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Green Urchin (Strongylocentrotus droebachiensis) Reconnaissance and Stock Assessment Surveys in Southeast Alaska in 2000–2001

by

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and

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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)

Measures (fisheries)

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

Mathematics, statistics

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

FISHERY DATA REPORT NO. 09-33

GREEN URCHIN (*STRONGYLOCENTROTUS DROEBACHIENSIS*) RECONNAISSANCE AND STOCK ASSESSMENT SURVEYS IN SOUTHEAST ALASKA IN 2000–2001

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TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ABSTRACT

Reconnaissance surveys for green urchins (*Strongylocentrotus droebachiensis*) were conducted from 1999 to 2001 throughout areas of northern and middle Southeast Alaska. Based on results from those surveys, population assessment surveys were conducted in portions of commercial fishing Districts 110, 112 and 113 to estimate green urchin population size, biomass, and size distribution. The population assessment surveys were conducted by Alaska Department of Fish and Game divers during March of 2000, March and April of 2001 and September 2001. Six areas were surveyed during 4 survey trips. None of the surveyed areas were subsequently opened to commercial fishing due to low levels of commercially marketable urchins. Total green urchin biomass for all areas surveyed was estimated at 1.98 million pounds with a 90% lower confidence bound of 1.25 million pounds. Biomass of commercial size urchins for all areas surveyed was estimated at 198,249 pounds, with a 90% lower confidence bound of 125,700 pounds, and a harvestable surplus of about 7,500 pounds. Rotulae were collected and aged from 634 urchins and ages ranged from 1 to 19 years.

Key words: green sea urchin, *Strongylocentrotus droebachiensis*, Southeast Alaska, biomass assessments, dive surveys, reconnaissance surveys

INTRODUCTION

Green sea urchins (*Strongylocentrotus droebachiensis*) support commercial fisheries on the east and west coasts of North America (e.g. Maine, New Brunswick, British Columbia), with primary markets historically found in Japan. They are prized for their roe, which is a delicacy in Japan and Europe. As a result of declining sea urchin stocks in Japan during the early 1980s other sources were sought out to support a growing market demand. Since that time, there has been interest in developing a green sea urchin commercial fishery in Southeast Alaska and there was limited harvest from 1981 to 1989. However, a red sea urchin (*Strongylocentrotus franciscanus*) fishery developed in the early 1990s, due in part to higher abundances than those of green sea urchins (Woodby 1991).

In 1998, following the success of the red sea urchin fishery, there was a resurgence of interest in developing a green sea urchin fishery. Federal funds were obtained through the National Oceanic and Atmospheric Administration (NOAA) to conduct the necessary background investigation. The funds were part of the first Nearshore Marine Research grant series and were to be spent over the period July 1, 1999 through June 30, 2001. In 1999, plans began for conducting exploratory surveys (known as "reconnaissance surveys") for green sea urchin and subsequent population assessment surveys in Southeast Alaska. The goal of these surveys was to determine whether the green sea urchin population in Southeast Alaska could sustain a commercial fishery, with primary objectives of estimating population size and biomass, delineating spatial distribution, and characterizing size distribution. Prior to this effort there has been no comprehensive stock assessment program for green urchins in Southeast Alaska. Consequently, methods were developed with ideas drawn from prior work on green sea urchins in British Columbia (Waddell et al. 1997), New Brunswick (Robinson and MacIntyre 1997), as well as data from red sea urchin and red sea cucumber fisheries in Southeast Alaska (Hebert and Clark 2002; Woodby et al. 1993).

METHODS

RECONNAISSANCE SURVEYS

Requests for bids on contracts for reconnaissance surveys began in October of 2000. These surveys were conducted primarily in 2000, with a lesser number in 2001. Contract winners were required to conduct surveys to delineate specific areas or beds with commercial potential. In general, green urchins occur in waters that are more sheltered from ocean surge, than those

where red sea urchins are found. Surveyors used SCUBA or surface-supplied air to conduct reconnaissance surveys along shoreline that seemed consistent with green urchin habitat. Reconnaissance surveys were conducted throughout portions of Southeast Alaska, in commercial fishing Districts 106, 108, 109, 110, 111, 112, 113, 114 and 115 (Figures 1 through 19).

To cover survey areas efficiently, Divers were usually towed by boat on a submersible sled. Intercom communications were used between diver and boat operator to allow accurate recording of findings. Diving depth usually ranged between 3 m and 15 m. Records were made of presence or absence of green urchins, sea cucumbers (*Parastichopus californicus* and *Cucumaria frondosa japonica*), geoducks (*Panopea abrupta*), red urchins (*Strongylocentrotus franciscanus*) and horse clams (*Tresus sp*). If green urchins were present, densities and average size were described as commercial or non-commercial. Descriptions of habitat and other comments were also recorded. A minimum of 75% of each section of shoreline was surveyed by diving, to ensure that patchy distributions, common in green urchins, were accounted for in the survey plan. At the discretion of the surveyor, 25% of the shoreline could be overlooked, if green urchin habitat was clearly not present or shoreline was difficult or impossible to survey. After compiling this reconnaissance information, Alaska Department of Fish and Game (ADF&G) biologists developed survey methods and surveyed 6 areas that showed promise for commercial harvest and marketability (Figures 20 through 26). Detailed information for the surveys can be found in Appendices A.1 through F.1)

EVALUATION OF STOCK ASSESSMENT SURVEY METHODS

Development of a green sea urchin fishery program depended on the successful design of a stock assessment method that could be used to provide precise estimates of density, size structure (test diameter), and biomass. Initial results showed possible commercial densities in Farragut Bay (Subdistrict 110-14) and North Kupreanof Island (Subdistricts 110-16, -17; see Appendices A and B). Using the state-owned research vessel R/V *Sundance*, ADF&G divers developed survey methods and surveyed these subdistricts in April of 2000. Method designs roughly resembled the transect method used by ADF&G to survey red sea urchins (Hebert and Clark 2002). However, since green urchins are more patchily distributed than red urchins, they are more difficult to survey with precision. To reduce sampling error, this initial survey focused on sampling techniques, which included adaptive methods (Woodby 1998) and green urchin survey techniques developed in British Columbia (Perry and Waddell 1998). The 4 methods used were termed “Swim-over”, “Continuous Transect”, “Continuous Quadrat”, and “Non-continuous Quadrat”. Techniques were evaluated for quality of data, cost-effectiveness and difficulty. To compare effectiveness, these 4 methods were used on 4 transects in Farragut Bay (Subdistrict 110-14) and on 4 transects on the shoreline of North Kupreanof Island (Subdistricts 110-16, -17). The Swim-over and Continous Transect methods were also used on several transects in Farragut Bay (Subdistrict 110-14). Following is a description of these techniques.

Swim-over

This method consisted of a brief dive conducted over a green urchin bed to visually estimate (no measurement tools) urchin density, average diameter and bed-width. Divers swam in pairs across (perpendicular to the shoreline) and along (parallel to the shoreline) bands of green urchins. Divers estimated minimum and average density (urchins per meter^2), average urchin diameter, and bed width and recorded time needed to complete the estimate.

Continuous Transect

This method consisted of modified survey techniques currently being used by ADF&G researchers to assess red sea urchin populations in Southeast Alaska. A one-meter wide transect that was oriented perpendicular to the shoreline was surveyed where all green urchins greater than 30 mm were recorded. A pair of divers completed this transect, each counting urchins under their half of a one-meter long rod. The "a" and "b" sides (each one-half of a meter) were averaged to get a transect sum. Transects began at shore at 0 mean lower low water (MLLW) and ended where green urchins were no longer observed, or at 33 ft MLLW, whichever came first. Two samples of 30 urchins were taken for diameter measurements from various depths within the beginning and ending half of each transect and sample depths were recorded.

After initial surveys, several modifications were made to this method. First, all green urchins greater than 36 mm were recorded. This was due to the large number of urchins observed that were between 30 mm and 36 mm, which required prolonged dive times. Second, the maximum sampling depth was increased to 50 ft MLLW as large numbers of urchins were observed beyond the original maxiumum depth of 33 ft MLLW. Third, the number of urchins taken for diameter measurements was reduced to one sample of 30 collected along the transect length. Finally, instead of divers sharing one transect rod, each diver held a one-meter rod and each of the "a" and "b" sides of the transects were one meter in width.

Continous Quadrat

This method attempted to mirror those used by research teams in British Columbia (Perry and Waddell 1998). A transect was oriented perpendicular to the shoreline and using a single one-meter squared quadrat, diver pairs counted all green urchins within the quadrat and collected all green urchins for diameter measurement. This was repeated at every meter, from the beginning of the transect (waters edge), to the end of the urchin bed, which resulted in a one-meter wide path where every urchin was counted and measured underwater. Depths were recorded for each placement of the quadrat.

Non-Continuous Quadrat

This method was a modification of the Continuous Quadrat method, where the frequency of quadrat placement was reduced. This method required a swim-over prior to the survey to determine the bed width and length. Surface buoys were used to delineate the boundaries of the urchin bed. Divers used a one-meter^2 quadrat attached to a 5-meter line. Originally a 0.10m^2 quadrat was used, however, the sampling area was too small and often resulted in zero counts. Divers entered the water at the beginning of the urchin bed, the the quadrat was placed on the bottom haphazardly and all urchins within the quadrat were collected for measurement at the surface. The lead diver would swim with the quadrat perpendicular to the shore for 5 meters until the following diver tugged on the line to indicate the next sampling station. This continued until the deep edge of the bed was reached. All green urchins along a one-meter wide path, between the quadrats, that were larger than 30 mm were counted and recorded. Originally, a one-meter line was used; this was discontinued due to prolonged dive times.

This method was further modified, such that 5 sample sites that were positioned throughout the bed width, where all green sea urchins within the one-m^2 quadrat were collected and measured at the surface. Urchins between quadrats were not counted. For long transects, divers were carried by a

skiff and dropped in at the beginning of the bed, ¼ through, ½ through, ¾ through, and at the end of the bed. Sampling stations were located and indentifed with anchored buoys prior to diving.

FINAL SURVEY METHODS

After initial surveys in 2000, the Department that determined that the Continuous Transect methods optimized data quality and cost and was considered the most efficient way to survey green urchins in Southeast Alaska. After this first season, the Department moved to the second phase of surveys and began population assessments. Data collected for each transect consisted of counts of urchins greater than 35 mm diameter along a pair of one meter-wide transects, and 5 samples of urchins throughout the width (and depth range) of urchin beds to obtain average size and size distributions. During March and April of 2001 surveys were conducted in Thomas Bay (Subdistrict 110-12), North Kupreanof Island (Subdistricts 110-16,-17), Gambier Bay (110-23), Hidden Falls/Catherine Island (Subdistricts 112-11,-22) and Peril Strait (113-63,-64,-65). Another series of surveys were conducted in September of 2001 in Thomas Bay (Subdistrict 110-12), Farragut Bay (Subdistrict 110-14), and North Kupreanof Island (Subdistrict 110-16).

Shoreline transects were paired, and the location of each transect pair was systematically distributed (i.e. equally spaced), along known green urchin beds discovered by industry reconnaissance (Figures 1 through 19). All transect-pair locations were marked on nautical charts for operational use during the surveys (Figures 20 through 24), using latitude/longitude coordinates found in Appendix C. Transects extended from zero to 15 m depth (50 ft below MLLW, corrected for tide height).

Two divers swam parallel to one another on each transect pair, with each diver holding a rod (one meter by 2.1 cm diameter plastic rod), in a horizontal position, perpendicular to the census path. Transect direction was maintained using a compass mounted on the rod. Divers maintained a distance of 5 to 10 meters from each other, and each diver descended while counting the number of green sea urchins seen under the rod. Only urchins larger than 35 mm were counted and urchins near this size boundary were checked against a 36 mm long mark on the plastic rod. Counts of urchins were recorded on data sheets attached to the rod. The beginning and ending times for each transect were recorded to allow for standardization of depths to MLLW.

DENSITY ESTIMATES

Average density, $\bar{d}$, was estimated in units of urchins per meter of shoreline (pms) for each survey area:

$$\bar{d} = \left(\frac{\sum_{t} \Sigma c_i / m}{n_t} \right), \tag{1}$$

where c is the count of sea urchins ≥ 36 mm diameter on each transect, i is the transect number from 1 to m (m is at most 2 transects per pair), and n_t is the number of transect pairs. Transect count data is listed in Appendix D.

Shoreline lengths (Table 1) were calculated using raster images of NOAA Nautical Charts in ArcView (ESRI 1998) GIS computer software. Shoreline was measured to include any area that was considered potential green urchin habitat, based on reconnaissance survey results.

URCHIN SIZES AND WEIGHTS

Average size of green urchins for each area was used to convert densities to biomass, to serve as a baseline to monitor changes in urchin size for future surveys, and to characterize population structure (Table 2). Urchins were collected from at least one sample depth chosen on each transect pair. Prior to diving, a sample depth (shallow, medium or deep) was selected and all visible urchins surrounding the sample location were collected until 30 urchins were obtained. When urchins were scarce, divers searched for and collected urchins from outside of the chosen depth. Urchins were placed in mesh bags and were carried up to the dive skiff or were placed in buoyed mesh bags for retrieval by the tender in the dive skiff.

Outside test (shell) diameters excluding the spines were measured to the nearest millimeter with calipers (Appendix E). If conditions permitted, urchins were measured immediately aboard the skiff and returned to the general area from which they were removed.

Average mass in grams was estimated from average test diameter (mm) for each area using the following relationship:

$$\text{mass} = 0.000475 \times \text{diameter}^{2.9346}. \quad (2)$$

The parameters in Equation 2 were estimated from 565 urchins sampled from Subdistricts 110-12, -14, -16 and -17 during the 2000 surveys (Appendix F), using a log transformed regression. The equation was applied to each urchin sampled for size. Additional urchins were collected in 2001 in Subdistricts 113-63, -64, and -65. Including these additional samples (grand total of 787 urchins) changed the parameter values to mass = 0.0005133 x diameter$^{2.915760}$.

The average mass (W_t) for each subdistrict was estimated as:

$$\overline{W_t} = \left(\frac{\sum_{j=i}^{\Sigma w_i / \Sigma o_i}}{n_j} \right), \quad (3)$$

Where w_i is the estimated weight (based on Equation 2) of all urchins in sample i, o_i is the count of all urchins greater than 36 mm in sample i, and n_j is the total number of weight samples taken in subdistrict j.

POPULATION SIZE AND BIOMASS

The population size of urchins ≥36 mm diameter in each subdistrict was calculated as the product of average density (urchins pms) and the total available habitat (meters of urchin-compatible shoreline).

Total biomass (b) for each subdistrict was calculated as:

$$b_j = \overline{d}_j W_j l_j, \quad (4)$$

where l is the length of shoreline in a subdistrict. The lower bound of the biomass estimate was calculated as the percent precision (Equation 5) times the biomass.

A sample goal of 15 to 25 transect pairs was established for each subdistrict. This sample size was expected to achieve 60 to 70% precision (defined in Equation 5 below) based on information from prior red sea urchin surveys. The certainty in the estimate of biomass is expressed as the percent precision in Table 1. The index is equal to the lower bound of the one-sided 90% confidence interval expressed as a percent of the average biomass:

$$\text{Percent precision} = 100\left(1 - t_{\alpha}\frac{SE}{\bar{b}_j\sqrt{n_j}}\right), \tag{5}$$

where t is the t-value from Student's distribution for a one-sided interval with significance level α = 10% (see Ricker 1975), SE is the standard error of the biomass among n transect pairs (Table 1). The t-value is approximately 1.32 to 1.38 for the various subdistricts.

AGING

Ages were estimated from counts of growth rings within rotulae, which are bony segments of a complex mouth structure called the Aristotle's lantern. Growth rings on the rotulae have been successfully used to age green urchins from eastern Canada using a charring, sanding, and oiling method to highlight the rings (Robinson and MacIntyre 1997). Populations in Alaska from St George Island, near Juneau, and Kodiak Island have been aged successfully (Urban 2004; Munk 1999; Munk 1992; and Donaldson and Byersdorfer 1990). Our method used rotulaes and a break and burn technique that lightly chars the bony structure (Munk 2005). Evidence that these rings are annual comes from microprobe analysis of the ratios of magnesium to calcium on transects across the ring structures. The oscillations in ratios, which are temperature dependent and expected to be annual, were strongly correlated with the incidence of individual rings. Similar work was done with Southeast Alaskan populations of green urchins to verify that rings can be counted and that these rings correspond to annual changes in chemical composition of the hard mouthparts. Aging work was done at the ADF&G Age Determination Unit, and the microprobe work was completed at the University of Alaska Fairbanks.

RESULTS AND DISCUSSION

RECONNAISSANCE SURVEY DATA

Information from reconnaissance surveys was condensed and a brief overall impression of each area was summarized by the individual surveyors. Detailed results were then compiled into tables (Appendix B), which correspond to marks on survey maps (Figures 2 through 19). Of the areas where reconnaissance surveys were conducted, few were found to support commercially marketable quantities of green urchins; 5 areas were considered to hold sufficient potential for a commercial fishery to warrant stock assessments.

DENSITY, POPULATION SIZE, AND BIOMASS

Data collected during the 2000 stock assessment surveys were not used to evaluate density, population size, or biomass, due to the irregularities of the surveys while modifying and evaluating methodologies. However calculations were performed to compare methods (see

Tables 3 and 4). Methods were standardized for the 2001 stock assessment surveys and data quality was considered to be acceptable for producing estimates of population size (Table 1).

Average densities across areas for urchins greater than 35 mm test diameter ranged from 0.1 urchin pms (Subdistrict 110-23), to 310.7 urchins pms (Subdistrict 110-16 and -17). The wide range is largely due to the bed width of urchins, which is greatly influenced by habitat features such as depth, contour, and bottom type. The nearshore subtidal zone of the northern shore of Kupreanof Island (Subdistricts 110-16, -17) features a wide shelf with a shallow gradient slope of gravel substrate. Green sea urchins were commonly observed throughout this shelf, which resulted in the highest number of green urchins per meter of shoreline among survey areas. Other areas, such as Gambier Bay (Subdistrct 110-23) are characterized by steeper sloped submarine terrain, which provides limited habitat and narrow beds of green sea urchins.

Total precision (a combination of density precision and weight precision) of the surveys ranged from 0% to 69.5% (Table 1). Areas with low precision are largely explained by a patchy distribution of urchins. The weight component of precision usually accounts for a very small amount (less than 5%) of the overall precision because relative to density, there is little variation in urchin weights.

The biomass estimate of green urchins greater than 35 mm in all areas surveyed in 2001 is 1.98 million pounds. The 90% lower bound estimate of biomass is 1.25 million pounds. The biomass of commercially marketable sized urchins for all areas surveyed was estimated at 198,249 pounds, with a 90% confidence interval lower bound of 125,700 pounds. If a harvest rate of 6% is applied to the lower bound value, as is done for red sea urchins in Southeast Alaska, a harvestable surplus of about 7,500 pounds may be available. In comparison, the Southeast Alaska commercial red sea urchin fishery quota for the 2006-2007 season was about 5.6 million pounds. ***The low level of harvestable, commercially marketable green sea urchins prevents a sustainable, manageable commercial green sea urchin fishery in Southeast Alaska.***

District 110

Subdistrict 110-12 (Thomas Bay) green urchin density was 264.7 pms in spring 2001, changing to 219.9 urchins pms based on resurvey of the area in fall 2001. Green urchins were observed on all transects and the largest urchins were observed on transects located near the mouth of the bay. Of surveyed areas, Thomas Bay had the second largest biomass, with about 0.5 million pounds of green urchins. However, marketable-sized urchins comprised only 15% (fall estimate) and 22% (spring estimate) of this amount.

In subdistrict 110-14 (Farragut Bay), average green urchin density was 61.1 urchins pms. This was the lowest density of all survey areas, except for Subdistrict 110-23 where no urchins were observed. The survey was concentrated on the western shore of the bay. Only 1% of the sampled urchins were of commercially marketable size. Zero urchins were observed on 50% of transects in the fall survey.

The north shore of Kupreanof Island (Subdistricts 10-16 and -17) had a density of 229.2 urchins pms in the spring 2001 survey, and 392.2 urchins pms in the fall 2001, representing a 41% increase. This was the largest change between survey and re-survey for all areas surveyed. The lower counts in the spring may reflect the exposed nature of the area and a shift in distribution following the winter. Other possible explanations include recruitment observed in the fall or survey error.

Survey transects were terminated in Gambier Bay (Subdistrict 110-23) after several dives were done without finding any urchins. This was not a surprise, as reconnaissance surveys discovered only 3 small beds of urchins.

District 112

Subdistricts 112-11, -21 and -22 (Hidden Falls/Catherine Island) had a density of 125.1 urchins pms in the spring of 2001. This area had the largest percentage of commercial-size urchins, with 37% of the population greater than 50 mm diameter. The biomass estimate was only 56,000 pounds of urchins, due to the limited amount of urchin habitat in the area.

District 113

Subdistricts 113-63, -64 and -65 (Peril Strait) had the highest density in the spring of 2001 with 309.4 urchins pms. Only 8% of the population was found to be above commercially marketable size. Most of the urchins were observed in subdistrict 113-63.

RECRUITMENT AND SIZE DISTRIBUTIONS

Divers collected a total of 8,518 green sea urchins from all surveyed areas, to estimate average diameter and size distributions (Figure 27 and Appendix E). In general, the size distribution of urchins indicates the majority of urchins are small (<40 mm). For most areas a broad range of size classes was observed. The overall average diameter was 32.3 mm, with the largest average diameter of 46.4 mm observed in Peril Strait in 2001. Only 11% of the sampled green urchins were above commercially marketable size.

District 110

Subdistrict 110-12 (Thomas Bay) had an average diameter of 38.5 mm in the fall of 2001, with little change seen in the fall average of 40.0 mm (Figure 27). Most of the population was within 30 to 55 mm with a broad range of sizes.

Subdistrict 110-14 (Farragut Bay) was the location of the initial survey area in 2000. All transects were surveyed using the swim-over method. Transects 10, 11, 12, and 21 were also surveyed, using the other previously described methods. Using all available information, size averaged 31.7 mm. During the 2001 survey, an average diameter of 27.6 mm was observed during the spring survey and 27.9 mm was observed during the fall. Size ranges were between 20 mm and 40 mm, with smaller urchins seen during the fall survey. Very few urchins larger than 50 mm were seen.

In Subdistricts 110-16 and -17 (north shore of Kuprenof Island), there was a notable size change, from an average of 18.0 mm in the spring of 2000, to an average of 29.1 mm in the spring of 2001. The large component of 10–15 mm urchins observed in 2000 may have grown into the 25 mm size class by the spring of 2001, and 30 mm in the fall of 2001, although this is speculation.

No green urchins were available for sampling for Subdistrict 110-23 (Gambier Bay).

District 112

Subdistricts 112-11,-21 and -22 (Hidden Falls/Catherine Island) had the largest average size of green urchins, at 46.4 mm. The population showed a broad range of sizes, with most of the urchins falling between 35 and 65 mm (Figure 27).

District 113

District 113-63, -64 and -65 (Peril Strait) had a broad range of sizes with an average diameter of 34.1 mm. Most urchins' diameters fell between 25 and 50 mm (Figure 27).

General Method Comparison And Evaluation

The 4 previously described methods were used in Farragut Bay (Subdistrict 110-14) on transects 10, 11, 12, and 21 during the 2000 spring survey. Additionally the Swim-over and the Continuous Transect methods were used on several other transects in Farragut Bay.

The Swim-over method consisted of a brief dive over a green urchin bed to visually estimate without tools, density, average diameter and bed-width. The idea behind evaluating this method was that a "quick and easy" may produce reasonably similar estimates to more thorough methods at a fraction of the cost. This method was faster than other methods, but estimates were produced with very low precision. Beginning and ending locations could be determined but population size could only be vaguely estimated. Based on comparisons to the other methods, we believe the Swim-over method grossly underestimated the urchin density.

The Continuous Quadrat method provided an extremely thorough accounting of urchin density and size at a specific location. However, it took a tremendous amount of time and would clearly reduce time available to sample a broader area. Survey time for this method was double that of the other methods in many instances and for transect 21 required 3 times more bottom time as the other methods. This method did reduce precision for estimates of average diameter. This may have been due to measuring both the largest urchins as well as the large number of tiny urchins discovered between rocks as a result of conducting a thorough search for all urchins. Although thorough for specific area, this method is not economically practical in many areas of Southeast Alaska where vast quantities of tiny urchins may be interspersed with larger urchins.

The Non-continuous Quadrat method required an initial survey to determine the edge of the beds. This method was impractical due to the extra time and diving required to preview the bed. This method may have advantages for surveying wide beds, if the boundaries are known, however without prior information, there was no way to avoid completing a series of dives to determine where to place quadrats for sampling.

The Continuous Transect method seemed to be the best option for assessment of green urchin populations in Southeast Alaska. Only one transect pass was required per sampling location, the data quality was acceptable, and the dive durations were not excessive. This method took half the time as the Continuous Quadrat method with comparable results. However, a difference was that the Continuous Transect method estimated lower average weights than the Continuous Quadrat method.

Age Data

Ages were similar among the 3 areas where urchins were collected, with slight variations for average, minimum, and maximum age (Table 5). Aging results were comparable to a sample of green urchins collected during a separate study near Juneau, Alaska, which were found to be from 1 to 14 years of age (Munk 1999). Green urchins that were aged from St George Island, Alaska were found to be from 2 to 24 years of age (Urban 2004), and Donaldson and Byersdorfer (1990) aged Kodiak green urchins from 0.75 to 6+ years of age.

Although our aging data may provide an opportunity for further analysis, we did not pursue this as the primary objective of this study was to determine if a commercial fishery was feasible. Once it became clear from the results of the biomas calculations that a fishery was not appropriate, additional analysis of the aging data was not considered.

SEX RATIOS

An attempt was made to determine gender for the 787 urchins sampled for weight and length, by inspection of gonads. Of the total, 293 were males, 267 were females, and 227 were unknown. Many of the unknowns were very small individuals with undeveloped gonads.

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TABLES

Table 1.–Southeast Alaska green urchin biomass estimates determined from surveys in spring and fall 2001

Subdistrict	Transects	Average density	Percent Precision	Shoreline Length (m)	Average mass (g)	Average mass (oz.)	Biomass (lbs)	Lower Bound (lbs)	Quotas (lbs)	Commercial Size Biomass (lbs)	Commercial Size Lower Bound (lbs)	Potential Quota (lbs)
SPRING 2001												
110-12	25	264.7	60.3	19,094	49.3	1.7	550,938	332,287	19,937	55,094	33,229	1,994
110-16,17	16	229.2	62.5	21,043	59.2	2.1	631,561	394,510	23,671	63,156	39,451	2,367
110-23	7	0.1		2,074	0.0	0.0	0	0	0	0	0	0
112-11,21,22	18	125.1	67.7	3,427	59.3	2.1	56,215	38,049	2,283	5,621	3,805	228
113-63,64,65	20	309.4	69.5	6,963	49.7	1.8	236,657	164,551	9,873	23,666	16,455	987
Total						0.0	1,182,499	726,796	43,608	147,537	92,940	5,576
FALL 2001												
110-12	27	219.8	61.8	19,094	54.8	1.9	508,705	314,579	18,875	50,871	31,458	1,887
110-14	20	61.1	54.9	34,939	60.1	2.1	283,076	155,362	9,322	28,308	15,536	932
110-16,17	22	392.2	67.4	21,043	61.5	2.2	1,121,872	756,698	45,402	112,187	75,670	4,540
Total							1,913,653	1,226,639	73,598	191,365	122,664	7,360
COMBINED												
110-12	26	242.3	61.1	19,094	52.1	1.8	529,822	323,433	19,406	52,982	32,343	1,941
110-14	20	61.1	54.9	34,939	60.1	2.1	283,076	155,362	9,322	28,308	15,536	932
110-16,17	19	310.7	65.0	21,043	60.4	2.1	876,716	575,604	34,536	87,672	57,560	3,454
110-23	7	0.1	0.0	2,074	0.0	0.0	0	0	0	0	0	0
112-11,21,22	18	125.1	67.7	3,427	59.3	2.1	56,215	38,049	2,283	5,621	3,805	228
113-63,64, 65	20	309.4	69.5	6,963	49.7	1.8	236,657	164,551	9,873	23,666	16,455	987
Total							1,982,487	1,257,000	75,420	198,249	125,700	7,542

Table 2.–Southeast Alaska green sea urchin diameter and weight summary combined for surveys in spring and fall 2001**.**

Subdistrict	**110-14**	**110-16, 17**	**110-12**	**113-63, 64, 65**	**Totals**
Average of diameter (mm)	44.3	42.9	40.0	37.6	41.0
Average of weight (g)	53.2	41.7	35.9	30.8	40.0
Count	194	171	200	222	787

Table 3.–Southeast Alaska green urchin survey method comparisons of surveys in Subdistrict 110-14 in the spring of 2000 compared to 2001 data.

Subdistrict	**Continuous Transect (2000)**	**Continuous Quadrat (2000)**	**Swim-over (2000)**	**Continuous Transect (2001)**
No of Transects	4	4	4	20
No of Urchins sampled >29 mm	156	721	—	92 >35mm
Average urchin density	76.3 (pms)	85.1 (m^2)	3.8 (m^2)	61.1 (pms)
Standard Deviation	54.9	63.4	—	88.8
Percent Precision	34.3	14.5	—	54.9
Shoreline Length (m)	2,172	2,172	543	34,939
Average mass (lb)	0.107	0.160	0.052	0.13
Average biomass (lb/m)	8.13	13.60	—	8.10
Biomass (lbs)	17,661	29,546	8,122	283,076
Lower Bound (lbs)	6,053	4,275	—	155,362
Potential quota (lbs)	1,211	855	487	9,322

Table 4.–Summary of results for Swim-over method used to assess green sea urchins in Farragut Bay (Subdistrict 110-14), Southeast Alaska during spring 2000.

Transect number	10	11	12	21	Average	Total
Average diameter (mm)	60	23	22	25	32.5	—
Average mass (lbs)	0.174	0.011	0.009	0.013	0.052	—
Average density >30mm (m^2)	2.4	0.6	7.3	5.0	3.8	—
Bed width (m)	30	10	30	4	18.5	—
Shoreline length (m)	543	543	543	543	543	—
Area (m^2)	16,290	5,430	16,290	2,172	—	40,182
Biomass (lbs)	6,899	35	1,044	144	—	8,122

Table 5.–Summary of green urchin age results in years for 3 areas in Southeast Alaska.

Location	Sample Size	Average Age	Minimum Age	Maximum Age	Average Diameter (mm)
Farragut Bay	213	6.9	1	18	38.5
Peril Strait	222	7.0	1	17	37.5
Thomas Bay	199	8.2	2	19	40.0

FIGURES

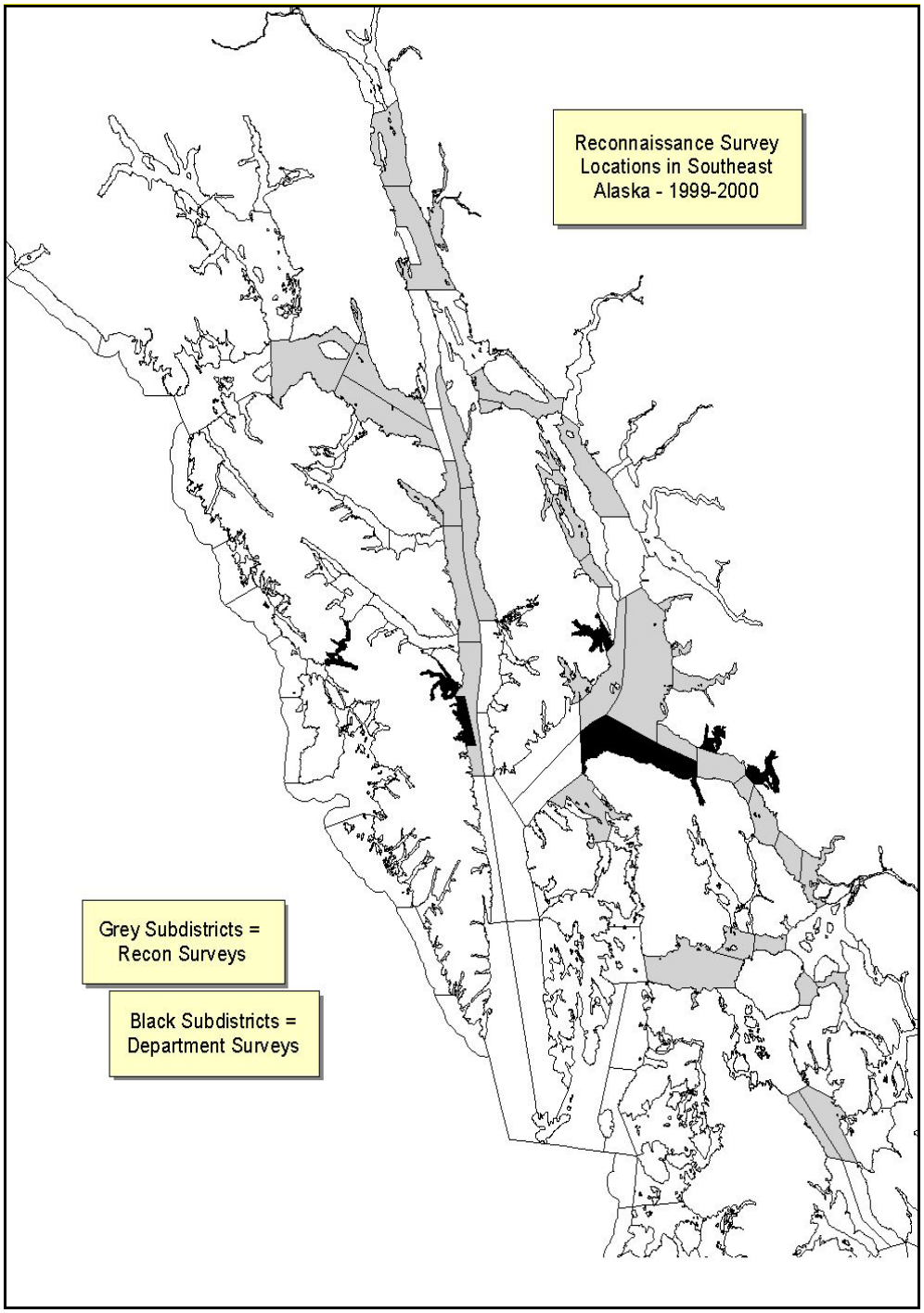

Figure 1.–Locations reconnaissance surveys and biomass surveys of green sea urchins in Southeast Alaska during 1999–2001. Areas shaded gray represent locations of reconnaissance surveys, and areas shaded black represent locations of reconnaissance surveys, followed by department biomass surveys.

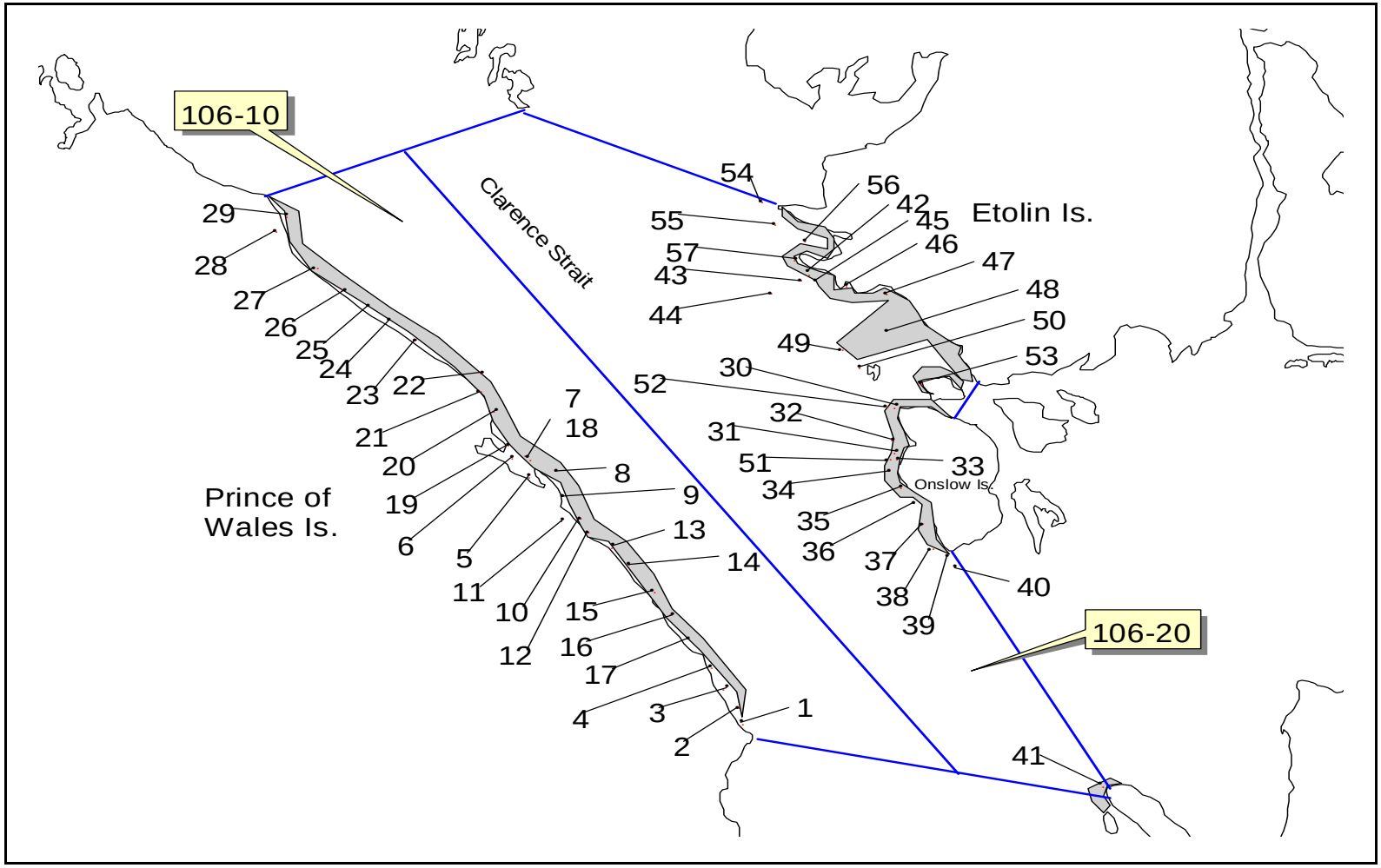

Figure 2.–Map of Subdistricts 106-10, -20 and results of 1999 green urchin reconnaissance survey. Solid gray area identifies shoreline surveyed and numbers identify points of recorded observations (see Appendix B.1).

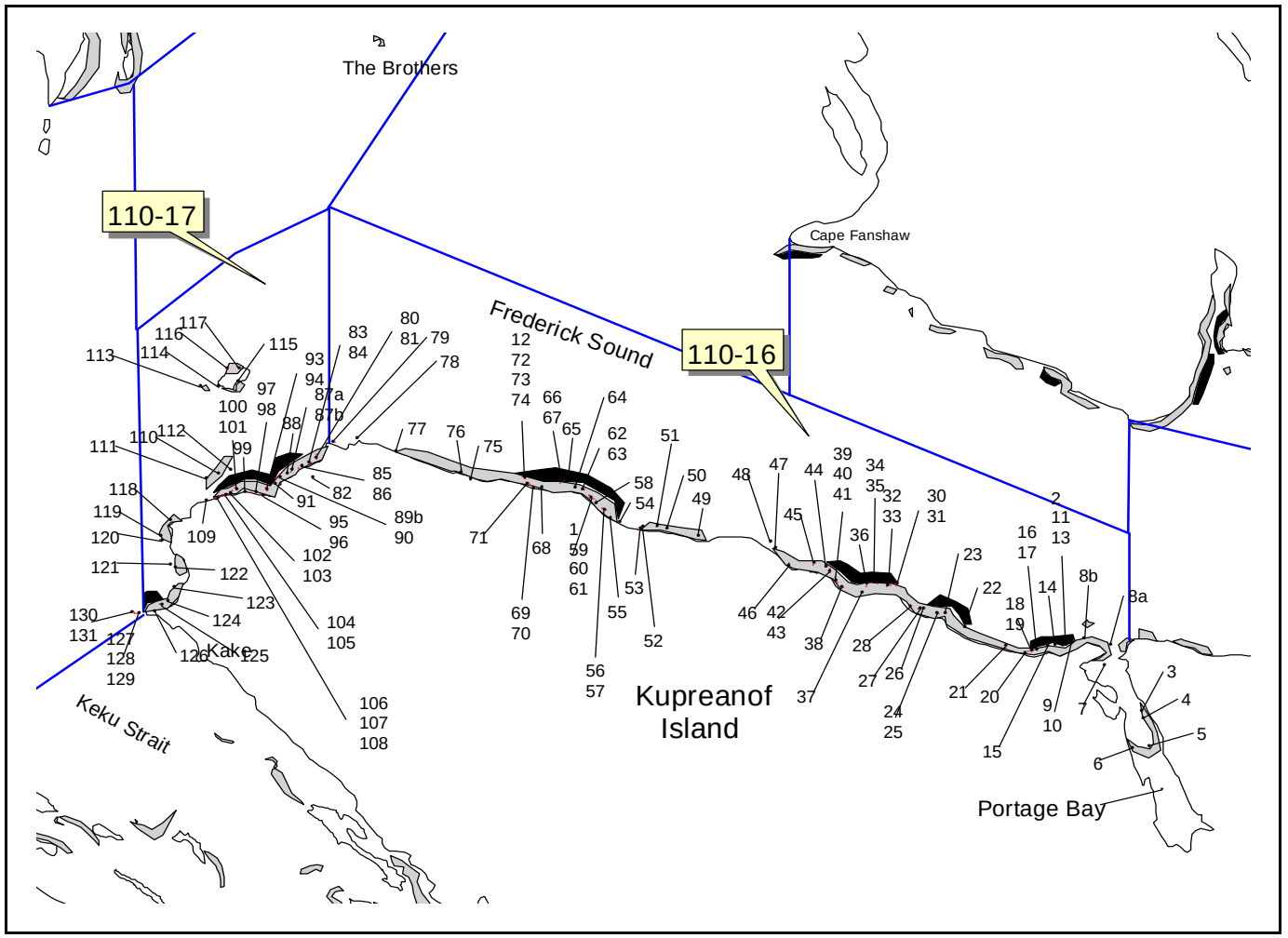

Figure 3.–Map of Subdistricts 110-16, -17 and results of 1999 green urchin reconnaissance survey. Solid gray area identifies shoreline surveyed, black area identifies areas with commercial harvest potential, and numbers identify points of recorded observations (see Appendix B.2).

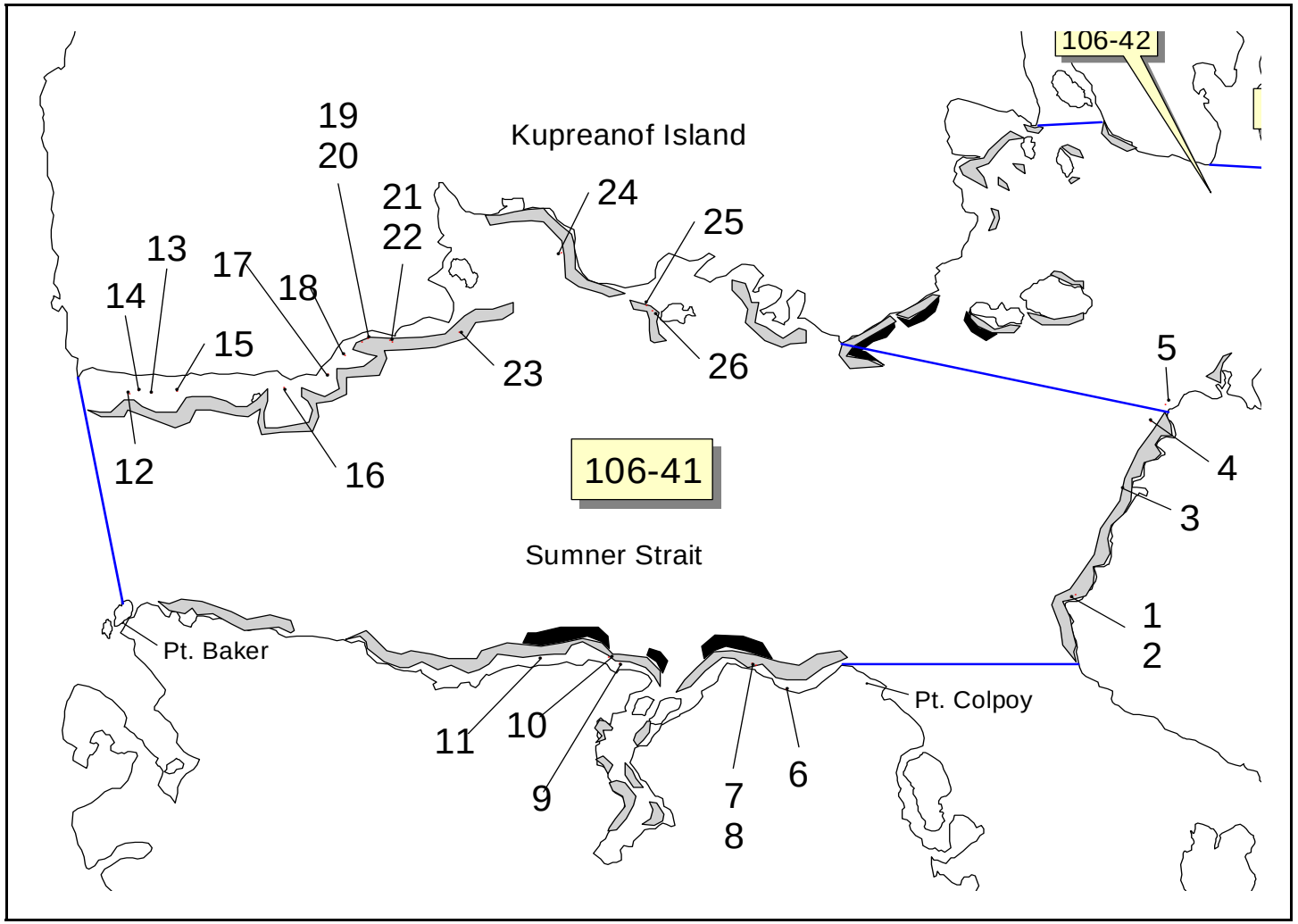

Figure 4.–Map of Subdistrict 106-41 and results of 2000 green urchin reconnaissance survey. Solid gray area identifies shoreline surveyed, black area identifies areas with commercial harvest potential, and numbers identify points of recorded observations (see Appendix B.3).

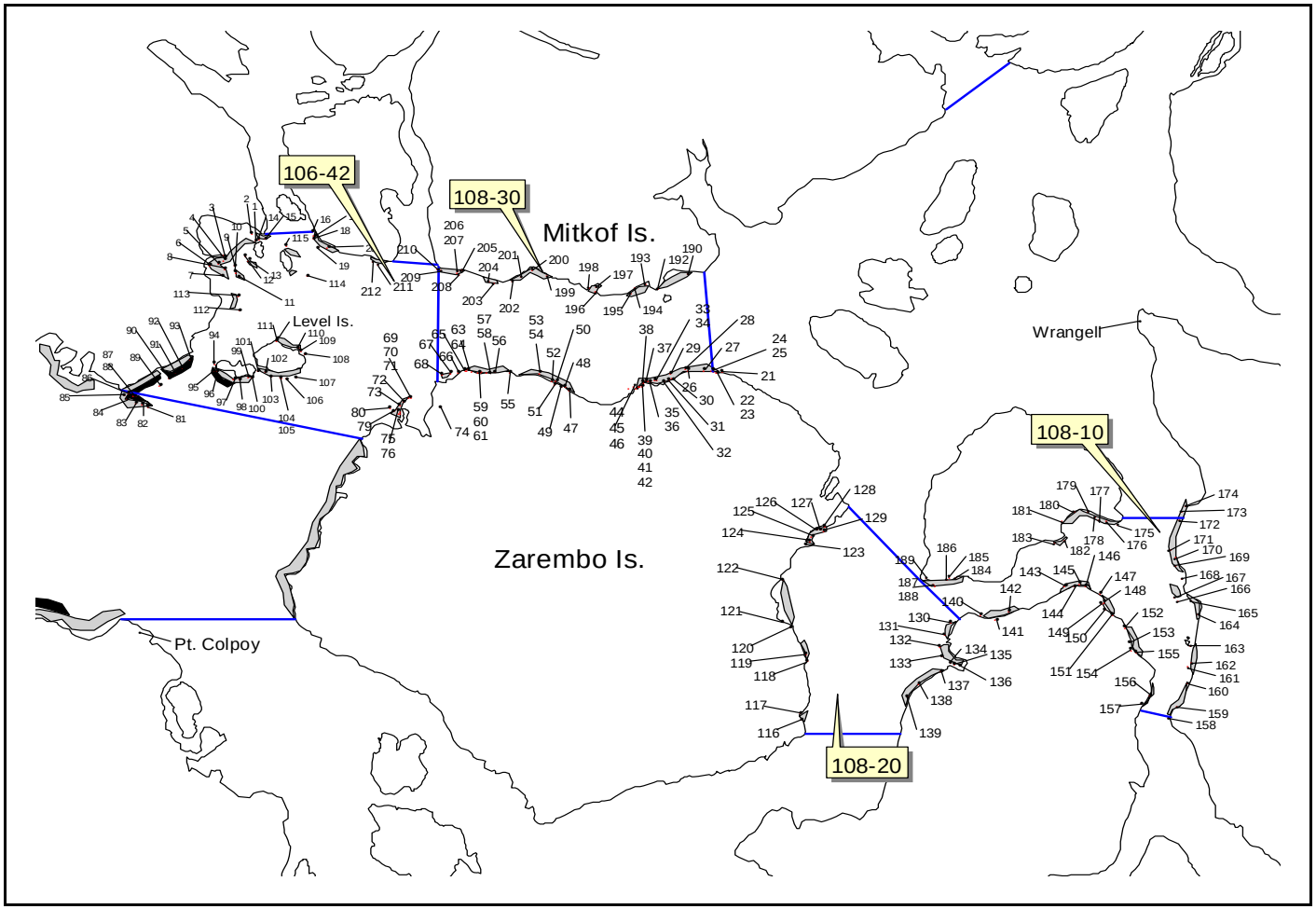

Figure 5.–Map of Subdistricts 106-42; 108-10, -20, -30, and results of 1999 green urchin reconnaissance survey. Solid gray area identifies shoreline surveyed, black area identifies areas with commercial harvest potential, and numbers identify points of recorded observations (see Appendices B.4 and B.5).

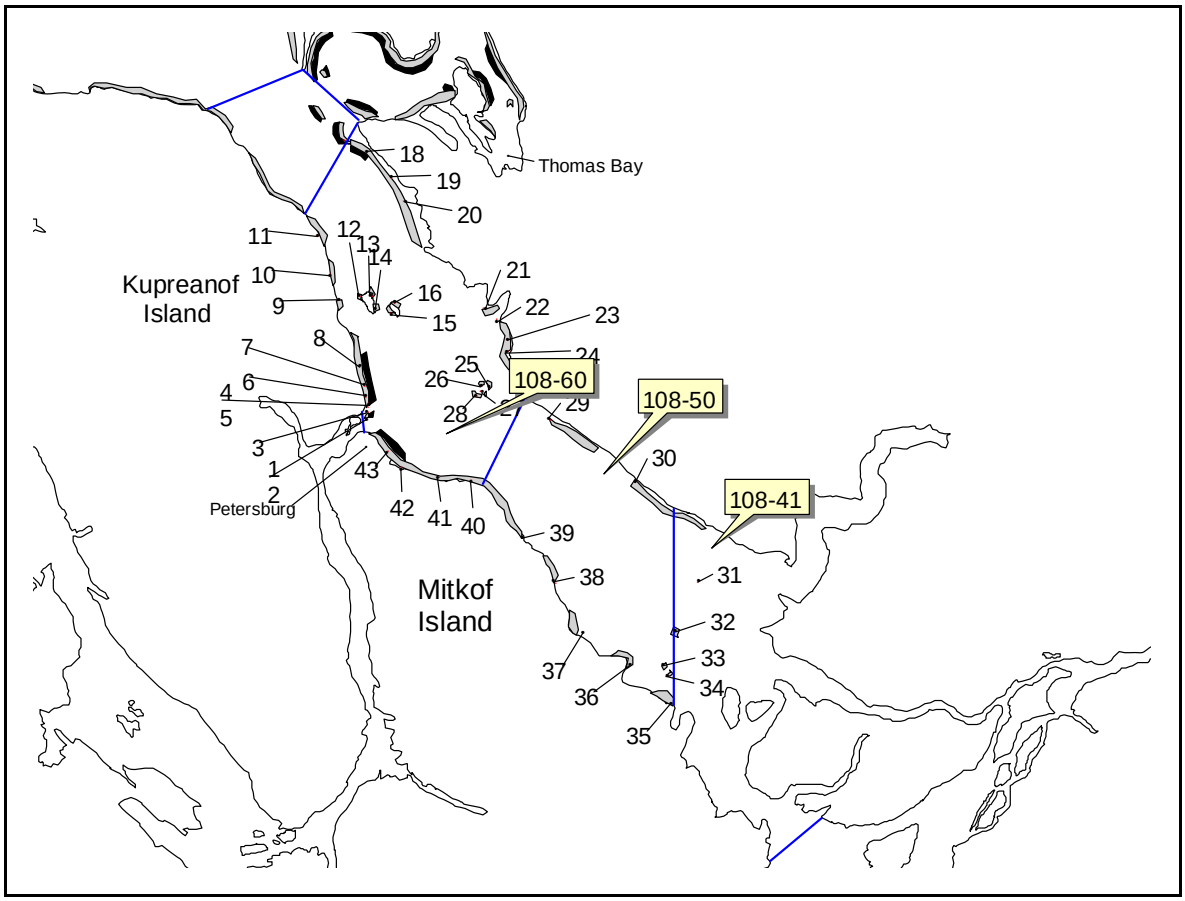

Figure 6.–Map of Subdistricts 108-41,-50, -60, and results of 1999 green urchin reconnaissance survey. Solid gray area identifies shoreline surveyed, black area identifies areas with commercial harvest potential, and numbers identify points of recorded observations (see Appendix B.6).

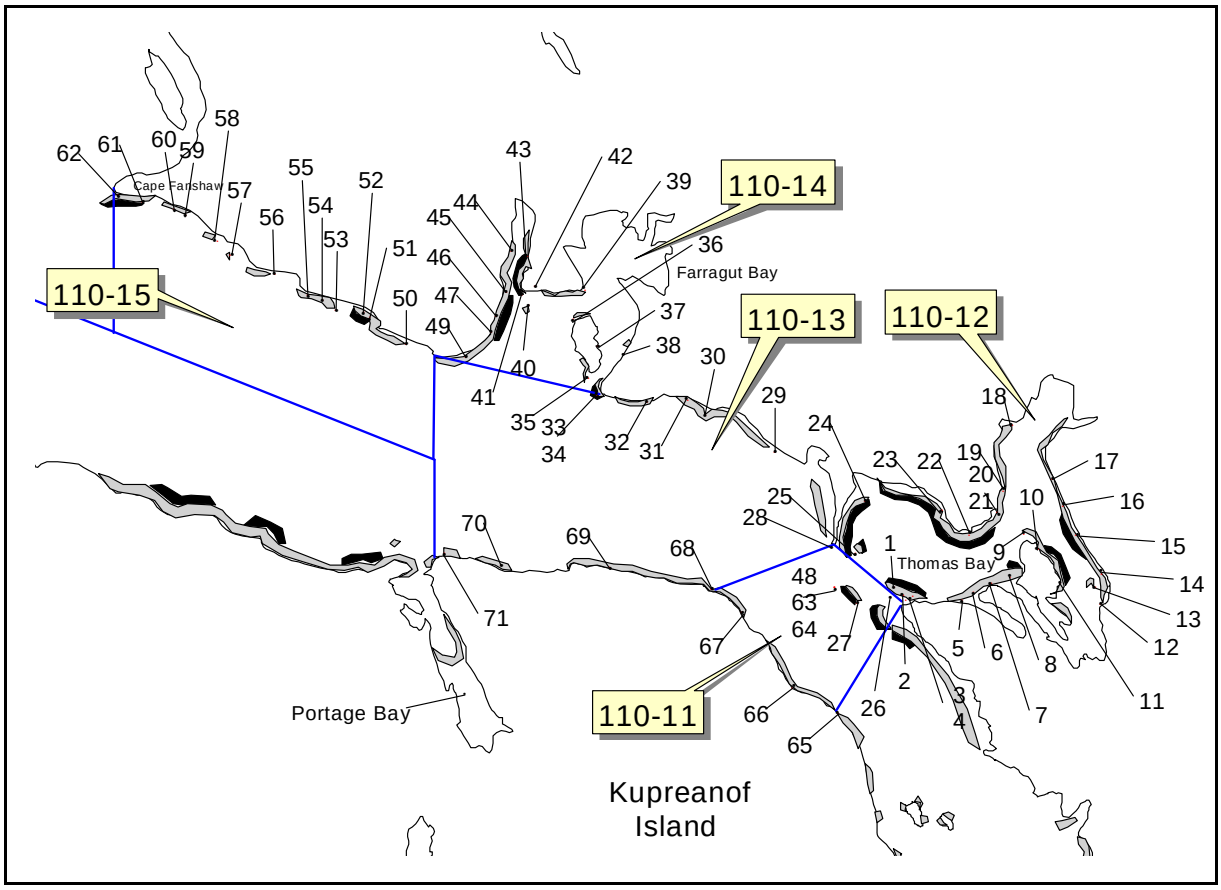

Figure 7.–Map of Subdistricts 110-11, -12, -13, -14, and -15, and results of 1999 green urchin reconnaissance survey. Solid gray area identifies shoreline surveyed, black area identifies areas with commercial harvest potential, and numbers identify points of recorded observations (see Appendix B.7).

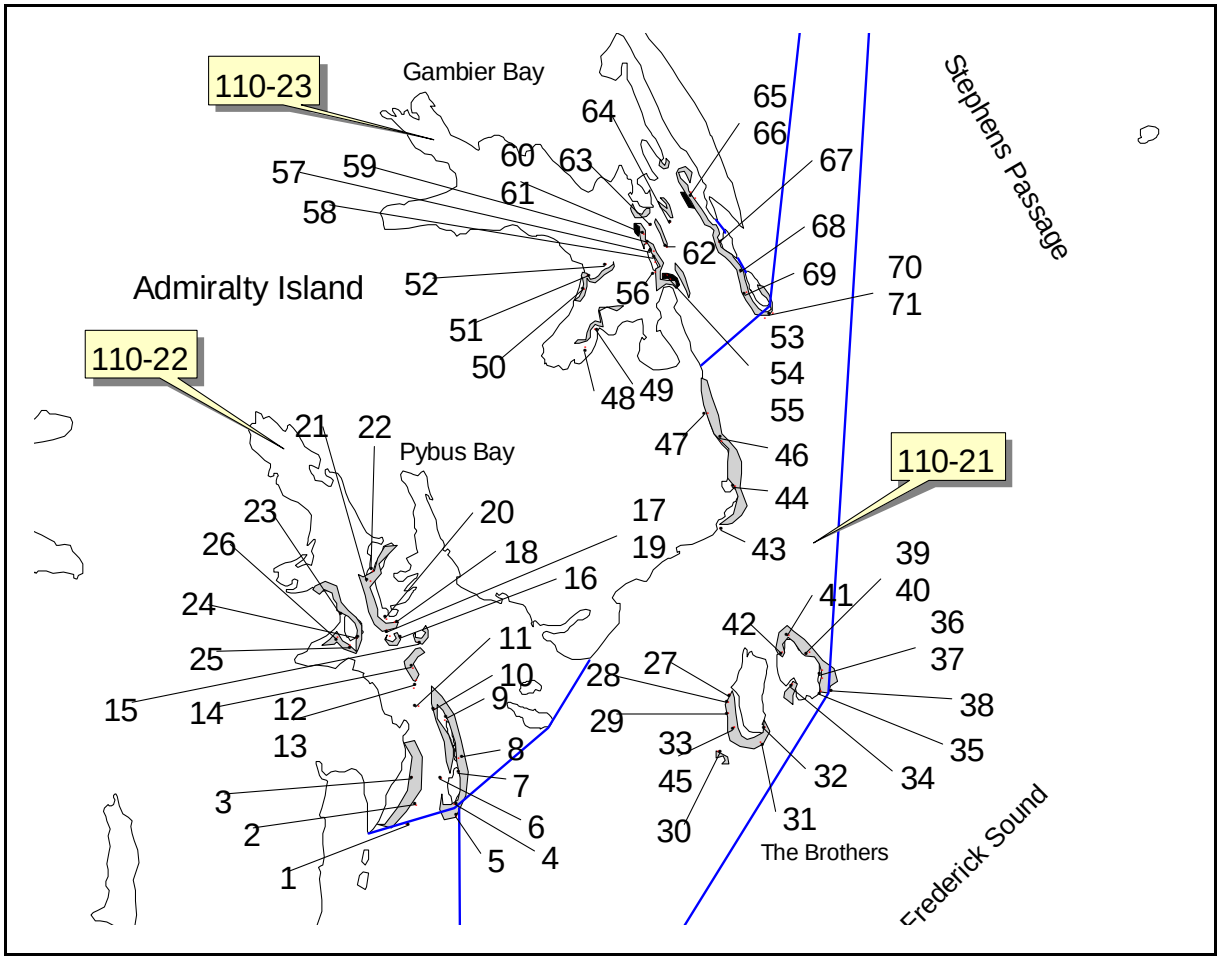

Figure 8.–Map of Subdistricts 110-21, -22, -23, and results of 2000 green urchin reconnaissance survey. Solid gray area identifies shoreline surveyed, black area identifies areas with commercial harvest potential, and numbers identify points of recorded observations (see Appendix B.8).

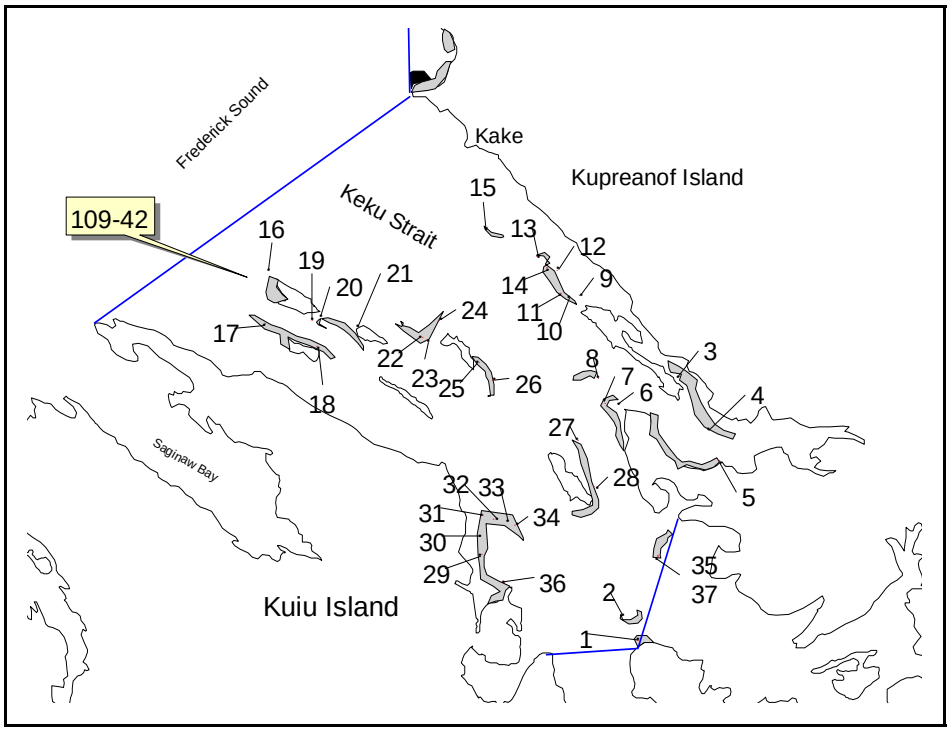

Figure 9.–Map of Subdistrict 109-42, and results of 2000 green urchin reconnaissance survey. Solid gray area identifies shoreline surveyed, black area identifies areas with commercial harvest potential, and numbers identify points of recorded observations (see Appendix B.9).

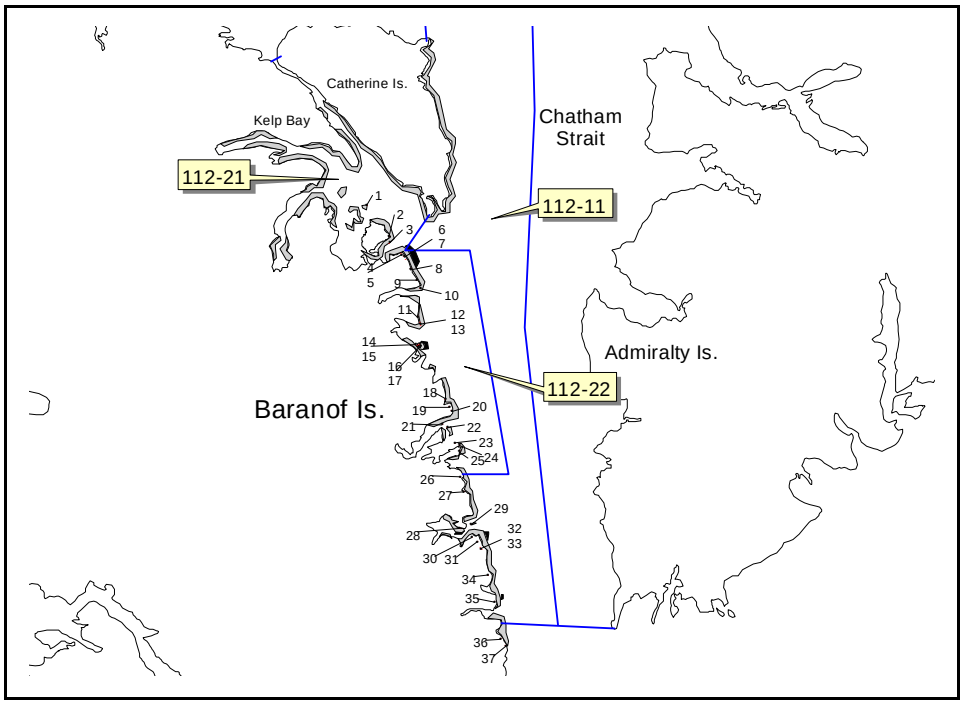

Figure 10.–Map of Subdistricts 112-11,-21, and -22, as well as results of the green urchin reconnaissance survey in 2000. Solid gray area identifies shoreline surveyed, black area identifies areas with commercial harvest potential, and numbers identify points of recorded observations (see Appendix B.10).

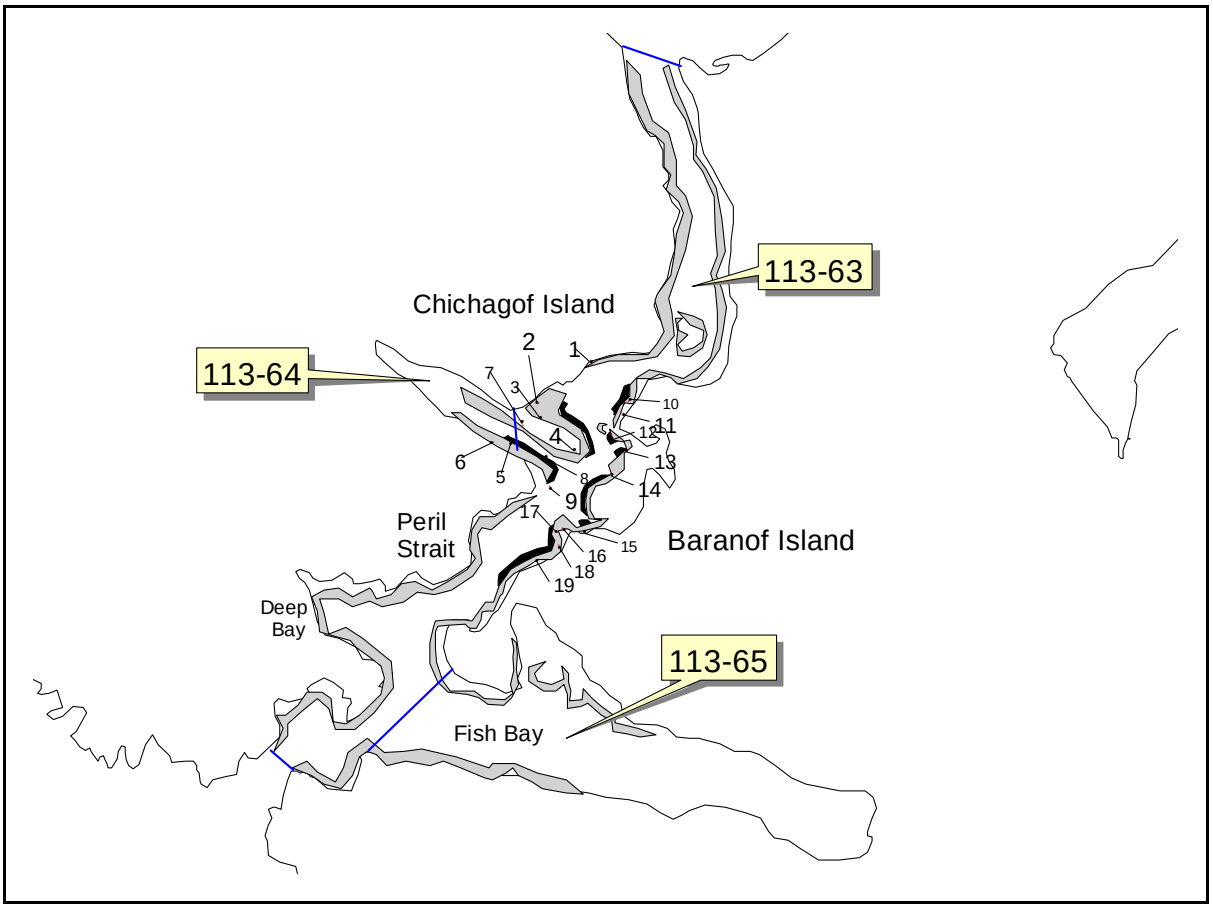

Figure 11.–Map of Subdistricts 113-63, -64, and -65, as well as results of the green urchin reconnaissance survey in 2000. Solid gray area identifies shoreline surveyed, black area identifies areas with commercial harvest potential, and numbers identify points of recorded observations (see Appendix B.11).

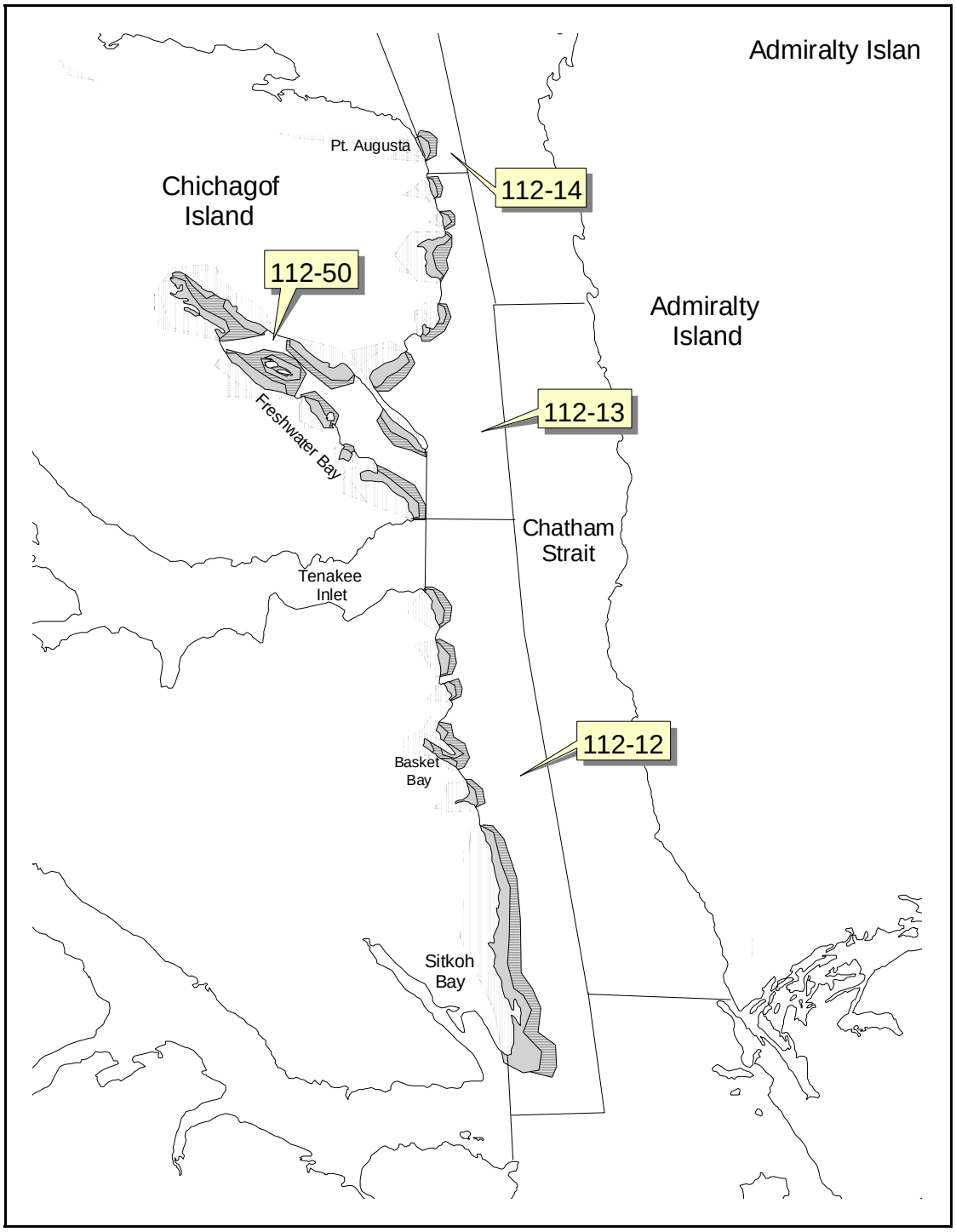

Figure 12.–Map of Subdistricts 112-12, -13, -14, and -50, and results of 2001 green urchin and sea cucumber reconnaissance survey. Solid gray area identifies shoreline surveyed and hatched area identifies areas with commercial sea cucumber harvest potential (see Appendix B.12).

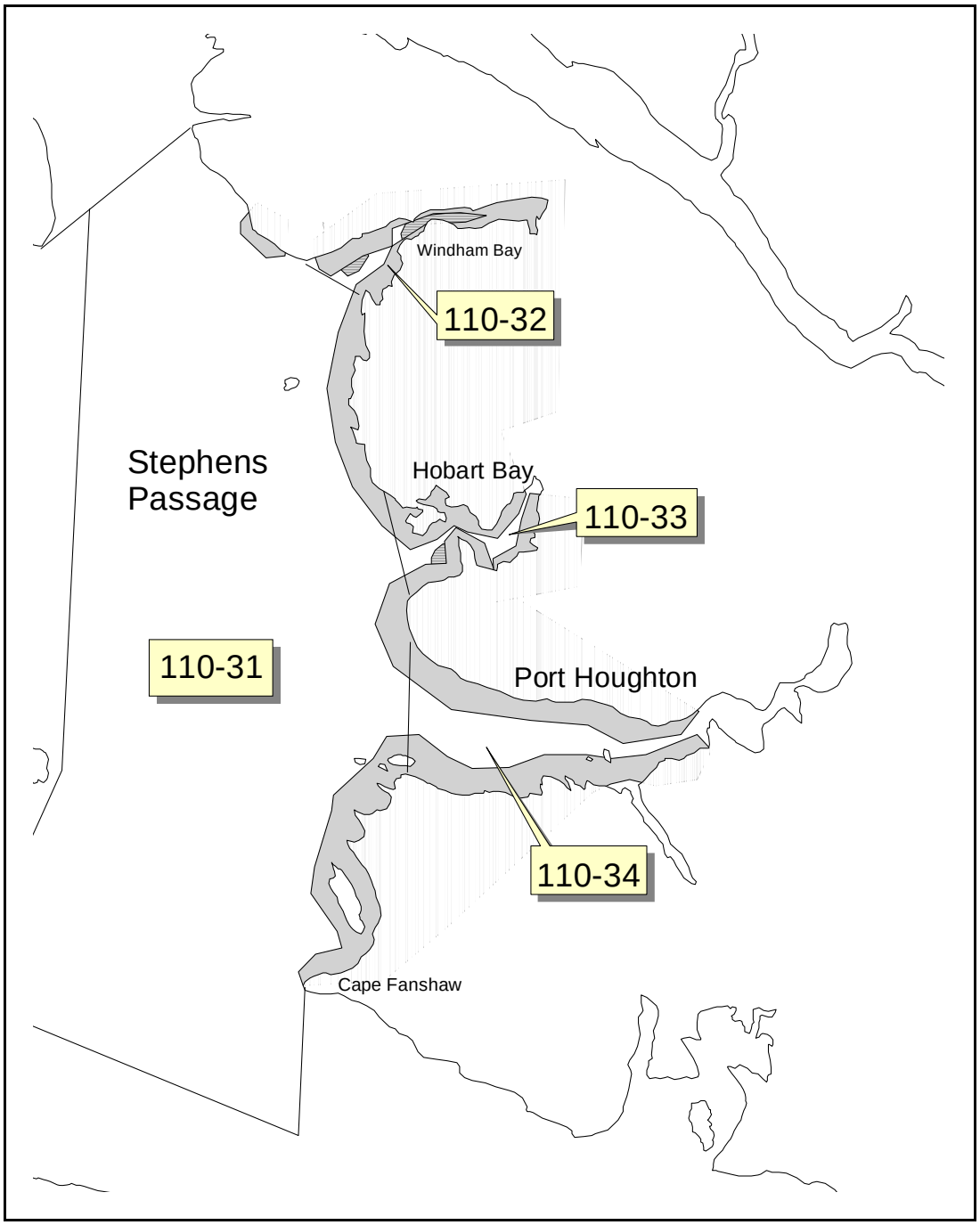

Figure 13.–Map of Subdistricts 110-31, -32, -33, and -34, and results of 2001 green urchin and sea cucumber reconnaissance survey. Solid gray area identifies shoreline surveyed (see Appendix B.13).

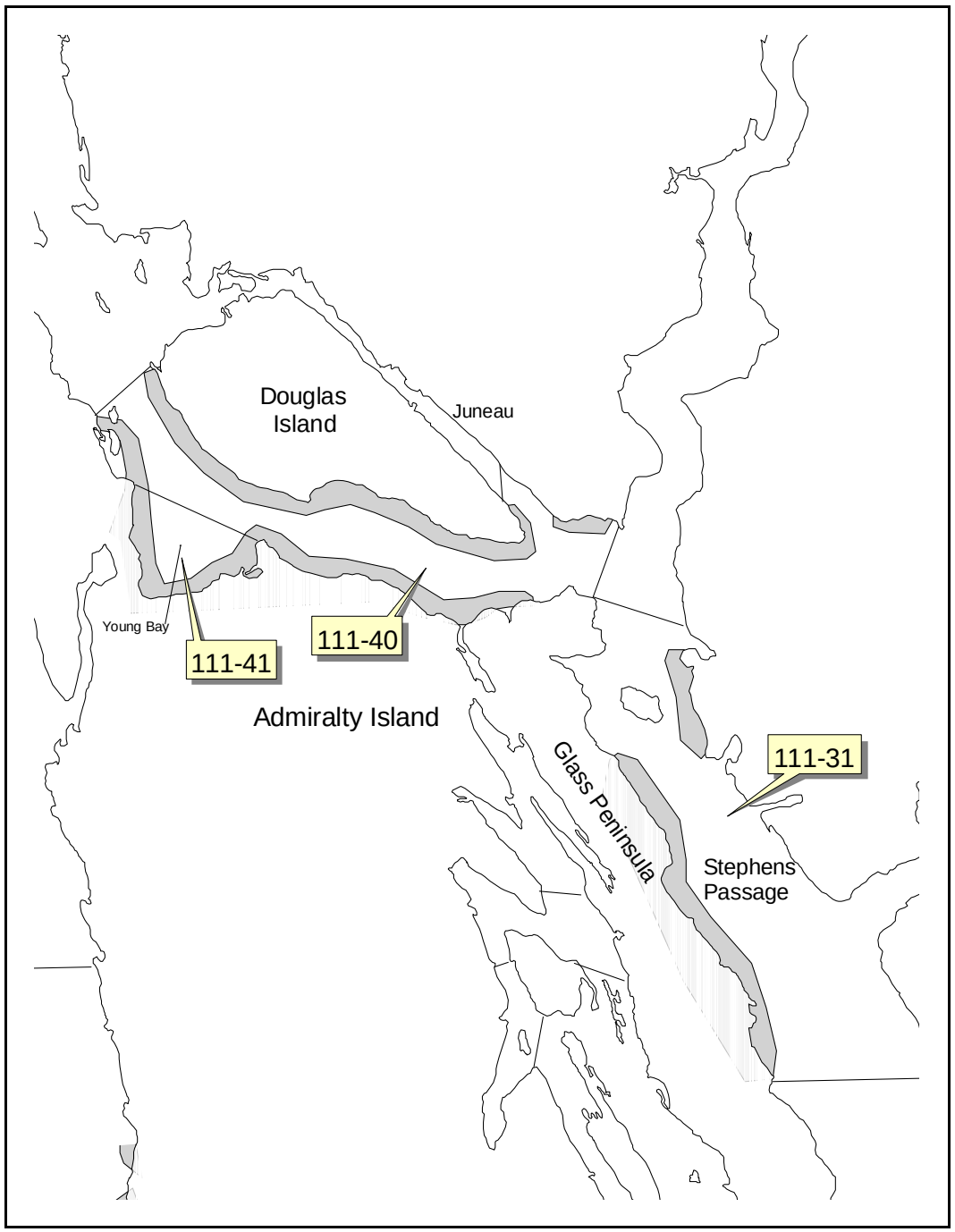

Figure 14.–Map of Subdistricts 111-31, -40, and -41, and results of 2001 green urchin and sea cucumber reconnaissance survey. Solid gray area identifies shoreline surveyed (see Appendix B.14).

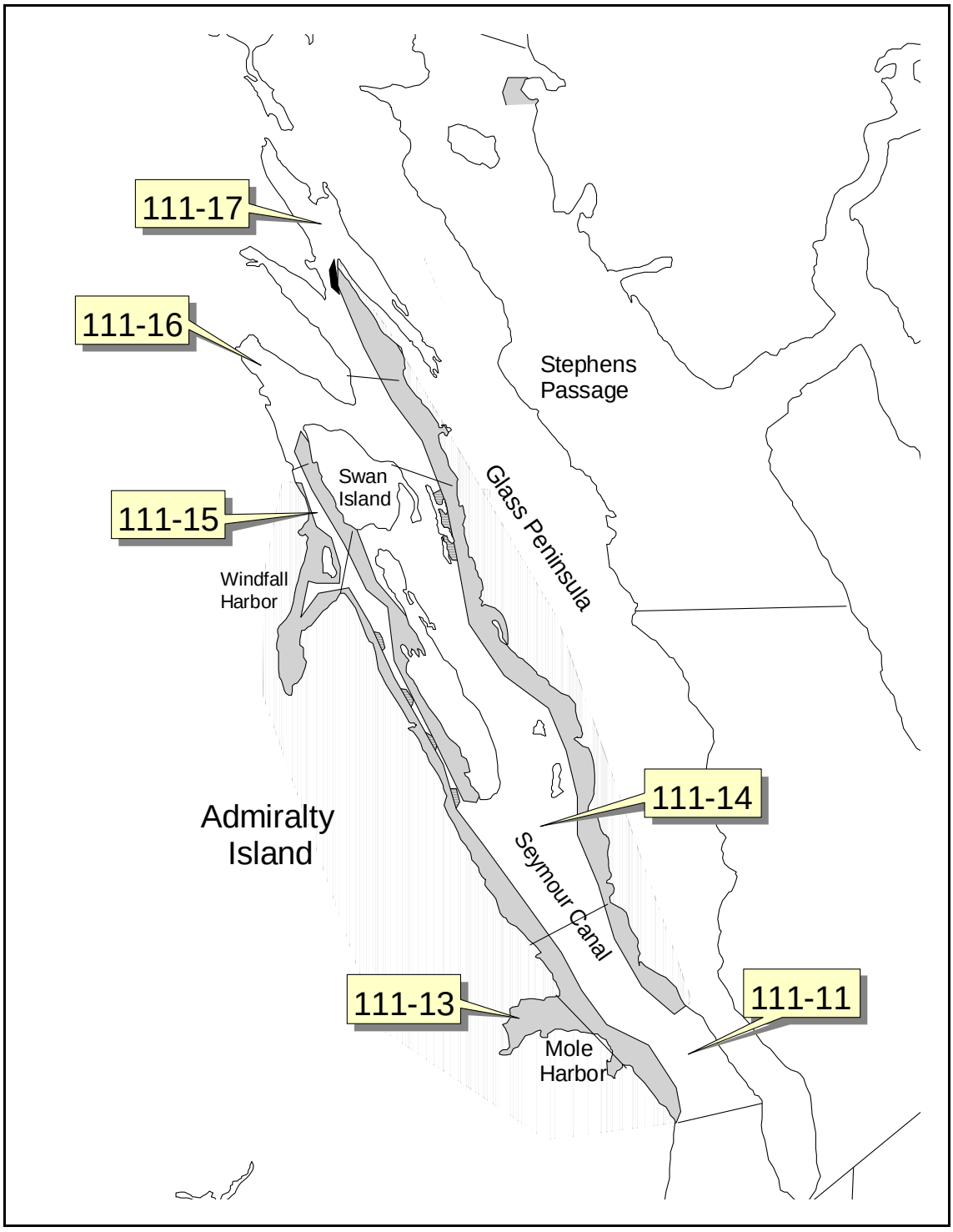

Figure 15.–Map of Subdistricts 111-11, -12, -13, -14, -15, -16, and -17, and results of 2001 green urchin and sea cucumber reconnaissance survey. Solid gray area identifies shoreline surveyed and black area identifies areas with commercial green urchin harvest potential (see Appendix B.15).

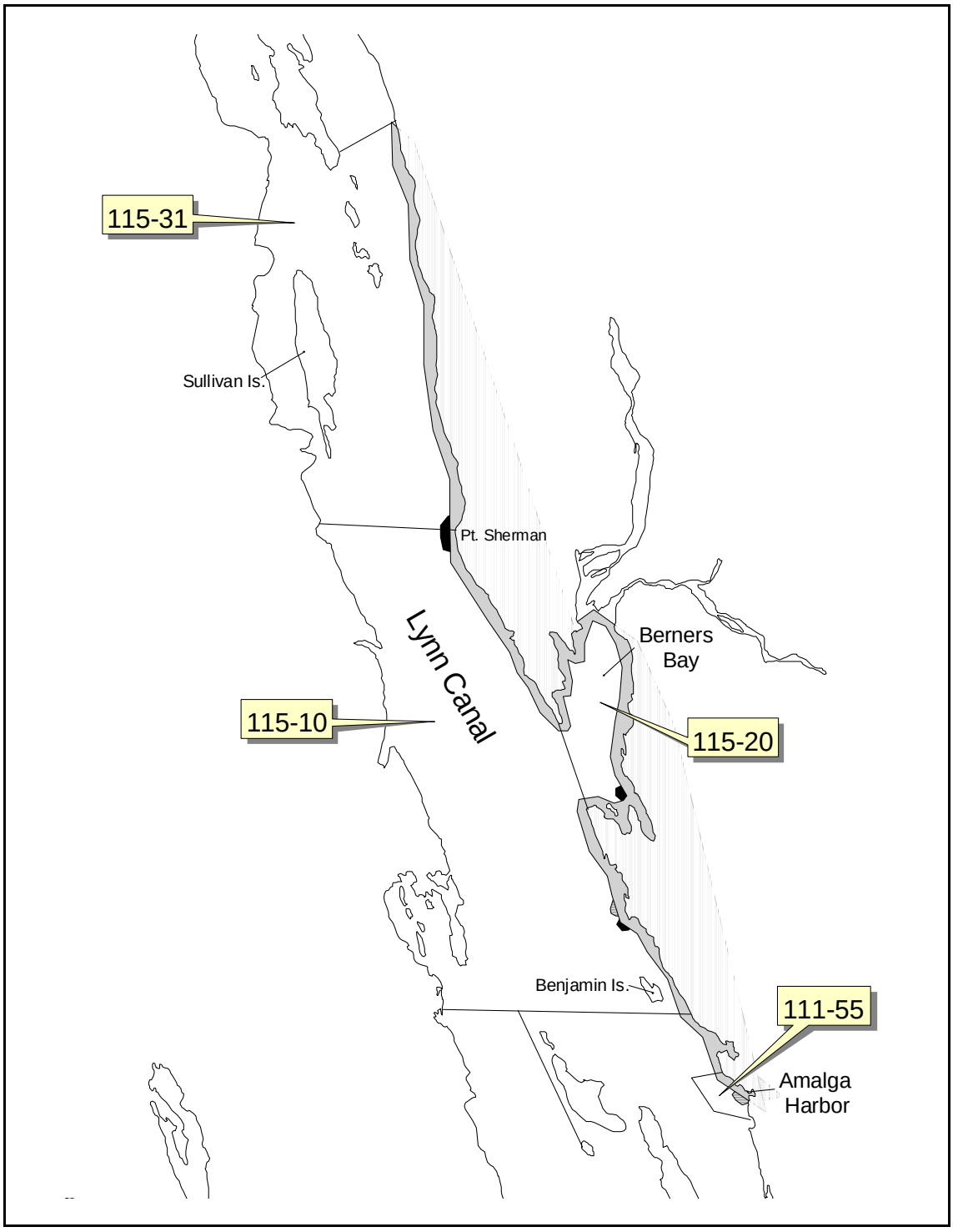

Figure 16.–Map of Subdistricts 115-10, -20, -31, and -55, and results of 2001 green urchin and sea cucumber reconnaissance survey. Solid gray area identifies shoreline surveyed and black area identifies areas with commercial green urchin harvest potential (see Appendix B.16).

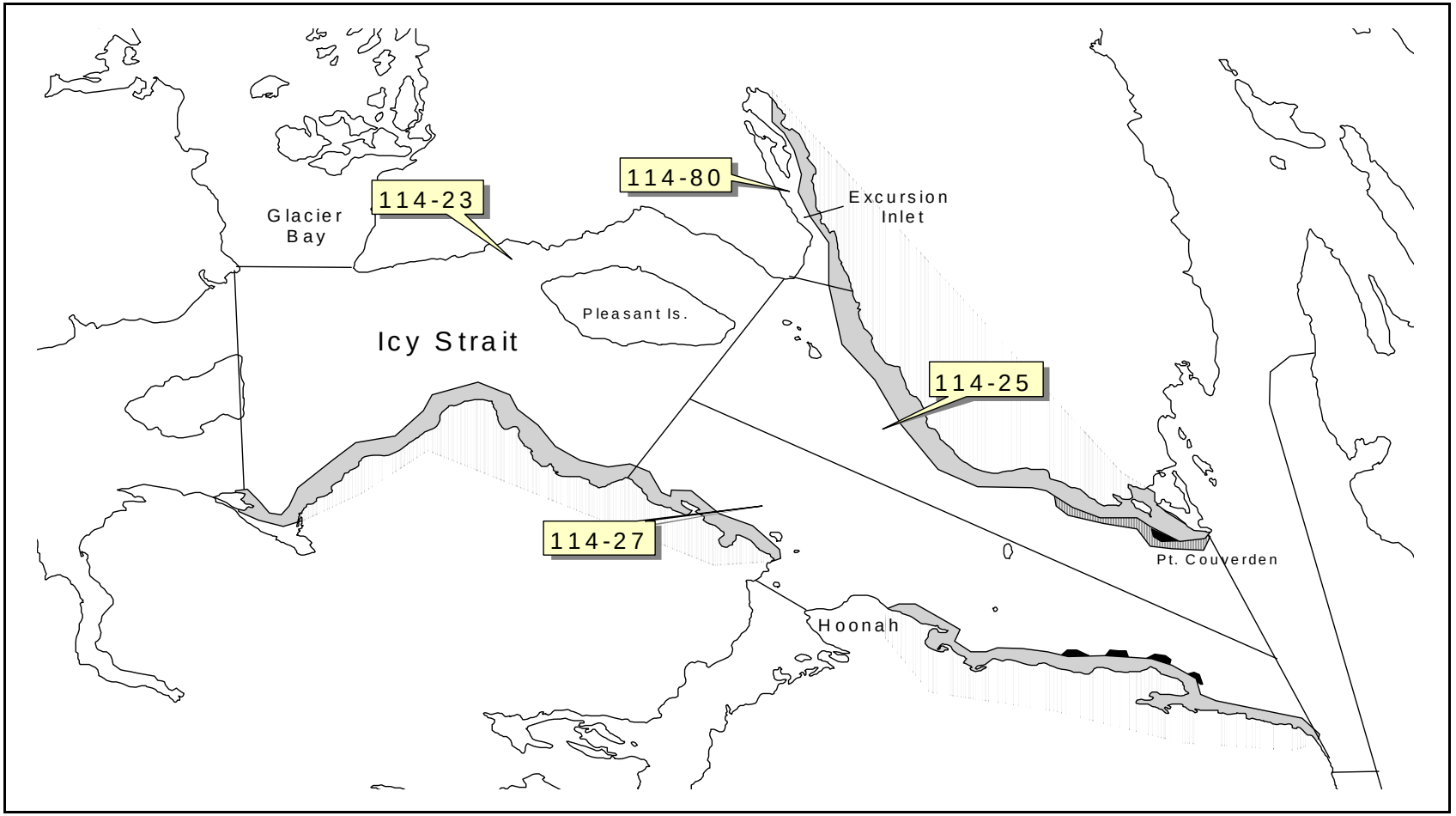

Figure 17.–Map of Subdistricts 114-23, -25, -27, and -80, as well as results of the 2001 green urchin and sea cucumber reconnaissance survey. Solid gray area identifies shoreline surveyed, black area identifies areas with commercial green urchin harvest potential and hatched area identifies areas with commercial sea cucumber harvest potential (see Appendix B.17).

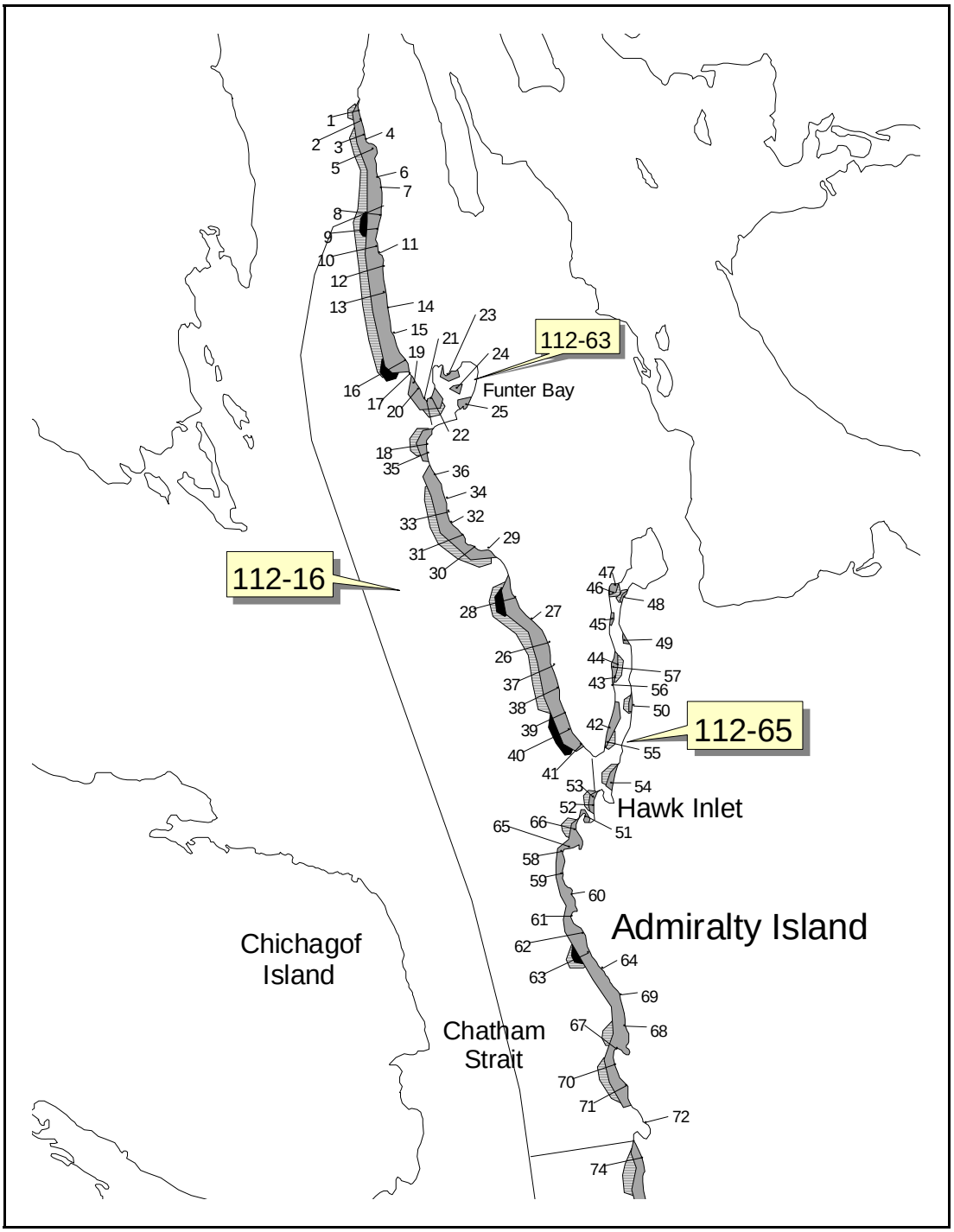

Figure 18.–Map of Subdistricts 112-16, -17, -63, and -65, as well as results of the northern half of the 2001 green urchin and sea cucumber reconnaissance survey. Solid gray area identifies shoreline surveyed, black area identifies areas with commercial green urchin harvest potential, hatched area identifies areas with commercial sea cucumber harvest potential and numbers identify points of recorded observations (see Appendix B.18).

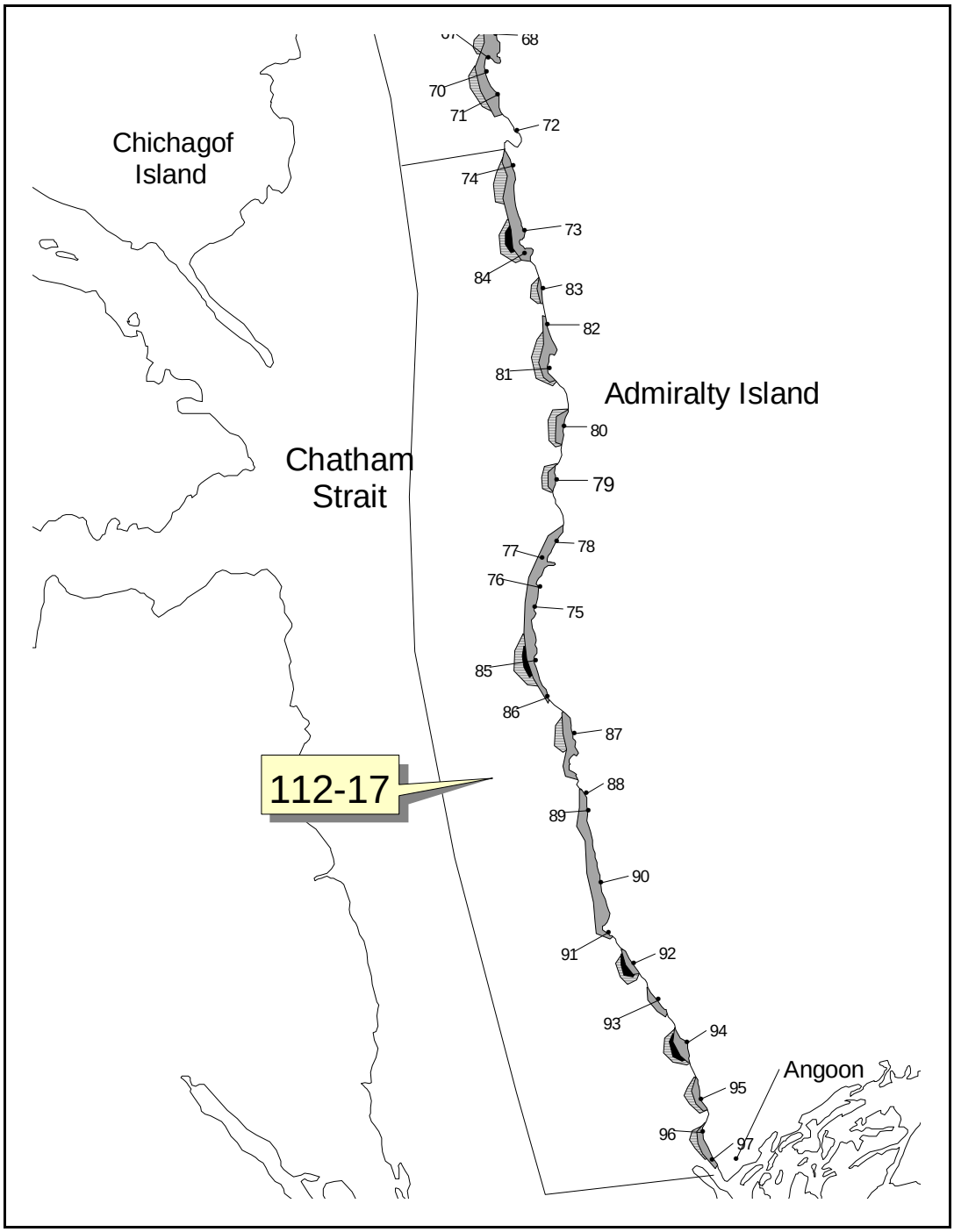

Figure 19.–Map of Subdistricts 112-16, -17, -63, and -65, as well as results for the southern half of the 2001 green urchin and sea cucumber reconnaissance survey. Solid gray area identifies shoreline surveyed, black area identifies areas with commercial green urchin harvest potential, hatched area identifies areas with commercial sea cucumber harvest potential and numbers identify points of recorded observations (see Appendix B.18).

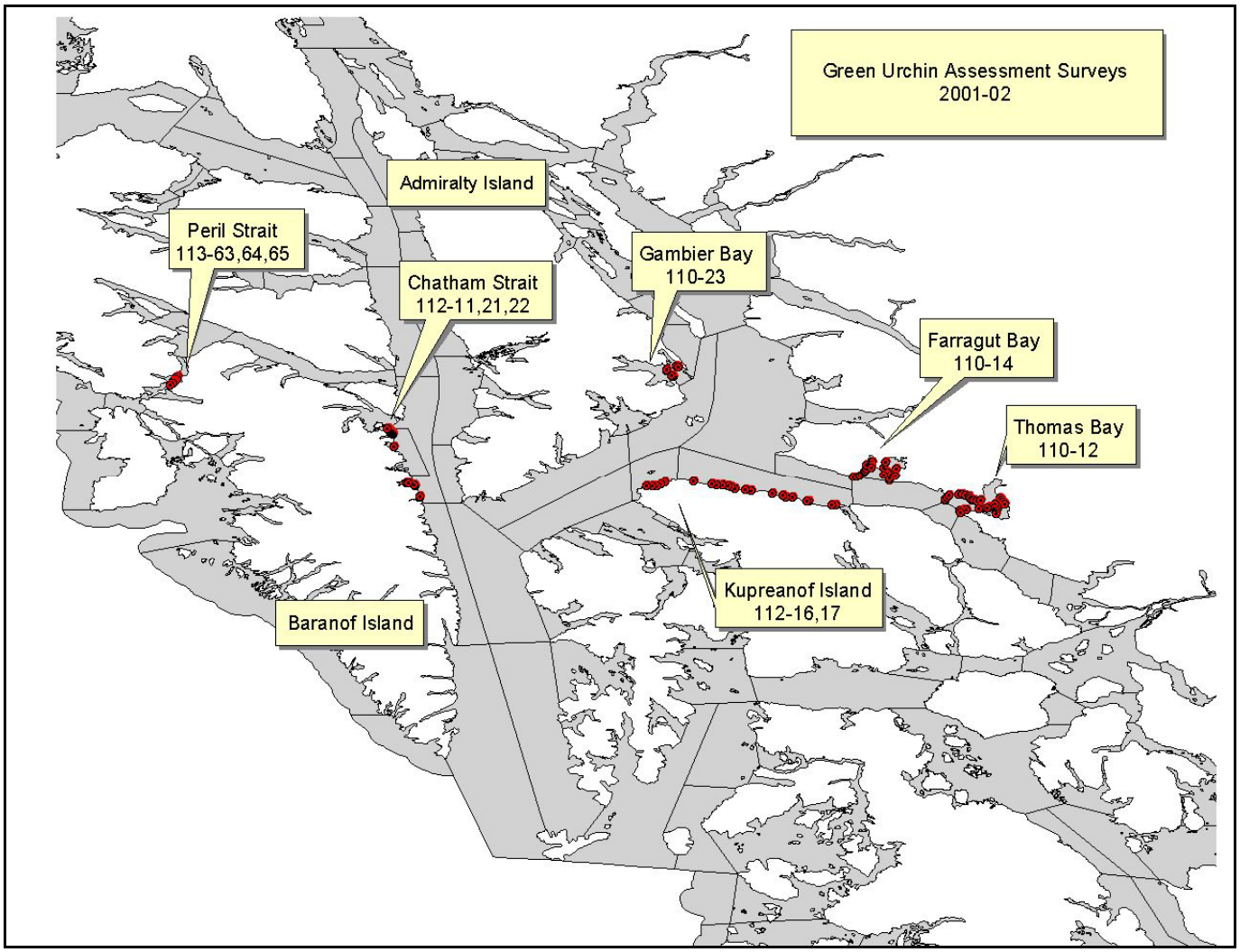

Figure 20.–Green sea urchin assessment survey transect locations (circles) surveyed during 2000 and 2001

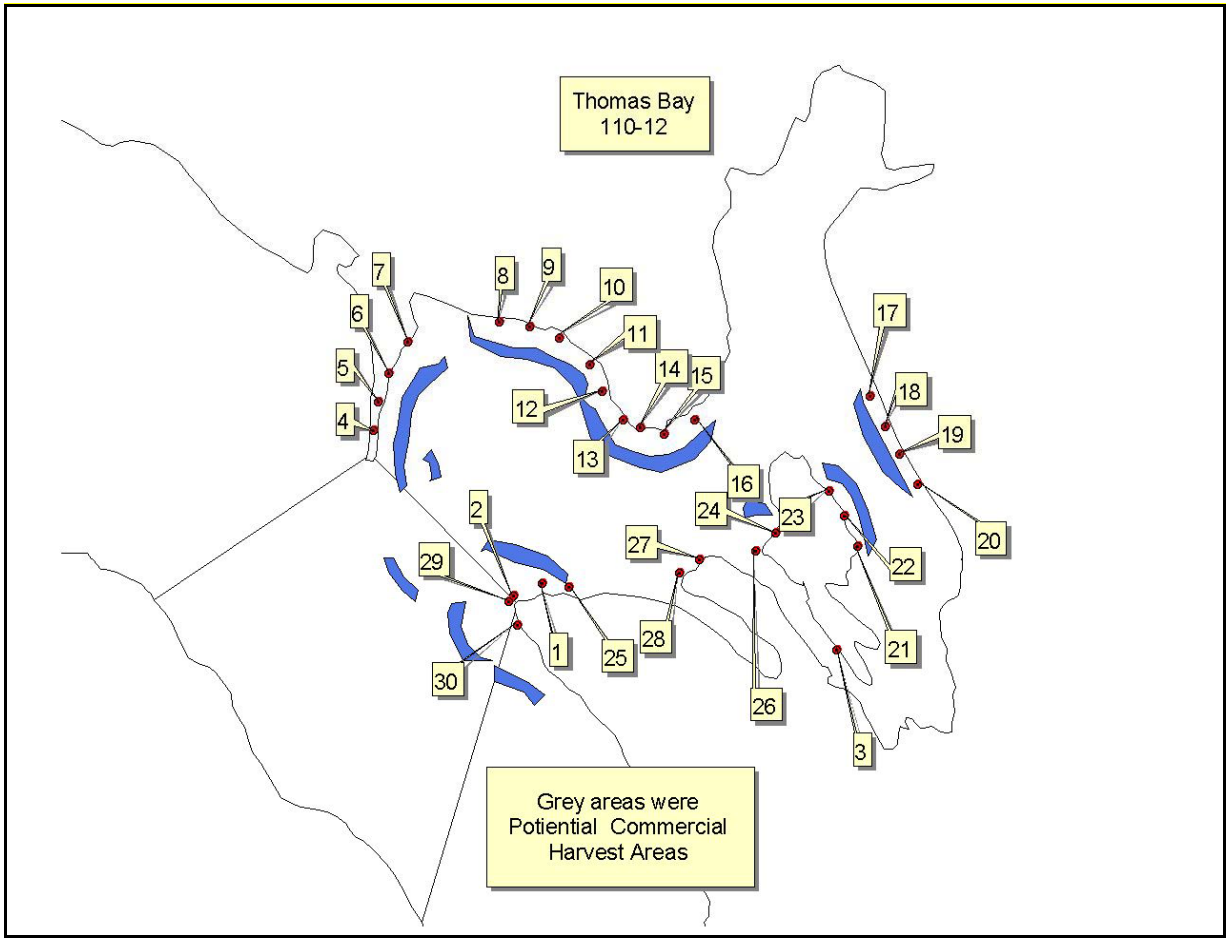

Figure 21.–Green sea urchin assessment survey transect pair locations in Subdistrict 110-12. Shading indicates areas with potential commercial harvest value.

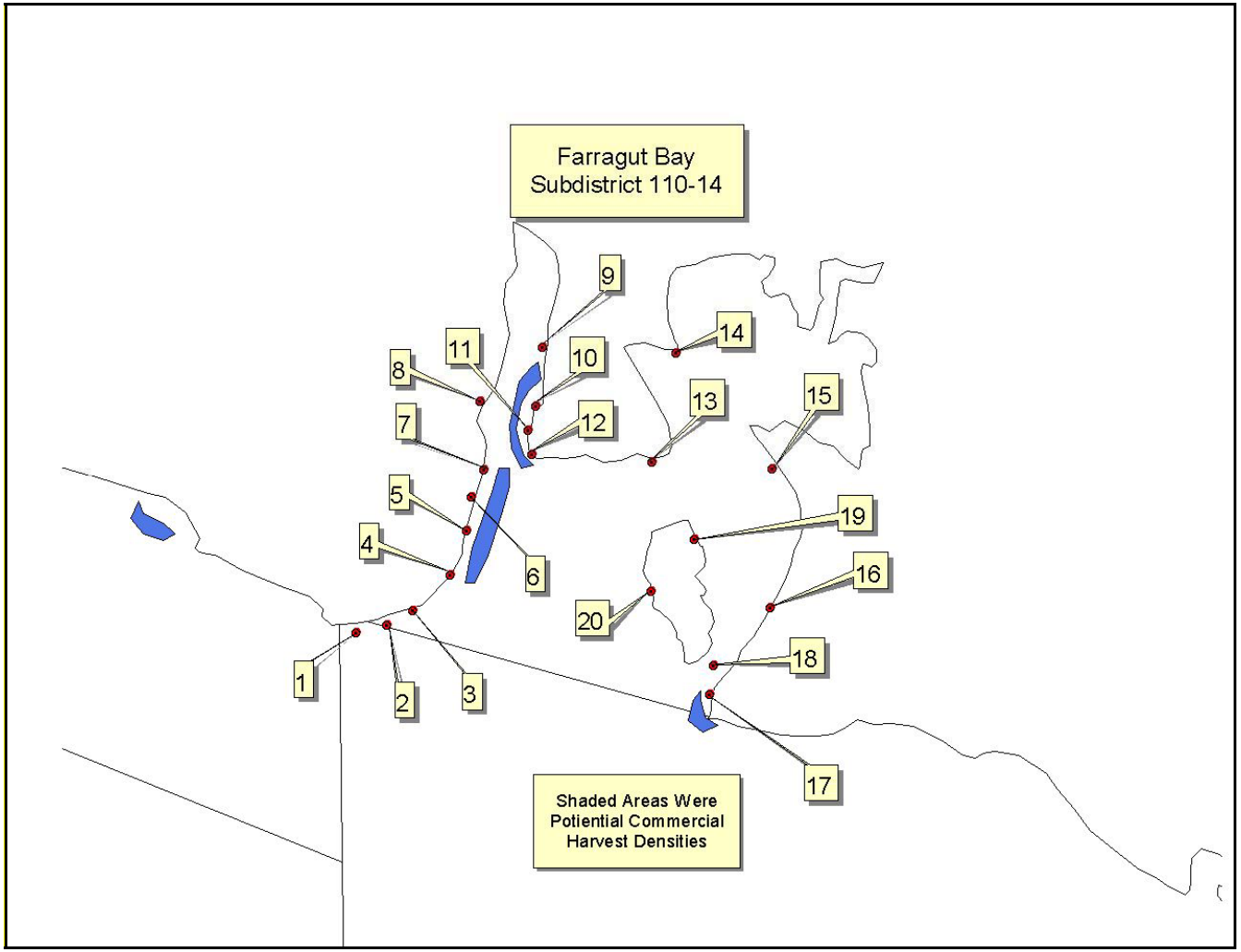

Figure 22.–Green urchin assessment survey transect pair locations in Subdistrict 110-14. Shading indicates areas with potential commercial harvest value.

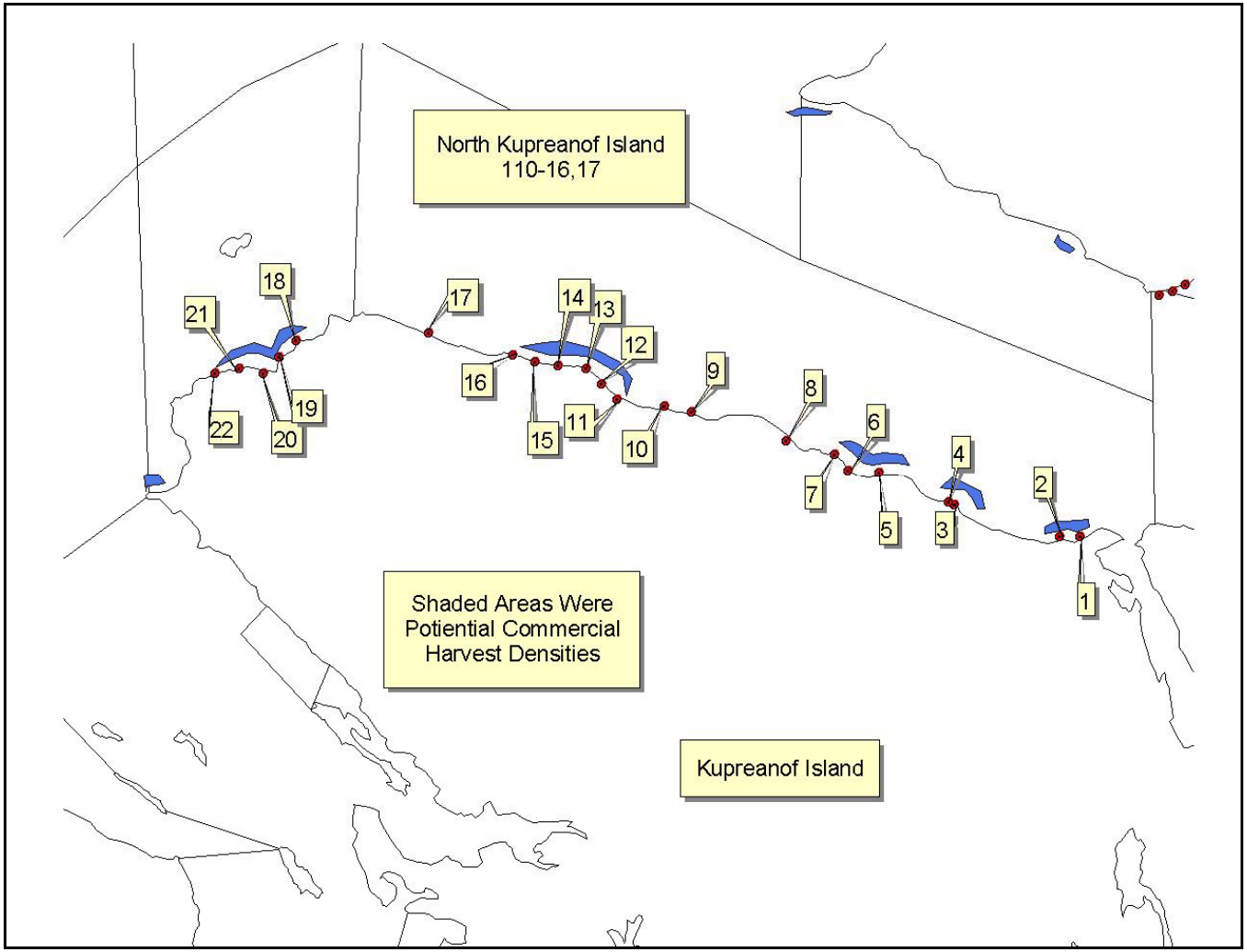

Figure 23.–Green urchin assessment survey transect pair locations in Subdistricts 10-16, -17. Shading indicates areas with potential commercial harvest value.

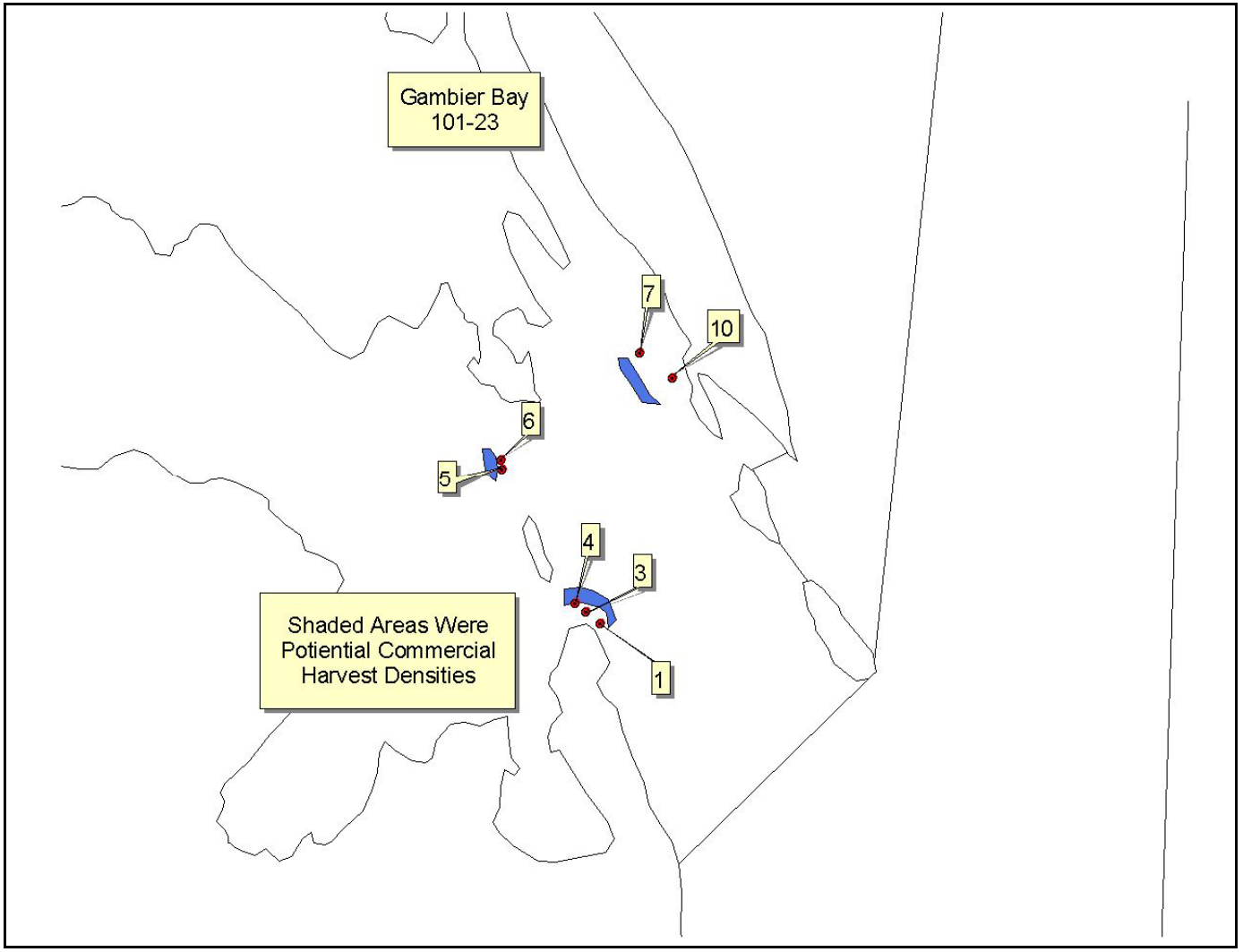

Figure 24.–Green urchin assessment survey transect pair locations in statistical area 110-23. Shading indicates areas with potential commercial harvest value.

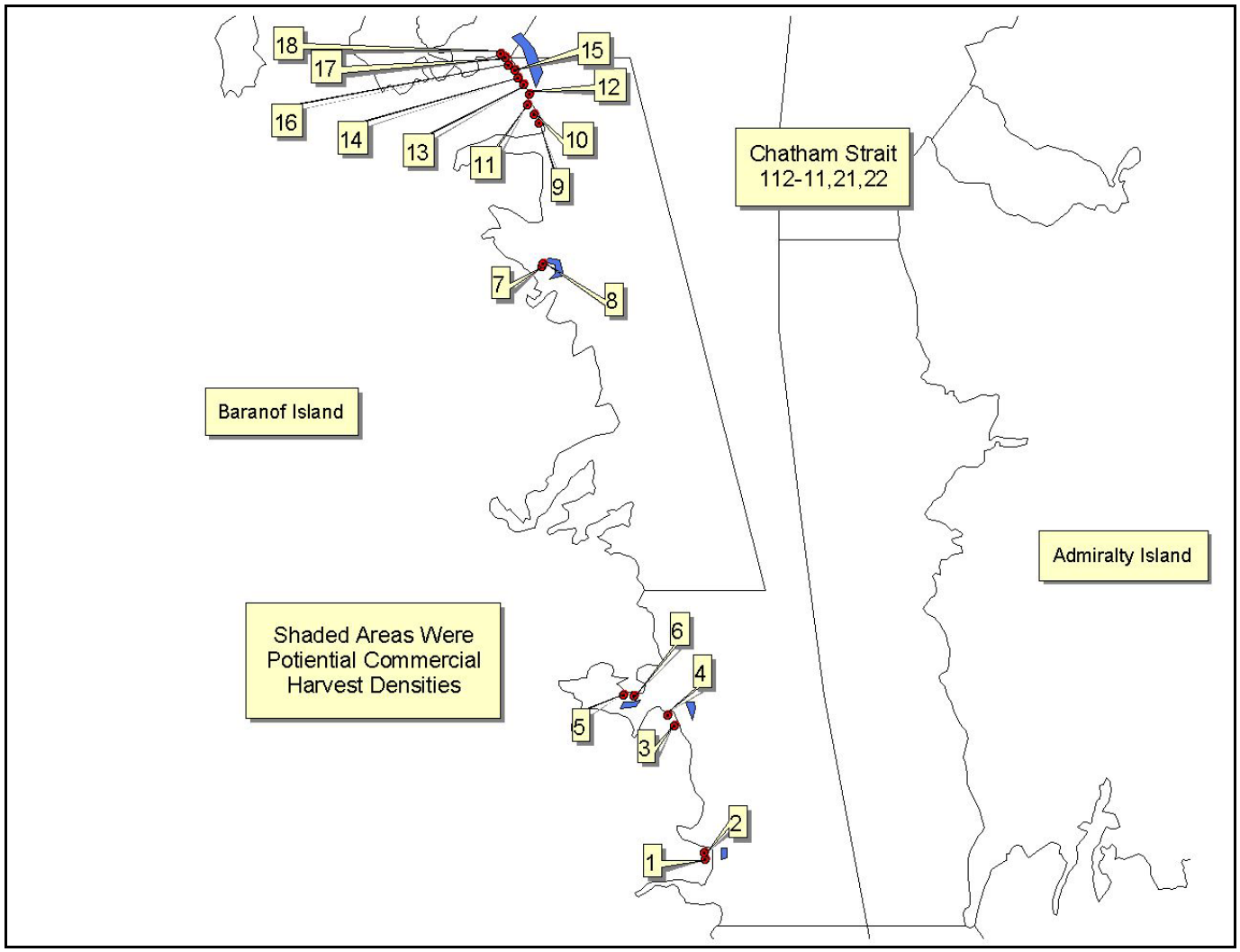

Figure 25.–Green urchin assessment survey transect pair locations in statistical area 112-11, -21, -22. Shading indicates areas with potential commercial harvest value.

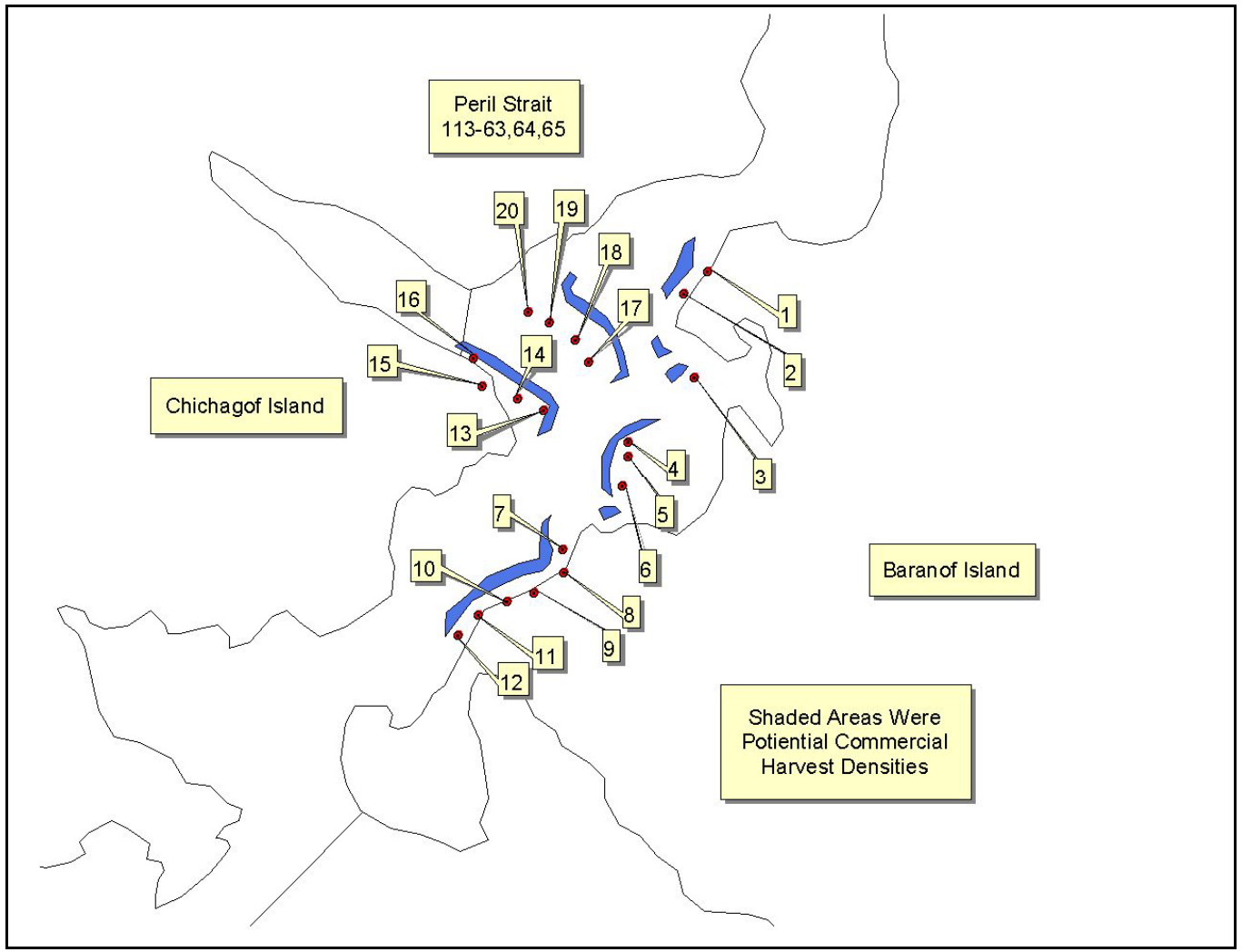

Figure 26.–Green urchin assessment survey transect pair locations in statistical area 113-63, -64, -65. Shading indicates areas with potential commercial harvest value.

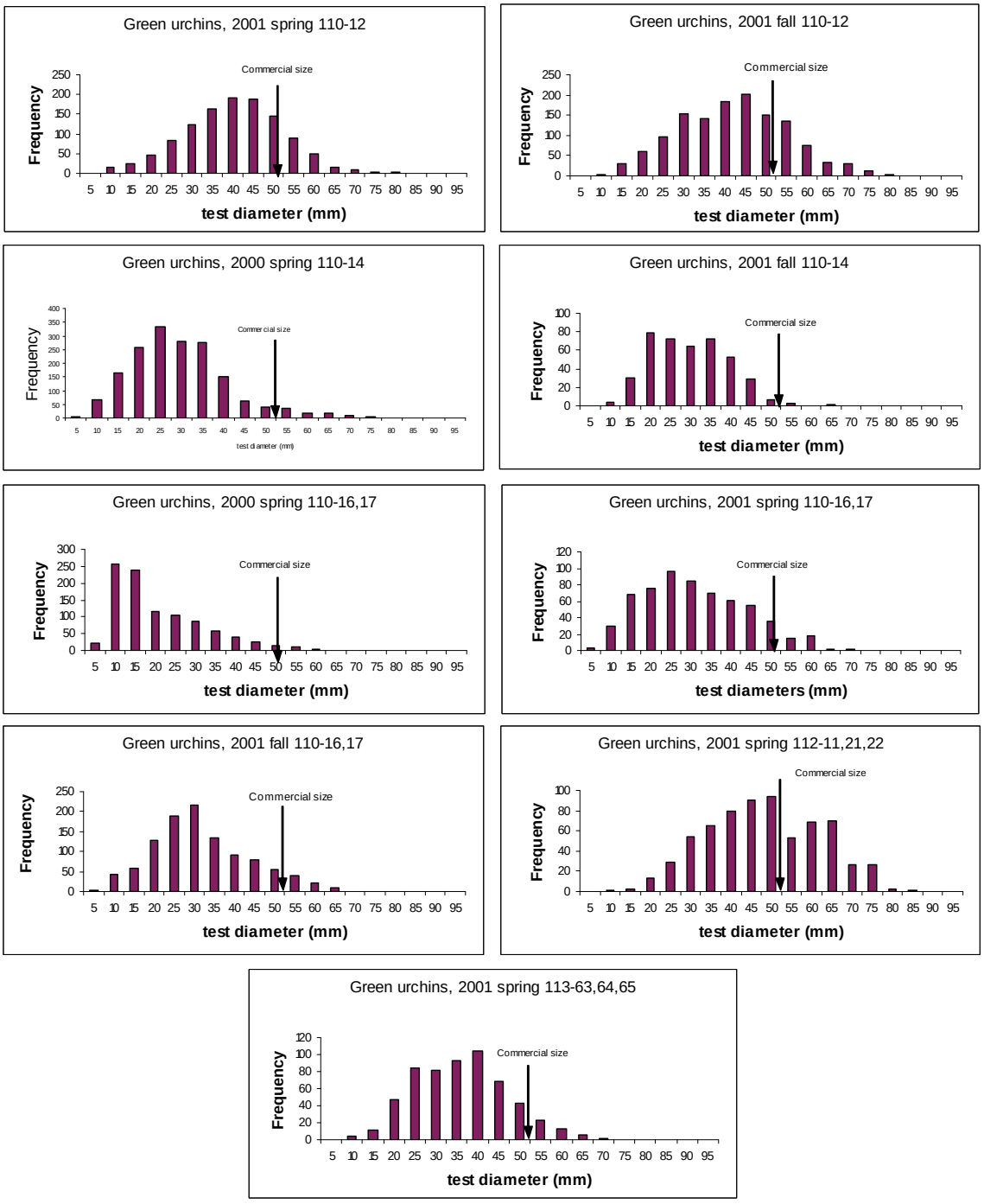

Figure 27.–Green urchin test diameter frequency distributions in Districts 110, 112, and 113 from surveys in 2000 and 2001.

APPENDICES

Appendix A. 1.–Impressions of Reconnaissance Survey Divers on potential for Commercial Green Sea Red Urchin Harvest.

106-10, -20 (Mitch Cowan)

The green sea urchin survey in areas 106-10 and 106-20 went exceptionally well, thanks mainly to the fine weather condition during the first couple of weeks in September. The surveys gave us reasonable grounds to form an opinion as to the commercial viability of dive harvests in these areas.

In our survey we were unable to locate any green sea urchins. We found no areas that could be considered for green sea urchin harvest. These areas provide good habitat for many marine species, including significant numbers of red sea urchins and sea cucumbers. We noticed few areas which had commercially harvestable quantities of either of these species, although we did note a few exceptionally good areas. From our observation these areas would benefit from a few more years of recovery from prior harvests. We believe that it would be best for the sea cucumber population if we allow these areas additional time for recovery.

The red sea urchin populations were widespread but there were few areas of dense population. These populations are sparse enough that we could not recommend them for traditional harvest operations.

In conclusion, we feel that areas 106-10 and 106-20 should be allowed additional time for recovery of the sea cucumber population before additional harvesting, and that they not be considered at this time for commercial harvest. If, in the future a harvest management system is developed which would not concentrate effort of the entire local fleet in these areas, such as individual quotas, these areas should be re-evaluated for some amount of harvest of red sea urchins. These areas do not support a green sea urchin population and should not be considered for any type of green sea urchin harvest.

110-16, -17 (Alan Benitz)

I felt that the green sea urchin beds that I marked on the chart would be a good product to harvest. The size and quantity of the large 2-inch or more sea urchins in these areas would, I feel, sustain a commercial harvest. The quality of the urchins and the roe in them was good to excellent.

I have 11 years experience diving in these waters commercially for abalone, sea cucumbers, coral, geoducks and sea urchins.

Urchins were found in depths averaging 20 feet down to 55 feet (at high tide). They seemed to congregate just outside of the kelp, with bed widths varying from 10 ft to 100 ft wide. They preferred a rocky/sandy substrate as opposed to mud or rock substrate. They do not occur on the steep beaches, and generally like points of land along the shoreline. The larger urchins occurred on the outer edges of the beds that were mainly comprised of small urchins.

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106-42; 108-10, -20 ,-30 (Alan Benitz)

In Subdistrict 106-42, green sea urchins were present. In the Mitchell Point area, the green urchins are of commercial density and size. The topography of the bottom made it very difficult to measure bed sizes. Considering the amount of proper habitat, depth, bull kelp, etc., I feel that this area may contain large amounts of harvestable green sea urchins. Around Level Islands the green sea urchins appeared to be both below commercial harvestable density and of non-commercial size.

The Kah Sheets Bay area appeared to be too silty for both sea urchins and sea cucumbers. Most of the subdistrict, however, had the ideal habitat for sea cucumbers (currents and food) and commercial harvestable amounts and sizes were seen.

Subdistrict 108-10 appeared to have no commercially harvestable green sea urchins. It may, however, be considered for future sea cucumber reconnaissance. Circle Bay on Woronkofski may be considered for the possibility of geoduck clams.

Subdistrict 108-20 appeared to have no green sea urchins. It may, however, be considered for future sea cucumber reconnaissance.

Subdistrict 108-30 appeared to have no green sea urchins. The amount of sea cucumber seen did not appear to be of commercial quantities. In Little Baht Harbor on Zarembo Island, the presence of large clam holes suggests the possibility of geoduck Clams or horseclams.

110-11, -12, -13, -14, -15 (Brett Stillwaugh/Lauren Rogers)

Our observations of green urchins surveyed in areas 110-11, -12, -13, -14, and -15 showed the potential for a limited fishery mainly in the areas of Cape Fanshaw, Farragut Bay, and Thomas Bay. Although green urchins were found in other areas, it did not appear that sufficient populations existed to support a commercial harvest. In all areas surveyed, green urchins were found mainly in depths of 6 to 12 feet on gravel and rock bottoms. Other areas consisted of soft bottoms (mud & sand), where little, or no, green urchins were found. In observations in these areas, there appeared to be a large number of clam species, indicated by the abundance of clam shells and divots on bottom. Unfortunately, lack of siphons showing made it difficult to confirm species or densities. It was observed there was not a lot of feed in most of the areas. The roe samples taken indicated that the inch and a half to inch and 3 quarters had a better roe content than the 2 inch green urchins. This may vary depending upon time of year and feed available. In our opinion, there needs to be a minimum size limitation placed on any future commercial harvests.

108-41,-50, -60 (Brett Stillwaugh/Lauren Rogers)

Our observations of green urchins surveyed in areas 108-41, -50, -60 showed the potential for a very limited fishery mainly in the northern entrance to the Wrangell Narrows, approximately a mile to either side. Although green urchins were found in other areas, it did not appear that sufficient populations existed to support a commercial harvest. In all areas surveyed, green urchins were found mainly in depths of 6 to 12 feet on gravel and rock bottoms. Other areas consisted of soft bottoms (mud and sand), where little, or no, green urchins were found. In observations in these areas, there appeared to be a large number of clam species, indicated by the abundance of clam shells and divots on bottom. Unfortunately, lack of siphons showing made it difficult to confirm species or densities. It was observed there was not a lot of feed in most of the areas. The roe samples taken indicated that the inch and a half to inch and 3 quarters had a better roe content than the 2 inch green Urchins. This may vary depending upon time of year and feed available. In our opinion, there needs to be a minimum size limitation placed on any future commercial harvests. Most of the areas surveyed were void of Green Urchins.

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106-41 (Gig Decker)

Clay Bezenek and I were generally disappointed at the numbers of commercially viable green urchins we found.

- MacNamera Shoreline: There were almost no green urchins here.
- Red Bay: The only viable commercial densities and sizes of greens were on either side of Red Bay. This represented little biomass, due to the small area.
- Inside Red Bay: Found few green urchins.
- Buster Bay to Point Baker: There were few to no green urchins.
- West side of Totem Bay to Point Barrie: There were very large populations of small green urchins. There was a good showing of green urchins west of Moss Island, but their sizes were just below commercially viable.
- Douglas Bay: No green urchins.

There were many green urchins on the Totem Bay shoreline, however, they were generally small and few were of commercial size.

I believe from my experiences from areas like Kindergarten Bay that large populations of juvenile urchins can represent large populations of mature urchins in deeper water that may move in shallow at different times. From my experience, adult green urchins are highly migratory and my hopes are that the Totem Bay to Point Barrie can represent an area of commercial interest.

My overall impression of this entire district is that it doesn't represent a priority for ADF&G bomass surveying.

[I have had several reports from locals who have seen large populations of large green urchins at low tide in Rocky Passage.]

109-42 (Tom Carruth)

Surveys were conducted in April and May 2000 in Keku Strait Subdistrict 109-42.The goal of this survey work was to identify aggregations of green urchins (*Stronglocentrotus droebachiensis*) define the habitat, document test sizes and locations of this species.

This survey started on April 16th at the southern statistical line of Subdistrict 109-42. During April 16th–19th Hamilton Pt., Hamilton Bay, Hamilton Island, Eva Island and Grave Islands were surveyed. During May 2nd –4th Keku Islands, Hound Island, South Hamilton Pt. and the foul area north of Gil Harbor were surveyed.

There are areas that contained a variety of clams including horse clams and sea cucumbers that were documented. The black cucumber (*Cucumaria frondosa japonica*) was found in areas of this subdistrict in large numbers.

Subdistrict 109-42 encompasses a vast area. Due to the enormity of this area this report should take in to account that all areas were not surveyed. The conclusions in this report are based on the specific locations that were surveyed.

Keku Strait Subdistrict 109-42 contains green urchins. The conclusions of this survey are that a commercial fishery in this area is unfeasible. Urchins in this area had small test sizes well below what we would determine as commercial. Furthermore small urchins are distributed over a large area or not present at all.

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110-21,22,23 (Tom Carruth)

Alaska Research conducted reconnaissance surveys in subdistricts 110-21, -22, -23 during April and May 2000.The surveys were conducted in Gambier Bay, Pybus Bay, Brothers Islands and the eastern shore of Admiralty Island.

The goal of these surveys was to identify aggregations of green urchins (*Strongylocentrotus droebachiensis*) define the habitat, document test size and locations of this species.

This survey started on April 21st on East Brother Island (subdistrict 110-21). On April 22nd–25th surveys were conducted in Gambier Bay (subdistrict 110-23). On April 26th the Eastern shore of Admiralty Island and West Brother Island (subdistrict 110-21). On April 27th–May 1st efforts were concentrated in the Pybus Bay area 110-22). May 1st Brothers Islands and concluded reconnaissance of subdistricts 110-21, -22, -23.

There are areas that contain a variety of clams and sea cucumbers that were documented. The black cucumber (*Cucumaria frondosa japonica*) was found in large numbers in certain areas.

Subdistricts 110-21, -22, -23 encompass 80 nautical miles. Due to the enormity of this area this report should take into account that all areas within these subdistricts could not be surveyed. The conclusions in this report are based on the specific locations that were surveyed.

112-11, -21, -22 and 113-63, -64, -65 (Eric Hamilton)

This was a big area that improved significantly the farther south I dove. Unfortunately, I was severely hampered by poor visibility which slowed down the survey and reduced accuracy. The green urchins on the Chatham Strait survey tended to be larger over-all, but the quality was still terrible. It wasn't until the southern boundary coast where I found urchins eating palm kelp that I found any semblance of roe. I found many locations of scattered or sparse urchin beds and only a handful of dense beds; fewer beds still that were of any size commercially. Overall, I am pessimisstic about the prospects of a commercial green sea urchin fishery in either 112-11, -21, -22 or 113-63, -64, -65. Both areas were supporting large amounts of sea cucumbers.

112-12, -13, -14, -50 (Alan Benitz)

The divers overall impression of the coastline surveyed is as follows. Green sea urchin; there are no commercial densities of them in the entire area. Sea cucumbers; there are commercial densities of these the entire area. The sea cucumbers in the area are relatively large, with the larger sea cucumbers occurring in the back of Freshwater Bay. It is this diver's opinion that the Freshwater Bay area be surveyed by the Alaska Department of Fish and Game for future sea cucumber openings.

Appendix B.1.–Results of green urchin reconnaissance survey in Subdistricts 106-10 and -20, September 3–15, 1999. See Figure 2 for Mark locations.

Mark	Latitude	Longitude	Depth Start (ft)	Depth Stop (ft)	Comments
1	55.7875	-132.4797	24	30	Mixed sand and shells. Sea cucumbers, large, moderate quantity
2	55.7935	-132.4821	42	30	Scattered red sea urchins, fewer cukes. Steep rock
3	55.8004	-132.4900	31	23	Patches of sand, mostly rocky. More red urchins
4	55.8083	-132.4966	42	33	Pretty much the same,no greens.
5	55.8791	-132.5948	40	42	Scattered strong concentration of large cukes. Shale and heavy large leaf kelp.
6	55.8862	-132.6038	15	46	Extremely good habitat. No abalone, no sea cucumbers, no sea urchins. Vis 25'.
7	55.8855	-132.5939	27	48	Good bottom. Red sea urchins appear to have been previously harvested.
8	55.8815	-132.5809	44	37	More of same, not as pretty around mouth of Ratz Harbor.
9	55.8723	-132.5765	30	47	Very high concentration of sea cucumber at 30-40'. Perhaps due to high buildup of kelp from storms. Vis30+.
10	55.8640	-132.5671	40	33	Beautiful dive, sharp ledges for urchins.
11	55.8630	-132.5775	30	50	Beautiful bottom for cukes. Sandy, shelly bottom, scattered dense cucumbers. Appears to be horse clam shells
12	55.8590	-132.5624	40	39	Up and down. Looks to have been red sea urchin. Scattered red habitat.
13	55.8532	-132.5498	38	49	Very deep, more scattered reds.
14	55.8467	-132.5410	35	52	Boring bottom. Short leafy kelp to large leafy kelp and sand.
15	55.8368	-132.5269	54	38	Aside from excellent weather for live boating, not much to report. Water turned to chocolate, no critters.
16	55.8281	-132.5190	33	47	Beat tired. Time for lunch and nap. Long swim. More of same narrow dive area.
17	55.8195	-132.5088	40	45	Boring bottom. Rocky leaf shelving. Swam down to 90', still boring
18	55.8873	-132.5971	32	32	Vis 15'. Strong current. Many patches of commercially harvestable red urchins. Rocky. Bull kelp.
19	55.8909	-132.6056	35	36	Same as above. Heavy barnacle growth. More patches of reds. Visibility improved.
20	55.9036	-132.6133	43	35	More seive kelp. Heavy patches of red urchins, especially on rock walls.
21	55.9111	-132.6206	26	27	More scattered red concentrations. Roe 8-10%. Don't see much recruitment.
22	55.9180	-132.6206	37	26	Same! Same! Walls of reds. On flats cukes from deep to shallow.
23	55.9306	-132.6554	28	20	Well, where are the green urchins? Not even any wandering gypsies.
24	55.9379	-132.6703	24	27	High concentrations of cukes.

–continued–

Mark	Latitude	Longitude	Depth Start (ft)	Depth Stop (ft)	Comments
25	55.9434	-132.6819	36	27	Loads of cukes! As for green urchins our luck is like the beached sailboat we just saw!
26	55.9488	-132.6946	33	28	Flat. Cuke country, lots!
27	55.9571	-132.7083	29	32	Sandy shelly bottom, high concentrations of cukes.
28	55.9704	-132.7304	30	32	Red sea urchins on rocks, cukes scattered throughout. Dog tired of looking at sieve kelp.
29	55.9756	-132.7249	31	38	Even after rotating marathon swims up this coastline, if a green urchin bit me in the ass I wouldn't believe it!
30	55.9052	-132.3983	20	29	North end Onslow Island. Vis 20'. Sandy gravel with mostly rock mixed kelp heavy barnacles.
31	55.8881	-132.3983	21	38	Light concentration of red urchins & cukes. Urchin row approx. 10%. Rocks, kelp, good bottom.
32	55.8930	-132.4000	33	28	Same as above, some cukes, no urchins, rocks, kelp, great bottom.
33	55.8861	-132.3969	24	42	Same as above, some cukes, no urchins.
34	55.8816	-132.4011	36	48	Beautiful bottom, aquarium conditions, Sea cucumbers, red urchins, & abalone, none in harvestable quantities. Sandy, kelp
35	55.8756	-132.3950	26	28	Nice bottom, still no greens!
36	55.8701	-132.3879	26	33	Soft bottom. The further inside, the more barren the bottom.
37	55.8619	-132.3832	28	26	Started in rocks, healthy beds of abalone and red urchins. No greens. Nothing commercial quantity.
38	55.8526	-132.3780	27	25	More urchins, abalone. Still not commercial quantities.
39	55.8502	-132.3701	22	38	Ernest Pt. Highest concentration of reds, marginally harvestable quantities.
40	55.8461	-132.3657	35	48	High quantity of red urchins, very high quantity of rock scallops. High current. McHenry's Ledge. Apparent GPS error, low battery.
41	55.7642	-132.2863	37	38	Dove bay out where we started, Lemesurier Pt. Large concentration of small sea cucumbers.
42	55.9543	-132.4441	29	26	Large leaf kelp into hard rock. Few red urchins.
43	55.9521	-132.4487	22	31	Good concentration of cukes. Rocky with red urchins.
44	55.9478	-132.4647	45	27	Swam rock channels around islands. Found strong cukes and reds, some rock scallops.
45	55.9526	-132.4412	36	36	Leafy kelp. Ran series of deep dives to 65'. Few red urchins scattered. Strong quantities of small cukes
46	55.9500	-132.4242	20	19	Silty into rock. Heavy leaf kelp. Few cukes.
47	55.9471	-132.4030	30	29	Very barren, flat bottom, leafy kelp.
48	55.9338	-132.4032	40	36	Abalone, red urchins, better country.
49	55.9267	-132.4266	21	38	Surprisingly steady concentration of cukes. Some red sea urchins.

–continued–

Mark	Latitude	Longitude	Depth Start (ft)	Depth Stop (ft)	Comments
50	55.9198	-132.4174	40	33	Choose to dive 106-10 #4. Protected period. ¾ days diving. Wind 25-30 SE. Sandy bottom after sieve kelp. No reds, few cukes.
51	55.8859	-132.4009	24	21	Just as bad as Mable Island. Nothing on beaches, inlets, few cukes.
52	55.9053	-132.4018	31	25	Sandy, gravel, more sieve kelp. Many barnacles. Nothing to write home about.
53	55.9136	-132.3839	23	36	Lots of fun diving. What does a green urchin look like? Sieve kelp, boulders, etc., almost fell asleep
54	55.9812	-132.4695	34	36	Sandy and shell bottom to boulders. Scattered red urchins and cukes. Inside McHenry Anchorage
55	55.9729	-132.4626	32	41	Sand.
56	55.9667	-132.4462	40	30	After swimming around, long, long reef, only scattered cukes.
57	55.9598	-132.4521	53	54	Steep rocky beach. Bull kelp to sieve kelp. Few cukes in boulders.

Appendix B. 2.–Results of green urchin reconnaissance survey in Subdistricts 110-16, and -17, September 8-14, 1999. See Figure 2 for Mark locations.

Mark	Latitude	Longitude	Comments
1	57.0759	-133.7159	No urchins, rocky bottom
2	57.0118	-133.3635	No urchins, rocky bottom
3	56.9835	-133.3066	End of dive, no urchins, muddy bottom
4	56.9807	-133.3051	No urchins, eel grass, muddy bottom
5	56.9676	-133.3004	No urchins, mud bottom
6	56.9676	-133.3137	No urchins, mud bottom
7	57.0030	-133.3345	No urchins, eel grass
8a	57.0122	-133.3300	No urchins, sand bottom, Dungeness crab
8b	57.0154	-133.3496	No urchins, sand bottom, some bottom kelp
9	57.0136	-133.3567	End of urchin bed, sand gravel bottom
10	57.0127	-133.3587	Large amount of urchins, average size to small to harvest.
11	57.0125	-133.3629	Large 2 ½ to 3” urchins, 15’ wide bed
12	57.0834	-133.7647	Urchin sample number 6
13	57.0125	-133.3629	Begin urchin bed, rocky sandy bottom
14	57.0125	-133.3712	Urchin ended, bed was 60’ wide
15	57.0116	-133.3756	Continuation of urchin bed, large urchins
16	57.0099	-133.3840	Beginning of urchin bed
17	57.0098	-133.3859	End of urchins
18	57.0095	-133.3895	Beginning of urchins, 40’ wide, lot’s of smalls
19	57.0087	-133.3908	
20	57.0089	-133.3931	Rocky sandy bottom
21	57.0111	-133.4075	Sand bottom no urchins
22	57.0196	-133.4383	Gravel and sand bottom no urchins
23	57.0256	-133.4525	Commercial size urchins rocky bottom, end of bed
24	57.0258	-133.4589	End of dive, rocky bottom, urchins present
25	57.0257	-133.4570	
26	57.0273	-133.4685	Rocky bottom, sea urchins present
27	57.0277	-133.4723	End of bed, rocky sandy
28	57.0291	-133.4790	Sandy bottom
30	57.0377	-133.4877	Lot’s of 2” plus urchins, 32’ deep
31	57.0379	-133.4886	Sample #5, width 100’, 24’ to 46’ deep
32	57.0375	-133.4930	Small urchins, 1 ½”, 19’ deep
33	57.0373	-133.4960	
34	57.0383	-133.5034	Good number of 2” plus urchins
35	57.0389	-133.5064	End of bed
36	57.0373	-133.5112	No urchins, depth 40’
37	57.0350	-133.5150	Small urchins 1” or less, sandy, muddy bottom, width 70’ plus, very dense
38	57.0368	-133.5284	Lot of small urchins depth 30’
39	57.0389	-133.5328	End of bed
40	57.0393	-133.5338	Sandy, muddy flat, with commercial size urchins, bed width 60’ to 70’

–continued–

Mark	Latitude	Longitude	Comments
41	57.0411	-133.5344	Small urchins
42	57.0433	-133.5381	Small urchins, sparse bed 20’ deep
43	57.0446	-133.5383	Start of dive
44	57.0457	-133.5412	2” plus urchins, bed 20’ to 40’ wide
45	57.0467	-133.5503	
46	57.0470	-133.5683	Sandy rocky bottom, no urchins
47	57.0538	-133.5792	Rocky bottom, no urchins
48	57.0563	-133.5822	Begin of dive
49	57.0591	-133.6355	End of dive
50	57.0626	-133.6589	No urchins
51	57.0628	-133.6671	Small urchins, scattered on bottom
52	57.0624	-133.6770	No urchins
53	57.0622	-133.6808	60’ wide, small urchins, start of dive
54	57.0653	-133.6951	End of dive, no urchins
55	57.0671	-133.7005	No urchins
56	57.0699	-133.7048	Bed width 40’, all small urchins
57	57.0708	-133.7068	Bed width 10’, end of bed – bed ran from mark 60
58	57.0736	-133.7113	Urchins, 60’ width, very thick
59	57.0746	-133.7134	Urchins, 40’ width, very thick
60	57.0759	-133.7159	Sample #3, 20’ to 30’ deep, 80’ wide, sample not from center of bed
61	57.0764	-133.7173	Urchins, 40’ bed width, 1 ¾ - 2”, very thick
62	57.0788	-133.7203	End of bed, sandy bottom, no urchins
63	57.0789	-133.7226	1” urchins, 60’ wide bed
64	57.0797	-133.7276	Start of dive
65	57.0831	-133.7320	End of dive, no urchins
66	57.0825	-133.7361	High density, 2 ½”,
67	57.0814	-133.7386	40’ wide bed, 1 ½ - 2”, rocky bottom
68	57.0801	-133.7521	10’ bed of 2” plus, small bed, small sample of urch, bed continues from
69	57.0804	-133.7592	Crab pot
70	57.0805	-133.7605	Good size urchins
71	57.0816	-133.7620	40’ bed, 1 ½”, picture of beach
72	57.0834	-133.7647	Sample #2, 28’ to 42’ depth, 40’ to 50’ wide
73	57.0836	-133.7645	Urchins, 1 ½”, beach picture
74	57.0846	-133.7666	Rocky bottom no urchins
75	57.0842	-133.8049	Start of dive, no urchins
76	57.0868	-133.8122	End of dive, no urchins
77	57.0951	-133.8596	No urchins, big sea cucumbers
78	57.1005	-133.8899	No urchins, end of dive
79	57.0991	-133.9062	No urchins, start of dive
80	57.0936	-133.9193	No urchins, end of dive

–continued–

Mark	Latitude	Longitude	Comments
81	57.0918	-133.9191	No urchins, mud bottom
82	57.0842	-133.9222	Start of new bed, cont. of bed from mark 83
83	57.0905	-133.9241	80’ wide bed, 2” plus urchins, depth 60’
84	57.0902	-133.9255	Heavy concentrations, 20’ wide, 2” plus urchins
85	57.0895	-133.9303	No urchins
86	57.0882	-133.9328	1’ urchins, heavy concentrations, width 60’
87a	57.0881	-133.9375	2” urchins, 30’ bed width
87b	57.0865	-133.9386	Very heavy 1” urchins, bed width 50 – 60’
88	57.0861	-133.9410	30’ bed, average size 2”
89a	57.0854	-133.9462	End of bed
89b	57.0840	-133.9471	Same bed, bigger urchins, 2” plus
90	57.0836	-133.9496	Urchins, thick bed, depth 45’, 1 ½” to 2”
91	57.0812	-133.9507	Urchins, small, few big ones mixed in
92	57.0811	-133.9565	Small urchins 1 to 1 ½” – few, depth 40’, gravel/sandy bottom
93	57.0795	-133.9566	Sandy bottom, 60’ bed, very small urchins, sea cucumbers
94	57.0780	-133.9564	Very thick small urchins, 60’ bed, some 3” urchins
95	57.0763	-133.9595	No urchins
96	57.0767	-133.9615	2 – 2 ½” urchins, few
97	57.0779	-133.9641	No urchins, sandy bottom
98	57.0778	-133.9675	1” –1 ½” urchins, 60’ bed width, thick urchins
99	57.0782	-133.9728	Urchins, some 2”, mainly 1 ½”
100	57.0791	-133.9781	End of dive, no urchins
101	57.0799	-133.9802	End of dive, urchins
102	57.0783	-133.9823	Bed width 60 to 80’, 1 1/1” urchins, small brown roe
103	57.0770	-133.9849	Sample #1,heavy urchins, average size 1 ½”, roe brown and small
104	57.0760	-133.9873	1” size, sandy bed, width 80’, roe sampled – small and brown
105	57.0761	-133.9885	Large bed of 2” + urchins
106	57.0758	-133.9914	2” +, sampled urchins, very small sample, no roe %
107	57.0755	-133.9948	20’ bed with urchins
108	57.0758	-133.9914	Urchins, not enough to harvest
109	57.0745	-134.0014	In front of pinta rocks, sandy rocky bottom, not enough urchins to harvest,
110	57.0858	-133.9920	Pinta rocks rocky bottom no urchins or cucumbers, start of dive
111	57.0835	-134.0020	Pinta rocks rocky bottom no urchins or cucumbers
112	57.0876	-133.9833	Pinta rocks rocky bottom no urchins or cucumbers, end if dive
113	57.1230	-134.0051	Free dive, 2 ½” urchin, very few (10), good roe
114	57.1228	-133.9916	No urchins, rocky bottom, no cucumbers, start of dive
115	57.1257	-133.9784	No urchins, rocky bottom, no cucumbers, end of dive
116	57.1306	-133.9860	Gravel bottom, no urchins, start of dive
117	57.1312	-133.9787	Gravel bottom, no urchins, end of dive
118	57.0658	-134.0284	End of dive

–continued–

Appendix B.2.–Page 4 of 4.

Mark	Latitude	Longitude	Comments
119	57.0587	-134.0351	Large amount of sea cucumbers, no urchins
120	57.0572	-134.0355	Start of dive, no urchins
121	57.0472	-134.0278	End of dive, no urchins
122	57.0456	-134.0240	Rocky bottom, start of dive, no urchins
123	57.0369	-134.0252	End of dive no urchins, rocky bottom
124	57.0312	-134.0294	Urchin bed, very small 20’ width
125	57.0293	-134.0355	Start of dive, no urchins
126	57.0264	-134.0396	End of dive no urchins
127	57.0258	-134.0507	Rocky bottom, many sea cucumbers, no urchins
128	57.0257	-134.0529	End of urchin bed
129	57.0255	-134.0543	Urchins, 2” +, small bed, 60’ wide, 40’ deep
130	57.0257	-134.0549	No urchins
131	57.0263	-134.0557	Rocky bottom, no urchins, start of dive

Appendix B. 3.–Results of green urchin reconnaissance survey in Subdistricts 106-41, April 16-25, 1999. See Figure 3 for Mark locations.

Mark	Latitude	Longitude	Commercial Density	Commercial Size	Depth Start (ft.)	Depth Stop (ft.)	Bed Width (ft.)	Habitat	Comments
1	56.3592	-133.0668	no	no	—	—	—	jagged rocks, kelp, silty, low visibility	small patches of greens, excellent concentrations of dungeness crabs
2	56.3600	-133.0639	—	—	—	—	—	jagged rocks, kelp, silty, low visibility	horse clams, excellent concentrations of dungeness crabs
3	56.3975	-133.0362	no	no	—	—	—	jagged rocks, kelp, silty, low visibility	small patches of greens, few scattered cukes, excellent concentrations of dungeness crabs
4	56.4215	-133.0195	—	—	—	—	—	jagged rocks, kelp, silty, low visibility	commercially viable cukes in small area, excellent concentrations of dungeness crabs
5	56.4273	-133.0114	—	—	—	—	—	jagged rocks, kelp, silty, low visibility	horse clams, excellent concentrations of dungeness crabs
6	56.3264	-133.2347	no	no	—	—	—	heavy kelp beds, sandy mud bottom	horse clams, small patches of greens, scattered cukes, dungeness crab
7	56.3348	-133.2527	yes	yes	12	24	100	heavy kelp beds, sandy mud bottom	good patches of commercial size & density greens, urchin sample #1, scattered cukes, dungeness crab
8	56.3357	-133.2546	yes	yes	12	24	100	heavy kelp beds, sandy mud bottom	good patches of commercial size & density greens, urchin sample #1, scattered cukes, dungeness crab
9	56.3354	-133.3330	yes	yes	12	24	20–50	sandy to cobble rock bottom	large commercial density, but patchy commercial size greens, can see where greens have grazed the bottom
10	56.3378	-133.3389	yes	yes	12	24	20–50	sandy to cobble rock bottom	large commercial density, but patchy commercial size greens, can see where greens have grazed the bottom
11	56.3377	-133.3792	yes	yes	12	24	50–100	sandy to cobble rock bottom, massive kelp	good patch of greens, both density and size, urchin sample #2, can see where greens have grazed the bottom, scattered cukes and dungeness
12	56.4314	-133.6214	—	—	—	—	—	heavy kelp	scattered greens, sparse cukes, 2 sea otters
13	56.4318	-133.6089	—	—	—	—	—	heavy kelp	scattered greens, scattered cukes

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Appendix B.3.–Page 2 of 2.

Mark	Latitude	Longitude	Commercial Density	Commercial Size	Depth Start (ft.)	Depth Stop (ft.)	Bed Width (ft.)	Habitat	Comments
14	56.4326	-133.6161	—	—	—	—	—	sandy bottom	scattered greens, dungeness crab
15	56.4321	-133.5935	yes	no	12	24	10–50	sandy, mud bottom	very large concentrations of small greens, close to comm. size
16	56.4334	-133.5305	yes	no	12	24	50	sandy, cobble bottom	very large concentrations of small greens, close to comm. size, medium density dukes
17	56.4382	-133.5050	no	no	—	—	—	rocky, sandy	scattered greens and cukes
18	56.4450	-133.4947	no	no	—	—	—	cobble, sand,kelp	scattered greens, horse clams,very good cukes
19	56.4497	-133.4846	yes	no	18	24	70	cobble, sand, kelp	heavy, small urchins(1-1 1/2"), sparse cukes
20	56.4508	-133.4810	no	no	—	—	—	cobble, sand, kelp	horse clams, sparse small greens
21	56.4503	-133.4679	no	no	—	—	—	cobble, sand, kelp	horse clams, sparse small greens
22	56.4497	-133.4667	no	no	—	—	—	cobble, sand, kelp	horse clams, sparse small greens, heavy cukes
23	56.4532	-133.4271	no	no	—	—	—	cobble, sand, kelp	horse clams, sparse small greens
24	56.4812	-133.3674	—	—	—	—	—	sandy, mud bottom	dungeness & king crabs, no greens
25	56.4625	-133.3167	yes	no	18	24	80–100	rocky, ledges	heavy, small greens
26	56.4605	-133.3134	yes	no	18	24	80–100	rocky, ledges	heavy, small greens, good cukes

Appendix B.4.–Results of green urchin reconnaissance survey in Subdistricts 106-41, April 16-25, 1999. See Figure 4 for Mark locations.

Mark	Latitude	Longitude	Comments
1	56.5228	-133.0941	Muddy/clam shells
2	56.5262	-133.0978	muddy
3	56.5155	-133.1198	muddy/logs/dungeness crab
4	56.5133	-133.1197	rocky
5	56.5116	-133.1237	rocky/muddy/dng crab
6	56.5106	-133.1311	muddy/dng crab
7	56.5060	-133.1209	mud/eel grass/dng crab
8	56.5086	-133.1195	mud/gravel/eel grass/dng crab
9	56.5104	-133.1115	mud
10	56.5072	-133.1101	mud/gravel
11	56.5054	-133.1079	mud/rock
12	56.5154	-133.1027	mud/gravel
13	56.5132	-133.1000	gravel
14	56.5236	-133.0912	rock/gravel/sea cucumber/shrimp
15	56.5237	-133.0868	gravel/rock/1 urchin *1
16	56.5271	-133.0495	rock/sea cucumber/bull kelp
17	56.5249	-133.0480	rocky/sea cucumbers
18	56.5240	-133.0480	large rocks/basket stars/cucumbers
19	56.5194	-133.0439	rock/snails (Leafy Hornmouth)
20	56.5191	-133.0376	rocky/sea cucumbers
21	56.4580	-132.7220	rocky/bull kelp
22	56.4575	-132.7257	sand/gravel/rocky
23	56.4576	-132.7272	rocky/sea cucumber
24	56.4581	-132.7287	rocky gravel
25	56.4583	-132.7307	rocky
26	56.4583	-132.7500	rocky/very steep/sea cucumber
27	56.4586	-132.7363	rocky/very steep
28	56.4591	-132.7520	rocky
29	56.4568	-132.7632	rocky/gravel
30	56.4548	-132.7625	mud/sandy/large clam holes present
31	56.4536	-132.7646	mud/sand/clam
32	56.4528	-132.7685	mud/sand/clam shells
33	56.4538	-132.7743	mud/large clam holes present
34	56.4535	-132.7767	rocky/basket stars
35	56.4528	-132.7792	rocky/gravel
36	56.4528	-132.7809	gravel/large anemones
37	56.4534	-132.7833	gravel/rocky
38	56.4526	-132.7854	gravel/rock
39	56.4515	-132.7854	gravel/rock
40	56.4508	-132.7856	rocky

–continued–

Mark	Latitude	Longitude	Comments
42	56.4505	-132.7877	rocky/sea cucumber
43	56.4504	-132.7890	rocky
44	56.4498	-132.7908	rocky/bull kelp
45	56.4504	-132.7930	rocky
46	56.4500	-132.7969	rocky/bull kelp
47	56.4489	-132.8438	rocky/very steep
48	56.4505	-132.8476	rocky/very steep/cucumbers
49	56.4505	-132.8505	rocky
50	56.4530	-132.8548	rocky
51	56.4517	-132.8557	rocky
52	56.4532	-132.8575	rocky
53	56.4585	-132.8664	rocky/very steep
54	56.4570	-132.8682	rocky/very steep
55	56.4572	-132.8916	rocky/very steep/sea cucumber
56	56.4581	-132.9033	rocky/very steep
57	56.4572	-132.9076	rocky/gravel/bull kelp
58	56.4572	-132.9098	rocky/gravel/sand
59	56.4579	-132.9140	rocky/very steep
60	56.4576	-132.9150	rocky/gravel/steep
61	56.4574	-132.9170	rocky
62	56.4579	-132.9218	rocky
63	56.4590	-132.9249	rocky/gravel
64	56.4587	-132.9256	rocky
65	56.4586	-132.9274	rocky/sand
66	56.4572	-132.9325	rocky/sea cucumber
67	56.4569	-132.9391	rocky/very steep
68	56.4563	-132.9459	rocky/very steep
69	56.4453	-132.9700	rocky/gravel
70	56.4448	-132.9707	rocky/gravel
71	56.4448	-132.9720	gravel
72	56.4431	-132.9763	rocky/gravel
73	56.4411	-132.9789	large rocks/basket stars
74	56.4405	-132.9470	very rocky/bull kelp
75	56.4392	-132.9810	very rocky/bull kelp
76	56.4379	-132.9796	gravel/rocky/large sea anemones
77	56.4371	-132.9795	sand/gravel/clam shells
78	56.4370	-132.9801	mud/rock/dungeness crab
79	56.4382	-132.9840	mud/clam shells
80	56.4400	-132.9874	mud/dungeness crab

–continued–

Mark	Latitude	Longitude	Comments
81	56.4406	-133.1808	rocky/gravel/mud/urchin/bull kelp
82	56.4418	-133.1849	rocky/gravel/urchin (2"+)
83	56.4421	-133.1906	rocky urchin *2
84	56.4442	-133.1973	sand/gravel/mud
85	56.4467	-133.1986	rocky/urchin/bull kelp
86	56.4469	-133.1958	rocky
87	56.4458	-133.1919	rocky/urchin/bull kelp
88	56.4457	-133.1900	rocky/urchin/bull kelp
89	56.4509	-133.1714	gravel/sea cucumber/urchin
90	56.4546	-133.1632	rocky/bull kelp/gravel/urchin
91	56.4576	-133.1587	rocky/gravel/bull kelp
92	56.4594	-133.1523	rocky/sand/urchin/bull kelp
93	56.4641	-133.1466	rocky
94	56.4618	-133.1273	gravel/sand/rock/bull kelp
95	56.4584	-133.1280	rocky/bull kelp/small urchin
96	56.4583	-133.1254	rocky/bull kelp/small urchin
97	56.4542	-133.1121	rocky/bull kelp/gravel/2" urchin
98	56.4542	-133.1078	gravel/rocky/urchin (2"+)
99	56.4554	-133.1006	rocky/gravel
100	56.4552	-133.0973	rocky/gravel/sand
101	56.4583	-133.0926	gravel/small rocks
102	56.4578	-133.0867	rock/gravel/2 small red urchin
103	56.4557	-133.0822	rocky/gravel/dungeness crab
104	56.4552	-133.0750	rocky/gravel/bull kelp
105	56.4549	-133.0739	gravel/sand
106	56.4545	-133.0699	rock/gravel
107	56.4554	-133.0623	rocky/bull kelp
108	56.4666	-133.0554	rocky/sand/bull kelp/sea cucumber
109	56.4680	-133.0583	gravel/rock/sea cucumber
110	56.4699	-133.0597	sand
111	56.4733	-133.0774	gravel/sand/rocky/bull kelp/urchin *3
112	56.4886	-133.1073	rocky/gravel/bull kelp
113	56.4953	-133.1080	rocky/bull kelp
114	56.5053	-133.0528	rocky/pop weed/bull kelp
115	56.5201	-133.0703	rocky/gravel/bull kelp/green urchin
116	56.2853	-132.6590	rocky/sea cucumbers/red urchin
117	56.2882	-132.6598	rocky/very steep
118	56.3139	-132.6544	rocky/bull kelp
119	56.3175	-132.6553	rocky/sea cucumbers
120	56.3310	-132.6682	gravel/sand

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Appendix B.4.–Page 4 of 6.

Mark	Latitude	Longitude	Comments
121	56.3337	-132.6735	gravel/rocks/sand
122	56.3546	-132.6737	gravel/rocks
123	56.3723	-132.6550	mud/sand/clam shells
124	56.3740	-132.6521	gravel/rocky/sea cucumbers
125	56.3763	-132.6505	rocky/sea cucumbers
126	56.3797	-132.6465	rocky/sandy/sea cucumbers
127	56.3797	-132.6435	rocky/sandy/sea cucumbers
128	56.3811	-132.6404	rocky/sea cucumbers
129	56.3788	-132.6408	sandy/rocky/sea cucumbers/bull kelp
130	56.3333	-132.5396	rocky/sea cucumbers/red urchin
131	56.3276	-132.5450	rocky
132	56.3215	-132.5487	rocky/sea cucumber
133	56.3168	-132.5468	rocky/sandy
134	56.3137	-132.5400	sand/mud/clam shells
135	56.3126	-132.5369	sand/mud
136	56.3122	-132.5318	mud/dungeness crab
137	56.3091	-132.5473	gravel/rock/bull kelp
138	56.3029	-132.5657	gravel/rock/sea cucumbers
139	56.2968	-132.5742	rocky
140	56.3370	-132.5160	very steep/rocky
141	56.3350	-132.5042	very steep/rocky
142	56.3391	-132.4930	rocky/sea cucumbers
143	56.3516	-132.4488	rocky/very steep
144	56.3514	-132.4410	rocky
145	56.3526	-132.4372	rocky/sea cucumbers
146	56.3514	-132.4317	rocky/sandy
147	56.3473	-132.4204	very steep/rocky
148	56.3435	-132.4177	very steep/rocky
149	56.3425	-132.4190	rocky/sandy/sea cucumbers
150	56.3398	-132.4168	rocky/sandy/clam shells
151	56.3373	-132.4110	gravel/rocky
152	56.3306	-132.4003	rocky/gravel/sand
153	56.3238	-132.3966	gravel/sand
154	56.3195	-132.3958	gravel/rocky
155	56.3185	-132.3919	rocky/sea cucumbers
156	56.2972	-132.3814	rocky/very steep
157	56.2926	-132.3882	rocky/very steep/sea cucumbers
158	56.2862	-132.3657	rock/very steep/sea cucumbers
159	56.2918	-132.3592	rocky/very steep
160	56.3032	-132.3501	rocky/very steep/sea cucumbers

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Appendix B.4.–Page 5 of 6.

Mark	Latitude	Longitude	Comments
161	56.3112	-132.3500	rocky/very steep
162	56.3134	-132.3477	rocky/very steep
163	56.3220	-132.3480	rocky/sea cucumbers
164	56.3378	-132.3425	rocky/gravel/sea cucumber
165	56.3441	-132.3474	rocky/sandy/dungeness crab
166	56.3440	-132.3585	gravel/rock/sea cucumber
167	56.3460	-132.3610	rocky
168	56.3553	-132.3551	gravel/sand/clam shells
169	56.3617	-132.3598	rock/gravel/sea cucumber
170	56.3655	-132.3606	rocky/sand
171	56.3693	-132.3644	rocky/very steep
172	56.3841	-132.3568	rocky/gravel/sea cucumber
173	56.3886	-132.3556	rocky
174	56.3915	-132.3524	rocky/sandy/sea cucumbers
175	56.3823	-132.4070	gravel/rocky/3 small green urchin *4
176	56.3838	-132.4153	gravel/sand/horseclams/cucumbers
177	56.3843	-132.4212	gravel/sand/horseclams/cucumbers
178	56.3861	-132.4244	gravel/sand/horseclams/cucumbers
179	56.3888	-132.4306	gravel/sand/horseclams/cucumbers
180	56.3886	-132.4412	gravel/sand/horseclams/cucumbers
181	56.3836	-132.4510	gravel/sand/horseclams/cucumbers
182	56.3745	-132.4489	very steep/rocky/sea cucumbers
183	56.3727	-132.4568	very steep/rocky/sea cucumbers
184	56.3559	-132.5361	very steep/rocky/sea cucumbers
185	56.3560	-132.5408	very steep/rocky/gravel
186	56.3548	-132.5425	very steep/rocky/sea cucumbers
187	56.3516	-132.5529	rocky/red urchin/bull kelp
188	56.3527	-132.5537	steep/rocky/sea cucumber/bull kelp
189	56.3560	-132.5592	rocky/sea cucumbers/bull kelp
190	56.5064	-132.7493	gravel/rocky/dungeness crab
191	57.1714	-132.7570	mud/sand/clam shells
192	56.4987	-132.7730	mud/sand/clam shells
193	56.5009	-132.7832	mud/sand/dungeness crab
194	56.4992	-132.7920	rocky/sea cucumbers
195	56.4969	-132.7952	rocky/sea cucumbers
196	56.4977	-132.8238	rocky/sea cucumbers
197	56.5000	-132.8225	mud/clam shells
198	56.4992	-132.8282	rocky/very steep
199	56.5053	-132.8620	rocky/very steep
200	56.5082	-132.8737	gravel/sand/dungeness crab

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Appendix B.4.–Page 6 of 6.

Mark	Latitude	Longitude	Comments
201	56.5051	-132.8822	rocky/sea cucumbers
202	56.5026	-132.8898	rocky/sea cucumbers
203	56.5016	-132.9044	rocky/very steep/sea cucumbers
204	56.5028	-132.9081	rocky/very steep/sea cucumbers
205	56.5082	-132.9296	gravel/sand/dungeness crab
206	56.5078	-132.9329	gravel/sand/dungeness crab
207	56.5068	-132.9344	rocky/sea cucumbers
208	56.5061	-132.9322	rocky/sea cucumbers
209	56.5082	-132.9468	very steep/rocky
210	56.5087	-132.9499	very steep/rocky
211	56.5111	-132.9969	steep/rocky/basket star/cucumbers
212	56.5124	-133.0009	steep/rocky/basket star/cucumbers

Appendix B.5.–Results of green urchin reconnaissance survey in Subdistricts 108-10,20 and 30. See Figure 5 for Mark locations.

Marks 1–8	Kah Sheets Bay was covered with mud and littered with clam shells. No green urchin located in the bay. The bottom was also littered with logs, clam shells, and pop-weed, with occasional patches of eel grass. Dive depths were 5–40 ft of water. Visibility was approximately 2–3 feet. Some areas consisted of rocky and gravel bottoms. Dungeness crab were seen throughout all areas and appeared to be eating clams.
Marks 9–13	Second and third dive areas were free of urchins. Ten to forty foot range of depth was surveyed. Visibility was approximately 2–3 feet. Environment was mud and eel grass, inhabited by dungeness crab, butter and cockle clams.
Marks 14–15	Consisted of rocky, gravel bottom. Dive depth was 5–40 feet of water. Visibility was approximately 5 ft. This area was a “free dive” because of wind and seas. There was one urchin located in this area. It was collected and taken into the Fish and Game office for measuring and a row percentage (57mm / 31% roe). A good number of commercial size sea cucumbers were in this area, as well as a large amount of small shrimp (approx. 2 inches and smaller).
Marks 16–20	Consisted of a very steep and rocky bottom. Visibility was approximately 5–8 feet and the depths surveyed were 20–60 ft. arge numbers of basket stars and Leafy Hornmouth snails were present, as were commercial quantities of large sea cucumbers. Also, small patches of Bull Kelp were present.
Marks 21–29	Craig Pt. to Little Baht Harbor was almost all rocky terrain.
Marks 30–32	Little Baht Harbor had a muddy, sandy bottom with holes which appeared to be from geoducks or large horseclams.
Marks 33–68	Decent habitat for green sea urchins, however, none were found. Visibility was approximately 10–15 ft.
Marks 69–80	In the St. John Harbor area, visibility was 2–3 feet and the bottom, both rocky and muddy, was covered with a fine layer of silt. Depths surveyed were 10–50 ft. Visibility was approximately 3–5 feet.
Marks 81–93	At Mitchell Pt.the bottom terrain (very rocky) and the limited visibility (2–3 ft), made surveying very difficult. There were large patches of bull kelp in the entire area. It was in this area that green sea urchins were found in both commercial size and quantity. Beds varied in size from 5 to 40 feet long and 2 to 20 feet wide. The urchins were very large. Depths surveyed were 0–45 ft. Visibility was approximately 2–4 feet.
Marks 94–111	Around Level Islands the bottom consisted of gravel and rock with large patches of bull kelp. here were not large concentrations of green sea urchins, and, of the specimens found, most were not of commercial size. The entire area was covered with a fine layer of silt. Depths surveyed were 10–40 feet. Visibility was approximately 2–5 feet.
Marks 112–113	No urchins seen from marks 112–113. However, large patches of bull kelp were present. Depths surveyed were 10–40 ft. Visibility was approximately 2–3 ft.
Mark 114	Void of green sea urchins. Depths surveyed were between 0-35 feet. Visibility was approximately 5 feet.
Mark 115	Mark 115 (free dive due to high current) revealed a very small patch of approximately 30 green urchins, at a depth of approximately 15 feet. Because of the current, no sample was taken. Visibility was approximately 3 feet.
Marks 116–117	Round Pt., on Zarembo Island , was rocky and very steep. Depths surveyed were 10–50 feet. Sea cucumbers and 2 red urchins were seen here. Visibility was 30+ feet.
Marks 118–119	Rocky bottoms, with a very steep slope. Sea cucumbers were seen along with a small patch of bull kelp. Depth surveyed 10–45 feet. Visibility 20 feet.
Marks 120–122	Meter Bight was rock and gravel. Depths surveyed were between 5–45 feet. This area appeared to be pounded by storms, as there was hardly any marine life present and the rocks appeared to move frequently. Visibility 20+ feet.

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Marks 123–129	Fritter Cove looked to be ideal bottom habitat for green urchin, however, no urchin were found. Large quantities of sea cucumbers were seen at 50 feet. Surveyed depths were 0–60 feet. Visibility 20+ feet.
Marks 130–133	Etolin Island was a steep rocky bottom. One red urchin was seen at a depth of approximately 20 feet. Sea cucumbers were seen in depths of 40 feet. Depths surveyed were 10–50 feet. Visibility was approximately 10–20 feet.
Marks 135–136	King George Bay was a sandy and muddy bottom, some dungeness crab were seen. Depths surveyed were 5–40 feet. Visibility was 3–5 feet.
Marks 137–139	Gravel and rocky with some bull kelp present. The bottom was very steep from marks 138 to 139. Depths surveyed were 15–50 feet, visibility was 10–15 feet. Some sea cucumbers were seen.
Marks 140–151	Very steep and rocky. Depths surveyed were 15–50 feet. Visibility was 15 feet. Some sea cucumbers were seen.
Marks 152–154	Ideal green urchin habitat, but none were seen, however, some sea cucumbers were found. Depths surveyed were 10–40 feet. Visibility was 10–15 feet.
Marks 156–157	Steep and rocky. Depths surveyed were 10–40 feet. Some sea cucumbers were seen. Visibility was 10–15 feet.
Marks 158–159	Nemo Point, on Wrangell Island was rocky and very steep with some sea cucumbers seen. Depths surveyed were 10–50 feet, visibility was 10–15 feet.
Marks 160–171	Wrangell Island was rock, gravel and sand. Depths surveyed were from 5 to 40 feet, visibility was 10–15 feet. The area appeared to be good habitat for green sea urchin, but none were found. The entire area was covered with a fine layer of silt. Sea cucumbers were seen in the 40 feet range of depth.
Marks 172–174	Not in the survey area, however, no green urchin were found here.
Mark 175	On Woronkofski Island 3 small green urchin were found in 15 feet of water where the gravel changed to rock. Depths surveyed 0–40 feet, visibility 20 feet.
Marks 176–181	The Circle Bay area (Marks 176 to 181) was a gravel and sand bottom with large amounts of horseclams present. Large amounts of sea cucumbers were seen in approximately 50 feet of water. Depths surveyed were 10–50 feet, visibility was 20 feet.
Marks 182–183	Steep and rocky. Depths surveyed were 15–50 feet, visibility was 20 feet. Some sea cucumbers were seen here.
Marks 183–184	The Woronkofski shoreline area between marks 183 and 184 were very steep and rocky and not surveyed due to no obvious habitat for green sea urchin.
Marks 184–186	Gravel and rocky with a steep slope. Depths surveyed were 15–50 feet, visibility was 20 feet. Sea cucumbers were seen in the 40 to 50 foot depth range.
Marks 187–188	Drag Island was a free dive. It was a very steep rocky terrain with bull kelp present. Depths surveyed were 0–60 feet, visibility was 20+ feet. Sea cucumbers were seen in the 40–50 foot depth range and one red sea urchin was seen at 20 feet.
Mark 189	Reef Pt. was a free dive. It was a very steep, rocky terrain with some bull kelp present. Depths surveyed were 5–60 feet, visibility was 20+ feet. Sea cucumbers were seen at 40 feet.
Marks 190–208	Mitkof Island had all types of bottom terrain. Depths surveyed ranged from 5–60 feet and visibility varied from 3 to 10 feet. No green urchins were found in this area, and neither were there commercial quantities of sea cucumbers present. The entire area was covered with a fine layer of silt.
Marks 209–212	Woewodski Island had a very steep rock bottom. Depths surveyed were 10–55 feet with a visibility of approximately 5 to 8 feet. Basket stars and sea cucumbers were seen from the 40–50 foot range.

Appendix B.6.–Results of green urchin reconnaissance survey in Subdistricts 108-41,50,60, December 16-27, 1999. See Figure 6 for Mark locations.

Mark	Latitude	Longitude	Density	Size	Depth Start (ft)	Depth Stop (ft)	Bed Width (ft)	Habitat	Comments
1	56.8298	-132.9391	Commercial	Commercial	15	24	10–30 ft.	Sand, Few Rocks, & Kelp	Urchins in Shallower Water (9–6 ft.)
2	56.8298	-132.9391	Commercial	Commercial	20	6	10–30 ft.	Rock, Cobble, Sand	No Urchins Below 12 ft.
3	56.8338	-132.9368	Commercial	Commercial	7	25	10–20 ft.	Rock, Cobble, Sand	No Urchins Below 12 ft.
4	56.8364	-132.9365	Commercial	Commercial	7	30	10–35 ft.	Rock, Cobble, Sand	Urchins Observed Down to 30 ft. in Areas
5	56.8382	-132.9370	Commercial	Commercial	7	24	10–20 ft.	Rocky Cobbles	Urchins in 7 to 12 ft. Depth
6	56.8421	-132.9387	Commercial	Commercial	36	7	10–20 ft.	Rocky Cobbles	AT Mark 7, Urchins Starting to thin out—Habitat Changing From Rock to Sand
7	56.8476	-132.9407	Non-Commercial	Commercial	30	7	Scattered	Cobbles & Sand	Urchins Dissapear Midway Between Points 7 & 8
8	56.8586	-132.9455	None	None	6	30	None	Rock & Sand	Heavy Barnacles on Rocks—No Urchins
9	56.8948	-132.9649	None	None	25	8	None	Sand & Shells	None
10	56.9089	-132.9739	None	None	28	9	None	Sand & Shells	Some Rock in Places Above 10 ft. in Depth—Rock Encrusted With Barnacles
11	56.9300	-132.9860	None	None	10	30	None	Sand & Rock	Mainly Sand With Intersprsed Rocks—Shallow—Rocks Covered in Barnacles
12	56.8971	-132.9447	None	None	22	7	None	Sand, Kelp, Shells	None
13	56.8972	-132.9331	Non-Commercial	Commercial	6	23	None	Sand & Rock	Few Small Clusters of Urchins (Spuratic)

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Appendix B.6.–Page 2 of 3.

Mark	Latitude	Longitude	Density	Size	Depth Start (ft)	Depth Stop (ft)	Bed Width (ft)	Habitat	Comments
14	56.8902	-132.9305	None	None	6	42	None	Sand, Rock, Kelp	No Urchins Observed
15	56.8876	-132.9150	None	None	6	23	None	Sand & Rock	None
16	56.8932	-132.9110	None	None	8	30	None	Sand, Shells, & Kelp	No Urchins Observed
17	56.9823	-132.9596	Commercial	Commercial	6	25	5–10 ft.	Sand, Some Rocky, Cobble	Thin Band of Urchins Above 7 ft. in Depth
18	56.9753	-132.9386	Non-Commercial	Commercial	6	30	None	Mud & Sand	Mud Flats
19	56.9612	-132.9139	None	None	6	30	None	Mud & Sand	Mud Flats
20	56.9489	-132.9018	None	None	6	30	None	Mud & Sand	Mud Flats
21	56.8905	-132.8235	None	None	6	21	None	Sand & Mud	Dungeness Crab
22	56.8839	-132.8114	None	None	6	30	None	Mud & Sand	None
23	56.8736	-132.8008	None	None	6	30	None	Mud & Sand	None
24	56.8670	-132.8005	None	None	6	30	None	Mud & Sand	None
25	56.8474	-132.8191	Non-Commercial	Non-Commercial	8	22	None	Rock	Small Area of Urchins on Rocks at 8–12 ft. Depth
26	56.8477	-132.8256	None	None	6	30	None	Rock	None
27	56.8446	-132.8268	None	None	6	30	None	Rock	None
28	56.8427	-132.8310	None	None	6	30	None	Rock & Kelp	Heavy Kelp
29	56.8294	-132.7592	None	None	6	30	None	Rock & Kelp	Steep Wall—Barnacles
30	56.7957	-132.6763	None	None	6	24	None	Rock, Kelp, & Sand	Poor Visibility
31	56.7406	-132.6147	None	None	6	24	None	Sand & Mud	Poor Visibility
32	56.7140	-132.6370	None	None	6	24	None	Sand & Mud	Poor Visibility

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Mark	Latitude	Longitude	Density	Size	Depth Start (ft)	Depth Stop (ft)	Bed Width (ft)	Habitat	Comments
33	56.6949	-132.6483	None	None	6	28	None	Rock & Mud	Barnacles on Rock
34	56.6897	-132.6440	None	None	6	28	None	Rock & Mud	None
35	56.6745	-132.6400	None	None	6	28	None	Mud & Sand	Dungeness Crab
36	56.6955	-132.6799	None	None	8	30	None	Mud & Sand	Dungeness Crab
37	56.7131	-132.7268	None	None	8	35	None	Mud, Shells, & Sand	Dungeness Crab
38	56.7400	-132.7537	None	None	8	28	None	Mud, Shells, & Sand	Dungeness & King Crab
39	56.7643	-132.7859	None	None	9	28	None	Sand & Rock	9–12 ft. & Above is Generally Rock—Below 12 ft. is Sand
40	56.7965	-132.8358	None	None	9	28	None	Sand & Rock	None
41	56.7979	-132.8679	Non-Commercial	Commercial	9	25	Scattered	Sand & Rock	Spotty, Small Populations of Urchins Where Rock Meets Sand
42	56.8037	-132.9045	Commercial	Commercial	9	25	10–20 ft.	Sand & Rock	Urchins at 18–14 ft. Depth—Black Cukes Present
43	56.8122	-132.9179	Commercial	Commercial	6	25	10–40 ft.	Rock & Sand	Large Bed of Commercial Urchins—High Percentage Above 1.5%—Black Cukes Present

Appendix B.7.–Results of green urchin reconnaissance survey in Subdistricts 110-11, -12, -13, -14 and -15, December 6–9, 1999. See Figure 7 for Mark locations

Mark	Latitude	Longitude	Density	Size	Depth Start (ft)	Depth Stop (ft)	Bed Width (ft)	Habitat	Comments
1	57.0002	-132.9530	Commercial	Commercial	7	25	10–15 ft.	Rock with Sand	20–30 % Of Urchins over 1.5 inch—Black Cukes
2	56.9962	-132.9453	Commercial	Commercial	8	30	10–20 ft.	Rock with Sand	20–30 % Of Urchins over 1.5 inch.—Non-continuous broken bed
3	56.9934	-132.9431	Commercial	Commercial	8	30	10–15 ft	Rock with Sand	20–30 % Of Urchins over 1.5 inch.—Non-continuous broken bed
4	56.9955	-132.9384	Non-Commercial	Non-Commercial	10	25	None	Sand	No Urchins
5	56.9938	-132.8993	None	None	10	25	None	Hard Rock, Sand, & Mud	None
6	56.9975	-132.8898	Non-Commercial	Non-Commercial	10	30	None	Sand, Mud, & Rock	Thinley Scattered Urchins @ 18ft.—Non-Commercial Quantities
7	57.0016	-132.8764	Non-Commercial	Non-Commercial	10	30	None	Hard Rock, Sand, & Gravel	Thinley Scattered Urchins @ 18ft.—Non-Commercial Quantities
8	57.0049	-132.8612	Commercial	Commercial	12	30	40 ft.	Hard Rock, Sand, & Gravel	20–30 % Commercial size @ 19 ft.
9	57.0248	-132.8507	Non-Commercial	Commercial	12	30	None	Rock, & Steep	Few scattered Urchins @19–21 ft.—20–30 % 1.5 or larger
10	57.0177	-132.8391	Commercial	Commercial	12	25	10 ft.	Rock, & Steep	Thin band—20 to 30 % 1.5 & larger--better roe content
11	57.0018	-132.8213	None	None	8	25	None	Glacial Silt, & Mud	None
12	56.9921	-132.7903	None	None	12	30	None	Sand & Mud	8 ft. visability
13	57.0004	-132.7939	Non-Commercial	Commercial	12	28	None	Rocky	Poor visability—few Urchins @ 19 ft—20 to 30 % over 1.5 inch.
14	57.0064	-132.7896	Commercial	Commercial	18	30	10ft.	Steep & Rocky	Narrow Band @ 20 ft.averaging 15–25 % over 1.5 inch.

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Mark	Latitude	Longitude	Density	Size	Depth Start (ft)	Depth Stop (ft)	Bed Width (ft)	Habitat	Comments
15	57.0246	-132.8096	Commercial	Commercial	18	30	Scattered	Steep & Rocky	Over-all, larger Urchins—70 % over 1.5 inch.
16	57.0381	-132.8200	Non-Commercial	Non-Commercial	10	25	Scattered	Steep Rock	Heavy Barnicle incrustations on rock
17	57.0504	-132.8285	None	None	25	12	None	Rocky & Glacial Silt	Poor Visability, Rocks covered with Banracles
18	57.0756	-132.8595	See Comments	See Comments	25	0	None	Mud & Glacial Silt	At Mark 26, a Few Scattered Urchins—Numerous Juvinile Tanner Crab
19	57.0450	-132.8673	None	None	25	12	None	Rocky & Glacial Silt	None
20	57.0351	-132.8713	None	None	25	12	None	Rocky & Glacial Silt	None
21	57.0351	-132.8713	Commercial	Commercial	11	32	Scattered	Steep Rock	15–25 % over 1.5 inch.
22	57.0245	-132.8936	Commercial	Commercial	12	32	Scattered	Steep Rock	25–30 % over 1.5 inch.
23	57.0357	-132.9151	Commercial	Commercial	6	30	Scattered	Rock & Sand	18-9 ft., Scattered Urchins—20 to 35% over 1.5 inch.
24	57.0405	-132.9763	Commercial	Commercial	9	20	Spuratic	Rocky Cobbles & Sand	9–12 ft. Depth, Larger Urchins over-all—at mark 39, Black Cukes
25	57.0157	-132.9829	Commercial	Commercial	9	22	Scattered	Rocky Cobbles & Sand	Urchins 9–12 ft. Depth
26	56.9950	-132.9553	Commercial	Commercial	8	18	30ft.	Rocky Cobbles & Sand	Black Cukes
27	56.9927	-132.9819	Commercial	Commercial	8	20	Scattered	Rocky	Black Cukes—Urchins @ 8–10 ft.
28	57.0186	-133.0025	None	None	6	40	None	Sand, Mud, & Shells	Not Urchin Habitat—A lot of Clam shells—Suspect large amounts of various clam species

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Appendix B.7.–Page 3 of 5.

Mark	Latitude	Longitude	Density	Size	Depth Start (ft)	Depth Stop (ft)	Bed Width (ft)	Habitat	Comments
29	57.0631	-133.0474	None	None	8	42	None	Sand, Rocks, & Heavy Kelp	Steep Rock Wall on Portion—Areas of Tube Worms
30	57.0807	-133.1011	Non-Commercial	Non-Commercial	6	24	None	Sand, Rocks, & Kelp	A Few Scattered Non-Commercial Urchins—Tube Worms
31	57.0878	-133.1156	None	None	6	28	None	Tube Worms, Sand, Cobble	(Tube Worms, Sand, & Cobble Stones)
32	57.0869	-133.1477	Non-Commercial	Commercial	6	28	Scattered—Non-Cont.	Rock, Kelp, Sand	A Thin, Non-Continuous Band of Urchins Between 6 to 10 ft. in Depth
33	57.0898	-133.1873	Commercial	Commercial	7	29	15 ft.	Sand, Shells, Heavy Kelp	Urchins 7–9 ft. in Depth
34	57.0910	-133.1878	Non-Commercial	Commercial	10	40	None	Sand, Silt, Rock, Shells	Very Few Scattered Pockets of Urchins
35	57.0977	-133.1938	None	None	6	30	None	Sand, Shells, Kelp,Anenome	No Urchins
36	57.1254	-133.2060	None	None	14	28	None	Sand, Shells	Heavy Barnicle and Crustations in 10 ft. & Shallower
37	57.1128	-133.1861	None	None	10	40	None	Sand, Silt, Rock	Barnacles 12 ft and Shallower
38	57.1094	-133.1663	None	None	6	22	None	Sand, Silt, Cobbles	8 ft. and up, Cobbles With White Barnacles
39	57.1391	-133.1967	None	None	8	28	None	Sand, Rock, Kelp	Shells-—Heavy Kelp
40	57.1319	-133.2405	None	None	8	25	None	Rock & Kelp	None
41	57.1367	-133.2461	Commercial	Commercial	12	30	20 ft.	Sm. Boulders & Cobbles	30–40 % of Urchins over 1.5 inches

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Mark	Latitude	Longitude	Density	Size	Depth Start (ft)	Depth Stop (ft)	Bed Width (ft)	Habitat	Comments
42	57.1410	-133.2366	Commercial	Commercial	9	30	20–30 ft.	Rocky, Sand, & Cobbles	40–50 % Urchins over 1.5 inches
43	57.1552	-133.2421	Non-Commercial	Non-Commercial	11	30	None	Sandy Silt	None
44	57.1576	-133.2543	None	None	12	26	None	Mud & Sand	Northern and Western Shore of Inlet Void of Urchins—A Lot of Fresh Water
45	57.1380	-133.2588	Commercial	Commercial	9	30	20–40 ft.	Boulders & Rocks	20–40 % over 1.5 inches—Nice Bed of Urchins
46	57.1271	-133.2667	Non-Commercial	Non-Commercial	9	30	Scattered	Boulders & Sand	When Bottom Changes from Boulders to Sand, Urchins Thin Out to Nothing
47	57.1194	-133.2700	None	None	9	25	None	Rock, Sand, & Shells	Rock from 0 to12 ft.—Sand at 12 ft +
48	57.0000	-133.0000							
49	57.1076	-133.2910	Non-Commercial	Commercial	9	27	None	Sand, Rock, & Shells	Rock Down to 18 ft. in Places—A Few Isolated Areas of Urchins Above 10 ft.
50	57.1140	-133.3381	None	None	12	30	None	Sand, Shells, Rock, Kelp	A Few Scattered Cukes Below 30 ft.
51	57.1262	-133.3665	None	None	10	28	None	Sand	None
52	57.1289	-133.3714	Commercial?	Commercial	9	28	10–20 ft.	Rock & Sand	Urchins Between 9 and 14 ft.—Are Smaller Average size
53	57.1301	-133.3933	Non-Commercial	Commercial	8	35	4–15 ft.	Rock & Sand	Urchins 11–14 ft.
54	57.1343	-133.4037	Non-Commercial	Non-Commercial	8	29	None	Rock & Sand	Small Scattered Urchins
55	57.1364	-133.4151	None	None	6	25	None	Sand, Shells, Rock, Kelp	Odd Pocket of Non–Commercial Urchins (small)

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Appendix B.7.–Page 5 of 5.

Mark	Latitude	Longitude	Density	Size	Depth Start (ft)	Depth Stop (ft)	Bed Width (ft)	Habitat	Comments
56	57.1464	-133.4416	Non-Commercial	Non-Commercial	7	36	Scattered	Sand & Shells	Unidentified Plant Life—Few Scattered Rocks with Urchins on them—Dungeness
57	57.1556	-133.4759	None	None	14	50	None	Rock Reef	Scattering of Cukes Below 35 ft.
58	57.1623	-133.4865	None	None	6	28	None	Sand & Rock	Mainly Sand with Few Rocks, Occasionally Few Urchins on Rocks
59	57.1740	-133.5110	None	None	10	31	None	Sand, Shells, Kelp	Various Species of Clams
60	57.1764	-133.5209	Non-Commercial	Commercial	10	25	Spuratic	Rock, Shells, Sand, Cobbles	Few Small Areas of Lightly Scattered Urchins Above 12 ft.
61	57.1802	-133.5452	Non-Commercial	Non-Commercial	9	45	None	Sand, Shells, Cobbles	Few Small Areas of Lightly Scattered Urchins Above 12 ft.—Few Scattered Cukes Below 40 ft.
62	57.1830	-133.5648	Commercial	Commercial	10	35	10–40 ft.	Gravel, Rock, Sand	High Concentration of Urchins—40 to 50 % Above 1.5 inch.
63	57.0000	-133.0000	—	—	—	—	—	—	—
64	57.0000	-133.0000	—	—	—	—	—	—	—
65	56.9407	-132.9970	None	None	12	30	None	Sand & Shells	Dead Bottom
66	56.9530	-133.0327	None	None	12	31	None	Sand & Shells	Heavy Kelp in Areas
67	56.9880	-133.0726	None	None	12	30	None	Sand & Shells	Heavy Kelp in Areas
68	56.9991	-133.0965	None	None	12	30	None	Sand & Shells	Few Areas of Steep Rock—No Urchins Found
69	57.0093	-133.1770	None	None	12	30	None	Sand & Shells	None
70	57.0105	-133.2634	None	None	12	30	None	Sand, Mud, & Shells	A Lot of Clam Shells—No Siphons Showing
71	57.0160	-133.3072	None	None	12	30	None	Sand, Mud, & Shells	A Lot of Clam Shells—No Siphons Showing

Appendix B.8.–Results of green urchin reconnaissance survey in Subdistricts 110-21,22,23, April 21-May 1,2000. See Figure 8 for Mark locations

Mark	Latitude	Longitude	Density	Size	Depth Start (ft)	Depth Stop (ft)	Bed Width (ft)	Habitat	Comments
1	57.2466	-134.0921	Non-commercial	Non-commercial	10	30	750	rck,bld,snd,ala,ner,lbk	This area contains more greens than any other areas surveyed in Pybus Bay. The urchins are small (1/2in and smaller) and scattered.This foul area continues into district 109-30.We found *Cucmaria frondosa japonica* an under-utilized species and believe it cont
2	57.2541	-134.0852	Non-commercial	Non-commercial	15	40	none	rck,cbl,snd,shl,ala	Dense concentration of *Cucumaria frondosa japonica.* It appeared to be a type of vegitation.This area is 750 ft across, 15–40ft deep.This species we felt could be commercially viable due to its abundance.It may continue into subdistrict 109-30.
3	57.2643	-134.0878	Non-commercial	Non-commercial	20	50	none	rck,bld,snd,shl,ala,ner,lbk	Scattered small greens in this area sizes 1/2 in and smaller. *Alaria* floating on surface with some nereocystis.
4	57.2543	-134.0588	Non-commercial	Non-commercial	15	30	1500	rck,cbl,snd,shl,ala,ner,lbk	*Alaria* floating on surface with some nereocystis.Urchins cattered consistently accross this area sizes 1/2 in. through this area.

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Mark	Latitude	Longitude	Density	Size	Depth Start (ft)	Depth Stop (ft)	Bed Width (ft)	Habitat	Comments
5	57.2497	-134.0570	Non-commercial	Non-commercial	15	30	1500	rck,cbl,snd,ala,ner,lbk	Urchins scattered accross this area inside of reefs south of Elliot island.Urchins are small 1/2 in. sizes and there are more than what we saw in other areas in Pybus.They seem to be in cuts between islands.Non-commercial area.
6	57.2639	-134.0675	Non-commercial	Non-commercial	15	30	none	rck,cbl,snd,ala,ner,lam	There are greens scatered here sizes are extremly small (1/2in and less). *Alaria* and *Nereocyistis* floating on the surface in this area.Some of the bull kelp seems to be older and there is young bull kelp 2–3ft off the bottom.
7	57.2663	-134.0558	Non-commercial	Non-commercial	15	35	none	rck,cbl,snd,shl,ala,ner,lam,lbk	This not a definably bed of urchins but more scattered small urchins of noncommercial sizes (1/2 in and smaller).Lots of Alaria and some Nereo-cystis floating on the surface.
8	57.2709	-134.0557	Non-commercial	Non-commercial	20	40	none	mus,snd,cbl,lam,ala	Urchins are small and scattered through site # 10 Urchins sizes 1/2 in and smaller. Non-commercial
9	57.2852	-134.0649	Non-commercial	Non-commercial	20	40	600	rck,cbl,snd,ala,lbk	Urchins in this area were on the edge of the reef and out in the flats.
10	57.2891	-134.0724	Non-commercial	Non-commercial	20	40	none	rck,snd,shl,cbl,cor,hir	Urchins small (1/2in and less). Lot of empty urchin shells.

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Mark	Latitude	Longitude	Density	Size	Depth Start (ft)	Depth Stop (ft)	Bed Width (ft)	Habitat	Comments
11	57.2903	-134.0838	None	None	20	40	none	rck,cbl,snd,lbk	this area is a long bank running south of the island.
12	57.2968	-134.0869	None	None	15	35	none	rck,cbl,snd,ala,cor,hir	This seemed like it could be urchin habitat.There was *Alaria* and *Nereocystis* floating on the surface.
13	57.2998	-134.0847	None	None	20	45	none	rck,snd,shl,hir,ala,	We did not see urchins in this area.
14	57.3046	-134.0876	None	None	20	45	none	rck,snd,shl,lam,ala,ner	Less *Laminaria* in this area vegetation transition.
15	57.3137	-134.0833	Non-commercial	Non-commercial	10	30	none	rck,snd,ala,lbk	This area is a transition in vegetation.There was heavy *Alaria* growth and *Nereocystis* growth.This growth is 2–3 weeks behind the *Nereocyistis* in subdistricts 104-30, -20. and is approximatly 2–3ft off the ocean floor.
16	57.3154	-134.0958	Non-commercial	Non-commercial	10	35	none	rck,snd,shl,ala,ner,lam,lbk	There was more surface kelp in this area.Alaria mostly scattered nereocystis
17	57.3158	-134.1033	None	None	10	50	none	rck,snd,shl,lbk,	We did not see urchins in this area.
18	57.3210	-134.1000	None	None	10	30	none	rck,snd,shl,lbk,lam,cor	We did not see urchins in this area.
19	57.3183	-134.1053	None	None	10	35	none	rck,cbl,snd,shl,lam,lbk,cor	We did not see urchins in this area.
20	57.3226	-134.1059	Non-commercial	Non-commercial	10	30	none	rck,snd,shl,lbk,lam	Urchins scattered here and there. Not a definable bed.

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Mark	Latitude	Longitude	Density	Size	Depth Start (ft)	Depth Stop (ft)	Bed Width (ft)	Habitat	Comments
20	57.3226	-134.1059	Non-commercial	Non-commercial	10	30	none	rck,snd,shl,lbk,lam	Urchins scattered here and there. Not a definable bed.
21	57.3361	-134.1168	None	None	10	40	none	snd,shl,lam	This area is not urchin habitat.
22	57.3401	-134.1150	None	None	10	40	none	snd,shl,lam	Scattered giant red cucumber *Parasticopus californicus* in site# 8. Not a high concentration of this specie was observed throughout site#
23	57.3247	-134.1381	None	None	15	30	none	snd,shl,lam	This is not urchin habitat. Scattered small urchins across between Henrys Arm to the pt. N. of Midway islands. Area is NONCOMMERCIAL.
24	57.3153	-134.1257	None	None	10	35	none	snd,shl,lam	Scattered giant red cucumbers through site # 8. Not a high concen-tration of this specie in this area.
25	57.3128	-134.1312	None	None	10	30	none	snd,shl,agm,lam	This area is not urchin habitat.Scattered giant red cucumbers *Parastchopus californicus* in this spot; not a high concentration.
26	57.3157	-134.1392	None	None	10	30	none	mud,snd,shl,lam	This is not urchin habitat.This a mud flat area.
27	57.2948	-133.8683	Non-commercial	Non-commercial	10	40	1000	rck,bld,ala,ner,lbk	Scattered urchins in this cove and along the edge of the reef that runs out of the W. side of the cove.This reef is defined by a bed of *Alaria* with *Nereocystis* mixed

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Mark	Latitude	Longitude	Density	Size	Depth Start (ft)	Depth Stop (ft)	Bed Width (ft)	Habitat	Comments
28	57.2916	-133.8690	Non-commercial	Non-commercial	10	35	500	rck,bld,cbl,snd,ala,lbk	This island was not visible on the nobeltech program. Some urchins scattered along.
29	57.2878	-133.8696	Non-commercial	Non-commercial	15	40	1000	rck,bld,cbl,ala,red	Urchins scattered patches, sizes 2 in. and larger.There is gear storage on this island. These urchins were empty and hollow, containg very low percentage of gonad in this population. However, this may fluctuate with seasonal changes.
30	57.2736	-133.8761	None	None	20	40	none	rck,snd,ala,lam	This seemed like it would be urchin habitat.There was large kelp beds of *Alaria* mixed with *Nereocystis* We did not find a concentration here.
31	57.2769	-133.8469	Non-commercial	Non-commercial	20	50	1000	rck,snd,ala,ner,lbk	Greens scattered along this shoreline. *Alaria* visible from surface.Urchins ran a little deeper in this area and where scattered without a definable concentration.
32	57.2827	-133.8442	Non-commercial;	Non-commercial;	10	30	none	rck,snd,ala,lam	Scattered greens in this area also giant red cucumber *Parasticupus californicus*—not a high concentration.
33	57.2826	-133.8650	Non-commercial	Non-commercial	10	45	none	rck,bld,gvl,ala,lbk	No definable bed of green urchins, only scattered groups here and there. Greens also on the edge of reef that breaks away to deeper wall.These urchins were hollow and empty with low percentage of gonad present.

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Mark	Latitude	Longitude	Density	Size	Depth Start (ft)	Depth Stop (ft)	Bed Width (ft)	Habitat	Comments
34	57.2983	-133.8247	None	None	10	40	none	rck,snd,shl,lam,hir	We did not see urchins in this area.
35	57.2957	-133.8055	Non-commercial	Non-commercial	10	40	1500	rck,gvl,snd,mus,red,ala	Not a definable bed of urchins; there are patchs here and there. Larger urchin, test sizes 2-2 ½ inches. Clams are scattered through this area.
36	57.3004	-133.8044	Non-commercial	Non-commercial	10	35	none	rck,gvl,snd,ala.cor,red	Urchins scattered—not a definable bed. *Alaria* and scattered *Nereocyistis* visible from surface.Urchin gonad percentages were extremely low, with a variety of colors rangeing from off white,orangish-brown to yellow.
37	57.3034	-133.8044	Non-commercial	Non-commercial	10	40	none	rck,gvl,snd,ala.cor,red	Urchins scattered over a large area —not a definable bed.
38	57.2960	-133.7987	None	None	10	30	none	rck,cbl,snd,ala,lbk	In this area, a well defined reef that breaks away fast and deep, and has a relatively small area with *Alaria* visible from the surface.We did not see urchins here, but did find them directly accross the channel on E. Brother island.
39	57.3101	-133.8130	Non-commercial	Non-commercial	15	35	none	rck,bld,snd,shl,ala,lbk,red	Heavy vegetative growth in this area lbks Urchins scattered and undefinable. Palm kelp, *Agarum*— also scattered giant red cucumber *Parasticapus californicus,* but not in a high concentration

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Mark	Latitude	Longitude	Density	Size	Depth Start (ft)	Depth Stop (ft)	Bed Width (ft)	Habitat	Comments
40	57.3098	-133.8156	Non-commercial	Non-commercial	10	40	none	rck,cbl,snd,ala,lbk	There is a fairly consistent concentration of giant red cucumber *Parasticapus californicus* at 40–50ft.Urchin populations along this shoreline are not commercially viable.
41	57.3165	-133.8275	Non-commercial	Non-commercial	10	40	none	rck,snd,shl,ala,hir,lbk	No definable urchin bed in this area.There is heavy vegetation in this area that consists of lbk,ala and a type of palm kelp.
42	57.3099	-133.8319	Non-commercial	Non-commercial	10	40	none	rck,cbl,snd,shl,ala,ner,lbk,hir	Urchins scattered outside of *Alaria* on snd, hir. No urchins concentrated on rock as we expected. Urchin test size varied greatly in this area, with larger urchins @ 2 1/2 in. and an average size below 1 in. Gonad percentage low.
43	57.3557	-133.8751	None	None	10	30	none	rck,snd,ala,ner,lam,lbk	Seemed like area would be excellent urchin habitat.Lots of washrocks and shallows with large surface kelps *Alaria* and some *Nereocystis*. This area is totally exposed to S.E.winds.We did not find urchins here.
44	57.3711	-133.8648	Non-commercial	Non-commercial	10	40	none	rck,cbl,snd,ala,lbk	This area seemed like it would be excellent urchin habitat. Lots of washrocks and we did find urchins in this area as well as giant red cucumber *Parastichopus californicus* scattered.There is probably an urchin bed here that wasn't found.

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Mark	Latitude	Longitude	Density	Size	Depth Start (ft)	Depth Stop (ft)	Bed Width (ft)	Habitat	Comments
45	57.2826	-133.8650	Non-commercial	Non-commercial	10	45	none	rck,bld,gvl,ala,lbk	Greens scattered, 2 in size., No definable bed, There are patches here and there. also on the edge of reef that breaks away to a deeper wall.
46	57.3879	-133.8743	Non-commercial	Non-commercial	10	40	none	rck,bld,cbl,snd,ala,cor,lbk	Urchins scattered and small (1/2 in).Urchins on rock and into the flats boulder cobble.
47	57.3979	-133.8834	Non-commercial	Non-commercial	10	40	none	rck,cbl,snd,shl,ala,lam	Urchins small (1/2 in and smaller) and scattered *Cucumaria frondosa japonica*,.scattered clams, possible geoduck. Some brittle star concentrations deeper.
48	57.4223	-133.9684	None	None	20	40	none	mud,shl	This is a mud flat area—not urchin habitat.
49	57.4288	-133.9616	None	None	15	30	none	mud,snd,shl,lam	Not urchin habitat.There is more growth in this area.
50	57.4438	-133.9688	None	None	15	50	none	snd,shl,lam,	Some clams in this area
51	57.4488	-133.9666	None	None	15	30	none	snd,shl,lam	Lots of necks (types of clams) in this area
52	57.4524	-133.9541	None	None	10	30	none	rck,snd,shl,lam	Site # 2 does not contain urchins and is not urchin habitat.This is more of a clam habitat and there are clams in the last areas of site # 2
53	57.4470	-133.9094	Commercial	Commercial	20	40	1000	rck,cbl.,snd,hir,red	Urchins are scattered and less concentrated than what was found right on Church Pt.

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Mark	Latitude	Longitude	Density	Size	Depth Start (ft)	Depth Stop (ft)	Bed Width (ft)	Habitat	Comments
54	57.4487	-133.9123	Commercial	Commercial	20	40	1000	rck,cbl.,ala,lbk,hir,red	Urchins in this area were some of the largest we saw—some 3 1/2in and a lot we saw 3 in and smaller. This is one of the higher concentrations that.This area is commercially viable.
55	57.4488	-133.9135	Non-commercial	Non-commercial	20	40	none	rck,cbl.,ala,lbk,hir,red	This the edge; urchins become scattered and are spread over a large area.This area is also a high current area which is where we seemed to find the largest concentrations of green urchins. Coincidence? I dont think so.
56	57.4495	-133.9195	Non-commercial	Non-commercial	15	40	none	rck,gvl,snd,lbk,red	Urchins scattered over a large area.Test sizes seemed smaller than what we saw on Church Pt., without a real concentration.
57	57.4572	-133.9206	Non-commercial	Non-commercial	10	40	none	rck,cbl,snd,lbk,hir,red	No definable bed of urchins in this area.
58	57.4534	-133.9200	None	None	10	40	none	rck,snd,cbl,lbk,red,hir	Pockets of urchins that are few and far between. Not a definable bed in this area.
59	57.4603	-133.9262	None	None	10	40	none	rck,cbl,snd,shl,lbk,red,lam	We did not find urchins in this area. Higher concentrations occur across north of the cut between N. Gain and S. Tree islands.This was similar to Church Pt as far as being a high current area
60	57.4639	-133.9282	Non-commercial	Non-commercial	15	40	none	rck,cbl,snd,shl,lbk,red,lam	This is the edge of the higher concentration— breaks away from the shoreline deeper, with urchins scattered to none out on the flats.

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Mark	Latitude	Longitude	Density	Size	Depth Start (ft)	Depth Stop (ft)	Bed Width (ft)	Habitat	Comments
61	57.4635	-133.9281	Commercial	Commercial	15	35	250-300	rck,snd,cbl,hir,ala,lbk	The urchins here start on cbl,rck, at 35ft and run up onto rck in the shallows. Urchins were heavily concentrated here and were observed climbing up palm kelp totally covering it to the top.This was a nice concentration.
62	57.4589	-133.9123	Non-commercial	Non-commercial	20	40	250-300	rck,cbl.snd,shl,ala,lbk	This area is rather small there is a nice consistent concentration scattered This area breaks away fast and deep which is why we chose noncommercial The north side of this rock was steep and deep and we didn't see much.
63	57.4670	-133.9234	None	None	10	35	none	rck,bld,snd,shlala,fuc,lbk	We expected to see urchins in this area because there were some other nice concentrations in this area also the habitat didn't seem to change however we did not see urchins here.
64	57.4680	-133.9094	Non-commercial	Non-commercial	10	40	none	rck,cbl,snd,ala,lbk	The urchins here are scattered and run out to the end of this bank 57 28.029N 133 54.436W there is palm kelp in this area urchins are bank 57 28.029N 133 54.436W there is palm kelp in this area urchins are
65	57.4770	-133.8924	Non-commercial	Non-commercial	20	40	1000	rck,snd	On this spot you can see through the cut to the west side of Good Island. Urchins are scattered in this area.Gonad percentages low to empty,hollow

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Mark	Latitude	Longitude	Density	Size	Depth Start (ft)	Depth Stop (ft)	Bed Width (ft)	Habitat	Comments
66	57.4788	-133.8955	Commercial	Commercial	20	40	1500	snd,rck,lbk,	This is the highest concentration of urchins that we saw in this survey.Urchins were consistently 2 in. and concentrated all along this shoreline and broke away to less consistent groups that were scattered.Gonad melted instantly.
67	57.4607	-133.8752	None	None	10	30	none	rck,cbl,snd,ala,lbk	We did not see urchins along this shoreline which was suprising because of the concentration we found on Good island.We felt that this would continue south down Romp and Gambier islands and it did not.
68	57.4501	-133.8605	None	None	10	40	none	rck,cbl,snd,ala,lbk	We did not see urchins in this area from Romp island to Gambier island this was suprising because we had found the largest concentration of greens on Good island and thought it would continue this way it did not.
69	57.4422	-133.8569	None	None	15	35	none	rck,cbl,snd,ala,,lbk	No urchins in this area.
70	57.4329	-133.8437	None	None	15	35	none	rck,snd,shl,ala,lbk	No urchins here.looked like good urchin habitat and it was surprising that there were not urchins.
71	57.4347	-133.8384	None	None	10	40	none	rck,cbl,snd,shl,lam,lbk	There is heavy lbk growth down to 30ft.This seemed like urchin habitat we did not see urchins in this area.This area includes part of statistical rt of subdistrict

Appendix B.9.–Results of green urchin reconnaissance survey in Subdistricts 109-42, April 16-May 2, 2000. See Figure 9 for Mark locations

Mark	Latitude	Longitude	Density	Size	Depth Start (ft)	Depth Stop (ft)	Bed Width (ft)	Habitat	Comments
1	56.8112	-133.8850	Non-commercial	Non-commercial	10	20	None	rck,lbk,snd	This area is a small bank running off Camden pt to 60ft.It is also the boundry of the subdistricts 109-43,105-32.It starts as rock and rapidly changes to a sand bank.There are a hand full of urchins scattered here and is defininately not commercially significant
2	56.8213	-133.8960	None	None	10	40	None	rck,lam,snd	This area contained scattered sea cucumbers and horseclams we would see green urchins in this area because we saw scattered urchin on Camden Pt.The cukes were Parasticupus californicus we did not see the black cucumber Cucumaria frondosa japonica here
3	56.9151	-133.8564	None	None	5	40	None	snd,lam	This area is not urchin habitat it does contain clams
4	56.8947	-133.8361	None	None	10	30	None	rck to snd,ala	This is not urchin habitat.This area contains a variety of clams.
5	56.8819	-133.8276	None	None	10	40	None	rck,snd,shl,lam,hir	This is the end of site # 4.We did not see urchins in Hamilton Bay we did see urchins on Hamilton Pt. which is a high current area

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Mark	Latitude	Longitude	Density	Size	Depth Start (ft)	Depth Stop (ft)	Bed Width (ft)	Habitat	Comments
6	56.9042	-133.8988	Non-commercial	Non-commercial	15	30	None	rck,bld,ala,ner	Urchins scattered off reef.This is a large kelp bed floating on the surface.*Nereocystis* mixed with *Alaria*..
7	56.9044	-133.9088	Non-commercial	Non-commercial	20	45	None	rck,snd,shl,cbl,ala,ner	There are urchins scattered through this area.The sizes are small 1/2 in test sizes. There were scattered black sea cucumbers in this area.Cucumaria frondosa japonica.
8	56.9141	-133.9139	Non-commercial	Non-commercial	15	40	None	rck,snd,shl,ner,ala	There is a large floating kelp bed(*Alaria*) here along the edge on the northside.This breaks away to sand.There were scattered *Parasticubus californicous*.Urchins are concentrated on the northwest end of this island between the island and a washrock that is
9	56.9470	-133.9267	Non-commercial	Non-commercial	20	40	None	rck,snd,shl,ala,ner,red	Urchins small and scattered sizes 1/2 Urchins run on edge of reef out on the sand shell.They were mainly on sand shell and not on the reef.
10	56.9457	-133.9350	Non-commercial	Non-commercial	20	40	500.0000	rck,snd,shl,ner,lbk	This area contains scattered small urchins.1/2 in.The urchins are off the reef on the sand.
11	56.9475	-133.9404	Non-commercial	Non-commercial	20	40	None	rck,snd,shl,lbk,ner	Urchins here are small 1/2 in. there is not adefinable bed here only scattered small 1/2 in.

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Mark	Latitude	Longitude	Density	Size	Depth Start (ft)	Depth Stop (ft)	Bed Width (ft)	Habitat	Comments
12	56.9567	-133.9431	Non-commercial	Non-commercial	20	30	None	rck,bld,snd,shl,lbk,ner	There is large floating surface kelp in this area(*ALARIA*).There is not a definable bed in this area.
13	56.9620	-133.9572	Non-commercial	Non-commercial	20	40	None	rck,cbl,snd,shl,lbk,ner	This area contains small scattered urchins 1/2 in. test size.
14	56.9578	-133.9507	None	None	10	45	None	rck,snd,shl	This area contains walls that break away to a sand shell type bottom.There were not urchins in this area.
15	56.9734	-133.9928	Non-commercial	Non-commercial	15	45	None	bld,cbl,snd,	This area contains small scattered urchins 1/2 in. There is not much bottom vegitation in this area Urchins are scattered here and there without a high concentration.
16	56.9573	-134.1485	Non-commercial	Non-commercial	20	40	None	rck,bld,cbl,ala,ner,lbk	Large beds of alaria with nereocystis visable from the surface. Scattered small urchins 1/2 in. test size.
17	56.9357	-134.1509	Non-commercial	Non-commercial	20	40	None	rck,cbl,snd,shl,ala,ner,lam,red	This is a poor urchin concentration.Urchins are small 1/2 in and smaller and scattered.There are urchins scattered accross this bank to a large ala,ner kelp bed that is visable from the surface
18	56.9267	-134.1141	Non-commercial	Non-commercial	15	40	None	rck,snd,cor,ala,ner	This area is pathtic and can not even be refered to as an urchin bed but as a large area with very few urchins with sizes well below 1/2 in.

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Mark	Latitude	Longitude	Density	Size	Depth Start (ft)	Depth Stop (ft)	Bed Width (ft)	Habitat	Comments
19	56.9367	-134.1171	Non-commercial	Non-commercial	20	45	None	rck,bld,snd,ala,ner,lbk	There is heavy vegitative growth in this area.
20	56.9388	-134.1109	Non-commercial	Non-commercial	10	45	None	rck,snd,ala,lbk	This area breaks away deep fast and has growth deeper.There is no real concentration of urchins. Urchin sizes are well under 1/2 in scattered over a large area. There is lbk growth deeper here to 45-50ft.
21	56.9346	-134.0846	Non-commercial	Non-commercial	15	35	None	rck,snd,shl,ala,ner,lbk	Some urchins on rck urchins scattered and small.There is no t a population that can be deemed as commercially viable.Even if there were higher concen-trations in this area test size would be to small.The average size is less than1/2in
22	56.9303	-134.0388	Non-commercial	Non-commercial	15	40	None	rck,bld,snd,ala,ner,lbk	There wasnt real signifcant concentrations of urchins on this side of this island. The other side had consistent urchins all along over a large area Sizes were consistently small 1/2 in and smaller.
23	56.9292	-134.0357	Non-commercial	Non-commercial	20	50	1500.0000	rck,bld,cbl,lbk,lam,ala,cor	There were urchins scattered along this area. The sizes of these urchins were extremely small. This is a definable bed that runs along the eastern shoreline of this island. This area is NONCOMMERCIAL

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Mark	Latitude	Longitude	Density	Size	Depth Start (ft)	Depth Stop (ft)	Bed Width (ft)	Habitat	Comments
24	56.9368	-134.0269	Non-commercial	Non-commercial	30	45	None	rck,bld,lam,lbk	This area breaks away deep and fast..There is no real concentration of urchins but more scattered small urchin 1/2 in. test sizes.
25	56.9203	-133.9984	Non-commercial	Non-commercial	20	40	None	rck,snd	Scattered black cucumber *Cucumaria frondosa japonica* in 20ft on rock Types of black sponges on rock.
26	56.9133	-133.9888	Non-commercial	Non-commercial	20	35	None	rck,snd,ner,ala,lbk,cor	*Alaria* is visable from the surface and defines this area.There was some nereo-cystis mixed.There are small urchins scattered along the edge of this kelp bed. Bank west of this spot is extremly foul.Use caution when navigating this area.
27	56.8898	-133.9285	Non-commercial	Non-commercial	20	40	None	rck,bld,cbl,snd,red,cor,lam	There are *Cucmaria frondosa japonica* on this bank.We saw more shallow 20ft. They are also accross this chanel S. Hamilton Pt. and on the South end of Hound Island. They became scattered deeper 40ft range.
28	56.8717	-133.9166	Non-commercial	Non-commercial	20	40	None	rck,bld,cbl,snd,ala,ner,lam,red	There were *Cucumaria frondosa japonica* black sea cucumbers in this area. This area is defined by alaria which is visable from the surface.Greens were scatered and small 1/2 in test sizes.NONCOMMERCIAL

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Mark	Latitude	Longitude	Density	Size	Depth Start (ft)	Depth Stop (ft)	Bed Width (ft)	Habitat	Comments
29	56.8450	-133.9966	Non-commercial	Non-commercial	10	35	None	rck,snd,shl,gvl,ala,cor,hir,lbk	Urchins in small scatered here and there not a definable bed.*Cucumaria frondosa japonica* black sea cucumbers scattered around.Higher concentration east of this area same site.
30	56.8522	-133.9982	Non-commercial	Non-commercial	15	40	None	rck,cbl,snd,shl,ala,cor,hir,lbk	Green urchins scattered and small totally inconsistent except for test sizes 1/2 in and smaller.
31	56.8603	-133.9962	Non-commercial	Non-commercial	20	40	None	gvl,snd,shl,ala,cor,hir,lbk	Greens on gvl,shl,snd bottom more concentrated than westside of this site. Small sizes 1/2 in NONCOMMERCIAL
32	56.8585	-133.9883	Non-commercial	Non-commercial	20	40	None	rck,snd,shl,cor,hir,ala,lbk	Cobble sand groups of *Cucumaria frondosa japonica*.This species was found throghout this site and may have commercial potential.Greens scattered up on reef also.
33	56.8583	-133.9783	Non-commercial	Non-commercial	20	40	None	rck,snd,shl,cor,hir,ala,lbk	Greens on reef.This area is well defined by *Alaria* that is visable from the surface.Greens small test sizes 1/2 in.NONCOMMERCIAL

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Mark	Latitude	Longitude	Density	Size	Depth Start (ft)	Depth Stop (ft)	Bed Width (ft)	Habitat	Comments
34	56.8566	-133.9729	Non-commercial	Non-commercial	20	40	None	rck,snd,shl,ala,cor,hir	Urchins small and scattered over a large area patchs here and there.Test sizes 1/2 in. and smaller.Not a definable bed in this area.Alaria visable from surface.
35	56.8440	-133.8715	None	None	10	30	None	rck,snd,shl,lam	Heavy vegitation in this area.No urchins.
36	56.8342	-133.9806	None	None	10	30	None	rck,snd,shl,lam	We did not find greens in this area.Heavy bottom vegitation.
37	56.8443	-133.8715	None	None	10	30	None	rck,snd,shl,lbk,lam	We did not see urchins in this area.There is heavy vegitation in this area.

Appendix B.10.–Results of green urchin reconnaissance survey in Subdistricts 112-11,21,22, June ,2000. See Figure 10 for Mark locations

Mark	Latitude	Longitude	Density	Size	Depth Start (ft)	Depth Stop (ft)	Bed Width (ft)	Comments
1	57.30385	-134.901	poor	good	20	35	None	Yellow Rock: a few scattered g.u. with LBK, NER
2	57.28262	-134.875	poor	good	35	70	None	East Pond Isle: A few scattered g.u. with LBK, NER
3	57.27823	-134.875	poor	good	35	70	None	Same as Mark 2
4	57.27097	-134.861	good	good	35	85	500	South Point: Big Bed, LBK, NER; South Pt. 2 nautical mi. to Cosmos cove mouth is populated with some very productive beds of greens that dissipate into the 85ft plus range. Best concentrations at edges of kelp on barren gravel. Best at South Pt.
5	57.27045	-134.86	good	good	15	45	10	silt to big rock becoming more scattered
6	57.26882	-134.858	poor	good	20	30	20/scattered	loose population on rocks below LBK
7	57.26742	-134.856	poor	good	15	65	300	ocasional patch in shallow otherwise scattered, NER, LBK, etc
8	57.26072	-134.85	poor	good	15	55	100–150	shallow best, silt, brown fuzz, scattered
9	57.25278	-134.843	poor	good	24	55	100	scattered
10	57.24793	-134.839	poor	good	40	40	None	LBK, NER
11	57.22815	-134.841	poor	good	40	55	100	silt, brown fuzz, scattered deeper anemones, smaller product
12	57.22417	-134.839	good	good	10	20	100–25	lots of small g.u., good cukes; this is a nice thick green urchin patch nestled in between ner, lbk that scatters out north and south.
13	57.2229	-134.838	poor	good	20	40	50	scattered on rocks lightly
14	57.20955	-134.844	good	good	15	30	100	small but over 1.5", ribbon (LBK), NER, , fuzz, rock, gravel scattering out to North.
15	57.20898	-134.842	good	good	20	40	100	few scattered below lbk silt, gravel cukes; lots of cukes and good green density.
16	57.20932	-134.84	good	poor	10	60	100	lots of small g.u. good cukes
17	57.20882	-134.839	poor	poor	10	60	100	few scattered below lbk; most coves and many points support some cukes.
18	57.17273	-134.809	poor	good	35	35	10	few scattered below LBK; north wall of small cove supporting scattered greens with the south wall holding good cukes.

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Mark	Latitude	Longitude	Density	Size	Depth Start (ft)	Depth Stop (ft)	Bed Width (ft)	Comments
19	57.16778	-134.805	poor	good	30	40	None	few scattered below lbk
20	57.16527	-134.802	poor	poor	20	40	None	few scattered below LBK; a scattering of greens at edge of kelp.
21	57.1559	-134.812	poor	good	20	40	None	few scattered below lbk; some greens on rocks.
22	57.15413	-134.807	good	poor	15	60	500	outside takatz Bay on rocks. Loaded with small urch. , NER, LBK; some decent concentrations of empty urchins with a scattering sprinkled over a large area of reef.
23	57.14328	-134.798	poor	good	20	40	None	few scattered below lbk
24	57.14157	-134.793	good	good	38	55	20	decent patch along kelp edge north Takatz Isle, relatively deep.
25	57.13778	-134.793	poor	good	20	35	40	some nice pockets in 20-25' otherwise scattered amongst boulders edge of kelp
26	57.12023	-134.791	poor	good	25	25	30	small scattered patch of greens; urchins and cukes, urchins lightly scattered.
27	57.11025	-134.788	poor	poor	30	30	30	Same as Mark 26
28	57.08533	-134.793	good	good	15	50	5	scattered dense patches along edge of Bll kelp along beach-intermittent; Hot Springs Bay is filled from tide line to sometimes 50' or more with lbk and not supporting urchins except for Mark 28 and Mark 29.
29	57.08817	-134.779	poor	good	20	50	100	scattered few on rocks at edge of NER, , LBK
30	57.07942	-134.778	good	good	10	20	15 –3	thick in shallow tight in little cove, dispersing toward mouth to scattered NER, , LBK
31	57.07687	-134.772	good	good	10	20	20	small but over 1.5", ribbon (LBK), NER, , fuzz, rock, gravel
32	57.0729	-134.769	good	good	15	30	30	A nice patch located @ 57.04.375 134.46.172 scattering at ends. Cukes, NER, LBK,
33	57.07163	-134.766	poor	good	20	45	50	scattered few on rocks at edge of NER, , LBK
34	57.05362	-134.759	poor	good	25	25	10	scattered few on rocks at edge of NER, , LBK
35	57.03615	-134.752	good	good	15	30	5 or 10	occasional thick patches along this stretch of coast best in 20' on edge of kelp patties
36	57.01082	-134.744	poor	good	20	25	10	scattered g.u.; sea otter seen eating just north of here at 57.01.022-134.44.747; some good cukes with scattered urchins outside kelp.
37	57.00608	-134.739	good	good	15	55	10 – 200	best concentration @56.59.868 134.44.392. Small urchin but over 1.5". Eating palm kelp in spots where it drops deeper than the NER, , LBK. Lots on rabble rock and gravel. Brief spots without urchins and then they start again mostly in scattered pat

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Appendix B.11.–Results of green urchin reconnaissance survey in Subdistricts 113-63,64,65, May 30-31, 2000. See Figure 11 for Mark locations

Mark	Latitude	Longitude	Density	Size	Depth Start (ft)	Depth Stop (ft)	Bed Width (ft)	Comments
1	57.451	-135.5777	good	poor	08	20	10 –60	Arthur Isle; NER, LBK; good green urchin density, somewhat scattered & smaller in size; big kelp (ner,lbk) patch to below 10' where bottom turns to gravel, rock and g.u. start--this is consistent habitat for this area; cukes amongst thick lbk.
2	57.4434	-135.5964	good	good	05	25	3 –50	NW of Big Island good g.u. concentration eating red scum @ tide line; best quality, easy harvest. Big gravel flats, walls w/NER, LBK.
3	57.4407	-135.5960	good	good	10	50	10 –50	#2, 3 are NW of Big Isle-poor quality, kelp patties of NER, LBK; lots of small g.u. scattered on gravel 0-55', some commercial size and density, patches along shore and reefs, bed continues towards deep bay.
4	57.4339	-135.5832	good	good	07	40	100 –30	rock, red kelp, brown fuzz, slbk, bll, brittlestars, good densities of g.u., better size, poor quality throughout; relatively small (1.5"), no thick clusters.
5	57.4355	-135.6061	good	good	07	40	10 –200	good densities of urchin all the way around unnamed isle in Deep Bay,with cukes, muss, clms, britt, fuzz, bll, etc. In some places g.u. are small 0.5" and poor quality, but many were over 1.5". Big mussels and clam beds and some cuke patches.
6	57.4359	-135.6123	good to poor	good	20	40	20 –100	Urchins scattered poor to good densities. Size is getting bigger in some places, still lots of smalls; greens 20-40' or deeper. If quality was good area has potential. LBK, , NER, cukes, worms black cukes, muss, clams, britt, fuzz
7	57.4393	-135.6020	poor	poor	05	20	n/a	Good densities, better size, poor quality; a few scattered gu, rock, gravel, NER, Slbk, lbk
8	57.4329	-135.5934	good	good	10	50	10 –500	good density and size all around Grasstop with kelp patties, rock, gravel; this is another large bed like No. Big Island bed; scattered along for several hundred feet. Very little vegetation.

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Appendix B.11.–Page 2 of 2.

Mark	Latitude	Longitude	Density	Size	Depth Start (ft)	Depth Stop (ft)	Bed Width (ft)	Comments
9	57.4273	-135.5924	good	good	10	40	010 –500	N. Little Is: good-fair density and size, potential if quality there; S.Little Is:no consistent urchins, some good cukes; Adams Canal: few greens scattered; incorporates the washrock @ 57.25.805 135.35.578
10	57.4439	-135.5650	good	good	10	50	100	Good density and good size between 10–50', carpet of baby black cukes in shallow, NER, LBK; S. of Yellow Pt. pretty thick concentrations at the tidal level and scattered deeper; some bigger product showing up on east side.
11	57.4417	-135.5673	poor	poor	10	50	100	Decreases out toward Middle Pt., thick carpet of baby black cukes in shallows; greens all the way up to cukes, urchins poor quality and good density.
12	57.4374	-135.5709	good to poor	poor	10	50	100 –200	Lots of small urchins, getting thinner the further east toward Baby Bear Bay, big bed 100–200' wide; definite possibility of harvest if quality there; gravel, rock, ner, lbk
13	57.4346	-135.5658	good	good	10	40	50	Good density & size this area and size; density and size become commercially viable in 10-40' until 57.25.871 where it becomes cuke bottom until top of Bear Bay Is.
14	57.4298	-135.5712	good	good	05	40	005 –25	Density & size are good between 5–40', best in shallow. One of best potential areas heading south becomes cuke country; at 57.25.277 south throughout bear bay lots of cukes.
15	57.4184	-135.5805	good	good	05	15	005 –30	Green urchins start in patches w/ a thick small patch on gravel flat; Excellent cukes on this point; urchins stop in density until south of Pt. Siroi, which has a few urchins.
16	57.4191	-135.5879	good	good	20	20	005 –10	" "
17	57.4183	-135.5898	great	good	0	25	80	Great urchins, good size, 0–25', cukes also, NER, rock
18	57.4158	-135.5893	good	good to poor	10	25	150	Good density, urchins are getting smaller. This area is loaded with cukes.
19	57.4129	-135.5972	good north less to south	poor	0	25	20 –50	Great density of greens in shallow, small urchins and decreasing to south. At about 57.24.706, 135.36.062 it turns to thick lbk cuke bottom throughout Mt. Head and into Fish Bay; ner, sand, rock

Appendix B.12.–Results of green urchin reconnaissance survey in Subdistricts 112-12,13,14,50, March 24-27, 2001. See Figure 12 for survey areas

Mark	Latitude	Longitude	Dive Sequence	(Commercial) Density	(Commercial) Size	Depth (ft)	Habitat	Comments: species start/stop
1	57.4660	-134.8115	first dive 1	—	—	35	very rocky, bottom kelp	—
2	57.4669	-134.8101		above comm	comm	40	rocky	sea cukes
3	57.4708	-134.8111		—	—	25	rocky w/mixes of sand	—
4	57.4744	-134.8084		—	—	50	steep rock cliffs	basket stars
5	57.4765	-134.8099		above comm	comm	40	rocky bottom kelp	sea cukes
6	57.4842	-134.8141		below comm	comm	40	rocky bottom kelp	2 red sea urchins
7	57.4878	-134.8193		above comm	comm	30	rocky, sandy clam shells	sea cukes
8	57.4850	-134.8231		below comm	non comm	25	sandy, gravel	horse clams
9	57.4899	-134.8299		above comm	comm	30	steep rocky,bottom kelp	sea cukes
10	57.4906	-134.8307	end of dive	—	—	35	End of dive 1	—
11	57.4947	-134.8344	start of dive 2	—	—	—	—	—
12	57.4956	-134.8349		above comm	comm	30	rocky,bottom kelp	sea cukes
13	57.5019	-134.8354		below comm	non comm	20	gravel, rocky, popweed	green urchins
14	57.4983	-134.8302		above comm	comm	35	steep, rocky	sea cukes
15	57.4948	-134.8272		—	—	45	very rocky, bottom kelp	basket stars
16	57.4995	-134.8249		above comm	comm	40	rocky bottom	sea cukes
17	57.5022	-134.8272	end of dive	—	—	45	—	—
18	57.5085	-134.8289	start of dive 3	—	—	—	steep, rocky, bottom kelp	
19	57.5108	-134.8294		above comm	comm	45	rock, sand, clam shells	sea cukes
20	57.5203	-134.8291		above comm	non comm	35	rocky, bottom kelp	sea cukes
21	57.5199	-134.8456		below comm	comm	25	rocky, gravel, sand	2 green sea urchins
22	57.5240	-134.8483		—	—	45	steep, very rocky	no urchins or cukes
23	57.5293	-134.8521	end of dive	—	—	—	—	—
24	57.5327	-134.8557	start of dive 4	—	—	—	—	—
25	57.5385	-134.8562		below comm	non comm	20	rocky, gravel, 1 1/2 average	green urchins
26	57.5424	-134.8527		above comm	comm	45	gravel, bottom kelp	sea cukes

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Mark	Latitude	Longitude	Dive Sequence	(Commercial) Density	(Commercial) Size	Depth (ft)	Habitat	Comments: species start/stop
27	57.5459	-134.8483		above comm	non comm	30	gravel, sand patch 5x20ft	green urchins
28	57.5566	-134.8532		above comm	comm	45	rocky, bottom kelp	sea cukes
29	57.5570	-134.8527		—	—	40	very rocky,steep	end of dive
30	57.5639	-134.8528	start dive 5	below comm	comm size	20	gravel rock	green urchins
31	57.5664	-134.8508		above comm	comm size	45	rocky,gravel,sand	sea cucumbers
32	57.5719	-134.8507		below comm	non comm	15	sand,gravel	green urchins
33	57.5768	-134.8512		above comm	comm size	45	very steep, rocky	sea cucumbers
34	57.5816	-134.8510		below comm	non comm	25	rocky,with gravel covering #5	green urchins
35	57.5880	-134.8545	start dive 6	—	—	40	very steep, rock	—
36	57.5921	-134.8536		above comm	comm size	50	rocky, bottom kelp	sea cucumbers
37	57.5947	-134.8573		below comm	non comm	20	gravel, sand	green urchins
38	57.5972	-134.8584	end of dive	—	—	40	very steep, rocky	—
39	57.6082	-134.8639	start dive 7	—	—	—	—	57 36.494N
40	57.6109	-134.8676		below comm	non comm	15	rocky,sand w/shells	green urchins
41	57.6151	-134.8692		above comm	comm size	45	rocky, bottom kelp	sea cucumbers
42	57.6166	-134.8698	end of dive	—	—	—	very steep, rocky	—
43	57.6329	-134.8809	start dive 8	—	—	—	gravel, sand, shells	—
44	57.6338	-134.8842		—	—	35	gravel	no cucumber or urchins
45	57.6369	-134.8837	end of dive	—	—	—	rocky, very steep	—
46	57.6557	-134.8975	start dive 9	—	—	—	—	—
47	57.6558	-134.9011		above comm	comm size	45	rocky, gravel	sea cucumbers
48	57.6577	-134.9075	end of dive	—	—	—	steep, rocky	—
49	57.6659	-134.9307	start dive 10	—	—	—	—	—
50	57.6661	-134.9310		below comm	non comm	30	gravel, rocks	green urchins
51	57.6668	-134.9324		above comm	comm size	40	rocky, gravel, sand	sea cucumbers
52	57.6680	-134.9334		above comm	comm size	40	gravel, sand, bottom kelp	sea cukes/dungeness crab

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Appendix B.12.–Page 3 of 9.

Mark	Latitude	Longitude	Dive Sequence	(Commercial) Density	(Commercial) Size	Depth (ft)	Habitat	Comments: species start/stop
53	57.6691	-134.9349		—	—	20	gravel, sand	dungeness crab
54	57.6700	-134.9344		above comm	comm size	20	sand, silt	horse clams
55	57.6704	-134.9337	end of dive	—	—	25	gravel	—
56	57.6637	-134.9106		above comm	comm size	45	very steep, rocky, bottom kelp	sea cucumbers
57	57.6635	-134.9053		cukes above comm	comm size	25-45	very steep, rocky	sea urchins & cukes
58	57.8492	-134.9434	dive1 day2	—	—	—	—	—
59	57.8495	-134.9438		above comm	comm size	45	very steep, rocky	sea cucumbers
60	57.8520	-134.9464		below comm	comm size	25	very steep, rocky	green urchins
61	57.8564	-134.9563		above comm	comm size	45	very steep, rocky	sea cucumbers
62	57.8635	-134.9753		above comm	comm size	50	very steep, rocky	sea cucumbers/basket stars
63	57.8674	-134.9827	end of dive	—	—	—	very steep, rocky	—
64	57.8967	-135.0259	start dive 2	—	—	—	—	—
65	57.8975	-135.0272		above comm	comm size	45	rocky, bottom kelp	sea cucumbers
66	57.8986	-135.0288		below comm	comm size	25	rocky, bottom kelp	2 green urchins
67	57.8972	-135.0338		above comm	comm size	40	rocky, bottom kelp	sea cucumbers
68	57.8956	-135.0367		below comm	comm size	35	rocky, bottom kelp	green urchins
69	57.8952	#VALUE!		below comm	non comm	35	rocky, bottom kelp	green urchins
70	57.8991	-135.0498		below comm	comm size	30	gravel, sand	horse clams
71	57.8992	-135.0505		above comm	comm size	35	rocky	sea cucumbers
72	57.8990	-135.0525		above comm	comm size	45	rocky	sea cucumbers
73	57.9007	-135.0581		—	—	50	rocky	—
74	57.9022	-135.0657		above comm	non comm	40	rocky	sea cucumbers
75	57.9048	-135.0762		below comm	non comm	25	gravel, rocky bottom kelp	green urchins
76	57.9102	-135.0801		above comm	comm size	35	shell, gravel, rock	sea urchins
77	57.9109	-135.0881		below comm	non comm	35	rocky, bottom kelp	green urchins
78	57.9121	-135.0908		above comm	comm size	40	rocky, bottom kelp	sea urchins
79	57.9126	-135.0926		above comm	comm size	30	gravel, sand, shells	horse clams

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Appendix B.12.–Page 4 of 9.

Mark	Latitude	Longitude	Dive Sequence	(Commercial) Density	(Commercial) Size	Depth (ft)	Habitat	Comments: species start/stop
79	57.9126	-135.0926		above comm	comm size	30	gravel, sand, shells	horse clams
80	57.9132	-135.0957		above comm	comm size	35	rocky	sea urchins
81	57.9150	-135.1045		above comm	comm size	40	rocky	sea urchins
82	57.9167	-135.1107	end of dive	—	—	—	—	—
83	57.9213	-135.1286	start dive 3	—	—	—	—	—
84	57.9217	-135.1291		above comm	comm size	35	rocky	sea urchins
85	57.9220	-135.1296				40	gravel, sand, shells	weather vane scallop
86	57.9225	-135.1316		above comm	comm size	40	rocky, gravel, bottom kelp	sea urchins
87	57.9227	-135.1375		above comm	comm size	30	gravel, sand, shells	horse clams
88	57.9228	-135.1400		above comm	comm size	35	rocky, bottom kelp	sea urchins
89	57.9230	-135.1402		above comm	comm size	30	rocky, bottom kelp	sea urchins
90	57.9239	-135.1412		—	—	45	small skiff in front of log land	sunk boat 20 Ft
91	57.9277	-135.1485		above comm	comm size	40	rocky, gravel	sea urchins
92	57.9278	-135.1550		below comm	non comm	35	gravel, sand	green urchins
93	57.9325	-135.1604		above comm	comm size	40	rocky, bottom kelp	sea urchins
94	57.9359	-135.1659		—	—	45	gravel, shell	tanner crab
95	57.9364	-135.1672	end of dive	—	—	—	—	—
96	57.9429	-135.1894	start dive 4	—	—	—	—	—
97	57.9433	-135.1909		—	—	45	gravel, shell, bottom kelp	tanner crab
98	57.9438	-135.1920		above comm	non comm	40	gravel, shell, bottom kelp	sea urchins
99	57.9439	-135.1932		—	—	45	gravel, shell, bottom kelp	king crab
100	57.9445	-135.1941		above comm	comm size	40	gravel, shell, bottom kelp	sea urchins large
101	57.9455	-135.1966		above comm	comm size	45	gravel, shell, bottom kelp	sea urchins
102	57.9467	-135.1992		—	—	45	gravel, shell, bottom kelp	king crab
103	57.9483	-135.2025		above comm	comm size	40	gravel, shell, bottom kelp	sea urchins
104	57.9461	-135.2038		—	—	40	gravel, shell, bottom kelp	tanner crab
105	57.9451	-135.2017	end of dive	—	—	—	—	—

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Appendix B.12.–Page 5 of 9.

Mark	Latitude	Longitude	Dive Sequence	(Commercial) Density	(Commercial) Size	Depth (ft)	Habitat	Comments: species start/stop
106	57.9426	-135.1980	start dive 5	—	—	—	—	—
107	57.9415	-135.1978		above comm	comm size	40	rocky, gravel	tanner crab/sea cukes
108	57.9391	-135.1976		—	—	45	gravel, sand, shells	king crab
109	57.9377	-135.1986		below comm	non comm	35	gravel, sand, shells	green urchins
110	57.9358	-135.1995		above comm	comm size	40	rocky, gravel	sea urchins
111	57.9346	-135.2006		above comm	comm size	35	mud, sand, logs	sea urchins
112	57.9330	-135.1946		below comm	non comm	35	gravel, rock, bottom kelp	green urchins
113	57.9318	-135.1944		above comm	comm size	35	gravel, rock, bottom kelp	sea urchins
114	57.9308	-135.1907	end of dive	—	—	40	gravel, rock, bottom kelp	king crab
115	57.9301	-135.1910	start dive 6	—	—	—	rocky, bottom kelp	—
116	57.9298	-135.1909		above comm	comm size	30	rocky, bottom kelp	sea urchins
117	57.9297	-135.1909		below comm	comm size	30	rocky, bottom kelp	green urchins
118	57.9290	-135.1904		above comm	comm size	25	silty, sand, shells	sea urchins
119	57.9239	-135.1824	boat hit rock	—	—	—	rock	—
120	57.9223	-135.1774		below comm	comm size	20	rocky, bottom kelp	green urchins
121	57.9222	-135.1770		above comm	comm size	20	rocky, bottom kelp	sea urchins
122	57.9211	-135.1721		above comm	comm size	35	rocky, bottom kelp	sea urchins
123	57.9197	-135.1673		above comm	comm size	25	rocky,sand w/shells	albino sea cucumber
124	57.9170	-135.1651		above comm	comm size	35	rocky, sand, shells	sea urchins
125	57.9319	-135.1683	end of dive 6	—	—	—	—	—
126	57.9030	-135.1496	start dive 7	above comm	comm size	30	sand, shell, gravel	sea cukes
127	57.9016	-135.1427		above comm	comm size	20	sand, gravel, rocks	sea cukes
128	57.8948	-135.1438		—	—	35	sand, gravel, bottom kelp	weather vane scallop
129	57.8869	-135.1290		above comm	comm size	40	rocky	sea cukes
130	57.8857	-135.1237		above comm	comm size	40	rocky, very steep	sea cukes
131	57.8854	-135.1213		above comm	comm size	20	sand, gravel	horse clams
132	57.8850	-135.1192		above comm	comm size	25	sand, gravel	Horse clams/weather vane scallop

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Mark	Latitude	Longitude	Dive Sequence	(Commercial) Density	(Commercial) Size	Depth (ft)	Habitat	Comments: species start/stop
133	57.8832	-135.1164		above comm	comm size	50	sand, gravel	sea cukes big
134	57.8822	-135.1109		—	—	35	sand, gravel	weather vane scallop
135	57.8819	-135.1085		above comm	comm size	35	sand, gravel	horse clams/scallop
136	57.8812	-135.1037		above comm	comm size	40	rocks, gravel, bottom kelp	sea cukes
137	57.8813	-135.0983	end of dive 7	—	—	—	—	—
138	57.8977	-135.1011	start dive 2	—	—	—	rocky, bottom kelp	—
139	57.8989	-135.1010		below comm	non comm	25	rocky	green urchins
140	57.9004	-135.1069		above comm	comm size	45	rocky	sea cukes
141	57.8993	-135.1158		above comm	comm size	40	rocky	sea cukes
142	57.8946	-135.1034		above comm	comm size	45	gravel	sea cukes
143	57.8900	-135.0908		—	—	45	steep, rocky, bottom kelp	sea cukes
144	57.8900	-135.0879	end of dive 2	—	—	—	—	—
145	57.8797	-135.0777	start dive 3	—	—	—	—	—
146	57.8796	-135.0749		above comm	comm size	40	rocky, gravel	sea cukes
147	57.8749	-135.0684		above comm	comm size	25	sand, gravel, bottom kelp	horse clams
148	57.8677	-135.0620		above comm	comm size	35	gravel	sea cukes
149	57.8665	-135.0508		above comm	comm size	40	gravel, shell	sea cukes
150	57.8643	-135.0465		above comm	comm size	45	gravel, shell	sea cukes
151	57.8626	-135.0535		above comm	comm size	45	gravel shell	sea cukes
152	57.8607	-135.0501	end of dive 3	—	—	—	—	—
153	57.8473	-135.0279	start dive 4	—	—	—	—	—
154	57.8456	-135.0266		above comm	comm size	45	rocky, gravel, bottom kelp	sea cukes
155	57.8425	-135.0259		below comm	non comm	25	gravel, sand, shells	green urchins
156	57.8463	-135.0180	end of dive 4	—	—	—	—	—
157	57.8339	-134.9866	start dive 5	—	—	—	—	—
158	57.8314	-134.9245		above comm	comm size	30	gravel, sand, bottom kelp	sea cukes
159	57.8261	-134.9822		below comm	comm size	20	gravel, rocks	green urchins

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Mark	Latitude	Longitude	Dive Sequence	(Commercial) Density	(Commercial) Size	Depth (ft)	Habitat	Comments: species start/stop
160	57.8181	-134.9592		above comm	comm size	35	rocky, bottom kelp	sea cukes
161	57.8102	-134.9532		cukes above	comm size	30	gravel, sand, rocks sample #2	sea cukes/green urchins
162	57.7603	-134.9350	start dive 6	—	—	40	rocky, gravel	
163	57.7575	-134.9281		below comm	non comm	20	gravel, sand rock	green urchins
164	57.7537	-134.9259		above comm	comm size	40	gravel, bottom kelp	sea cukes
165	57.7497	-134.9216	end of dive 6	—	—	—	—	—
166	57.7452	-134.9225	start dive 7	—	—	—	—	—
167	57.7443	-134.9227		above comm	comm size	25	gravel, sand bottom kelp	horse clams
168	57.7426	-134.9182		below comm	comm size	30	gravel, sand bottom kelp	green urchins
169	57.7422	-134.9177		above comm	comm size	30	gravel, sand bottom kelp	sea cukes
170	57.7410	-134.9175		above comm	comm size	25	gravel, sand bottom kelp	horse clams
171	57.7407	-134.9171	end of dive 7	—	—	—	—	—
172	57.7232	-134.9183	start dive 8	—	—	—	—	—
173	57.7189	-134.9177		above comm	comm size	35	rocky bottom	sea urchins
174	57.7130	-134.9157		above comm	comm size	40	rocky gravel	sea urchins
175	57.7120	-134.9165	end of dive 8	—	—	—	—	—
176	57.7046	-134.9096	start dive 9	—	—	—	—	—
177	57.7044	-134.9095		above comm	comm size	45	rocky, bottom kelp	sea cukes
178	57.7023	-134.9081		above comm	comm size	30	sandy, gravel, bottom kelp	horse clams
179	57.7011	-134.9056		below comm	comm size	35	sandy, gravel, bottom kelp	green urchins
180	57.7328	-134.9054	end of dive 9	—	—	—	—	—
181	57.6744	-134.9174	start dive 10	—	—	—	—	—
182	57.6735	-134.9179		above comm	comm size	40	steep, rocky, bottom kelp	sea cukes
183	57.6708	-134.9131		above comm	comm size	45	steep, rocky, bottom kelp	sea cukes
184	57.6676	-134.9071		below comm	non comm	15	gravel, rocks	green urchins
185	57.6684	-134.9060	end of dive 10	—	—	—	—	—

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Mark	Latitude	Longitude	Dive Sequence	(Commercial) Density	(Commercial) Size	Depth (ft)	Habitat	Comments: species start/stop
186	58.0411	-134.9485	start dive 1	—	—	—	very rocky, steep	—
187	58.0402	-134.9488		above comm	comm size	45	very rocky, steep	sea cukes
188	58.0340	-134.9426		above comm	comm size	45	very rocky, steep,bottom kelp	sea cukes
189	58.0324	-134.9410	end of dive 1	—	—	—	—	—
190	58.0143	-134.9292	start dive 2	—	—	—	very rocky, steep, bottom kelp	—
191	58.0123	-134.9314		above comm	comm size	20	very rocky, steep, bottom kelp sample 4	sea cukes
192	58.0123	-134.9314		below comm	non comm	15	very rocky, steep, bottom kelp sample 4	sea urchins
193	58.0101	-134.9319	end of dive 2				very rocky, steep, bottom kelp sample 4	—
194	57.9973	-134.9327		below comm	comm size	45	very rocky, steep, bottom kelp scuba	sea cukes
195	57.9869	-134.9183		below comm	non comm	15	very rocky, steep, bottom kelp scuba	sea urchin
196	57.9869	-134.9183		above comm	comm size	50	very rocky, steep, bottm kelp scuba	sea cukes
197	57.9772	-134.9118		above comm	non comm	15	very rocky, steep, bottom kelp sample 5	green urchins
198	57.9742	-134.9185	start dive 3	—	—	—	—	—
199	57.9730	-134.9214		above comm	comm size	45	very rocky, steep, bottom kelp	sea cukes
200	57.9726	-134.9255		above comm	comm size	40	sand, gravel, shells	sea cukes
201	57.9722	-134.9272		—	—	35	sand, gravel, shells	baby king crabs 4"
202	57.9721	-134.9291		above comm	comm size	30	sand, gravel, shells	horse clams
203	57.9718	-134.9300		above comm	comm size	30	sand, gravel, shells	butter & cockles clams
204	57.9719	-134.9280		above comm	comm size	30	sand, gravel, shells	sea cukes
205	57.9707	-134.9326		—	—	30	sand,gravel, shells	dungeness crab
206	57.9694	-134.9328		above comm	comm size	30	sand, gravel, shells	horse clams
207	57.9689	-134.9327		—	—	35	sand, gravel, shells	dungeness crab
208	57.9685	-134.9326		—	—	35	sand, gravel, shells	butter clams
209	57.9673	-134.9315		—	—	40	sand, gravel, shells	dungeness crab
210	57.9666	-134.9312		above comm	comm size	35	sand, gravel, shells	sea cukes
211	57.9649	-134.9306		above comm	comm size	20	rocky, sand, gravel	sea cukes
212	57.9640	-134.9298		above comm	comm size	35	rocky, sand, gravel	sea cukes
213	57.9599	-134.9279	end of dive 3	—	—	—	—	—

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Mark	Latitude	Longitude	Dive Sequence	(Commercial) Density	(Commercial) Size	Depth (ft)	Habitat	Comments: species start/stop
214	57.9581	-134.9326		below comm	non comm	30	gravel, rocks	green urchins
215	57.9346	-134.9179	start dive 4	—	—	—	—	—
216	57.9315	-134.9188		above comm	comm size	40	rocks, very steep, bottom kelp	sea cukes
217	57.9232	-134.9197	end of dive 4	—	—	—	—	—
218	57.9162	-134.9385		below comm	non comm	15	rocky, very steep	green urchins
219	57.9162	-134.9385		below comm	non comm	50	rocky, very steep	sea cukes
220	57.8990	-134.9642	start dive 5	—	—	—	—	—
221	57.8988	-134.9686		above comm	comm size	20	gravel, sand, shells	sea cukes
222	57.8982	-134.9690		below comm	comm size	25	gravel, sand, shells	green urchins
223	57.8968	-134.9742		above comm	comm size	20	gravel, sand, shells	horse clams
224	57.8938	-134.9845		above comm	comm size	35	gravel, sand, shells	sea cukes
225	57.8941	-134.9854		—	—	30	gravel, sand, shells	butter clams
226	57.8937	-134.9877		—	—	30	gravel, sand, shells	dungeness crab
227	57.8912	-134.9948	end of dive 5	—	—	—	—	—

Appendix B.13.–Results of green urchin reconnaissance survey in Subdistricts 110-31,32,33,34, February 2-10, 2001. See Figure 13 for survey area

Mark	Sub district	Latitude	Longitude	(Commercial) Density	(Commercial) Size	Start depth (ft)	Stop depth (ft)	Habitat	Comments
1	110-15	57.1825	133.5667	NO	NO	—	—	SND, LAM, SHL	Nothing.
2	110-31	57.1862	133.5763	NO	NO	—	—	SND, SHL, GVL scattered LAM, transition from Icon to E.	Nothing.
3	110-31	57.1942	133.5451	NO	NO	—	—	SND with red algae	King crabs, crab bottom type.
4	110-31	57.2154	133.5073	NO	NO	15	50	SND, SHL, RCK, GVL, LAM	
5	110-31	57.2224	133.5017	NO	NO	20	40	SND with red algae, crab bottom type	DEAD ZONE
6	110-31	57.2252	133.5011	NO	NO	20	40	Transition from last lat and long. Ner visible on surface. SND, SHL, GUL.	Lots of clamshells.
7	110-31	57.2214	133.5123	NO	NO	35	40	GVL, SND, SHL edge of bank transitional area.	Scattered cukes, not highly concentrated. Most cukes at 57 13.597N 133 30.640W.
8	110-31	57.2222	133.5318	NO	NO	—	—	RCK, SND, NER, LAM	Steep and deep.
9	110-31	57.2268	133.5354	NO	NO	—	—	SND, RFK, NER on surface	—
10	110-31	57.2366	133.5433	NO	NO	35	10,000	RCK, BLD, LAM, NER on surface to SND BLD	Breaks away fast.
11	110-31	57.2418	133.5475	NO	NO	cliff drops off to 100 feet fast	114	—	cukes and green sea urchins scattered at bottom of wall
12	110-31	57.2439	133.5454	NO	NO	20	40	GVL, LAM, RCK, NER visible on surface. BLD, LBK, palm. Pops up from SND to a reef, nice bull kelp breaks away to a deep wall.	—
13	110-31	57.2450	133.5416	NO	NO	20	40	Black SND, scattered shell, no vegetation	—

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Mark	Sub district	Latitude	Longitude	(Commercial) Density	(Commercial) Size	Start depth (ft)	Stop depth (ft)	Habitat	Comments
14	110-31	57.2469	133.2469	NO	NO	20	50	SND shell off NER visible on SVR.	Green sea urchins on flats. Cukes. At 40 feet highest concentration of greens. This would be a commercial concentration, there is a density but they are patches about 30 feet long then they just stop.
15	110-31	57.2488	133.5425	NO	NO	20	70	NER on surface, RCK to SND, Palm LAM, FVC, heavy vegetation.	—
16	110-31	57.2211	133.5551	NO	NO	20	40	Finger reef breaks away. RCK to sand.	Some cukes.
17	110-31	57.2202	133.5660	NO	NO	20	60	Palm, steep wall. LAM, BLD, RCK, to SND, GVL.	Cukes at 55 ft, climbing slope.
18	110-31	57.2169	133.5708	NO	NO	35	50	SND, GVL, SHL, NER on surface	Cukes on east side of wash rocks, 35–40 feet, cukes on transition.
19	110-31	57.2130	133.5778	NO	NO	20	65	Shallow Shoal, rock wall LAM, SND, Palm, bottom of wall 65ft to SND.	Nobeltech shows island and there isn't one.
20	110-31	57.2637	133.5308	NO	NO	20	40	NER on surface, SND, SHELL, BLD, MLD.	Some greens.
21	110-31	57.2695	133.5173	NO	NO	20	40	SND, Shell, popweed, GVL, CBL, lively bottom, SND spit.	Lots of empty urchin shells, DEAD ZONE at some places, scattered non-commercial greens at 57 16.178N 133 31.057W.
22	110-31	57.2794	133.5219	NO	NO	20	45	NER on surface, 35ft SND, BLD, GRNS.	Scattered greens at 45ft.
23	110-31	57.2803	133.5131	NO	NO	40	45	NER, LBK, Palm 30ft offshore, SND, BLD.	Greens off NER bed.
24	110-31	57.2800	133.5052	NO	NO	20	25	RCK, palm, SND, BLD, GVL.	Transition to LAT/LONG end is a DEAD ZONE. Sand with red algae.

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Mark	Sub district	Latitude	Longitude	(Commercial) Density	(Commercial) Size	Start depth (ft)	Stop depth (ft)	Habitat	Comments
25	110-31	57.2833	133.4929	NO	NO	30	60	SND, SHL, GRNS	DEAD ZONE
26	110-31	57.2876	133.4999	NO	NO	20	60	MUS Urchin, SND, BLD.	—
27	110-31	57.2906	133.5010	NO	NO	20	40	SND, BLD.	Small sized green urchins.
28	110-31	57.2942	133.4932	NO	NO	20	40	SND, SHL, GVL, Scattered LAM, more lively bottom. Ends in eel grass in shallows of 20 feet or less.	—
29	110-31	57.2976	133.4864	NO	NO	30	70	SND, LAM, BLD breaks away fast.	—
30	110-31	57.2986	133.4912	YES	YES	40	70	SND, SHL	cukes on this slope, 500 foot bed.
31	110-31	57.3008	133.5013	NO	NO	40	50	BLD, SND.	Greens scattered deep.
32	110-31	57.3046	133.5069	NO	NO	20	70	MUS SND, SHL, to GVL, BLD, SND, GRNS, in some cukes.	—
33	110-31	57.3028	133.4914	NO	NO	20	60	MUS, SHL, SND, BLD, GVL, to RCK, LAM, palm	cukes at 60 feet, greens at 30–40ft.
34	110-31	57.3101	133.4978	NO	NO	40	50	GRNS, SND, SHL finger reefs BLD on SND	—
35	110-34	57.3517	133.4416	NO	NO	20	40	SND with red Algae DEAD ZONE	—
36	110-31	57.3691	133.4748	NO	NO	20	40	RCK Fingers on SND NER on surface, LAM on reef, green scattered on reef.	Scattered greens from 15 feet
37	110-31	57.3804	133.4782	NO	NO	20	40	NER, VRZ on surf, reefy SND, LAM, BLD, GVL, off reef palm, 15ft.	—
38	110-33	57.3992	133.4825	NO	NO	—	—	BLD, GVL, SND, RCK	—
39	110-33	57.3977	133.4609	NO	NO	—	—	SND, SHL	Couple cukes.
40	110-33	57.4040	133.4214	NO	NO	20	40	—	DEAD ZONE
41	110-33	57.4129	133.4397	YES	YES	20	45	LAM, SND, SHE	Cukes.
42	110-33	57.4147	133.4334	NO	NO	20	60	RCK, BLD, GVL to SND Lots of Brittle Stars	—

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Mark	Sub district	Latitude	Longitude	(Commercial) Density	(Commercial) Size	Start depth (ft)	Stop depth (ft)	Habitat	Comments
43	110-33	57.4162	133.4386	YES	YES	20	70	Ner on Surface. BLD, SND, GVL, LAM.	Commercial cukes, this is a happening bank. Cukes run all around. Scattered greens (non-com)
44	110-33	57.4205	133.4414	NO	NO	—	—	SND, GVL, LAM breaks away fast.	Cukes on slope.
45	110-33	57.4220	133.4304	NO	NO	70	80	Finger reefs to shallow 10ft, Palm LAM, RCK breaks away to GVL, SND, BLD 70-80ft wall come cukes.	—
46	110-33	57.4252	133.4306	NO	NO	20	40	Foul area in the middle of the narrows. Rock reef. Palm, lam, bld, snd, greens.	Breaks away fast.
47	110-33	57.4265	133.4326	NO	NO	30	40	Bld, snd, scattered greens.	Wall to 45 feet.
48	110-33	57.4240	133.4362	NO green urchins, YES cukes	NO green urchins	30	70	Snd, shl, mjs. At 60-70 feet breaks away to sand deep end. Commercial cuke spot at west end of bank.	—
49	110-33	57.4264	133.4401	NO	NO	20	40	Steep slope, dead zone with red algae.	—
50	110-33	57.4250	133.4439	NO	NO	20	100	Wall sand at bottom 100ft. Starts to break away at 20ft. Slope at end, cukes after 90ft of dead zone. Transition to snd, shl, lam in shallows.	—
51	110-33	57.4253	133.4490	YES cukes	YES	20	60	Commercial cukes all along flats to slope at tend of lat and long. MUS, shl, gvl, lam.	Good spot.
52	110-31	57.4208	133.4662	NO	NO	30	80	Snd, rck, reef, gvl, some cukes.	—
53	110-31	57.4262	133.4678	NO	NO	40	70	Snd, shell, lbk.	—
54	110-31	57.4271	133.4729	NO	NO	10	40	Hir, snd, shl at 30ft, scattered cukes in 34 ft shallow.	—
55	110-31	57.4302	133.4856	NO	NO	20	50	cukes at 50 feet, snd, lam, some shl, gvl, rck to shallow, fringe reefs at 20ft.	scattered cukes at 40ft.

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Mark	Sub district	Latitude	Longitude	(Commercial) Density	(Commercial) Size	Start depth (ft)	Stop depth (ft)	Habitat	Comments
56	110-31	57.4324	133.4839	NO	NO	20	40	snd, gvl to rock in shallows, fuc, popweed, red lam, palm on rock, lively bottom.	—
57	110-31	57.4310	133.4791	NO	NO	16	40	rck to bld, snd, gvl, shl, lam, red, fuc, lively bottom.	—
58	110-31	57.4368	133.4872	NO	NO	50	60	Empty urchin shells, snd, shl. Shallows, rck, snd, bld, palm, witch hair.	DEAD ZONE
59	110-31	57.4416	133.4936	NO	NO	15	30	Gvl, snd, palm, lots of mvj, quick transition to sand. Eel grass in shallows.	—
60	110-31	57.4462	133.5010	NO	NO	20	40	sand and eel grass	—
61	110-31	57.4594	133.5075	NO	NO	9	40	Rck, lam, snd, reef drops off at 40 feet bld transition.	—
62	110-31	57.4657	133.5188	NO	NO	20	30	Cbl, snd comes up quick, types of clams at 20 feet. Break to sand slope.	—
63	110-31	57.4716	133.5205	NO	NO	—	—	Super steep.	—
64	110-31	57.4753	133.5232	NO	NO	10	20	Rock to bld to snd with patches of eel grass.	—
65	110-31	57.4775	133.5244	YES cukes	YES cukes	20	60	Cukes between lat and long on rck wall to snd cbl lam at bottom of wall. Commercial cukes at 20-30 feet.	—
66	110-31	57.4791	133.5206	NO	NO	20	30	Cukes off the edge of reef to bld to snd palm in shallows.	—
67	110-31	57.4783	133.5283	NO	NO	20	40	—	DEAD ZONE
68	110-31	57.4789	133.5166	NO	NO	15	30	Snd to rock, lam, palm, red on snd.	—
69	110-31	57.4969	133.5252	NO	NO	20	40	Ner on surface, bld, lam, palm, nice reef.	—
70	110-31	57.5073	133.5260	NO	NO	20	40	Rck, snd.	—

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Mark	Sub district	Latitude	Longitude	(Commercial) Density	(Commercial) Size	Start depth (ft)	Stop depth (ft)	Habitat	Comments
71	110-31	57.5182	133.5258	NO	NO	0	40	Rck, gvl, snd, palm, ner on surface, shl, nice reef, lbk scattered palm.	All offshore islands in this stat area have commercially harvestable amounts of cukes. Most of these areas break away fast and deep and are relatively small but could potentially be worked.
72	110-34	57.5490	133.5099	YES cukes	YES cukes	20	40	Snd, rck, shl, cukes on wall, break away to finger reefs, cukes here.	—
73	110-34	57.5474	133.5046	NO	NO	20	45	Snd, shl, scattered lam drift , bottom cukes at 40-45 feet, no urchin.	—
74	110-34	57.5436	133.5011	NO	NO	10	45	Sand shl 20-45 feet, sand 10-20 feet transition to crab bottom type dead zone.	—
75	110-34	57.5425	133.4997	YES cukes	YES cukes	10	45	Snd, shl, dead zone, several hundred king crab. Sand, shl transition scattered lam, nice finger reefs with cukes.	—
76	110-34	57.5501	133.4969	NO	NO	20	40	Red algae, lam, snd, shl, witch hair, hir.	—
77	110-34	57.5561	133.4856	YES cukes	YES cukes	20	40	35ft dead zone, sand, red algae, eel grass in the shallows, cukes start at 25 feet with palm kelp, snd, lam, nice rock reef.	—
78	110-34	57.5589	133.4821	NO	NO	30	80	Sand, shl, break away hir lam, scattered.	—
79	110-34	57.5723	133.4818	YES cukes	YES cukes	20	40	Cukes start here on wall, snd, shl, lam to rock green leaf kelp.	Cukes on wall at end lat and long.
80	110-34			YES cukes	YES cukes		40	—	Cukes on wall at end lat and long.
81	110-34	57.5756	133.4719	YES cukes	YES cukes	35	40	Rck, snd, shl, lam, popweed.	Cukes running deep. 50+ cukes hiding in lam.

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Mark	Sub district	Latitude	Longitude	(Commercial) Density	(Commercial) Size	Start depth (ft)	Stop depth (ft)	Habitat	Comments
82	110-34	57.5777	133.4633	YES cukes	YES cukes	20	40	22ft transition to lam, snd, gvl, shl, looks like cuke habitat.	We did not see cukes here except commercial area at end lat and long.
83	110-34	57.5790	133.4563	YES cukes	YES cukes	20	30	cukes in shallow.	—
84	110-34	57.5811	133.4558	YES cukes	YES cukes	20	50	Cukes, rock, snd, palm kelp.	Cukes on wall.
85	110-34	57.5844	133.4529	NO	NO	45	80	Palm kelp on rock, 20-25 feel break away to rck fingers on sand.	Not much going on here for cukes. Seems like there should be some.
86	110-34	57.5862	133.4539	NO	NO	50	70	Cukes consistent on rock wall at this lat and long. Breaks away to 115ft fast.	—
87	110-34	57.5871	133.4520	NO	NO	20	40	40ft banks down snd, shl, lam, looks like cuke habitat but none seen.	At ending lat and long, is dead zone, sand less lively.
88	110-34	57.5862	133.4426	YES cukes	YES cukes	40	90	40ft rck, snd, cukes deep fast to 90ft, cukes climbing steep slope.	—
89	110-34	57.5898	133.4246	NO	NO	20	40	rck on snd shl, lam, pectin scallops step deep.	—
90	110-34	57.5907	133.4163	NO	NO	20	40	Snd, shl, lam, looks like cuke habitat, lively bottom.	—
91	110-34	57.5879	133.3673	NO	NO	20	40	Snd, shl, scattered kelp, lively bottom, at greater depths cbl, and gvl.	—
92	110-34	57.5844	133.4773	NO	NO	25	80	Snd, shl, king crabs at 25-80 feet, steep slopes. Not cukes seen.	Some areas in this sector are 400 feet deep.
93	110-34	57.5757	133.5095	NO	NO	20	40		DEAD ZONE
94	110-34	57.5735	133.5206	NO	NO	20	40	Rock, bld, to snd, popweed, lots of drift kelp, looks like cuke habitat.	Ball of king crab, several hundred.
95	110-34	57.5706	133.5296	YES cukes	YES cukes	15	60	Cukes, mus, ner on surface. 35 feet breaks away fast, cukes on rck in lbk, scattered greens.	—

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Mark	Sub district	Latitude	Longitude	(Commercial) Density	(Commercial) Size	Start depth (ft)	Stop depth (ft)	Habitat	Comments
96	110-34	57.5706	133.5296	NO	NO	20	40	Snd, shl, some lam, palm kelp on sand.	—
97	110-34	57.5650	133.5465	NO	NO	20	40	Sand wall, snd, shl, lam, palm, to dead zone, to bld, lam, snd, rck, shl, nice reef at last lat and long.	—
98	110-34	57.5616	133.5229	YES cukes	YES cukes	30	50	35 ft rock on snk, cukes at 50ft, snd. Lam, break away from reef to snd, mus, gvl.	—
99	110-34	57.5595	133.5274	YES cukes	YES cukes	20	140	Snd to large rock reef, lam palm 20ft breaks away to wall 130-140 feet down.	Drops away to "like a million feet" be careful.
100	110-34	57.5589	133.5250	NO	NO	40	50	Snd, shl, looks like good cuke habitat.	—
101	110-34	57.5589	133.5181	NO	NO	20	40	Rck finger reefs to bld cukes on rock.	—
102	110-34	57.4967	133.5809	NO	NO	20	40	Ner on surface, snd, shl, rock, lots of sun stars, steep and deep.	—
103	110-34	57.4945	133.5837	NO	NO	—	—	Non-commercial scattered greens on bld, gul.	Scattered cukes could be commercial if added to biomass from other areas. With cukes in stat area however it is a small area that breaks away deep and fast.
104	110-31	57.4306	133.5521	NO	NO	20	50	Rck, bld, snd, lam, sieve kelp, nice reef bank.	—
105	110-31	57.4276	133.5517	YES cukes	YES cukes	40	50	Bld, palm, nice jag, sand and shl at transition.	—
106	110-31	57.4234	133.5500	YES cukes	YES cukes	20	50	Snd, shl, across small bank.	Very consistent cukes probably 1,000 foot bed.
107	110-31	57.4232	133.5312	NO	NO	30	50	Snd, shl.	Jag of cukes off reef.

Appendix B.14.–Results of green urchin reconnaissance survey in Subdistricts 111-31,40,41, February 11-March 7, 2001. See Figure 14 for survey area

Mark	Sub district	Latitude	Longitude	Density commercial?	Size commercial?	Start depth (ft)	Stop depth (ft)	Habitat	Comments
109	111-31	57.8036	133.8990	NO	NO	20	40	Lam, snd, deadish, heavier lam in the shallows.	—
110	111-31	57.8387	133.9344	NO	NO	20	40	Snd, shl, gvl, clams of unknown origin.	—
111	111-31	57.8431	133.9412	NO	NO	20	50	Snd, shl, steep slope.	DEAD ZONE
112	111-31	57.8566	133.9637	NO	NO	40	80	Bow on the beach, 45-50 snd, shl at 70-80 breaks away quickly.	—
113	111-31	57.8589	133.9693	NO	NO	20	40	Steep and deep, clb, scattered bld, first lat and long is a transition to snd, red algae.	DEAD ZONE
114	111-31	57.8674	133.9695	NO	NO	20	40	Ner on surface, snd, shl, gvl, red algae, palm kelp, scattered lam.	—
115	111-31	57.8771	133.9830	NO	NO	20	40	Snd, shl, scattered ribbon kelp, some palm towards end lat and long.	—
116	111-31	57.8992	133.9832	NO	NO	19	140	rocks in shallows with heavy lam, breaks away to snd and shl, gvl slope.	140 feet deep at end lat and long. Off shore pinnacle is deep.
117	111-31	57.9121	133.9854	NO	NO	30	90	Bld, snd, rck reef, heavy bottom growth on rock, lam, agm, transition breaks off wall very fast.	Very deep at the end lat and long.
118	111-31	57.9271	133.0127	NO	NO	deep	—	115 feet here right off the beach. Forget it.	—
119	111-31	57.9348	133.0202	NO	NO	20	40	Rock on beach to sea pen, snd, shl, slope to snd, red algae.	—
120	111-31	57.9409	133.0348	NO	NO	20	45	Lam, snd, gvl, looks like cuke habitat. Scattered clams, type unknown.	End lat and long DEAD ZONE.

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Mark	Sub district	Latitude	Longitude	Density commercial?	Size commercial?	Start depth (ft)	Stop depth (ft)	Habitat	Comments
121	111-31	57.9426	133.0368	NO	NO	20	40	Snd, shl, gvl, red algae, lots of empty mussel shells at start lat and long. Ner on surface. Little bit of lam, empty urchin shells.	—
122	111-31	57.9485	133.0445	NO	NO	20	40	Ner on surface at 20ft more red algae, snd, less shl, some bld, patchy, dead zone type bottom.	Clams of unknown type, and *Cucamaria frondosa japonica* seen north of here— highly concentrated near shore and out on bank similar to areas seen on Hound Island near Kake.
123	111-31	57.9515	133.0506	NO	NO	12	40	12ft of water, heavy concentrations of cucumaria frondosa Japanica bundles of rock on the sand. These cucumbers are the black cuke, appears to be in a dormant state. They were laying down with the "flower" looking mouth retracted. When we observed CF J	—
124	111-31	57.9513	133.0485	NO	NO	25	30	Nice bundles of CF Japanica "Black Cuke". Snd, shl, bld, green scatted and small non commercial, black cukes an underutilized species that is here in commercial quantities all year.	—
125	111-31	57.9527	133.0487	NO	NO	20	40	Snd, shl, gvl, 57 57.187N 134 02.994W. At 40ft snd, gvl, scattered red algae, a couple black cukes at 33ft. Cukes starting dormant on bld on the snd cukes higher concentrations in shallows dormant.	—

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Mark	Sub district	Latitude	Longitude	Density commercial?	Size commercial?	Start depth (ft)	Stop depth (ft)	Habitat	Comments
126	111-31	57.9652	133.0469	NO	NO	35	50	At 35ft drops off. Snd, gvl, scattered small greens. No cukes, non commercial, ner on surface lots of empty urchin shells, mussels, bld, gvl.	—
127	111-31	57.9679	133.0528	NO	NO	20	40	Ner on surface, gvl, greens scattered, SND, greens 1/2 to 1 inch too small.	—
128	111-31	57.9688	133.0551	NO	NO	20	40	Steep and deep, snd, shl, gvl.	—
129	111-31	57.9774	133.0889	NO	NO	20	40	Bld, gvl, at 25 feet one piece of bull kelp on surface, at 30 feet snd, bld, gvl, some clams in gvl.	—
130	111-31	57.9799	133.0910	NO	NO	20	40	Transition to less shl, bld scattered lam to 30 ft.	End lat and long DEAD ZONE.
131	111-31	57.9862	133.0908	NO	NO	50	55	Wall, snd scattered bld. One red cuke Parasticopus Californicus between this lat and long and the next.	—
132	111-31	57.9868	133.0936	NO	NO	40	50	Snd, shl, lam, gvl, transitional area to end lat and long, red algae on the sand, dead zone at end.	—
133	111-31	57.9892	133.0913	NO	NO	40	60	Snd, shl.	—
134	111-31	57.0007	133.0839	NO	NO	very deep		"A million feet deep, was not able to look here."	—
135	111-31	57.0629	133.0200	NO	NO	20	40	Clams unknown, shl, lam, lbk, scattered bld rock, looks like cuke habitat.	—
136	111-31	57.0639	133.0170	NO	NO	20	40	Clams of unknown type, snd, shl, on red cuke seen.	—

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Mark	Sub district	Latitude	Longitude	Density commercial?	Size commercial?	Start depth (ft)	Stop depth (ft)	Habitat	Comments
137	111-31	57.0674	133.0149	NO	NO	20	40	Sand, shl, scattered bold, very scattered small greens on bld, maybe a dozen non-commercial near state dock.	—
138	111-31	57.0701	133.0146	NO	NO	20	40	Snd, shl, gvl, popweed, clams of unknown type.	—
139	111-31	57.2016	133.1528	NO	NO	20	40	Snd, bld, lam, shl, mus, green urchins small, scattered, non-commercial.	—
140	111-31	57.2046	133.1557	NO	NO	20	40	Snd, gvl, shl, lam, palm, empty urchin shells, clams of unknown type.	—
141	111-31	57.2056	133.1616	NO	NO	20	40	Snd, shl, mus, gvl, empty urchin shells.	—
142	111-31	57.2048	133.1662	NO	NO	40	50	Ner on surface, gvl, bld, deep zone, deep past 50 feet, scattered king crab.	—
143	111-31	57.2061	133.1722	NO	NO	20	40	Sand	DEAD ZONE
144	111-31	57.2064	133.1753	NO	NO	20	40	Snd, shl, wall, gets deep fast.	—
145	111-31	57.2077	133.1824	NO	NO	20	70	Snd, lots of sun stars, slope breaks away to 70 feet fast. Empty urchin shells with lack of live urchins.	Not exactly a coincidence, suns stars love to munch urchin.
146	111-31	57.2074	133.1892	NO	NO	20	40	Rock on beach to snd. Patchy bld on sand.	—
147	111-31	57.2055	133.1973	NO	NO	20	40	Snd to mus, hir, snd, shl, beginning transition on end lat and long.	—

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Mark	Sub district	Latitude	Longitude	Density commercial?	Size commercial?	Start depth (ft)	Stop depth (ft)	Habitat	Comments
148	111-31	57.2051	133.2057	NO	NO	20	40	Snd, shl, gvl, bld, reef rock with empty green shells.	—
149	111-31	57.2045	133.2154	NO	NO	20	40	Lam, palm, snd, gvl, clams at 40 feet.	—
150	111-31	57.2071	133.2256	NO	NO	40	60	Mus, lots of clams, snd, shl.	—
151	111-31	57.2093	133.2301	NO	NO	20	40	Snd, shl, gvl, lam, scattered bld, clams.	—
152	111-31	57.2137	133.2380	NO	NO	20	40	Empty urchin shells, mussels also empty, snd, gvl, bld on snd to snd with red algae.	Last lat and long DEAD ZONE.
153	111-31	57.2191	133.2461	NO	NO	0	20	Ner, bld green empty shells, gvl on sand, to greens on snd.	—
154	111-31	57.2201	133.2475	NO	NO	15	20	Greens scattered, snd, gvl.	DEAD ZONE
155	111-31	57.2228	133.2536	NO	NO	20	40	Greens on sand, red algae.	DEAD ZONE
156	111-31	57.2260	133.2592	NO	NO	0	20	Snd, red algae, bld, lettuce kelp, green leaf.	—
157	111-31	57.2277	133.2650	NO	NO	20	40	Gvl, mus.	DEAD ZONE at 35 feet.
158	111-31	57.2289	133.2691	NO	NO	20	40	Rock reefs to snd, non commercial scattered greens.	Last lat and long DEAD ZONE.
159	111-31	57.2305	133.2724	NO	NO	20	40		DEAD ZONE
160	111-31	57.2351	133.2815	NO	NO	10	30	Bld, few greens to sand.	DEAD ZONE at 20 feet.
161	111-31	57.2434	133.2962	NO	NO	10	30	17ft bld, snd, gvl, mus.	—
162	111-31	57.2470	133.3008	NO	NO	10	30	Sand.	"Just forget it."
163	111-40	57.1981	133.2608	NO	NO	20	40	Snd, sea pens, dead zone, to ner on surface, shl.	This is a little cove between Douglas and Marmion Islands.

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Appendix B.14.–Page 6 of 11.

Mark	Sub district	Latitude	Longitude	Density commercial?	Size commercial?	Start depth (ft)	Stop depth (ft)	Habitat	Comments
164	111-40	57.1945	133.2593	NO	NO	20	40	Snd, shl, gvl, rock, empty urchin shells.	—
165	111-40	57.1930	133.2732	NO	NO	30	40	Snd, gvl, bld, shl, steep slope.	Steep and deep in this area.
166	111-40	57.1922	133.2855	NO	NO	25	50	Snd, shl, gvl, steep slope.	—
167	111-40	57.1938	133.3034	NO	NO	25	50	Rock, gvl, to snd, shl, slope, steep at 30feet.	—
168	111-40	57.1955	133.3253	NO	NO	25	50	27-50 foot break away fast, dead zone, red algae, sand.	Empty urchin shell scattered.
169	111-40	57.2220	133.4324	NO	NO	30	45	This area was a lot of slopes that broke away fast and deep. Ran down the line to try to find a change in the bottom. Snd, shl, bld, lam, palm, cukes Parasticopus Californicus.	Some cukes between these lat and longs.
170	111-40	57.2249	133.4419	NO	NO	20	40	Dead zone at 40 feet, snd, red algae. Fairly rapidly changing bottom. This area and last lat and long are defined on the chart by a bank that runs off the beach.	—
171	111-40	57.2254	133.4477	NO	NO	20	40	—	DEAD ZONE
172	111-40	57.2184	133.4102	NO	NO	30	75	Snd, slope, big ball of king crabs at 60-70 feet. At 40-50 feet slope, sea pens, one huge rock. Mostly dead zone.	—
173	111-40	57.2169	133.4972	NO	NO	40	50	Maybe 1/4 mile off shore, snd, shl, scattered cukes.	—

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Mark	Sub district	Latitude	Longitude	Density commercial?	Size commercial?	Start depth (ft)	Stop depth (ft)	Habitat	Comments
174	111-40	57.2154	133.5013	Possible	YES	30	50	Cukes on gvl snd off of kelp transition, not in the lam at 50 ft. This was a nice jag of Californicus maybe 500-1000 feet wide. We couldn't find more.	This spot does have a commercial concentration, but at the end lat and long, there were no more.
175	111-40	57.2162	133.5115	NO	NO	20	50	red algae, snd, dead zone, clams.	—
176	111-40	57.2171	133.5167	NO	NO	20	50	red algae, snd, dead zone, clams.	—
177	111-40	57.2182	133.5235	NO	NO	30	40	red algae, snd, dead zone, clams.	—
178	111-40	57.2222	133.5366	NO	NO	20	40	red algae, snd, dead zone, clams.	—
179	111-40	57.2224	133.5447	NO	NO	20	40	Heavier red algae, thins as gets deeper, clams of types unknown.	—
180	111-40	57.2233	133.5540	NO	NO	20	40	Heavier red algae, thins as gets deeper, clams of types unknown.	—
181	111-40	57.2259	133.5674	NO	NO	20	40	red algae, snd, dead zone, clams.	—
182	111-40	57.2272	133.5764	NO	NO	20	50	This area is all rather similar bottom type where you usually wouldn't find urchins. No reefs, snd bottom.	—
183	111-40	57.2293	133.5902	NO	NO	20	70	Snd, slope breaking away fast. At 20-40 feet bld transition.	—
184	111-40	57.2318	133.5926	NO	NO	20	30	Snd, shl, gvl, slope, clams unknown.	—
185	111-40	57.2348	133.5965	NO	NO	20	40	Snd, gvl, slope.	—
186	111-40	57.2354	133.5976	NO	NO	20	40	Snd, gvl, slope.	—
187	111-40	57.2384	133.6053	NO	NO	20	40	Snd, gvl, slope.	—
188	111-40	57.2408	133.6114	NO	NO	20	40	Snd, gvl, slope.	—
189	111-40	57.2428	133.6196	NO	NO	20	40	Snd, sea pen, 30 ft, dead zone.	—

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Mark	Sub district	Latitude	Longitude	Density commercial?	Size commercial?	Start depth (ft)	Stop depth (ft)	Habitat	Comments
190	111-40	57.2451	133.6224	NO	NO	20	40	Clams, snd.	—
191	111-40	57.2447	133.6236	NO	NO	20	40	Snd, gvl, slope.	—
192	111-40	57.2456	133.6311	NO	NO	20	40	Snd bank off west of Middle Point, drops off from 25ft to 100 feet fast. Sea pens, sand, dead zone, sand spit off point.	—
193	111-40	57.2472	133.6350	NO	NO	20	50	Snd, shl, rock, palm, lam, seems like good cuke habitat, none seen, transitional area.	—
194	111-40	57.2487	133.6350	NO	NO	20	40	Palm, snd, shl, gvl, lam, cuke habitat.	—
195	111-40	57.2573	133.6523	NO	NO	20	40	Sea pens, dead zone. This is consistent on this shoreline. Crab bottom.	—
196	111-40	57.2645	133.6523	NO	NO	20	40	Snd, lam, cukes at 40 feet, nice jag from here to next lat and long, small area that switches back to dead zone fast.	—
197	111-40	57.2650	133.6528	NO	NO	20	40	Less cukes here.	—
198	111-40	57.2491	133.6538	NO	NO	20	40	Dead zone, sand, sea pens.	—
199	111-40	57.2674	133.6531	NO	NO	20	40	Dead zone.	—
200	111-40	57.2742	133.6640	NO	NO	15	40	Mus, snd, shl, couple cukes, transitional, scattered.	—
201	111-40	57.2824	133.6753	NO	NO	20	40	Sand.	—
202	111-40	57.2875	133.6808	NO	NO	20	40	Nice reef on this lat and long. At 20 feet, lbk, rck, bld, palm to sand at 40 ft.	—

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Mark	Sub district	Latitude	Longitude	Density commercial?	Size commercial?	Start depth (ft)	Stop depth (ft)	Habitat	Comments
203	111-40	57.2912	133.6830	NO	NO	20	40	Snd, dead zone.	—
204	111-40	57.2934	133.6842	YES cukes	YES Cukes	20	40	Lbk, palm on rock, bld, snd, shl, lam to 40 feet. Transition area. Cukes commercial from here to South of Auke Bay Northern statistical line.	—
205	111-40	57.2968	133.6875	NO	NO	20	40	Snd , slope, cukes scattered.	—
206	111-40	57.3034	133.6913	NO	NO	40	70	Cukes at 20 feet rock palm lam to snd, shl at 50 feet. Slopes off fast.	This area with the last lat and long that had cukes is a small area. It could be fished and is commercial—however this small of an area may turn out a very small quota and may not be worth the ADF&G's time to survey.
207	111-40	57.3037	133.6900	NO	NO	20	40	Sea pens, dead zone.	—
208	111-40	57.3024	133.6868	NO	NO	40	75	Snd, slope.	—
209	111-40	57.3057	133.6892	NO	NO	20	40	Lam, snd, shl, mus, gvl. Looks like cuke habitat but none seen.	—
210	111-40	57.3068	133.6867	NO	NO	20	40	Rck, snd, shl, palm.	End of Douglas Island crossing over to North Admiralty Island.
211	111-40	57.2644	133.7209	NO	NO	20	40	black cukes, small greens scattered on rock to bld, snd less urchin at 40ft.	—
212	111-40	57.2642	133.7219	NO	NO	20	40	30-35 feet, sea pens, snd, few greens because all the green throughout these lats and longs are non-commercial because they are only half the size of a commercial urchin.	—
213	111-40	57.2629	133.7244	NO	NO	20	40	Snd, shl, dead zone.	—
214	111-40	57.2617	133.7267	NO	NO	20	40	Dead zone.	—

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Mark	Sub district	Latitude	Longitude	Density commercial?	Size commercial?	Start depth (ft)	Stop depth (ft)	Habitat	Comments
215	111-40	57.2606	133.7268	NO	NO	20	40	Snd, shl, lam.	—
216	111-40	57.2592	133.7248	NO	NO	20	50	Nice jag of red cukes here but they stopped abruptly. Small concentration. Snd, shl at 50 feet.	—
217	111-40	57.2578	133.7231	NO	NO	20	40	Gvl, snd, a couple of red cukes, some green urchin. No concentration.	—
218	111-40	57.2574	133.7233	NO	NO	20	40	Scattered greens and small urchin.	—
219	111-40	57.2548	133.7209	NO	NO	20	40	Bld, snd, greens small and scattered.	—
220	111-40	57.2507	133.7187	NO	NO	20	40	Ner, bld, snd, greens all along black cukes…non-commercial.	—
221	111-40	57.2485	133.7174	NO	NO	20	40	Snd, some greens, couple of black cukes, greens scattered all along.	—
222	111-40	57.2440	133.7191	NO	NO	20	50	Snd, shl, looks like cuke habitat, dead zone.	—
223	111-40	57.2366	133.7210	NO	NO	20	40	Dead zone.	This area looks like it has potential for cukes. Nice narrows with current.
224	111-40	57.2439	133.7044	NO	NO	20	40	Dead zone. Sea pens, consistent down this shoreline.	—
225	111-40	57.2272	133.7044	NO	NO	20	40	Dead zone. Sea pens, consistent down this shoreline.	—
226	111-40	57.2040	133.7082	NO	NO	20	40	Offshore bank, snd, shl, gvl.	—
227	111-40	57.1896	133.7023	NO	NO	20	40	Snd, gvl, one red cuke seen.	—
228	111-40	57.1870	133.6965	NO	NO	20	40	Snd, shl, dead zone.	—
229	111-40	57.1714	133.6973	NO	NO	20	40	Dead zone.	—

–continued–

Mark	Sub district	Latitude	Longitude	Density commercial?	Size commercial?	Start depth (ft)	Stop depth (ft)	Habitat	Comments
230	111-40	57.1671	133.6971	NO	NO	20	40	Snd, shl, dead zone.	—
231	111-40	57.1644	133.6439	NO	NO	20	50	This area changes from mainly dead zone to occasional patches of snd and shl that looked like cuke habitat but no cukes were present.	—
232	111-40	57.1751	133.6040	NO	NO	20	40	Consistent cukes scattered at 50 feet. Snd and shl. This area could be harvested but there is much area without cukes. The area would probably yield a very small quota.	—
233	111-40	57.1834	133.5992	NO	NO	20	50	Snd, shl, lam, cukes at 30 feet scattered.	—
234	111-40	57.1848	133.5942	NO	NO	20	40	Snd, shl.	—
235	111-40	57.1928	133.5812	NO	NO	20	50	Red cukes scattered at 40-50 feet, snd, shl, gvl. Cukes at end lat and long are enough for small commercial harvest.	Again, areas with cukes are patchy. There are commercially harvestable areas but each area is in the middle of extensive shoreline without product.
236	111-41	57.1816	133.5236	NO	NO	20	40	Mainly dead zone with scattered snd and shl.	Start of Admiralty Island East of Young Bay.
237	111-41	57.1741	133.4315	NO	NO	20	40	Mainly dead zone with scattered snd and shl.	—
238	111-41	57.1686	133.4037	NO	NO	20	40	Mainly dead zone with scattered snd and shl.	—
239	111-41	57.1586	133.3798	NO	NO	20	40	Mainly dead zone with scattered snd and shl.	—

Appendix B.15.–Results of green urchin reconnaissance survey in Subdistricts 111-11,12,13,14,15,16,17, April 18-21, 2001. See Figure 15 for survey area

Mark	Begin Latitude	Begin Longitude	Green urchin Density commercial?	Green urchin size commercial?	Cucumber Density commercial?	Min. Depth	Max. Depth	Bed Width	Habitat	Comments
1	57.6691	-133.9347	No	n/a	No	20'	50'	NA	gvl,snd, lbk	low density cucumbers, lots of kelp some light commercial patches
2	57.7032	-133.9816	No	n/a	No	20'	60'	n/a	mud,snd,lbk	king crab,cucumbers present
3	57.7194	-134.0011	No	n/a	No	20'	60'	n/a	snd,shl,lbk	lots of kelp cucumbers but non comm
4	57.7282	-134.0044	No	n/a	No	20'	60'	—	snd,shl,lbk	lots of kelp some non com cucumbers
5	57.7430	-134.0037	No	n/a	No	20'	60'	n/a	snd,shl,lbkk	
6	57.7565	-134.0147	No	n/a	No	20	60'	n/a	snd,shl,rck	lots of kelp some cucumbers but non comm
7	57.8058	-134.0429	No	n/a	No	20	60'	n/a	—	—
	57.8438	-134.0971	No	n/a	No	20'	60'	n/a	—	—
8	57.8887	-134.1312	No	No	Yes	30	60	300	grv,snd,rocky	hig current area,lots of kelp,by the end urchin patch non com
9	57.9098	-134.1470	No	No	No	20'	60'	n/a	gvl,shl,snd,	lots of kelp some ok patches
10	57.9198	-134.1435	No	No	No	20'	60'	n/a	—	—
11	58.0021	-134.2127	No	No	No	20'	60'	n/a	—	—
12	58.0221	-134.2365	Yes	Yes	No	20'	60'		urchins patches	urchins patches ,sponges
13	58.0360	-134.2516	Yes	Yes	No	20'	60'	n/a	—	urchins only in large sizes, lots of sponges, star fish in places were there are no urchins.
15	57.9821	-134.2161	No	No	No	—	—	n/a	shl,roc,gvl, star fish	only non-commercial cucumbers—no urchins ,
16	57.9528	-134.2925	No	No	No	20'	60'	n/a	mud,snd,lbk	no urchins some non comm cucumbers
17	57.9099	-134.2510	No	No	No	20'	60'	n/a	gvl,mud,shl,star fish	cucumbers very rare
18	57.8924	-134.2806	No	No	No	20'	60'		snd rck lbk	—
19	57.8600	-134.2950	No	No	No	20'	60'	n/a	snd rck lbk	—

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Mark	Begin Latitude	Begin Longitude	Green urchin Density commercial?	Green urchin size commercial?	Cucumber Density commercial?	Min. Depth	Max. Depth	Bed Width	Habitat	Comments
20	57.8558	-134.3093	No	No	No	20'	60'	n/a	snd rck lbk	—
21	57.8548	-134.2892	No	No	No	20'	60'	n/a	snd rck lbk	—
22	57.8753	-134.2517	No	No	light comm	20'	60'	—	sndgvl lbk	—.
23	57.8558	-134.2190	No	No	No	20'	60'	—	snd rck lbk	—
24	57.8348	-134.2102	—	—	—	—	—	—	—	—
25A	57.8254	-134.2001	No	No	No	20'	60'		gvl, lose rck	some light comm patches
25B	57.8101	-135.1831	No	No	Yes	20	60	patches	snd,rck, gvl	some light comm patches—some urchins present only by the sand bar
26	57.7650	-134.1397	No	No	Yes	—	—	patches	snd,rck,	—
27	57.7515	-134.1358	No	No	No	—	60	n/a	gvl,rck,mud,shl	—
28	57.8967	-134.2233	No	No	No	—	60	n/a	—	—.
29	57.8849	-134.2133	No	No	No	20	60	n/a	gvl,rck,mud,shl	—
30	57.8502	-134.1966	No	No	No	20	60	n/a	soft mud,gvl,lbk,	—
31	57.8528	-134.1818	No	No	No	20	60	n/a	shl,mud,gvl,lbk	—
32	57.8422	-134.1931	No	No	No	20	60	n/a	snd,lbk,rck	—
33	57.8018	-134.1511	No	No	No	20	60	n/a	snd,lbk,rck	light commercial patch
34	57.7985	-134.1546	No	No	No	20	60	n/a	snd,lbk,rck	some marginal commercial cucumbers around the rocks
35	57.7941	-134.1434	No	No	No	20	60	n/a	snd,lbk,rck	—
36	57.7720	-134.1219	No	No	No	20	60		snd,lbk,rck	—
37	57.7147	-134.0877	No	—	—	20	60	n/a	gvl,rck,shl,lbk	very good looking bottom but cucumbers rare; starfish predation
38	57.6789	-134.0448	No	No	No	20	60	n/a	—	—
39	57.6707	-134.0716	No	No	No	20	60	n/a	gvl,lbk,	star and sun fish predation–no cucumbers

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Appendix B.15.–Page 3 of 3.

Mark	Begin Latitude	Begin Longitude	Green urchin Density commercial?	Green urchin size commercial?	Cucumber Density commercial?	Min. Depth	Max. Depth	Bed Width	Habitat	Comments
40	57.6610	-134.0465	No	—	—	20	60	n/a	—	—
41	57.6691	-134.0374	No	No	No	20	60	n/a	—	—
42	57.6463	-133.9907	No	No	No	20	60	n/a	—	—
43	57.6354	-133.9669	No	—	—	20	60	n/a	snd,	We counted cucumbers between points— total 200 cucumbers in that area. Results apprx. reflects most of the area, not counting inlets where there is almost no cucumbers
44	57.6272	-133.9546	No	No	No	20	60	n/a	snd,	—

Appendix B.16.–Results of green urchin reconnaissance survey in Subdistricts 115-10,-20,-31, April 14, 2001. See Figure 16 for survey area

Mark	Begin Latitude	Begin Longitude	Green urchin Density commercial?	Green urchin size commercial?	Cucumber Density commercial?	Min. Depth	Max. Depth	Bed Width	Habitat	Comments
1	58.4942	134.7973	No	not	yes, marginal	20'	50'	NA	bld, gvl,mud,shl, king crab	low density cucumbers, marginal
2	58.5428	134.8764	No	n/a	No	20'	60'	n/a	rck,snd,cbl,wdy,lbk	hard to get area, some cucumbers, not comm
3	58.6070	134.9333	No	n/a	No	20'	60'	n/a	snd,rck,shl,lbk	cucumbers present mostly around the rocks, very non commercial
4	58.6281	134.9508	No	n/a	Yes.	20'	60'	300'	rck,snd,lbk	cucumbers present , low comm
5	58.6341	134.9500	Yes	Yes	Yes	20'	60'	400'	rck,snd,lbk,red,hir,	current area, cucumbers low commercial, in S. part, N part had only single cucumbers, sea urchins mostly small, but there are comm size too
6	58.6439	134.9644	No	n/a	No	20	60	n/a	snd,rck,shl,lbk	single cucumbers only, non comm, no bottom
7	58.6660	134.9857	No	n/a	No	20	60	n/a	snd,rck shl,lbk	sandy bottom past p.Bridget, lots of shells, star fish
Echo Cove entrance	58.6834	135.9238	Yes	Yes	No	20'	60'	300'	cbl,snd	high density urchins, but only in narrow passage—starfish predation outside cove, inside Echo cove only sand
8	58.6834	135.9238	No	No	No	20	60	n/a	snd, rck, lbk,gvl	some single cucumbers, not comm
9	58.7114	134.9495	No	No	No	20'	60'	n/a	snd,rck,shl,lbk	some single cucumbers, not comm
10	58.7760	134.9371	No	No	No	20'	60'	n/a		
11	58.7702	135.0224	No	No	No	20'	60'	n/a	mud,shl,lbk,	Dungeness crab, tuner .crab,lots of clam holes some very large, blue mussel shells

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Mark	Begin Latitude	Begin Longitude	Green urchin Density commercial?	Green urchin size commercial?	Cucumber Density commercial?	Min. Depth	Max. Depth	Bed Width	Habitat	Comments
12	58.7299	135.0203	No	No	No	20'	60'	n/a	mud,shl,rck,bldlbk,brown algae	kelp on rocks, king crab, no cucumbers or urchins
13	58.7940	135.0934	No	No	No	20'	60'	n/a		only single cucumbers
14	58.8447	135.1543	No	No	No	20'	60'	n/a	low density cucumbers, marginal	—
15	58.8592	135.1577	5 0	No	No	20'	60	n/a	bld with algae, gvl,mud,shl, king crab	urchins in patches—some com, some not
16	58.8827	135.1475	No	No	No	20'	60'	n/a	bld, gvl,mud,shl,	urchins in patches—some com some not
17	58.9065	135.1609	No	No	No	20'	60'	n/a	san,rck,bld,	only single urchins present
18	58.0098	135.1943	No	No	No	20'	60'	n/a	san,rck,bld,	only single urchins present

Appendix B.17.– Results of green urchin reconnaissance survey in Subdistricts 114-23,25,27,80, March 12-May 5, 2001. See Figure 17 for survey area

Section No.	Date	Latitude	Longitude	Commercial Green urchin density?	Commercial Green urchin size?	Commercial Cucumber density?	Min. Depth	Max. Depth	Habitat	Comments
1	3/12/2001	58.1435	-135.3999	NO	NO	NO	20'	50'	sand, rck,	some cucumbers only on rocks
2	3/12/2001	58.1194	-135.3330	NO	NO	NO	20'	60'	—	—
3	3/12/2001	58.0965	-135.2277	NO	NO	NO	20'	60'	snd,grl,rck,	urchins in patches mostly small
4	3/12/2001	58.0963	-135.2237	NO	NO	NO	20'	60'	rck,grl,	urchins in patches mostly small
5	3/12/2001	58.0939	-135.1742	NO	NO	NO	20'	60'	sand rck	—
6	3/12/2001	58.0921	-135.1105	NO	NO	NO	20	60	—	small patch comm, rest non-comm, few cucumbers non-comm
7	3/12/2001	58.0810	-135.0833	NO	NO	NO	20	60	snd rck	—
	3/12/2001	—	—	—	—	—	—	—	—	large urchins in comm patches—some cucumbers, mussels
8	3/12/2001	58.0714	-135.1114	NO	NO	NO	20	60	mud,rck	large urchins , comm patches—some cucumbers
9	3/12/2001	58.0714	-135.0781	NO	yes	NO	20'	60'	mud,rck	large urchins , comm patches—some cucumbers, king crab
10	3/12/2001	58.0648	-135.0866	NO	NO	NO	20'	60'	—	—
11	3/12/2001	58.0646	-135.0538	NO	NO	NO	20'	60'	—	—
12	3/12/2001	58.0521	-135.9988	NO	NO	NO	20'	60'	—	—
13	3/12/2001	58.0420	-135.9527	NO	NO	NO	20'	60'	rck,snd,lbk,	no urchins, single cucumbers
14	3/12/2001	58.2169	-135.9601	NO	NO	NO	20'	60'	—	—
15	3/12/2001	58.2393	-135.9262	5 0	NO	NO	20'	60	soft cloy	Fern-shape moss-like kelp—some kind of clam holes in the bottom

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Section No.	Date	Latitude	Longitude	Commercial Green urchin density?	Commercial Green urchin size?	Commercial Cucumber density?	Min. Depth	Max. Depth	Habitat	Comments
17	3/12/2001	58.2500	-135.8978	NO	NO	NO	20'	60'	mud,rck,lbk	rocks covered with mud, moss-like 3- to 4-inch kelp
18	3/12/2001	58.2849	-135.8279	NO	NO	NO	20'	60'	—	—
	3/12/2001	—	—	—	—	—	—	—	rck	—
19	3/12/2001	58.2883	-135.7903	—	—	—	—	—	—	—
	3/12/2001	—	—	—	—	—	—	—	—	—
20	3/12/2001	58.2782	-135.7732	—	—	NO	20'	60'	mud,rck	some cukes on shallow
21	3/12/2001	58.2769	-135.7560	—	—	NO	20'	60	mud,rock	some cucumbers present, moss-like kelp
	3/12/2001	—	—	—	—	NO	20'	60	—	high current
22	3/12/2001	58.2361	-135.6449	—	—	NO	20'		—	—
	3/12/2001	—	—	—	—	NO	20'	60	—	—
23	3/12/2001	58.2251	-135.6323	—	—	NO	20	60	mud,lose rock,lbk	—
	3/12/2001	—	—	—	—	NO	20	60	—	—
24	3/12/2001	58.2174	-135.6015	—	—	NO		60	—	—
	3/12/2001	—	—	—	—	NO	20	60	—	—
25	3/12/2001	58.1885	-135.5261	—	—	NO	20'	60		cucumbers presen,t sea anemones,
	3/12/2001	—	—	—	—	NO	20'	60	—	—

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Section No.	Date	Latitude	Longitude	Commercial Green urchin density?	Commercial Green urchin size?	Commercial Cucumber density?	Min. Depth	Max. Depth	Habitat	Comments
26	3/12/2001	58.1738	-135.4948	—	—	NO	20'	60		
	3/12/2001	—	—	—	—	NO	20'	60	snd,grvl,	ribbon kelp, empty shells,silty bottom, green lettuce kelp
	3/12/2001	—	—	—	—	NO	20'	60	—	—
27	3/12/2001	58.1874	-135.0625	—	—	comm.	20'	60	—	—
	3/12/2001	—	—	—	—	NO	20'	—	mud, brown alge,shl	cucumbers present, light commercial patches
	3/12/2001	—	—	—	—	NO	20'	—	—	—
28	3/12/2001	58.2016	-135.0939	—	—	NO	20'	—	—	cucumbers present, light commercial patches
	3/12/2001	—	—	—	—	NO	20'	—	—	—
29	3/12/2001	58.2005	-135.1097	—	—	—	—	—	—	—
	3/12/2001	—	—	NO	NO	NO	20'	60	—	—
30	3/12/2001	58.1886	-135.0932	NO	NO	NO	20'	60'	—	—
	3/12/2001	—	—	NO	NO	NO	20'	60'	—	—
	3/12/2001	—	—	NO	NO	NO	20'	60'	—	—
31	3/12/2001	58.1894	-135.0903	NO	NO	NO	20'	60'	—	—
	3/12/2001	—	—	NO	NO	NO	20	60	—	—
	3/12/2001	—	—	NO	NO	NO	20	60	—	—
32	3/12/2001	58.2038	-135.1298	—	—	—	—		—	—
	3/12/2001	—	—	NO	NO	light comm.	20	60	mussel shl	Cucumbers, light commercial

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Section No.	Date	Latitude	Longitude	Commercial Green urchin density?	Commercial Green urchin size?	Commercial Cucumber density?	Min. Depth	Max. Depth	Habitat	Comments
33	3/12/2001	58.2008	-135.1407	NO	yes	light com	20'	60'	—	Cucumbers, light commercial
	3/12/2001	—	—	NO	NO	NO	20'	60'	—	—
	3/12/2001	—	—	NO	NO	NO	20'	60'	—	—
34	3/12/2001	58.2282	-135.2261	NO	NO	NO	20'	60'	—	—
	3/12/2001	—	—	NO	NO	NO	20'	60'	—	—
35	3/12/2001	58.2334	-135.2261	NO	NO	NO	20'	60'	—	cucumbers non-comm
	3/12/2001	—	—	5 0	NO	NO	20'	60	—	—
36	3/12/2001	58.2441	-135.3140	NO	NO	NO	20'	60'	snd,rck,shl	cucumbers non-comm
	3/12/2001	—	—	NO	NO	NO	20'	60'	snd,rck,shl	mostly non-comm patches; cucumbers commercial patches
37	3/12/2001	58.2639	-135.3364	NO	NO	NO	20'	60'	—	—
38	3/12/2001	58.2732	-135.3504	—	—	—	—	—	—	—
39	3/12/2001	58.2878	-135.3571	—	—	—	—	—	—	—
40	3/12/2001	58.3240	-135.4017	NO	NO	NO	20'	60	mud	Non-comm. cucumbers
41	3/12/2001	58.3566	-135.4149	NO	NO	NO	20'	60'	—	—
	3/12/2001	—	—	NO	NO	NO	20'	60'	—	—
42	3/12/2001	58.3892	-135.4298	NO	NO	NO	20'	60'	—	—
	3/12/2001	—	—	NO	NO	NO	20	60	Snd,rck,mud	—

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Section No.	Date	Latitude	Longitude	Commercial Green urchin density?	Commercial Green urchin size?	Commercial Cucumber density?	Min. Depth	Max. Depth	Habitat	Comments
43	3/12/2001	58.4492	-135.4596	NO	NO	comm	20	60	—	—
	3/12/2001	—	—	—	—	—	—	—	snd rck	good cucumbers commercial
44	3/12/2001	58.4597	-135.4602	NO	NO	NO	20	60	—	—
	3/12/2001	—	—	NO	yes	NO	20'	60'	—	Non-comm cucumbers king crabs
45	3/12/2001	58.4672	-135.4626	NO	NO	NO	20'	60'	—	—
	3/12/2001	—	—	NO	NO	NO	20'	60'	—	Non-comm cucmbers, king crabs
46	5/5/2001	58.4758	-135.4690	NO	NO	NO	20'	60'	—	—

Appendix B.18.–Results of green urchin reconnaissance survey in Subdistricts 112-16,17,63,65, May18-23, 2001. See Figure 19 for Mark locations

Mark	Begin Latitude	Begin Longitude	Green urchin Density commercial?	Green urchin size commercial?	Cucumber Density commercial?	Min. Depth	Max. Depth	Habitat	Comments
1	58.3637	134.9690	Commercial	—	None	45	—	sand, shell	good cukes 45'—not much in rocky kelp, no urchins
2	58.3615	134.9697	NO	—	None	40	45	rocky	few cukes, no urchins, deep, steep beach
3	58.3714	134.9661	NO	—	None	45	50	rocky cliff	steep rocky cliff beach, some cukes 45–50+, very deep-med. To small cukes, no urchins
4	58.3484	134.9629	Commercial	—	None	40	—	rock, sand	good cukes 40ft, rocky, sandy-steep! No urchins
5	58.3466	134.9583	Commercial	—	None	30	40	sandy, silt	Good to very good cukes 40+ft, sandy/silty bottom-not much deep, no urchins
6	58.3369	134.9579	Commercial	—	None	35	40	stony, sandy	35–40+ft stony, sandy , mussels-sloping beach—fair to good cukes, no urchins
7	58.3294	134.9526	Commercial	—	None	40	45	sand, rock	fair/good cukes, no urchins
8	58.3220	134.9544	Commercial	large	NO	35	—	mussels, gravel	fair/good cukes, mussels/gravelly, sporadic green urchins large size
9	58.3166	134.9558	Commercial	—	None	40	—	rocky	hard, rocky bottom, fair cukes, 40ft+
10	58.3103	134.9576	Commercial	—	None	50	60	rocky	very steep, rocky; good cukes between 50–60'
11	58.3021	134.9505	Commercial	—	None	30	60	sand, shell	easy slope, 30–60' good to very good cukes
12	58.2948	134.9512	Commercial	—	None	40	60	sand, rock	rocky kelp to 40'; cukes fair from 40'–60'; sandy mussel bottom
13	58.2872	134.9490	Commercial	—	None	40	60	sand, rock	rocky kelp to 40'; cukes fair from 40–60'; sandy mussel bottom
14	58.2767	134.9455	Commercial	—	None	40	60	sand, rock	rocky kelp to 40'; cukes fair from 40'-60'; sandy mussel bottom
15	58.2726	134.9451	Commercial	—	None	30		shell, sand	shell, sand, sloping beach; 30+ft very good cukes
16	58.2683	134.9426	Commercial	—	NO	35	40	—	very flat, grad sloping; fair cukes; 35-40' few green urchins

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Mark	Begin Latitude	Begin Longitude	Green urchin Density commercial?	Green urchin size commercial?	Cucumber Density commercial?	Min. Depth	Max. Depth	Habitat	Comments
17	58.2611	134.9458	NO	—	None	50	—	rocky	shallow spot off beach; rocky kelp; @50' few cukes-not too good
18	58.2275	134.9197	Commercial	—	None	30	—	sandy	mostly sandy; fair to good cukes @30'
19	58.2550	134.9312	None	—	None	—	—	mud	no cukes; mud flat bottom
20	58.2522	134.9321	None	—	None	—	—	rocky	inside Kittens; rocky; no cukes
21	58.2481	134.9245	None	—	None	—	—	mud	mud flats; nothing here
22	58.2449	134.9143	Commercial	—	None	—	—	silt, mud	fair cukes; steep, silty, mud in places
23	58.2537	134.8990	None	—	None	—	—	silt	silty bottom
24	58.2440	134.8869	None	—	None	—	—	rock	very rocky
25	—	—	None	—	None	—	—	mud	muddy (no coordinates given)
26	58.1411	134.8259	None	—	None	—	—	—	steep cliff; no cukes or urchins
27	58.1547	134.8369	Commercial	—	None	40	—	sand, shells	flat, sandy, mussels, shells; good cukes 40', no urchins
28	58.1625	134.8464	Commercial	—	NO	10	40	sand	places w/ good cukes 15-40', other places fair; some urchins shallow 10', no commercial quantity
29	58.1767	134.8644	Commercial	—	None	49	—	sand	good cukes @ 49', sandy gradual bottom
30	58.1814	134.8761	Commercial	Commercial	Not	25	40	—	small patches of urchins, some commercial size; some very good patches of cukes between 25-40'
31	58.1841	134.8861	Commercial	—	None	25	40	sand, gravel, rock	no urchins; good cukes 25-40'; gravelly, sandy bottom, some rocky bottom here—no cukes there
32	58.1914	134.8957	Commercial	—	None	40	60	rock	rocky and steep; some cukes deep 40–60'
33	58.2007	134.9017	Commercial	—	None		—	rock	rocky, drops off fairly fast; fair number of cukes
34	58.2098	134.9085	Commercial	—	None	30	—	sand	good cukes 30'+, patchy, lots of kelp, anemones; good cukes when you find clear sandy bottoms

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Mark	Begin Latitude	Begin Longitude	Green urchin Density commercial?	Green urchin size commercial?	Cucumber Density commercial?	Min. Depth	Max. Depth	Habitat	Comments
35	58.2151	134.9145	None	—	None	—	—	rock	too steep up to beach; cliffy
36	58.2249	134.9195	NO	—	None	—	—	rock	sparse cukes, rocky bottom, deep
37	58.1337	134.8195	Commercial	—	None	30	40	sand	fair cukes, 30–40', sandy; no urchins
38	58.1229	134.8145	NO	Commercial	Not	30	40	sand	steeper beach; cukes 30–40'; sandy, kelpy, some bull kelp; occaisional urchins, some harvestable, non–commecial quantity
39	58.1173	134.8128	NO	—	Not	—	—	rock	rocky; poor cukes; some patches urchins, steep
40	58.1117	134.8096	NO	Not	Not	—	—	rock	mostly rocky; poor cukes; some larger patches of non–comm urchins; bull kelp; white anemone
41	58.0998	134.7928	NO	—	Not	—	—	rock	kelp; rocky bottom; poor cukes; heavey kelp over 20'
42	58.1210	134.7699	Commercial	—	None	—	—	sand	sandy, kelp; good cukes; steep
43	58.1300	134.7713	Commercial	—	None	25	—	—	kelp shallow; marginal cukes 25'+
44	58.1382	134.7693	Commercial	—	None	—	—	sand	sandy, kelp, marginal cukes
45	58.1499	134.7709	None	—	None	—	—	sand, mud	sandy, mud; no cukes
46	58.1614	134.7704	Commercial	—	Not	10	—	sand, shell	sandy, shell; good cukes, some urchins; cukes to 10'
47	58.1646	134.7709	None	—	None	—	—	mud	mud, flat bottom
48	58.1611	134.7644	Commercial	—	None	—	—	sand, mud	good cukes; sandy, mud
49	58.1408	134.7569	None	—	None	—	—	mud	muddy, no cukes
50	58.1250	134.7567	Commercial	—	None	20		sandy	kelpy bottom shallow; sandy deeper; marginal cukes 20'
51	58.0736	134.7927	None	—	None	—	—	mud	mud
52	58.0783	134.7877	Commercial	—	None	35		sand, shell	sandy, shell; goo cukes, very large 35'+
53	58.0818	134.7856	Commercial	—	None	35	—	—	mussel/kelp; good cukes 35'+ very good cukes
54	58.0901	134.7708	Commercial	—	None	25	—	—	kelp shallow; good cukes 25'+

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Mark	Begin Latitude	Begin Longitude	Green urchin Density commercial?	Green urchin size commercial?	Cucumber Density commercial?	Min. Depth	Max. Depth	Habitat	Comments
55	58.0975	134.7777	Commercial	—	None	—	—	sand	kelp, sand; lots of kelp shallow; marginal cukes
56	58.1078	134.7745	None	—	None	—	—	—	very steep beach
57	58.1115	134.7724	Commercial	—	None	20		sand, mud	good cukes in sandy mud 20' plus/steep
58	58.0569	134.8135	None	—	None	—	—	rock	Pt Marsden and cove; lots of kelp beds; deep rocks off marsden
59	58.0452	134.8121	None	—	None	—	—	—	light; heavy kelp
60	58.0376	134.8028	None	—	None	—	—	rock	steep, kelp, rocky
61	58.0301	134.8049	None	—	None	—	—	—	steep to beach
62	58.0225	134.7957	NO	—	None	—	—	—	5'vis, 1 cuke; very heavy kelp on beach
63	58.0148	134.7904	Commercial	—	Not	—	—	sand	sandy, kelpy bottom; marginal cukes; possible geoducks; some green urchins
64	58.0076	134.7833	None	—	None	—	—	rocky	rocky, very steep, kelp
65	58.0623	134.8078	None	—	None	—	—	mud	mud flat
66	58.0697	134.8085	Commercial	—	None	35	—	sand, shell	sandy, shell bottom; good big cukes 35'+
67	57.9757	134.7658	Commercial	—	None	25	—	sand	sandy kelp, very good cukes @ 25' and down
68	57.9785	134.7632	None	—	None	—	—	mud	muddy, no cukes
69	57.9868	134.7645	NO	—	None	—	—	rock, sand	steep rocky, sand; poor cukes
70	57.9722	134.7747	Commercial	—	None	30	—	pebble, shell	good cukes 30'
71	57.9610	134.7670	Commercial	—	None	—	—	sand	sandy bottom; good cukes inside rocks just north of Cube Cove
72	—	—	—	—	—	—	—	—	Cube Cove - logs in rafts in the bay
73	57.9155	134.7502	Commercial	—	None	—	—	shell	steep, mussel, shell; good cukes
74	57.9345	134.7567	Commercial	—	Not	40		sand, rock	sandy, rock; good cukes; some urchins 40'

–continued–

Mark	Begin Latitude	Begin Longitude	Green urchin Density commercial?	Green urchin size commercial?	Cucumber Density commercial?	Min. Depth	Max. Depth	Habitat	Comments
75	57.7443	134.7332	None	—	None	—	—	mud	steep, sandy, mud; no cukes
76	57.7533	134.7337	None	—	None	—	—	mud, sand	muddy, sand; no cukes
77	—	—	None	—	None	—	—	mud	Fishery Creek; mud flats
78	57.7752	134.7162	None	—	None	—	—	mud, sand	muddy sand; no cukes
79	57.7963	134.7212	No	—	None	—	—	sand, mud	poor cukes
80	57.8250	134.7122	Commercial	—	None	35	—	sand, rock, shell	good cukes 35'+; white anemones
81	57.8470	134.7257	Commercial	—	None	40	—	—	good cukes 40'
82	57.8593	134.7217	None	—	None	—	—	mud	no cukes
83	57.8790	134.7287	Commercial	—	None	—	—	shell	mussels, shell, good cukes
84	57.8960	134.7437	Commercial	—	None	40		shell, sand	marginal cukes 40'+
85	57.7240	134.7335	Commercial	—	Commercial	—	—	sand, rock	good cukes; sandy, stoney, good urchins (scuba)
86	57.7097	134.7220	None	—	None	—	—	mud	no cukes or urchins
87	57.6927	134.7040	Commercial	—	None	30		rock, sand	good cukes 30'+; possible geoducks
88	—	—	None	—	None	—	—	mud	mud flats; nothing here
89	57.6537	134.6942	None	—	None	—	—	mud	no cukes
90	57.6310	134.6830	None	—	None	—	—	mud	no cukes
91	57.6060	134.6737	None	—	None	—	—	mud, sand	no cukes
92	57.6102	134.6548	No	Commercial	Not	—	—	sand, rock	sand, large cliffy rocks; some large green urchins; poor cukes; 1 large red urchin
93	57.5860	134.6447	None	—	None	—	—	mud	extremely heavy current
94	57.5683	134.6228	Commercial	—	Not	20	—	sand	sandy; kelpy; good cukes; some urchins; cukes 20'+
95	57.5473	134.6050	Commercial	—	None	—	—	pebble, sand	good cukes
96	57.5347	134.5983	Commercial	—	None	—	—	sand, rock	sandy, stoney, kelpy, good cukes
97	57.5233	134.5993	None	—	None	—	—	rock	rock cliff; too deep

Appendix C.1.–Latitude and longitudes of green sea urchin transect pairs completed in Southeast Alaska, 2000–2001.

Subdistrict 110-12			Subdistrict 110-14		
Transect #	**Latitude**	**Longitude**	**Transect #**	**Latitude**	**Longitude**
1	56.9954	-132.9374	1	57.1062	-133.3053
2	56.9929	-132.9479	2	57.1076	-133.2950
3	56.9820	-132.8290	3	57.1102	-133.2860
4	57.0260	-132.9992	4	57.1169	-133.2734
5	57.0318	-132.9975	5	57.1250	-133.2676
6	57.0375	-132.9935	6	57.1312	-133.2660
7	57.0438	-132.9866	7	57.1363	-133.2619
8	57.0478	-132.9530	8	57.1490	-133.2633
9	57.0468	-132.9417	9	57.1589	-133.2418
10	57.0446	-132.9308	10	57.1481	-133.2444
11	57.0392	-132.9199	11	57.1436	-133.2470
12	57.0338	-132.9151	12	57.1392	-133.2456
13	57.0282	-132.9076	13	57.1377	-133.2048
14	57.0266	-132.9013	14	57.1578	-133.1965
15	57.0252	-132.8923	15	57.1365	-133.1639
16	57.0282	-132.8814	16	57.1107	-133.1644
17	57.0330	-132.8167	17	57.0947	-133.1852
18	57.0268	-132.8112	18	57.1001	-133.1837
19	57.0212	-132.8062	19	57.1234	-133.1902
20	57.0152	-132.7995	20	57.1138	-133.2051
21	57.0027	-132.8213	—	—	—
22	57.0089	-132.8263	—	—	—
23	57.0138	-132.8318	—	—	—
24	57.0054	-132.8515	—	—	—
25	56.9945	-132.9274	—	—	—
26	57.0019	-132.8587	—	—	—
27	57.0001	-132.8794	—	—	—
28	56.9974	-132.8868	—	—	—
29	56.9917	-132.9496	—	—	—
30	56.9869	-132.9463	—	—	—

–continued–

Appendix C. 1.–Page 2 of 3.

Subdistrict 110-16,17			Subdistrict 110-23		
Transect #	**Latitude**	**Longitude**	**Transect #**	**Latitude**	**Longitude**
1	57.0094	-133.3632	1	57.4446	-133.9065
2	57.0096	-133.3776	3	57.4460	-133.9101
3	57.0223	-133.4548	4	57.4472	-133.9127
4	57.0234	-133.4594	5	57.4647	-133.9303
5	57.0352	-133.5101	6	57.4659	-133.9304
6	57.0361	-133.5325	7	57.4797	-133.8972
7	57.0425	-133.5425	10	57.4765	-133.8892
8	57.0480	-133.5778	—	—	—
9	57.0595	-133.6473	—	—	—
10	57.0617	-133.6669	—	—	—
11	57.0645	-133.7016	—	—	—
12	57.0706	-133.7128	—	—	—
13	57.0767	-133.7245	—	—	—
14	57.0782	-133.7447	—	—	—
15	57.0797	-133.7621	—	—	—
16	57.0821	-133.7783	—	—	—
17	57.0913	-133.8393	—	—	—
18	57.0882	-133.9362	—	—	—
19	57.0815	-133.9491	—	—	—
20	57.0751	-133.9603	—	—	—
21	57.0767	-133.9782	—	—	—
22	57.0748	-133.9956	—	—	—

–continued–

Subdistrict 112-11			Subdistrict 1113-63,64,65		
Transect #	**Latitude**	**Longitude**	**Transect #**	**Latitude**	**Longitude**
1	57.0370	-134.7532	1	57.4439	-135.5625
2	57.0389	-134.7537	2	57.4417	-135.5668
3	57.0759	-134.7698	3	57.4335	-135.5649
4	57.0789	-134.7730	4	57.4272	-135.5769
5	57.0848	-134.7970	5	57.4258	-135.5769
6	57.0844	-134.7914	6	57.4228	-135.5779
7	57.2095	-134.8403	7	57.4166	-135.5889
8	57.2103	-134.8399	8	57.4143	-135.5887
9	57.2509	-134.8418	9	57.4123	-135.5940
10	57.2534	-134.8447	10	57.4115	-135.5990
11	57.2562	-134.8481	11	57.4101	-135.6042
12	57.2594	-134.8474	12	57.4082	-135.6078
13	57.2620	-134.8504	13	57.4303	-135.5923
14	57.2640	-134.8533	14	57.4314	-135.5970
15	57.2662	-134.8549	15	57.4327	-135.6035
16	57.2678	-134.8585	16	57.4354	-135.6050
17	57.2699	-134.8600	17	57.4350	-135.5841
18	57.2711	-134.8625	18	57.4372	-135.5866
—	—	—	19	57.4389	-135.5912
—	—	—	20	57.4399	-135.5951

Appendix D.1.–Green sea urchin transect survey data collected in Southeast Alaska, 2000-01. Sides "a" and "b"are counted urchins >36 mm within 1-meter width paired transects to depth.

	Subdistrict 110-12 – March 2001			Subdistrict 101-12 - September, 2001		
Transect no.	Side A	Side B	Maximum Depth (mllw, ft.)	Side A	Side B	Maximum Depth (mllw, ft.)
1	101	199	40	0	0	40
2	1621	1076	40	Not	Done	40
3	110	55	40	608	360	40
4	227	245	40	181	141	40
5	1031	1039	40	483	282	40
6	101	175	40	196	182	40
7	1452	1233	40	779	801	40
8	57	86	40	264	617	40
9	276	245	40	106	238	40
10	426	267	40	125	139	40
11	50	88	40	60	42	40
12	123	206	40	35	35	40
13	27	37	40	234	279	40
14	590	496	40	497	288	40
15	99	75	40	46	58	40
16	77	53	40	62	72	40
17	94	102	40	37	66	40
18	84	84	40	41	73	40
19	9	20	40	6	6	40
20	0	8	40	11	3	40
21	63	48	40	83	70	40
22	67	153	40	66	80	40
23	89	134	40	181	35	40
24	157	111	40	38	26	40
25	39	32	40	0	0	40
26	—	—	—	1833	1159	40
27	—	—	—	161	320	40
28	—	—	—	153	210	40

–continued–

Subdistrict 110-14 C.ounts from Continuous Swim-Over Method								
	March 2000					September 2001		
Transect no.	Side a	Side b	Side c	Side d	Maximum Depth (mllw, ft.)	Side a,b	Side c,d	Maximum Depth (mllw, ft.)
1	19	7	22	155	40	0	0	40
2	578	106	177	55	40	80	120	40
3	—	—	—	—	—	10	45	40
4	—	—	—	—	—	0	0	40
5	40	85	20	43	40	260	200	40
6	64	234	110	198	40	374	194	40
7	129	121	348	126	40	0	0	40
8	—	—	—	—	—	0	0	40
9	—	—	—	—	—	0	0	40
10	63	50	141	121	40	0	0	40
11	0	0	2	5	40	12	8	40
12	54	191	131	147	40	182	124	40
13	46	51	53	59	40	88	120	40
14	—	—	—	—	—	0	0	40
15	56	53	73	37	40	81	46	40
16	—	—	—	—	—	0	0	40
17	102	200	208	188	40	57	46	40
18	—	—	—	—	—	170	225	40
19	—	—	—	—	—	0	0	40
20	557	207	232	338	40	0	0	40

–continued–

	Subdistrict: 110-14 - March 2000, Transect Swim-Over Method							
	Side A				Side B			
Transect no.	total density (U/M^2)	average size	prop >=36 mm	bed width (m)	total density (U/M^2)	average size (mm)	prop >=36 mm	bed width (m)
1	4	30	50	4	50	30	20	2
2	80	30	20	80	60	25	10	70
3	0	0	0	0	0	0	0	0
4	10	40	75	2	2	30	10	1
5	200	25	5	35	20	24	35	40
6	50	35	30	50	9	30	10	40
7	5	40	75	20	8	75	70	13
8	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0
10	2	60	—	30	—	—	—	—
11	0.3	30	—	20	—	—	—	—
12	30	25	50	40	—	—	—	—
13	45	20	5	30	25	25	5	35
14	0	0	0	0	0	0	0	0
15	30	30	10	20	12	35	50	10
16	2	30	50	3	—	—	—	—
17	35	30	10	50	40	25	5	80
18	2	40	100	1	—	—	—	—
19	30	40	90	1	60	30	40	1
20	25	40	80	20	20	30	50	10
21	5	25	—	5	—	—	—	—

–continued–

Transect No.	Subdistrict: 110-16, -17								
	March 2000			March and April 2001			September 2001		
	Side a	Side b	maximum depth (mllw, ft.)	Side a	Side b	maximum depth (mllw, ft.)	Side a	Side b	maximum depth (mllw, ft.)
1	2,436	3,100	33	—	—	—	838	590	50
2	1,117	678	33	—	—	—	473	850	50
3	658	409	33	—	—	—	488	318	50
4	647	2182	33	—	—	—	1581	1398	50
5	—	—	—	—	—	—	202	481	50
6	—	—	—	—	—	—	721	710	50
7	—	—	—	—	—	—	1145	1253	50
8	—	—	—	—	—	—	79	56	50
9	—	—	—	281	98	50	0	0	50
10	—	—	—	275	340	50	399	474	50
11	—	—	—	18	47	50	0	0	50
12	—	—	—	77	81	50	85	4	50
13	—	—	—	50	155	50	0	0	50
14	—	—	—	1139	317	50	19	57	50
15	—	—	—	314	510	50	590	542	50
16	—	—	—	0	0	50	390	160	50
17	—	—	—	0	0	50	0	0	50
18	—	—	—	6	13	50	0	0	50
19	—	—	—	95	220	50	751	730	50
20	—	—	—	190	248	50	727	797	50
21	—	—	—	808	735	50	144	107	50
22	—	—	—	163	56	50	26	73	50

–continued–

	Subdistrict 110-16, -17 Transect Data from Swim-over Method							
	Side A				Side B			
Transect no.	total density (U/M^2)	average size	prop >=36 mm	bed width (m)	total density (U/M^2)	average size	prop >=36 mm	bed width (m)
1	60	30	15	280	40	30	20	200
2	35	25	15	180	25	30	40	150
3	12	38	30	190	15	33	25	150
4	20	30	5	300	30	25	15	300

–continued–

Transect No–Frame No	Method[a]	Side A				Side B			
		total density (U/M2)	average size (mm)	prop >=36 mm	Count >=36 mm	total density (U/M2)	average size (mm)	prop >=36 mm	Count >=36 mm
1-1	cq	15	30	20	7	10	30	60	11
1-2	cq	35	25	5	2	30	25	20	0
1-3	cq	25	40	75	16	15	40	40	14
1-4	cq	25	35	50	22	15	40	85	21
1-5	cq	20	25	10	0	40	25	5	0
2-1	cq	20	15	0	0	45	12	0	0
2-2	cq	50	40	50	28	90	28	7	31
2-3	cq	30	60	90	18	35	40	95	22
2-4	cq	20	15	0	0	10	30	15	1
2-5	cq	30	30	5	13	60	25	10	14
3-1	ct	40	35	35	11	25	38	45	7
3-2	ct	2	40	50	2	5	45	60	4
3-3	ct	0	0	0	0	0	0	0	0
3-4	cq	0	0	0	0	0	0	0	0
3-5	cq	10	30	30	3	10	35	50	4

[a] cq denotes Continuous Quadrant method; ct denotes Continuous Transect method

–continued–

	Subdistrict: 110-23 March 2001			Subdistrict: 112-11,21,22 April 2001			Subdistrict: 113-63,64,65 April 2001		
Transect No.	Side a	Side b	maximum depth (mllw, ft.)	Side a	Side b	maximum depth (mllw, ft.)	side a	side b	maximum depth (mllw, ft.)
1	0	1	50	54	54	50	1	280	450
2	—	—	—	137	146	50	2	71	132
3	0	0	50	27	22	50	3	298	199
4	0	0	50	85	193	50	4	206	328
5	0	0	50	0	1	50	5	304	752
6	0	0	50	19	84	50	6	380	232
7	0	0	50	83	213	50	7	0	0
8	—	—	—	92	116	50	8	772	1365
9	—	—	—	34	116	50	9	575	560
10	0	0	50	82	45	50	10	126	133
11	—	—	—	28	0	50	11	0	0
12	—	—	—	101	79	50	12	0	1
13	—	—	—	71	85	50	13	498	435
14	—	—	—	691	417	50	14	218	148
15	—	—	—	181	211	50	15	467	397
16	—	—	—	334	104	50	16	150	112
17	—	—	—	141	85	50	17	189	210
18	—	—	—	202	171	50	18	5	10
19	—	—	—	—	—	—	19	180	390
20	—	—	—	—	—	—	20	1280	553

Appendix E.1.–Green sea urchin test diameters in millimeters by subdistrict and transect, collected in Southeast Alaska, 2000 to 2001.

Sample Rank	Transects Sampled, by Subdistrict and Sample Date															
	Subdistrict 110-14, April 2000													Subdistrict 110-16, -17, March 2000		
	1	2	5	6	7	10	11	12	13	15	17	20	21	1	2	3
1	13	5	8	12	16	42	8	8	15	8	6	10	5	3	4	4
2	14	6	9	13	17	44	9	10	16	10	7	13	8	5	5	5
3	15	7	10	15	20	45	10	12	17	11	8	14	9	6	6	6
4	16	8	11	17	23	46	11	13	18	14	9	16	10	7	7	7
5	20	9	12	18	24	47	12	16	19	15	10	18	12	8	8	8
6	22	10	13	19	25	48	13	17	20	16	11	20	13	9	9	9
7	23	11	14	20	26	49	14	18	21	17	12	21	14	10	10	10
8	24	12	15	21	27	50	15	19	22	18	13	22	15	11	11	11
9	25	13	16	22	28	51	16	20	23	19	14	23	16	12	12	12
10	26	14	17	23	29	52	17	21	24	20	15	24	17	13	13	13
11	27	15	18	24	30	53	18	22	25	21	17	25	18	14	14	14
12	28	16	19	25	31	54	19	23	26	22	18	26	19	15	15	15
13	29	17	20	26	32	55	20	24	27	23	19	27	20	16	16	16
14	30	18	21	27	33	56	21	25	28	24	20	28	21	17	17	17
15	31	19	22	28	34	57	22	26	29	25	21	29	22	18	18	18
16	32	20	23	29	35	58	23	27	30	26	22	30	23	19	19	19
17	33	21	24	30	36	59	24	28	31	27	23	31	24	20	20	20
18	34	22	25	31	37	60	25	29	32	28	24	32	25	21	21	21
19	35	23	26	32	38	61	26	30	33	29	25	33	26	22	22	22
20	36	24	27	33	39	62	27	31	34	30	26	34	27	23	23	23
21	37	25	28	34	40	63	28	32	36	31	27	35	28	24	24	24
22	38	26	29	35	41	64	30	33	38	32	28	36	29	25	25	25
23	39	27	30	36	42	65	31	34	39	33	29	37	30	26	26	26
24	40	28	32	37	43	66	32	35	40	34	30	38	31	27	27	27
25	41	29	—	38	44	67	33	36	47	35	31	39	32	28	28	28
26	42	30	—	39	45	68	37	37	—	36	32	40	34	29	29	29
27	43	31	—	40	46	69	42	39	—	37	33	41	35	30	30	30
28	45	32	—	41	47	71	—	41	—	38	34	42	36	31	31	32
29	48	33	—	42	49	74	—	42	—	40	35	43	37	32	32	33
30	54	34	—	44	50	75	—	45	—	41	36	44	38	33	33	34
31	55	35	—	45	53	77	—	47	—	43	37	45	39	34	34	35
32	—	37	—	48	—	—	—	60	—	47	38	46	—	35	35	36
33	—	38	—	49	—	—	—	—	—	54	39	47	—	36	36	37
34	—	39	—	52	—	—	—	—	—	—	40	48	—	37	37	38
35	—	40	—	—	—	—	—	—	—	—	42	49	—	38	38	39
36	—	43	—	—	—	—	—	—	—	—	43	50	—	39	40	40
37	—	39	—	—	—	—	—	—	—	—	44	52	—	40	41	41
38	—	40	—	—	—	—	—	—	—	—	45	54	—	41	42	43
39	—	43	—	—	—	—	—	—	—	—	48	63	—	42	44	44
40	—	—	—	—	—	—	—	—	—	—	50	—	—	43	45	45
41	—	—	—	—	—	—	—	—	—	—	51	—	—	44	46	46
42	—	—	—	—	—	—	—	—	—	—	52	—	—	45	47	48
43	—	—	—	—	—	—	—	—	—	—	53	—	—	46	49	53
44	—	—	—	—	—	—	—	—	—	—	—	—	—	47	50	—
45	—	—	—	—	—	—	—	—	—	—	—	—	—	48	52	—
46	—	—	—	—	—	—	—	—	—	—	—	—	—	50	53	—
47	—	—	—	—	—	—	—	—	—	—	—	—	—	53	54	—
48	—	—	—	—	—	—	—	—	—	—	—	—	—	55	55	—
49	—	—	—	—	—	—	—	—	—	—	—	—	—	—	59	—
50	—	—	—	—	—	—	—	—	—	—	—	—	—	—	60	—
51	—	—	—	—	—	—	—	—	—	—	—	—	—	—	65	—
Average	32	23	20	31	35	58	22	28	28	27	28	34	23	28	30	26
Maximum	55	43	32	52	53	77	42	60	47	54	53	63	39	55	65	53
Minimum	13	5	8	12	16	42	8	8	15	8	6	10	5	3	4	4

–continued–

Sample Rank	Transects Sampled in Subdistrict 110-12, during March 2001																							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
1	24	11	17	27	18	21	25	14	20	26	5	6	12	30	22	38	15	35	39	34	36	28	15	8
2	25	13	18	32	19	22	27	18	25	27	6	18	26	31	25	39	19	36	42	39	37	41	16	22
3	28	14	19	33	20	24	29	19	26	28	7	19	28	32	28	42	20	37	44	40	38	42	18	24
4	29	18	23	34	22	25	30	20	27	29	8	21	29	33	30	44	21	38	46	42	39	44	19	25
5	31	22	24	35	23	33	31	21	28	30	9	22	31	34	32	45	24	39	48	44	40	45	21	30
6	34	23	25	38	24	34	32	22	29	31	10	23	32	35	33	46	25	40	49	45	41	47	22	32
7	36	24	28	39	25	39	33	23	30	32	11	24	33	36	34	47	26	41	50	46	42	48	23	33
8	37	25	30	42	26	40	34	24	31	33	12	25	36	37	35	48	27	42	52	47	43	49	25	34
9	38	26	31	44	27	41	35	25	33	35	13	26	37	38	36	49	28	43	54	48	45	50	26	35
10	39	27	33	45	28	42	36	26	34	36	14	28	38	39	37	50	29	44	55	49	46	51	27	36
11	40	28	34	48	29	43	37	27	35	37	15	29	39	40	38	51	30	45	56	50	47	52	28	37
12	41	29	38	49	30	46	38	28	38	39	16	30	40	41	39	52	31	46	58	51	48	53	29	38
13	42	30	39	50	32	47	39	29	39	40	17	31	41	42	40	53	32	47	62	52	50	54	30	39
14	43	31	40	51	33	49	41	30	40	41	18	32	42	43	41	54	33	48	64	53	52	55	31	40
15	44	32	43	52	35	52	42	31	41	42	19	33	43	44	42	55	34	49	67	54	55	56	33	41
16	45	33	45	53	39	60	43	32	42	43	20	34	44	45	43	56	35	50	71	55	56	57	34	42
17	46	34	46	59	40	62	44	33	43	44	21	36	45	46	44	57	36	51	76	57	—	58	35	43
18	51	36	54	60	41	65	45	36	44	45	22	37	48	48	45	58	37	52	—	58	—	59	37	44
19	—	38	—	—	42	66	46	37	46	56	23	38	49	49	46	60	38	53	—	62	—	64	41	47
20	—	39	—	—	45	67	47	38	47	—	24	41	50	54	47	62	39	55	—	63	—	—	45	48
21	—	40	—	—	46	72	49	40	48	—	26	42	52	55	48	63	40	56	—	—	—	—	47	59
22	—	42	—	—	47	—	53	43	49	—	27	43	53	56	50	74	41	57	—	—	—	—	58	69
23	—	43	—	—	48	—	—	44	50	—	28	—	54	—	52	78	42	58	—	—	—	—	—	—
24	—	47	—	—	50	—	—	45	52	—	29	—	56	—	53	87	43	59	—	—	—	—	—	—
25	—	48	—	—	51	—	—	54	53	—	30	—	57	—	59	—	44	60	—	—	—	—	—	—
26	—	49	—	—	52	—	—	—	54	—	31	—	59	—	60	—	45	62	—	—	—	—	—	—
27	—	54	—	—	56	—	—	—	57	—	32	—	60	—	78	—	46	65	—	—	—	—	—	—
28	—	—	—	—	58	—	—	—	58	—	33	—	64	—	—	—	47	67	—	—	—	—	—	—
29	—	—	—	—	—	—	—	—	59	—	34	—	65	—	—	—	48	68	—	—	—	—	—	—
30	—	—	—	—	—	—	—	—	68	—	36	—	—	—	—	—	49	—	—	—	—	—	—	—
31	—	—	—	—	—	—	—	—	69	—	41	—	—	—	—	—	50	—	—	—	—	—	—	—
32	—	—	—	—	—	—	—	—	—	—	43	—	—	—	—	—	51	—	—	—	—	—	—	—
33	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	53	—	—	—	—	—	—	—
34	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	54	—	—	—	—	—	—	—
35	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	55	—	—	—	—	—	—	—
36	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	56	—	—	—	—	—	—	—
37	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	59	—	—	—	—	—	—	—
38	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	73	—	—	—	—	—	—	—
39	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	85	—	—	—	—	—	—	—
40	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
41	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
42	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
43	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
44	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
45	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
46	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
47	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
48	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
49	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
51	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average	37	32	33	39	36	45	38	30	42	37	21	29	44	41	42	55	40	50	55	49	45	50	30	38
Maximum	51	54	54	60	58	72	53	54	69	56	43	43	65	56	78	87	85	68	76	63	56	64	58	69
Minimum	24	11	17	18	18	21	25	14	20	26	5	6	12	30	22	38	15	35	39	34	36	28	15	8

–continued–

Sample Rank	Transects sampled in Subdistricts 110-16, -17, during March and April 2001													
	5	**6**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**18**	**19**	**20**	**21**	**22**
1	7	10	5	9	14	6	31	6	4	2	8	7	15	24
2	9	11	12	12	16	7	35	10	14	14	10	8	16	27
3	10	12	13	13	17	8	36	11	15	15	15	9	18	28
4	11	14	17	14	18	9	38	12	16	17	16	10	19	29
5	12	15	20	15	19	10	39	13	17	19	17	11	21	30
6	13	18	21	16	20	11	40	14	20	20	19	12	23	31
7	14	19	22	17	21	12	41	15	21	21	20	13	25	32
8	15	21	23	18	22	13	44	16	24	22	21	14	27	33
9	16	22	24	20	23	14	45	17	29	23	23	15	29	34
10	17	23	25	21	24	15	46	18	30	24	25	16	30	38
11	19	24	28	22	25	16	47	19	31	25	28	17	31	39
12	23	25	31	23	26	17	48	20	32	26	29	18	32	41
13	24	26	32	24	27	18	49	22	33	28	30	20	33	42
14	25	27	33	25	28	19	50	23	35	29	31	23	34	44
15	26	28	34	26	30	20	51	27	37	30	32	26	35	48
16	27	29	35	27	31	21	52	29	38	32	33	27	37	49
17	28	31	37	29	35	22	53	30	40	44	34	28	38	51
18	29	32	41	30	36	23	56	32	43	45	35	30	39	52
19	32	33	48	31	40	24	57	—	44	46	37	31	40	55
20	33	37	49	32	42	25	58	—	46	49	38	32	41	57
21	35	38	—	33	45	26	59	—	48	—	41	33	42	58
22	36	39	—	34	—	37	62	—	49	—	42	35	43	69
23	37	40	—	35	—	38	—	—	50	—	43	39	44	—
24	38	41	—	36	—	39	—	—	56	—	44	42	45	—
25	39	43	—	37	—	41	—	—	60	—	47	43	46	—
26	40	44	—	38	—	43	—	—	—	—	48	45	54	—
27	42	45	—	40	—	44	—	—	—	—	49	—	57	—
28	44	47	—	41	—	—	—	—	—	—	51	—	59	—
29	45	49	—	43	—	—	—	—	—	—	58	—	—	—
30	46	—	—	—	—	—	—	—	—	—	65	—	—	—
31	48	—	—	—	—	—	—	—	—	—	—	—	—	—
32	50	—	—	—	—	—	—	—	—	—	—	—	—	—
33	51	—	—	—	—	—	—	—	—	—	—	—	—	—
34	53	—	—	—	—	—	—	—	—	—	—	—	—	—
35	55	—	—	—	—	—	—	—	—	—	—	—	—	—
36	56	—	—	—	—	—	—	—	—	—	—	—	—	—
Average	31	29	28	26	27	21	47	19	33	27	33	23	35	41
Maximum	56	49	49	43	45	44	62	32	60	49	65	45	59	69
Minimum	7	10	5	9	14	6	31	6	4	2	8	7	15	24

–continued–

Sample Rank	Transects sampled in Subdistricts 112-11,-21,and -22, during April 2001																
	1	**2**	**3**	**4**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
1	32	24	15	18	17	25	30	19	19	10	25	22	24	26	36	16	41
2	34	29	21	22	20	27	31	22	21	15	28	23	28	28	37	24	50
3	36	31	26	23	23	28	35	29	22	18	29	30	29	30	38	39	51
4	37	32	29	28	25	29	37	30	23	19	30	32	30	39	40	45	53
5	39	33	30	33	26	30	38	35	24	21	31	33	31	40	42	51	54
6	40	34	43	34	28	31	40	37	27	22	32	35	33	41	43	52	55
7	46	35	44	35	29	32	42	38	28	24	34	36	34	42	44	54	56
8	47	36	45	38	30	33	43	40	29	25	35	41	35	44	45	56	57
9	48	37	47	39	32	34	44	41	35	27	36	42	36	45	46	62	60
10	50	38	49	40	33	35	45	43	40	28	37	43	37	46	48	63	61
11	51	39	50	45	34	36	46	44	42	29	38	44	39	48	51	64	62
12	52	40	52	47	35	37	47	45	45	31	39	45	41	49	57	66	63
13	54	41	54	49	36	38	48	46	46	32	40	47	42	53	58	67	64
14	55	42	55	50	37	42	49	47	48	35	42	48	43	54	59	69	65
15	57	44	56	51	38	43	50	49	49	37	43	49	45	56	60	70	66
16	59	45	58	53	39	44	53	50	50	41	44	54	46	57	61	71	67
17	60	46	59	55	40	46	54	53	51	42	46	57	48	58	62	72	68
18	61	48	60	56	41	47	55	57	52	44	47	58	50	59	63	74	71
19	62	49	61	59	42	48	57	58	53	45	48	59	58	62	65	75	72
20	63	50	62	61	44	49	58	63	54	46	50	61	62	63	67	77	74
21	64	52	65	63	62	50	59	72	55	47	52	63	69	68	68	82	79
22	73	—	67	64	—	53	60	—	57	48	58	64	74	—	70	—	—
23	—	—	71	65	—	58	61	—	58	52	59	67	—	—	71	—	—
24	—	—	74	66	—	60	62	—	59	53	64	—	—	—	72	—	—
25	—	—	—	67	—	71	65	—	60	56	65	—	—	—	73	—	—
26	—	—	—	68	—	73	68	—	61	59	75	—	—	—	74	—	—
27	—	—	—	75	—	—	69	—	65	60	—	—	—	—	75	—	—
28	—	—	—	—	—	—	—	—	73	62	—	—	—	—	—	—	—
29	—	—	—	—	—	—	—	—	—	66	—	—	—	—	—	—	—
30	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
31	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
32	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
33	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average	51	39	50	48	34	42	50	44	45	38	43	46	42	48	56	59	61
Maximum	73	52	74	75	62	73	69	72	73	66	75	67	74	68	75	82	79
Minimum	1	24	15	15	17	17	25	19	19	10	10	22	22	24	26	16	16

–continued–

Sample Rank	Transects sampled in Subdistricts 113-63, -64, -65, during April 2001																
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
1	19	9	28	17	14	23	19	22	21	9	16	21	22	8	15	10	18
2	20	14	30	19	16	25	21	23	29	24	18	22	25	10	18	12	19
3	22	15	31	21	18	26	22	24	30	28	19	24	26	12	19	14	22
4	23	16	33	23	20	30	24	25	31	29	20	26	30	14	23	16	23
5	24	18	36	24	21	35	27	26	33	32	34	27	31	16	32	17	24
6	25	19	37	25	22	36	28	27	34	34	37	28	32	19	35	18	25
7	26	20	38	26	23	38	29	28	35	35	38	31	33	21	36	19	26
8	27	21	39	27	25	39	30	30	38	36	39	33	34	22	43	20	28
9	28	22	40	29	26	40	31	31	39	37	40	35	35	23	45	21	29
10	29	24	41	30	27	42	32	32	40	39	41	38	37	25	66	22	32
11	30	25	42	31	28	43	33	33	41	41	42	39	38	28	—	23	33
12	31	26	43	32	29	44	34	34	43	43	45	41	39	29	—	24	34
13	33	28	44	33	30	48	37	37	44	44	46	43	40	30	—	25	35
14	34	30	45	34	31	51	38	42	45	46	47	45	42	34	—	26	36
15	36	32	46	36	32	55	39	43	48	47	49	—	43	35	—	27	37
16	37	33	49	37	33	—	40	44	49	49	52	—	45	37	—	28	39
17	41	34	54	38	34	—	41	45	50	52	54	—	46	38	—	30	40
18	44	35	—	39	38	—	43	49	53	—	56	—	47	39	—	32	43
19	45	36	—	40	42	—	45	50	55	—	59	—	50	40	—	33	45
20	47	38	—	42	48	—	48	52	56	—	60	—	51	42	—	34	51
21	49	40	—	43	59	—	—	58	58	—	61	—	54	43	—	35	—
22	50	46	—	44	—	—	—	—	65	—	—	—	55	44	—	36	—
23	51	50	—	46	—	—	—	—	—	—	—	—	59	46	—	38	—
24	54	53	—	58	—	—	—	—	—	—	—	—	61	48	—	42	—
25	—	56	—	—	—	—	—	—	—	—	—	—	—	53	—	44	—
26	—	62	—	—	—	—	—	—	—	—	—	—	—	—	—	52	—
27	—	66	—	—	—	—	—	—	—	—	—	—	—	—	—	55	—
28	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
29	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
30	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
31	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
32	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
33	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average	34	32	40	33	29	38	33	36	43	37	42	32	41	30	33	28	32
Maximum	54	66	54	58	59	55	48	58	65	52	61	45	61	53	66	55	51
Minimum	19	9	28	17	14	23	19	22	21	9	16	21	22	8	15	10	18

–continued–

Sample Rank	Transects sampled in Subdistricts 110-16, -17. during September 2001																Transects sampled in Subdistrict 110-14, during September 2001									
	1	**2**	**3**	**4**	**5**	**7**	**8**	**10**	**12**	**14**	**15**	**16**	**19**	**20**	**21**	**22**	**2**	**3**	**5**	**6**	**11**	**12**	**13**	**15**	**17**	**18**
1	13	9	9	12	2	8	12	16	18	5	27	14	22	16	17	10	9	25	18	17	11	6	14	13	20	10
2	15	10	22	13	10	9	14	17	22	6	34	15	23	17	19	12	12	26	21	18	12	9	15	14	29	15
3	16	11	23	17	11	10	16	18	23	7	35	16	24	18	22	13	13	28	23	25	13	12	17	16	30	17
4	17	12	24	18	13	11	17	19	24	8	37	17	25	19	23	16	14	30	24	26	14	13	18	17	31	19
5	19	13	25	19	15	12	18	20	25	9	38	18	26	20	24	17	15	31	25	27	15	14	20	18	32	20
6	20	14	26	20	16	13	19	21	26	10	40	19	27	21	25	20	16	32	26	28	16	15	22	20	33	23
7	21	15	27	21	17	14	20	22	27	12	41	20	28	23	26	23	17	34	27	29	17	16	25	24	34	24
8	22	16	28	22	18	15	21	23	28	13	42	21	29	24	27	26	18	35	28	30	18	20	26	25	35	25
9	23	17	29	23	19	16	22	24	29	14	43	22	30	25	28	33	19	36	29	31	19	22	28	26	37	27
10	24	18	31	24	20	18	23	25	30	15	44	23	31	30	29	35	20	40	30	32	20	23	29	29	38	28
11	25	20	34	25	21	19	24	26	31	16	45	24	32	31	30	37	21	—	31	33	22	24	30	33	40	29
12	26	21	35	26	22	20	25	27	33	17	46	25	33	33	31	40	22	—	32	34	23	25	31	38	—	31
13	27	22	38	27	23	21	26	28	34	18	47	26	34	34	32	41	23	—	33	35	24	26	32	39	—	32
14	28	23	40	28	24	22	27	29	37	19	48	27	35	35	33	42	24	—	34	36	25	27	33	40	—	33
15	29	24	45	29	25	23	28	30	39	20	49	28	36	37	34	43	25	—	35	37	35	28	34	42	—	35
16	30	25	46	30	26	25	29	31	42	21	50	29	37	38	35	44	26	—	37	38	36	29	35	43	—	37
17	31	26	49	31	27	26	30	32	45	23	51	30	38	40	36	45	27	—	38	39	37	30	36	45	—	39
18	32	27	52	32	29	27	31	33	47	27	52	31	39	41	38	47	28	—	39	40	38	31	41	46	—	43
19	33	28	53	33	30	29	32	35	48	28	53	32	40	42	40	48	31	—	43	41	39	32	42	—	—	—
20	34	29	54	34	32	30	33	37	60	29	54	33	41	43	50	49	34	—	54	42	40	34	43	—	—	—
21	35	30	55	35	36	31	34	38	—	31	56	34	42	44	—	50	40	—	—	43	42	35	47	—	—	—
22	36	31	56	37	38	32	35	41	—	33	58	36	43	45	—	51	46	—	—	44	44	37	61	—	—	—
23	37	32	57	38	39	33	36	42	—	36	59	37	44	48	—	52	48	—	—	45	45	38	—	—	—	—
24	38	33	58	42	48	34	37	44	—	41	—	38	45	49	—	53	—	—	—	46	48	39	—	—	—	—
25	39	34	61	44	55	35	38	50	—	42	—	53	48	50	—	59	—	—	—	—	50	40	—	—	—	—
26	40	35	62	48	60	36	39	—	—	43	—	—	52	51	—	61	—	—	—	—	52	41	—	—	—	—
27	41	37	63	49	—	39	42	—	—	44	—	—	57	52	—	—	—	—	—	—	—	42	—	—	—	—
28	42	40	65	51	—	40	43	—	—	45	—	—	61	53	—	—	—	—	—	—	—	43	—	—	—	—
29	44	53	—	52	—	41	45	—	—	47	—	—	—	—	—	—	—	—	—	—	—	44	—	—	—	—
30	45	—	—	58	—	42	47	—	—	48	—	—	—	—	—	—	—	—	—	—	—	53	—	—	—	—
31	46	—	—	—	—	43	48	—	—	49	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
32	47	—	—	—	—	45	—	—	—	50	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
33	48	—	—	—	—	—	—	—	—	52	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
34	49	—	—	—	—	—	—	—	—	55	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
35	50	—	—	—	—	—	—	—	—	62	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
36	51	—	—	—	—	—	—	—	—	65	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average	36	24	42	31	26	26	29	29	33	29	46	27	37	35	30	37	24	32	31	34	29	28	31	29	33	27
Maximum	60	53	65	58	60	45	48	50	60	65	59	53	61	53	50	61	48	40	54	46	52	53	61	46	40	43
Minimum	13	9	9	12	2	8	12	16	18	5	27	14	22	16	17	10	9	25	18	17	11	6	14	13	20	10

–continued–

Appendix E.1.–Page 7 of 7.

Sample Rank	Transects sampled in Subdistrict 110-12, during September 2001																									
	2	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**26**	**27**	**28**
1	14	33	23	23	16	9	18	11	15	20	22	23	18	16	27	22	35	30	50	27	33	15	7	18	15	10
2	19	35	27	24	17	11	21	15	21	21	25	24	20	17	35	23	36	34	56	30	38	38	15	22	16	11
3	29	36	28	25	19	12	31	16	22	22	26	26	22	19	39	25	37	35	57	39	39	40	16	31	17	12
4	45	37	29	26	20	14	32	19	23	23	27	27	23	23	40	26	38	37	58	41	40	41	17	36	18	13
5	48	38	30	27	21	15	34	20	24	25	28	31	38	27	41	27	39	40	61	42	41	42	19	38	20	14
6	49	39	32	28	26	16	35	22	25	26	29	32	39	32	42	28	40	41	—	43	42	43	20	40	21	15
7	50	40	33	29	27	18	36	23	26	27	30	33	41	33	43	29	41	42	—	45	44	44	22	43	22	16
8	51	42	35	30	28	20	37	24	27	28	31	34	42	34	44	30	42	43	—	46	45	45	23	44	23	18
9	52	43	36	31	31	22	38	25	28	29	32	35	43	35	45	31	44	44	—	50	46	46	24	45	24	19
10	54	44	38	32	32	24	39	26	29	30	33	36	44	36	46	32	45	45	—	51	47	47	25	46	25	20
11	55	45	43	33	33	26	40	27	30	31	35	37	45	37	47	33	46	46	—	52	48	48	26	48	26	22
12	57	46	47	35	34	27	41	28	31	32	37	38	47	38	49	34	47	47	—	53	49	49	27	49	27	23
13	58	47	48	36	35	28	42	29	32	33	38	39	48	39	51	36	48	48	—	54	50	50	30	50	32	24
14	59	48	50	37	36	30	43	30	33	34	39	40	49	40	52	37	49	50	—	55	51	51	31	51	33	26
15	60	50	52	40	38	35	44	31	34	35	40	41	50	42	54	39	50	52	—	57	53	52	32	52	34	27
16	61	51	53	41	39	37	45	32	36	36	41	42	52	43	55	40	51	53	—	58	54	53	33	53	35	28
17	62	52	54	42	40	38	46	33	38	37	42	48	53	44	56	41	52	55	—	59	55	54	34	54	36	29
18	63	53	55	44	41	40	47	34	41	38	43	49	54	45	57	42	53	56	—	60	56	55	35	55	37	30
19	64	54	59	45	43	41	48	35	43	39	44	—	55	46	58	43	54	57	—	61	58	56	36	56	38	31
20	65	56	60	46	45	42	51	36	47	40	46	—	59	47	60	44	55	59	—	63	61	57	37	58	39	32
21	66	58	61	47	47	43	52	52	49	41	—	—	62	48	63	45	57	60	—	64	—	60	38	59	40	34
22	67	59	62	48	48	44	53	56	—	42	—	—	—	49	64	47	58	62	—	66	—	—	39	64	41	39
23	69	60	—	50	50	45	55	—	—	45	—	—	—	50	67	48	59	63	—	67	—	—	40	—	42	41
24	70	62	—	52	55	47	63	—	—	52	—	—	—	51	72	49	60	65	—	68	—	—	42	—	43	42
25	71	63	—	53	68	48	—	—	—	58	—	—	—	52	—	50	61	71	—	69	—	—	—	—	45	43
26	72	66	—	54	—	49	—	—	—	66	—	—	—	53	—	53	62	—	—	70	—	—	—	—	46	50
27	—	67	—	58	—	52	—	—	—	—	—	—	—	—	—	55	66	—	—	71	—	—	—	—	50	51
28	—	69	—	—	—	56	—	—	—	—	—	—	—	—	—	57	67	—	—	75	—	—	—	—	52	53
29	—	71	—	—	—	—	—	—	—	—	—	—	—	—	—	58	68	—	—	78	—	—	—	—	58	54
30	—	74	—	—	—	—	—	—	—	—	—	—	—	—	—	60	69	—	—	—	—	—	—	—	60	—
31	—	76	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average	55	52	43	38	36	32	41	28	31	35	34	35	43	38	50	39	51	49	56	56	48	47	28	46	34	29
Maximum	72	76	62	58	68	56	63	56	49	66	46	49	62	53	72	60	69	71	61	78	61	60	42	64	60	54
Minimum	14	33	23	23	16	9	18	11	15	20	22	23	18	16	27	22	35	30	50	27	33	15	7	18	15	10

Appendix F.1.–Green sea urchin test diameters in millimeters and weight in grams by subdistrict collected in Southeast Alaska, 2000-2001.

Urchins Sampled in Subdistrict 110-14, during March 2000									
Dia	**Wt**	**Dia**	**Wt**	**Dia**	**Wt**	**Dia**	**Wt**	**Dia**	**Wt**
11	1	25	6	39	24	52	57	68	112
11	1	25	7	39	22	52	57	68	117
11	1	25	7	39	23	53	58	68	107
11	1	25	6	39	19	53	61	69	119
12	1	25	7	39	23	53	56	69	127
12	1	26	7	40	22	53	56	71	126
12	1	26	8	40	24	54	60	71	130
12	1	26	8	41	28	55	59	71	141
12	1	27	8	41	26	55	55	71	130
12	1	27	8	41	27	55	62	72	129
13	1	28	9	41	25	55	62	72	140
13	1	28	9	42	30	55	63	73	147
13	1	28	9	42	31	55	62	73	140
14	1	29	9	43	29	56	69	73	135
14	1	29	10	43	30	56	69	75	144
14	1	29	10	44	33	56	68	76	175
14	1	30	12	44	31	56	64	76	142
15	1	30	11	44	31	57	68	76	164
15	2	30	10	44	35	58	71	76	156
15	2	30	11	44	35	58	82	76	162
16	2	31	12	45	32	60	86	76	151
16	2	31	12	45	35	60	111	76	157
17	2	31	12	45	34	61	87	77	156
17	2	31	12	45	36	61	78	77	163
17	3	31	10	47	36	63	104	77	157
19	3	32	14	47	38	63	99	77	163
19	3	32	13	48	43	63	90	77	171
19	3	33	14	48	42	64	94	77	170
19	3	33	14	48	43	64	105	77	157
21	4	34	15	48	38	64	93	77	178
21	4	34	14	49	43	64	101	78	167
22	5	34	16	49	44	65	93	81	183
22	4	35	17	49	45	65	111	82	189
22	5	35	16	50	50	65	103	83	221
22	4	35	17	50	47	65	96	—	—
23	5	36	18	50	51	65	108	—	—
23	5	36	19	50	45	66	105	—	—
24	5	36	17	51	50	66	95	—	—
24	5	37	19	51	43	67	108	—	—
24	6	38	21	52	55	67	106	—	—

–continued–

Urchins Sampled in Subdistrict 110-12, during March 2001											
Dia	**Wt**	**Dia**	**Wt**	**Dia**	**Wt**	**Dia**	**Wt**	**Dia**	**Wt**	**Dia**	**Wt**
9	1	23	6	34	14	47	38	54	61	64	96
10	1	23	6	34	14	47	43	54	59	64	98
10	1	23	6	34	15	47	40	55	60	65	94
10	1	23	5	35	19	47	41	55	63	66	103
10	1	23	6	35	18	47	41	55	59	66	88
10	1	23	5	35	19	47	38	55	55	66	110
11	1	24	7	35	16	48	38	56	63	68	108
11	1	25	6	35	16	48	41	56	65	69	122
11	1	26	8	36	19	48	42	57	73	69	124
11	1	26	8	36	18	48	39	57	70	73	132
11	1	26	8	37	21	48	41	57	63	—	—
11	1	26	7	37	19	49	38	58	68	—	—
11	1	26	8	38	23	49	44	58	73	—	—
11	1	26	7	39	24	49	44	58	68	—	—
12	1	26	7	39	23	49	42	59	73	—	—
12	1	27	8	39	27	49	41	60	77	—	—
13	1	27	7	39	25	49	42	60	77	—	—
14	1	28	11	39	23	50	49	61	72	—	—
14	2	28	10	40	24	50	50	61	74	—	—
14	2	28	10	40	21	50	49	61	88	—	—
16	2	28	9	41	28	50	42	61	81	—	—
16	2	28	9	41	27	51	48	62	85	—	—
16	2	29	11	41	27	51	48	62	77	—	—
17	2	29	11	42	31	51	46	62	78	—	—
17	2	29	11	42	29	52	49	62	81	—	—
17	2	30	12	42	29	52	49	62	93	—	—
18	3	30	11	42	28	52	51	62	85	—	—
18	2	31	12	42	27	53	53	62	85	—	—
18	2	31	12	43	36	53	58	63	106	—	—
19	4	31	14	43	32	53	56	63	90	—	—
19	4	31	11	44	33	53	56	63	93	—	—
19	3	32	13	45	32	54	69	63	87	—	—
20	3	32	12	46	35	54	57	63	85	—	—
21	5	32	12	46	36	54	54	63	81	—	—
21	4	32	12	46	26	54	63	64	89	—	—
21	4	33	13	46	37	54	57	64	91	—	—
21	4	33	14	46	37	54	55	64	94	—	—
22	5	34	16	46	30	54	56	64	86	—	—

–continued–

Subdistrict 110-16,17 March 2000									
Dia	**Wt**	**Dia**	**Wt**	**Dia**	**Wt**	**Dia**	**Wt**	**Dia**	**Wt**
12	1	26	7	42	27	56	61	63	99
12	1	27	8	42	28	56	67	64	82
12	1	27	8	42	29	56	64	64	99
12	1	28	8	43	31	56	59	65	102
12	1	28	8	43	30	56	56	65	94
13	1	28	9	44	33	57	66	65	93
13	1	28	9	44	31	57	69	65	100
13	1	28	9	44	33	57	64	65	96
13	1	28	10	44	35	57	73	65	94
14	1	29	10	45	33	58	67	66	97
14	1	30	11	45	30	58	70	66	98
15	1	30	11	45	34	59	71	66	106
15	1	30	9	46	39	60	74	67	103
15	1	31	11	46	36	60	76	67	94
15	1	31	11	46	32	60	74	67	109
16	1	31	12	46	32	60	79	69	110
16	2	31	12	46	36	61	79	70	118
17	1	31	13	47	41	61	75	71	130
17	2	32	12	47	37	61	73	75	152
19	3	32	12	48	42	61	76	—	—
20	3	32	13	48	33	61	84	—	—
20	3	32	12	48	37	61	79	—	—
21	3	33	14	49	47	61	79	—	—
22	4	34	14	49	46	61	82	—	—
22	5	34	14	50	43	62	82	—	—
22	5	35	17	51	46	62	84	—	—
23	5	35	15	52	50	62	84	—	—
23	5	35	16	52	49	62	79	—	—
24	4	35	17	52	49	62	86	—	—
24	6	36	19	53	53	62	68	—	—
25	6	36	16	53	59	62	90	—	—
25	6	38	19	54	60	62	84	—	—
25	4	38	18	55	59	62	84	—	—
26	7	38	19	55	61	62	86	—	—
26	7	39	25	55	62	63	91	—	—
26	7	40	22	55	61	63	94	—	—
26	6	41	23	55	60	63	90	—	—
26	8	41	28	56	66	63	90	—	—

–continued–

Urchins Samplued in Subdistricts 113-63, -64, and -65 during April 2001											
Dia	**Wt**	**Dia**	**Wt**	**Dia**	**Wt**	**Dia**	**Wt**	**Dia**	**Wt**	**Dia**	**Wt**
10	0.5	20	4	28	8	38	22	49	42	56	63
11	1	20	4	28	9	38	22	49	41	56	75
12	1	20	4	29	11	39	25	49	50	56	65
12	1	20	4	29	10	39	26	49	38	56	59
12	1	20	4	30	12	39	24	49	45	57	67
13	1	20	4	30	10	39	21	49	44	57	70
13	1	20	3	31	14	40	24	49	43	57	63
13	1	21	4	31	12	40	27	50	54	58	66
13	1	21	4	32	12	40	25	50	47	60	81
14	2	21	5	32	12	41	27	50	42	60	78
14	1	21	5	33	15	41	30	50	49	60	73
15	2	21	4	33	15	42	31	51	52	60	81
15	2	22	5	33	16	42	28	51	53	60	79
15	1	22	4	34	16	42	26	51	46	61	87
15	1	22	4	34	18	42	29	51	48	61	88
15	1	22	6	34	15	42	29	51	48	61	83
16	3	22	5	34	16	42	26	51	48	61	86
16	2	22	5	34	17	42	28	51	47	62	92
16	2	22	5	34	17	43	28	52	47	62	85
16	2	22	4	34	17	43	32	52	53	63	90
17	2	23	6	35	17	43	36	52	50	63	82
17	2	23	5	35	17	44	30	53	58	63	81
17	2	23	7	35	11	44	34	53	54	63	98
17	2	24	6	35	19	44	32	53	56	63	84
17	2	24	6	36	23	46	37	53	58	63	92
17	2	24	6	36	46	46	40	53	55	64	98
18	3	24	6	36	22	46	39	54	57	65	109
18	2	24	6	36	17	46	34	54	61	65	97
18	3	25	7	36	20	47	39	54	52	65	99
18	2	25	7	36	18	47	38	54	58	66	102
18	3	25	7	36	18	47	43	54	52	66	105
18	3	26	7	37	18	47	38	54	61	69	114
18	2	26	8	37	23	47	44	54	57	—	—
19	3	26	7	37	20	47	43	54	60	—	—
19	3	26	8	38	22	47	45	55	69	—	—
19	4	26	8	38	28	48	37	55	65	—	—
19	3	27	9	38	26	48	41	55	56	—	—
19	3	28	10	38	23	48	43	55	59	—	—