GEODUCK CLAM STOCK ASSESSMENT SURVEYS

AND FISHERY MANAGEMENT

FOR THE 2002/2003 SEASON

By

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ABSTRACT

Surveys were conducted in portions of Subdistricts 101-23, 103-50, and 103-60 to estimate geoduck clam biomass. These areas included three new commercial areas identified through industry reconnaissance and one control area. Surveys were conducted by Alaska Department of Fish and Game (ADF&G) divers during June and August 2002 using the ADF&G *R/V Sundance*. Individual fishing areas were opened for the 2002/2003 season based on preliminary paralytic shellfish poison (PSP) testing. The first openings occurred on January 21, 2003. Total Guideline Harvest Level for the 2002/2003 season was 173,318 kg (382,100 lb). An estimated total of 177,286 kg (390,848 lb) of geoduck clams were harvested during the 2002/2003 fishery.

INTRODUCTION

Historically, geoduck clam assessment surveys have been limited in scope in Southeast Alaska. Stock assessment surveys were first completed in Southeast Alaska in 1982 at Noyes Island and in 1988 and 1989 at Biorka Island, Kah Shakes, and Gravina Island. Although commercial fisheries have been ongoing in these areas since 1985 no additional surveys were conducted until 1997. Beginning in 1997 established commercial harvest areas were resurveyed, as were several new areas. The principal goals of this project were to: 1) conduct a biomass assessment survey prior to opening a commercial fishery in potential new areas for the 2001/2002 season, and 2) continue improvement of assessment techniques for future surveys. Areas surveyed were Northern Duke Island, Cat and Dog Islands in Subdistrict 101-23, South Vallenar Point in Subdistrict 101-29, Eastern Fernando Island, northern San Juan Bautista Island and Balandra Island in Subdistrict 103-60, Kelp Island area in Subdistrict 101-21, and Port Mayoral control area in Subdistrict 103-50 (Figure 1).

METHODS

Density estimates were made by scuba divers along two-meter-wide strip transects. There are two types of transects that may be used depending on the area, type I and II; these transects serve as the primary sampling unit. Type I transects run perpendicular to shore and are used along straight shorelines (not coves or bays). Transects extend to a minimum target depth of 17 m (55 fsw) below mean lower low water (MLLW). Dives to the target depth include the majority of habitat in which commercial divers normally operate. Dives are limited to a maximum depth of 21 m (70 fsw) because deeper dives severely limit total bottom time for scuba divers and pose safety risks when conducted repetitively over several days. Transect length varies depending on the slope of the bottom. For type I transects, two divers swam as a team along each transect, with one diver holding a two-meter rod (a 2.1-cm diameter white PVC tube) in a horizontal position, perpendicular to the census path. Transect direction was maintained by reference to a compass mounted on the rod. The diver carrying the rod counted the number of geoduck clams passing under one side of the rod (usually the left) while the second diver counted geoducks on the other side (usually the right). Alternatively, each diver may carry a one-meter rod, but under no circumstances would a diver count an area wider than one meter. Type I transects are used in areas such as Vallenar Bay and Cone Island.

Type II transects are used in coves and embayments where a reasonable estimate of seabed area can be made. A buoyed anchor is dropped on a transect location where divers descend and survey a predetermined measured distance. Beginning at the anchor, a 1-m^2 PVC frame is flipped along a compass heading (generally toward mouth of bay), and all geoducks within each frame are counted and recorded. Type II transects were not used this survey season.

A variation of type I transects involves using a 1-meter square that is placed at the beginning of the transect and flipped until target depth (type I) is reached. Geoduck counts are made within each square. This method has the advantage of focusing the counts into a well-defined area and may achieve a higher within transect precision (though this has not been tested). The disadvantages are the cumbersome use of the square, particularly in dense kelp, and the longer dive time required to complete a transect.

In addition to recording the geoduck count for each transect, divers also recorded data for start and stop depths, substrate type, percent vegetative cover, vegetative type, and the presence of other species of interest including sea urchins, sea cucumbers, abalone, and *Sargassum muticum*. Vegetative type was recorded for the two most common types on each transect, with the most prevalent type listed first. Substrates were coded using a key that groups various algae and intertidal plant species into categories (Appendix A). Similarly, substrate type was recorded as "percent cover" for up to two types and was coded (Appendix B).

The beginning and ending time for each transect was recorded by a dive tender to allow for standardization to the mean lower low water (mllw) tide stage. Preferably, shoreline (type-one) transects were paired (sides A and B) so that a dive team would census one strip while descending, and then a second strip when returning to shore. The second transect in each pair is approximately 10–15 meters to the left (when facing shore) of the first transect. This is the preferred method but may not be practical when a gentle slope requires extended bottom times, with multiple dives often necessary to complete one transect. It is left to the divers discretion as to whether a paired transect is appropriate for a particular transect site. The appendices list whether a transect was paired or not.

Density estimates for each linear shoreline (type I) were calculated as the average number of geoducks per meter of shoreline length:

$$D_1 = \sum_{i=1}^{n} \frac{L_i}{kL_t} c_i \quad , \tag{1}$$

where:

D_1 = estimated number of geoducks per meter of shoreline,
i = transect index,
c_i = count of geoduck clams on each transect i,
L_i = shoreline segment length associated with each transect i,
L_t = total shoreline length,
k = either 2 or 4.

The variable k in Equation 1 is equal to 2 when only side A is counted on a type 1 transect, or equals 4 when both sides A and B are counted, and corrects for the 2-meter width of each transect side.

Where a reasonable estimate of seabed area could be made (type II transects), the density per square meter of seabed is estimated:

$$D_2 = \frac{1}{Tn_D} \sum_{i=1}^{n} C_i \quad , \tag{2}$$

where:

D_2 = estimated number of geoducks per square meter,
c_i = count of geoduck clams on each transect i from 1 to n,
n_D = number of transects,
T = transect length.

Uncertainty in the density estimate is expressed as the percent precision. The index is equal to the lower bound of the one-sided 90% confidence interval expressed as a percent of the average density and calculated as:

$$P_D = 100\left(1 - t_\alpha \frac{s}{D\sqrt{n}}\right), \quad (3)$$

where:

P_D = percent precision of the density estimate,
t_α = t-value from Student's distribution for a one-sided interval with significance, level α = 10%,
s = standard deviation of the mean,
D = estimated density of geoducks (D_1 or D_2).

In a perfectly precise estimate, P_D would equal 100%; decreasing numbers indicate increasing uncertainty.

Geoduck Weight Estimates

Geoduck weight estimates were made using data collected from previous commercial fisheries and assessment surveys. All data available (i.e. both commercial and survey samples) were combined and applied to the biomass estimates. In new areas where no data have been collected, all data collected and available from Southeast Alaska were averaged and used to estimate the biomass. After the fishery has occurred, data collected for that area's commercial fishery will be averaged and used to recalculate the biomass estimate.

Mean weight per geoduck within a given area is estimated as:

$$W = \frac{\sum w_i}{n_w}, \quad (4)$$

where:

W = estimated mean weight per whole geoduck,
w_i = weight of the ith geoduck from the available data,
n_w = sample n for weight.

Geoduck Biomass Estimates

The estimate of total geoduck biomass in an area was calculated as:

$$B_{bed} = (D_1)(W)(S) \quad \text{or,} \quad (5)$$

$$B_{bed} = (D_2)(W)(A). \quad (6)$$

Where:

B_{bed} = estimated total geoduck biomass per defined area,
D_1 = estimated density of geoducks per linear meter of shoreline,
D_2 = estimated density of geoducks (number per square meter),
S = total estimated shoreline length (in meters, using NOAA charts),
A = total estimated bed area (in square meters, using NOAA charts).

Confidence limits for the biomass estimates are based on an estimate of the variance of the biomass. A variance-of-products formula (Goodman 1960) was used to calculate a variance estimate for the product of mean density and mean weight per geoduck. Assuming that there is no correlation between density and weight then the variance of the biomass is:

$$\delta_B^2 = D^2 \frac{\delta_w^2}{n_w} + W^2 \frac{\delta_D^2}{n_D} - \frac{\delta_D^2 \delta_W^2}{n_D n_w}, \quad (7)$$

where:

δ^2_B = variance of biomass, B,
δ^2_D = variance of mean density,
δ^2_W = variance of mean weight.

Uncertainty in the biomass estimate is expressed as the percent of precision. The index is equal to the lower bound of the one-sided 90% confidence interval expressed as a percent of the biomass. This index, similar to P_D (Equation 3), was calculated as:

$$P_B = 100\left(1 - t_\alpha \frac{s}{B_{bed}\sqrt{n_D}}\right), \quad (8)$$

where:

P_B = percent precision of the density estimate,
s = standard deviation of the mean biomass estimate (δ_B, from Equation 7).

The guideline harvest levels for biomass estimates were calculated using a precision adjusted biomass.

$$B_{adj} = P_B * B_{bed} \quad (9)$$

where:

B_{adj} = precision adjusted biomass estimate (used to calculate GHL),
P_B = from Equation 8,
B_{bed} = from Equation 5 or 6.

SHOW FACTOR SURVEYS

Geoduck clams can be difficult to count when they are hidden below the substrate. For this reason the true clam density may be underestimated. The method described below, used to estimate the true density of geoducks from visual counts, is patterned after that used by the Washington Department of Fish and Wildlife (Bradbury et al. 2000). This method was originally introduced by Goodwin (1977) who coined the term "show factor." A "show" is either a siphon visible above the substrate or a depression in the substrate that can be identified as having been made by a clam siphon (see ADF&G RIR 1J01-25 for a complete description for department show plot methodology).

The show factor, F, is the ratio of geoduck clam shows visible during a single observation of any defined area and the true abundance of harvestable geoducks within that area:

$$F = n / N, \tag{10}$$

where:

n = the number of visible shows within a defined area (show plot),
N = the absolute number of harvestable geoducks within the area.

The guideline harvest levels for Southeast areas open during the 2000/2001 season were adjusted for a show factor as:

$$GHL_F = \frac{GHL_{bed}}{F}, \tag{11}$$

where:

GHL_F = show factor adjusted guideline harvest level (GHL) estimate,
GHL_{bed} = geoduck GHL estimate,
F = show factor, from Equation 10.

SURVEY RESULTS AND DISCUSSION

A total of 67 transects were completed during the 2002 survey season in four areas of Southeast Alaska (Table 1; Figures 2–8). Industry divers provided reconnaissance data[2] prior to department surveys. From this reconnaissance, two new areas were surveyed by the department for possible commercial fisheries in the 2001/2002 season: Kelp Island (southeast Dall Island in Subdistrict 101-23) and the eastern shore of San Fernando Island (in Subdistrict 103-60). Additional transects were completed in Subdistrict 101-23 north of Duke Island and in the Cat and Dog Islands area; additional transects are scheduled to be completed during the 2003 survey season. In addition to providing for a commercial harvest, the Port Mayoral geoduck control area (in Subdistrict 103-50) was surveyed. The Appendices list the GHL, raw data, and biomass estimates for each area.

[2] Industry reconnaissance was funded by grant NA06FN0385 from the National Oceanic and Atmospheric Administration (NOAA). The views expressed are those of the authors and do not necessarily reflect the views of NOAA or any of its sub-agencies.

Since neither assessment surveys nor commercial fisheries have occurred in the areas surveyed during the 2002 season, no area-specific weight data was available to calculate biomass. Instead, all available geoduck clam weight data from Southeast Alaska was averaged and used to calculate the estimated biomass for these areas. This data was collected from both department assessment surveys and commercial fisheries from 1978/1979 through 2001/2002 seasons. Average weight was 1,1,116 g (2.4 lb) resulting from a sample size of 6,066 clams collected from 20 areas in Southeast Alaska.

A total of 24 transects were located over 4,676 m of shoreline in the San Alberto Bay area which included the east shore of San Fernando Island, the northern shore of San Juan Bautista Island, and Balandra Island. Most of the biomass in the area surveyed was located on San Fernando Island. Transects near San Juan Bautista and Bautista Islands indicated a relatively low density of geoducks. San Fernando Island is an historic sea cucumber control site and this area was not included in the commercial geoduck fishery to protect control site integrity. East San Fernando Island accounted for only 44.5% of the shoreline surveyed in San Alberto Bay but contained over 65% of the geoducks counted. Geoduck counts along the eastern San Fernando shoreline resulted in a biomass estimate of 159,893 kg (352,498 lb). Survey raw data is in Appendix F.

A total of 18 transects were located over 3,557m of shoreline in the Kelp Island area. Geoduck counts resulted in a biomass of 344,171 kg (758,754 lb). Survey raw data is in Appendix D.

As per the Geoduck Management Plan (Pritchett 1999), closed waters will be designated for research and conservation purposes. Research in closed areas will be conducted to detect population trends that are independent of commercial harvest. As these programs are developed and areas defined, small beds or portions of beds may be closed to commercial geoduck harvest. Populations in refuges provide opportunities for research of important life history events, individual growth rates, recruitment, mortality, and related information. Possible areas may be control sites, long term show factor sites, or recruitment study areas where a commercial harvest would negate any benefits that might be obtained. Refuges also meet the biological conservation objective by providing some assurance that unharvested populations remain at levels necessary for successful reproduction. These populations may provide the nucleus for production of larvae for restocking adjacent areas in the event that they are inadvertently depleted. In 2001, two areas were initially designated and subsequently surveyed as geoduck clam control areas in Southeast Alaska: Port Mayoral in portions of Subdistrict 103-50, and the Cat and Dog islands area in portions of Subdistrict 101-23. Both control areas are located in areas that have not previously been open to commercial harvest. These areas were chosen because of their proximity to important commercial harvest areas.

A total of 12 transects located over 1,200 m of shoreline were surveyed the Port Mayoral geoduck control area. The estimated biomass for this area is 39,859 kg (87,872). Survey raw data is in Appendix E.

A total of 13 transects were surveyed in the Cat and Dog islands control area in 2002. Initially, in 2001, it was thought that this area might serve as a geoduck control area. Additional transects in 2002 indicate this area probably does not contain sufficient densities of geoducks to warrant this designation. Consequently additional transects will be plotted and surveyed and this area may be opened to commercial harvest. Currently, during survey seasons 2001 and 2002 a total of 26 transects located over 4,300 m of shoreline have been surveyed. The estimated biomass for this area is 78,768 kg (173,651 lb). Survey raw data is in Appendix C.

Collecting data necessary for calculating show factors is very labor intensive and requires that divers be able to visit a site continuously for relatively lengthy periods (up to 5–7 days per site). The remoteness of most geoduck fisheries in Southeast prohibits establishing show factors specific for individual geoduck harvest areas. Data collection to develop show factors began in Southeast in 1998 (Pritchett et al. 1999). Following the 2000 survey season, a total of six sets (three 2x10 m plots per set) of show plots had been located and

surveyed in areas of Southeast Alaska where geoduck assessment surveys and harvest occurs: one set each near Kolosh Island, Legma Island, Middle Gravina, Blank Inlet, Grant Island, and San Juan Bautista. The overall average show factor derived from these combined show plots was 0.80. This value compensates for retracted or covered geoduck siphons not visible during surveys. The overall affect of applying show factors is an increased estimate of biomass. No additional show plot work was completed in 2002.

FISHERY MANAGEMENT AND SEASON SUMMARY

Geoduck clams are long-lived with low and sporadic recruitment, therefore, the objective of geoduck fishery management is to allow low exploitation rates on beds open to commercial harvest. Commercial harvest is also restricted to beds for which biomass estimates are available. The guideline harvest level (GHL) for each area is calculated as 2% of the estimated biomass per year (Larson and Minicucci 1997). Harvests historically have been allowed from October 1 through May 31 to avoid the summer spawning and recovery period and to minimize PSP toxin levels.

Open fishing areas were approved for harvesting geoduck clams for intrastate and interstate sale by ADEC. Geoducks were sold either fresh or frozen only after satisfactory testing for Paralytic Shellfish Poisoning (PSP) by the ADEC prior to sale and distribution. A certificate and permit from ADEC was required to possess, harvest, process, and distribute geoduck clams for sale for human consumption or bait.

The geoduck fishery in Southeast Alaska was under limited entry during this season with 104 divers eligible to participate. Each diver was required to have a current Miscellaneous Shellfish Species Registration Form during fishing operations. The ADF&G Ketchikan area office had responsibility for geoduck fisheries management within all open areas except Symonds Bay and the Goddard area that was managed through the Sitka office.

In cooperation with the Southeast Alaska Regional Dive Fishery Association (SARDFA), the commercial geoduck fishery openings was based on preliminary Paralytic Shellfish Poisoning (PSP) testing, conducted by the Alaska Department of Environmental Conservation (ADEC). The testing is designed to increase the likelihood of live product shipment. Because of recent requests by SARDFA for changes to ADEC's program, ADEC held a Geoduck Conference in Anchorage, August 5 and 6, 2002. The result of this conference was implementation of a PSP testing program for geoduck which necessitates some ADF&G management considerations/changes in order to target live geoduck sales.

Prefishery monthly testing of each area began in November. Weekly testing began in January 2003 in those areas that had passed monthly testing (i.e. in 2003, the first monthly test that passed became synonymous with the first weekly test). Once an area had passed two consecutive weeks of PSP testing the area was opened. The department issued a news release the day after the results were received, from ADEC, from a second week of positive testing. The news release was then issued to open the area in 7 days. This will allow for a third week of PSP testing just prior to the fishery and a 7-day notice of intent to open the fishery. Once an announcement had been made to open an area, that area remained open regardless of subsequent PSP testing and until the Guideline Harvest Level (GHL) for that area level has been taken. This management scenario effectively put all Southeast Alaskan commercial geoduck fisheries on 7-day notice, dependent on PSP testing, after approximately the second week of January 2003.

Total quota available for harvest was 173,318 kg (382,100 lb, Table 2). A total of 50 divers participated in the Southeast Alaska geoduck fishery, landing a preliminary estimate of 177,286 kg (390,848 lb) of geoduck clams (Table 2). Open area descriptions for the commercial geoduck clam fisheries can be found in Appendix G.

Foggy Bay

Foggy Bay (in Subdistrict 101-23) opened for a guideline harvest level of 28,531 kg (62,900 lb) of whole geoduck clams. The area was open from 9:00 a.m. to 3:00 p.m. daily, beginning 9:00 a.m. Tuesday, January 21, 2003 and was closed by emergency order effective 3:00 p.m., Tuesday, January 28, 2003. The total harvest was 27,808 kg (61,306 lb) with a total of 15 divers making 89 landings.

Gravina Island

Nehenta Bay on west Gravina Island (in Subdistrict 101-29) opened for a guideline harvest level of 10,886 kg (24,000 lb) of whole geoduck clams. The area was open from 9:00 a.m. to 3:00 p.m. daily, beginning and was closed by emergency order effective 3:00 p.m., Wednesday, May 14, 2003. The total harvest was 10,876 kg (23,977 lb) with a total of 6 divers making 17 landings.

East San Fernando Island

East San Fernando Island (in Subdistrict 103-60) opened for a guideline harvest level of 5,579 kg (12,300 lb) of whole geoduck clams. The area was open from 9:00 a.m. to 3:00 p.m. daily, beginning and was closed by emergency order effective 3:00 p.m., Tuesday, May 13, 2003. The total harvest was 5,609 kg (12,366 lb) with a total of 5 divers making 13 landings.

Southern Sea Otter Sound

Southern Sea Otter Sound (in Subdistrict 103-90) opened for a guideline harvest level of 13,018 kg (28,700 lb) of whole geoduck clams. The area was open from 9:00 a.m. to 3:00 p.m. daily, beginning 9:00 a.m. Tuesday, January 21, 2003 and was closed by emergency order effective 3:00 p.m., Monday, January 27, 2003. The total harvest was 11,989 kg (26,431 lb) with a total of 20 divers making 47 landings.

Little Steamboat Bay

Little Steamboat Bay (in Subdistrict 103-70) opened for a guideline harvest level of 5,488 kg (12,100 lb) of whole geoduck clams. The area was open from 9:00 a.m. to 3:00 p.m. daily, beginning 9:00 a.m. Tuesday, January 21, 2003 and was closed by emergency order effective 12:00 noon, Friday, February 21, 2003. The total harvest was 4,717 kg (10,400 lb)with a total of 19 divers making 21 landings.

Ulitka Bay

Ulitka Bay (in Subdistrict 103-70) opened for a guideline harvest level of 4,717 kg (10,400 lb) of whole geoduck clams. The area was open from 9:00 a.m. to 3:00 p.m. daily, beginning 9:00 a.m. Tuesday, January 21, 2003 and was closed by emergency order effective 3:00 p.m., Sunday, February 2, 2003. The total harvest was 4,372 kg (9,638 lb) with a total of 12 divers making 28 landings.

San Christoval

San Christoval (in Subdistrict 103-70) opened for a guideline harvest level of 18,370 kg (40,500 lb) of whole geoduck clams. The area was open for beginning 9:00 a.m., Tuesday, February 18, 2003 and was closed by emergency order effective 3:00 p.m., Wednesday, February 19, 2003. The total harvest was 24,034 kg (52,986 lb) with a total of 28 divers making 56 landings.

Cone Island

Cone Island area (in portions of Subdistricts 103-50, 104-35 and 40) opened for a guideline harvest level of 55,837 kg (123,100 lb) of whole geoduck clams. The area was opened 9:00 a.m. to 3:00 p.m. daily, beginning 9:00 a.m. Tuesday, January 21, 2003 and was closed by emergency order effective 10:00 a.m., Sunday, February 9, 2003. The total harvest was 55,878 kg (123,190 lb) with a total of 40 divers making 172 landings.

Port Santa Cruz

Port Santa Cruz (in Subdistrict 104-30) was opened for a guideline harvest level of 22,618 kg (50,300 lb) of whole geoduck clams. The area was opened 9:00 a.m. to 3:00 p.m. daily, beginning 9:00 a.m. Tuesday,

January 21, 2003 and was closed by emergency order effective 3:00 p.m., Monday, February 17, 2003. The total harvest was 23,998 kg (52,907 lb) with a total of 21 divers making 56 landings.

Symonds Bay

Symonds Bay (in Subdistrict 113-31) opened for a guideline harvest level of 1,542 kg (3,400 lb) of whole geoduck clams. The area was open from 9:00 a.m. to 3:00 p.m. daily beginning 9:00 a.m., Thursday, January 23, 2003 and was closed by emergency order effective 12:00 p.m., Thursday, February 20, 2003. The total harvest was 1,532 kg (3,377 lb) with a total of 6 divers making 10 landings.

Goddard

The Goddard area (in portions of Subdistricts 113-31 and 113-41) opened with a guideline harvest level of 6,532 kg (14,400 lb) of whole geoduck clams. The area was open from 9:00 a.m. to 3:00 p.m. daily beginning 9:00 a.m., Thursday, January 23, 2003 and was closed by emergency order effective 3:00 p.m., Thursday, February 6, 2003. The total harvest was 6,473 kg (14,270 lb) with a total of 7 divers making 27 landings.

Commercial Sampling

A total of 1,331 whole geoduck clams were sampled during the 2002/2003 commercial fishery (Table 3). Average weight for this fishery was 1,177 g (2.60 lb) with, on average, smaller clams being harvested from Symonds Bay and larger clams being harvested from the Goddard area.

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Table 1. Biomass estimates of geoduck clams from four areas surveyed in Southeast Alaska in 2002.

	San Alberto Bay	East San Fernando Island[e]	Kelp Island	Port Mayoral Control[c]	Port Mayoral Control[c]	Dog & Cat Island[d]
Number of Transects	24	11	18	9	12	26
Average per Linear Meter	47	69	87	25	30	16.7
Variance of Counts	2,975.250	2,495.041	19,196.301	765.861	762.023	374.718
Std. Variance of Mean	123.969	226.822	1,066.461	85	63.502	14.412
Shoreline (m)	4,676	2,081	3,557	900	1,200	4,300
Total Number of Geoducks	219,869	143,400	308,669	22,400	36,300	71,736
Variance of Total Number	2,710,573,331	982,266,078	13,493,131,986	68,927,500	91,442,727	266,482,392
Precision of Estimate	68.8%	70.0%	49.8%	48.2%	64.1%	70.0%
90% Coefficient of Variation	40.6%	39.6%	65.5%	68.9%	47.3%	38.9%
90% two-tail Precision	59.4%	60.4%	34.5%	31.1%	52.7%	61.1%
Average Weight g (lb)[a]	1,116 (2.4)	1,116 (2.4)	1,116 (2.4)	1,116 (2.4)	1,116 (2.4)	1,116 (2.4)
Variance of Average Weight[a]	0.00009100	0.00009100	0.00009100	0.00011281	0.00011281	0.00011281
Biomass Estimate kg (lb)	245,158 (540,472)	159,893 (352,498)	344,171 (758,754)	24,596 (54,224)	39,859 (87,872)	78,768 (173,651)
Variance of Biomass Est.	16,382,792,664	5,937,124,950	81,539,696,660	403,951,016	535,975,518	1,562,087,156
Precision of Estimate	68.7%	70.0%	49.8%	48.2%	64.1%	70.0%
90% Coefficient of Variation	40.6%	39.6%	65.5%	68.9%	47.3%	38.9%
90% two-tail Precision	59.4%	60.4%	34.5%	31.1%	52.7%	61.1%
Lower Bounds Biomass Est. (lb)	321,105	212,843	262,006	16,850	46,295	106,139
Upper Bounds Biomass Est. (lb)	759,839	492,153	1,255,501	91,598	129,448	241,162
Show Factor Adjustment	0.80	0.80	0.80			0.80
Target Harvest Rate	4%	4%	4%			4%
Precision Adjusted Quota[b] kg (lb)	8,427 (18,579)	5,596 (12,338)	8,573 (18,900)			1,991 (4,389)

[a] Weight values from overall Southeast commercial and survey weight data from 1978/1979 through 2001/2002. N = 6,066.
[b] In pounds. No harvest occurs in control areas.
[c] Three transects added in 2002. Data presented for original nine transects for comparison to 2001.
[d] Contains transects surveyed 2001 and 2002. Thirteen transects surveyed in 2002. This area is scheduled to be completed in 2003.
[e] East San Fernando Island is a subset of San Alberto Bay transects.

Table 2. Southeast Alaska 2002/2003 season commercial geoduck clam harvest by area.

Area	Subdistrict-Bed	Number of		Guideline Harvest Level, kg (lb)	Kilograms (lb) Harvested[a]
		Divers	Landings		
Foggy Bay	101-23	15	89	28,531 (62,900)	27,808 (61,306)
Gravina Island	101-29	6	17	10,886 (24,000)	10,876 (23,977)
East San Fernando I.	103-60	5	13	5,579 (12,300)	5,609 (12,366)
Southern Sea Otter Sound	103-90	20	47	13,018 (28,700)	11,989 (26,431)
Little Steamboat Bay	103-70	19	21	5,488 (12,100)	4,717 (10,400)
Ulitka Bay	103-70	12	28	4,717 (10,400)	4,372 (9,638)
San Christoval	103-70	28	56	18,370 (40,500)	24,034 (52,986)
Cone Island	103-50, 104-35 & 40	40	172	55,837 (123,100)	55,878 (123,190)
Port Santa Cruz	104-30	21	56	22,816 (50,300)	23,998 (52,907)
Symonds Bay	113-31	6	10	1,542 (3,400)	1,532 (3,377)
Goddard	113-31-815002, 41	7	27	6,532 (14,400)	6,473 (14,270)
Total		50	537	173,318 (382,100)	177,286 (390,848)

[a] As per IFDB (Integrated Fishticket Data Base) May 23, 2003.

Table 3. Commercial geoduck weights collected during the 2002/2003 fishery.

	Geoduck Weight (g)					
	Count	Min	Max	Mean	Variance	Std Dev
Goddard	96	479	2837	1497	194004	440
Kah Shakes	200	458	2,246	1,067	84,156	290
Nakat Bay	175	420	1,741	1,051	59,201	243
Steamboat Bay	200	479	2,714	1,242	163,749	405
Symonds Bay	160	163	1,760	969	57,269	239
Percy_Hotspur Islands	200	467	2,281	1,198	91,132	302
103-50	300	573	2,361	1,276	104,961	324
Total (weighted, grams)	1,331	163	2,837	1,177	122,183	350
			Geoduck Weight (lb)			
Total (weighted, pounds)	2.93	0.36	6.25	2.60	269.37	0.77

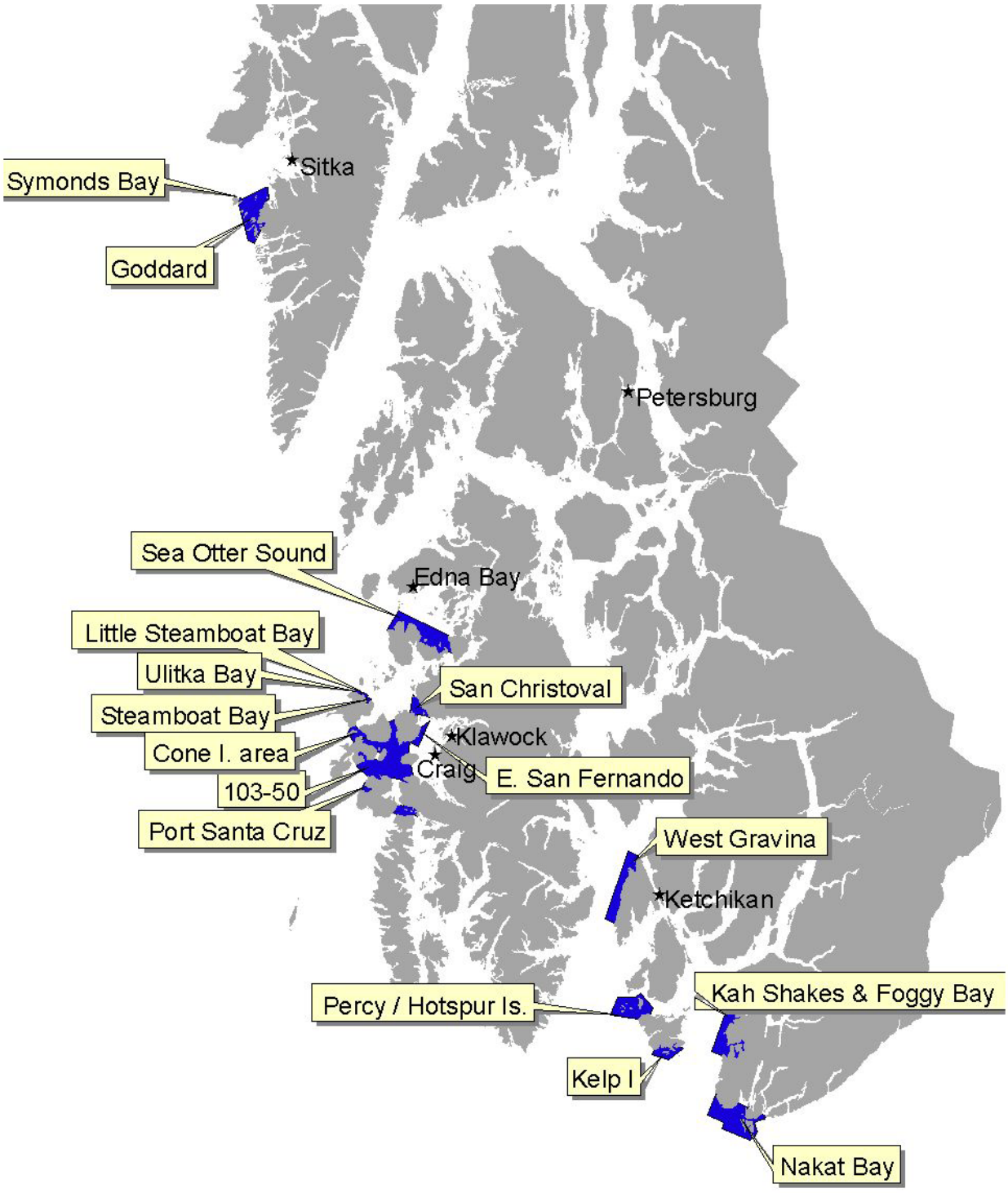

Figure 1. Geoduck clam survey and commercial harvest areas in Southeast Alaska.

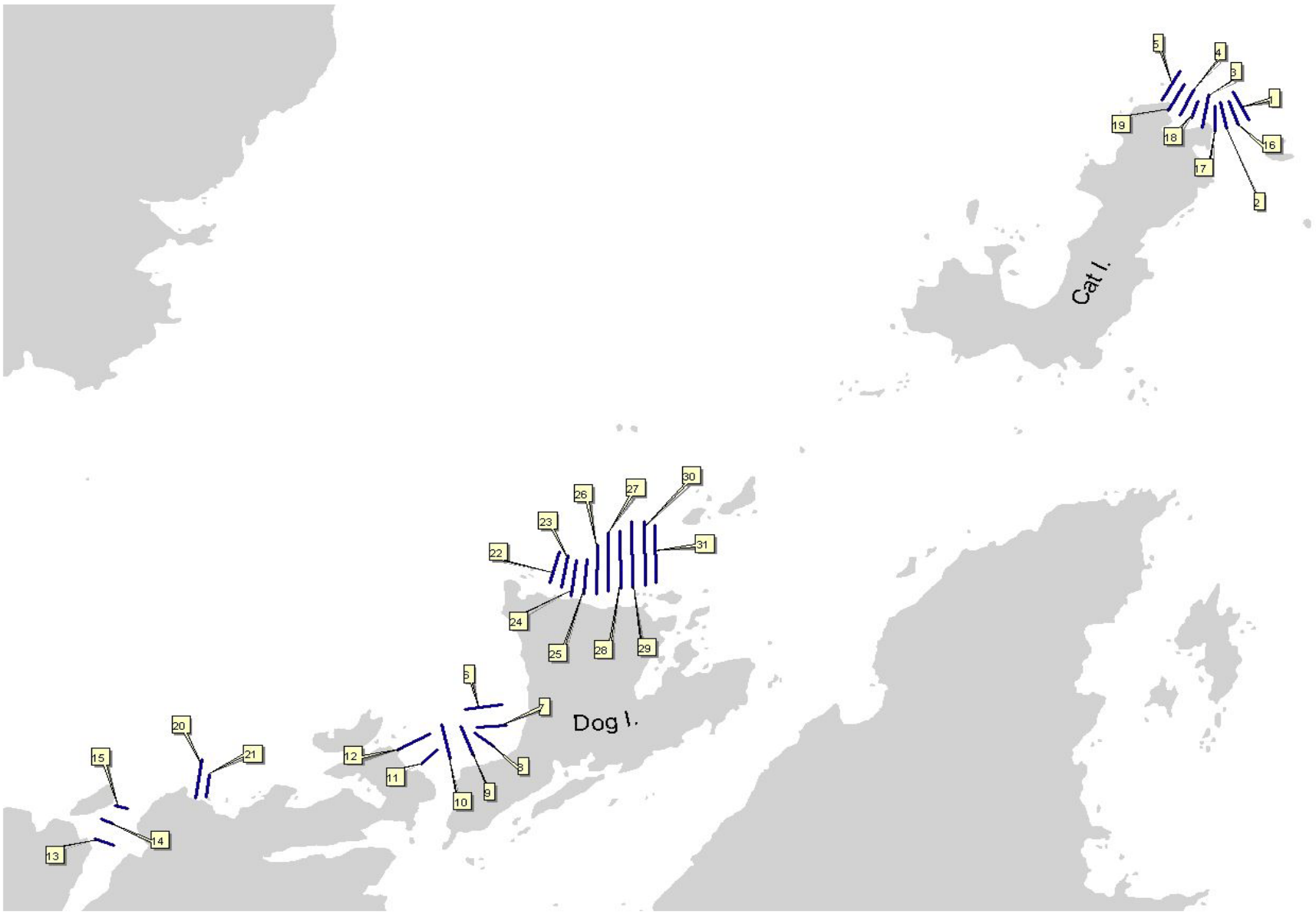

Figure 2. Dog and Cat islands areas (in Subdistrict 101-23) geoduck survey transect locations.

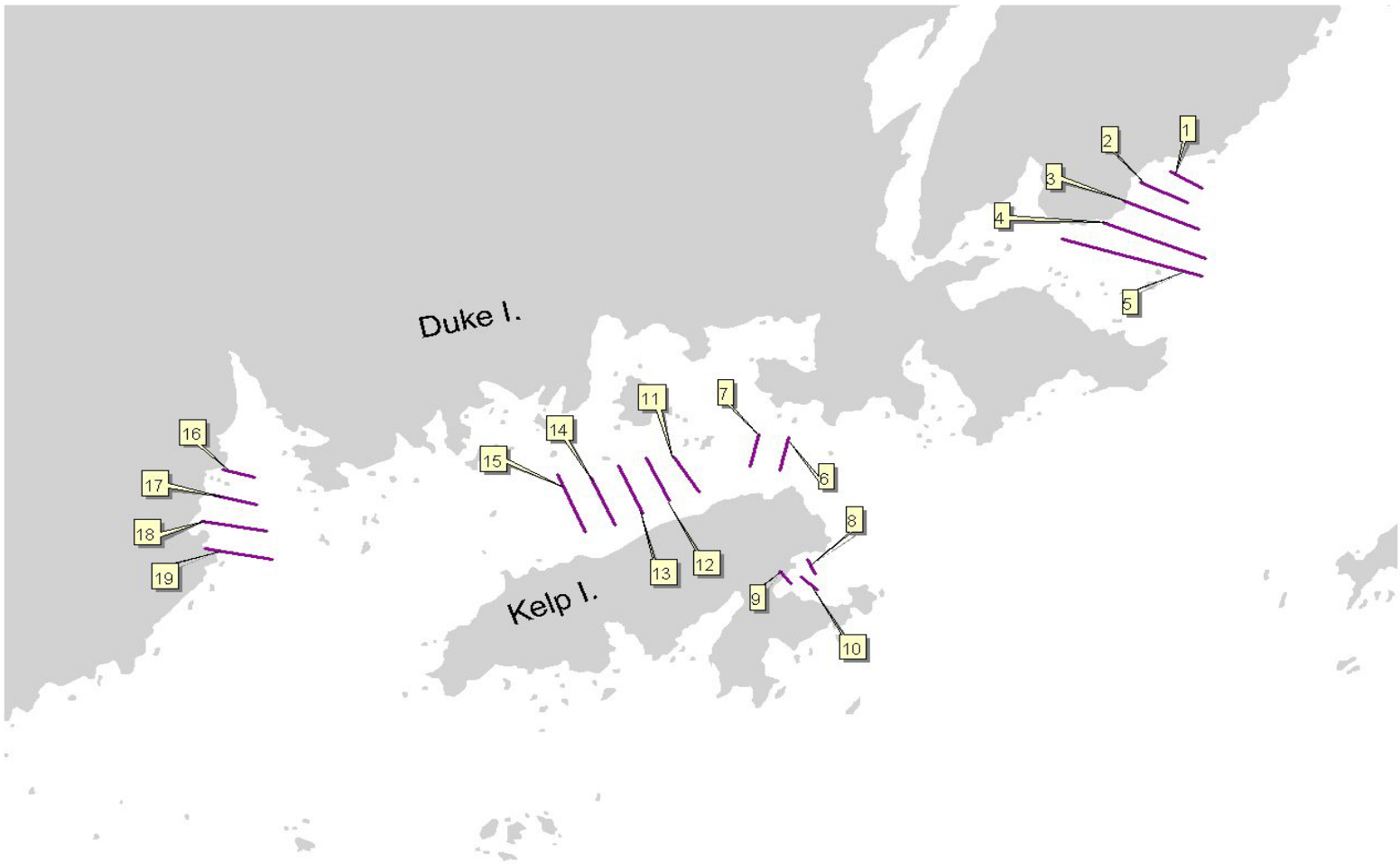

Figure 3. Kelp Island (in Subdistrict 101-21) geoduck survey transect locations.

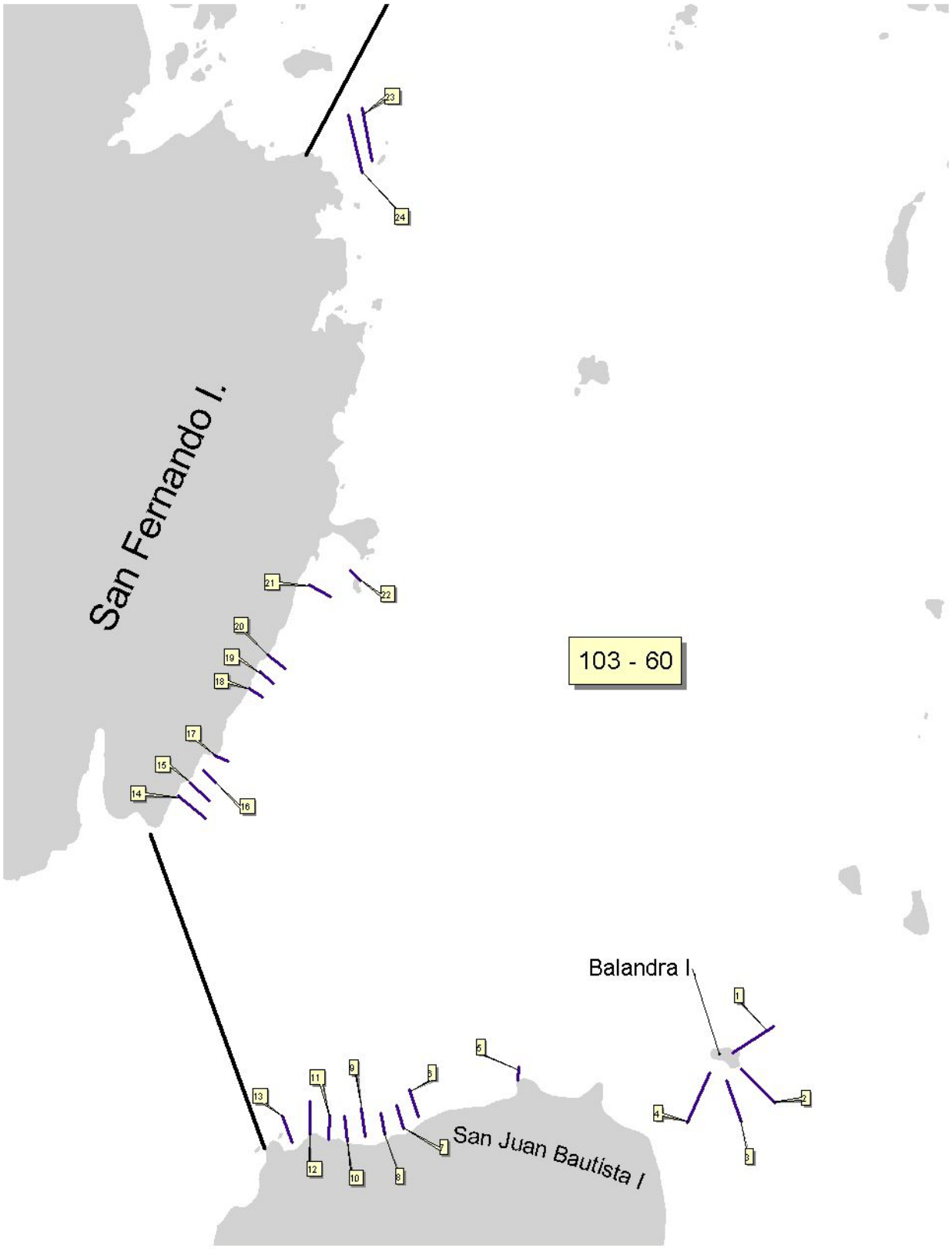

Figure 4. San Alberto Bay (in Subdistrict 103-60) 2002 geoduck survey transect locations.

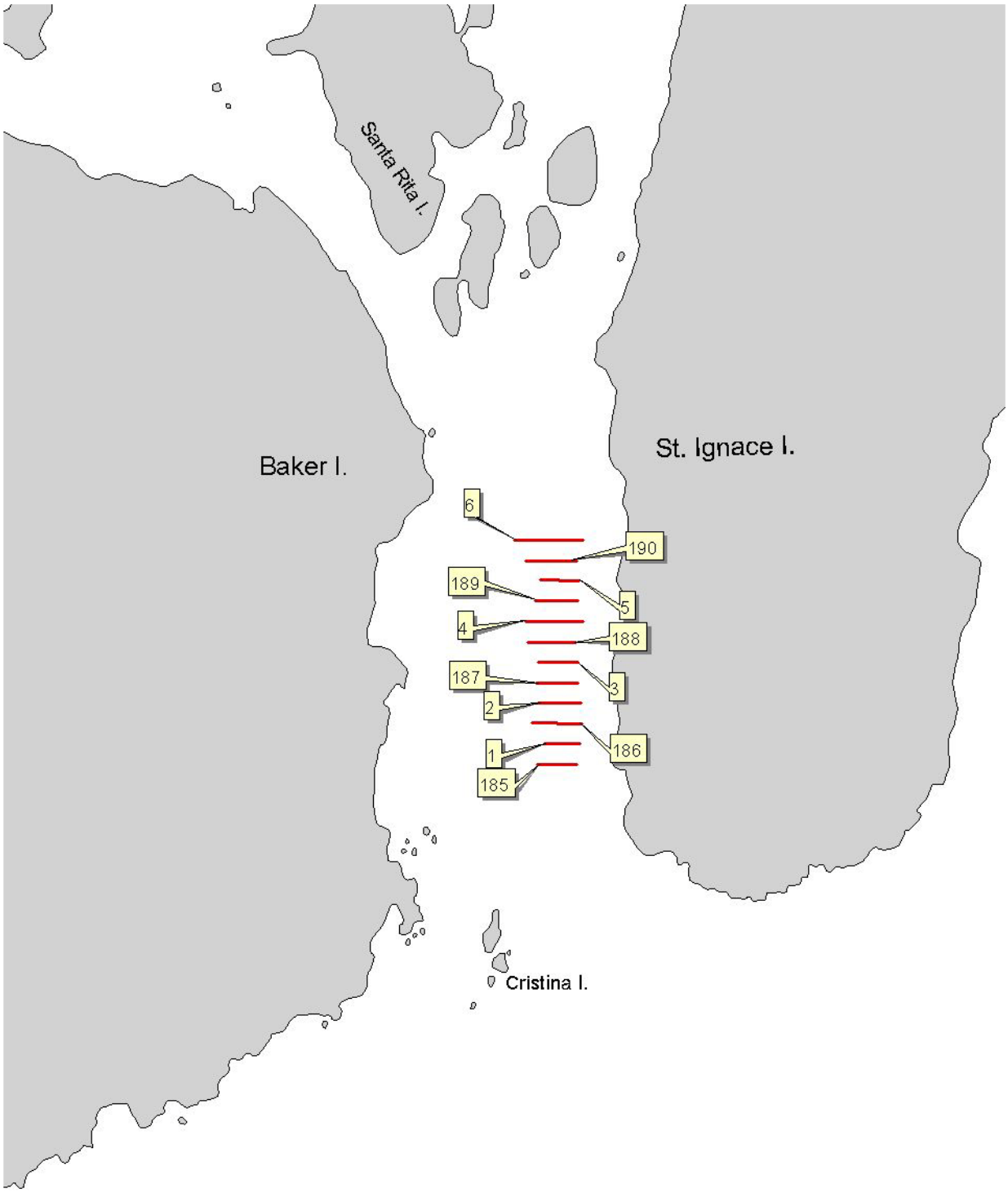

Figure 5. Port Mayoral control area (in Subdistrict 103-50) 2002 geoduck survey transect locations.

APPENDICES

Appendix A. Key to vegetative substrate types used for geoduck clam surveys.

Code	Expanded Code	Species Included	Latin Names
AGM	Agarum	Sieve kelp	*Agarum clathratum*
ALA	Alaria	Ribbon kelps	*Alaria marginata, A. nana, A. fistulosa*
ELG	Eel grass	Eel grass, surfgrasses	*Zostera marina, Phyllospadix serrulatus, P. scouleri*
FIL	Filamentous red algae	Sea brush, poly, black tassel	*Polysiphonia pacifica, P. hendryi, Pterosiphonia bipinnata*
FIR	Fir kelp	Black pine, Oregon pine (red algae)	*Neorhodomela larix, N.oregona*
FUC	Fucus	Rockweed or popweed	*Fucus gardneri*
HIR	Hair kelp	Witch's hair, stringy acid kelp	*Desmarestia aculeata, D. viridis*
LAM	Laminaria	split kelp, sugar kelp, suction-cup kelp	*Laminaria bongardiana, L. saccharina, L. yezoensis (when isolated and identifiable)*
LBK	Large Brown Kelps	Five-ribbed kelp, three-ribbed kelp, split kelp, sugar kelp, sea spatula, sieve kelp, ribbon kelp	*Costaria costata, Cymathere triplicata, Laminaria spp., Pleurophycus gardneri, Agarum, Alaria spp.*
MAC	Macrocystis	macrocystis	*Macrocystis integrifolia*
NER	Nereocystis	Bull kelp	*Nereocystis leutkeana*
RED	Red algae	All red leafy algae (red ribbons, red blades, red sea cabbage, Turkish washcloth)	*Palmaria mollis, P. hecatensis, P. callophylloides, Dilsea californica, Neodilsea borealis, Mastocarpus papillatus, Turnerella mertensiana*
ULV	Ulva	Sea lettuce	*Ulva fenestrata, Ulvaria obscura*
COR	Coralline algae	Coral seaweeds (red algae)	*Bossiella, Corallina, Serraticardia*

Appendix B. Key to bottom types used for geoduck clam surveys.

Code	Expanded code	Definition
RCK	Bedrock	Various rocky substrates > 1 meter in diameter
BLD	Boulder	Substrate between 25 cm and 1 meter
CBL	Cobble	Substrate between 6 cm and 25 cm
GVL	Gravel	Substrate between 0.4 cm and 6 cm
SND	Sand	Clearly separate grains of < 0.4 cm
MUD	Mud	Soft, paste-like material
SIL	Silt	Fine organic dusting
BAR	Barnacle	Area primarily covered with barnacles
SHL	Shell	Area primarily covered with whole or crushed shells
MUS	Mussels	Area primarily covered with mussels
WDY	Woody debris	Any submerged bark, logs, branches or root systems

Appendix C. Dog and Cat Islands geoduck area assessment survey, 2002.

Date	Transect #	Transect side	Time in	Time out	Total time	Diver #1	Diver #2	Width	MLLW start (fsw)	MLLW End (fsw)	No. geoducks	No. horseclams	Bottom type #1	Bottom type #2	% vegetation cover	Predominant Vegetation	Comments
27-Jul-02	1	a	14:35	14:44	0:09	JR	TO	2	-12	19	0		rck		100	elg	
27-Jul-02	1	a	14:35	14:44	0:09	JR	TO	2	19	55	97		cbl	shl			
27-Jul-02	16	a	14:43	15:50	1:07	BL	KM	2	12	14	0						
27-Jul-02	16	a	14:43	15:50	1:07	BL	KM	2	14	55	61		shl	snd	35		most geoducks between 55-68 fsw
27-Jul-02	16	a	15:02	15:39	0:37	WB	TO	2	10	17	0		cbl	gvl			
27-Jul-02	16	a	15:02	15:39	0:37	WB	TO	2	17	55	8	7	gvl				
27-Jul-02	17	a	15:14	15:35	0:21	MP	BL	2	14	16	0		snd		20	elg	
27-Jul-02	17	a	15:14	15:35	0:21	MP	BL	2	14	55	5		snd				shells 4-6" deep on slope
27-Jul-02	18	a	15:59	16:26	0:27	WB	JR	2	14	17	8		snd		50	elg	
27-Jul-02	18	a	15:59	16:26	0:27	WB	JR	2	17	20	28		sil		5	lbk	
27-Jul-02	23	a	11:17	11:53	0:36	JR	WB	2	24	34	62	6	snd	cbl	70	lbk	
27-Jul-02	23	a	11:17	11:53	0:36	JR	WB	2	34	41	5	0	cbl	shl	25	lbk	
27-Jul-02	23	a	11:17	11:53	0:36	JR	WB	2	41	55	49		cbl	shl	25	lbk	contour for this dive went up and down
27-Jul-02	25	a	11:07	11:27	0:20	BL	MP	2	8	38	0						
27-Jul-02	25	a	11:07	11:27	0:20	BL	MP	2	38	55	37						approx 20 false geoduck
27-Jul-02	27	a	10:27	10:50	0:23	KM	BL	2	12	41	0		gvl	shl	25	agm	
27-Jul-02	27	a	10:27	10:50	0:23	KM	BL	2	41	35	0						
27-Jul-02	29	a	10:05	10:56	0:51	WB	TO	2	12	35	1		rck	gvl	80	agm	
27-Jul-02	29	a	10:05	10:56	0:51	WB	TO	2	35	20	0						
27-Jul-02	3	a	15:55	16:15	0:20	MP	KM	2	0	15	0		gvl		100	elg	approx 6 ft elg, thick, hard to swim through
27-Jul-02	3	a	15:55	16:15	0:20	MP	KM	2	15	21	0		snd	gvl	0		
27-Jul-02	3	a	15:55	16:15	0:20	MP	KM	2	21	55	22		snd	shl	10	lam	
27-Jul-02	31	a	9:58	10:13	0:15	MP	KM	2	0	32	0						
27-Jul-02	31	a	9:58	10:13	0:15	MP	KM	2	32	38	23		gvl	snd	25	lam	false geoducks present
27-Jul-02	31	a	9:58	10:13	0:15	MP	KM	2	38	25	0						
28-Jul-02	19	a	8:18	8:49	0:31	TO	WB	2	10	30	0		rck	snd	20		
28-Jul-02	19	a	8:18	8:49	0:31	TO	WB	2	30	34	31						
28-Jul-02	19	a	8:18	8:49	0:31	TO	WB	2	34	38	125		snd		5	lam	
28-Jul-02	19	a	8:18	8:49	0:31	TO	WB	2	47	55	36						good density of geoducks at end of transect
28-Jul-02	4	a	8:03	8:17	0:14	BL	KM	2	15	29	0						geoducks @ 24 fsw off transect
28-Jul-02	4	a	8:03	8:17	0:14	BL	KM	2	29	55	8						
28-Jul-02	5	a	8:29	8:45	0:16	MP	BL	2	23	25	0						
28-Jul-02	5	a	8:29	8:45	0:16	MP	BL	2	25	54	61	10	snd	shl	10	lam	approx 17 false geoducks

-continued-

Cat and Dog Islands Geoduck 2002 Transect Summary

	2001		2002		
Transect	a	b	a	Average per meter	shoreline (m)
1	77		97	43.5	100
2	30	147		44.3	100
3	56	20	22	16.3	100
4	42	31	8	13.5	100
5	54	47	61	27.0	100
6	4	8		3.0	200
7	12	21		8.3	200
8	0			0.0	200
9	5			2.5	200
10	0			0.0	200
11	1	1		0.5	200
12	14	8		5.5	200
13	1	2		0.8	200
14	8	1		2.3	200
15	3	0		0.8	200
16	95		69	41.0	100
17	0		5	1.3	100
18	22		36	14.5	100
19	58	108	192	59.7	100
20	125	47		43.0	200
21	38	33		17.8	200
23			116	58.0	200
25			37	18.5	200
27			0	0.0	200
29			1	0.5	200
31			23	11.5	200

-continued-

Appendix C. (page 3 of 3)

Dog and Cat islands geoduck transect coordinates.

Transect no	Latitude	Longitude
1	55.03522	-131.23350
2	55.03453	-131.23606
3	55.03513	-131.23922
4	55.03565	-131.24207
5	55.03695	-131.24478
6	54.98465	-131.33383
7	54.98283	-131.33293
8	54.98127	-131.33443
9	54.98058	-131.33684
10	54.98024	-131.33955
11	54.97989	-131.34285
12	54.98093	-131.34647
13	54.97280	-131.38452
14	54.97461	-131.38422
15	54.97591	-131.38287
16	55.03493	-131.23464
17	55.03451	-131.23765
18	55.03528	-131.24056
19	55.03606	-131.24358
20	54.97672	-131.37342
21	54.97674	-131.37225
22	54.99519	-131.32629
23	54.99488	-131.32472
24	54.99440	-131.32338
25	54.99425	-131.32171
26	54.99433	-131.32009
27	54.99455	-131.31848
28	54.99481	-131.31682
29	54.99492	-131.31519
30	54.99499	-131.31355
31	54.99536	-131.31204

Appendix D. Kelp Island area assessment survey, 2002.

Date	Transect #	Transect side	Time in	Time out	Total time	Diver #1	Diver #2	Width	MLLW start (fsw)	MLLW End (fsw)	No. geoducks	No. horseclams	Bottom type #1	Bottom type #2	% vegetation cover	Predominant Vegetation	Comments
26-Jul-02	1	a	8:44	8:55	0:11	KM	JR	2	1	55	0						rck to 57 fsw then shell, also recon'd 25-50 m south w/no ducks
26-Jul-02	2	a	8:39	9:13	0:34	BL	TO	2	1	19	0						
26-Jul-02	2	a	8:39	9:13	0:34	BL	TO	2	19	55	484						
26-Jul-02	3	a	9:10	9:40	0:30	MP	JR	2	1	39	0		rck	gvl			
26-Jul-02	3	a	9:10	9:40	0:30	MP	JR	2	39	45	0		shl	cbl			
26-Jul-02	3	a	9:10	9:40	0:30	MP	JR	2	45	53	78		shl	snd			numerous false geoducks
26-Jul-02	3	a	9:10	9:40	0:30	MP	JR	2	53	54	137		shl	snd			depths from 52 to 53 to 53 (I.e. ended dive at 50 fsw after going to 53
26-Jul-02	4	a	9:26	10:07	0:41	WB	TO	2	1	44	113						depths from 0 to 43 to 20 fsw. 1st gd @ 20
26-Jul-02	5	a	10:03	10:36	0:33	MP	KM	2	21	29	0						
26-Jul-02	5	a	10:03	10:36	0:33	MP	KM	2	29	36	28						
26-Jul-02	5	a	10:03	10:36	0:33	MP	KM	2	36	50	131						
26-Jul-02	5	a	10:03	10:36	0:33	MP	KM	2	50	55	5						
26-Jul-02	6	a	10:46	11:15	0:29	BL	WB	2	7	18	0					elg	
26-Jul-02	6	a	10:46	11:15	0:29	BL	WB	2	18	39	1149						half way
26-Jul-02	7	a	10:57	11:23	0:26	JR	KM	2	11	18	19		snd		40	elg	
26-Jul-02	7	a	10:57	11:23	0:26	JR	KM	2	18	34	317		snd		15	lbk	half way & out of bed
26-Jul-02	8	a	16:03	16:25	0:22	TO	WB	2	-13	30	0						
26-Jul-02	8	a	16:03	16:25	0:22	TO	WB	2	30	55	33						
27-Jul-02	9	a	7:38	7:58	0:20	MP	BL	2	10	26	0		gvl	cbl	25		
27-Jul-02	9	a	7:38	7:58	0:20	MP	BL	2	26	46	135		sil	snd	0		approx 25-50 false geoduck scattered throughout transect
27-Jul-02	10	a	7:42	8:04	0:22	TO	JR	2	-1	18	0					elg	
27-Jul-02	10	a	7:42	8:04	0:22	TO	JR	2	18	43	162		snd				
27-Jul-02	10	a	7:42	8:04	0:22	TO	JR	2	43	42	4						
26-Jul-02	11	a	13:54	14:08	0:14	MP	JR	2	-2	16	0		bld	cbl	75	lam	
26-Jul-02	11	a	13:54	14:08	0:14	MP	JR	2	16	7	0		cbl	gvl	75	lam	went all way across
26-Jul-02	12	a	13:56	14:10	0:14	TO	WB	2	-12	19	0						
26-Jul-02	12	a	13:56	14:10	0:14	TO	WB	2	19	55	12						
26-Jul-02	13	a	14:23	14:35	0:12	KM	MP	2	1	12	0						
26-Jul-02	13	a	14:23	14:35	0:12	KM	MP	2	12	25	39						Sargassum muticum
26-Jul-02	14	a	14:23	14:50	0:27	WB	TO	2	-13	15	0				100	elg	
26-Jul-02	14	a	14:23	14:50	0:27	WB	TO	2	15	55	47						
26-Jul-02	15	a	14:46	15:00	0:14	JR	KM	2	0	5	5						many horseclams
26-Jul-02	16	a	15:11	15:37	0:26	TO	WB	2	-4	42	0						

Appendix D. (page 2 of 4)

Date	Transect #	Transect side	Time in	Time out	Total time	Diver #1	Diver #2	Width	MLLW start (fsw)	MLLW End (fsw)	No. geoducks	No. horseclams	Bottom type #1	Bottom type #2	% vegetation cover	Predominant Vegetation	Comments
26-Jul-02	16	a	15:11	15:37	0:26	TO	WB	2	42	55	2		mud				few cucs, no urchins
26-Jul-02	17	a	15:16	15:30	0:14	MP	JR	2	-14	26	0		rck	bld			
26-Jul-02	17	a	15:16	15:30	0:14	MP	JR	2	26	34	0		snd	shl			
26-Jul-02	17	a	15:16	15:30	0:14	MP	JR	2	34	53	16		snd	sil	0		
26-Jul-02	18	a	15:52	16:23	0:31	KM	MP	2	14	25	0						
26-Jul-02	18	a	15:52	16:23	0:31	KM	MP	2	25	32	76						
26-Jul-02	18	a	15:52	16:23	0:31	KM	MP	2	32	37	42						
26-Jul-02	18	a	15:52	16:23	0:31	KM	MP	2	37	42	90						

Kelp Island geoduck 2002 transect summary.

Transect	Transect side a	b	Average per meter
1	0		0.0
2	484		242.0
3	215		107.5
4	113		56.5
5	164		82.0
6	1149		574.5
7	336		168.0
8	33		16.5
9	135		67.5
10	166		83.0
11	0		0.0
12	12		6.0
13	39		19.5
14	47		23.5
15	5		2.5
16	2		1.0
17	16		8.0
18	208		104.0

-continued-

Kelp Island transect coordinates.

Transect	Latitude	Longitude
1	54.89653	-131.22003
2	54.89577	-131.22326
3	54.89455	-131.22488
4	54.89321	-131.22721
5	54.89193	-131.23095
6	54.87858	-131.25976
7	54.87881	-131.26279
8	54.87053	-131.25784
9	54.86978	-131.26067
10	54.86861	-131.25713
11	54.87520	-131.26936
12	54.87461	-131.27199
13	54.87397	-131.27492
14	54.87322	-131.27786
15	54.87252	-131.28069
16	54.87648	-131.31779
17	54.87491	-131.31890
18	54.87310	-131.32011
19	54.87112	-131.31951

Appendix E. Port Mayoral geoduck control assessment survey, 2002.

Date	Transect #	Transect side	Time in	Time out	Total time	Diver #1	Diver #2	Width	MLLW start (fsw)	MLLW End (fsw)	No. geoducks	No. horseclams	Bottom type #1	Bottom type #2	% vegetation cover	Predominant Vegetation	comments
06-Jun-02	1	a	8:25	8:38	0:13	MP	TO	2	17	35	0						otter digging started @ 53 fsw
06-Jun-02	1	a	8:25	8:38	0:13	MP	TO	2	35	55	12		snd		5	ala	
06-Jun-02	185	a	8:20	8:34	0:14	JM	KH	2	18	31	0						
06-Jun-02	185	a	8:20	8:34	0:14	JM	KH	2	31	55	138						geoducks consistent throughout and continue deeper
06-Jun-02	186	a	8:38	8:52	0:14	KH	JM	2	19	32							
06-Jun-02	186	a	8:38	8:52	0:14	KH	JM	2	19	54	2		snd		0		lots of otter digging & geoduck shells
06-Jun-02	187	a	9:06	9:19	0:13	KH	JM	2	6	23	0						
06-Jun-02	187	a	9:06	9:19	0:13	KH	JM	2	23	55	17		snd	shl	20	lam	all between 30-35 fsw
06-Jun-02	188	a	9:28	9:43	0:15	KH	JM	2	15	37	0						
06-Jun-02	188	a	9:28	9:43	0:15	KH	JM	2	37	55	36		snd		50	lbk	
06-Jun-02	189	a	10:43	10:57	0:14	KH	JM	2	18	33	0						
06-Jun-02	189	a	10:43	10:57	0:14	KH	JM	2	33	55	59		snd		25	lbk	most gd 40-50 fsw
06-Jun-02	190	a	11:02	11:18	0:16	KH	JM	2	13	19	0						
06-Jun-02	190	a	11:02	11:18	0:16	KH	JM	2	19	55	100		snd	shl	25	lam	most geoducks 40-45 fsw
06-Jun-02	2	a	8:50	9:03	0:13	KM	MP	5	24	37	0						
06-Jun-02	2	a	8:50	9:03	0:13	KM	MP	5	37	55	56		snd	shl	5	lam	otter holes @ 56 fsw
06-Jun-02	3	a	9:15	9:30	0:15	TO	KM	2	17	32	0						
06-Jun-02	3	a	9:15	9:30	0:15	TO	KM	2	32	55	45		snd		15	lbk	
06-Jun-02	4	a	9:43	10:01	0:18	MP	TO	2	11	21	0						
06-Jun-02	4	a	9:43	10:01	0:18	MP	TO	2	21	55	188						1 male RKC approx. 1" carapace @ 60 fsw; no otter holes
06-Jun-02	5	a	10:53	11:06	0:13	MP	KM	2	21	34	0						
06-Jun-02	5	a	10:53	11:06	0:13	MP	KM	2	34	55	33		shl	snd	0		no otter digging, small bed at approx. 55 fsw
06-Jun-02	6	a	11:16	11:45	0:29	MP	TO	2	13	15	0						
06-Jun-02	6	a	11:16	11:45	0:29	MP	TO	2	15	55	40		snd	shl			

-continued-

Port Mayoral geoduck control 2002 transect summary.

Sum of No geoducks Transect no	Transect (2 m)	Average per meter shoreline	Shoreline (m)
1	12	6	100
2	56	28	100
3	45	22.5	100
4	188	94	100
5	33	16.5	100
6	40	20	100
185	138	69	100
186	2	1	100
187	17	8.5	100
188	36	18	100
189	59	29.5	100
190	100	50	100

-continued-

Appendix E. (page 3 of 3)

Port Mayoral transect coordinates.

Transect no	Latitude	Longitude
1	55.38762	-133.44499
2	55.38938	-133.44499
3	55.39122	-133.44544
4	55.39310	-133.44492
5	55.39490	-133.44512
6	55.39671	-133.44473
185	55.38670	-133.44538
186	55.38849	-133.44482
187	55.39030	-133.44542
188	55.39213	-133.44538
189	55.39398	-133.44508
190	55.39577	-133.44512

Appendix F. San Alberto Bay (transects 1-13) and East San Fernando Island (transects) geoduck clam assessment survey, 2002.

Date	Transect #	Transect side	Time in	Time out	Total time	Diver #1	Diver #2	Width	MLLW start (fsw)	MLLW End (fsw)	No. geoducks	No. horseclams	Bottom type #1	Bottom type #2	% vegetation cover	Predominant Vegetation Type	Comments
06-Jun-02	1	a	14:04	14:45	0:41	KH	JM	2	20	56	69		snd	rck	50	lbk	1st gd @ 38 fsw
06-Jun-02	2	a	14:09	14:44	0:35	MP	TO	2	12	30	379		snd	shl			1st gd @ 34 fsw, hard to dig, numerous false geoducks
06-Jun-02	3	a	15:04	15:39	0:35	KH	JM	2	25	55	32		rck	snd	25	lbk	1st gd @ 36 fsw
06-Jun-02	4	a	15:09	15:53	0:44	MP	KM	2	24	32	157		gvl	cbl			1st gd @ 35 fsw, VERY hard digging!!, false gd @ 52 fsw
07-Jun-02	5	a	14:27	14:40	0:13	KH	TO	2	13	55	0		cbl		15	mac	
07-Jun-02	6	a	13:50	14:09	0:19	KM	KH	2	16	55	6		rck		70	lam	1st gd @ 50 fsw
07-Jun-02	7	a	13:28	13:43	0:15	MP	JM	2	14	55	0		snd	rck	50	lbk	
07-Jun-02	8	a	13:01	13:20	0:19	MP	JM	2	10	55	6		gvl	sil	50	lam	1st gd @ 32 fsw
07-Jun-02	9	a	11:20	11:38	0:18	KM	TO	2	21	55	41		cbl		60	agm	best at 35-45', first geoduck at 34
07-Jun-02	10	a	11:03	11:10	0:07	KH	TO	2	4	55	0		mud		25	lam	
07-Jun-02	11	a	10:37	10:51	0:14	KH	KM	2	12	55	9		snd	cbl	50	lam	first geoduck at 48'
07-Jun-02	12	a	10:21	10:42	0:21	MP	JM	2	3	55	36	12	snd	rck	50	lbk	1st geoduck @ 29
07-Jun-02	13	a	10:11	10:22	0:11	TO	KM	2	10	55	6		sil		10	agm	first geoduck at 23', horse clams
07-Jun-02	14	a	9:41	9:56	0:15	MP	JM	2	10	57	92		snd	shl	5	agm	bed appears to end (or less dense) @ 70 fsw
07-Jun-02	15	a	9:29	9:48	0:19	KH	TO	2	20	55	196		snd	shl	40	lam	first geoduck at 28' horseclams mixed with geoduck
07-Jun-02	16	a	9:22	9:34	0:12	MP	JM	2	2	55	252		snd	gvl	25	lbk	geoduck continue deeper same density, 1st gd @ 36 fsw
07-Jun-02	17	a	9:04	9:18	0:14	KH	KM	2	9	55	97		snd		20	lam	best at 45-50', first geoduck at 48'
07-Jun-02	18	a	8:52	9:02	0:10	MP	JM	2	7	55	119		shl		5	agm	1st gd @ 27
07-Jun-02	19	a	8:35	8:46	0:11	MP	JM	2	6	55	99		snd	rck	25	lbk	1st gd @ 31 fsw
07-Jun-02	20	a	8:14	8:27	0:13	MP	JM	2	16	55	52		shl	snd	5	lam	1st gd @ 29 fsw, most @ 40-45
07-Jun-02	21	a	8:14	8:44	0:30	TO	KM	2	24	55	331		cbl	snd	10	ala	
07-Jun-02	22	a	7:58	8:10	0:12	MP	JM	2	22	55	45		rck	snd	25	lbk	1st gd @ 32 fsw, most @ 32-45 fsw, many broken urchin tests
02-Jun-02	23	a	12:35	12:53	0:18	MP	JM	2	22	44	0	0	rck		75	agm	
02-Jun-02	23	a	12:35	12:53	0:18	MP	JM	2	44	55	8	0	snd	shl	0		100% polycheates, one fresh otter hole
02-Jun-02	24	a	11:23	12:09	0:46	KH	MP	2	13	26	0	0	rck	shl	90	lam	
02-Jun-02	24	a	11:23	12:09	0:46	KH	MP	2	26	55	225	15	snd		5	lam	carpet of polycheates (plush pile carpet)

Appendix F. (page 2 of 3)

San Alberto Bay including east San Fernando Island (transects 14-24) 2002 transect summary.

Transect	Transect Side	Average per meter
	a	
1	69	34.5
2	379	189.5
3	32	16.0
4	157	78.5
5	0	0.0
6	6	3.0
7	0	0.0
8	6	3.0
9	41	20.5
10	0	0.0
11	9	4.5
12	36	18.0
13	6	3.0
14	92	46.0
15	196	98.0
16	252	126.0
17	97	48.5
18	119	59.5
19	99	49.5
20	52	26.0
21	331	165.5
22	45	22.5
23	8	4.0
24	225	112.5

Appendix F (page 3 of 3).

San Alberto Bay transect coordinates.

Transect	Latitude	Longitude
1	55.45424	-133.21841
2	55.45249	-133.21692
3	55.45164	-133.21963
4	55.45230	-133.22250
5	55.45151	-133.25469
6	55.44800	-133.27147
7	55.44693	-133.27412
8	55.44640	-133.27732
9	55.44621	-133.28053
10	55.44580	-133.28351
11	55.44580	-133.28660
12	55.44624	-133.28986
13	55.44546	-133.29273
14	55.47871	-133.31194
15	55.47990	-133.31007
16	55.48116	-133.30758
17	55.48250	-133.30571
18	55.48903	-133.30002
19	55.49056	-133.29836
20	55.49219	-133.29687
21	55.49887	-133.29002
22	55.50015	-133.28251
23	55.53953	-133.27915
24	55.53828	-133.28086

Appendix G. Open area descriptions for the 2002/2003 geoduck clam commercial fishery.

Foggy Bay (Subdistrict 101-23): only in those waters of Foggy Bay along the mainland shore and the Delong Islands shore, south of the latitude of Kirk Point located at 55°00’00” N. latitude and north of the latitude of Foggy Point light at 54°55’32” N. latitude.

West Coast of Gravina Island (Subdistrict 101-29): only in those waters along the western shore of Gravina Island south of 55°16’11” N. latitude and north of 55°11’39” N. latitude.

East San Fernando Island (Subdistrict 103-60): only in those waters of San Alberto Bay along the eastern shore of San Fernando Island, south of a line drawn from Point Polocano to Point Ildefonso, north of the latitude of Point Cuerbo, and west of the longitude of Fern Reef light.

Southern Sea Otter Sound (Subdistrict 103-90): in those waters of Sea Otter Sound east and south of a line from the Cape Lynch light to the southernmost tip of Whale Head Island to the northernmost tip of Turn Point, with Karheen Passage closed south of the latitude of the northernmost tip of Cob Island.

Little Steamboat Bay (Subdistrict 103-70): in those waters along the northern shoreline of Noyes Island east of 133°41’20” W. longitude and west of Steamboat Point located at 133°38’54” W. longitude.

Ulitka Bay (Subdistrict 103-70**):** in those waters along the northern shoreline of Noyes Island east of Cape Ulitka at 133°43’31” W. longitude and west of 133°41’20” W. longitude.

San Christoval (Subdistrict 103-70): in those contiguous waters of 103-70 north and west of a line drawn from a point located on Prince of Wales Island at 55°34’37” N. latitude, 133°16’35” W. longitude to the southernmost tip of Rosary Island to Point Santa Lucia, south and east of a line drawn from Blanquizal Point located at 55°37’21” N. latitude, 133°23’53” W. longitude to a point in the Gulf of Esquibel located at 55°37’21” N. latitude, 133°24’42” W. longitude to Point San Pasqual.

Cone Island (Subdistricts 103-50, 104-40, 104-35): in those waters of St. Nicholas Channel, Cone Island and the eastern shore of Baker Island south of a line from the westernmost tip of Point St. Isidor to a point on Noyes Island at 55°27'16" N. latitude, 133°38'23" W. longitude, east of a line extending from the southernmost tip of St. Nicholas Point to the westernmost tip of Cone Island, north and east of a line extending from Siketi Point to a point on Baker Island located at 55°24’07” N. latitude, 133°36’42” W. longitude, and north and west of a line through Paloma Passage at the latitude of the southernmost tip of Pigeon Island located at 55°25’50” N. latitude.

Port Santa Cruz (Subdistrict 104-30): in those waters of Port Santa Cruz east of a line drawn from Point San Jose to Point Rosary.

Symonds Bay: in Subdistrict 113-31, only in those waters of Symonds Bay on Biorka Island south of a line from the westernmost tip of Hanus Island at 56°51'54" N. latitude, 135°30'30" W. longitude, to the easternmost tip of Entrance Island at 56°51'55" N. latitude, 135°31'31" W. longitude.

Goddard: in portions of Subdistricts 113-31 and 113-41, only in those waters along the western coast of Baranof Island south and west of a line beginning at the southern entrance to Kanga Bay at 56°53'33" N. latitude, 135°22'47" W. longitude to the northwesternmost tip of Kanga I. located at 56°54'04" N. latitude, 135°22'02" W. longitude, then extending north and west to the southernmost tip of Ulinoi I. located at 56°55'51" N. latitude, 135°23'45" W. longitude, to the northwest tip of Ulinoi I. located at 56°55'59" N.

latitude, 135°24'01" W. longitude, then southwest to the northernmost tip of the unnamed island within the Taigud Islands at 56°55'45" N. latitude, 135°24'51" W. longitude, then continues southwest to the northeasternmost tip of Hanus I. located at 56°51'56" N. latitude, 135°30'25" W. longitude, then north and east of a line extending from a point on the southeast shore of Biorka I. at 56°50'33" N. latitude, 135°30'58" W. longitude to a point at 56°45'00" N. latitude, 135°22'26" W. longitude; and north of 56°45'00" N. latitude and west of 135°20'00" W. longitude and all waters within Big Bay were open, with the following exception: All waters of Kliuchevoi Bay were closed east of a line from 56°50'24" N. latitude, 135°22'31" W. longitude to 56°50'12" N. latitude, 135°22'41" W. longitude, and those waters within the unnamed bay located southeast of Frosty Reef east of a line from 56°52'49" N. latitude, 135°22'56" W. longitude to 56°52'42" N. latitude, 135°22'59" W. longitude to 56°52'38" N. latitude, 135°22'59" W. longitude.