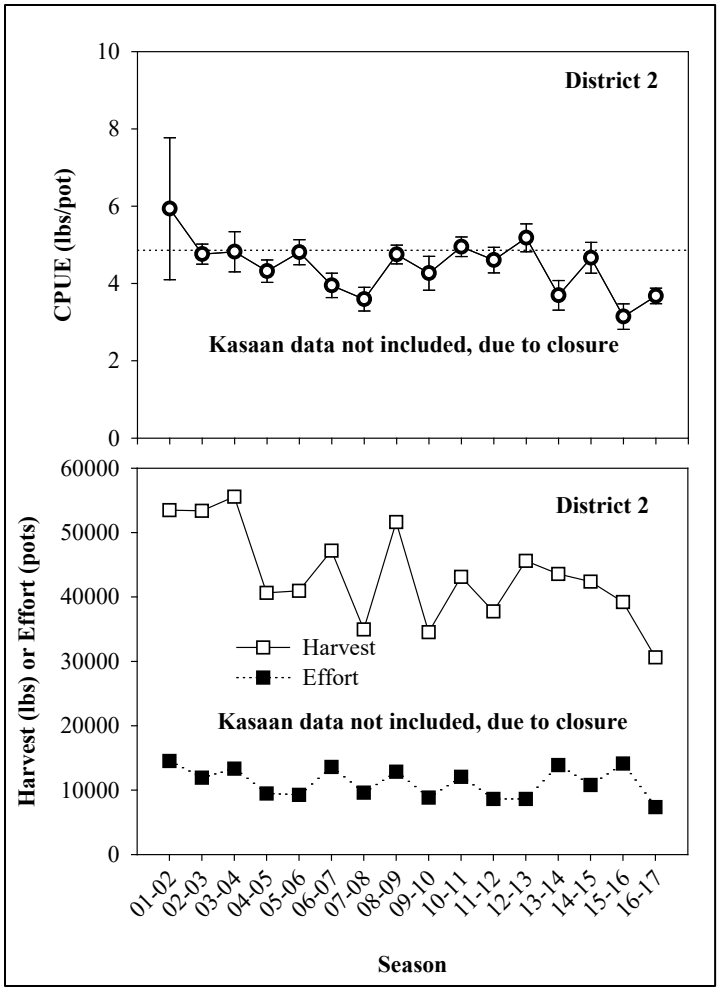

Figure 9.–Districtwide CPUE and effort data for District 2, 2001/02–2016/17 seasons. CPUE is weighted by analysis area weights to allow for an overall impression of fishery performance.

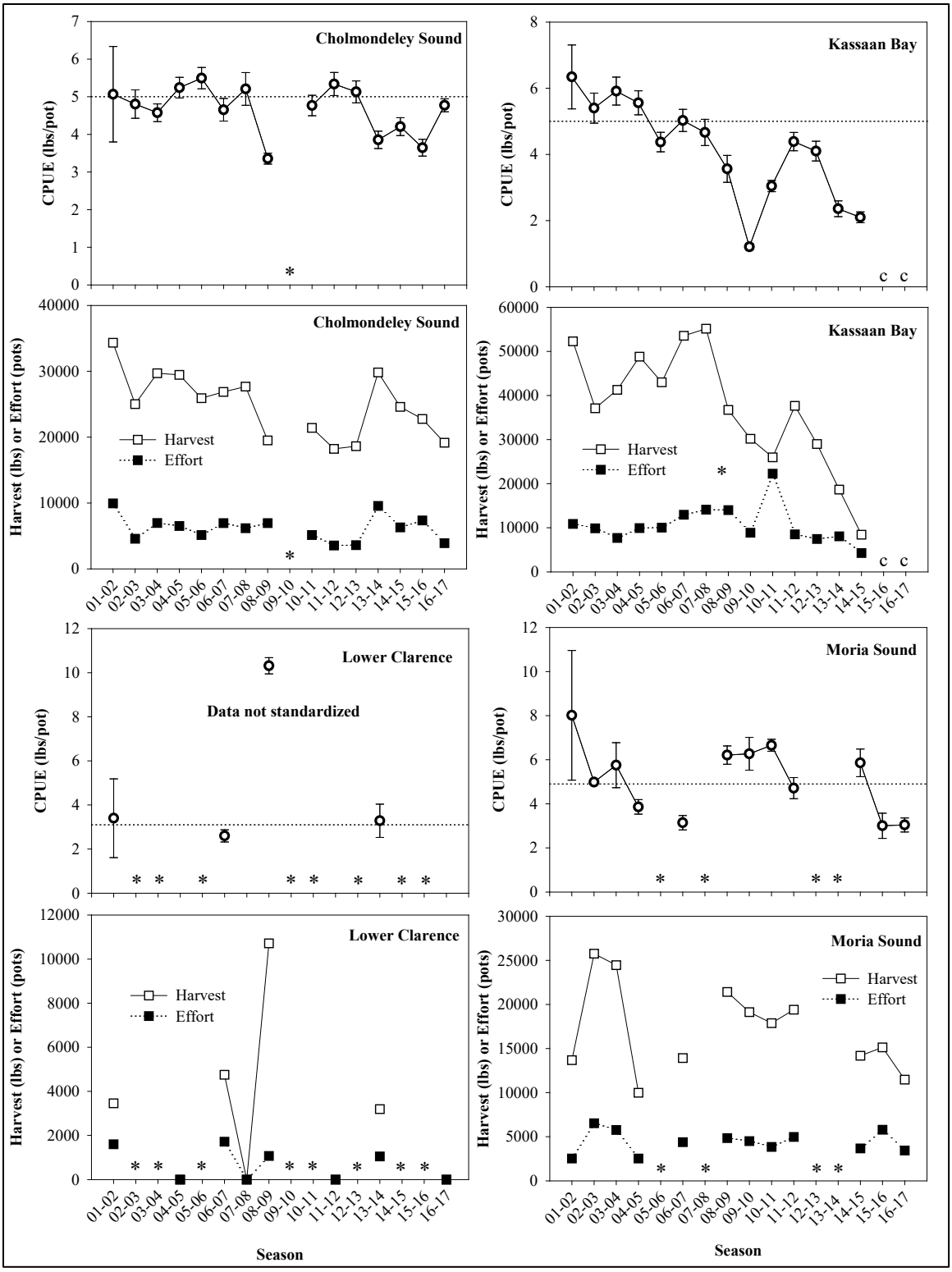

Figure 10.–Mean and standard error of spot shrimp catch rate from commercial harvest (dotted line represents the long-term baseline) and the commercial harvest and effort by analysis area in District 2, 2001/02–2016/17 seasons. Asterisks (*) indicate confidential data with less than three permits participating.

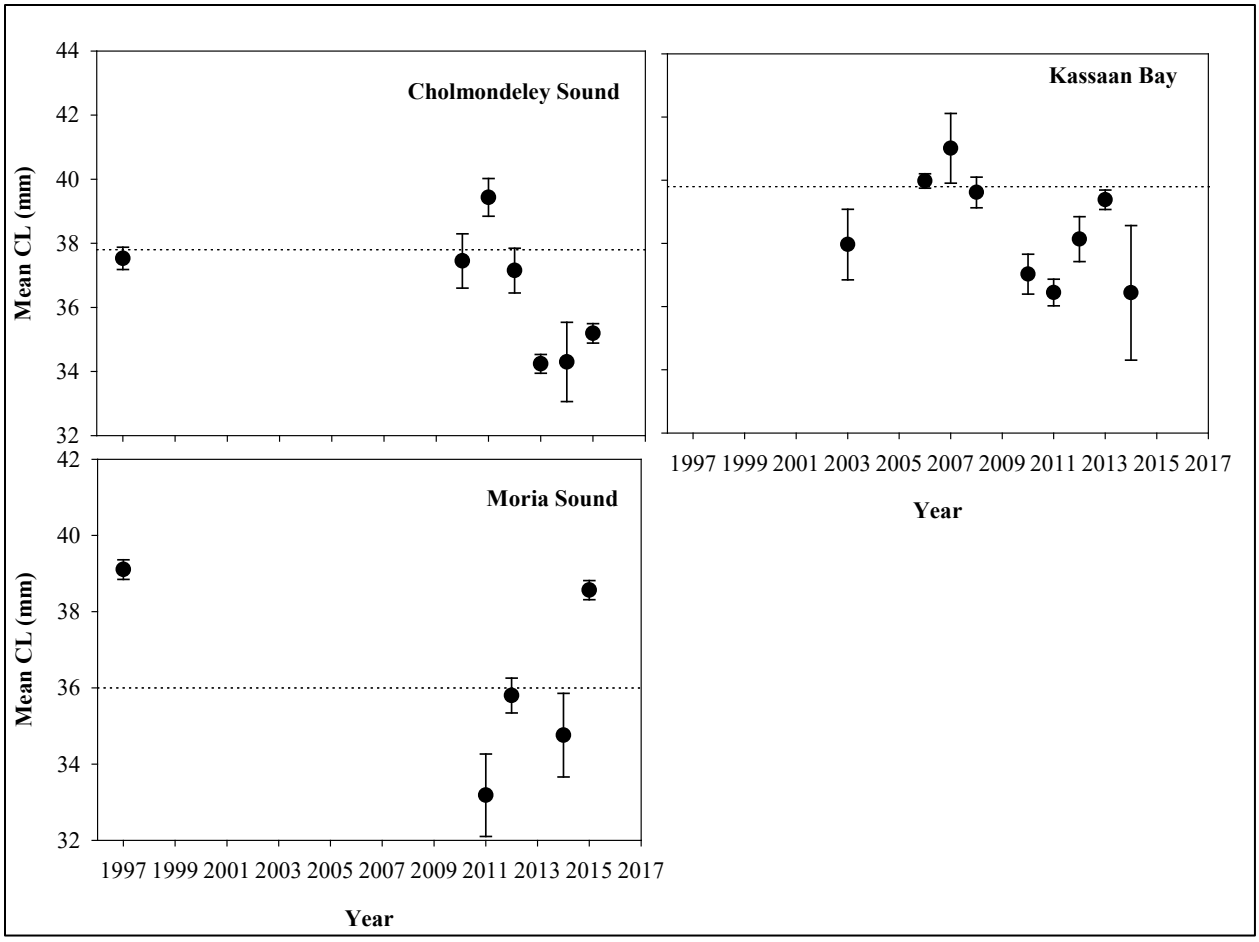

Figure 11.–Mean and standard error of spot shrimp carapace length from floating processor and on-the-grounds sampling in District 2, 1997/98–2016/17 seasons. (Dotted line represents the long-term baseline.) Only areas with baselines or 2016/17 season data are shown.

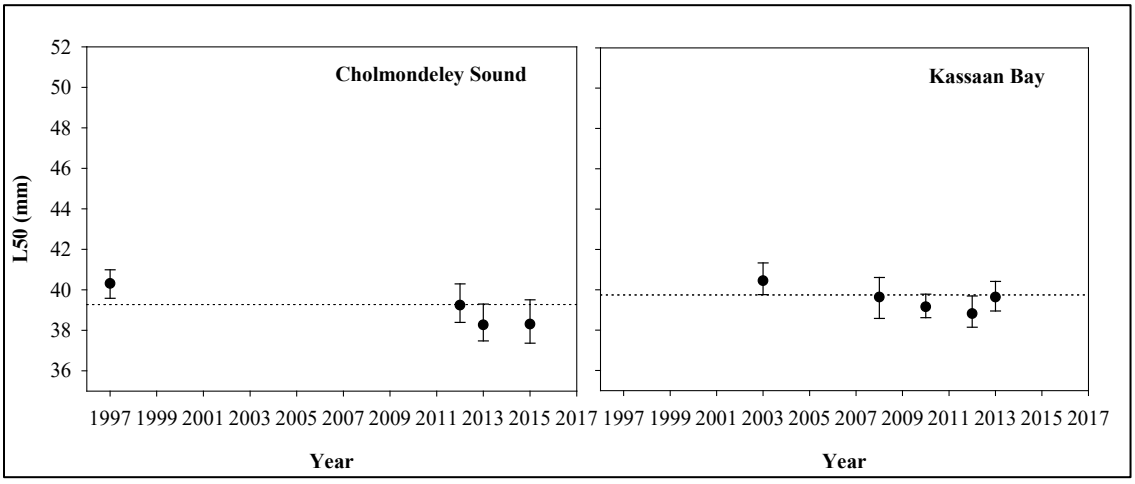

Figure 12.–L_{50} and 95% confidence intervals of spot shrimp from floating processor, on-the-grounds and dockside sampling in District 2, 1997/98–2016/17 seasons. Only areas with baselines or 2016/17 season data are shown.

District 3

Section 3-A

The GHL in Section 3-A has changed four times since the 1998/99 season. The GHL for this section was established at 264,000 lb beginning with the 2000/01 fishing season, when Section 3-A was split from Sections 3-B and C (Table 8). Prior to this, the GHL was 200,000 lb. In response to poor stock status, the Section 3-A GHL was reduced to 198,000 lb (-25%) for the 2004/05 fishing season, to 158,400 lb (-20%) for the 2008/09 fishing season, and then to 95,000 lb (-40%) for the 2010/11 season. The GHL was increased prior to the 2015/16 season to 114,000 lb. Over the last 10 years, harvest has averaged 128,700 lb (102% of GHL); however, in the past four seasons harvest has averaged 117% of the GHL. This section is divided into four analysis areas: Hetta Inlet, Lower Cordova Bay, Mid Cordova Bay, and Upper Cordova Bay (Table 3).

Survey catch rate of large class shrimp increased slightly in Hetta Inlet and is now at baseline, although it remains below baseline in Mid Cordova Bay. Catch rates of small class shrimp also increased slightly in Hetta Inlet but continued to drop sharply in Mid Cordova Bay. Mean survey CL increased strongly in both areas, though in Mid Cordova Bay this is likely explained by the continued loss of small class shrimp (Figure 13). L_{50} is below baseline in Hetta Inlet and at baseline in Mid Cordova. Due to inclement weather, there was no 2013 preseason survey, so 4-year trends could not be analyzed (Table 9, Figure 13 and 14).

Sectionwide CPUE showed an increase this season after a small drop in 2015/16 (Figure 15). Standardized commercial CPUE for Section 3-A was significantly below the baseline in Mid Cordova Bay and at the baseline for all other areas. Four-year analysis of standardized CPUE shows an increase in Lower Cordova Bay, a decrease in Mid Cordova Bay, and no trend for all other areas (Table 9, Figure 16).

On-the-grounds sampling showed CL above baseline in Mid Cordova Bay, at baseline in Upper Cordova Bay, and below baseline in Lower Cordova Bay. Insufficient L_{50} samples were taken to run analyses (Table 9, Figures 17 and 18).

Commercial logbook data showed the harvest rate of large class shrimp at 58% (excessive) in Hetta Inlet, 63% (excessive) in Upper Cordova Bay, and 12% (low) in Lower Cordova Bay.

Manager scores were neutral in all areas (Table 9).

The overall matrix score is -0.77 (moderate), up from -2.14 (below average) in the 2015/16 season, with 0.33 (moderate) confidence. This increase is due to the increased catch rate of large class shrimp in Hetta Inlet, the increased mean survey CL in Hetta Inlet, and the decreased logbook harvest rate in Lower Cordova Bay.

The fishery appears to be stable or increasing in most analysis areas with the exception of Mid Cordova Bay, where all estimates of abundance (survey catch rate, standardized commercial CPUE) are below average and declining. Although Mid Cordova Bay has traditionally made up only 10% of the harvest in Section 3-A, the magnitude of the decline is troubling.

Table 8.–Section 3-A matrix, Part A. A 15-season history, including stock assessment recommendations, for the pot shrimp fishery in Southeast Alaska.

Season	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Upper regulatory GHR	264,000	264,000	264,000	264,000	264,000	264,000	264,000	264,000	264,000
Actual GHL (lb spot shrimp)	264,000	264,000	198,000	198,000	198,000	198,000	158,400	158,400	95,000
Recommended GHL or stock status	–	211,000	Poor	Poor	Poor	Poor	Poor	Poor	Below Average
Season length (days)	41	47	20	15	18	229	120	32	30
Landings (number)	121	86	88	138	355	302	265	293	164
Harvest (lb spot shrimp)	264,653	284,808	256,392	202,186	205,435	182,145	114,048	137,015	85,228

Season	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Upper regulatory GHR	264,000	264,000	264,000	264,000	264,000	264,000
Actual GHL (lb spot shrimp)	95,000	95,000	95,000	95,000	114,000	114,000
Recommended GHL or stock status	Below Average	Below Average	Moderate	Moderate	Moderate	Moderate
Season length (days)	19	16	13	10	14	13
Landings (number)	171	156	132	135	147	150
Harvest (lb spot shrimp)	97,632	107,643	123,238	111,098	116,235	136,240

Note: En dash = not available.

Table 9.–Section 3-A matrix, Part B. Baselines, current season values, and scores for each stock status parameter and analysis area for the pot shrimp fishery in Southeast Alaska. Data sources are from ADF&G shrimp survey, fish tickets ("fish tix"), logbooks, and on-the-grounds (OTG) and dockside (DS) sampling of commercial catch. Data are divided by type: CPUE, harvest rate, mean carapace length (CL), and L_{50}. Score for each analysis area is the sum of all individual scores.

Analysis Area		Hetta Inlet			Lower Cordova Bay		
Area weighting			0.2			0.2	
Stock Status Parameters	Source	Baseline	Value	Score	Baseline	Value	Score
Catch rate ≥XL	survey	3.2	2.9	0.00	–	–	–
4-yr trend in catch rate	survey	–	NA	–	–	–	–
Std. Comm. CPUE	fish tix	7.3	8.6	0.00	6.2	6.1	0.00
4-yr trend in CPUE	fish tix	–	No trend	0.00	–	Sig. inc.	0.25
Catch rate ≥XL	logbook	–	–	–	–	–	–
Harvest rate ≥XL (2014)	logbook	–	–	–	–	10%	–
Harvest rate ≥XL (2015)	logbook	–	60%	–	–	83%	–
Harvest rate ≥XL (2016)	logbook	–	58%	-1.00	–	12%	1.00
Mean CL	survey	34.7	36.4	1.00	–	–	–
4-yr trend in CL	survey	–	NA	–	–	–	–
Mean CL	OTG	37.4	–	–	38.2	35.9	-1.00
4-yr trend in CL	OTG	–	–	–	–	NA	–
Mean CL	DS	–	–	–	–	–	–
4-yr trend in CL	DS	–	–	–	–	–	–
L_{50}	survey	38.5	35.8	-1.00	–	–	–
L_{50}	OTG/DS	37.2	–		38.9	–	–
Manager scores		–	–	0.00	–	–	0.00
Score		–	–	-1.00	–	–	0.25
Max. possible score		–	–	6.25	–	–	4.25
Stock Status		–	–	–	–	–	–
Confidence		–	–	0.41	–	–	0.29

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Table 9.–Page 2 of 2.

Analysis Area		Mid Cordova Bay			Upper Cordova Bay			
Area weighting			0.1			0.5		
Stock Status Parameters	Source	Baseline	Value	Score	Baseline	Value	Score	Total Score
Catch rate ≥XL	survey	0.6	0.4	-1.00	–	–	–	-0.33
4-yr trend in catch rate	survey		NA		–	–	–	–
Std. Comm. CPUE	fish tix	5.9	*	-1.00	5.9	6.6	0.00	-0.03
4-yr trend in CPUE	fish tix	–	Sig. dec.	-0.25	–	No trend	0.00	0.02
Catch rate ≥XL	logbook	–	–	–	–	–	–	–
Harvest rate ≥XL (2014)	logbook	–	–	–	–	–	–	–
Harvest rate ≥XL (2015)	logbook	–	–	–	–	60%	–	–
Harvest rate ≥XL (2016)	logbook	–	–	–	–	63%	-1.00	-0.56
Mean CL	survey	31.8	34.3	1.00	–	–	–	0.67
4-yr trend in CL	survey	–	NA	–	–	–	–	–
Mean CL	OTG	37.1	39.3	1.00	37.5	37.4	0.00	-0.08
4-yr trend in CL	OTG		NA			NA		
Mean CL	Dock S.	–	–	–	–	–	–	–
4-yr trend in CL	Dock S.	–	–	–	–	–	–	–
L_{50}	survey	36.2	35.8	0.00	–	–	–	-0.44
L_{50}	OTG/DS	38.5	–	–	36.6	–	–	–
Manager scores		–	–	0.00	–	–	0	0.00
Score		–	–	-0.25	–	–	-1.00	-0.77
Max. possible score		–	–	6.25	–	–	4.25	5.17
Stock Status		–	–	–	–	–	–	Moderate
Confidence		–	–	0.41	–	–	0.29	0.33

Note: * indicates confidential data with less than three permits participating. En dashes = not available, NA = not applicable, *Sig. inc.* = significant increase, *Sig. dec.* = significant decrease, ≥XL = ≥40 mm CL.

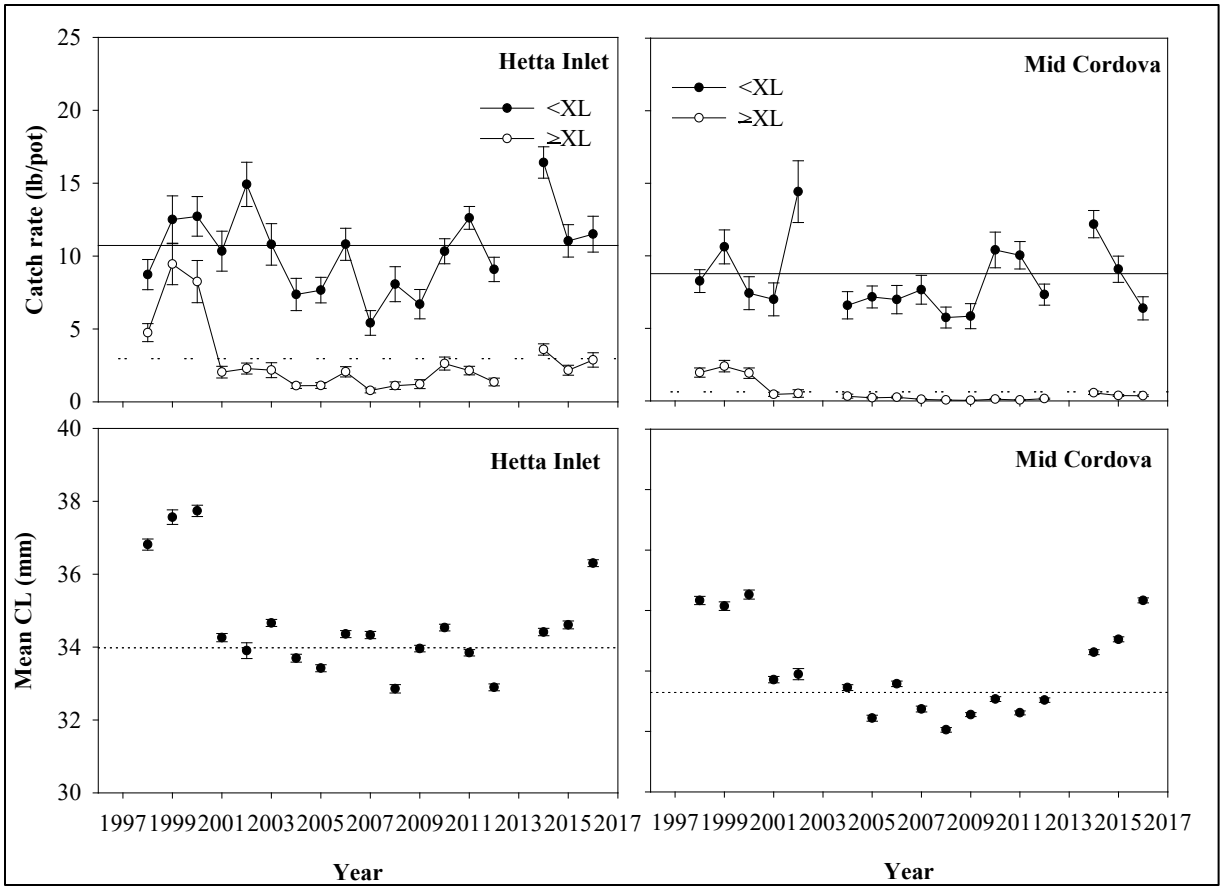

Figure 13.–Mean and standard error of spot shrimp catch rate (upper panels) and carapace length (lower panels) from preseason surveys in Section 3-A, 1998–2016. No survey was conducted in 2013 due to poor weather. Lines represent the long-term baselines.

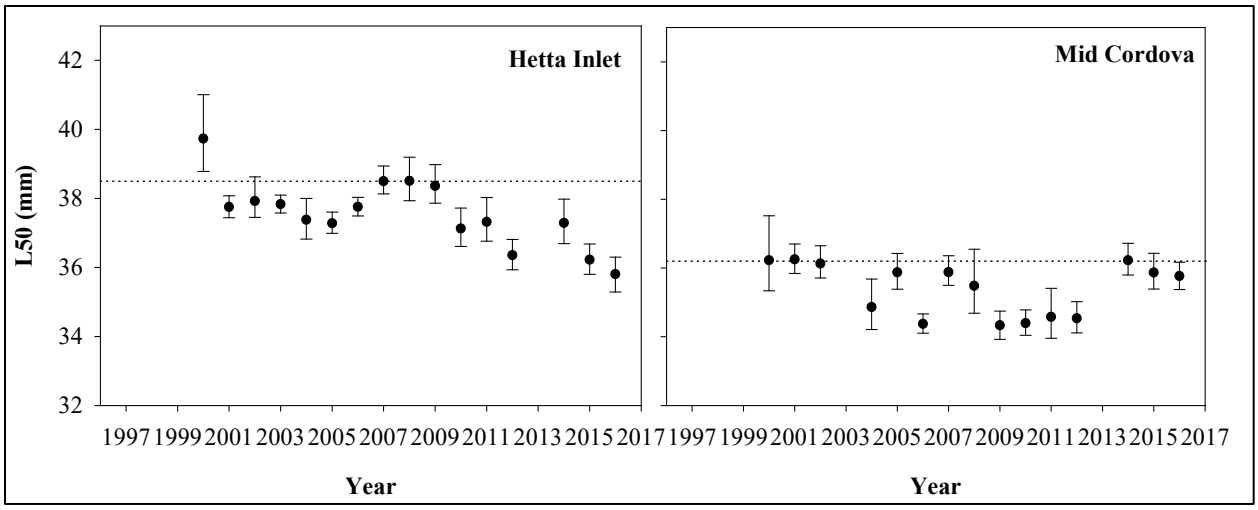

Figure 14.–L_{50} and 95% confidence intervals of spot shrimp from preseason surveys in Section 3-A, 2000–2016. No survey was conducted in 2013 due to poor weather. Dotted line represents the long-term baseline.

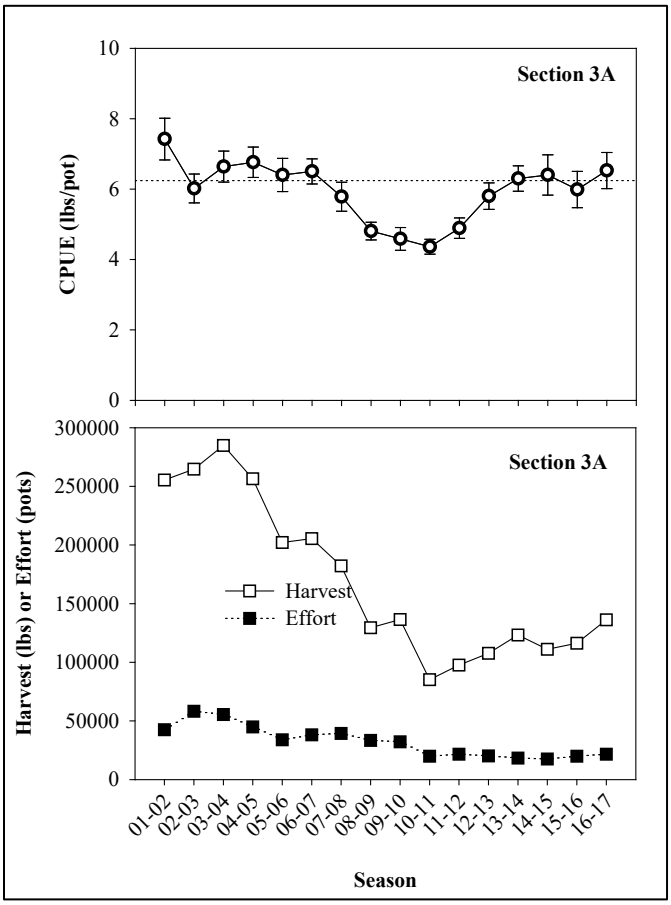

Figure 15.–Sectionwide CPUE and effort data for Section 3A, 2001/02–2016/17 seasons. CPUE is weighted by analysis area weights to allow for an overall impression of fishery performance.

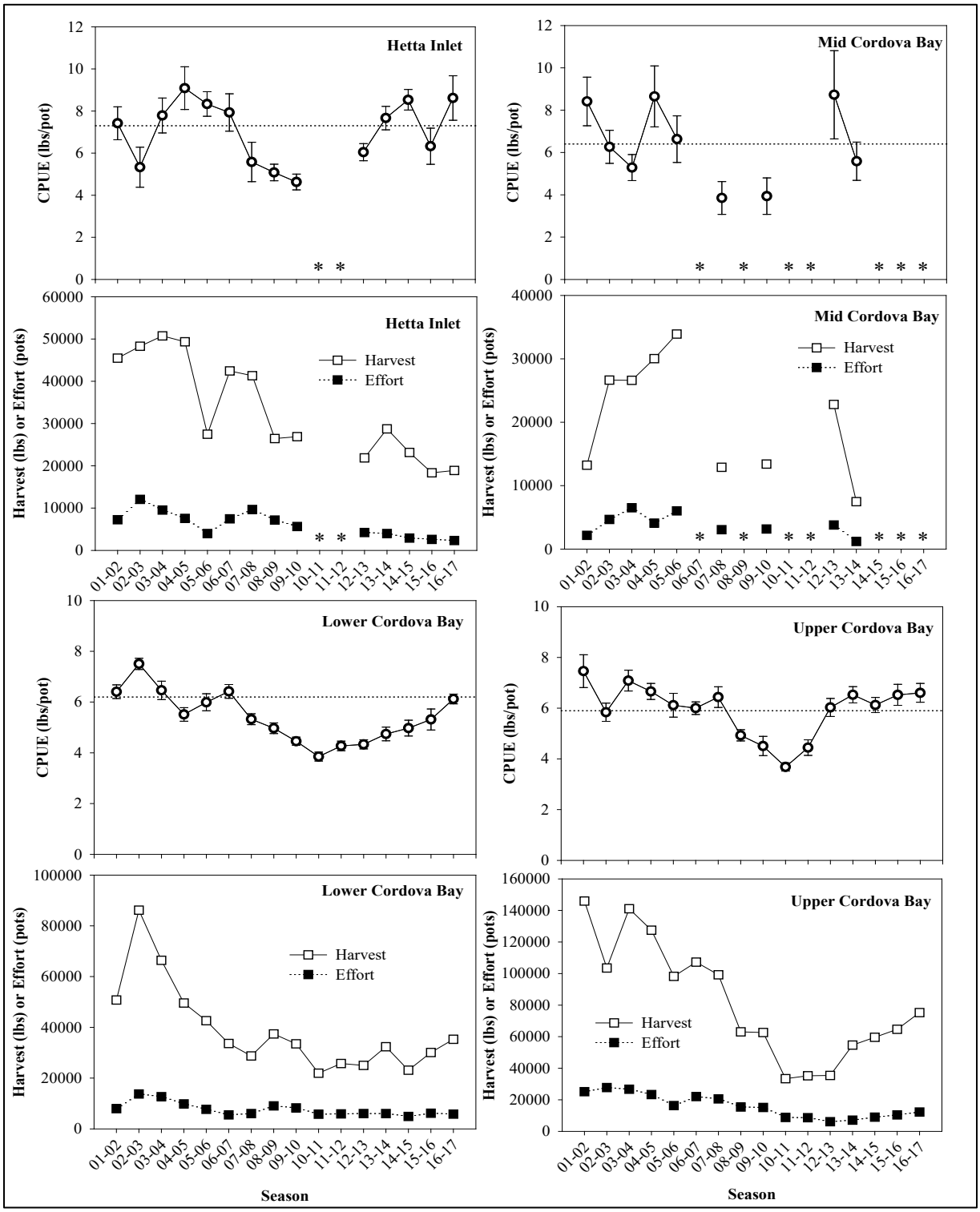

Figure 16.–Mean and standard error of spot shrimp catch rate from commercial harvest (dotted line represents the long-term baseline) and the commercial harvest and effort by analysis area in Section 3-A, 2001/02–2016/17 seasons. * indicates confidential data with less than three permits participating.

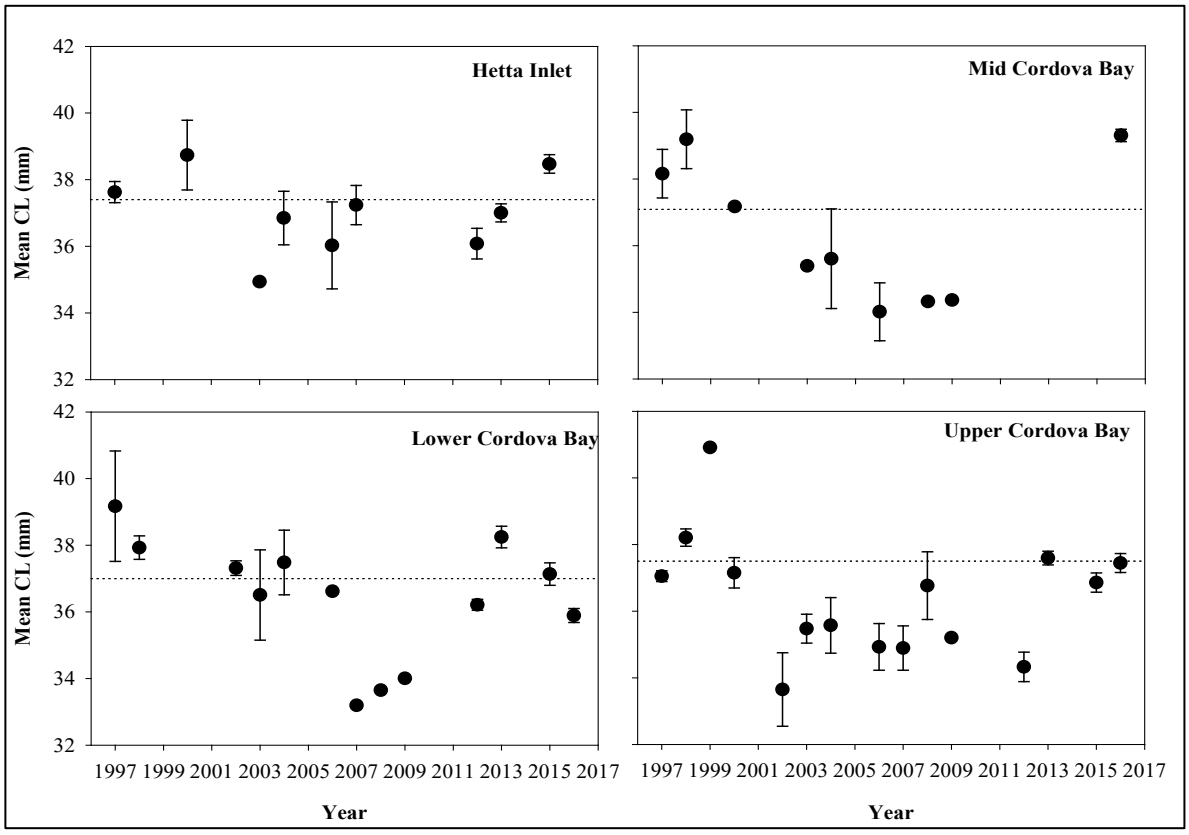

Figure 17.–Mean and standard error of spot shrimp carapace length from floating processor and on-the-grounds sampling in Section 3-A, 2001/02–2016/17 seasons. Dotted line represents the long-term baseline. Only areas with baselines or 2016/17 season data are shown.

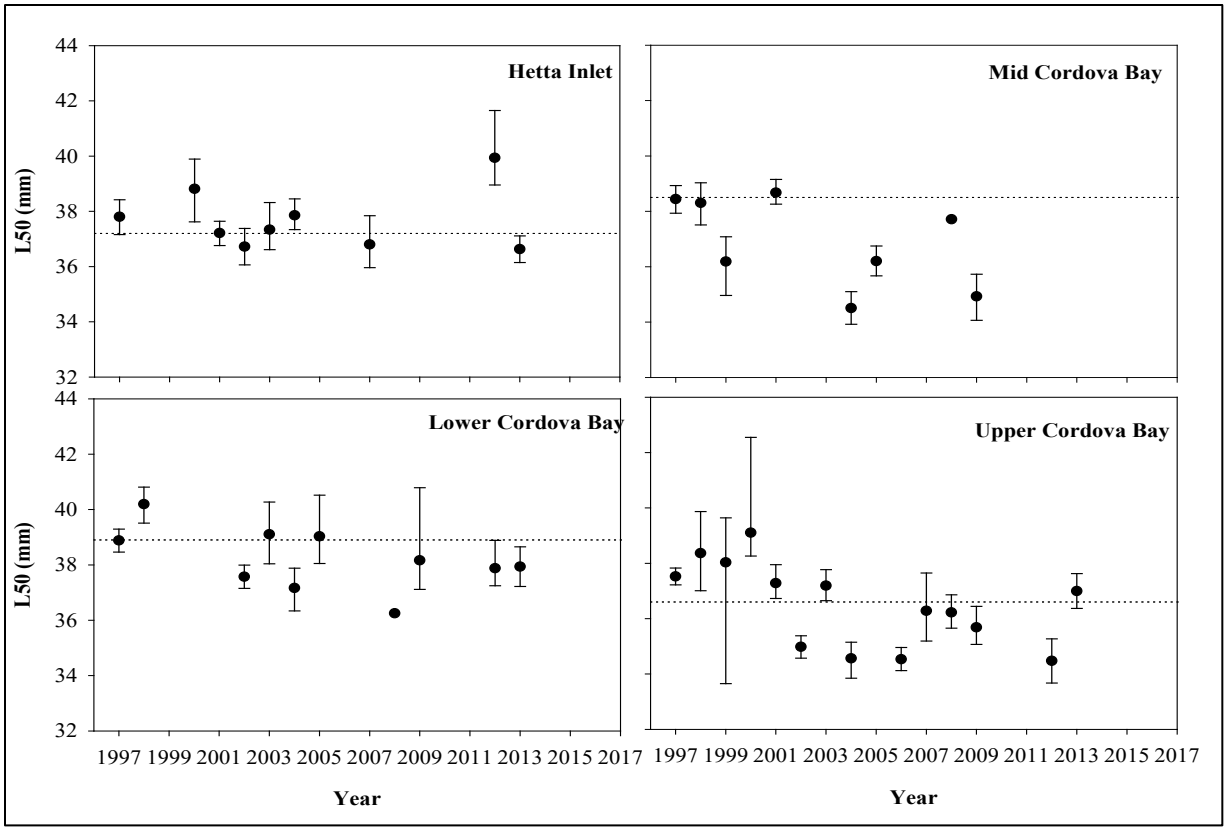

Figure 18.–L_{50} and 95% confidence intervals of spot shrimp from floating processor, on-the-grounds and dockside sampling in Section 3-A, 1997/98–2016/17 seasons. Dotted line represents the long-term baseline. Only areas with baselines or 2016/17 season data are shown.

Sections 3-B/C

The GHL in Sections 3-B/C has changed three times since the 1998/99 season. The GHL for these sections increased to 50,000 lb beginning with the 2000/01 fishing season when they were split from Section 3-A (Table 10). Beginning with the 2007/08 season, the GHL was reduced 20% to 40,000 lb in response to poor stock status. It was further reduced 25% to 30,000 lb for the 2010/11 fishing season due to continued stock health concerns. Harvest has averaged 36,000 lb (110% of the GHL) over the last 10 years. This section is divided into two analysis areas: Craig and Sea Otter Sound (Table 3).

Sectionwide CPUE increased slightly from last season and remains at baseline with high variation (Figure 19). Standardized analysis area commercial CPUE increased in Sea Otter Sound and decreased in Craig; it remains at the baseline in both areas (Table 11, Figure 20).

Commercial logbook data showed no model fit for harvest rate estimation in either area (Table 11).

No on-the-grounds samples were taken during the 2016/17 fishing season.

Manager scores were neutral for both areas (Table 11).

The overall matrix score is 0.00 (moderate), a decrease from 0.10 (moderate) in 2015/16 due to no longer having a significant 4-year increase in CPUE in Craig. Sections 3-B/C has low (0.18) data confidence.

Standardized commercial CPUE and logbooks are the only metric available to assess the population health in Sections 3-B/C. Although fishery-based data are notoriously unreliable for management purposes it seems that the population in this area may be stabilizing after rebounding from a period of below-baseline production.

Table 10.–Sections 3-B/C matrix, Part A. A 15-season history, including stock assessment recommendations, for the pot shrimp fishery in Southeast Alaska.

Season	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
Upper regulatory GHR	50,000	50,000	50,000	50,000	70,000	70,000	70,000	70,000
Actual GHL (lb spot shrimp)	50,000	50,000	50,000	50,000	50,000	40,000	40,000	40,000
Recommended GHL or stock status	–	–	–	–	30,000	Poor	Moderate	Below Average
Season length (days)	21	14	14	6	47	132	120	68
Landings (number)	507	493	421	312	355	252	62	121
Harvest (lb spot shrimp)	53,553	64,839	46,497	56,051	47,309	44,703	29,402	47,054

Season	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Upper regulatory GHR	70,000	70,000	70,000	70,000	70,000	70,000	70,000
Actual GHL (lb spot shrimp)	30,000	30,000	30,000	30,000	30,000	30,000	30,000
Recommended GHL or stock status	Moderate	Moderate	Below Average	Moderate	Moderate	Moderate	Moderate
Season length (days)	22	23	29	19	16	18	14
Landings (number)	44	50	68	52	67	47	52
Harvest (lb spot shrimp)	33,104	40,640	33,107	26,714	36,359	30,492	37,968

Note: En dash = not available.

Table 11.–Sections 3-B/C matrix, Part B. Baselines, current season values, and scores for each stock status parameter and analysis area for the pot shrimp fishery in Southeast Alaska. Data sources are from ADF&G shrimp survey, fish tickets ("fish tix"), logbooks, and on-the-grounds (OTG) and dockside (DS) sampling of commercial catch. Data are divided by type: CPUE, harvest rate, mean carapace length (CL), and L_{50}. Score for each analysis area is the sum of all individual scores.

Analysis Area		Craig			Sea Otter Sound			
Area weighting			0.4			0.6		
Stock Status Parameters	Source	Baseline	Value	Score	Baseline	Value	Score	Total Score
Catch rate ≥XL	survey	–	–	–	–	–	–	–
4-yr trend in catch rate	survey	–	–	–	–	–	–	–
Std. Comm. CPUE	fish tix	4.20	4.10	0.00	5.00	6.10	0.00	0.00
4-yr trend in CPUE	fish tix	–	No trend	0.00	–	No trend	0.00	0.00
Catch rate ≥XL	logbook	–	–	–	–	–	–	–
Harvest rate ≥XL (2014)	logbook	–	–	–	–	13%	–	–
Harvest rate ≥XL (2015)	logbook	–	47%	–	–	–	–	–
Harvest rate ≥XL (2016)	logbook	–	–	–	–	–	–	–
Mean CL	survey	–	–	–	–	–	–	–
4-yr trend in CL	survey	–	–	–	–	–	–	–
Mean CL	OTG	–	–	–	37.9	–	–	–
4-yr trend in CL	OTG	–	–	–	–	–	–	–
Mean CL	DS	–	–	–	–	–	–	–
4-yr trend in CL	DS	–	–	–	–	–	–	–
L_{50}	survey	–	–	–	–	–	–	–
L_{50}	OTG/DS	–	–	–	42.5	–	–	–
Manager scores		–	–	0.00	–	–	0.00	0.00
Score		–	–	0.00	–	–	0.00	0.00
Max. possible score		–	–	2.25	–	–	2.25	1.17
Stock Status		–	–	–	–	–	–	Moderate
Confidence		–	–	0.18	–	–	0.18	0.18

Note: * indicates confidential data with less than three permits participating. En dashes = not available, NA = not applicable, *Sig. inc.* = significant increase, *Sig. dec.* = significant decrease, ≥XL = ≥40 mm CL.

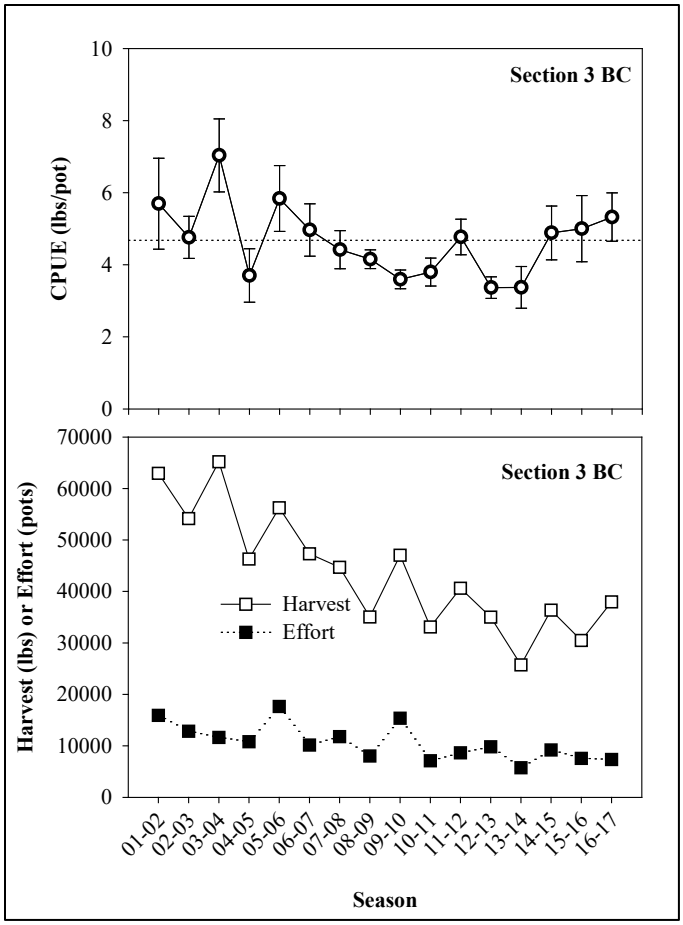

Figure 19.–Sectionwide CPUE and effort data for Sections 3-B/C, 2001/02–2016/17 seasons. CPUE is weighted by analysis area weights to allow for an overall impression of fishery performance.

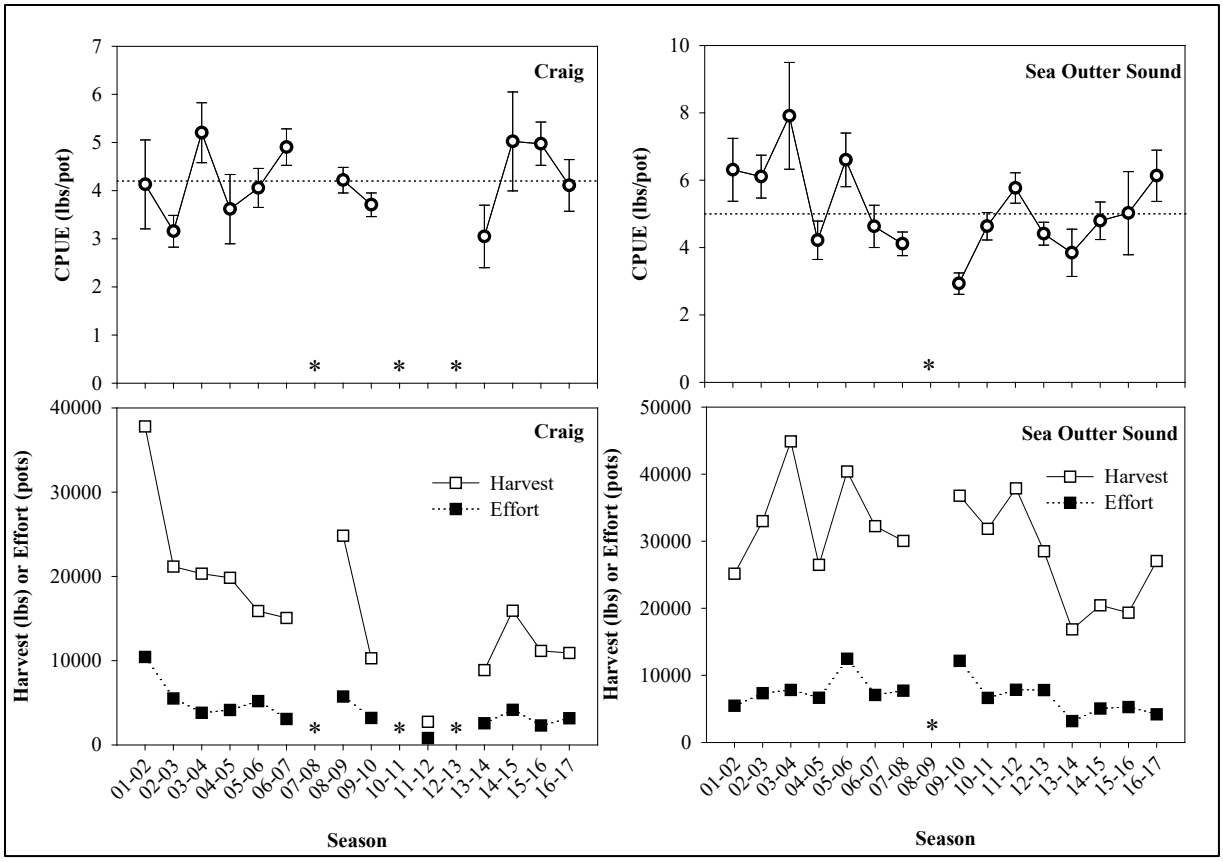

Figure 20.–Mean and standard error of spot shrimp catch rate from commercial harvest (dotted line represents the long-term baseline) and the commercial harvest and effort by analysis area in Sections 3-B/C, 2001/02–2016/17 seasons. * indicates confidential data with less than three permits participating.

District 4

The GHL for District 4 has been 20,000 lb since pot fishery GHLs were first established in the 1995/96 fishing season. Harvest has averaged 12,800 lb (60% of the GHL) over the last 10 years (Table 12). This district is not divided into analysis areas.

Standardized commercial CPUE is at the baseline with no 4-year trend (Table 13, Figure 21).

Commercial logbook data showed the harvest rate of large class shrimp at 99% (excessive) in District 4.

Manager scores were neutral for this area (Table 13).

The overall score for this district is -1.00 (below average) up from -1.25 (below average) in the 2015/16 season due to standard commercial CPUE no longer showing a decreasing 4-year trend. Data confidence is 0.24 (low).

Standardized CPUE is up slightly, although it should be noted that only 63% of the GHL was caught. Annual variation in CPUE in this area is high, and harvest under the current GHL has allowed for the population to rebuild in the past, most notably during the 2005/06–2012/13 period. The excessive harvest of large class shrimp from logbook data is troubling and if it continues, it is likely to negatively affect commercial CPUE in the future.

Table 12.–District 4 matrix, Part A. A 15-season history, including stock assessment recommendations, for the pot shrimp fishery in Southeast Alaska.

Season	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
Upper regulatory GHR	20,000	20,000	20,000	20,000	28,000	28,000	28,000	28,000
Actual GHL (lb spot shrimp)	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Recommended GHL or stock status	–	–	–	–	20,000	Poor	Poor	Above Average
Season length (days)	151	213	150	213	229	229	229	229
Landings (number)	28	53	57	75	68	*	0	66
Harvest (lb spot shrimp)	22,153	20,364	19,296	18,579	15,085	*	0	20,932

Season	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Upper regulatory GHR	28,000	28,000	28,000	28,000	28,000	28,000	28,000
Actual GHL (lb spot shrimp)	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Recommended GHL or stock status	Above Average	Above Average	Above Average	Moderate	Moderate	Below Average	Below Average
Season length (days)	125	229	229	151	151	151	229
Landings (number)	*	*	*	31	53	20	25
Harvest (lb spot shrimp)	*	*	*	9,196	18,129	19,591	12,591

Note: * indicates confidential data with less than three permits participating; en dash = not available.

Table 13.–District 4 matrix, Part B. Baselines, current season values, and scores for each stock status parameter and analysis area for the pot shrimp fishery in Southeast Alaska. Data sources are from ADF&G shrimp survey, fish tickets ("fish tix"), logbooks, and on-the-grounds (OTG) and dockside (DS) sampling of commercial catch. Data are divided by type: CPUE, harvest rate, mean carapace length (CL), and L_{50}. Score for each analysis area is the sum of all individual scores.

Analysis Area		District 4			
Area weighting			1.0		
Stock Status Parameters	Source	Baseline	Value	Score	Total Score
Catch rate ≥XL	survey	–	–	–	–
4-yr trend in catch rate	survey	–	–	–	–
Std. Comm. CPUE	fish tix	2.4	3.0	0.00	0.00
4-yr trend in CPUE	fish tix	–	No trend	0.00	0.00
Catch rate ≥XL	logbook	–	–	–	–
Harvest rate ≥XL (2014)	logbook	–	–	–	–
Harvest rate ≥XL (2015)	logbook	–	78%	–	–
Harvest rate ≥XL (2016)	logbook	–	99%	-1.00	-1.00
Mean CL	survey	–	–	–	–
4-yr trend in CL	survey	–	–	–	–
Mean CL	OTG	–	–	–	–
4-yr trend in CL	OTG	–	–	–	–
Mean CL	DS	–	–	–	–
4-yr trend in CL	DS	–	–	–	–
L_{50}	survey	–	–	–	–
L_{50}	OTG/DS	–	–	–	–
Manager scores		–	–	0.00	0.00
Score		–	–	-1.00	-1.00
Max. possible score		–	–	3.25	2.17
Stock Status		–	–	–	Below Average
Confidence		–	–	0.24	0.24

Note: * indicates confidential data with less than three permits participating. En dashes = not available, NA = not applicable, *Sig. inc.* = significant increase, *Sig. dec.* = significant decrease, ≥XL = ≥40 mm CL.

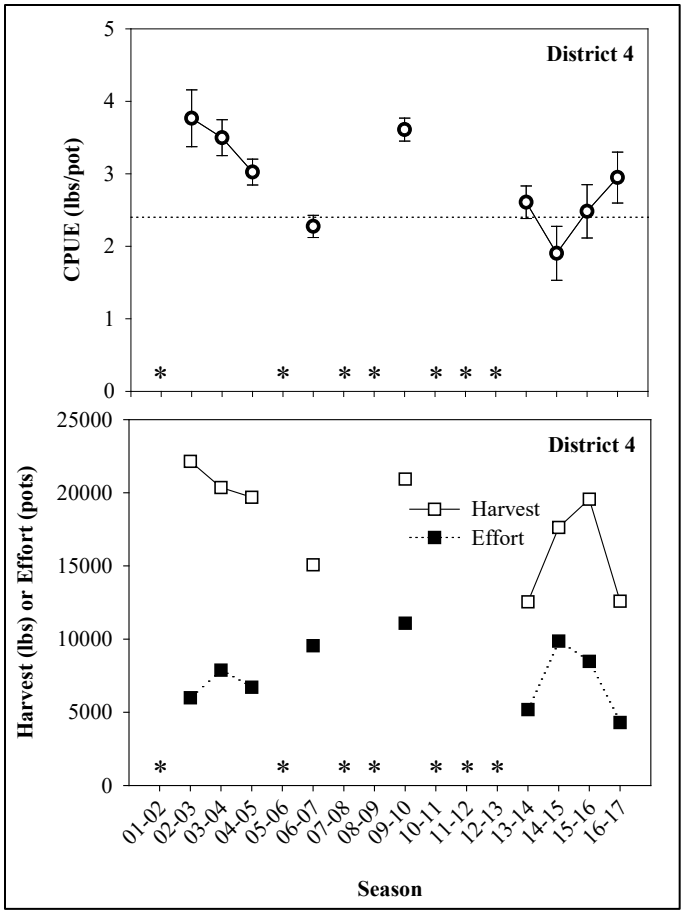

Figure 21.–Mean and standard error of spot shrimp catch rate from commercial harvest (dotted line represents the long-term baseline) and the commercial harvest and effort by analysis area in District 4, 2001/02–2016/17 seasons. * indicates confidential data with less than three permits participating.

PETERSBURG MANAGEMENT AREA

District 5

The GHL for District 5 was unchanged at 20,000 lb from the 1995/96 fishing season until the 2015/16 season when it was reduced to 12,000 lb (-60%) due to poor stock health. Harvest has averaged 5,500 lb (29% of the GHL) over the last 10 seasons (Table 14). This district is divided into three analysis areas: Affleck/Port Beauclerc, Rocky Pass, and Cape Pole to Point Baker (Table 3). The spatial composition of harvest is highly variable in this small-GHL district (Figure 23).

Districtwide CPUE increased strongly from a 14-year low in the 2014/15–2015/16 seasons (Figure 22). Standardized commercial CPUE data are at baseline values in Affleck/Port Beauclerc and significantly below baseline value in Rocky Pass.

Manager scores were neutral for this area (Table 15).

The overall matrix score is 0.04 (moderate) up from -1.85 (poor) for the 2015/16 season, due to increased CPUE in the Affleck/Port Beauclerc analysis area. District 5 data have 0.13 (very low) data confidence (Table 15).

Districtwide effort and harvest in the 2016/17 season were the lowest of any year fished; less than 14% of the GHL was harvested, making it difficult to accurately compare fishery performance between years.

Table 14.–District 5 matrix, Part A. A 15-season history, including stock assessment recommendations, for the pot shrimp fishery in Southeast Alaska.

Season	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
Upper regulatory GHR	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Actual GHL (lb spot shrimp)	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Recommended GHL or stock status	–	–	–	–	20,000	Poor	Moderate	Above Average
Season length (days)	228	229	222	151	151	229	229	151
Landings (number)	96	84	117	49	41	0	18	47
Harvest (lb spot shrimp)	19,049	17,733	21,498	19,282	10,216	0	3,653	16,683

Season	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Upper regulatory GHR	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Actual GHL (lb spot shrimp)	20,000	20,000	20,000	20,000	20,000	12,000	12,000
Recommended GHL or stock status	Above Average	Moderate	Moderate	Below Average	Below Average	Poor	Moderate
Season length (days)	229	229	151	229	229	229	229
Landings (number)	22	42	*	24	9	23	11
Harvest (lb spot shrimp)	10,555	8,568	*	2,768	2,039	4,886	1,666

Note: * indicates confidential data with less than three permits participating; en dash = not available.

Table 15.–District 5 matrix, Part B. Baselines, current season values, and scores for each stock status parameter and analysis area for the pot shrimp fishery in Southeast Alaska. Data sources are from ADF&G shrimp survey, fish tickets ("fish tix"), logbooks, and on-the-grounds (OTG) and dockside (DS) sampling of commercial catch. Data are divided by type: CPUE, harvest rate, mean carapace length (CL), and L_{50}.

Analysis Area		Affleck/Port Beauclerc			Rocky Pass			Cape Pole to Point Baker			
Area weighting			0.60			0.35			0.05		
Stock Status Parameters	Source	Baseline	Value	Score	Baseline	Value	Score	Baseline	Value	Score	Total Score
Catch rate ≥XL	survey	–	–	–	–	–	–	–	–	–	–
4-yr trend in catch rate	survey	–	–	–	–	–	–	–	–	–	–
Std. Comm. CPUE	fish tix	1.7	2.5	0.00	2.2	*	-1.00	1.30	*	–	-0.12
4-yr trend in CPUE	fish tix	–	Sig. inc.	0.25	–	NA	–	–	NA	–	0.17
Catch rate ≥XL	logbook	–	–	–	–	–	–	–	–	–	–
Harvest rate ≥XL (2014)	logbook	–	–	–	–	–	–	–	–	–	–
Harvest rate ≥XL (2015)	logbook	–	–	–	–	–	–	–	–	–	–
Harvest rate ≥XL (2016)	logbook	–	–	–	–	–	–	–	–	–	–
Mean CL	survey	–	–	–	–	–	–	–	–	–	–
4-yr trend in CL	survey	–	–	–	–	–	–	–	–	–	–
Mean CL	OTG	–	–	–	–	–	–	–	–	–	–
4-yr trend in CL	OTG	–	–	–	–	–	–	–	–	–	–
Mean CL	DS	–	–	–	–	–	–	–	–	–	–
4-yr trend in CL	DS	–	–	–	–	–	–	–	–	–	–
L_{50}	survey	–	–	–	–	–	–	–	–	–	–
L_{50}	OTG/DS	–	–	–	–	–	–	–	–	–	–
Manager scores		–	–	0	–	–	0	–	–	0	0.00
Score		–	–	0.00	–	–	0.00	–	–	0.00	0.04
Max. possible score		–	–	2.25	–	–	1.00	–	–	1.00	1.12
Stock Status		–	–	–	–	–	–	–	–	–	Moderate
Confidence		–	–	0.18	–	–	0.06	–	–	0.06	0.15

Note: * indicates confidential data with less than three permits participating. En dashes = not available, NA = not applicable, *Sig. inc.* = significant increase, *Sig. dec.* = significant decrease, ≥XL = ≥40 mm CL.

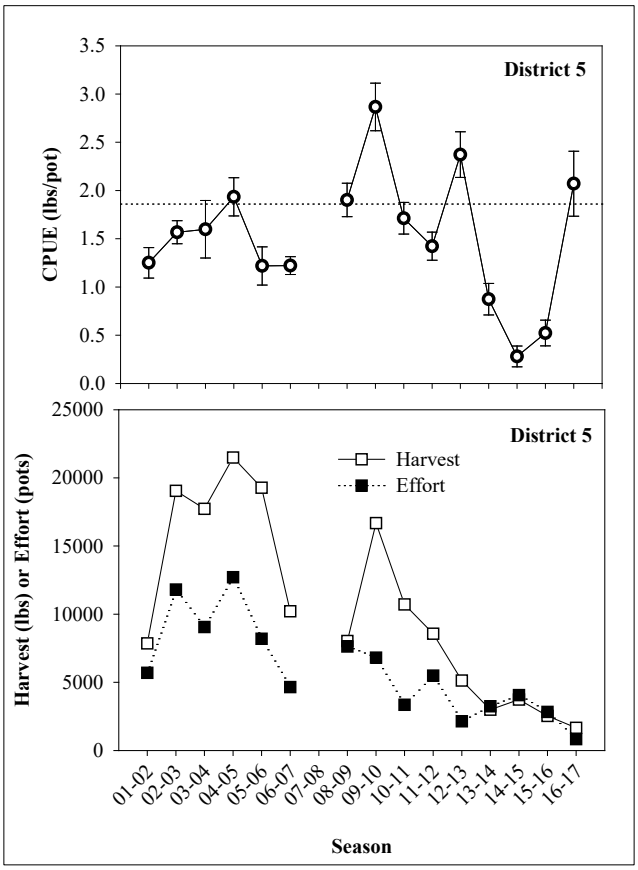

Figure 22.–Districtwide CPUE and effort data for District 5, 2001/02–2016/17 seasons. CPUE is weighted by analysis area weights to allow for an overall impression of fishery performance.

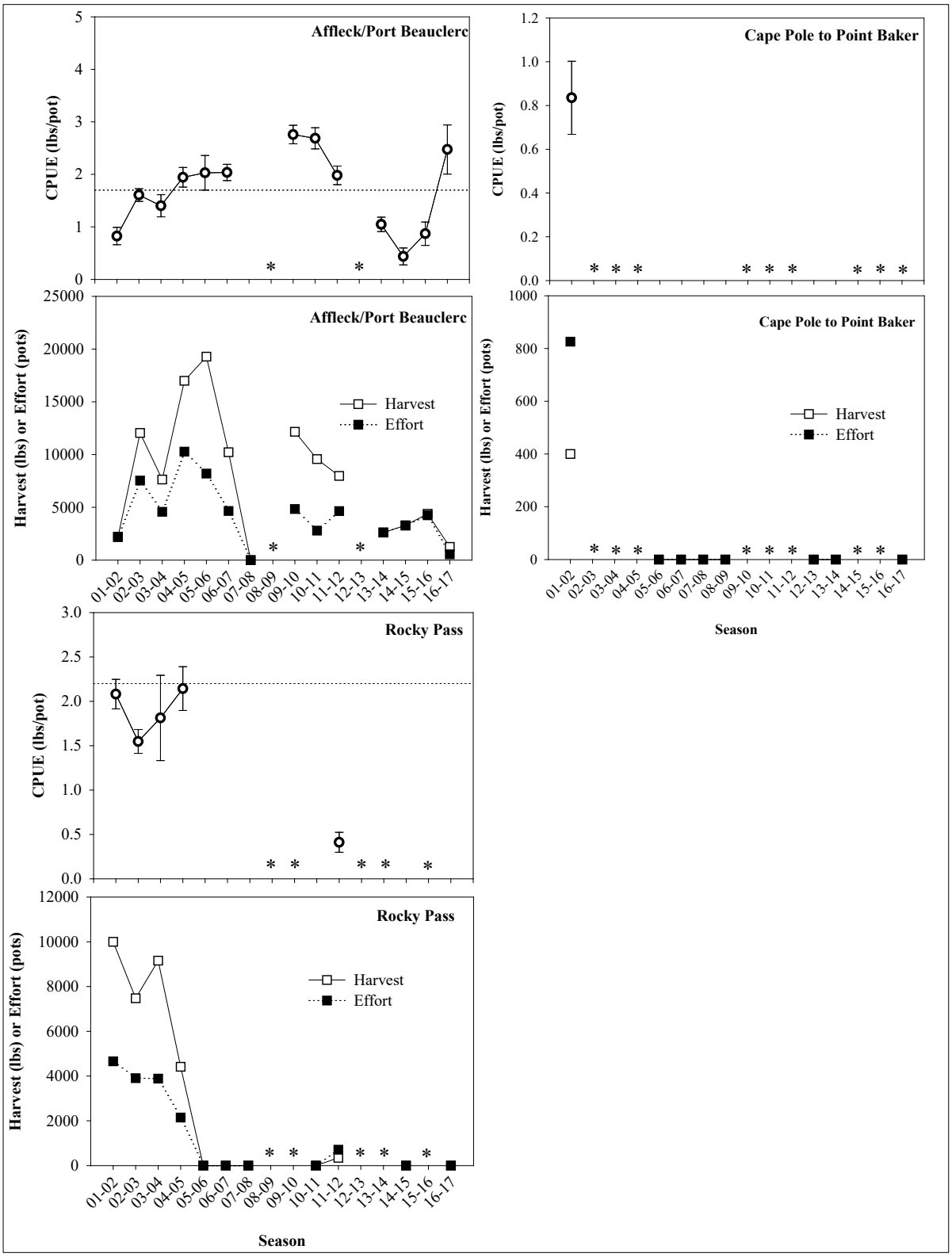

Figure 23.–Mean and standard error of spot shrimp catch rate from commercial harvest (dotted line represents the long-term baseline) and the commercial harvest and effort by analysis area in District 5, 2001/02–2016/17 seasons.* indicates confidential data with less than three permits participating.

District 6

The GHL in District 6 has changed four times since the 1998/99 season. The GHL for District 6 was increased 21% from 68,000 to 82,000 lb for the 2005/06 fishing season. It was reduced back to 68,000 lb for the 2008/09 fishing season. District 6 is divided into three analysis areas: Sumner Strait, SW Etolin Island, and Upper Clarence Strait (Table 3). Although most of the harvest comes from the Upper Clarence analysis area, the spatial composition of harvest has been fairly stable. The GHL in this district was not reached despite an extended season in 2007/08 or in the 2008/09 season when the GHL was further reduced and the season extended (Table 16). In 2009/10, 13,500 lb of the GHL remained unharvested after an 84-day season, and in 2010/11 half the GHL was caught after 94 days of fishing. The 2011/12 fishing season saw an unexpected increase in catch rates in Upper Clarence Strait and 132% of the GHL was caught in 10 days. The GHL was raised 33% to 32,000 lb for the 2012/13 season and an experimental inseason GHL adjustment system was implemented. Over the past 10 years, harvest has averaged 35,600 lb (84% of the GHL).

Commercial CPUE increased or was steady in the 2016/17 season. Districtwide weighted CPUE was up from last season (Figure 24) and is now above baseline. Upper Clarence Strait CPUE showed a strong increase and is now above the baseline and showing a significant increase in the 4-year analysis. Sumner Strait also showed a strong increase and is at baseline. The SW Etolin area CPUE was also at baseline and shows a significant increase in the 4-year analysis (Table 17, Figure 25).

Logbook harvest rate data of large size class shrimp showed good model fit in all areas with catch rates of 48% (moderate) in Upper Clearance, 45% (moderate) in SW Etolin, and 43% (moderate) in Sumner Strait. In Upper Clarence, the catch rate of large class shrimp is steady from the past two seasons (Table 17).

Mean CL from OTG sampling in Upper Clarence Strait increased from last season and is now above the baseline and showing a significant four-year increase (Table 17, Figure 26).

The L_{50} point estimate from OTG sampling in Upper Clarence remains near record low levels since sampling began in 1998 and continues to have very high variation (Table 17, Figure 27). This continued depression of L_{50} values is concerning due to its severity, a more than 2 mm drop in size was seen during the 2015/16 and 2016/17 seasons. However, the estimate is derived from a very small sample, which may not be representative of the analysis area as a whole.

The manager scores were positive in Upper Clarence and SW Etolin, and neutral in Sumner Strait.

The overall matrix score is 1.95 (above average), up from 0.12 (moderate) in the 2015/16 season. The 2016/17 increase was mainly due to increased fishery performance and mean carapace length in Upper Clarence, and well as positive manager scores in SW Etolin and Upper Clarence.

This was the fifth season of using pre-defined criteria to adjust the GHL inseason. The preseason GHL remained at 32,000 pounds of spot shrimp and was not adjusted so the full range of the GHR could be met by inseason adjustments. During the 2016/17 season, adjustments to the preseason GHL resulted in an upward adjustment of 14,800 lb for a final GHL of 44,800 lb.

It seems that the experimental management system in place in District 6 is continuing to work in that it increased harvest when populations were apparently high, reduced harvest to a reasonable

level when populations were apparently low, and has allowed for expanded harvest as populations increased again. During this time, it has consistently allowed for harvest rates between 35% and 48% of the large size class shrimp.

Table 16.–District 6 matrix, Part A. A 15-season history, including stock assessment recommendations, for the pot shrimp fishery in Southeast Alaska.

Season	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Upper regulatory GHR	68,000	68,000	68,000	68,000	82,000	82,000	82,000	82,000	82,000
Actual GHL (lb spot shrimp)	68,000	68,000	68,000	82,000	82,000	82,000	68,000	68,000	68,000
Recommended GHL or stock status	–	–	Moderate	Poor	49,200	Poor	Poor	Poor	Poor
Season length (days)	26	24	21	77	39	151	78	84	92
Landings (number)	174	173	141	220	241	133	97	169	102
Harvest (lb spot shrimp)	68,293	69,808	65,487	81,955	80,650	36,763	32,441	54,508	35,528

Season	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Upper regulatory GHR	82,000	82,000	82,000	82,000	82,000	82,000
Actual GHL (lb spot shrimp)	24,000	38,400	36,800	20,800	32,000	44,800
Recommended GHL or stock status	Above Average	Good	Moderate	Below Average	Moderate	Above Average
Season length (days)	10	11	21	17	23	18
Landings (number)	43	69	89	50	65	68
Harvest (lb spot shrimp)	31,756	37,323	35,116	22,039	27,971	41,156

Note: En dash = not available.

Table 17.–District 6 matrix, Part B. Baselines, current season values, and scores for each stock status parameter and analysis area for the pot shrimp fishery in Southeast Alaska. Data sources are from ADF&G shrimp survey, fish tickets ("fish tix"), logbooks, and on-the-grounds (OTG) and dockside (DS) sampling of commercial catch. Data are divided by type: CPUE, harvest rate, mean carapace length (CL), and L_{50}. Score for each analysis area is the sum of all individual scores.

Analysis Area		Sumner Strait			SW Etolin			Upper Clarence			
Area weighting		0.07			0.13			0.80			
Stock Status Parameters	Source	Baseline	Value	Score	Baseline	Value	Score	Baseline	Value	Score	Total Score
Catch rate ≥XL	survey	–	–	–	–	–	–	–	–	–	–
4-yr trend in catch rate	survey	–	–	–	–	–	–	–	–	–	–
Std. Comm. CPUE	fish tix	3.0	*	0.00	4.3	*	0.00	4.3	5.4	1.00	0.27
4-yr trend in CPUE	fish tix	–	NA	–	–	Sig. inc.	0.25	–	Sig. inc.	0.25	0.17
Catch rate ≥XL	logbook	–	–	–	–	–	–	–	No trend	0.00	0.00
Harvest rate ≥XL (2014)	logbook	–	–	–	–	–	–	–	–	–	–
Harvest rate ≥XL (2015)	logbook	–	–	–	–	37%		–	41%	–	–
Harvest rate ≥XL (2016)	logbook	–	43%	0.00	–	45%	0.00	–	48%	0.00	0.00
Mean CL	survey	–	–	–	–	–	–	–	–	–	–
4-yr trend in CL	survey	–	–	–	–	–	–	–	–	–	–
Mean CL	OTG	–	–	–	–	–	–	37.2	38.8	1.00	0.67
4-yr trend in CL	OTG	–	–	–	–	–	–	–	Sig. inc.	0.25	0.25
Mean CL	DS	–	–	–	–	–	–	43.6	–	–	–
4-yr trend in CL	DS	–	–	–	–	–	–	–	–	–	–
L_{50}	survey	–	–	–	–	–	–	–	–	–	–
L_{50}	OTG/DS	–	–	–	–	–	–	39.4	37.6	-1.00	-0.33
Manager scores		–	–	0.00	–	–	1.00	–	–	0.00	0.93
Score		–	–	0.00	–	–	1.25	–	–	2.50	1.95
Max. possible score		–	–	3.00	–	–	3.25	–	–	6.50	4.42
Stock Status		–	–	–	–	–	–	–	–	–	Above Average
Confidence		–	–	0.18	–	–	0.24	–	–	–	0.42

Note: * indicates confidential data with less than three permits participating. En dashes = not available, NA = not applicable, *Sig. inc.* = significant increase, *Sig. dec.* = significant decrease, ≥XL = ≥40 mm CL.

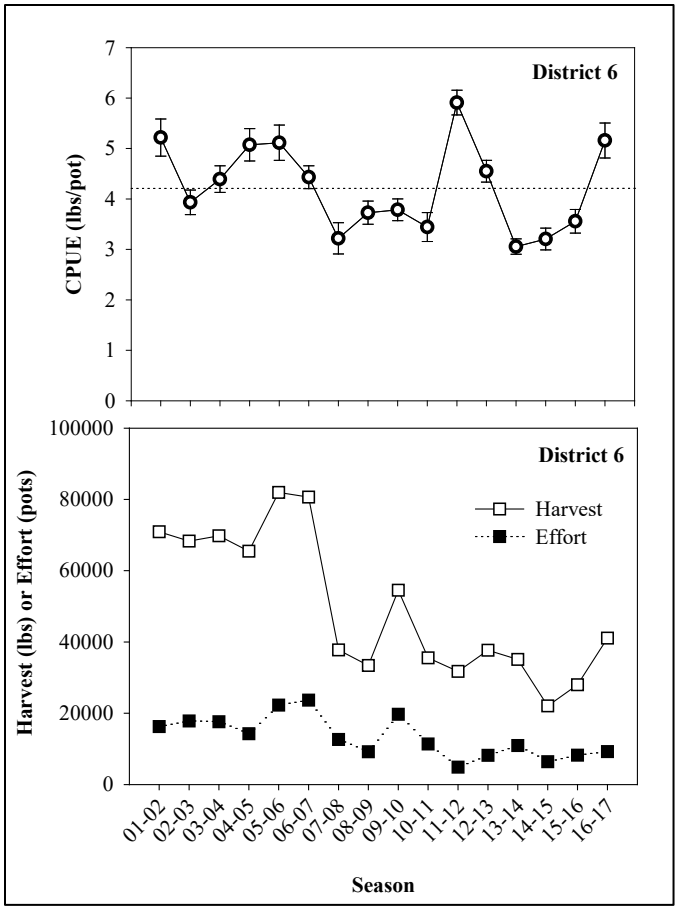

Figure 24.–Districtwide CPUE and effort data for District 6, 2001/02–2016/17 seasons. CPUE is weighted by analysis area weights to allow for an overall impression of fishery performance.

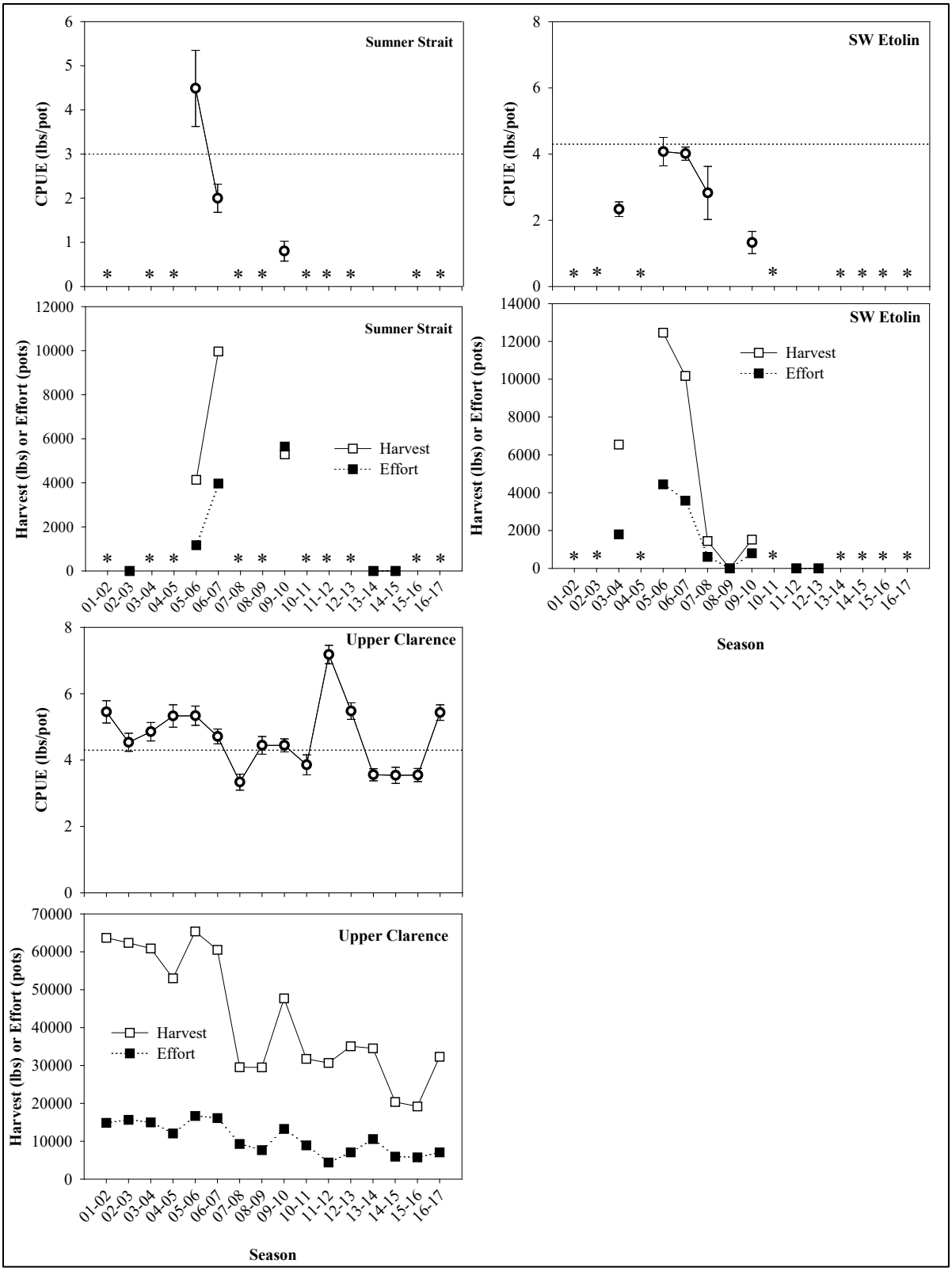

Figure 25.–Mean and standard error of spot shrimp catch rate from commercial harvest (dotted line represents the long-term baseline) and the commercial harvest and effort by analysis area in District 6, 2001/02–2016/17 seasons. *indicates confidential data with less than three permits participating.

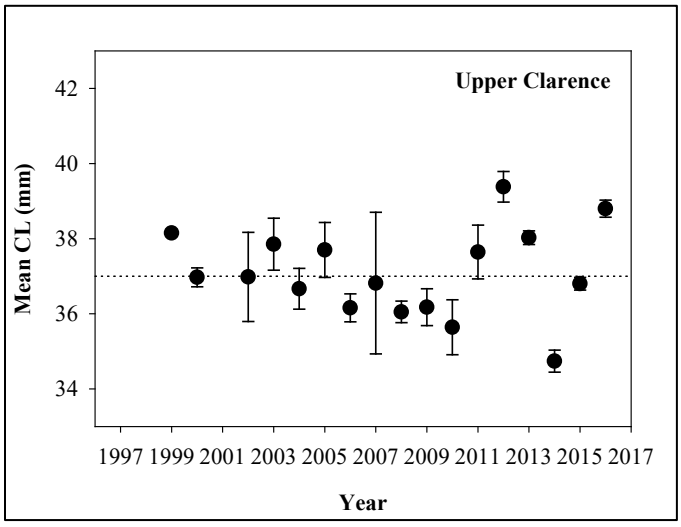

Figure 26.–Mean and standard error of spot shrimp carapace length from floating processor and on-the-grounds sampling in District 6, 1997/98–2016/17 seasons. Dotted line represents the long-term baseline. Only areas with baselines or 2016/17 season data are shown.

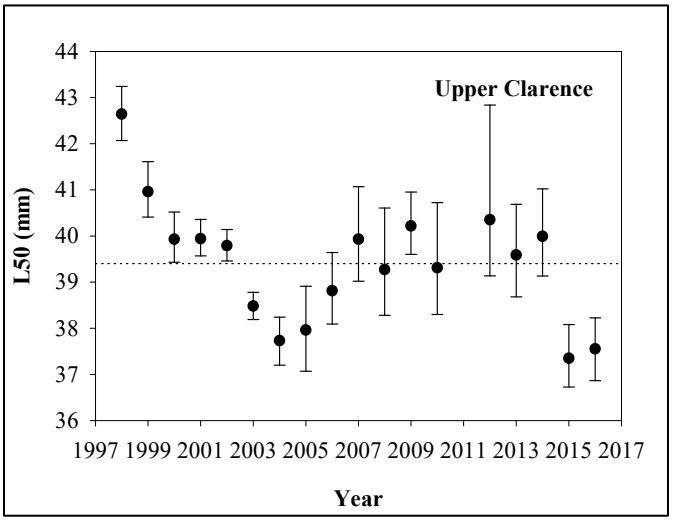

Figure 27.–L_{50} and 95% confidence intervals of spot shrimp from floating processor, on-the-grounds and dockside sampling in District 6, 1997/98–2016/17 seasons. Dotted line represents the long-term baseline. Only areas with baselines or 2016/17 season data are shown.

District 7

The GHL in District 7 has changed four times since the 1998/99 season. The GHL in District 7 was reduced 25% to 78,000 lb beginning with the 2004/05 season, prior to this it was 104,000 lb from 2000/01–2003/04, and 100,000 lb from the 1995/96–1999/00 fishing seasons. The district GHL was achieved in 2007/08 after fishing an extra 37 days and was not achieved in 2008/09 after fishing 19 extra days (Table 18). The GHL was met during the 2009/10 fishing season after an 84-day season, which was the longest in six years. The GHL was reduced 30% for the 2010/11 season to 54,600 lb, then increased 17% for the 2012/13 season, and an experimental inseason GHL adjustment system was implemented. During a meeting between industry and management in January 2015, it was mutually agreed to increase the preseason GHL from 63,700 lb to 74,300 lb so that the full range of the GHR could be met using inseason adjustments. During the last 10 years, harvest has averaged 73,600 lb (101% of the GHL) (Table 18). District 7 is divided into four analysis areas: Bradfield Canal, Lower Ernest Sound, Upper Ernest Sound, and Zimovia Strait (Table 3).

The District 7 pot shrimp survey is conducted within the Lower and Upper Ernest Sound analysis areas.

Survey catch rates of large size class shrimp are above baseline in Upper Ernest Sound and at baseline in Lower Ernest Sound; neither area shows a four-year trend. (Table 19, Figure 28). It should also be noted that CPUE of small size class shrimp, though not scored, continues to decrease in both areas. Mean survey CL increased strongly in both survey areas. This is in part due to the reduced abundance of small class shrimp. Both areas have mean CL values above the baseline with a significant increase in the four-year analysis in Lower Ernest Sound (Table 19, Figure 28). The baseline for CL in Upper Ernest Sound was adjusted after the 2015/16 season to the mean of the past 15 years at 35.6 mm. The early survey years were shown to have some of the highest CL values in the 17-year history of the survey. Removing the earliest three years from the baseline allowed for a more reasonable baseline value with which to compare the current year's estimate rather than the mean CL score always being negative due to comparison to an inflated baseline value. Survey L_{50} estimates were significantly below the long-term baseline in Upper Ernest Sound, and at the baseline in Lower Ernest Sound (Table 19, Figure 29).

Districtwide weighted CPUE increased after three years of decline and is still well above the baseline (Figure 30). Standardized commercial CPUEs are significantly above the long-term baseline in all areas except Lower Ernest Sound where it is at baseline. No areas show any trends in the four-year analysis (Table 19, Figure 31).

Logbook harvest rate data showed good model fit in all areas with catch rates of large size class shrimp at 39% (low) for Upper Ernest Sound, 22% (low) for Lower Ernest Sound, 42% (moderate) for Zimovia Strait, and 70% (excessive) for Bradfield (Table 19).

On-the-grounds CL measurements were available only in Bradfield (above baseline with an increasing four-year trend) and Upper Ernest Sound (at baseline with an increasing four-year trend). Sampling also occurred in Lower Ernest Sound, but there are no historical baselines for the area. Dockside CL was below the baseline in Bradfield Canal and is now decreasing in the four-year analysis (Table 19, Figure 32). On-the-grounds and dockside L_{50} samples were at baseline with no four-year trends in both areas (Table 19, Figure 33).

The manager scores are positive in Bradfield and Upper Ernest Sound and neutral in all other areas (Table 19).

The overall matrix score for District 7 is 1.31 (moderate) up from -1.25 (moderate) for the 2015/16 season. The increase in score this season was mainly due to improved survey catch rates and commercial CPUE in Lower Ernest Sound, lower logbook harvest rates outside of Bradfield, and increased survey mean CL. District 7 has a 0.65 (good) level of data confidence (Table 19).

The 2016/17 season was the fifth using inseason adjustments, and those adjustments seem to be tracking population metrics well. As metric scores declined over the previous two seasons the adjusted GHLs have declined as well. When metrics improved again in the 2016/17 season, the GHL increased 10%. Logbook based harvest rates are at low to moderate levels in all areas except Bradfield. However, Lower Ernest Sound and Bradfield also showed significantly declining catch rates of large class shrimp. In addition, Bradfield showed a second year of standardized CPUE decline. If this trend continues in Bradfield, a localized harvest limitation mechanism may be considered in the future.

Table 18.–District 7 matrix, Part A. A 15-season history, including stock assessment recommendations, for the pot shrimp fishery in Southeast Alaska.

Season	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
Upper regulatory GHR	104,000	104,000	104,000	104,000	104,000	104,000	104,000	104,000
Actual GHL (lb spot shrimp)	104,000	104,000	78,000	78,000	78,000	78,000	78,000	78,000
Recommended GHL or stock status	–	104,000	Poor	Poor	62,400	Moderate	Moderate	Poor
Season length (days)	39	113	37	30	22	59	78	84
Landings (number)	427	470	322	254	192	223	184	240
Harvest (lb spot shrimp)	99,250	104,394	80,072	79,927	80,491	76,613	52,345	74,474

Season	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Upper regulatory GHR	104,000	104,000	104,000	104,000	104,000	104,000	104,000
Actual GHL (lb spot shrimp)	54,600	54,600	80,899	77,500	70,000	74,300	81,730
Recommended GHL or stock status	Below Average	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Season length (days)	34	12	17	17	14	12	12
Landings (number)	135	83	124	168	132	156	146
Harvest (lb spot shrimp)	48,762	61,825	82,552	94,922	76,890	70,091	87,752

Note: En dash = not available.

Table 19.–District 7 matrix, Part B. Baselines, current season values, and scores for each parameter and analysis area for the pot shrimp fishery in Southeast Alaska. Data sources are from ADF&G shrimp survey, fish tickets ("fish tix"), logbooks, and on-the-grounds (OTG) and dockside (DS) sampling of commercial catch. Data are divided by type: CPUE, harvest rate, mean carapace length (CL), and L_{50}. Score for each analysis area is the sum of all individual scores.

Analysis Area		Bradfield			Lower Ernest Sound		
Area weighting			0.2			0.2	
Stock Status Parameters	Source	Baseline	Value	Score	Baseline	Value	Score
Catch rate ≥XL	survey	–	–	–	0.8	0.48	0.00
4-yr trend in catch rate	survey	–	–	–	–	No trend	0.00
Std. Comm. CPUE	fish tix	2.5	5.2	1.00	3.6	3.6	0.00
4-yr trend in CPUE	fish tix	–	No trend	0.00	–	No trend	0.00
Catch rate ≥XL	logbook	–	Sig. dec.	-1.00	–	Sig. dec.	-1.00
Harvest rate ≥XL (2014)	logbook	–	–	–	–	–	–
Harvest rate ≥XL (2015)	logbook	–	–	–	–	–	–
Harvest rate ≥XL (2016)	logbook	–	70%	-1.00	–	22%	1.00
Mean CL	survey	–	–	–	31.2	34.0	1.00
4-yr trend in CL	survey	–	–	–	–	Sig. inc.	0.25
Mean CL	OTG	41.8	46.9	1.00	–	40.1	–
4-yr trend in CL	OTG		Sig. inc.	0.25	–	–	–
Mean CL	DS	45.4	42.5	-1.00	–	–	–
4-yr trend in CL	DS	–	Sig. dec.	-0.25	–	–	–
L_{50}	survey	–	–	–	37.9	37.3	0.00
L_{50}	OTG/DS	46.7	47.5	0.00	–	38.9	–
Manager scores		–	–	1.00	–	–	0.00
Score		–	–	0.00	–	–	1.25
Max. possible score		–	–	7.75	–	–	7.75
Stock Status		–	–	–	–	–	–
Confidence		–	–	0.59	–	–	0.59

-continued-

Table 19.–Page 2 of 2.

Analysis Area		Upper Ernest Sound			Zimovia Strait			
Area weighting			0.5			0.1		
Stock Status Parameters	Source	Baseline	Value	Score	Baseline	Value	Score	Total Score
Catch rate ≥XL	survey	1.6	1.92	1.00	–	–	–	0.71
4-yr trend in catch rate	survey	–	No trend	0.00	–	–	–	0.00
Std. Comm. CPUE	fish tix	3.9	5.4	1.00	2.3	4.6	1.00	0.27
4-yr trend in CPUE	fish tix	–	No trend	0.00	–	No trend	0.00	0.00
Catch rate ≥XL	logbook	–	No trend	0.00	–	No trend	0.00	-0.40
Harvest rate ≥XL (2014)	logbook	–	26%	–	–	35%	–	–
Harvest rate ≥XL (2015)	logbook	–	44%	–	–	–	–	–
Harvest rate ≥XL (2016)	logbook	–	39%	1.00	–	42%	0.00	0.50
Mean CL	survey	35.0	37.1	1.00	–	–	–	0.67
4-yr trend in CL	survey	–	No trend	0.00	–	–	–	0.05
Mean CL	OTG	40.7	41.6	0.00	42.9	–	–	0.19
4-yr trend in CL	OTG	–	Sig. inc.	0.25	–	–	–	0.25
Mean CL	DS	43.2	–	–	–	–	–	-0.67
4-yr trend in CL	DS	–	–	–	–	–	–	-0.25
L_{50}	survey	42	40.2	-1.00	–	–	–	-0.48
L_{50}	OTG/DS	43.2	43.7	0.00	–	–	–	0.00
Manager scores		–	–	1.00	–	–	0.00	0.47
Score		–	–	4.25	–	–	1.00	1.31
Max. possible score		–	–	10.00	–	–	4.25	8.08
Stock Status		–	–	–	–	–	–	Moderate
Confidence		–	–	0.76	–	–	0.29	0.65

Note: * indicates confidential data with less than three permits participating. En dashes = not available, NA = not applicable, *Sig. inc.* = significant increase, *Sig. dec.* = significant decrease, ≥XL = ≥40 mm CL.

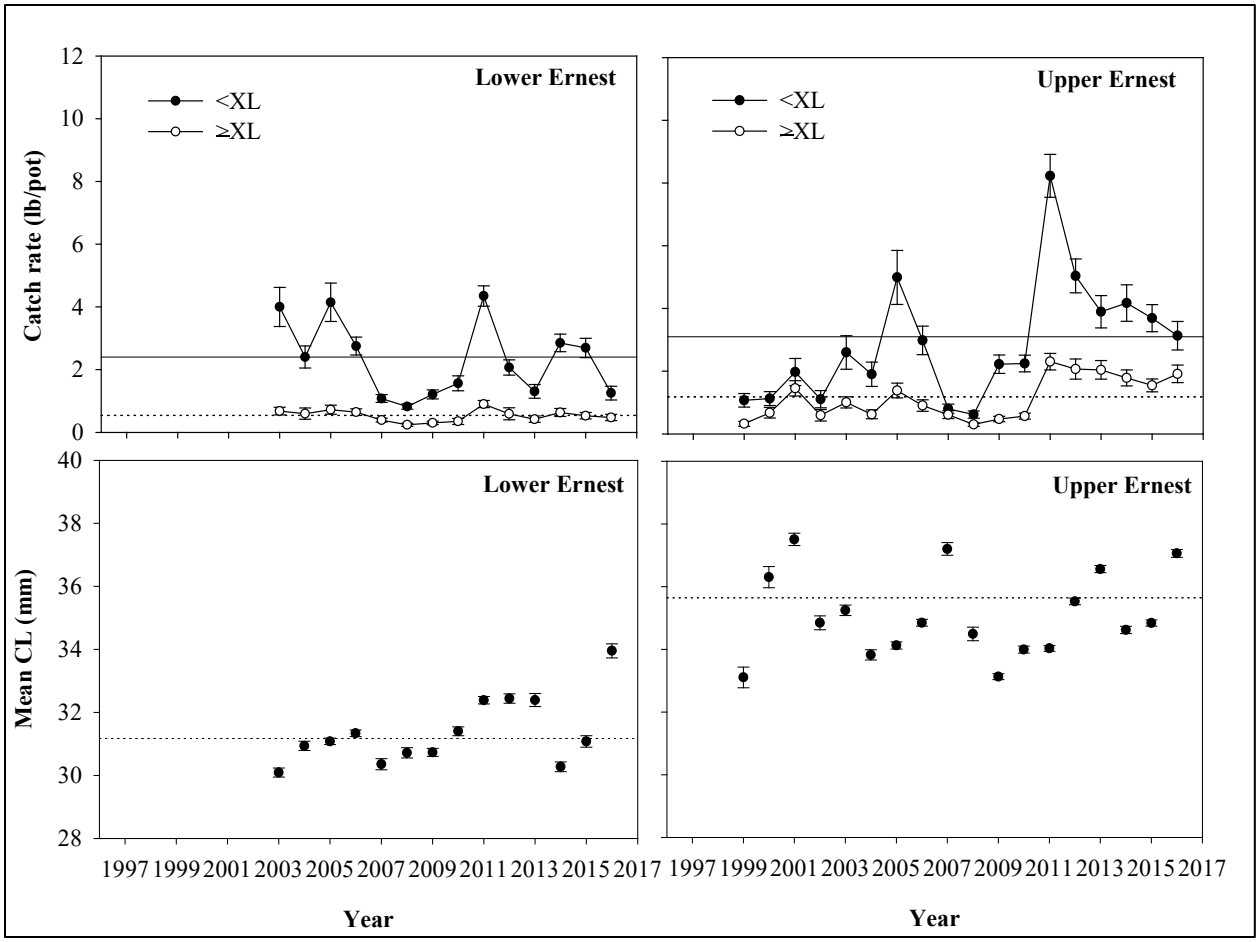

Figure 28.–Mean and standard error of spot shrimp catch rate (upper panels) and carapace length (lower panels) from preseason surveys in District 7, 1998-2016. Lines represent the long-term baselines.

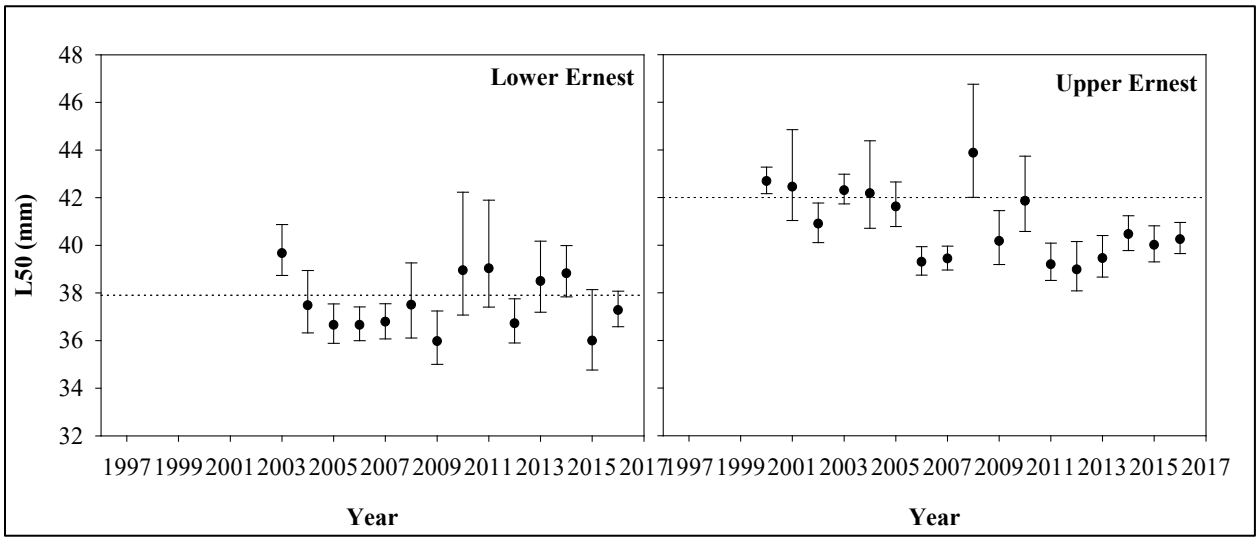

Figure 29.–L_{50} and 95% confidence intervals of spot shrimp from preseason surveys in District 7, 1998-2016. Dotted line represents the long-term baseline.

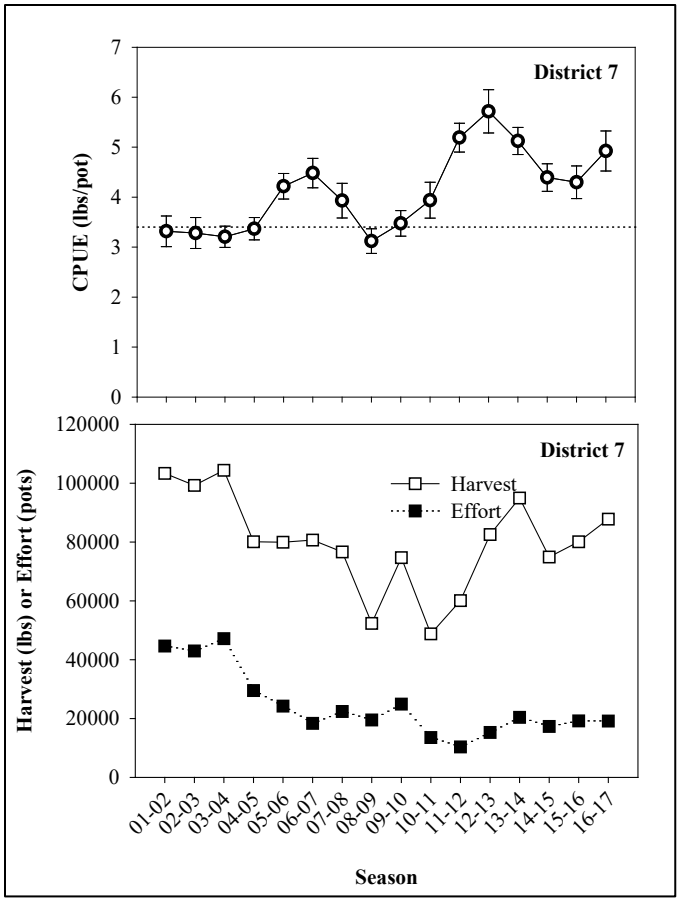

Figure 30.–Districtwide CPUE and effort data for District 7, 2001/02–2016/17 seasons. CPUE is weighted by analysis area weights to allow for an overall impression of fishery performance.

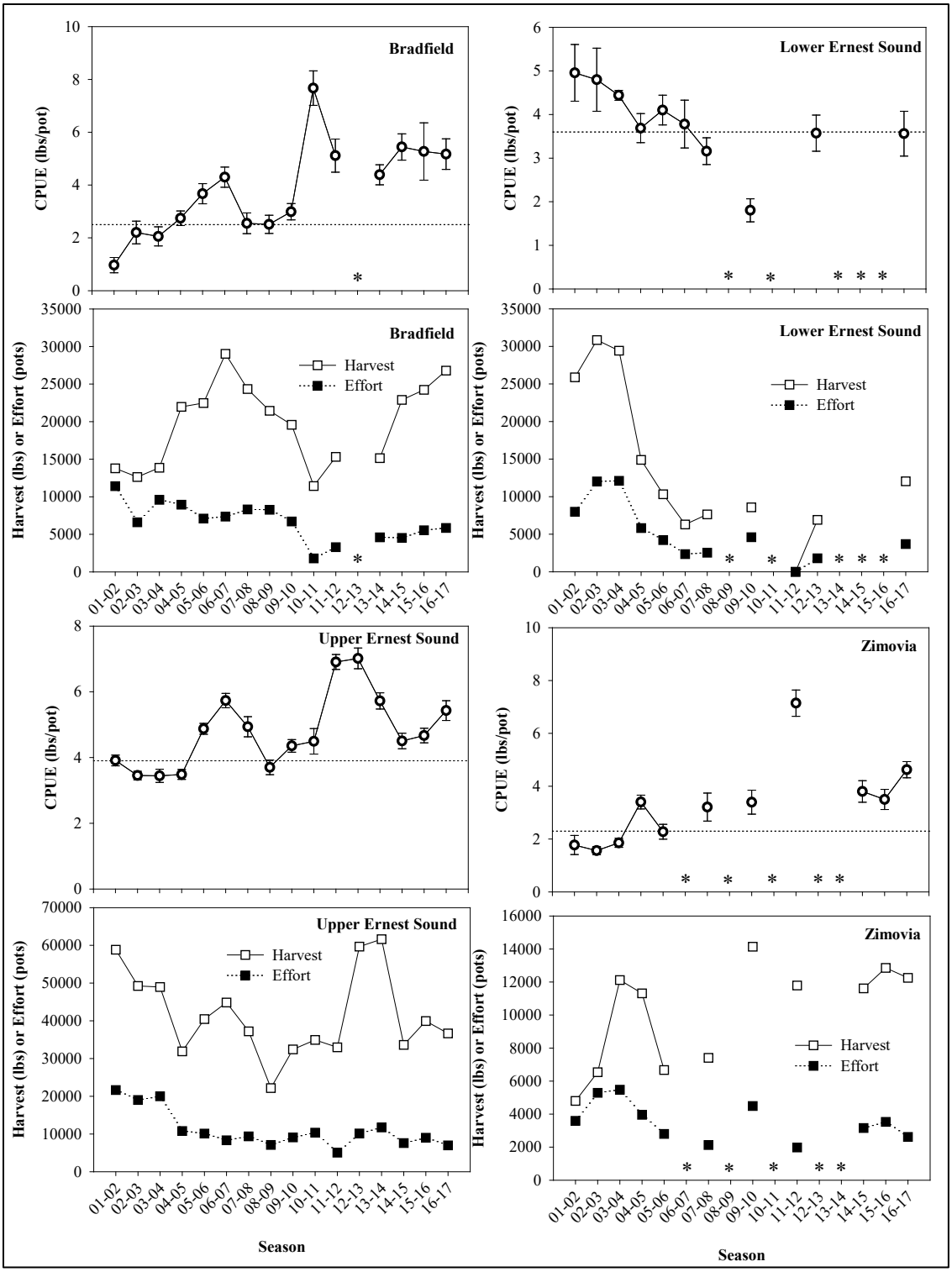

Figure 31.–Mean and standard error of spot shrimp catch rate from commercial harvest (dotted line represents the long-term baseline) and the commercial harvest and effort by analysis area in District 7, 2001/02–2016/17 seasons. * indicates confidential data with less than three permits participating.

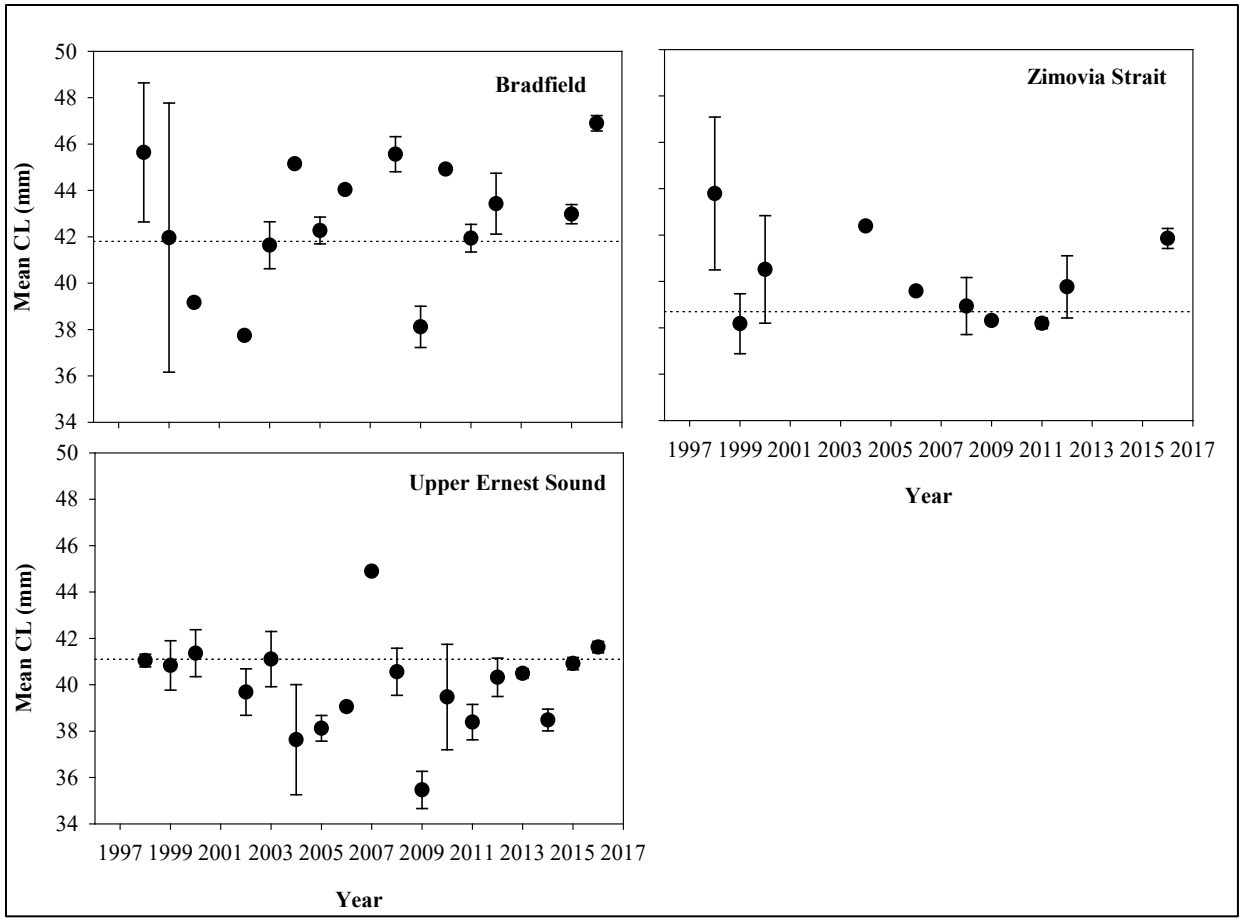

Figure 32.–Mean and standard error of spot shrimp carapace length from floating processor and on-the-grounds sampling in District 7, 1997/98–2016/17 seasons. Dotted line represents the long-term baseline. Only areas with baselines or 2016/17 season data are shown.

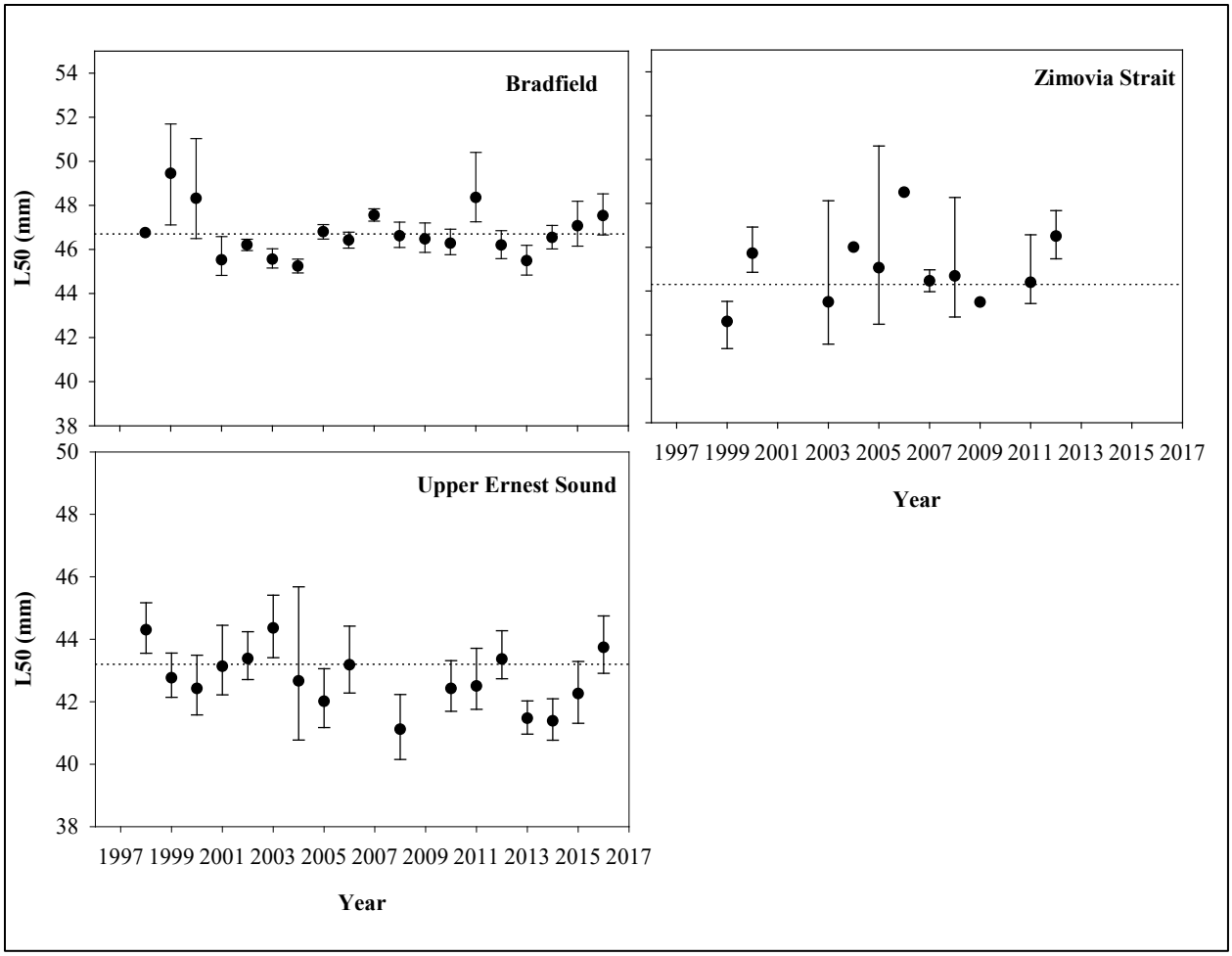

Figure 33.–L_{50} and 95% confidence intervals of spot shrimp from floating processor, on-the-grounds and dockside sampling in District 7, 1997/98–2016/17 seasons. Dotted line represents the long-term baseline. Only areas with baselines or 2016/17 season data are shown.

District 8

The GHL in District 8 has changed three times since the 1998/99 season. The GHL in District 8 was 20,000 lb since the 1997/98 season, prior to that time, a GHR of 75,000–100,000 lb was in place for Districts 6 and 8 combined. The GHL was reduced 25% to 15,000 for the 2010/11 season and reduced again to 10,500 for the 2014/15 season based on declining commercial catch. Over the last ten years, harvest has averaged 15,500 lb (85% of the GHL) (Table 20). District 8 is divided into three analysis areas: Eastern Sumner Strait, Frederick Sound, and Stikine Strait/Chichagof Pass (Table 3).

Districtwide commercial CPUE has increased by over a pound per pot from a low of 1.87 lb per pot during the 2013/14 season to 3.28 lb per pot during the 2016/17 season (Figure 34). Standardized commercial CPUE increased in all analysis areas in the 2016/17 season and is now above baseline in Stikine Strait and at baseline in both other areas. The four-year analysis shows significant increases in Eastern Sumner and Stikine Strait (Table 21, Figure 35).

Logbook data showed that catch rates of ≥XL size class shrimp are stable in Eastern Sumner. There was no model fit for harvest rate estimation in any analysis area (Table 21, Figure 36).

Manager scores were neutral in all areas. Managers noted that overall, the stock health shows signs of improving, but still appears to be questionable. Without having consistent harvest in most of the areas in District 8, confidence in catch data is low. Likewise, the biological data are also inconsistent. District 8 does receive an unknown, but assumed large, amount of personal use harvest due to the proximity of the communities of Petersburg and Wrangell.

The overall score is 0.24 (moderate) up from 0.16 (moderate) during the 2015/16 season and has a 0.22 (low) level of confidence (Table 21). The increase in score this season is due to increased commercial standardized CPUE.

The 2016/17 season was the third year at the reduced 10,500 lb GHL level. That GHL reduction seems to have allowed for some increase in CPUE. However, without logbook or survey data for the district, it is difficult to determine the effect of the reduction on population health.

Table 20.–District 8 matrix, Part A. A 15-season history, including stock assessment recommendations, for the pot shrimp fishery in Southeast Alaska.

Season	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Upper regulatory GHR	20,000	20,000	20,000	20,000	28,000	28,000	28,000	28,000	28,000
Actual GHL (lb spot shrimp)	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	15,000
Recommended GHL or stock status	–	–	Moderate	Moderate	20,000	Moderate	Poor	Below Average	Below Average
Season length (days)	31	18	37	37	30	151	120	73	92
Landings (number)	110	91	105	113	108	110	46	100	88
Harvest (lb spot shrimp)	22,105	20,867	18,960	21,814	21,976	15,346	7,223	20,389	13,637

Season	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Upper regulatory GHR	28,000	28,000	28,000	28,000	28,000	28,000
Actual GHL (lb spot shrimp)	15,000	15,000	15,000	10,500	10,500	10,500
Recommended GHL or stock status	Below Average	Below Average	Poor	Below Average	Moderate	Moderate
Season length (days)	22	21	28	28	22	18
Landings (number)	52	55	55	45	45	33
Harvest (lb spot shrimp)	12,484	12,854	12,228	8,815	10,166	11,590

Note: En dash = not available.

Table 21.–District 8 matrix, Part B. Baselines, current season values, and scores for each stock status parameter and analysis area for the pot shrimp fishery in Southeast Alaska. Data sources are from ADF&G shrimp survey, fish tickets ("fish tix"), logbooks, and on-the-grounds (OTG) and dockside (DS) sampling of commercial catch. Data are divided by type: CPUE, harvest rate, mean carapace length (CL), and L_{50}. Score for each analysis area is the sum of all individual scores.

Analysis Area		Eastern Sumner			Frederick Sound			Stikine Strait/Chichagof Pass			
Area weighting			0.70			0.05			0.25		Total
Stock Status Parameters	Source	Baseline	Value	Score	Baseline	Value	Score	Baseline	Value	Score	Score
Catch rate ≥XL	survey	–	–	–	–	–	–	–	–	–	–
4-yr trend in catch rate	survey	–	–	–	–	–	–	–	–	–	–
Std. Comm. CPUE	fish tix	2.7	3.3	0.00	2.6	*	0.00	2.3	3.3	1.00	0.08
4-yr trend in CPUE	fish tix	–	Sig. inc.	0.25		No trend	0.00	–	Sig. inc.	0.25	0.16
Catch rate ≥XL	logbook	–	No trend	0.00	–	–	–	–	–	–	0.00
Harvest rate ≥XL (2014)	logbook	–	48.9%	–	–	–	–	–	67%	–	–
Harvest rate ≥XL (2015)	logbook	–	35.3%	–	–	–	–	–	–	–	–
Harvest rate ≥XL (2016)	logbook	–	–	–	–	–	–	–	–	–	–
Mean CL	survey	–	–	–	–	–	–	–	–	–	–
4-yr trend in CL	survey	–	–	–	–	–	–	–	–	–	–
Mean CL	OTG	–	–	–	–	–	–	–	–	–	–
4-yr trend in CL	OTG	–	–	–	–	–	–	–	–	–	–
Mean CL	DS	46.2	–	–	–	–	–	44.0	–	–	–
4-yr trend in CL	DS	–	–	–	–	–	–	–	–	–	–
L_{50}	survey	–	–	–	–	–	–	–	–	–	–
L_{50}	OTG/DS	45.2	–	–	–	–	–	44.3	–	–	–
Manager scores		–	–	0.00	–	–	0.00	–	–	0.00	0.00
Score		–	–	0.25	–	–	0.00	–	–	1.25	0.24
Max. possible score		–	–	3.25	–	–	2.25	–	–	2.25	2.17
Stock Status		–	–	–	–	–	–	–	–	–	Moderate
Confidence		–	–	0.24	–	–	0.18	–	–	0.18	0.22

Note: * indicates confidential data with less than three permits participating. En dashes = not available, NA = not applicable, *Sig. inc.* = significant increase, *Sig. dec.* = significant decrease, ≥XL = ≥40 mm CL.

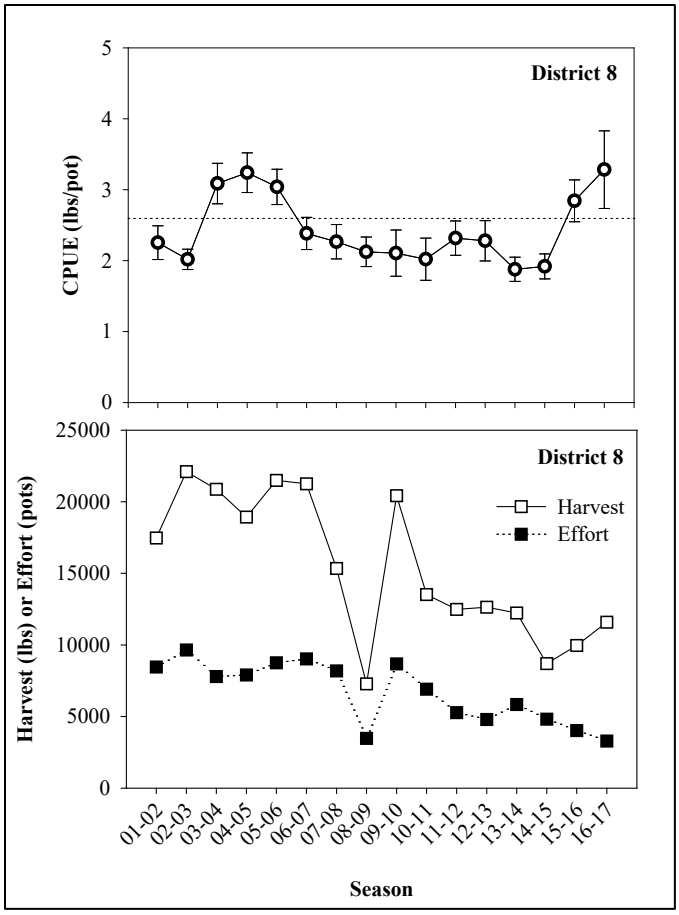

Figure 34.–Districtwide CPUE and effort data for District 8, 2001/02–2016/17 seasons. CPUE is weighted by analysis area weights to allow for an overall impression of fishery performance.

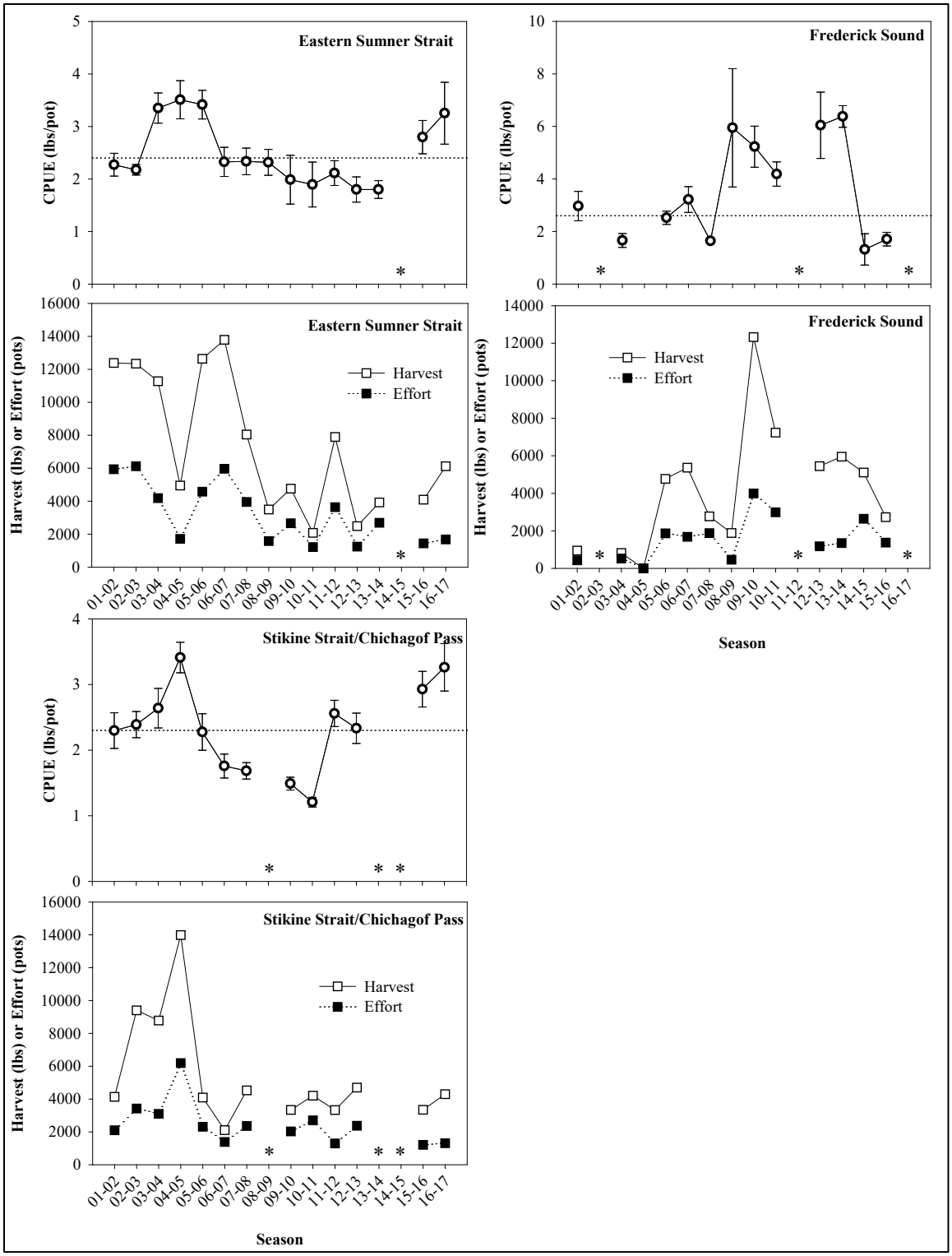

Figure 35.–Mean and standard error of spot shrimp catch rate from commercial harvest (dotted line represents the long-term baseline) and the commercial harvest and effort by analysis area in District 8, 2001/02–2016/17 seasons. * indicates confidential data with less than three permits participating.

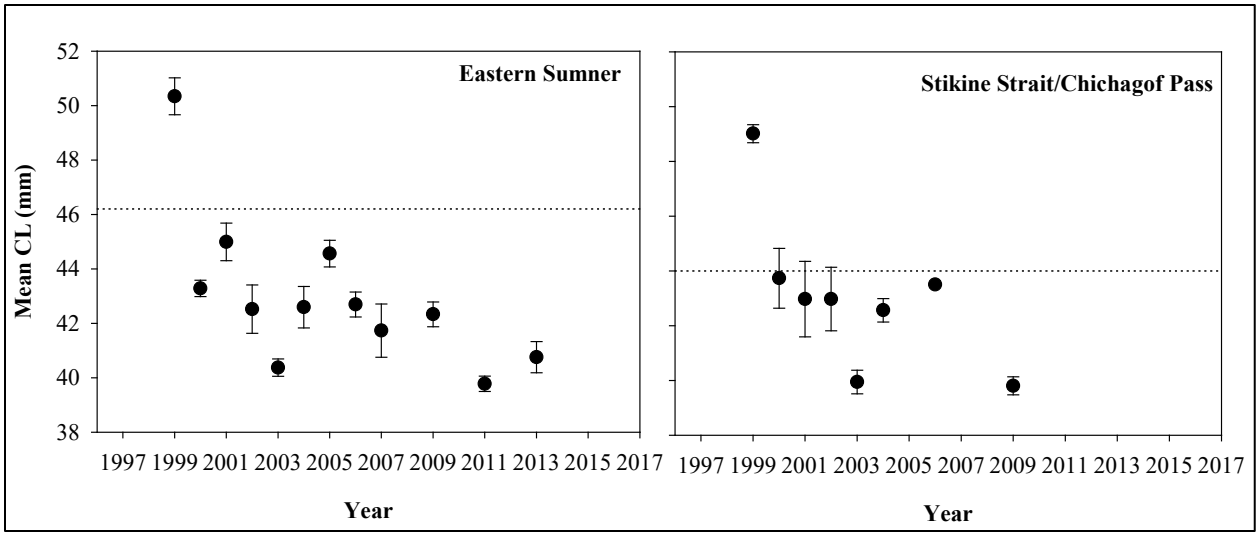

Figure 36.–Mean and standard error of spot shrimp carapace length from dockside and on-the-grounds sampling in District 8, 1997/98–2016/17 seasons. Dotted line represents the long-term baseline. Only areas with baselines or 2016/17 season data are shown.

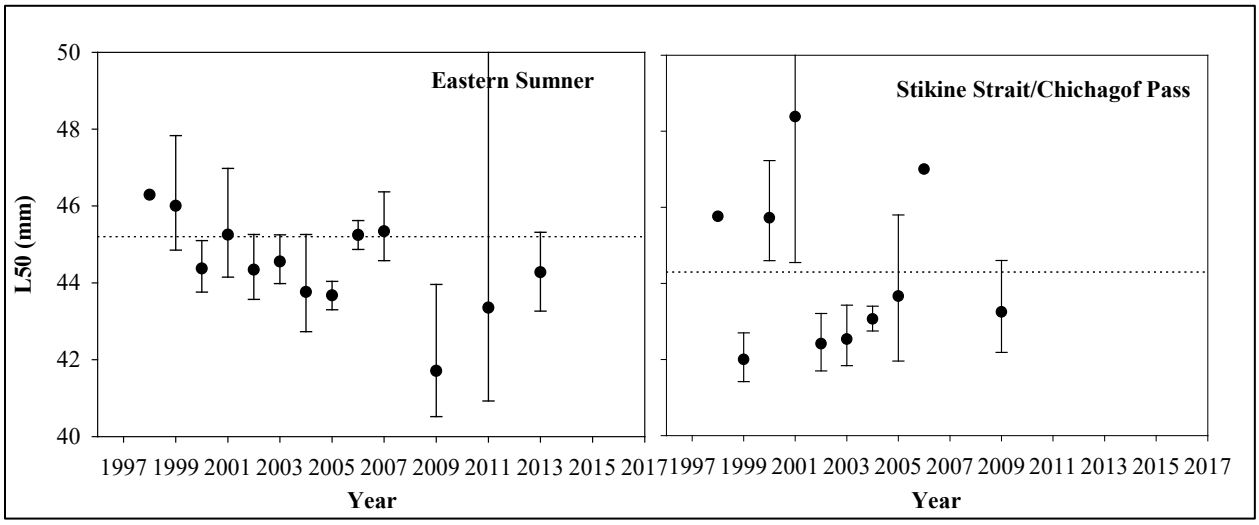

Figure 37.–L_{50} and 95% confidence intervals of spot shrimp from floating processor, on-the-grounds and dockside sampling in District 8, 1997/98–2016/17 seasons. Dotted line represents the long-term baseline. Only areas with baselines or 2016/17 season data are shown.

District 10

The GHL in District 10 has changed five times since 1999/00. The GHL increased from 30,000 lb to 35,000 lb in 2000/01, then to 36,000 lb in 2001/02, and to 48,000 lb in the 2004/05 fishing season. The first reduction of 25% was implemented prior to the 2013/14 season. Due to continued poor stock health the GHL was reduced 20% to 29,000 lb prior to the 2016/17 season. Over the last ten years harvest has averaged 45,000 lb (107% of the GHL) (Table 22). District 10 is divided into four analysis areas: Farragut Bay, Hobart/Windham Bays, Port Houghton, and SE Admiralty Island (Table 3). The composition of the harvest by analysis area is complex and variable.

Overall district CPUE increased slightly from a low in 2015/16 but remains well below baseline (Figure 38). Analysis area level standardized CPUE increased in all areas except Hobart/Windham, although standardized commercial CPUE data are significantly below the long-term baseline in all analysis areas, with no four-year trends (Table 23, Figure 39).

Logbook data showed a 38% (low) harvest rate of ≥XL class shrimp in the Port Houghton analysis area, down from 45% (moderate) in the 2015/16 season (Table 23).

On-the-grounds mean CL remains far below the long-term baseline with a declining four-year trend in Hobart/Windham and is below the baseline in Port Houghton where no four-year trend analysis was possible due to lack of data from the 2015/16 season (Table 23, Figure 40).

The L_{50} declined again in Hobart/Windham Bays and is below baseline and the lowest value on record. The L_{50} in Port Houghton is also below baseline and the third lowest value on record (Table 23, Figure 41).

Manager scores are neutral in all areas (Table 23).

The overall score is -0.45 (moderate) up from -1.52 (below average) in the 2015/16 season. This increase is due to the logbook-based harvest rate of large size class shrimp in Port Houghton going from moderate to low. District 10 has a 0.33 (low) level of data confidence (Table 23).

The 2016/17 season was the first at a reduced GHL, following three years of a previously reduced GHL. Although standardized commercial CPUE increased in some analysis areas, as is common with GHL reductions, the continued decline in mean CL and depression of L_{50} continues to be concerning.

Table 22.–District 10 matrix, Part A. A 15-season history, including stock assessment recommendations, for the pot shrimp fishery in Southeast Alaska.

Season	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
Upper regulatory GHR	36,000	36,000	36,000	36,000	58,000	58,000	58,000	58,000
Actual GHL (lb spot shrimp)	36,000	36,000	48,000	48,000	48,000	48,000	48,000	48,000
Recommended GHL or stock status	–	–	Good	Moderate	38,400	Moderate	Moderate	Above Average
Season length (days)	16	12	11	8	8	9	16	9
Landings (number)	109	104	78	67	73	63	82	73
Harvest (lb spot shrimp)	54,706	61,631	51,592	53,292	51,409	44,233	55,339	53,544

Season	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Upper regulatory GHR	58,000	58,000	58,000	58,000	58,000	58,000	58,000
Actual GHL (lb spot shrimp)	48,000	48,000	48,000	36,000	36,000	36,000	29,000
Recommended GHL or stock status	Moderate	Moderate	Below Average	Poor	Below Average	Below Average	Below Average
Season length (days)	8	7	9	10	14	16	14
Landings (number)	64	74	70	62	65	63	68
Harvest (lb spot shrimp)	56,748	52,735	40,321	35,600	35,734	33,705	41,943

Note: En dash = not available.

Table 23.–District 10 matrix, Part B. Baselines, current season values, and scores for each stock status parameter and analysis area for the pot shrimp fishery in Southeast Alaska. Data sources are from ADF&G shrimp survey, fish tickets ("fish tix"), logbooks, and on-the-grounds (OTG) and dockside (DS) sampling of commercial catch. Data are divided by type: CPUE, harvest rate, mean carapace length (CL), and L_{50}. Score for each analysis area is the sum of all individual scores.

Analysis Area		Farragut Bay			Hobart/Windham		
Area weighting			0.1			0.35	
Stock Status Parameters	Source	Baseline	Value	Score	Baseline	Value	Score
Catch rate ≥XL	survey	–	–	–	–	–	–
4-yr trend in catch rate	survey	–	–	–	–	–	–
Std. Comm. CPUE	fish tix	4.4	3.2	-1.00	4.8	4.0	-1.00
4-yr trend in CPUE	fish tix	–	No trend	0.00	–	No trend	0.00
Catch rate ≥XL	logbook	–	–	–	–	–	–
Harvest rate ≥XL (2014)	logbook	–	–	–	–	44%	
Harvest rate ≥XL (2015)	logbook	–	–	–	–	–	–
Harvest rate ≥XL (2016)	logbook	–	–	–	–	–	–
Mean CL	survey	–	–	–	–	–	–
4-yr trend in CL	survey	–	–	–	–	–	–
Mean CL	OTG	39.4	–	–	40.7	37.1	-1.00
4-yr trend in CL	OTG	–	–	–		Sig. dec.	-0.25
Mean CL	DS	–	–	–	–	–	–
4-yr trend in CL	DS	–	–	–	–	–	–
L_{50}	survey	–	–	–	–	–	–
L_{50}	OTG/DS	40.5	–	–	41.3	38.1	-1.00
Manager scores		–	–	0.00	–	–	0.00
Score		–	–	-1.00	–	–	-2.25
Max. possible score		–	2.25		–	4.50	
Stock Status		–	–	–	–	–	–
Confidence		–	–	0.18	–	–	0.35

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Table 23.–Page 2 of 2.

Analysis Area		Port Houghton			SE Admiralty			
Area weighting			0.4			0.15		
Stock Status Parameters	Source	Baseline	Value	Score	Baseline	Value	Score	Total Score
catch rate ≥XL	survey	–	–	–	–	–	–	–
4-yr trend in catch rate	survey	–	–	–	–	–	–	–
Std. Comm. CPUE	fish tix	5.7	*	-1.00	6.9	*	-1.00	-0.33
4-yr trend in CPUE	fish tix	–	No trend	0.00	–	No trend	0.00	0.00
catch rate ≥XL	logbook	–	–	–	–	–	–	–
hrvst rt on ≥XL (2014)	logbook	–	–	–	–	–	–	–
hrvst rt on ≥XL (2015)	logbook	–	45%	–	–	–	–	–
hrvst rt on ≥XL (2016)	logbook	–	38%	1.00	–	–	–	1.00
mean CL	survey	–	–	–	–	–	–	–
4-yr trend in CL	survey	–	–	–	–	–	–	–
mean CL	OTG	40.6	39.3	-1.00	37.6	–	–	-0.67
4-yr trend in CL	OTG	–	No trend	0.00	–	–	–	-0.12
mean CL	DS	–	–	–	–	–	–	–
4-yr trend in CL	DS	–	–	–	–	–	–	–
L_{50}	survey	–	–	–	–	–	–	–
L_{50}	OTG/DS	41.5	39.4	-1.00	39.9	–	–	-0.18
Manager scores		–	–	0.00	–	–	0.00	0.00
Score		–	–	-2.00	–	–	-1.00	-0.29
Max. possible score		–	–	5.50	–	–	2.25	3.42
Stock Status		–	–	–	–	–	–	Moderate
Confidence		–	–	0.41	–	–	0.18	0.33

Note: * indicates confidential data with less than three permits participating. En dashes = not available, NA = not applicable, *Sig. inc.* = significant increase, *Sig. dec.* = significant decrease, ≥XL = ≥40 mm CL.

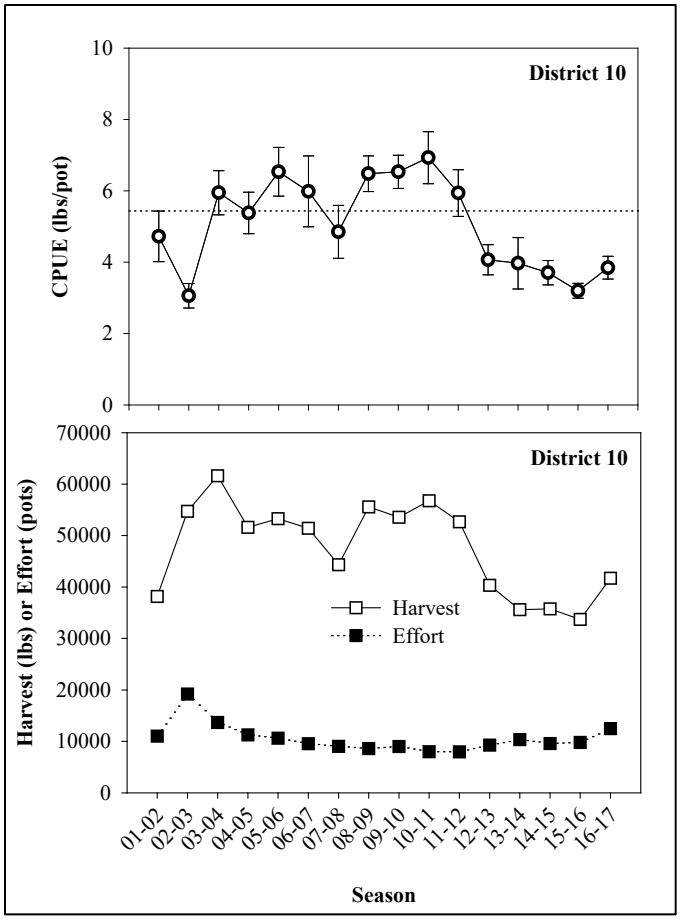

Figure 38.–Districtwide CPUE and effort data for District 10, 2001/02–2016/17 seasons. CPUE is weighted by analysis area weights to allow for an overall impression of fishery performance.

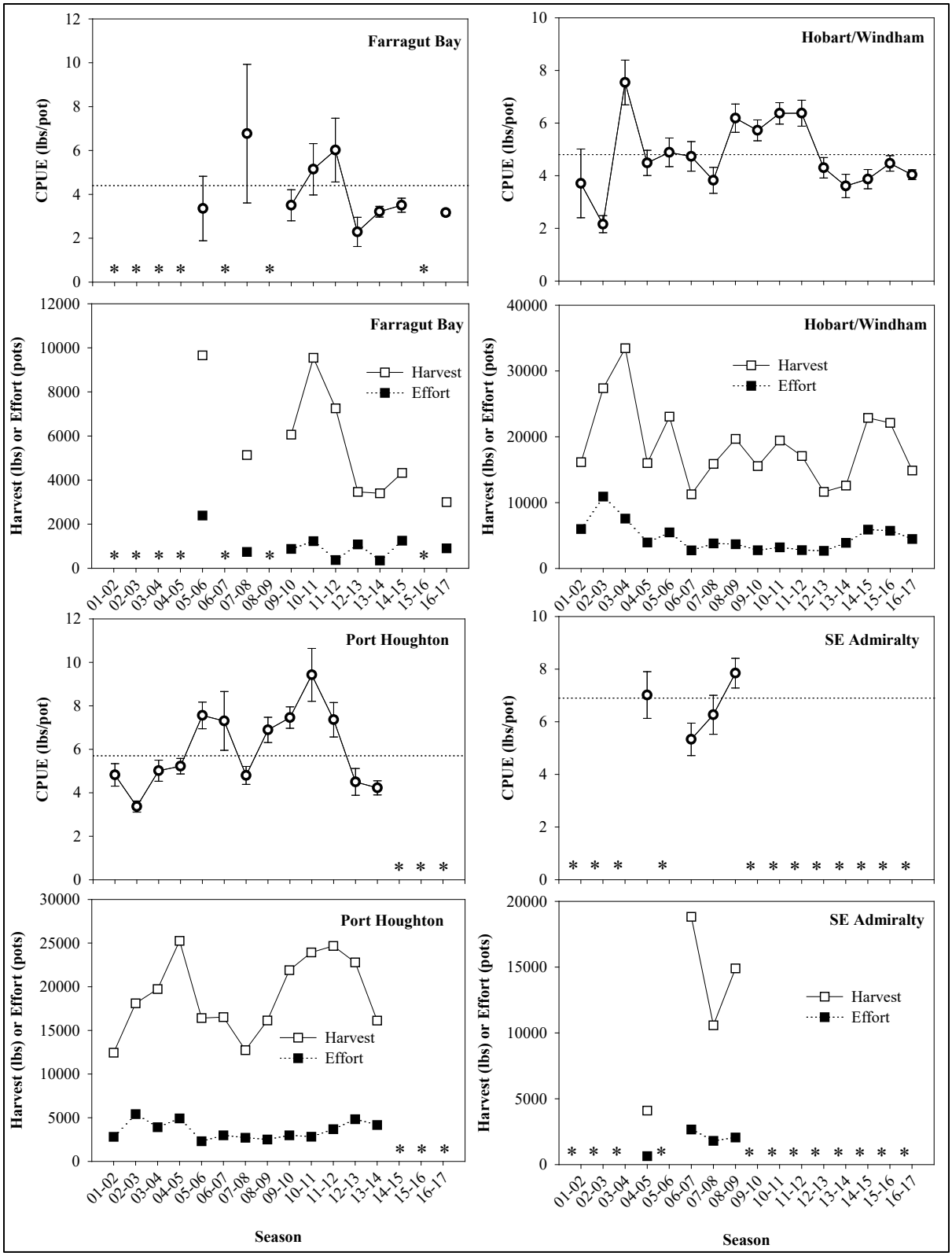

Figure 39.–Mean and standard error of spot shrimp catch rate from commercial harvest (dotted line represents the long-term baseline) and the commercial harvest and effort by analysis area in District 10, 2001/02–2016/17 seasons. * indicates confidential data with less than three permits participating.

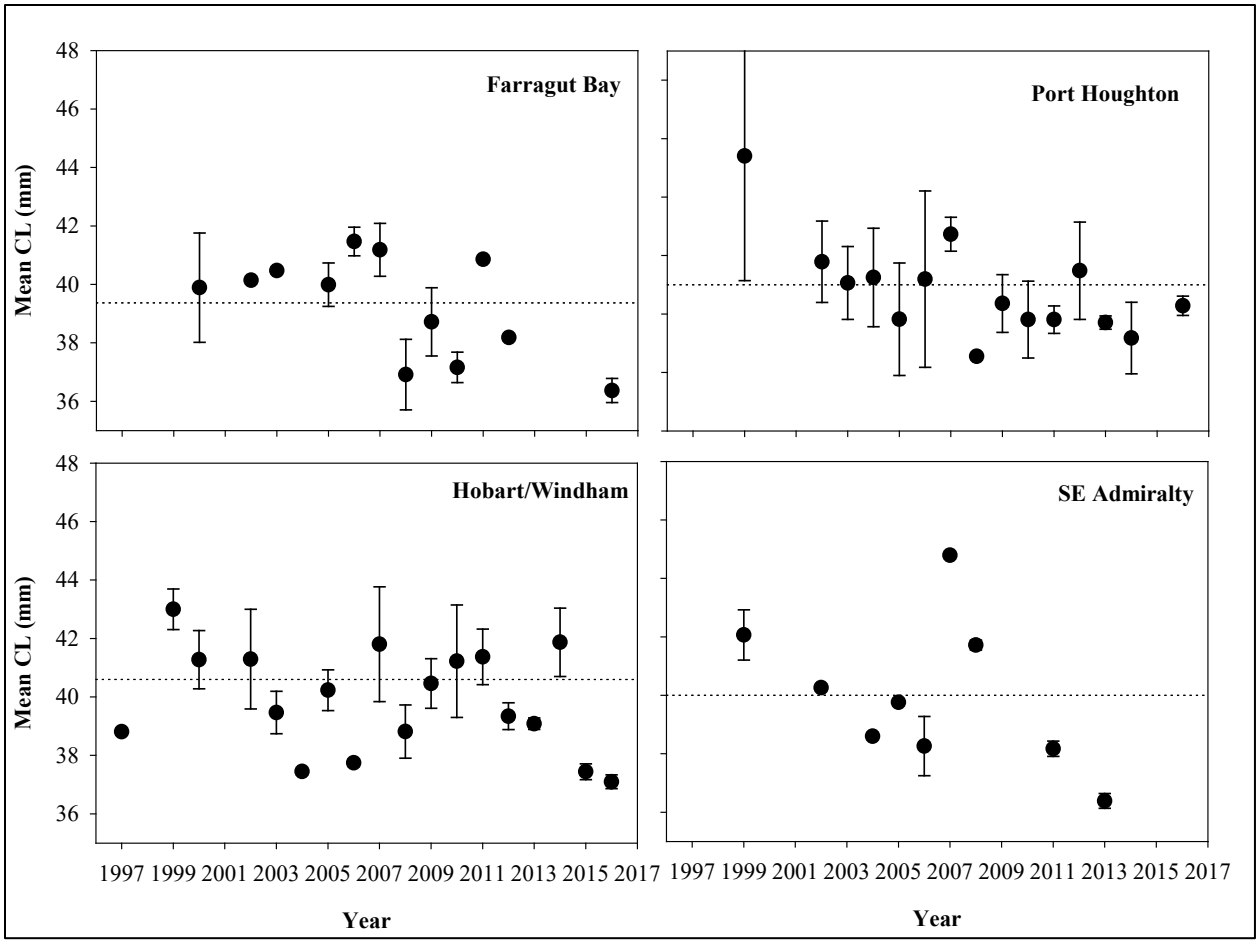

Figure 40.–Mean and standard error of spot shrimp carapace length from floating processor and on-the-grounds sampling in District 10, 1997/98–2016/17 seasons. Dotted line represents the long-term baseline. Only areas with baselines or 2016/17 season data are shown.

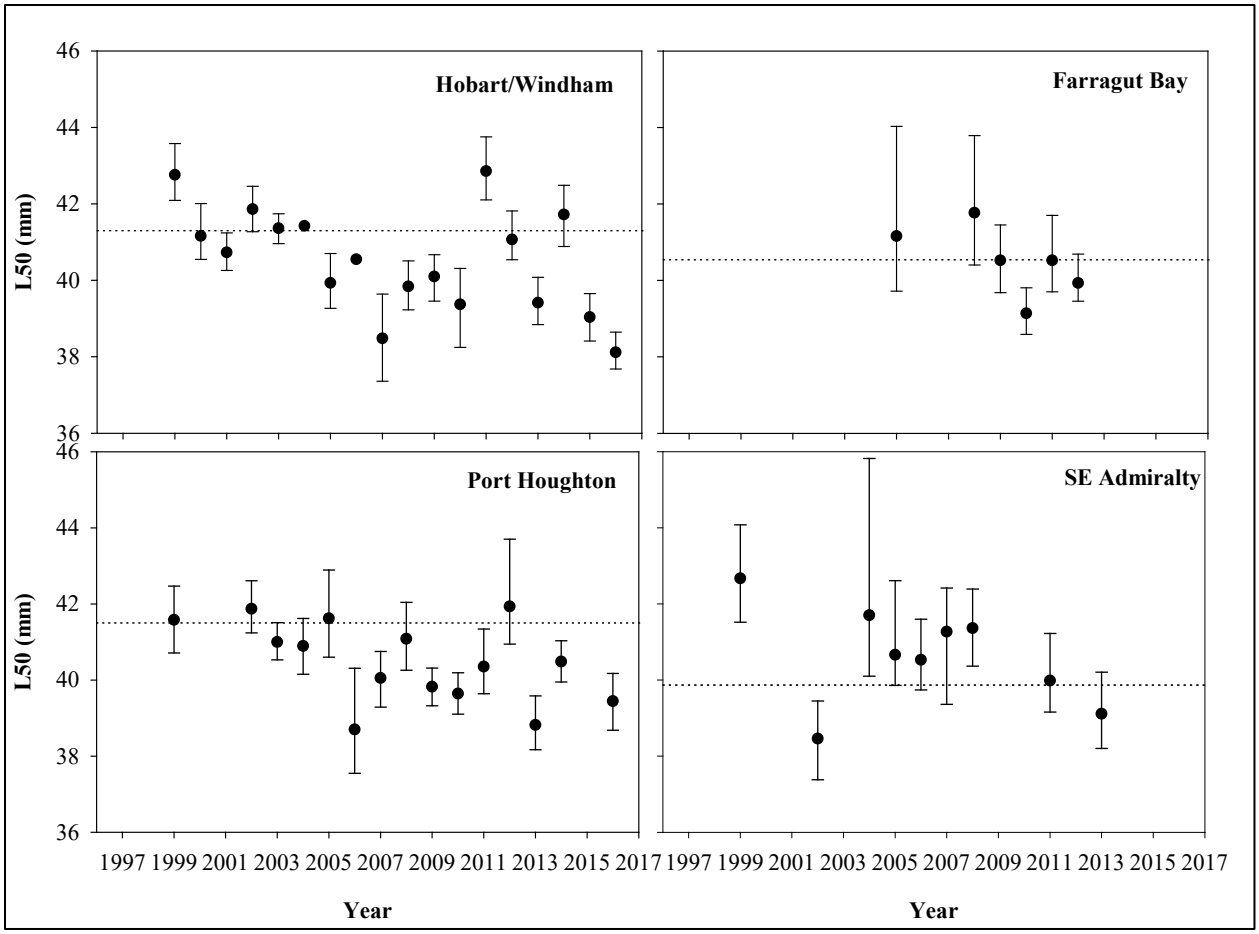

Figure 41.–L_{50} and 95% confidence intervals of spot shrimp from floating processor, on-the-grounds and dockside sampling in District 10, 1997/98–2016/17 seasons. Dotted line represents the long-term baseline. Only areas with baselines or 2016/17 season data are shown.

SITKA MANAGEMENT AREA

District 9

The GHL in District 9 has changed three times since the 1998/99 season. It was increased 20% from 15,000 to 18,000 lb in the 2000/01 fishing season, where it remained until the 2011/12 season when it was reduced to 14,000 lb. It was further reduced by 20% to 11,000 lb prior to the 2015/16 season due to continued declining standardized CPUE. Over the last ten years, harvest has averaged 11,100 lb (108% of the GHL) (Table 24). District 9 is divided into four analysis areas: Eliza Harbor, Keku Strait/Port Camden, SE Baranof Island, and Western Kuiu Island (Table 3). The analysis area composition of the harvest is variable, but most harvest comes from Eliza Harbor and SE Baranof Island. There were no landings from Keku Strait or Western Kuiu Island during the 2011/12 to 2016/17 fishing seasons.

The only data available for this district are standardized commercial CPUE. Overall district CPUE declined in the 2016/17 season after an increase in 2015/16. District CPUE has been below baseline for ten consecutive seasons (Figure 42). Area CPUE is below baseline in all fished analysis areas, with no four-year trends (Table 25, Figure 43).

There was no 2015/16 season logbook, dockside, or OTG data collected in this district.

Manager scores for this district were negative in SE Baranof Island and neutral in all other areas.

The overall matrix score is -0.70 (poor) down from -0.45 (moderate) in the 2015/16 season. This decline is due to standardized commercial CPUE going from above to below baseline in Eliza Harbor. District 9 has a 0.17 (low) level of data confidence.

This was the second season under a 20% GHL reduction. Standardized CPUE increased in SE Baranof and strongly decreased in Eliza Harbor. The 2015/16 season saw a very large increase and high variability of CPUE in Eliza Harbor, so the decline seen this season may be a more accurate representation of stock health in the area. The results of the 2017/18 fishing season may give a better indication of stock health in District 9.

Table 24.–District 9 matrix, Part A. A 15-season history, including stock assessment recommendations, for the pot shrimp fishery in Southeast Alaska.

Season	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
Upper regulatory GHR	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000
Actual GHL (lb spot shrimp)	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000
Recommended GHL or stock status	–	–	Moderate	–	18,000	Moderate	Moderate	Below Average
Season length (days)	32	24	30	19	16	14	12	24
Landings (number)	34	53	45	40	32	27	36	37
Harvest (lb spot shrimp)	15,713	17,904	17,911	20,252	24,113	17,336	17,139	18,960

Season	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Upper regulatory GHR	18,000	18,000	18,000	18,000	18,000	18,000	18,000
Actual GHL (lb spot shrimp)	18,000	14,000	14,000	14,000	14,000	11,000	11,000
Recommended GHL or stock status	Below Average	Moderate	Below Average	Below Average	Poor	Below Average	Poor
Season length (days)	49	10	11	11	10	8	8
Landings (number)	45	13	35	38	40	28	19
Harvest (lb spot shrimp)	21,893	10,799	16,184	15,243	18,495	12,213	12,757

Note: En dash = not available.

Table 25.–District 9 matrix, Part B. Baselines, current season values, and scores for each stock status parameter and analysis area for the pot shrimp fishery in Southeast Alaska. Data sources are from ADF&G shrimp survey, fish tickets ("fish tix"), logbooks, and on-the-grounds (OTG) and dockside (DS) sampling of commercial catch. Data are divided by type: CPUE, harvest rate, mean carapace length (CL), and L_{50}. Score for each analysis area is the sum of all individual scores.

Analysis Area		Eliza Harbor			Keku Strait/Port Camden		
Area weighting			0.4			0.025	
Stock Status Parameters	Source	Baseline	Value	Score	Baseline	Value	Score
Catch rate ≥XL	survey	–	–	–	–	–	–
4-yr trend in catch rate	survey	–	–	–	–	–	–
Std. Comm. CPUE	fish tix	5.7	*	-1.00	–	No Effort	–
4-yr trend in CPUE	fish tix	–	No trend	0.00	–	–	–
Catch rate ≥XL	logbook	–	–	–	–	–	–
Harvest rate ≥XL (2014)	logbook	–	–	–	–	–	–
Harvest rate ≥XL (2015)	logbook	–	–	–	–	–	–
Harvest rate ≥XL (2016)	logbook	–	–	–	–	–	–
Mean CL	survey	–	–	–	–	–	–
4-yr trend in CL	survey	–	–	–	–	–	–
Mean CL	OTG	–	–	–	–	–	–
4-yr trend in CL	OTG	–	–	–	–	–	–
Mean CL	DS	–	–	–	–	–	–
4-yr trend in CL	DS	–	–	–	–	–	–
L_{50}	survey	–	–	–	–	–	–
L_{50}	OTG/DS	–	–	–	–	–	–
Manager scores		–	–	0.00	–	–	0.00
Score		–	–	-1.00	–	–	0.00
Max. possible score		–	–	2.25	–	–	1.00
Stock Status		–	–	–	–	–	–
Confidence		–	–	0.18	–	–	0.06

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Table 25.–Page 2 of 2.

Analysis Area		SE Baranof			Western Kuiu			
Area weighting			0.55			0.025		
Stock Status Parameters	Source	Baseline	Value	Score	Baseline	Value	Score	Total Score
Catch rate ≥XL	survey	–	–	–	–	–	–	–
4-yr trend in catch rate	survey	–	–	–	–	–	–	–
Std. Comm. CPUE	fish tix	4.1	*	-1.00	–	No Effort		-0.33
4-yr trend in CPUE	fish tix	–	No trend	0.00	–	–	–	0.00
Catch rate ≥XL	logbook	–	–	–	–	–	–	–
Harvest rate ≥XL (2014)	logbook	–	–	–	–	–	–	–
Harvest rate ≥XL (2015)	logbook	–	–	–	–	–	–	–
Harvest rate ≥XL (2016)	logbook	–	–	–	–	–	–	–
Mean CL	survey	–	–	–	–	–	–	–
4-yr trend in CL	survey	–	–	–	–	–	–	–
Mean CL	OTG	–	–	–	–	–	–	–
4-yr trend in CL	OTG	–	–	–	–	–	–	–
Mean CL	DS	–	–	–	–	–	–	–
4-yr trend in CL	DS	–	–	–	–	–	–	–
L_{50}	survey	–	–	–	–	–	–	–
L_{50}	OTG/DS	–	–	–	–	–	–	–
Manager scores		–	–	-1.00	–	–	0.00	-0.37
Score		–	–	-2.00	–	–	0.00	-0.70
Max. possible score		–	–	2.25	–	–	1.00	1.17
Stock Status		–	–	–	–	–	–	Poor
Confidence		–	–	0.18	–	–	0.06	0.17

Note: * indicates confidential data with less than three permits participating. En dashes = not available, NA = not applicable, *Sig. inc.* = significant increase, *Sig. dec.* = significant decrease, ≥XL = ≥40 mm CL.

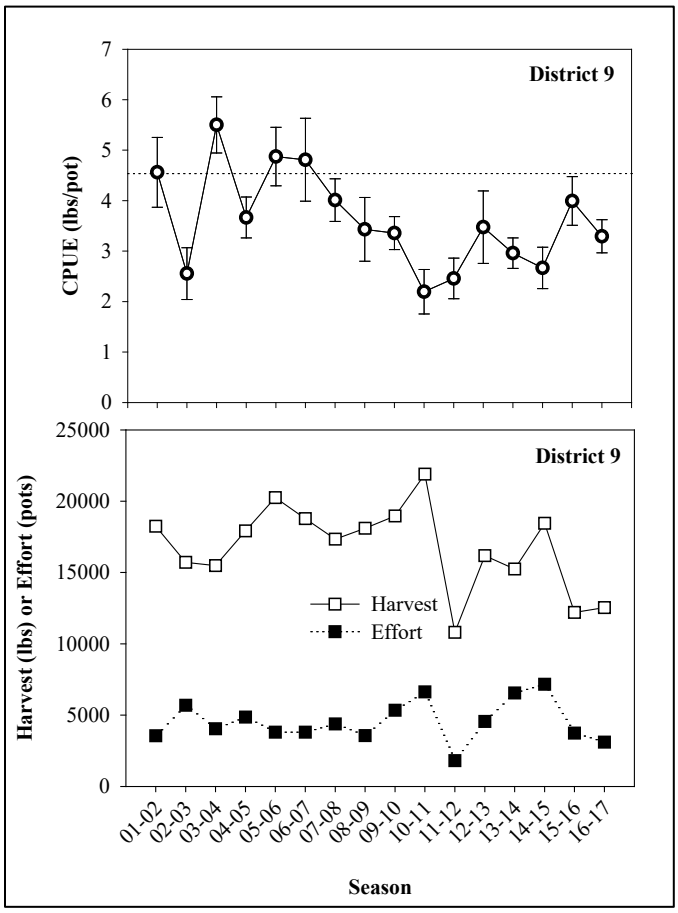

Figure 42.–Districtwide CPUE and effort data for District 9, 2001/02–2016/17 seasons. CPUE is weighted by analysis area weights to allow for an overall impression of fishery performance.

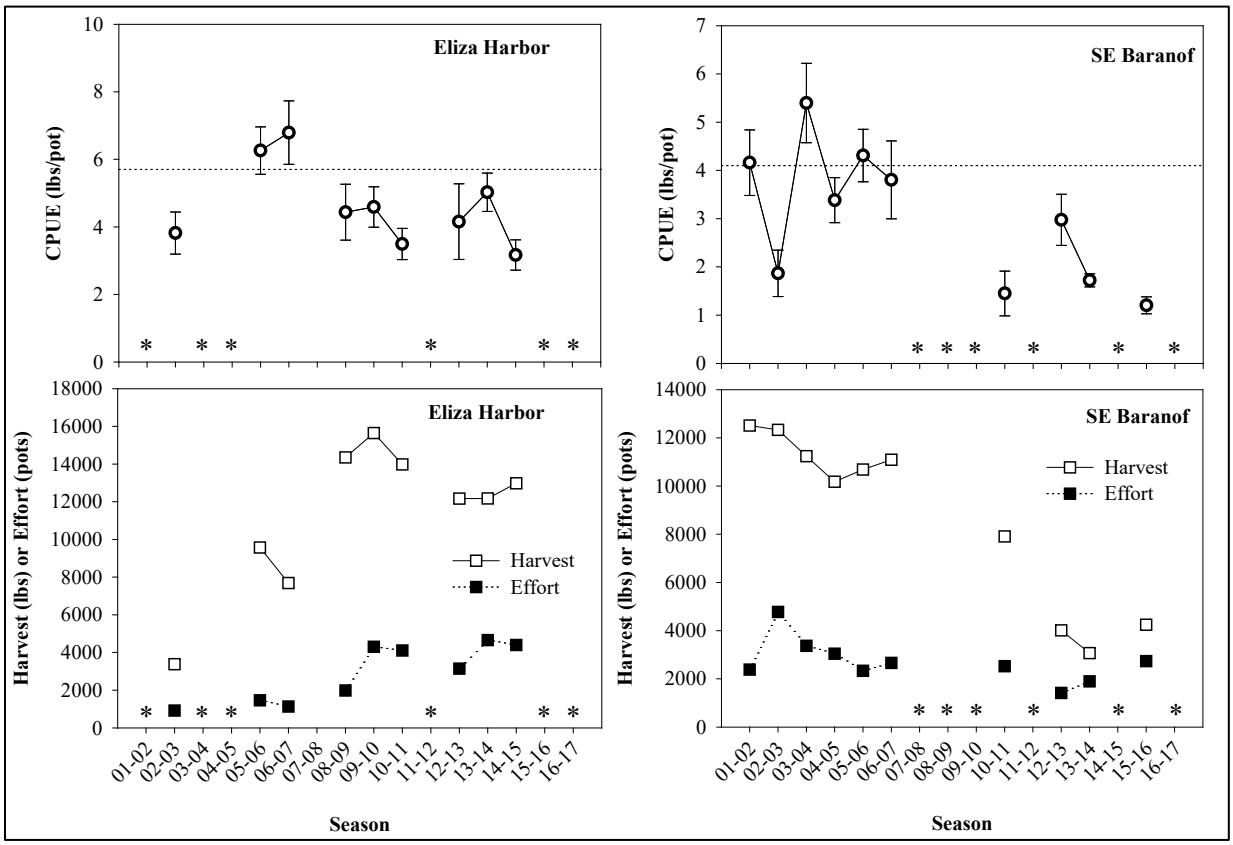

Figure 43.–Mean and standard error of spot shrimp catch rate from commercial harvest (dotted line represents the long-term baseline) and the commercial harvest and effort by analysis area in District 9, 2001/02–2016/17 seasons. * indicates confidential data with less than three permits participating.

District 13

Sections 13-A/B

Sections 13-A/B were divided from Section 13-C with a GHL of 15,000 lb beginning with the 2000/01 season; prior to this, the GHL for all of District 13 was 40,000 lb. Over the past 10 seasons, harvest has averaged 14,200 lb (94% of the GHL) (Table 26). This district is divided into four analysis areas: Crawfish Inlet, Larch/Branch Bays, Necker Bay, and Whale Bay (Table 3).

Sectionwide standardized commercial CPUE increased from last season with increased variation (Figure 44). Analysis area-specific standardized commercial CPUE shows highly variable but strong increases in both Crawfish and Necker. All analysis areas are at baseline with Crawfish showing an increasing four-year trend (Table 27, Figure 45).

The manager scores are negative for Crawfish Inlet but neutral for all other areas (Table 27).

The overall matrix score is -0.21 (moderate) up from -0.36 (moderate) in the 2015/16 season. The increase is due to standardized commercial CPUE in Crawfish now showing an increasing four-year trend, and Necker no longer showing a decreasing four-year trend. Section 13-A/B has a 0.18 (low) data confidence.

CPUE in all areas either increased or were flat for the 2016/17 season. Commercial CPUE in these areas is highly variable annually and spatially. The GHL in Section 13-A/B is currently at the maximum of the GHR, and there does not appear to be any stock health problems that would require a GHL decrease.

Table 26.–Sections 13-A/B matrix, Part A. A 15-season history, including stock assessment recommendations, for the pot shrimp fishery in Southeast Alaska.

Season	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Upper regulatory GHR	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000
Actual GHL (lb spot shrimp)	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000
Recommended GHL or stock status	–	15,000	–	Moderate	15,000	Moderate	Moderate	Below Average	Moderate
Season length (days)	97	152	152	30	17	14	120	151	151
Landings (number)	69	65	54	37	19	17	21	21	21
Harvest (lb spot shrimp)	14,066	13,606	18,306	13,194	16,819	11,606	11,902	9,301	11,193

Season	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Upper regulatory GHR	15,000	15,000	15,000	15,000	15,000	15,000
Actual GHL (lb spot shrimp)	15,000	15,000	15,000	15,000	15,000	15,000
Recommended GHL or stock status	Moderate	Above Average	Below Average	Below Average	Below Average	Moderate
Season length (days)	64	229	56	32	30	30
Landings (number)	28	21	48	49	43	43
Harvest (lb spot shrimp)	15,345	13,836	16,681	17,572	14,615	19,692

Note: En dash = not available.

Table 27.–Sections 13-A/B matrix, Part B. Baselines, current season values, and scores for each stock status parameter and analysis area for the pot shrimp fishery in Southeast Alaska. Data sources are from ADF&G shrimp survey, fish tickets ("fish tix"), logbooks, and on-the-grounds (OTG) and dockside (DS) sampling of commercial catch. Data are divided by type: CPUE, harvest rate, mean carapace length (CL), and L_{50}. Score for each analysis area is the sum of all individual scores.

Analysis Area		Crawfish			Larch/Branch Bays		
Area weighting			0.3			0.0	
Stock Status Parameters	Source	Baseline	Value	Score	Baseline	Value	Score
Catch rate ≥XL	survey	–	–	–	–	–	–
4-yr trend in catch rate	survey	–	–	–	–	–	–
Std. Comm. CPUE	fish tix	2.1	5.7	0.00	–	No Effort	–
4-yr trend in CPUE	fish tix	–	Sig. inc.	0.25	–	–	–
Catch rate ≥XL	logbook	–	–	–	–	–	–
Harvest rate ≥XL (2014)	logbook	–	–	–	–	–	–
Harvest rate ≥XL (2015)	logbook	–	–	–	–	–	–
Harvest rate ≥XL (2016)	logbook	–	–	–	–	–	–
Mean CL	survey	–	–	–	–	–	–
4-yr trend in CL	survey	–	–	–	–	–	–
Mean CL	OTG	–	–	–	–	–	–
4-yr trend in CL	OTG	–	–	–	–	–	–
Mean CL	DS	–	–	–	–	–	–
4-yr trend in CL	DS	–	–	–	–	–	–
L_{50}	survey	–	–	–	–	–	–
L_{50}	OTG/DS	–	–	–	–	–	–
Manager scores		–	–	-1.00	–	–	0.00
Score		–	–	-0.75	–	–	0.00
Max. possible score		–	–	2.25	–	–	1.00
Stock Status		–	–	–	–	–	–
Confidence		–	–	0.18	–	–	0.06

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Table 27.–Page 2 of 2.

Analysis Area		Necker			Whale Bay			
Area weighting			0.3			0.4		
Stock Status Parameters	Source	Baseline	Value	Score	Baseline	Value	Score	Total Score
Catch rate ≥XL	survey	–	–	–	–	–	–	–
4-yr trend in catch rate	survey	–	–	–	–	–	–	–
Std. Comm. CPUE	fish tix	2.7	*	0	2.4	*	0	0.00
4-yr trend in CPUE	fish tix	–	No trend	0	–	No trend	0	0.07
Catch rate ≥XL	logbook	–	–	–	–	–	–	–
Harvest rate ≥XL (2014)	logbook	–	–	–	–	–	–	–
Harvest rate ≥XL (2015)	logbook	–	–	–	–	–	–	–
Harvest rate ≥XL (2016)	logbook	–	–	–	–	–	–	–
Mean CL	survey	–	–	–	–	–	–	–
4-yr trend in CL	survey	–	–	–	–	–	–	–
Mean CL	OTG	–	–	–	–	–	–	–
4-yr trend in CL	OTG	–	–	–	–	–	–	–
Mean CL	DS	–	–	–	–	–	–	–
4-yr trend in CL	DS	–	–	–	–	–	–	–
L_{50}	survey	–	–	–	–	–	–	–
L_{50}	OTG/DS	–	–	–	–	–	–	–
Manager scores		–	–	0.00	–	–	0.00	-0.29
Score		–	–	0.00	–	–	0.00	-0.21
Max. possible score		–	–	2.25	–	–	2.25	1.17
Stock Status		–	–	–	–	–	–	Moderate
Confidence		–	–	0.18	–	–	0.18	0.18

Note: * indicates confidential data with less than three permits participating. En dashes = not available, NA = not applicable, *Sig. inc.* = significant increase, *Sig. dec.* = significant decrease, ≥XL = ≥40 mm CL.

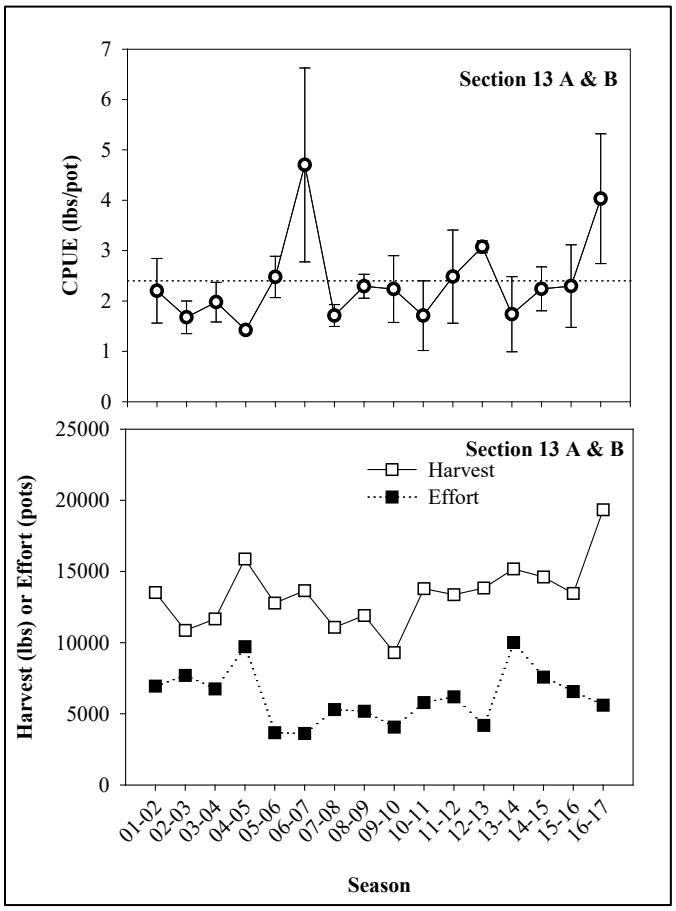

Figure 44.–Sectionwide CPUE and effort data for Sections 13-A/B, 2001/02–2016/17 seasons. CPUE is weighted by analysis area weights to allow for an overall impression of fishery performance.

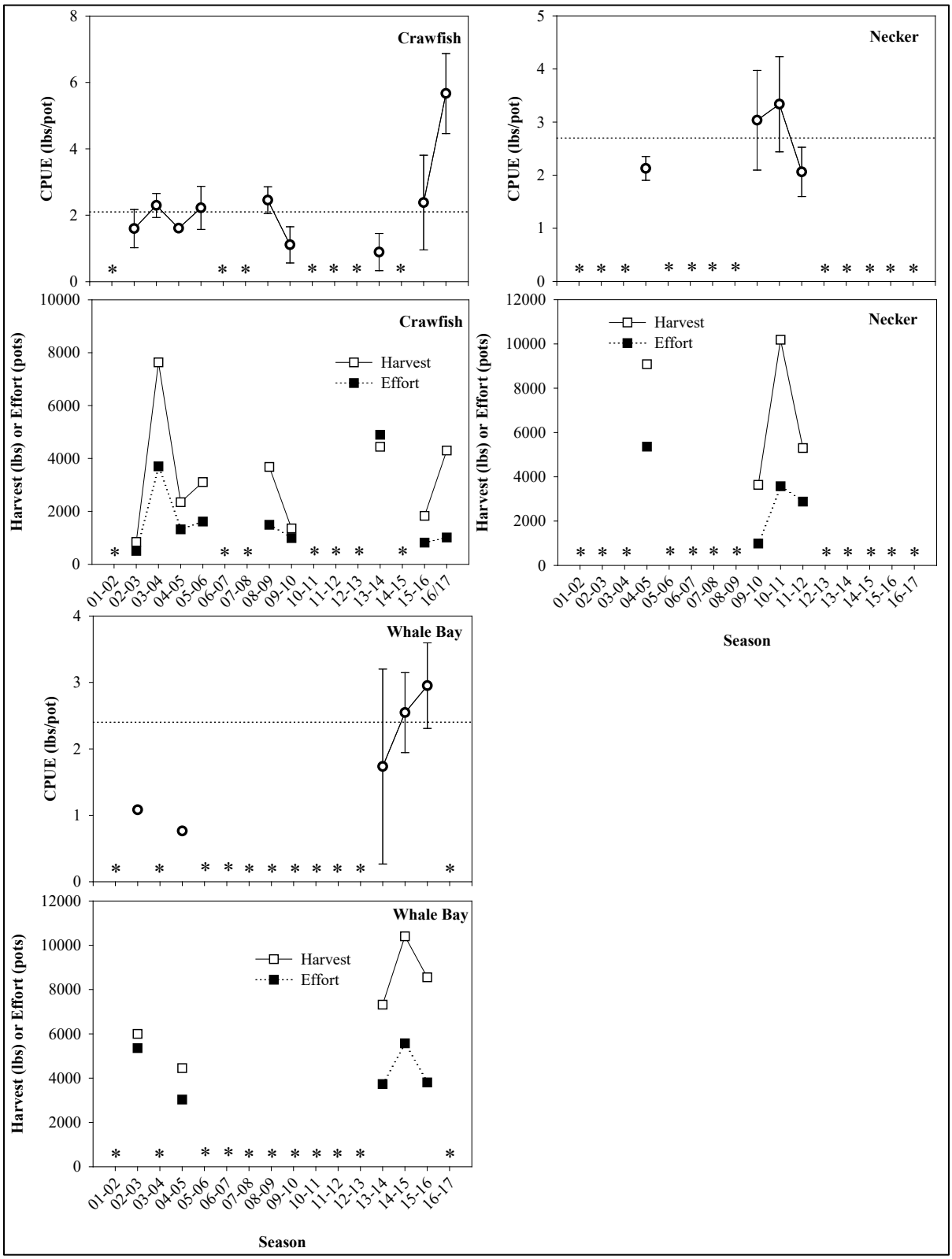

Figure 45.–Mean and standard error of spot shrimp catch rate from commercial harvest (dotted line represents the long-term baseline) and the commercial harvest and effort by analysis area in Sections 13-A/B, 2001/02–2016/17 seasons. * indicates confidential data with less than three permits participating.

Section 13-C

Section 13-C was divided from Sections 13-A/B with a GHL of 25,000 lb beginning with the 2000/01 season; prior to this, the GHL for all of District 13 was 40,000 lb. Subsequently the Section 13-C GHL was increased 40% to 42,000 lb for the 2004/05 fishing season. Due to survey results and poor fishery performance, the GHL was reduced 20% to 34,000 lb for the 2007/08 season, reduced 12% to 30,000 lb for the 2008/09 season, and finally reduced to 26,000 lb prior to the 2013/14 season (Table 28). Over the last 10 seasons, harvest has averaged 29,000 lb (102% of the GHL). This section is divided into two analysis areas: Hoonah Sound and Peril Strait (Table 3).

The annual preseason survey in Hoonah Sound was suspended beginning in the fall of 2015 due to budgetary constraints.

On-the-grounds mean CL has decreased to the lowest recorded level in the 2016/17 season. However, prior to the 2015/16 season OTG samples had not been collected since 2008/07. The baseline for survey collected CL was redefined in 2013 after it became clear the seasons on which it was based (1999–2001) had disproportionately high mean CL compared to all subsequent seasons. The OTG CL baseline is set on similar years, thus the negative score is suspect. When more data are collected in future years, it may be appropriate to redefine the OTG CL baseline as well. However, because the 2016/17 value is the lowest on record it should be taken as a negative indicator.

The sectionwide standardized commercial CPUE decreased strongly in the 2016/17 season to approximately half of the 2015/16 value. Standardized CPUE in the Hoonah Sound analysis area is below baseline with no four-year trend (Table 29, Figure 46).

Manager scores are neutral in Hoonah Sound and negative in Peril Strait.

The overall matrix score is -1.13 (poor), down from -0.80 (below average) in the 2015/16 season. This decrease is due to the strong decrease in standardized CPUE in Hoonah Sound. Section 13-C has 0.20 (low) data confidence (Table 29).

Due to the precipitous decline in standardized commercial CPUE and the lowest mean CL on record it is clear that the Hoonah Sound shrimp stock is in poor condition. Although the suddenness of the decrease is suspect, the severity is extreme. The department plans to survey the area prior to the 2017/18 season to determine the health of the stock in Hoonah Sound, and make any necessary adjustments to the GHL.

Table 28.–Section 13-C matrix, Part A. A 15-season history, including stock assessment recommendations, for the pot shrimp fishery in Southeast Alaska.

Season	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Upper regulatory GHR	30,000	30,000	30,000	30,000	50,000	50,000	50,000	50,000	50,000
Actual GHL (lb spot shrimp)	30,000	30,000	42,000	42,000	42,000	34,000	30,000	30,000	30,000
Recommended GHL or stock status	–	30,000	Good	Moderate	42,000	Poor	Poor	Below Average	Below Average
Season length (days)	5	5	5	6	5	7	5	4	6
Landings (number)	53	54	38	63	41	29	30	31	36
Harvest (lb spot shrimp)	38,318	42,240	34,270	43,605	36,449	29,395	29,724	25,993	33,104

Season	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Upper regulatory GHR	50,000	50,000	50,000	50,000	50,000	50,000
Actual GHL (lb spot shrimp)	30,000	26,000	26,000	26,000	26,000	26,000
Recommended GHL or stock status	Below Average	Moderate	Moderate	Moderate	Moderate	Poor
Season length (days)	4	4	4	4	5	5
Landings (number)	49	37	32	22	22	32
Harvest (lb spot shrimp)	37,415	29,048	23,171	26,532	26,228	27,946

Note: En dash = not available.

Table 29.–Section 13-C matrix, Part B. Baselines, current season values, and scores for each stock status parameter and analysis area for the pot shrimp fishery in Southeast Alaska. Data sources are from ADF&G shrimp survey, fish tickets ("fish tix"), logbooks, and on-the-grounds (OTG) and dockside (DS) sampling of commercial catch. Data are divided by type: CPUE, harvest rate, mean carapace length (CL), and L_{50}. Score for each analysis area is the sum of all individual scores.

Analysis Area		Hoonah Sound			Peril Strait			
Area weighting			0.8			0.2		
Stock Status Parameters	Source	Baseline	Value	Score	Baseline	Value	Score	Total Score
Catch rate ≥XL	survey	3.0	–	–	–	–	–	–
4-yr trend in catch rate	survey	–	–	–	–	–	–	–
Std. Comm. CPUE	fish tix	5.3	3.2	-1.00	3.7	No Effort	–	-0.33
4-yr trend in CPUE	fish tix	–	No trend	0.00	–	NA	–	0.00
Catch rate ≥XL	logbook	–	–	–	–	–	–	–
Harvest rate ≥XL (2014)	logbook	–	–	–	–	–	–	–
Harvest rate ≥XL (2015)	logbook	–	–	–	–	–	–	–
Harvest rate ≥XL (2016)	logbook	–	–	–	–	–	–	–
Mean CL	survey	37.8	–	–	–	–	–	–
4-yr trend in CL	survey	–	–	–	–	–	–	–
Mean CL	OTG	40.7	37.0	-1.00	36.1	–	–	-0.67
4-yr trend in CL	OTG	–	–	–	–	–	–	–
Mean CL	Dock S.	–	–	–	–	–	–	–
4-yr trend in CL	Dock S.	–	–	–	–	–	–	–
L_{50}	survey	42.1	–	–	–	–	–	–
L_{50}	OTG/DS	–	–	–	–	–	–	–
Manager scores		–	–	0.00	–	–	-1.00	-0.13
Score		–	–	-2.00	–	–	-1.00	-1.13
Max. possible score		–	–	3.25	–	–	1.00	1.83
Stock Status		–	–	–	–	–	–	Poor
Confidence		–	–	0.24	–	–	0.06	0.20

Note: * indicates confidential data with less than three permits participating. En dashes = not available, NA = not applicable, *Sig. inc.* = significant increase, *Sig. dec.* = significant decrease, ≥XL = ≥40 mm CL.

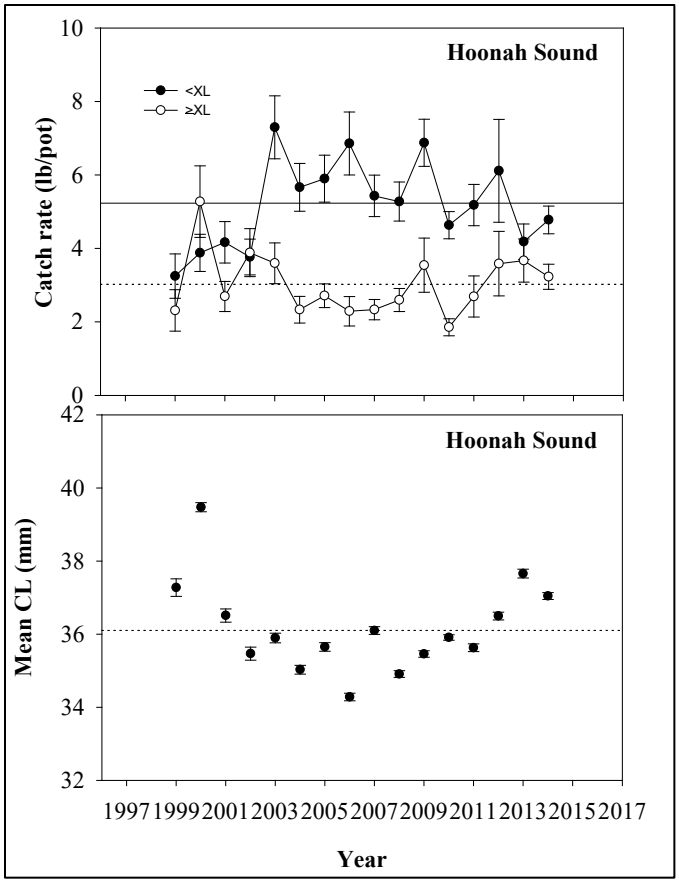

Figure 46.–Mean and standard error of spot shrimp catch rate (upper panels) and carapace length (lower panels) from preseason surveys in Section 13-C, 1999/00–2014/15 seasons. Lines represent the long-term baselines.

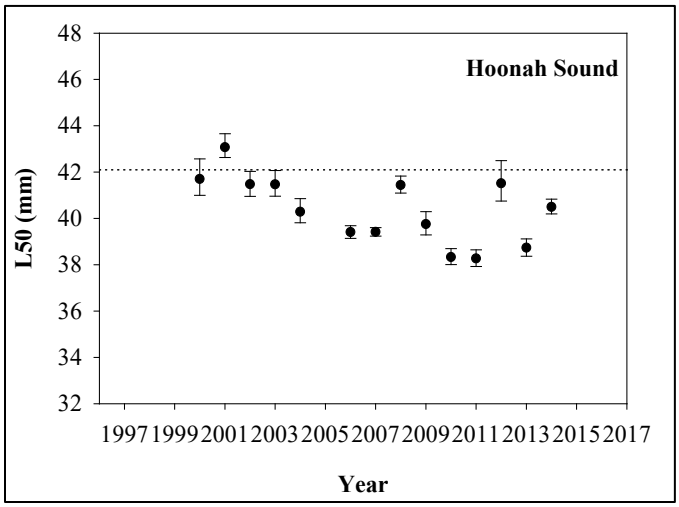

Figure 47.–L_{50} and 95% confidence intervals of spot shrimp from preseason surveys in Section 13-C, 1997/98–2014/15 seasons. Dotted line represents the long-term baseline.

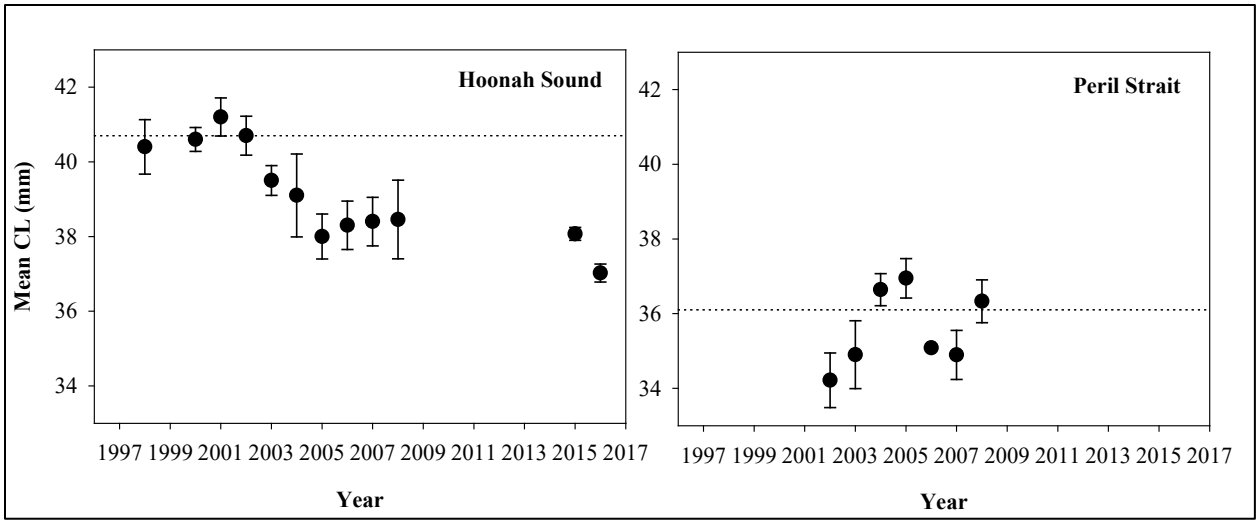

Figure 48.–Mean and standard error of spot shrimp carapace length from floating processor and on-the-grounds sampling in Section 13C, 1998/99–2016/17 seasons. Dotted line represents the long-term baseline. Only areas with baselines or 2016/17 season data are shown.

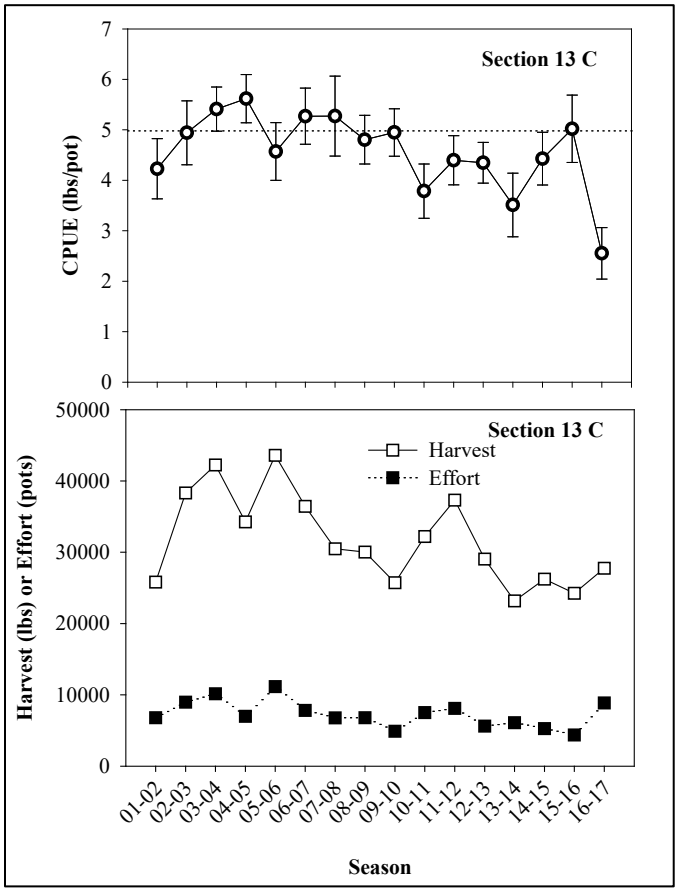

Figure 49.–Sectionwide CPUE and effort data for Section 13C, 2001/02–2016/17 seasons. CPUE is weighted by analysis area weights to allow for an overall impression of fishery performance.

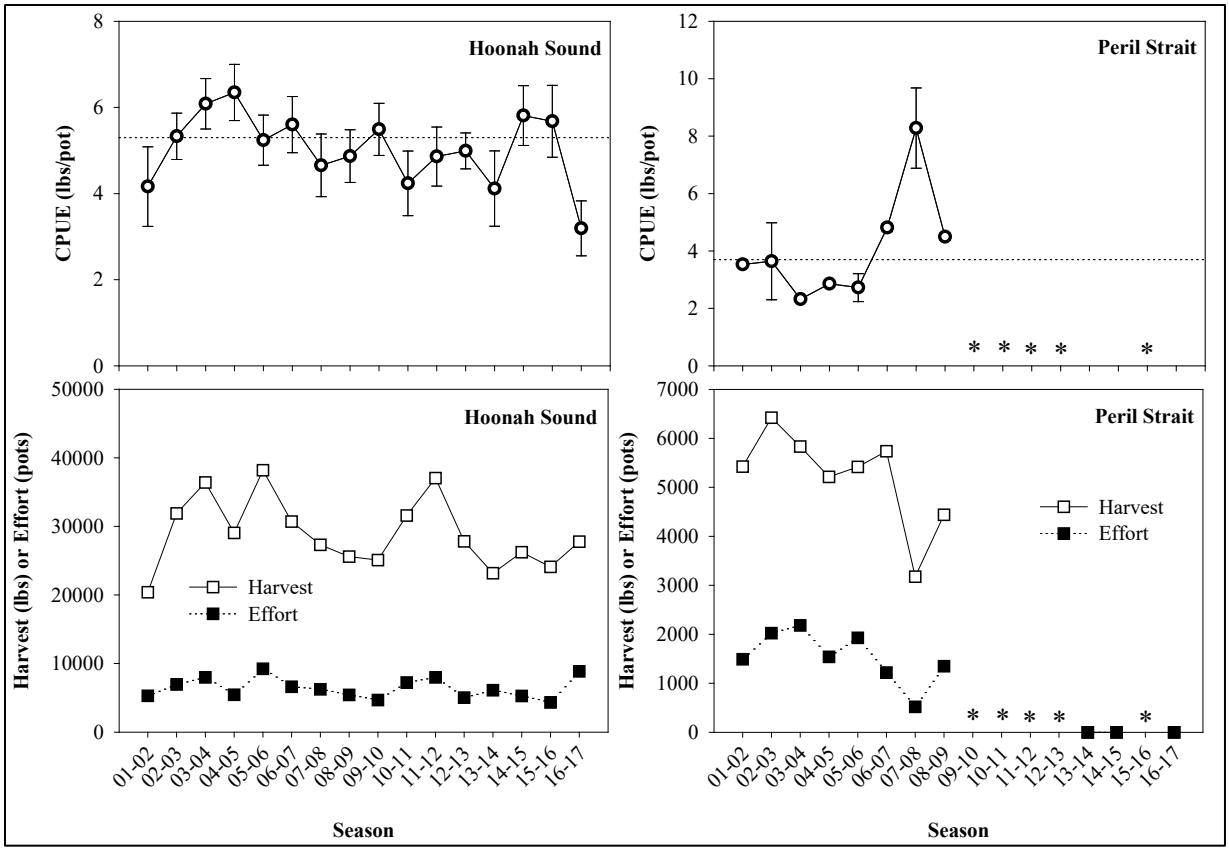

Figure 50.–Mean and standard error of spot shrimp catch rate from commercial harvest (dotted line represents the long-term baseline) and the commercial harvest and effort by analysis area in Section 13-C, 2001/02–2016/17 seasons. * indicates confidential data with less than three permits participating.

JUNEAU MANAGEMENT AREA

District 11

Seymour Canal

Seymour Canal was split from the Remainder of District 11 starting with the 2012/13 fishing season. The GHR of spot shrimp is 0–30,000 lb. The 2012/13 GHL was set using an experimental system on the grounds. A traditional GHL of 15,000 lb was implemented for the 2013/14 season and reduced to 12,000 lb prior to the 2014/15 season due to declining catch rates (Table 30). Seymour Canal contains one analysis area (Table 3).

Standardized commercial CPUE increased slightly from the 2015/16 season. It is still well below the long-term baseline and showing no four-year trend (Table 31, Figure 51).

Manager scores for Seymour Canal is neutral.

The overall matrix score is -0.33 (below average) the same as the past two seasons. Seymour Canal has a 0.18 (low) level of confidence (Table 31).

The standardized CPUE in Seymour Canal increased precipitously between the 2003/04 and the 2005/06 seasons, was quite high for five seasons, and then precipitously declined. It may be that Seymour Canal had a couple of large recruit classes that entered the fishery starting in 2004/05 which have been sustaining the fishery at high CPUEs until starting to decline in 2010/11. Based on the life history of the species in Alaska, and the consistent and large size of the shrimp observed on the grounds, this hypothesis seems plausible. The Seymour Canal stock may be returning to a state similar to that of seasons before 2004/05.

Table 30.–Seymour Canal matrix, Part A. A 15-season history, including stock assessment recommendations, for the pot shrimp fishery in Southeast Alaska.

Season	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
Upper regulatory GHR				20,000 all District 11				
Actual GHL (lb spot shrimp and coonstripe)				20,000 all District 11				
Recommended GHL or stock status	–	–	Moderate	–	16,000	Moderate	Moderate	Above Average
Season length (days)	73	48	43	43	19	15	19	10
Landings (number)	33	34	*	20	*	*	*	24
Harvest (lb spot shrimp)	12,148	14,207	*	15,565	*	*	*	25,287

Season	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
Upper regulatory GHR	20,000 all District 11		30,000	30,000	30,000	30,000
Actual GHL (lb spot shrimp and coonstripe)	20,000 all District 11		Experimental	15,000	12,000	12,000
Recommended GHL or stock status	Moderate	Below Average	Poor	Poor	Below Average	Below Average
Season length (days)	10	6	8	8	12	11
Landings (number)	26	30	30	21	*	*
Harvest (lb spot shrimp)	23,209	20,879	21,970	13,007	*	*

Season	2016/17
Upper regulatory GHR	30,000
Actual GHL (lb spot shrimp and coonstripe)	12,000
Recommended GHL or stock status	Below Average
Season length (days)	9
Landings (number)	*
Harvest (lb spot shrimp)	*

Note: * indicates confidential data with less than three permits participating; en dash = not available.

Table 31.–Seymour Canal matrix, Part B. Baselines, current season values, and scores for each stock status parameter and analysis area for the pot shrimp fishery in Southeast Alaska. Data sources are from ADF&G shrimp survey, fish tickets ("fish tix"), logbooks, and on-the-grounds (OTG) and dockside (DS) sampling of commercial catch. Data are divided by type: CPUE, harvest rate, mean carapace length (CL), and L_{50}. Score for each analysis area is the sum of all individual scores.

Analysis Area		Seymour Canal			
Area weighting			1.0		
Stock Status Parameters	Source	Baseline	Value	Score	Total Score
Catch rate ≥XL	survey	–	–	–	–
4-yr trend in catch rate	survey	–	–	–	–
Std. Comm. CPUE	fish tix	7.4	*	-1.00	-0.33
4-yr trend in CPUE	fish tix	–	No trend	0.00	0.00
Catch rate ≥XL	logbook	–	–	–	–
Harvest rate ≥XL (2014)	logbook	–	–	–	–
Harvest rate ≥XL (2015)	logbook	–	–	–	–
Harvest rate ≥XL (2016)	logbook	–	–	–	–
Mean CL	survey	–	–	–	–
4-yr trend in CL	survey	–	–	–	–
Mean CL	OTG	–	–	–	–
4-yr trend in CL	OTG	–	–	–	–
Mean CL	DS	–	–	–	–
4-yr trend in CL	DS	–	–	–	–
L_{50}	survey	–	–	–	–
L_{50}	OTG/DS	40.6	–	–	–
Manager scores		–	–	0.00	0.00
Score		–	–	-1.00	-0.33
Max. possible score		–	–	2.25	1.17
Stock Status		–	–	–	Below Average
Confidence		–	–	0.18	0.18

Note: * indicates confidential data with less than three permits participating. En dashes = not available, NA = not applicable, *Sig. inc.* = significant increase, *Sig. dec.* = significant decrease, ≥XL = ≥40 mm CL.

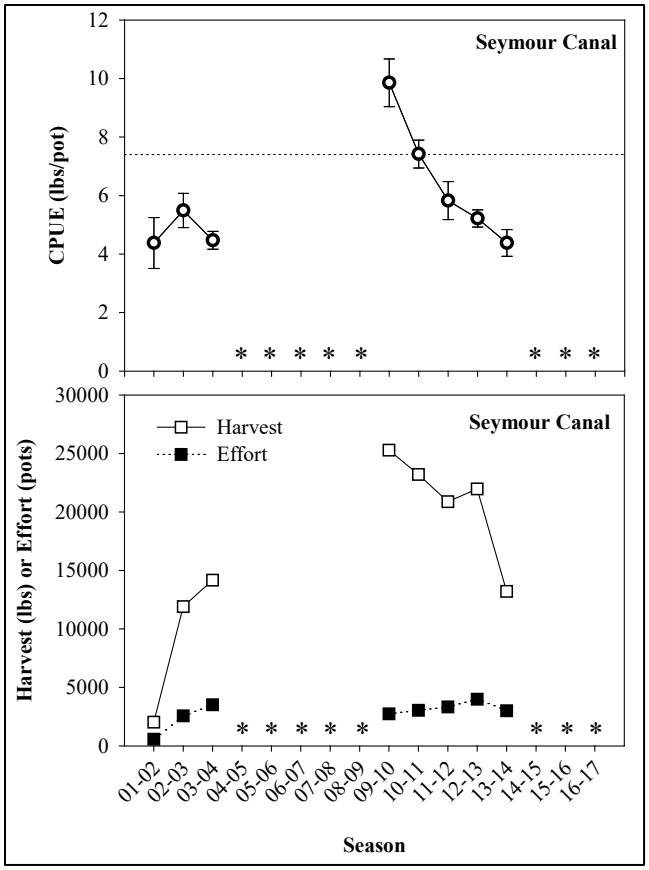

Figure 51.–Mean and standard error of spot and coonstripe shrimp catch rate from commercial harvest (dotted line represents the long-term baseline) and the commercial harvest and effort by in Seymour Canal, 2001/02–2016/17 seasons. * indicates confidential data with less than three permits participating.

Remainder of District 11

The GHL for spot and coonstripe shrimp in District 11 had been 20,000 lb since the 1995/96 fishing season. Beginning with the 2012/13 fishing season Seymour Canal was divided from the remainder of the district and the remainder was given an exploratory GHL of 7,500 lb. There has been a steady decline in the coonstripe and a corresponding increase in the spot shrimp harvest in this fishing area. Over the last ten years harvest has averaged 5,000 lb (54% of GHL) (Table 32). The Remainder of District 11 is divided into 2 analysis areas: 11-A and Glacier-fed Bays (Table 3).

Overall weighted CPUE for the Remainder of District 11 has declined and is now at the lowest level since standardization was possible (Figure 52). Effort in the Glacier-fed Bays area was the highest on record, while CPUE dropped. Standardized CPUE in the Glacier-fed Bays analysis area is significantly below the baseline and declining in the four-year analysis (Table 33, Figure 53). The 11-A analysis area was closed beginning with the 2013/14 season due to poor stock health.

The logbook harvest rate of large class shrimp in the Glacier-fed Bays analysis area was 75% (excessive) during the 2016/17 season. This is the second season of excessive harvest rates (85% in 2015/16) (Table 33).

Manager scores is negative for the Glacier-fed Bays analysis area (Table 33).

The overall matrix score is -2.17 (poor), down from 0.00 (moderate) in the 2015/16 season due to continued declines in commercial CPUE and the availability of logbook harvest rate data. The Remainder of 11 management area has a 0.04 (very low) level of data confidence (Table 33).

Due to declining commercial CPUE, the inability of the fleet to reach the current GHL, and the evidence of overharvest of large class shrimp from logbook data it is clear that the fished area cannot support the current 7,500 lb GHL.

Table 32.–District 11 matrix, Part A. A 15-season history, including stock assessment recommendations, for the pot shrimp fishery in Southeast Alaska.

Season	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
Upper regulatory GHR				20,000 all District 11				
Actual GHL (lb spot and coonstripe)				20,000 all District 11				
Recommended GHL or stock status	–	–	Moderate	–	16,000	Moderate	Moderate	Moderate
Season length (days)	73	48	43	43	19	15	19	10
Landings (number)	76	62	52	44	*	30	*	*
Harvest (lb spot shrimp)	7,213	4,685	5,500	7,816	*	4,226	*	*
Harvest (lb coonstripe shrimp)	286	3,123	930	262	*	24	*	*

Season	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Upper regulatory GHR	20,000 all District 11		15,000	15,000	15,000	15,000	15,000
Actual GHL (lb spot and coonstripe)	20,000 all District 11		7,500	7,500	7,500	7,500	7,500
Recommended GHL or stock status	Moderate	Moderate	Below Average	Above Average	Moderate	Moderate	Poor
Season length (days)	10	6	143	19	21	35	151
Landings (number)	*	*	20	21	24	28	34
Harvest (lb spot shrimp)	*	*	6,466	7,818	5,774	5,600	4,583
Harvest (lb coonstripe shrimp)	*	*	1,861	543	644	759	1,325

Note: * indicates confidential data with less than three permits participating; en dash = not available.

Table 33.–District 11 matrix, Part B. Baselines, current season values, and scores for each stock status parameter and analysis area for the pot shrimp fishery in Southeast Alaska. Data sources are from ADF&G shrimp survey, fish tickets ("fish tix"), logbooks, and on-the-grounds (OTG) and dockside (DS) sampling of commercial catch. Data are divided by type: CPUE, harvest rate, mean carapace length (CL), and L_{50}. Score for each analysis area is the sum of all individual scores.

Analysis Area		11-A			Glacier-fed Bays			
Area weighting			0.75			0.25		
Stock Status Parameters	Source	Baseline	Value	Score	Baseline	Value	Score	Total Score
Catch rate ≥XL	survey	–	–	–	–	–	–	–
4-yr trend in catch rate	survey	–	–	–	–	–	–	–
Std. Comm. CPUE	fish tix	–	Closed	–	1.9	1.3	-1.00	-0.33
4-yr trend in CPUE	fish tix	–	–	–	–	Sig. dec.	-0.25	-0.17
Catch rate ≥XL	logbook	–	–	–	–	–	–	–
Harvest rate ≥XL (2014)	logbook	–	–	–	–	–	–	–
Harvest rate ≥XL (2015)	logbook	–	–	–	–	85%	–	–
Harvest rate ≥XL (2016)	logbook	–	–	–	–	71%	-1.00	-1.00
Mean CL	survey	–	–	–	–	–	–	–
4-yr trend in CL	survey	–	–	–	–	–	–	–
Mean CL	OTG	–	–	–	–	–	–	–
4-yr trend in CL	OTG	–	–	–	–	–	–	–
Mean CL	DS	–	–	–	–	–	–	–
4-yr trend in CL	DS	–	–	–	–	–	–	–
L_{50}	survey	–	–	–	–	–	–	–
L_{50}	OTG/DS	–	–	–	–	–	–	–
Manager scores		–	–	–	–	–	-1.00	-0.67
Score		–	–	0.00	–	–	-3.25	-2.17
Max. possible score		–	–	0.00	–	–	3.25	2.17
Stock Status		–	–	–	–	–	–	Poor
Confidence		–	–	0.00	–	–	0.24	0.06

Note: * indicates confidential data with less than three permits participating. En dashes = not available, NA = not applicable, *Sig. inc.* = significant increase, *Sig. dec.* = significant decrease, ≥XL = ≥40 mm CL.

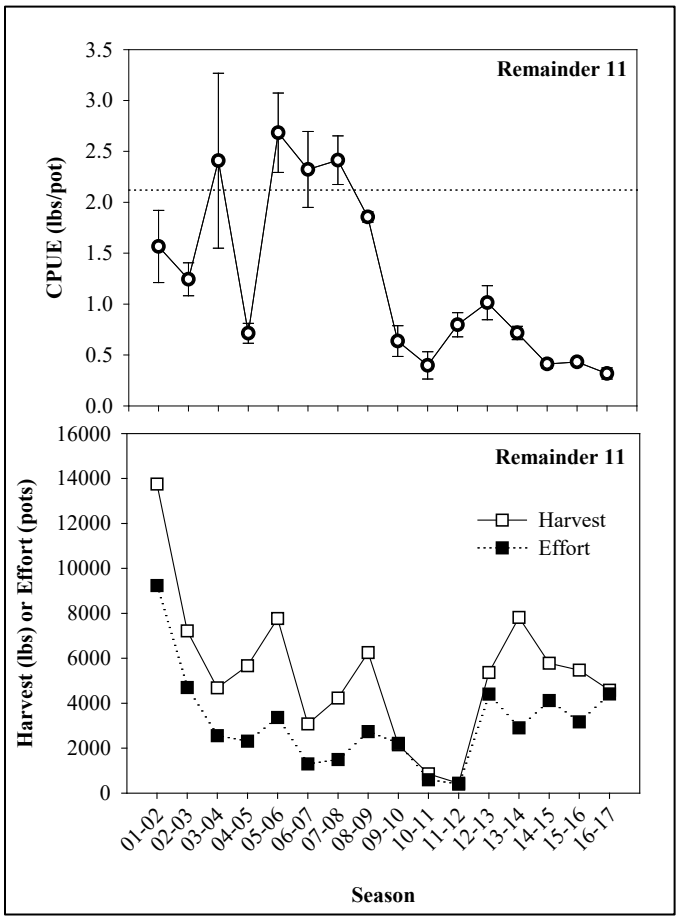

Figure 52.–Areawide CPUE and effort data for the Remainder of District 11, 2001/02–2016/17 seasons. CPUE is weighted by analysis area weights to allow for an overall impression of fishery performance.

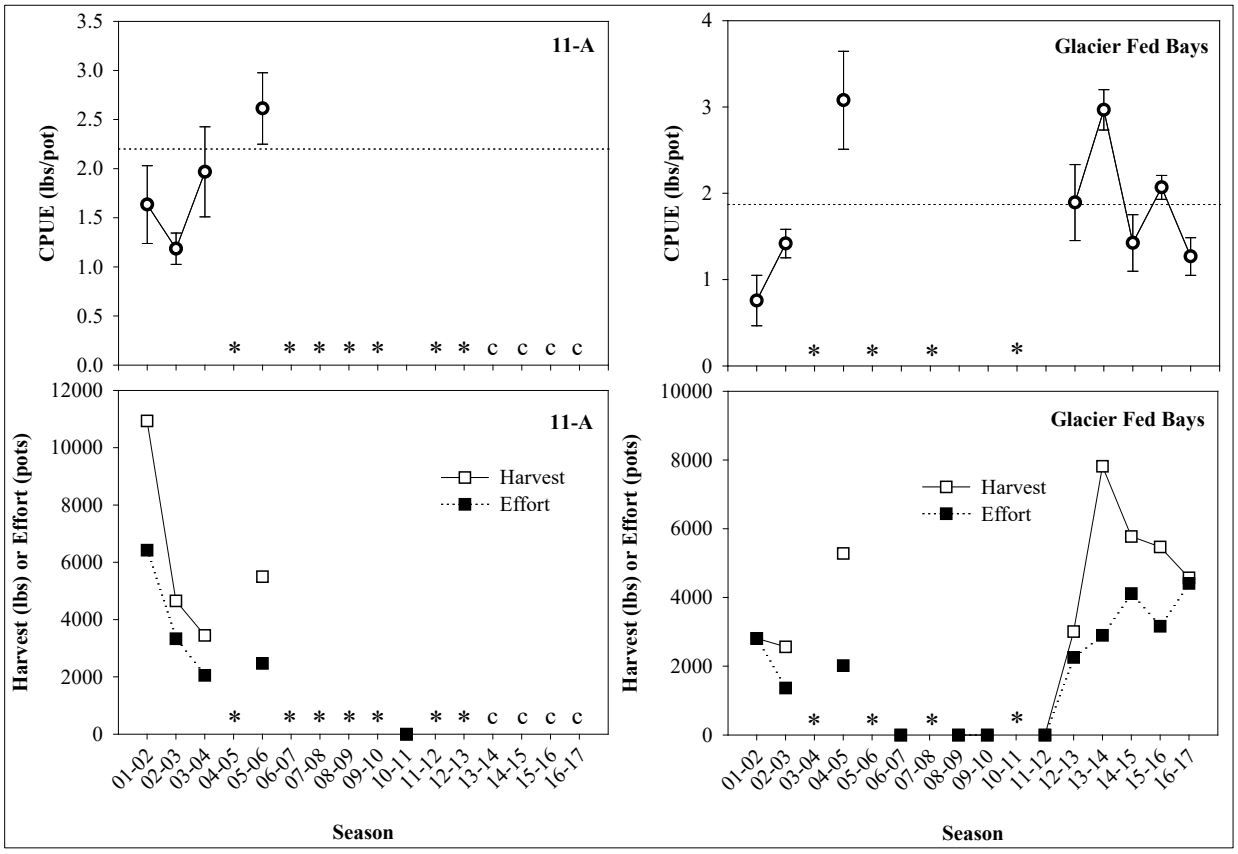

Figure 53.–Mean and standard error of spot and coonstripe shrimp catch rate from commercial harvest (dotted line represents the long-term baseline) and the commercial harvest and effort by analysis area in the Remainder of District 11, 2001/02–2016/17 seasons. * indicates confidential data with less than three permits participating; "c" indicates the area was closed to fishing.

District 12

Tenakee Inlet

Tenakee Inlet was divided from the rest of District 12 beginning with the 2001/02 fishing season with a GHR of 0–20,000 lb and a GHL of 20,000 lb. The upper end of the GHR was increased to 34,000 lb prior to the 2005/06 fishing season and the GHL was increased 30% to 28,000 lb. In response to declines in survey and fishery CPUE, the GHL was reduced 40% to 17,000 lb for the 2008/09 fishing season. Due to continued declines in stock status, the GHL was further lowered by 40% to 10,000 lb for the 2010/11 season and was closed to commercial fishing prior to the 2011/12 season. In 2012, Tenakee Inlet was closed to sport and personal use harvests. Over the last 10 years when the commercial fishery was open, harvest averaged 20,853 lb (100% of the GHL) (Table 34). This district is divided into two analysis areas: East Tenakee Inlet and West Tenakee Inlet (Table 3).

The preseason survey was discontinued in East Tenakee Inlet in 2015.

Survey CPUE of ≥XL shrimp for West Tenakee Inlet dropped precipitously during the 2011 survey to the lowest level in the history of the survey, and then dropped further in 2012. There was a very slight increase in 2013, then strong increases were seen from 2014–2016. The survey catch rate of large class shrimp in West Tenakee is now at baseline and shows a four-year increasing trend. The 2016 survey also showed a second year of increase in small class shrimp (Table 35, Figure 54). Mean CL from the survey continues to be above baseline in West Tenakee, but now shows a decline in the four-year analysis, likely due to the increased presence of small class shrimp (Table 35, Figure 54). Survey L_{50} is now above baseline (Table 35, Figure 55).

Commercial CPUE information has not been available due to the fishery closure since the 2010/11 season (Table 35, Figures 55 and 56).

Manager scores were neutral in East Tenakee and positive in West Tenakee.

The 2016/17 overall score is 2.02 (above average) up from -0.75 (moderate) in 2015/16, due improving survey catch rates, increased L_{50} values, and increased manager scores. Tenakee Inlet has a 0.32 (moderate) level of confidence.

Survey data have shown some stock recovery over the past three seasons, but stocks have still been at or below baseline levels. The department will survey West Tenakee Inlet prior to the 2017/18 fishing season and determine if opening the area to sport, personal use, or commercial fishing is warranted.

Table 34.–Tenakee Inlet matrix, Part A. A 15-season history, including stock assessment recommendations, for the pot shrimp fishery in Southeast Alaska.

Season	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
Upper regulatory GHR	20,000	20,000	20,000	34,000	34,000	34,000	34,000	34,000
Actual GHL (lb spot shrimp)	20,000	20,000	20,000	28,000	28,000	28,000	17,000	17,000
Recommended GHL or stock status	–	20,000	Moderate	Good	28,000	Moderate	Poor	Below Average
Season length (days)	6	6	3	5	4	3	4	3
Landings (number)	35	40	23	45	34	26	11	15
Harvest (lb spot shrimp)	21,558	30,494	23,729	36,435	30,032	18,086	12,270	10,981

Season	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Upper regulatory GHR	34,000	34,000	34,000	34,000	34,000	34,000	34,000
Actual GHL (lb spot shrimp)	10,000	Closed	Closed	Closed	Closed	Closed	Closed
Recommended GHL or stock status	Above Average	Closed	Closed	Closed	Closed	Closed	Closed
Season length (days)	2	Closed	Closed	Closed	Closed	Closed	Closed
Landings (number)	15	Closed	Closed	Closed	Closed	Closed	Closed
Harvest (lb spot shrimp)	14,152	Closed	Closed	Closed	Closed	Closed	Closed

Note: En dash = not available.

Table 35.–Tenakee Inlet matrix, Part B. Baselines, current season values, and scores for each stock status parameter and analysis area for the pot shrimp fishery in Southeast Alaska. Data sources are from ADF&G shrimp survey, fish tickets ("fish tix"), logbooks, and on-the-grounds (OTG) and dockside (DS) sampling of commercial catch. Data are divided by type: CPUE, harvest rate, mean carapace length (CL), and L_{50}. Score for each analysis area is the sum of all individual scores.

Analysis Area		East Tenakee			West Tenakee			
Area weighting			0.1			0.9		
Stock Status Parameters	Source	Baseline	Value	Score	Baseline	Value	Score	Total Score
Catch rate ≥XL	survey	3.7	–	–	7.1	6.4	0.00	0.00
4-yr trend in catch rate	survey	–	–	–	–	Sig. inc.	0.25	0.25
Std. Comm. CPUE	fish tix	4.5	Closed	–	7.0	Closed	–	–
4-yr trend in CPUE	fish tix	–	–	–	–	–	–	–
Catch rate ≥XL	logbook	–	–	–	–	–	–	–
Harvest rate ≥XL (2014)	logbook	–	–	–	–	–	–	–
Harvest rate ≥XL (2015)	logbook	–	–	–	–	–	–	–
Harvest rate ≥XL (2016)	logbook	–	–	–	–	–	–	–
Mean CL	survey	35.4	–	–	38.9	40.5	1.00	0.67
4-yr trend in CL	survey	–	–	–	–	Sig. dec.	-0.25	-0.17
Mean CL	OTG	–	–	–	41.1	–	–	–
4-yr trend in CL	OTG	–	–	–	–	–	–	–
Mean CL	DS	–	–	–	–	–	–	–
4-yr trend in CL	DS	–	–	–	–	–	–	–
L_{50}	survey	40.4	–	–	43	44.5	1.00	0.67
L_{50}	OTG/DS	–	–	–	–	–	–	–
Manager scores		–	–	0.00	–	–	1.00	0.60
Score		–	–	0.00	–	–	3.00	2.02
Max. possible score		–	–	1.00	–	–	4.50	3.42
Stock Status		–	–	–	–	–	–	Above Average
Confidence		–	–	0.06	–	–	0.35	0.32

Note: * indicates confidential data with less than three permits participating. En dashes = not available, NA = not applicable, *Sig. inc.* = significant increase, *Sig. dec.* = significant decrease, ≥XL = ≥40 mm CL.

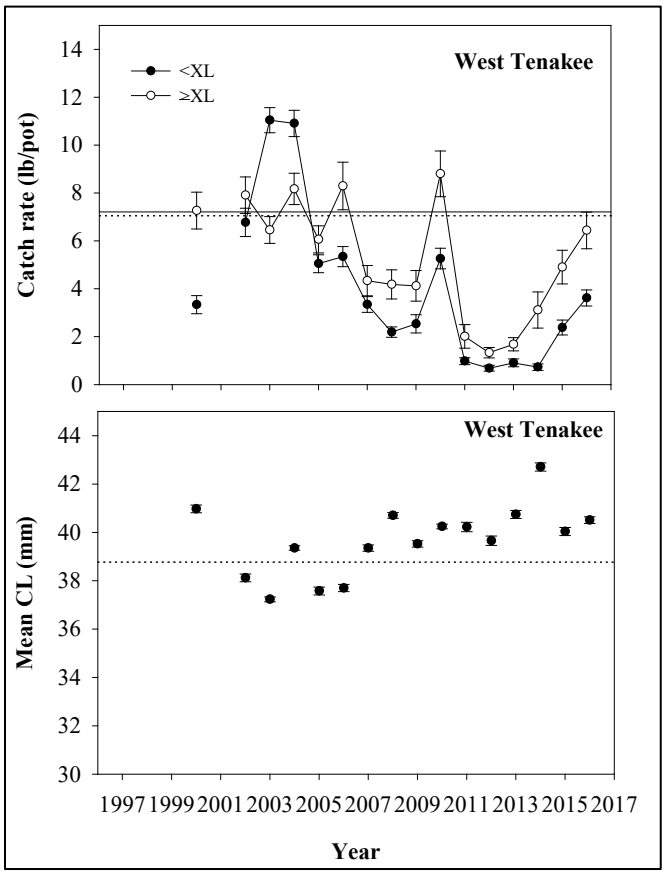

Figure 54.–Mean and standard error of spot shrimp catch rate (upper panels), and carapace length (lower panels) from preseason surveys in West Tenakee Inlet, 2000–2016. Lines represent the long-term baselines.

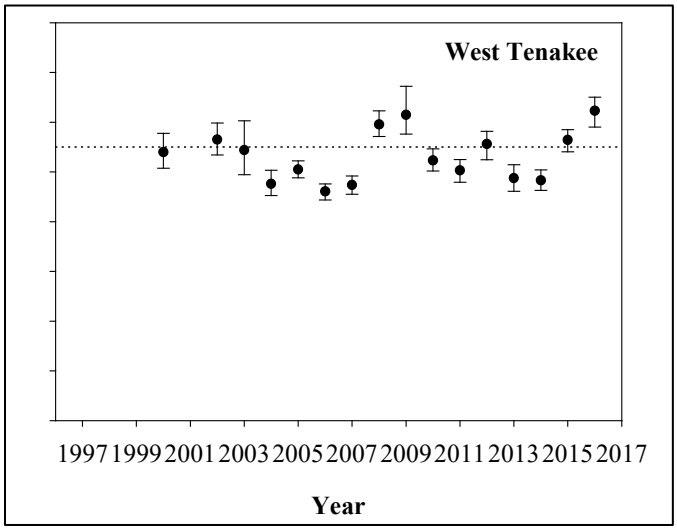

Figure 55.–L_{50} and 95% confidence intervals of spot shrimp from preseason surveys in West Tenakee Inlet, 2000–2016. Dotted line represents the long-term baseline.

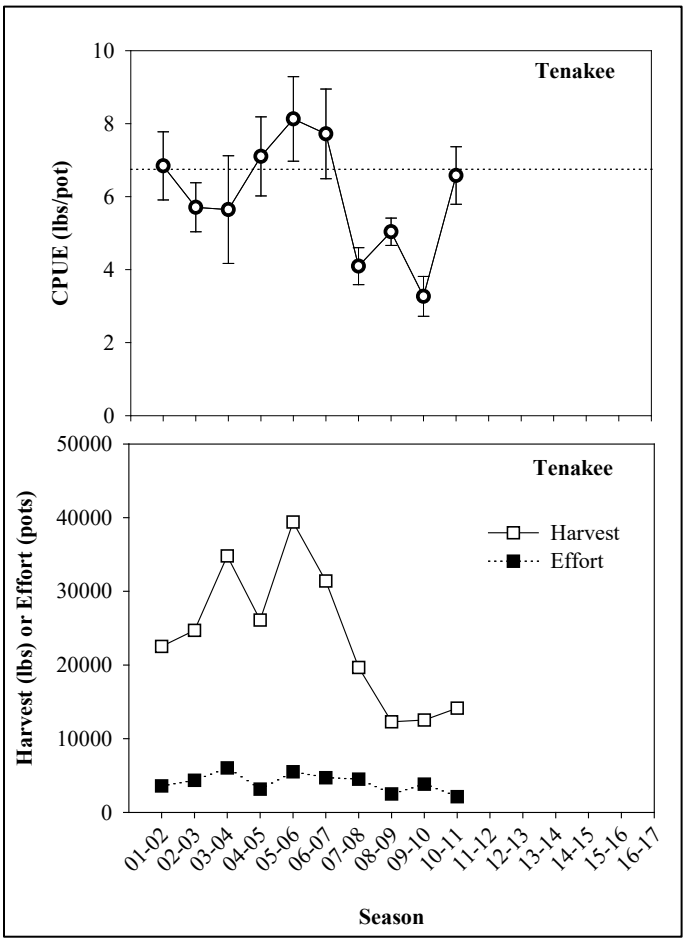

Figure 56.–Areawide CPUE and effort data for Tenakee Inlet, 2001/02–2016/17 seasons. CPUE is weighted by analysis area weights to allow for an overall impression of fishery performance.

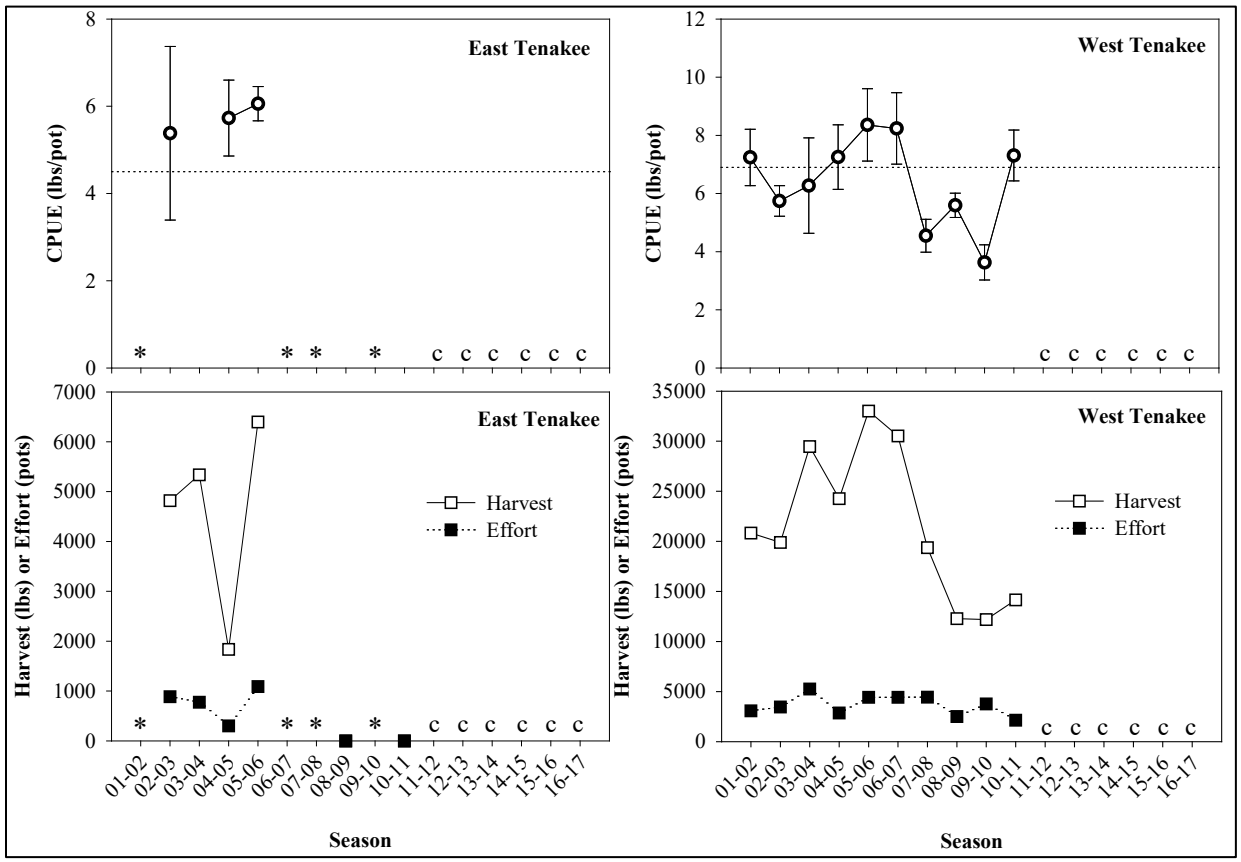

Figure 57.–Mean and standard error of spot shrimp catch rate from commercial harvest (dotted line represents the long-term baseline) and the commercial harvest and effort by analysis area in Tenakee Inlet, 2001/02–2016/17 seasons. * indicates confidential data with less than three permits participating; "c" indicates the area was closed to fishing.

Remainder of District 12

Remainder of District 12 was established prior to the 2001/02 season with a GHR of 0–15,000 lb and the GHL set at the upper end of the GHR. The GHL was reduced 33% to 10,000 lb for the 2008/09 fishing season. Due to declining CPUE, the Remainder of District 12 was closed prior to the 2012/13 fishing season. It was reopened at a reduced GHL of 7,500 lb for the 2015/16 season and closed for the 2016/17 season (Table 36). Over the last ten years that the fishery was open, harvest has averaged 10,800 lb (94% of the GHL). This district is divided into three analysis areas: Freshwater Bay, Kelp Bay, and Point Couverden (Table 3). The proportion of harvest that had come from Kelp Bay relative to the Freshwater Bay analysis area had increased prior to the closure.

Due to the lack of stock recovery in the 2015/16 season after a three-year closure, the Remainder of District 12 was closed for another three-year period beginning with the 2016/17 season (Table 37). This decision was based on the surveyed stock recovery in nearby West Tenakee Inlet where a measurable increase in survey CPUE was not seen until four years after the closure of the commercial, sport, and personal use fisheries. Sport and personal use fishing remain open in the Remainder of District 12 and current data indicate that stocks are still rebuilding in this area.

Table 36.–Remainder of District 12 matrix, Part A. A 15-season history, including stock assessment recommendations, for the pot shrimp fishery in Southeast Alaska.

Season	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
Upper regulatory GHR	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000
Actual GHL (lb spot shrimp)	15,000	15,000	15,000	15,000	15,000	15,000	10,000	10,000
Recommended GHL or stock status	–	15,000	–	–	15,000	Moderate	Poor	Below Average
Season length (days)	31	37	23	16	12	10	9	10
Landings (number)	55	68	51	34	39	28	24	27
Harvest (lb spot shrimp)	16,904	19,605	17,627	13,521	18,552	15,958	12,383	7,908

Season	2010/11	2011/12	2012/13	2013/14	2014/15	2014/15	2016/17
Upper regulatory GHR	15,000	15,000	15,000	15,000	15,000	15,000	15,000
Actual GHL (lb spot shrimp)	10,000	10,000	Closed	Closed	Closed	7,500	Closed
Recommended GHL or stock status	Poor	Poor	Closed	Closed	Closed	Poor	Closed
Season length (days)	19	42	Closed	Closed	Closed	9	Closed
Landings (number)	26	38	Closed	Closed	Closed	23	Closed
Harvest (lb spot shrimp)	8,953	6,336	Closed	Closed	Closed	5,238	Closed

Note: En dash = not available.

Table 37.–Remainder of District 12 matrix, Part B. Baselines, current season values, and scores for each stock status parameter and analysis area for the pot shrimp fishery in Southeast Alaska. Data sources are from ADF&G shrimp survey, fish tickets ("fish tix"), logbooks, and on-the-grounds (OTG) and dockside (DS) sampling of commercial catch. Data are divided by type: CPUE, harvest rate, mean carapace length (CL), and L_{50}. Score for each analysis area is the sum of all individual scores.

Analysis Area		Freshwater Bay			Kelp Bay			Point Couverden			
Area weighting			0.2			0.7			0.1		
Stock Status Parameters	Source	Baseline	Value	Score	Baseline	Value	Score	Baseline	Value	Score	Total Score
Catch rate ≥XL	survey	–	–	–	–	–	–	–	–	–	–
4-yr trend in catch rate	survey	–	–	–	–	–	–	–	–	–	–
Std. Comm. CPUE	fish tix	2.5	Closed	–	3.2	Closed	–	2.3	Closed	–	–
4-yr trend in CPUE	fish tix	–	–	–	–	–	–	–	–	–	–
Catch rate ≥XL	logbook	–	–	–	–	–	–	–	–	–	–
Harvest rate ≥XL (2014)	logbook	–	–	–	–	–	–	–	–	–	–
Harvest rate ≥XL (2015)	logbook	–	–	–	–	–	–	–	–	–	–
Harvest rate ≥XL (2016)	logbook	–	–	–	–	–	–	–	–	–	–
Mean CL	survey	–	–	–	–	–	–	–	–	–	–
4-yr trend in CL	survey	–	–	–	–	–	–	–	–	–	–
Mean CL	OTG	–	–	–	–	–	–	–	–	–	–
4-yr trend in CL	OTG	–	–	–	–	–	–	–	–	–	–
Mean CL	DS	–	–	–	–	–	–	–	–	–	–
4-yr trend in CL	DS	–	–	–	–	–	–	–	–	–	–
L_{50}	survey	–	–	–	–	–	–	–	–	–	–
L_{50}	OTG/DS	–	–	–	–	–	–	–	–	–	–
Manager scores		–	–	–	–	–	–	–	–	–	–
Score		–	–	0.00	–	–	0.00	–	–	0.00	–
Max. possible score		–	–	0.00	–	–	0.00	–	–	0.00	–
Stock Status		–	–	–	–	–	–	–	–	–	Closed
Confidence		–	–	0.00	–	–	0.00	–	–	0.00	–

Note: * indicates confidential data with less than three permits participating. En dashes = not available, NA = not applicable, *Sig. inc.* = significant increase, *Sig. dec.* = significant decrease, ≥XL = ≥40 mm CL.

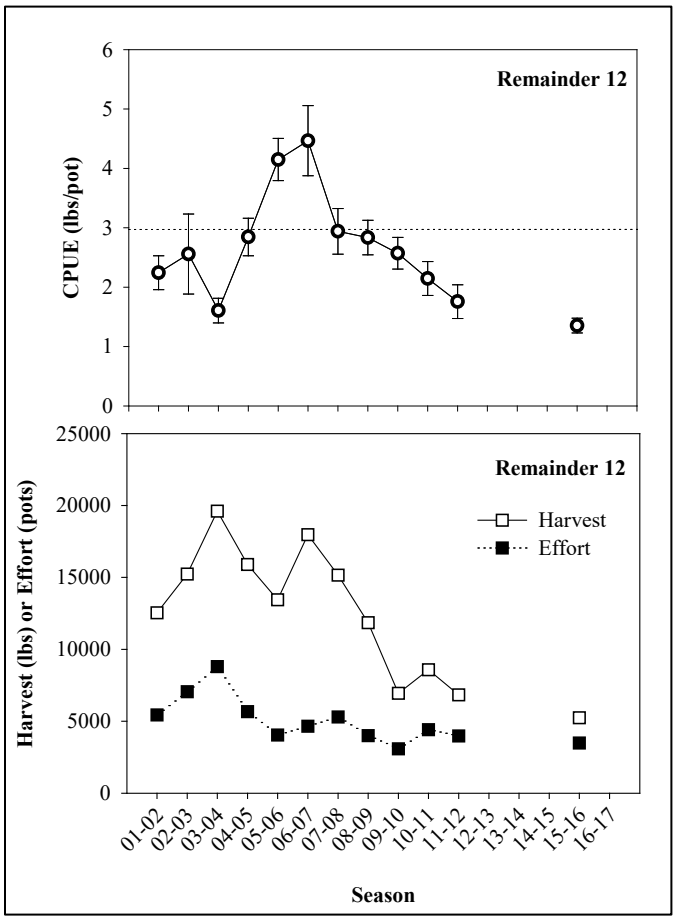

Figure 58.–Areawide CPUE and effort data for the Remainder of District 12, 2001/02–2016/17 seasons. CPUE is weighted by analysis area weights to allow for an overall impression of fishery performance.

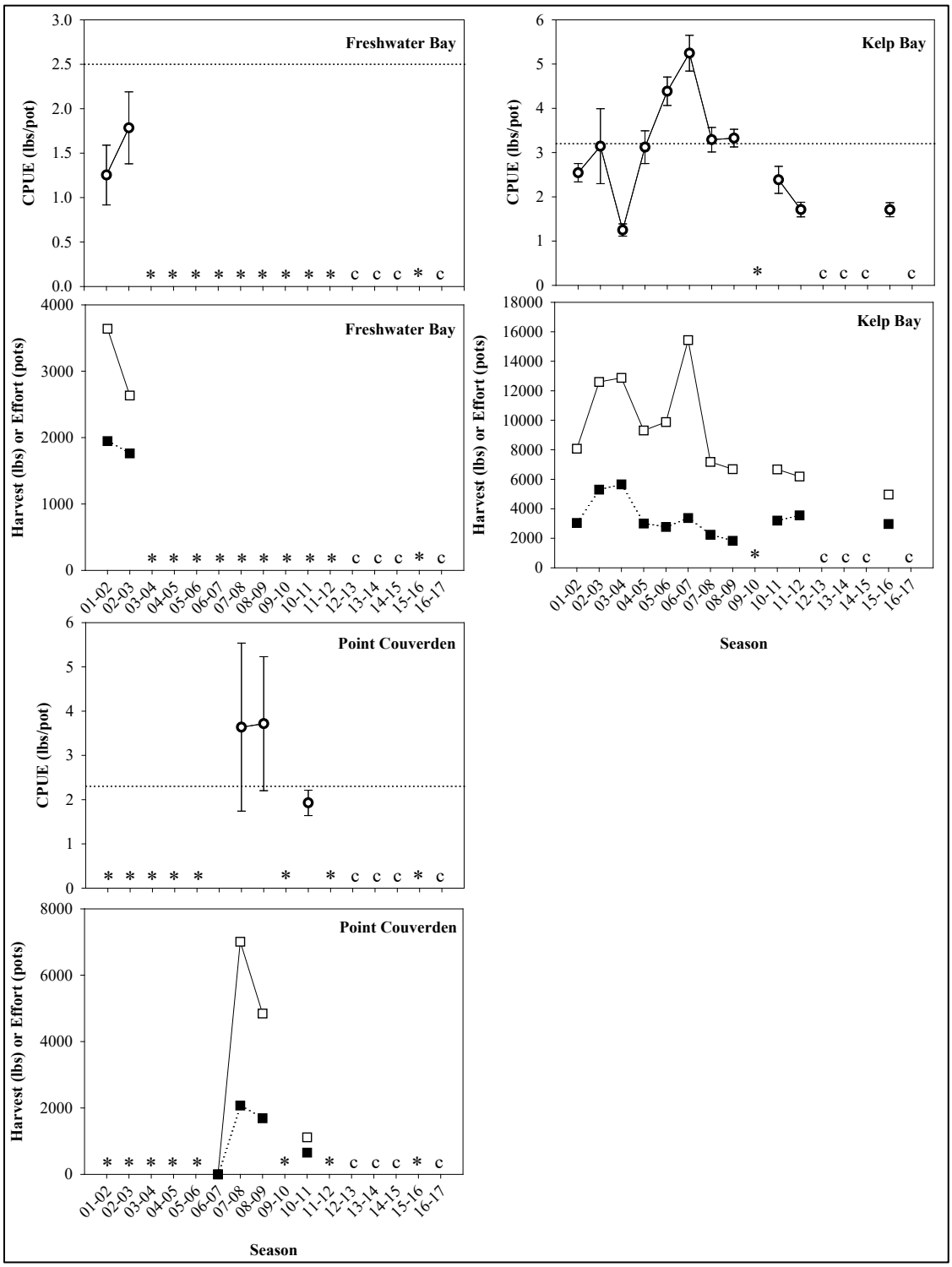

Figure 59.–Mean and standard error of spot shrimp catch rate from commercial harvest (dotted line represents the long-term baseline) and the commercial harvest and effort by analysis area in the Remainder of District 12, 2001/02–2016/17 seasons. * indicates confidential data with less than three permits participating; "c" indicates the area was closed to fishing.

District 14

In response to concerns over fishery performance, the GHL for spot shrimp in District 14 was reduced from 20,000 lb to 15,000 lb (-25%) beginning with the 2006/07 fishing season, and to 10,000 lb (-33%) for the 2008/09 season. The district was subsequently closed for the 2009/10–2011/12 seasons and reopened for the 2012/13 season. Due to continued poor performance, the fishery was closed for the 2013/14–2015/16 seasons (Table 38). The District reopened for the 2016/17 season with a 7,500 lb GHL. Over the past ten open fishing seasons, harvest averaged 15,100 lb (94% of the GHL). This district is divided into two analysis areas: Eastern Icy Strait and Port Frederick (Table 3).

Districtwide standardized commercial CPUE showed an increase from the 2012/13 season but is still below baseline (Figure 60). Eastern Icy Strait was the only analysis area fished and CPUE was at baseline (Figure 61). No four-year analyses were possible due to the 2013/14–2015/16 closure.

Manager scores were neutral for Eastern Icy Strait.

The overall matrix score is 0.00 (moderate) up from -1.00 (poor) in the 2012/13 season due to increases in commercial CPUE. District 14 has a 0.09 (very low) level of data confidence (Table 39).

The Eastern Icy Strait analysis area had the best overall CPUE since the 2000/01 season. However, the weather was exceptionally good, nearly flat calm throughout the season, allowing boats to fish areas in Icy Strait that are not usually accessible due to weather limitations. CPUE in these areas started high but decreased rapidly, as is common when newly located small populations are exploited. Although stock status has improved from when last fished, the population does not appear to be particularly robust. Given the slow response of the stock in the traditional fishing area to the two three-year closures, it seems that the current GHL of 7,500 lb is unsustainable under current conditions.

Table 38.–District 14 matrix, Part A. A 15-season history, including stock assessment recommendations, for the pot shrimp fishery in Southeast Alaska.

Season	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
Upper regulatory GHR	20,000	20,000	20,000	20,000	20,000	20,000	20,000	15,000
Actual GHL (lb spot shrimp)	20,000	20,000	20,000	20,000	15,000	15,000	10,000	Closed
Recommended GHL or stock status	–	20,000	Moderate	–	10,000	Poor	Poor	Closed
Season length (days)	110	107	68	151	151	151	120	Closed
Landings (number)	99	108	114	76	74	45	44	Closed
Harvest (lb spot shrimp)	19,903	19,590	21,282	15,845	13,259	13,054	7,796	Closed

Season	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Upper regulatory GHR	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Actual GHL (lb spot shrimp)	Closed	Closed	10,000	Closed	Closed	Closed	7,500
Recommended GHL or stock status	Closed	Closed	Poor	Closed	Closed	Closed	Moderate
Season length (days)	Closed	Closed	54	Closed	Closed	Closed	11
Landings (number)	Closed	Closed	53	Closed	Closed	Closed	22
Harvest (lb spot shrimp)	Closed	Closed	8,833	Closed	Closed	Closed	6,806

Note: En dash = not available.

Table 39.–District 14 matrix, Part B. Baselines, current season values, and scores for each stock status parameter and analysis area for the pot shrimp fishery in Southeast Alaska. Data sources are from ADF&G shrimp survey, fish tickets ("fish tix"), logbooks, and on-the-grounds (OTG) and dockside (DS) sampling of commercial catch. Data are divided by type: CPUE, harvest rate, mean carapace length (CL), and L_{50}. Score for each analysis area is the sum of all individual scores.

Analysis Area		Eastern Icy Strait			Port Frederick			
Area weighting			0.1			0.9		
Stock Status Parameters	Source	Baseline	Value	Score	Baseline	Value	Score	Total Score
Catch rate ≥XL	survey	–	–	–	–	–	–	–
4-yr trend in catch rate	survey	–	–	–	–	–	–	–
Std. Comm. CPUE	fish tix	1.7	1.79	0.00	1.6	No Effort	–	0.00
4-yr trend in CPUE	fish tix	–	–	–	–	–	–	–
Catch rate ≥XL	logbook	–	–	–	–	–	–	–
Harvest rate ≥XL (2014)	logbook	–	–	–	–	–	–	–
Harvest rate ≥XL (2015)	logbook	–	–	–	–	–	–	–
Harvest rate ≥XL (2016)	logbook	–	–	–	–	–	–	–
Mean CL	survey	–	–	–	–	–	–	–
4-yr trend in CL	survey	–	–	–	–	–	–	–
Mean CL	OTG	–	–	–	–	–	–	–
4-yr trend in CL	OTG	–	–	–	–	–	–	–
Mean CL	DS	40.4	–	–	–	–	–	–
4-yr trend in CL	DS	–	–	–	–	–	–	–
L_{50}	survey	–	–	–	–	–	–	–
L_{50}	OTG/DS	40.5	–	–	–	–	–	–
Manager scores		–	–	0.00	–	–	–	0.00
Score		–	–	0.00	–	–	0.00	0.00
Max. possible score		–	–	2.00	–	–	0.00	1.00
Stock Status		–	–	–	–	–	–	Moderate
Confidence		–	–	0.12	–	–	0.00	0.09

Note: * indicates confidential data with less than three permits participating. En dashes = not available, NA = not applicable, *Sig. inc.* = significant increase, *Sig. dec.* = significant decrease, ≥XL = ≥40 mm CL.

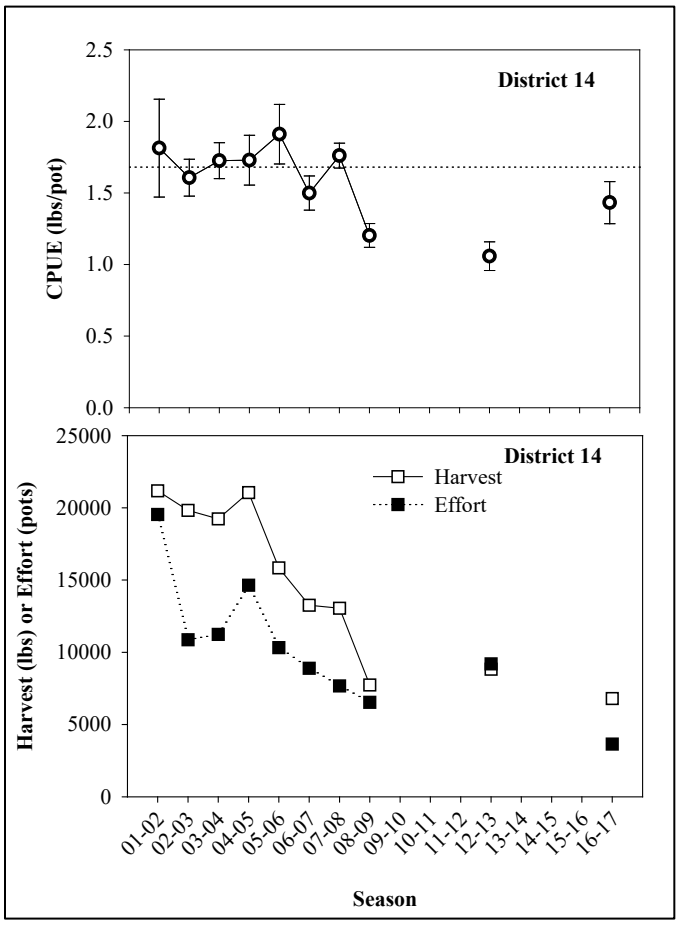

Figure 60.–Districtwide CPUE and effort data for District 14, 2001/02–2016/17 seasons. CPUE is weighted by analysis area weights to allow for an overall impression of fishery performance.

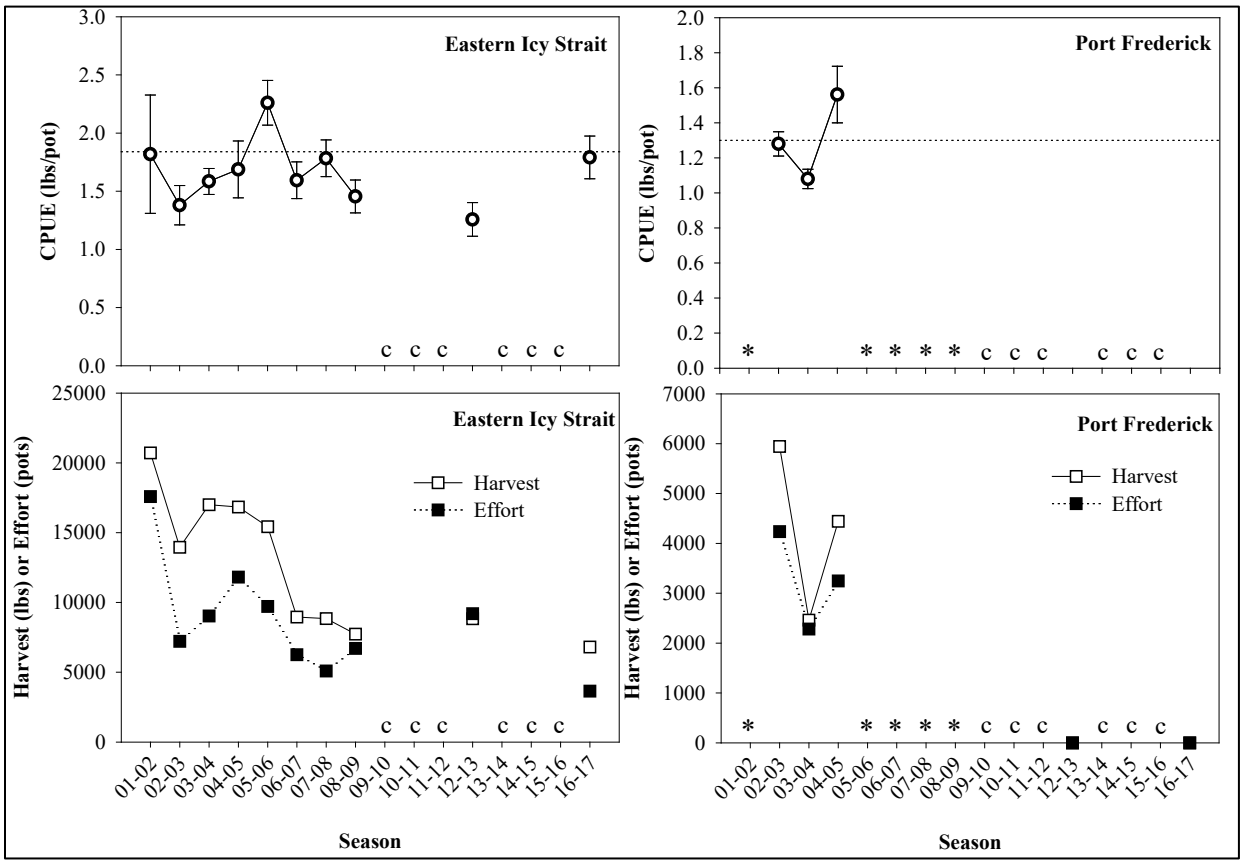

Figure 61.–Mean and standard error of spot shrimp catch rate from commercial harvest (dotted line represents the long-term baseline) and the commercial harvest and effort by analysis area in District 14 2001/02–2016/17 seasons. * indicates confidential data with less than three permits participating; "c" indicates the area was closed to fishing.

District 16

The initial GHL in District 16, established for the 1995/96 fishing season, was 20,000 lb of coonstripe shrimp. The GHL was reduced 25% to 15,000 lb for the 2004/05 fishing season. Continuing declines in fishery performance resulted in a three-year closure from 2005/06 through 2007/08. Following the closure, an every-other-year rotational fishery with a 15,000 lb GHL of combined spot and coonstripe shrimp was implemented beginning with the 2008/09 season. Since 2008/09, harvest has averaged 13,500 lb (90% of the GHL) (Table 40). This district is divided into two analysis areas: Lituya Bay and Rest of 16 (Table 3). In recent years, all harvest in the district has come from Lituya Bay.

Standardized commercial CPUE for spot and coonstripe shrimp combined is at baseline in the Lituya Bay analysis area. The species make-up of the catch has changed dramatically over the past ten years. The proportion of spot shrimp in the harvest was 7% to 29% between 2000 and 2010 (average 21%), since then it has steadily increased to 72% of the harvest in the 2016/17 season. The spot shrimp CPUE has slowly increased since the inception of rotational fisheries from 0.4 lb/pot to 2.6 lb/pot, and the coonstripe shrimp CPUE has fallen dramatically from 4.2 lb/pot to 0.9 lb/pot over the same time period (Figure 62).

Manager scores are negative for Lituya Bay.

The overall matrix score is 0.31 (moderate) up from 0.00 (moderate) in 2015/16 (Table 41). The increase is due to low logbook harvest rates, tempered by decreased manager scores. District 16 has a 0.18 (low) level of data confidence.

This was the first season since rotational fisheries began in 2008 that the full GHL was not harvested. Total harvest and CPUE are approximately the same as when the three-year closure was instituted. However, based on the logbook data, the District 16 stock does not appear to be overfished. If fishery performance does not improve in the 2018/19 season, inseason management action may be necessary.

Table 40.–District 16 matrix, Part A. A 15-season history, including stock assessment recommendations, for the pot shrimp fishery in Southeast Alaska.

Season	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
Upper regulatory GHR	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Actual GHL (lb coonstripe shrimp)	20,000	20,000	15,000	Closed	Closed	Closed	15,000	Closed
Recommended GHL or stock status	–	–	Poor	Closed	Closed	Closed	Above Average	Closed
Season length (days)	151	152	151	Closed	Closed	Closed	127	Closed
Landings (number)	51	41	*	Closed	Closed	Closed	*	Closed
Harvest (lb spot shrimp)	6,763	1,766	*	Closed	Closed	Closed	*	Closed
Harvest (lb coonstripe shrimp)	16,504	14,476	*	Closed	Closed	Closed	*	Closed

Season	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Upper regulatory GHR	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Actual GHL (lb coonstripe shrimp)	15,000	Closed	15,000	Closed	15,000	Closed	15,000
Recommended GHL or stock status	Good	Closed	Above Average	Closed	Above Average	Closed	Moderate
Season length (days)	54	Closed	72	Closed	72	Closed	151
Landings (number)	*	Closed	*	Closed	27	Closed	*
Harvest (lb spot shrimp)	*	Closed	*	Closed	7,763	Closed	*
Harvest (lb coonstripe shrimp)	*	Closed	*	Closed	6,849	Closed	*

Note: * indicates confidential data with less than three permits participating; en dash = not available.

Table 41.–District 16 matrix, Part B. Baselines, current season values, and scores for each stock status parameter and analysis area for the pot shrimp fishery in Southeast Alaska. Data sources are from ADF&G shrimp survey, fish tickets ("fish tix"), logbooks, and on-the-grounds (OTG) and dockside (DS) sampling of commercial catch. Data are divided by type: CPUE, harvest rate, mean carapace length (CL), and L_{50}. Score for each analysis area is the sum of all individual scores.

Analysis Area		Lituya Bay			Rest of 16			
Area weighting			1			0		
Stock Status Parameters	Source	Baseline	Value	Score	Baseline	Value	Score	Total Score
Catch rate ≥XL	survey	–	–	–	–	–	–	–
4-yr trend in catch rate	survey	–	–	–	–	–	–	–
Std. Comm. CPUE	fish tix	3.5	*	0.00	–	No Effort		0.00
4-yr trend in CPUE	fish tix	–	–	–	–	–	–	–
Catch rate ≥XL	logbook	–	–	–	–	–	–	–
Harvest rate ≥XL (2014)	logbook	–	–	–	–	–	–	–
Harvest rate ≥XL (2015)	logbook	–	–	–	–	–	–	–
Harvest rate ≥XL (2016)	logbook	–	23%	1.00	–	–	–	0.93
Mean CL	survey	–	–	–	–	–	–	–
4-yr trend in CL	survey	–	–	–	–	–	–	–
Mean CL	OTG	–	–	–	–	–	–	–
4-yr trend in CL	OTG	–	–	–	–	–	–	–
Mean CL	DS	–	–	–	–	–	–	–
4-yr trend in CL	DS	–	–	–	–	–	–	–
L_{50}	survey	–	–	–	–	–	–	–
L_{50}	OTG/DS	–	–	–	–	–	–	–
Manager scores		–	–	-1.00	–	–	–	-0.62
Score		–	–	0.00	–	–	0.00	0.31
Max. possible score		–	–	3.00	–	–	0.00	2.00
Stock Status		–	–	–	–	–	–	Moderate
Confidence		–	–	0.18	–	–	0.00	0.18

Note: * indicates confidential data with less than three permits participating. En dashes = not available, NA = not applicable, *Sig. inc.* = significant increase, *Sig. dec.* = significant decrease, ≥XL = ≥40 mm CL.

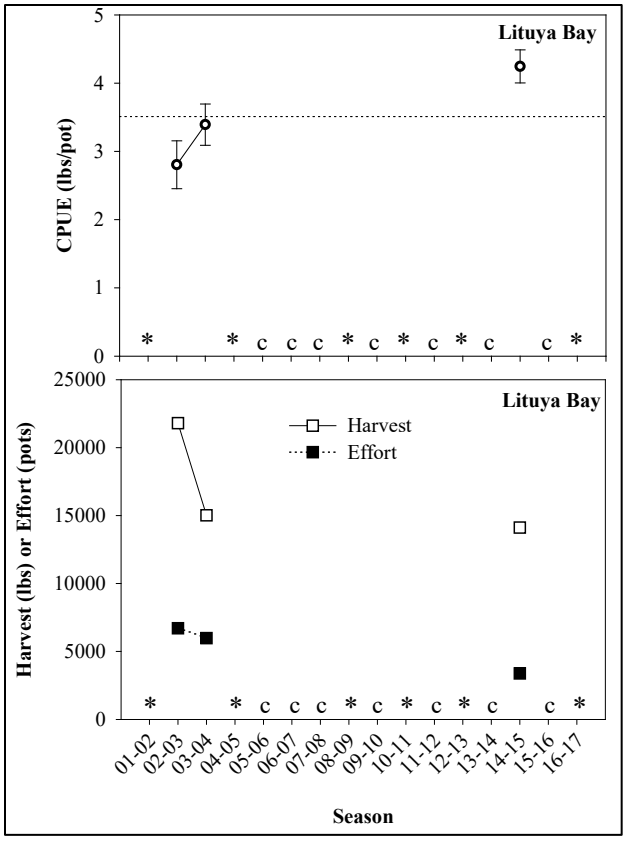

Figure 62.–Mean and standard error of spot and coonstripe shrimp catch rate from commercial harvest (dotted line represents the long-term baseline) and the commercial harvest and effort by analysis area in District 16, 2001/02–2016/17 seasons. * indicates confidential data with less than three permits participating; "c" indicates the area was closed to fishing.

HAINES MANAGEMENT AREA

District 15

Historically, the District 15 GHL for coonstripe shrimp was 20,000 lb through the 2004/05 season; it was reduced 25% to 15,000 lb for the 2005/06 season in response to conservation concerns. The district was closed for three seasons from 2006/07 to 2008/09. The District reopened in the 2009/10 season under a new spatial management strategy. Functionally, the District 15 GHL is now managed as two separate areas each with a specific GHL. One GHL of 7,500 lb is specific to "District 15-East," an area composed of Chilkoot, Lutak, and Taiya Inlets. A second 7,500 lb GHL is specified for "District 15-Remainder," which includes only Chilkat Inlet, although additional analysis areas may be added if other areas in District 15 are fished in the future. These area descriptions and GHLs are used as a management tool only and are not in regulation.

District 15-East

This area has been managed for a 7,500 lb GHL since reopening in 2009/10. During this time harvest has averaged 7,600 (101% of the GHL) (Table 42).

District 15-East standardized CPUE strongly declined for a second year in the 2016/17 season and is now near levels that triggered a closure in 2005/06 (Figure 63). Standardized CPUE was below baseline in Lutak Inlet and at baseline in Taiya (Table 43, Figure 64).

Dockside sampling was conducted in Taiya Inlet and mean CL is at baseline; four-year analyses could not be conducted due to lack of data (Table 43, Figure 65).

Manager scores were neutral in all areas in District 15-East (Table 43).

The overall matrix score is -0.09 (moderate) down from 0.18 (moderate) in 2015/16, based on decreased standardized CPUE in Lutak, and has 0.15 (low) data confidence (Table 43).

District 15-East CPUE was down drastically for the 2013/14 season (Figure 63). Much of this decline was due to the lack of effort in Taiya Inlet, which is weighted at 55%. In 2014/15 fishing resumed in Taiya Inlet and sectionwide CPUE rebounded. Sectionwide CPUE fell again during the 2015/16 season to below baseline. This was driven by the standardized CPUE in Taiya Inlet, which declined sharply. Sectionwide CPUE fell again in the 2016/17 season and is now approaching the level which triggered a three-year closure beginning in 2005/06; two out of the three analysis areas show CPUE below that which triggered the closure. Standardized CPUE is at or very near the lowest level since reopening in all analysis areas.

District 15-Remainder

This area has been managed for a 7,500 lb GHL since reopening in 2009/10. During this time harvest has averaged 4,508 lb (60% of the GHL) (Table 44).

There was no harvest in the District 15-Remainder during the 2016/17 season (Table 45).

Table 42.–District 15-East matrix, Part A. A 15-season history, including stock assessment recommendations, for the pot shrimp fishery in Southeast Alaska.

Season	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
Upper regulatory GHR				20,000 all District 15				
Actual GHL (lb coonstripe shrimp)	20,000 all District 15			15,000	Closed	Closed	Closed	7,500
Recommended GHL or stock status	–	20,000	Poor	Poor	Closed	Closed	Closed	Good
Season length (days)	129	230	226	151	Closed	Closed	Closed	151
Landings (number)	61	33	29	33	Closed	Closed	Closed	29
Harvest (lb coonstripe shrimp)	17,915	6,436	5,030	3,600	Closed	Closed	Closed	6,588

Season	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Upper regulatory GHR			20,000 all District 15				
Actual GHL (lb coonstripe shrimp)	7,500	7,500	7,500	7,500	7,500	7,500	7,500
Recommended GHL or stock status	Above Average	Moderate	Above Average	Moderate	Moderate	Moderate	Moderate
Season length (days)	151	28	99	39	34	151	229
Landings (number)	31	27	36	43	41	*	20
Harvest (lb coonstripe shrimp)	7,164	7,936	7,386	7,868	8,689	*	3,666

Note: * indicates confidential data with less than three permits participating; en dash = not available.

Table 43.–District 15-East matrix, Part B. Baselines, current season values, and scores for each stock status parameter and analysis area for the pot shrimp fishery in Southeast Alaska. Data sources are from ADF&G shrimp survey, fish tickets ("fish tix"), logbooks, and on-the-grounds (OTG) and dockside (DS) sampling of commercial catch. Data are divided by type: CPUE, harvest rate, mean carapace length (CL), and L_{50}. Score for each analysis area is the sum of all individual scores.

Analysis Area		Chilkoot Inlet			Lutak Inlet			Taiya Inlet			
Area weighting		0.25			0.20			0.55			
Stock Status Parameters	Source	Baseline	Value	Score	Baseline	Value	Score	Baseline	Value	Score	Total Score
Catch rate ≥XL	survey	–	–	–	–	–	–	–	–	–	–
4-yr trend in catch rate	survey	–	–	–	–	–	–	–	–	–	–
Std. Comm. CPUE	fish tix	2.0	No Effort	–	1.6	*	-1.00	1.9	1.9	0.00	-0.09
4-yr trend in CPUE	fish tix	–	–	–	–	No trend	0.00	–	NA	–	0.00
Catch rate ≥XL	logbook	–	–	–	–	–	–	–	–	–	–
Harvest rate ≥XL (2014)	logbook	–	–	–	–	–	–	–	–	–	–
Harvest rate ≥XL (2015)	logbook	–	–	–	–	–	–	–	–	–	–
Harvest rate ≥XL (2016)	logbook	–	–	–	–	–	–	–	–	–	–
Mean CL	survey	–	–	–	–	–	–	–	–	–	–
4-yr trend in CL	survey	–	–	–	–	–	–	–	–	–	–
Mean CL	OTG	34.8	–	–	33.4	–	–	34.5	34.7	0.00	0.00
4-yr trend in CL	OTG	–	–	–	–	–	–	–	–	–	–
Mean CL	DS	–	–	–	–	–	–	–	–	–	–
4-yr trend in CL	DS	–	–	–	–	–	–	–	–	–	–
L_{50}	survey	–	–	–	–	–	–	–	–	–	–
L_{50}	OTG/DS	–	–	–	30.5	–	–	31.3	–	–	–
Manager scores		–	–	0.00	–	–	0.00	–	–	0.00	0.00
Score		–	–	0.00	–	–	-1.00	–	–	0.00	-0.09
Max. possible score		–	–	2.25	–	–	2.25	–	–	3.00	1.83
Stock Status		–	–	–	–	–	–	–	–	–	Moderate
Confidence		–	–	0.18	–	–	0.18	–	–	0.18	0.15

Note: * indicates confidential data with less than three permits participating. En dashes = not available, NA = not applicable, *Sig. inc.* = significant increase, *Sig. dec.* = significant decrease, ≥XL = ≥40 mm CL.

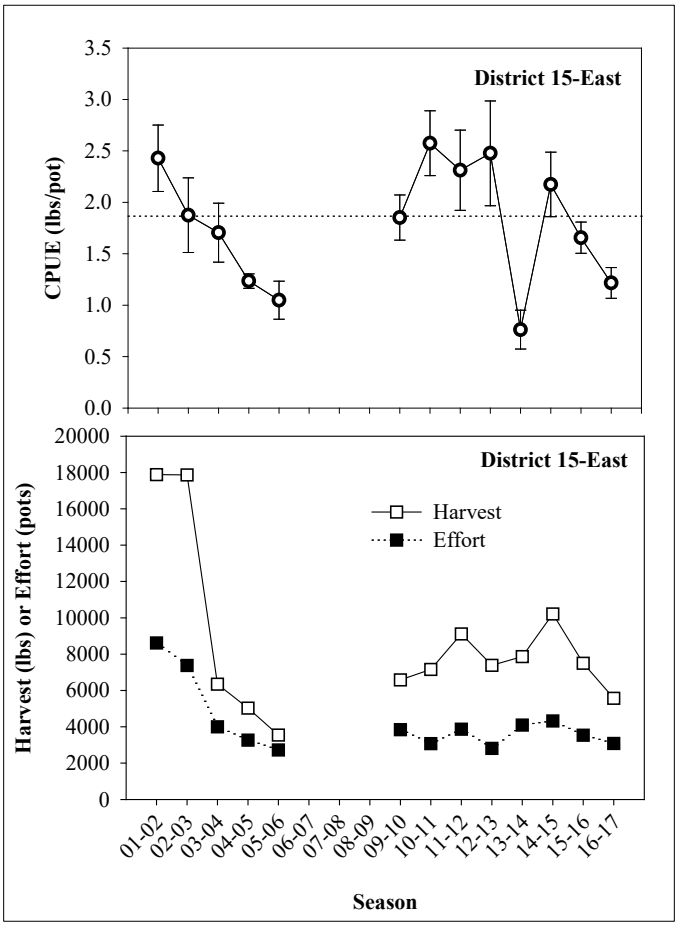

Figure 63.–Areawide CPUE and effort data for District 15-East, 2001/02–2016/17 seasons. CPUE is weighted by analysis area weights to allow for an overall impression of fishery performance.

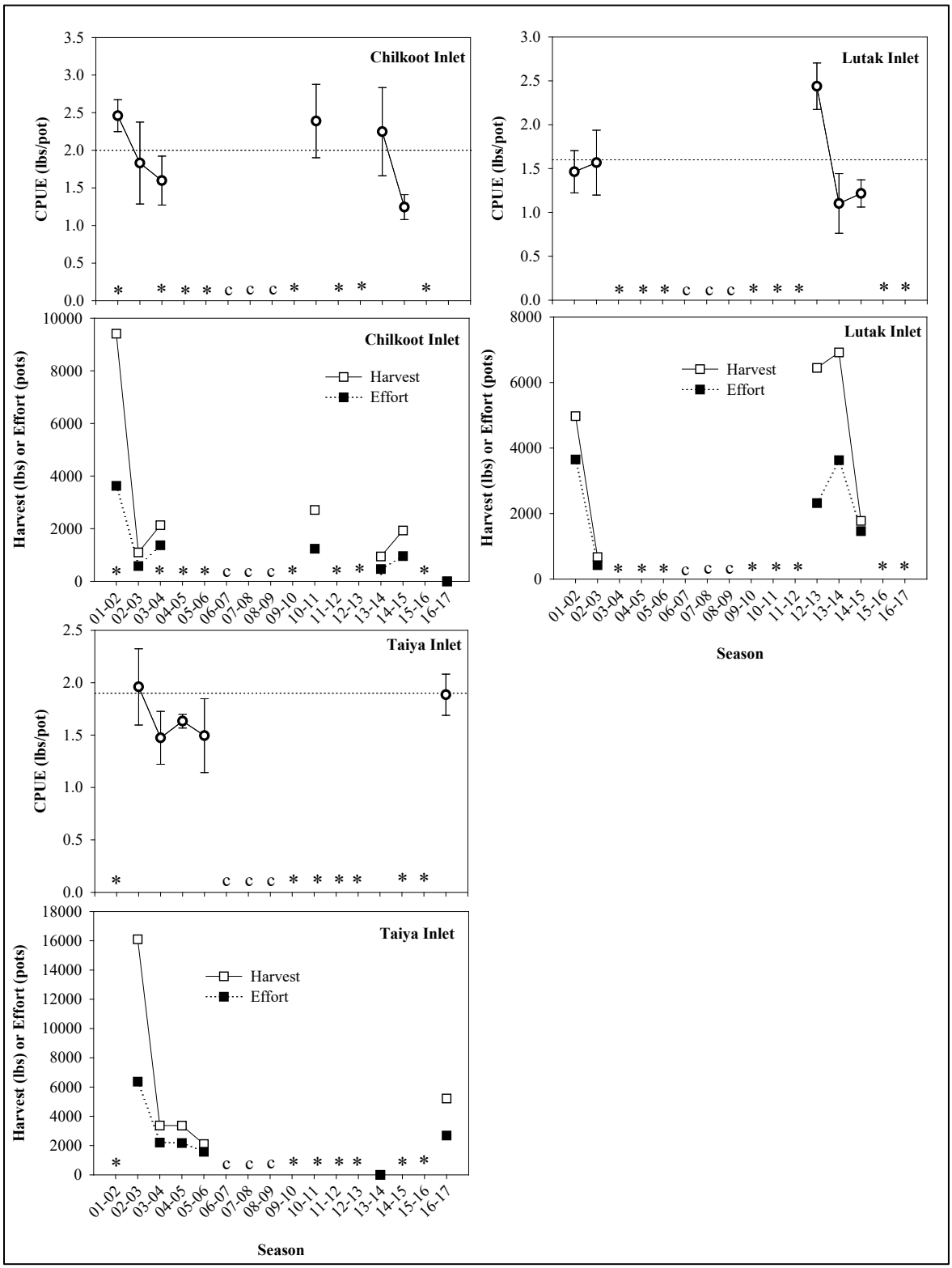

Figure 64.–Mean and standard error of coonstripe shrimp catch rate from commercial harvest (dotted line represents the long-term baseline) and the commercial harvest and effort by analysis area in District 15-East, 2001/02–2016/17 seasons. * indicates confidential data with less than three permits participating; "c" indicates the area was closed to fishing.

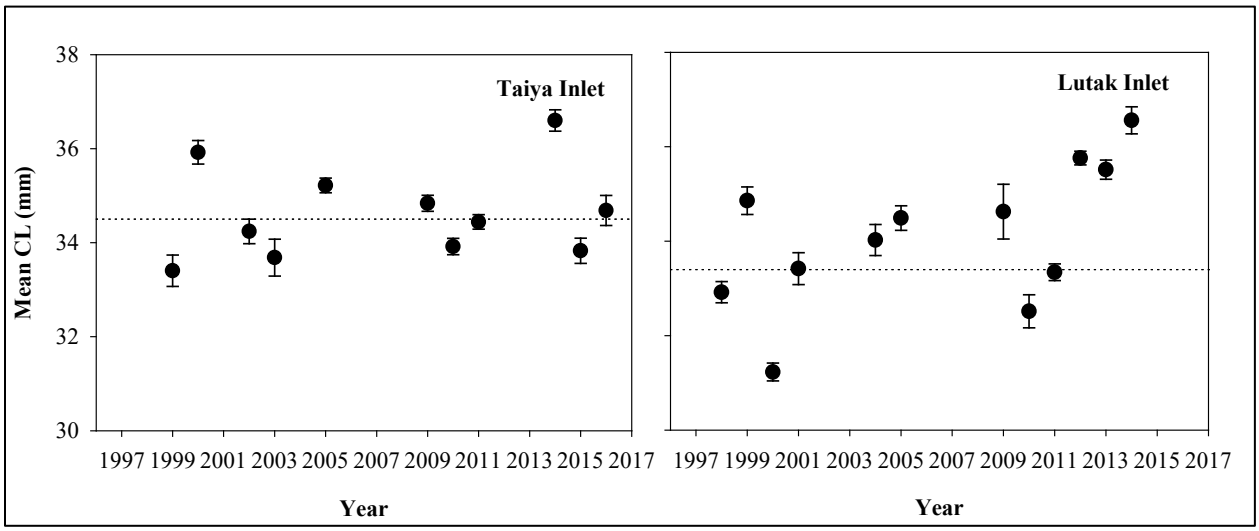

Figure 65.–Mean and standard error of coonstripe shrimp carapace length from floating processor and on-the-grounds sampling in District 15-East, 1999/00–2016/17 seasons. Dotted line represents the long-term baseline. Only areas with baselines or 2016/17 season data are shown.

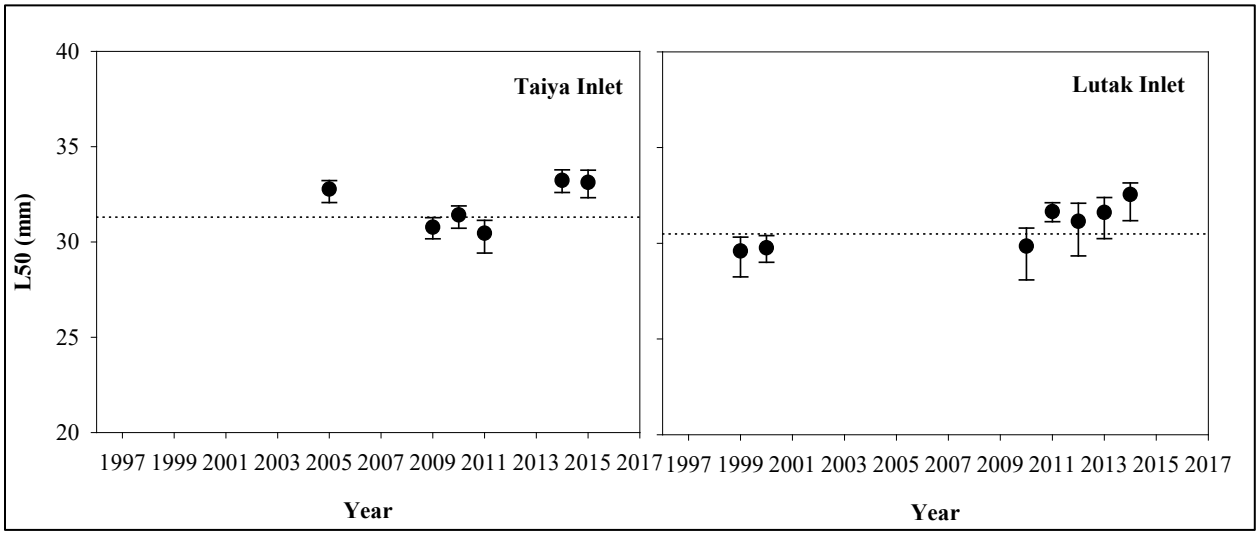

Figure 66.–L_{50} and 95% confidence intervals of coonstripe shrimp from floating processor, on-the-grounds, and dockside sampling in District 15-East, 1997/98–2016/17 seasons. Dotted line represents the long-term baseline. Only areas with baselines or 2016/17 season data are shown.

Table 44.–District 15-Remainder matrix, Part A. A 15-season history, including stock assessment recommendations, for the pot shrimp fishery in Southeast Alaska.

Season	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Upper regulatory GHR					20,000 all District 15				
Actual GHL (lb coonstripe shrimp)	20,000 all District 15			15,000	Closed	Closed	Closed	7,500	7,500
Recommended GHL or stock status	–	20,000	Poor	Poor	Closed	Closed	Closed	Good	Above Average
Season length (days)	129	230	229	151	Closed	Closed	Closed	151	151
Landings (number)	*	*	*	*	Closed	Closed	Closed	*	*
Harvest (lb coonstripe shrimp)	*	*	*	*	Closed	Closed	Closed	*	*

Season	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Upper regulatory GHR			20,000 all District 15			
Actual GHL (lb coonstripe shrimp)	7,500	7,500	7,500	7,500	7,500	7,500
Recommended GHL or stock status	Moderate	Above Average	Below Average	Above Average	Moderate	No Effort
Season length (days)	28	192	151	180	151	229
Landings (number)	*	73	42	40	*	0
Harvest (lb coonstripe shrimp)	*	8,389	6,124	4,192	*	0

Note: * indicates confidential data with less than three permits participating; en dash = not available.

Table 45.–District 15-Remainder matrix, Part B. Baselines, current season values, and scores for each stock status parameter and analysis area for the pot shrimp (coonstripe shrimp) fishery in Southeast Alaska. Data sources are from ADF&G shrimp survey, fish tickets ("fish tix"), logbooks, and on-the-grounds (OTG) and dockside (DS) sampling of commercial catch. Data are divided by type: CPUE, harvest rate, mean carapace length (CL), and L_{50}. Score for each analysis area is the sum of all individual scores.

Analysis Area		Chilkat Inlet			
Area weighting			1.0		
Stock Status Parameters	Source	Baseline	Value	Score	Total Score
Catch rate ≥XL	survey	–	–	–	–
4-yr trend in catch rate	survey	–	–	–	–
Std. Comm. CPUE	fish tix	1.3	No Effort	–	–
4-yr trend in CPUE	fish tix	–	–	–	–
Catch rate ≥XL	logbook	–	–	–	–
Harvest rate ≥XL (2014)	logbook	–	–	–	–
Harvest rate ≥XL (2015)	logbook	–	–	–	–
Harvest rate ≥XL (2016)	logbook	–	–	–	–
Mean CL	survey	–	–	–	–
4-yr trend in CL	survey	–	–	–	–
Mean CL	OTG	33.8	–	–	–
4-yr trend in CL	OTG	–	–	–	–
Mean CL	DS	–	–	–	–
4-yr trend in CL	DS	–	–	–	–
L_{50}	survey	–	–	–	–
L_{50}	OTG/DS	–	–	–	–
manager scores		–	–	0	0.00
Score		–	–	0.00	0.00
Max. possible score		–	–	1.00	0.67
Stock Status		–	–	–	No Effort
Confidence		–	–	0.06	0.06

Note: * indicates confidential data with less than three permits participating. En dashes = not available, NA = not applicable, *Sig. inc.* = significant increase, *Sig. dec.* = significant decrease, ≥XL = ≥40 mm CL.

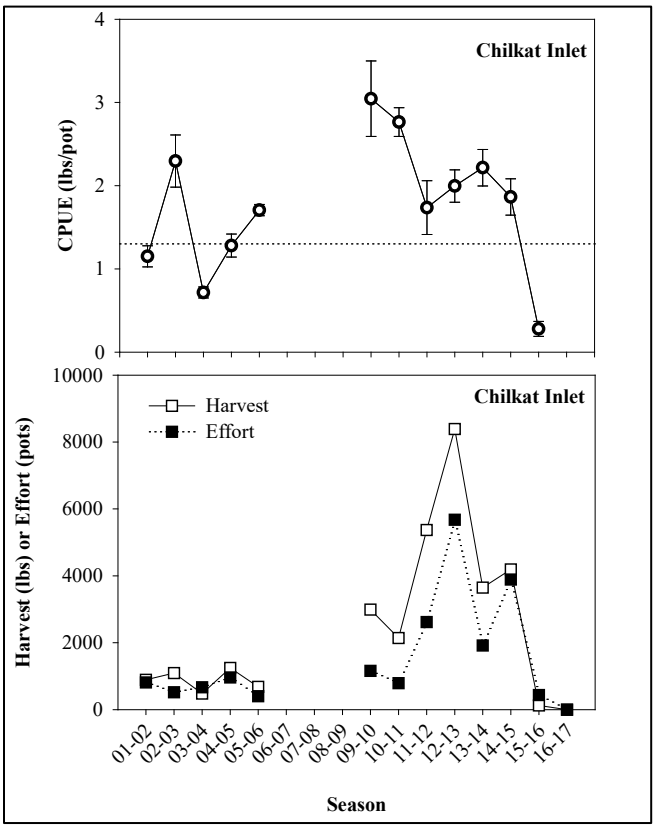

Figure 67.–Mean and standard error of coonstripe shrimp catch rate from commercial harvest (dotted line represents the long-term baseline) and the commercial harvest and effort by analysis area in District 15-Remainder, 2001/02–2016/17 seasons. * indicates confidential data with less than three permits participating.

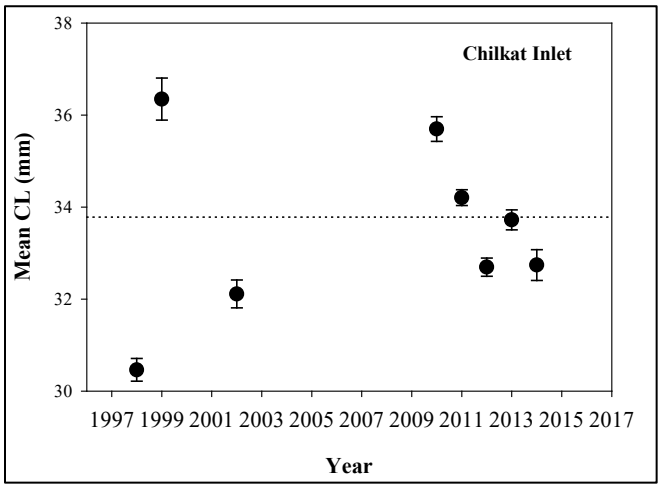

Figure 68.–Mean and standard error of coonstripe shrimp carapace length from floating processor and on-the-grounds sampling in District 15-Remainder, 1997/98–2016/17 seasons. Dotted line represents the long-term baseline. Only areas with baselines or 2016/17 season data are shown.

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APPENDIX A:
POT SHRIMP MATRIX WEIGHTING STUDY

Appendix A.–Pot shrimp matrix weighting study conducted by Katie Palof, Biometrician II, ADF&G Commercial Fisheries, Juneau, and Quinn Smith, Fishery Biologist III, ADF&G Commercial Fisheries, Douglas.

Background

Stock assessment for the Southeast pot shrimp fishery utilizes many data sources to evaluate stock health in order to assist fishery managers in setting guideline harvest levels (GHLs) for the upcoming season. These multiple indices of stock health are summarized in a matrix where each are evaluated based on how the current season compares to long-term baselines, and if there are any significant trends in the past four years. Each index is then give a "score" based on whether is it either significantly different from the baselines (this could be positive or negative) or a score of zero if the index is at the mean or similar to past years. Each long-term baseline comparison is assigned a value of either -1, 0, or 1. Each short-term trend is assigned a value of either -0.25, 0, or 0.25. These scores are summed by analysis area to create a total score for the district or section which is then standardized by the number of indices available in that year which allows for comparison between years.

Since the matrix was established, it has been observed that some of the indices are more informative than others; however, quantifying these differences is not straightforward. In this review we attempted to quantify the influence of each index on the total standardized score in order to establish an informed weighting of the scores. The weighting would put more emphasis on those indices that are informative and therefore giving them a larger weight in the overall standardized score.

Objectives

The overall objective of this review is to attempt to provide a "weighting" to the current shrimp stock health matrix. This is a 3-tiered approach:

a) Propose a method to determine "weightings".
b) Evaluate these methods on multiple management districts.
c) Determine a regional weighting for the matrix for consistency among the districts.

Methods

Evaluating the influence of each index on the total score is not straightforward since they are on different scales (e.g., carapace length vs catch rate) and each index is evaluated and scored twice based on the baseline and short term tests. Therefore, it was determined that the score for each index would be evaluated for its influence on the total district / section score calculation.

District 7 was chosen to use as a template for this analysis since it is the most data rich district. Data from all four analysis areas from 2001 to 2015 were used for all 15 indices.

A pairwise multivariate correlation analysis was performed with all indices, comparing them to each other and to the district wide total score and the district wide standardized score. The pairwise part of this analysis allowed for a review of the indices to determine if any were redundant (highly correlated to each other and therefore not providing any unique information) or non-informative (having the same score every year and therefore not having a correlation coefficient).

-continued-

The correlation between each index and the standardized district score correlation was used to determine the weighting scheme (as described below in the results of District 7). The same methods were then applied to all other surveyed areas (Districts 1, 2, Tenakee, and Sections 3A, and 13C) for comparison. A regional weighting scheme was determined by comparing the mean, mode, median, and weighted mean of the correlation coefficients for each district. Sample size and time series continuity were taken into account during this comparison.

Results

District 7

The results of the pairwise multivariate analysis for District 7 suggested that each index provided some unique information; the highest correlation was 0.70, and the majority of the pairwise correlations were below 0.20 (data not presented here). Because each index does provide some unique information, removing indices due to redundancy was not suggested at this time. However, two indices did not have enough data or contrast to have correlations (4-year L_{50} trends for both survey and OTG data). Due to the way L_{50} is calculated, one must have a significant regression based on only 4 points (1 per year) in order for these indices to have a score other than 0, something that happens extremely rarely with real-world biological data, and thus these indices are considered non-informative.

The correlation of each index with the districtwide score and standardized score was used to evaluate the influence of each index on the overall stock health determination, with the correlation to the standardized score chosen as the most important (Table 1). The correlation values in Appendix Table 1 were then divided into three groups, since this appeared to be the most parsimonious. Those with correlations greater than 0.4400 were considered highly correlated (for this data set), the medium correlation group ranged from 0.4399 to 0.2800, and the low correlation group were those correlations less than 0.2799. Based these results it was suggested to weight the highly correlated group by 1, the medium correlation group by 2/3 and the low correlation group by 1/3. This would allow those indices that have higher utility to be more influential in the final matrix summation.

-continued-

Appendix Table 1.–Correlation of indices with the district wide standardized (STD) score for District 7.

Stock Health Index	Correlation	Recommended weighting
Survey CR ≥XL vs Baseline	0.478	1
Survey CR ≥XL 4-yr	0.514	1
Std. Comm. CPUE	0.156	1/3
4-yr trend in CPUE	0.291	2/3
Catch rate ≥XL (logbook)	0.525	1
Harvest rate ≥XL (logbook)	0.573	1
Mean CL (survey)	0.361	2/3
4-yr CL survey	0.305	2/3
Mean CL (OTG)	0.166	1/3
4-yr CL OTG	0.449	1
L_{50} (Survey)	0.157	1/3
4-yr L_{50} (Survey)	NA	1/3*
L_{50} (OTG)	-0.085	1/3
4-yr L_{50} (OTG)	NA	1/3*
Manager scores	0.617	1

Note: * = Indices are non-informative, as significant regressions very rarely occur.

Regional summary

The same multiple correlation analysis was performed on Districts 1 and 2, Tenakee Inlet, and Sections 3A and 13C. Similar correlation results were obtained when comparing each index to its standardized district wide score (Table 2). From these correlations each index was given a weighting (1/3, 2/3, or 1) specific to each district. It is also noted that the two indices flagged from the District 7 analysis (the 4-year trends in L_{50} for both the survey and OTG) were uninformative for most districts.

Appendix Table 2.–Correlations with district wide standardized (STD) score for all districts.

	Correlation					
Stock health index	District 7	District 1	District 2	Section 3A	Tenakee Inlet	Section 13-C
Survey CR ≥XL vs Baseline	0.479	0.704	0.639	0.333	0.299	0.696
Survey CR ≥XL 4-yr	0.515	NA	0.577	-0.213	0.426	0.495
Std. Comm. CPUE	0.156	0.480	0.238	0.130	0.261	-0.177
4-yr trend in CPUE	0.291	0.383	0.202	0.395	0.192	-0.039
Catch rate ≥XL (logbook)	0.526	NA	NA	NA	NA	NA
Harvest rate ≥XL (logbook)	0.573	0.516	0.716	0.482	NA	NA
Mean CL (survey)	0.361	0.058	0.494	0.478	0.215	0.669
4-yr CL survey	0.305	NA	0.577	-0.246	0.095	0.698
Mean CL (OTG)	0.166	0.753	0.298	0.508	NA	0.286
4-yr CL OTG	0.450	0.518	0.302	NA	NA	0.224
L_{50} (Survey)	0.157	0.909	0.125	0.315	0.171	0.481
4-yr L_{50} survey	NA	NA	NA	0.253	0.096	NA
L_{50} (OTG)	-0.085	NA	0.515	0.155	NA	NA
4-yr L_{50} OTG	NA	NA		NA	NA	NA
Manager scores	0.617	0.196	0.109	0.374	0.735	-0.138

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The weightings for each index in all six locations were considered to determine a regional weighting. The mean weighting for each index was chosen as the best representation of all six districts. The resulting weightings for each index are in Appendix Table 3. For those indices where the mean fell between two levels (for example between 0.33 and 0.66) the district with the larger sample size was chosen to have more influence, and its weighting was chosen for the regional weight.

Appendix Table 3.–Regional weight for each index.

Stock health index	Regional Weighting
Survey CR ≥XL vs Baseline	1
Survey CR ≥XL 4-yr	1
Std. Comm. CPUE	1/3
4-yr trend in CPUE	2/3
Catch rate ≥XL (logbook)	1
Harvest rate ≥XL (logbook)	1
Mean CL (survey)	2/3
4-yr CL survey	2/3
Mean CL (OTG)	2/3
4-yr CL OTG	1
L_{50} (Survey)	2/3
4-yr L_{50} survey	*
L_{50} (OTG)	1/3
4-yr L_{50} OTG	*
Manager scores	2/3

Note: * = Indices were considered non-informative therefore have a weighting of 0.

Conclusion/Recommendations

The shrimp stock assessment matrix combines multiple indices to give managers a relative idea of the stock health of each management district. Since the inception of the matrix, it has commonly been known that some of the indices provide more reliable and consistent information, while others do not track population health well. However, due to the variability of index availability among districts, all indices are currently included in the matrix. A solution to the differences among the indices would be to develop an informative weighting for each index. The objective of this analysis was to develop an informative weighting for each index so that the stock health score for each district would be more representative of those indices that are more informative.

The weightings developed from these correlation analyses give more influence to those indices that track with the overall calculation of stock health. Therefore, those indices that are most informative will have the highest weight in the overall matrix score. The weighting presented in Appendix Table 3 is recommended for implementation in the shrimp management matrix for the most current season. In addition to the weighting of 1/3, 2/3, and 1, two indices are recommended to be removed due to their non-informative nature. These are the 4-year trends in L_{50} from both the survey and OTG data.