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Abalone Resurvey in the Southeast Queen Charlotte Islands in 1994

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Abalone Resurvey in the Southeast Queen Charlotte Islands, 1994

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ABSTRACT

Winther, I., A. Campbell, G.A. Thomas, B.E. Adkins & B.G. Clapp. 1995. Abalone resurvey in the southeast Queen Charlotte Islands, 1994. Can. Manuscr. Rep. Fish. Aquat. Sci. 2273: 46 p.

Abalone stocks on the southeast coast of the Queen Charlotte Islands were assessed from surveys of 70 standard sites. Mean total abalone density estimated in 1994 was 11% of the original mean density measured in 1978 and 1979. Significant declines were observed in estimates of total abalone density and new recruit (100-106 mm) abalone density between 1994 and 1990, while no significant difference was observed in legal (>100 mm), mature (>70 mm) and pre-recruit (92-99 mm) abalone. Total estimated abalone abundance has declined 30% since surveys in 1990.

RÉSUMÉ

Winther, I., A. Campbell, G.A. Thomas, B.E. Adkins & B.G. Clapp. 1995. Abalone resurvey in the southeast Queen Charlotte Islands, 1994. Can. Manuscr. Rep. Fish. Aquat. Sci. 2273: 46 p.

Les stocks d'haliotides de la côte sud-est des iles Reine-Charlotte ont été évalués à l'aide de relevés effectués dans 70 sites standards. La densité moyenne totale estimée des haliotides en 1994 équivalait à 11 p. 100 de la densité moyenne initiale mesurée en 1978 et 1979. Des déclins statistiquement significatifs ont été observés dans les valeurs estimées de la densité totale des haliotides et de la densité des recrues (100-106 mm) entre 1994 et 1990, alors que l'on n'a pas constaté de différences statistiquement significatives dans le cas des haliotides de taille légale (>100 mm), des haliotides à maturité (>70 mm) et des pré-recrues (92-99 mm). L'abondance totale estimée des haliotides a décliné de 30 p. 100 depuis les relevés effectués en 1990.

INTRODUCTION

Northern abalone (*Haliotis kamtschatkana*) were harvested in commercial, native and recreational fisheries in British Columbia until 1990. The Department of Fisheries and Oceans collected data on the commercial fishery from 1952 to 1990. Native and recreational fisheries of unknown magnitude were assumed to be small relative to the commercial fishery. Sloan and Breen (1988) provide a comprehensive review of abalone fisheries and life history information. Breen & Adkins (1979) documented the expansion of the commercial fishery in 1976 from small vessels supplying local fresh markets to larger, freezer equipped vessels supplying export markets. The fishery expanded north and annual abalone harvests reached a maximum of 481,365 kilograms in 1977. Over half of the 1977 catch came from the Queen Charlotte Islands. Access to the commercial fishery was first limited when abalone harvesters were assigned licence tab numbers in 1977, restricting the fishery to 26 operators. In May of 1979 a quota of 118,000 kilograms, distributed equally among the licensed operators, was established for the rest of the year. Catches and quotas from 1977 to 1990 are presented in Table 1. Faced with the possibility of population collapse the fishery was closed in 1990 to all users.

Abalone stocks in British Columbia have been assessed through surveys of standard sites, alternating between areas of the Central Coast and the Queen Charlotte Islands. The southeast coast of the Queen Charlotte Islands, Area 2E, (Figure 1) contributed significantly to the commercial fishery; over 30% of abalone landed in British Columbia from 1977 to 1990 were from Area 2E (Table 1). Base line data for the assessment of Area 2E abalone stocks were collected in 1978 and 1979 by Breen & Adkins (1979, 1981). A resurvey in 1984 found a 75% reduction in legal sized abalone and an 81% reduction in total abalone density (Boutillier et al. 1985). No difference was observed between the 1984 survey and another conducted in 1987 (Carolsfeld et al. 1988). Abalone populations had remained low but it was unclear whether the survey technique could detect changes at these levels of abundance (Sloan & Breen 1988). Further reductions in total abalone abundance observed in 1990, (Thomas et al. 1992) combined with similar observations in the Central Coast, provided the basis for closure of the fishery.

This survey was undertaken to assess the response of abalone populations in the Queen Charlotte Islands to closure of the fishery. We attempt to quantify changes in abalone abundance at selected sites by comparing estimates of abalone density with those measured in previous surveys.

METHODS

This assessment was a joint project of Operations Branch and Science Branch of the Department of Fisheries and Oceans. A member of the Haida native band also participated in the survey. The Institute of Ocean Sciences vessel *Vector* provided the base for survey operations. Two rigid hulled inflatable boats (Zodiac Hurricanes) provided by Science Branch were used as dive platforms. The Zodiacs were equipped with combination depth sounders and GPS (Global Positioning System) units.

Sampling methods described by Breen and Adkins (1979) have been used consistently through all historical surveys. The following procedures were incorporated in this survey: Charts and written site descriptions were used to identify sites from previous surveys. For the first time,

site locations were documented using GPS for future reference. At each site, divers located abalone and identified the extent of the abalone habitat. Divers placed a 1 meter square quadrat in a standard pattern starting randomly at the top of the habitat or zone. Divers moved down through the abalone zone sampling every second quadrat until they had sampled 4 quadrats and travelled 7 meters (m). Divers then moved over 4 m and repeated the 4 quadrat transect moving up through the zone. The sequence continued, moving over 4 m, sampling down through the zone, moving over 4 m and sampling up through the zone until a pattern of 16 quadrats arranged in 4 transects had been sampled within a 7 m by 16 m area. Vegetation was cleared from the substrate and all visible abalone were collected from each quadrat. Divers recorded the number of abalone collected from each quadrat, dominant vegetation, substrate type and maximum and minimum depths of the sample area. Abalone were brought to the surface, measured and returned to the site immediately.

In 1984, 1987 and 1990, divers collected all visible abalone, then lifted rocks to find any cryptic abalone. Divers did not move rocks in 1994 or in 1978/79. Cryptic abalone were not counted in 1994 so that the number of quadrats sampled could be increased. Abalone densities presented here refer only to exposed abalone to be consistent over all years sampled.

In past surveys divers aborted the sample if no abalone were found in the first eight quadrats. In 1994, divers tried to complete two full samples (32 quadrats) per site even if no abalone were found. 28 quadrats were sampled at one site due to poor diving conditions. Three samples (48 quadrats) were completed at 2 sites and 4 samples (64 quadrats) were completed at 7 sites.

Abalone abundance has been expressed as density per square meter for total abalone and size categories of legal (>100 mm), pre-recruit (92-99 mm), new recruit (100-106 mm) and mature (>70 mm) abalone. Historical data was reviewed for the comparison of densities between years. Abalone densities were compared using two tailed Wilcoxon signed rank tests. Differences were deemed significant if the probability of being the same was less than 0.05. SYSTAT software (Wilkinson 1992) and a personal computer were used.

The number of abalone measured from a site often did not match the total number of abalone recorded by the divers. Densities by size classification were produced by applying the proportions of abalone in each length classification to the density data collected by divers for each site. This procedure was applied to historical data as well as data collected in 1994.

The total number of abalone and the number of legal sized abalone were determined in 1978/79 but length data was not collected at all sites. Comparisons of mature, pre-recruit, and recruit sized abalone in 1978/79 are limited to 33 sites with length data, 28 of which were common to subsequent sample years.

RESULTS

ABUNDANCE

Estimates of abalone density at all 70 sites surveyed in 1994 are compared with past surveys in Appendices 1, 2 and 3. Site specific information on substrate type, vegetation and abalone per quadrat are presented in Dive Station Logs (Appendix 4). Table 2 presents total abalone sites sampled by year with summaries of counts and estimated densities for total abalone and legal sized (>100 mm) abalone.

Comparison between 1994 and 1990:

All 69 sites surveyed in 1990 were among the 70 sites resurveyed in 1994. Estimates of mean total abalone density and mean legal sized abalone density declined 35% between 1990 and 1994 (total 0.46 to 0.30 m^{-2}, legal 0.097 to 0.063 m^{-2}). Wilcoxon signed rank tests showed a significant difference in total abalone density measured at the 69 sites ($p = 0.036$). Legal abalone density estimates compared between 1990 and 1994 at 68 common sites were not significantly different ($p = 0.12$). (Note that abalone size categories are compared over 68 sites as there was no length data for 1 site in 1994.) The mean density of new recruit abalone declined significantly from 0.040 m^{-2} to 0.019 m^{-2} ($p = 0.042$). Declines in mature abalone (0.27 m^{-2} to 0.18 m^{-2}) and pre-recruit abalone (0.047 m^{-2} to 0.028 m^{-2}) were not significant between 1990 and 1994 ($p = 0.16$ and 0.25 for mature and pre-recruit abalone respectively). Density estimates for 1990 and 1994 are presented in Table 3.

Comparison between all sample years:

Estimates of total and legal abalone densities from 58 sites common to all sample years are presented in Table 4. The matrix of probabilities for the hypothesis that total and legal abalone density estimates were the same between sample years (compared using Wilcoxon signed rank tests) is presented in Table 5. Total abalone density estimated in 1994 was significantly less than all other years except 1990. Total abalone density estimates in 1984 were not significantly different from estimates in 1987 or 1990. Other comparisons of total abalone density between years in Table 5 were different. Legal abalone density measured in 1994 was significantly less than 1987 and 1979.

The number of sites with no abalone and the number of sites with no legal abalone among 58 sites common to all sample years are presented by year in Table 6. A change in sampling effort should be considered when interpreting this data: Prior to 1994 divers aborted samples at 8 quadrats if no abalone were found; in 1994 divers completed 32 quadrats even if no abalone were found. The number of sites with no legal abalone has remained (at least) double the number observed (15) in 1979.

Estimates of mean total abalone density are compared between sample years in Table 7 for sites open and closed to commercial fishing. The areas around Hot Springs Island (subarea 2-11) and Cumshewa Inlet containing 11 sites common to all sample years were closed to commercial abalone fishing in 1973 as a refuge for native and recreational interests (Boutillier et al. 1985). Six Selwyn Inlet sites were in an area closed to commercial fishing in 1984. Mean total abalone densities in closed areas showed slight improvement in 1987 after severe declines between 1979 and 1984, but continued to decline in 1990 and 1994. The 1987 improvement is only significant (Wilcoxon signed rank test $p = .046$) for the Selwyn Inlet sites. Mean total abalone density in the open areas

between 1979 and 1984, but continued to decline in 1990 and 1994. The 1987 improvement is only significant (Wilcoxon signed rank test $p = .046$) for the Selwyn Inlet sites. Mean total abalone density in the open areas did not show improvement in 1987.

Density estimates for mature (>70 mm), pre-recruit (92-99 mm) and new recruit (100-106 mm) abalone for all sample sites are presented in Appendices 2 and 3. Length data was available for 28 sites common to all sample years. Mean abalone density estimates for the 28 sites are presented by sample year in Table 8. Although mean abalone density estimates were less in 1994 than in 1990 for all size categories, the difference was not significant in any category when compared using Wilcoxon signed rank tests. Probabilities from Wilcoxon signed rank tests that abalone density estimates in the 28 sites were the same between sample years are presented in Table 9 for total, legal, mature, pre-recruit and new recruit abalone.

SIZE FREQUENCY

Mean abalone length and proportion of legal sizes abalone (>100 mm) for each sample year are presented in Table 10. Mean abalone length has remained between 75 and 81 mm since 1984. The proportion of legal sized abalone in the population has ranged from a low of 12.8% in 1979 to a high of 30.4% in 1987. The length frequency of all abalone collected during density surveys in 1994 is compared with collections of exposed abalone from 1990, 1987 and 1984 in Figure 2.

DISCUSSION

The 1994 survey provides no evidence that abalone populations on the southeast coast of the Queen Charlotte Islands are recovering. Abalone densities measured from indicator sites continue to decline. Mean total and mean legal abalone densities were over 30% less in 1994 than in 1990. Mean total abalone density in 1994 was only 11% of that measured in 1979. Mean legal abalone densities measured in 1994 at 0.06 m^{-2} are less than 3% of the 2.5 m^{-2} postulated by Breen (1980) as the historic level in commercial abalone habitat.

Sloan and Breen (1988) discussed the inherent weakness in the 16 quadrat sampling procedure when used to compare densities measured at a specific site with those measured previously. Increased sampling effort in 1994 was part of assessing the method for the optimum number of quadrats to be sampled at each site (Campbell 1994). A comparison of this method to another is also required.

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Table 1. British Columbia abalone landings (kg), quotas and Area 2E contribution to the total by year. Data was collected from harvest logs.

Year	BC total (kg)	Area 2E (kg)	% 2E	Quota (kg)
1977	481,365	258,803	53.8%	None
1978	403,956	101,150	25.0%	None
1979	208,639[a]	32,123	15.4%	118,000
1980	104,653	16,155	15.4%	118,000
1981	93,654	21,321	22.8%	94,000
1982	82,214	13,620	16.6%	94,000
1983	53,078	17,430	32.8%	71,000
1984	57,736	14,034	24.3%	59,000
1985	45,164	4,409	9.8%	47,000
1986	45,669	6,453	14.1%	47,000
1987	46,402	14,342	30.9%	47,000
1988	47,323	19,242	40.7%	47,000
1989	46,888	11,362	24.2%	47,000
1990	47,344	12,603	26.6%	47,000
Total	1,764,085	543,049	30.8%	

a) The catch in 1979 included an open season from January to May, before the quota was set.

Table 2. Total and legal abalone counts and estimated mean densities (#/m^2) by survey year from total sites and total quadrats sampled.

Year	Sites sampled	Total quadrats	Total abalone	Legal abalone	Total density	Legal density
1979	65	1044	2788	427	2.75	0.405
1984	70	1044	587	103	0.53	0.092
1987	71	1091	724	216	0.64	0.190
1990	69	1144	576	116	0.46	0.097
1994	70	2492	747	172	0.30	0.063

Table 3. Mean abalone density estimates (#/m^2) for 1990 and 1994.

Year	1990	1994
Total abalone - 69 sites	0.46	0.30
Legal (>100 mm) - 68 sites	0.097	0.063
Mature (>70 mm) - 68 sites	0.27	0.18
Pre-recruit (92-99 mm) - 68 sites	0.047	0.028
New recruit (100-106 mm) - 68 sites	0.040	0.019

Table 4. Mean total and legal abalone density estimates (#/m^2) from 58 common survey sites.

Year	# Quadrats sampled	Total abalone	Legal abalone	Total density	Legal density
1979	932	2573	367	2.85	0.39
1984	872	519	86	0.56	0.09
1987	903	620	133	0.67	0.14
1990	976	532	92	0.50	0.09
1994	2076	677	140	0.32	0.06

Table 5. Wilcoxon signed rank probabilities that abalone density estimates were the same when compared between sample years for 58 common sample sites. Comparisons were made for density estimates of total abalone and legal sized abalone. * indicates a difference at the 0.05 level of significance.

Year	1979	1984	1987	1990
TOTAL ABALONE				
1984	<0.0005*			
1987	<0.0005*	0.209		
1990	<0.0005*	0.499	0.025*	
1994	<0.0005*	0.003*	<0.0005*	0.052
LEGAL SIZED ABALONE (>100 mm)				
1984	<0.0005*			
1987	<0.0005*	0.051		
1990	<0.0005*	0.757	0.034*	
1994	<0.0005*	0.166	0.001*	0.138

Table 6. Summary by year of the number of sites where no abalone were found, and the number of sites where no legal sized abalone were found.

# ZERO SITES for:	1979	1984	1987	1990	1994
Total Abalone/58 sites	0	9	4	5	3
Legal Abalone/58 sites	15	32	26	33	30

Table 7. Mean total abalone density estimates (#/m^2) for common sites in areas open and closed to commercial fishing by sample year.

Site Type	Sites	1979	1984	1987	1990	1994
Open	41	2.20	0.60	0.55	0.49	0.36
Closed	11	5.81	0.64	1.20	0.72	0.24
Closed 1984	6	1.88	0.14	0.50	0.21	0.18
Total	58	2.85	0.56	0.67	0.50	0.32

Table 8. Mean density estimates (#/m^2) for total abalone and size categories of legal, mature, pre-recruit, and new recruit abalone from 28 sites with length data in all sample years.

Year	1979	1984	1987	1990	1994
Quadrats	436	400	431	424	956
Total	3.545	0.690	0.792	0.444	0.333
Legal (>100 mm)	0.302	0.089	0.133	0.067	0.060
Mature (>70 mm)	1.595	0.366	0.394	0.243	0.186
Pre-recruit (92-99 mm)	0.272	0.075	0.070	0.037	0.033
New recruit (100-106 mm)	0.140	0.038	0.053	0.037	0.021

Table 9. Wilcoxon signed rank probabilities that estimates of abalone density was the same when compared between sample years for 28 common sites. Probabilities are presented for total abalone and size categories of legal, mature, pre-recruit and new recruit abalone. * indicates a difference in density at the 0.05 level of significance.

Year	1979	1984	1987	1990
TOTAL ABALONE				
1984	<0.0005*			
1987	<0.0005*	0.726		
1990	<0.0005*	0.085	0.005*	
1994	<0.0005*	0.014*	0.007*	0.346
LEGAL SIZED ABALONE (>100 mm)				
1984	0.001*			
1987	0.019*	0.288		
1990	0.004*	0.425	0.046*	
1994	0.001*	0.609	0.066	0.588
MATURE SIZED ABALONE (>70 mm)				
1984	0.001*			
1987	<0.0005*	0.577		
1990	<0.0005*	0.123	0.031*	
1994	<0.0005*	0.072	0.041*	0.432
PRE-RECRUIT SIZED ABALONE (92-99 mm)				
1984	0.013*			
1987	0.006*	0.975		
1990	0.004*	0.091	0.070	
1994	0.001*	0.117	0.182	0.407
NEW RECRUIT SIZED ABALONE (100-106 mm)				
1984	0.022*			
1987	0.017*	0.377		
1990	0.028*	0.720	0.326	
1994	0.001*	0.451	0.014*	0.382

Table 10. Mean abalone length and proportion of legal sized abalone for all sites sampled in each year. Sample years 1984, 1987 and 1990 include only non cryptic abalone samples for comparison with 1979 and 1994.

Year>	1979	1984	1987	1990	1994
Mean Length (mm)	NA	75.4	80.8	76.3	77.6
% Legal	12.8%	16.0%	30.4%	20.0%	23.3%

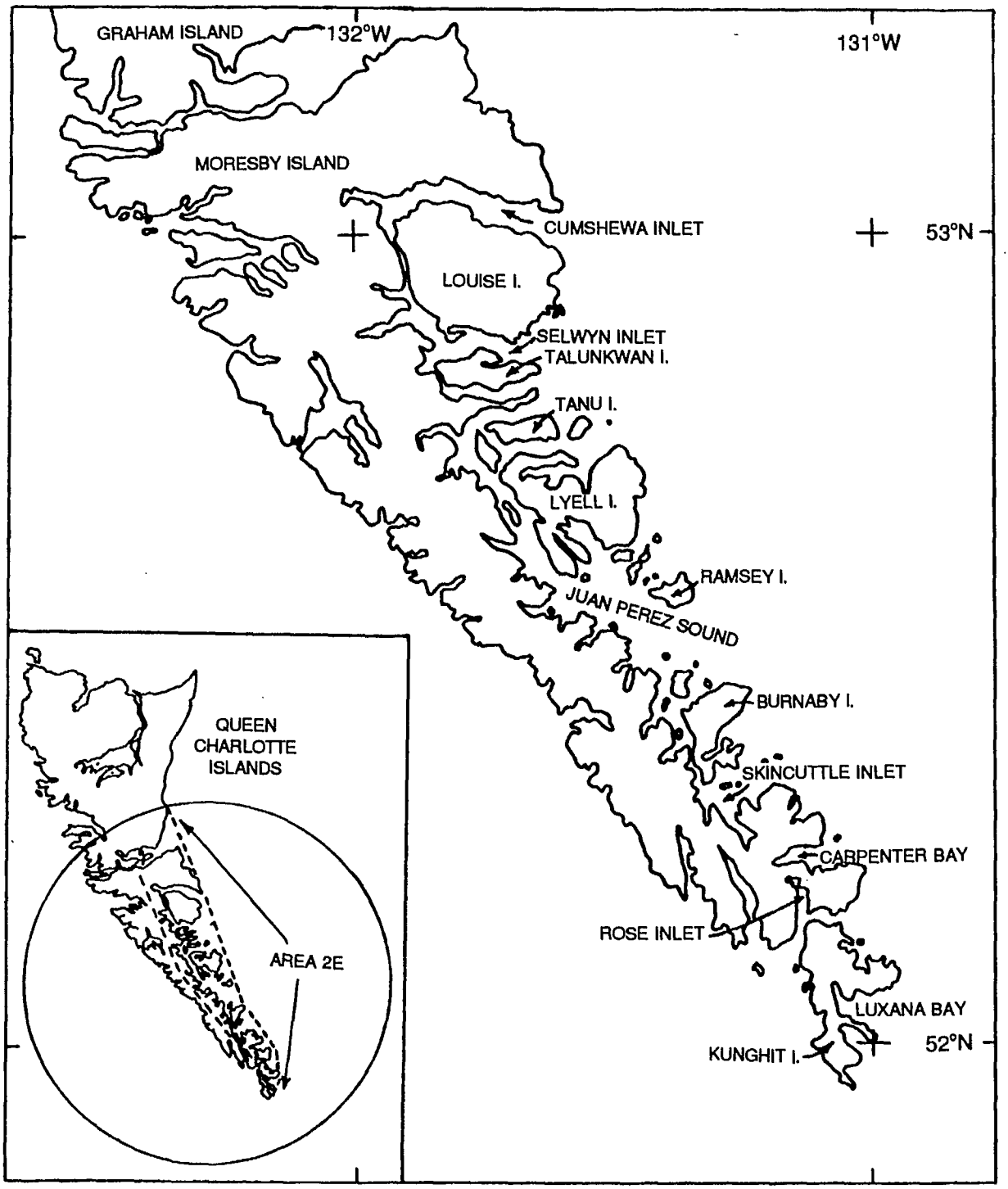

Figure 1. The southern Queen Charlotte Islands, dotted lines on the inset bound Area 2E.

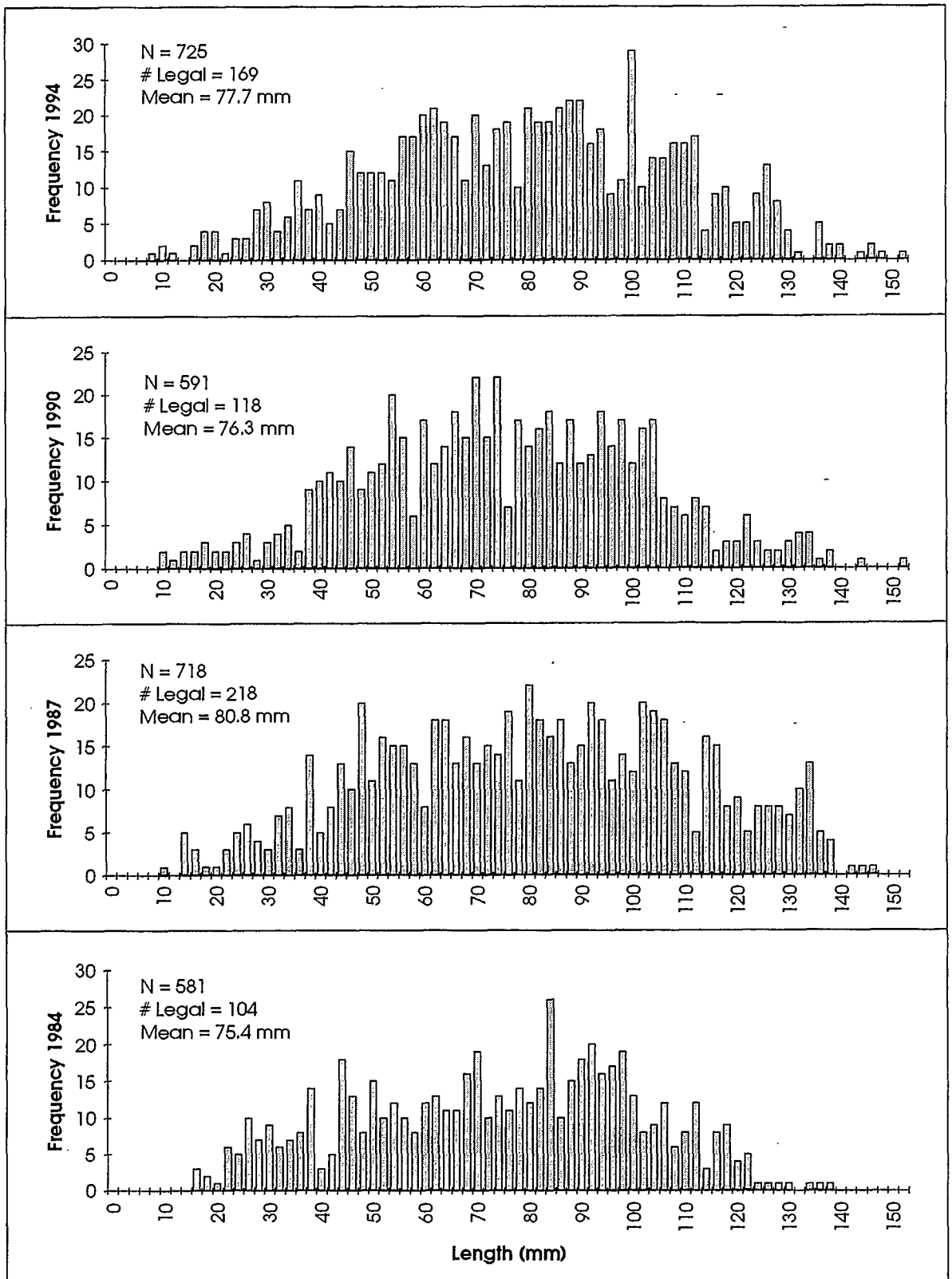

Figure 2. Length frequency comparisons of exposed abalone collected from all survey sites of the southeast Queen Charlotte Islands from 1984 to 1994. # Legal refers to abalone over 100 mm.

Appendix 1. Total exposed abalone density by site and number of quadrats sampled per site for all sample years. * indicates no sample. Site types are 1 = open to commercial fishing, 2 = closed in 1973, 3 = closed in 1984.

		Denstiy (#/sq. m)					Quadrats/site				
SITE	type	1979	1984	1987	1990	1994	1979	1984	1987	1990	1994
Cumshewa Inlet sites											
75	2	1.125	*	0.4375	0.0625	0	16	*	16	16	32
76	2	2.875	*	0.125	0.375	0.1875	16	*	16	16	32
77	2	1.4375	*	0	*	0.0625	16	*	4	*	32
78	2	0.875	*	1.5	0.75	0.0625	16	*	16	16	32
Selwyn Inlet sites											
65	3	1.0625	0.125	0.5	0.0625	0.25	16	16	16	16	32
66	3	0.625	0.125	0.3125	0.0625	0.34375	16	16	16	16	32
67	3	0.9375	0	0.5625	0.3125	0.09375	16	8	16	16	32
68	3	1.125	0.1875	1.1875	0.625	0.125	16	16	16	16	32
69	3	3.875	0.0625	0.1875	0.125	0.1875	16	16	16	16	32
70	3	3.625	0.3125	0.25	0.0625	0.0625	16	16	16	16	32
Tanu Island sites											
59	1	1.4375	0.875	1.0625	0.625	0.8125	16	16	16	16	64
60	1	*	1.25	0.625	0	0.1875	*	16	16	8	64
61	1	1.53125	0.3125	0	0	0.28125	32	16	16	8	32
62	1	*	0.5625	0.8125	0.625	0.15625	*	16	16	16	32
63	1	1.4375	0.1875	0.1875	0.5625	0.3125	16	16	16	16	32
64	1	2.1875	0.0625	0.75	0.0625	0.03125	16	16	16	16	32
73	1	*	*	1	0.125	0.375	*	*	16	16	32
74	1	*	*	0.125	0.0625	0.59375	*	*	16	16	32
Upper Juan Perez Sound sites											
36	2	2.4375	0	0	0	0.21875	16	8	16	16	32
37	1	1.125	0	0.375	0.1875	0.0625	16	8	16	16	32
38	1	2.4375	1	0.6875	0.9375	0.40625	16	16	16	16	32
39	1	6.38462	1.8125	0.875	0.3125	0.28125	13	16	16	16	32
40	1	1	0.125	0.0625	0.083333	0.03125	16	16	16	48	32
41	1	0.25	0.0625	0.0625	0	0.0625	16	16	16	16	32
44	1	6.5625	0.125	0.4375	0.0625	0.0625	16	16	16	16	32
45	1	4.25	0.75	0.625	0.8125	0.125	16	16	16	16	32
46	2	7.0625	0.5	4	1.4375	0.21875	16	16	16	16	32
47	*	*	0	*	*	*	*	8	*	*	*
48	1	3.625	1.1875	0.8125	0.4375	0.1875	16	16	16	16	48
49	1	1.8125	0.5625	0.875	2.10417	0.25	16	16	16	48	64
50	2	0.625	1.1875	0.375	0.5625	0.21875	16	16	16	16	32
51	1	0.75	0	0.5	0.375	0.234375	16	16	16	16	64
52	1	8.85714	2	0.5	0.6875	0.0625	7	16	16	16	32
53	2	8.125	0.3125	0.75	0.9375	0	16	16	16	16	32
54	2	0.625	1	1.5	0.5	0.265625	16	16	16	16	64
55	2	5.875	0.875	2.5625	1.1875	0.375	16	16	16	16	32
56	2	7.25	1.75	1.125	1.75	0.59375	16	16	16	16	32
57	2	2.625	1	0.25	0	0	16	16	16	16	32
58	2	3.375	0.0625	0.25	0.25	0	16	16	16	16	32

Appendix 1. Total exposed abalone density by site and number of quadrats sampled per site for all sample years. * indicates no sample. Site types are 1 = open to commercial fishing, 2 = closed in 1973, 3 = closed in 1984.

		Denstiy (#/sq. m)					Quadrats/site				
SITE	type	1979	1984	1987	1990	1994	1979	1984	1987	1990	1994
Lower Juan Perez Sound sites											
42	2	16.5625	0.0625	1.5625	0.625	0.515625	16	16	16	16	64
43	2	9.375	0.3125	0.8125	0.6875	0.265625	16	16	16	16	64
Skincuttle Inlet sites											
22	1	1.625	0.0625	0	0.625	0.09375	16	16	0	16	32
23	1	1.125	0.6875	0.625	0.3125	0.03125	16	16	16	16	32
24	1	0.75	0.8125	1.125	0.375	0.25	16	16	16	16	48
25	1	2.25	0.75	*	*	*	16	16	*	*	*
26	1	0.5625	2	2.125	1.25	0.34375	16	16	16	16	32
27	1	0.625	0	0.0625	0.0625	0.0625	16	8	16	16	32
28	1	3.0625	1.125	1.125	0.3125	0.875	16	16	16	16	32
29	1	0.9375	0.6875	0.375	0.1875	0.34375	16	16	16	16	32
30	1	3.3125	1.25	0.4375	0.875	0.53125	16	16	16	16	32
31	1	1.75	0.5	0.9375	0.25	0.3125	16	16	16	16	32
32	1	5.75	0	0.5	0.125	0.09375	16	8	16	16	32
33	1	3	0.8125	0.75	0.0625	1.15625	16	16	16	16	32
34	1	6.125	0.9375	0.4375	0.1875	0.25	16	16	16	16	28
35	1	0.3125	0.375	0.5	0.0625	0.34375	16	16	16	16	32
72	1	*	*	1	*	*	*	*	16	*	*
Carpenter Bay sites											
10	1	1.0625	0.6875	0.5625	0.3125	0.34375	16	16	16	16	32
11	1	0.1875	0	0.1875	0.0625	0.15625	16	8	16	16	32
12	1	0.125	0.1875	0.1875	0.3125	0.21875	16	16	16	16	32
13	1	2.3125	0.416667	*	*	*	16	12	*	*	*
14	1	2.3125	0.5625	0.625	1.5625	0.3125	16	16	16	16	32
15	1	3.375	0.5	0.4375	0.375	0.96875	16	16	16	16	32
16	1	2.5625	0.0625	*	*	*	16	16	*	*	*
17	1	1.1875	0.0625	0.5625	0.125	0.40625	16	16	16	16	32
18	1	1.4375	0.8125	0.25	0.25	0.625	16	16	16	16	32
19	1	1	0	0.375	0.3125	0.90625	16	16	16	16	32
20	1	1.125	1.625	0.066667	0.3125	0.71875	16	16	15	16	32
21	1	0.9375	0	0	0	0.03125	16	8	8	8	32
Kunghit Island sites											
1	1	2.625	1.0625	1.0625	1.9375	0.46875	16	16	16	16	32
2	1	0.6875	0.375	1.0625	1.5	0.21875	16	16	16	16	32
3	1	1.625	0.375	0.375	0.9375	1.625	16	16	16	16	32
4	1	*	0.125	0.4375	0.125	0	*	16	16	16	32
5	1	*	0	*	*	*	*	8	*	*	*
6	1	*	0.5	0	*	*	*	16	8	*	*
7	1	*	0.1875	0.125	0.1875	0.15625	*	16	16	16	32
8	1	*	0.0625	*	*	*	*	16	*	*	*
9	1	*	0.4375	*	*	*	*	16	*	*	*
71	1	*	*	0.3125	0.1875	0.1875	*	*	16	16	32
79	1	*	*	*	0.3125	0.03125	*	*	*	16	32

Appendix 2. Legal exposed abalone density by site and mature exposed abalone density by site for all sample years. * indicates no sample or no length data.

	Legal (>100 mm) abalone density					Mature (>70 mm) abalone density				
SITE	1979	1984	1987	1990	1994	1979	1984	1987	1990	1994
Cumshewa Inlet sites										
75	0.84375	*	0.4375	0.0625	0	1.05469	*	0.4375	0.0625	0
76	1.4375	*	0.0625	0.125	*	2.15625	*	0.125	0.25	*
77	0.4375	*	0	*	0.0625	0.8125	*	0	*	0.0625
78	0.75	*	1.5	0.6875	0.03125	0.875	*	1.5	0.6875	0.0625
Selwyn Inlet sites										
65	0.10625	0	0.125	0	0.0625	*	0.0625	0.4375	0.0625	0.09375
66	0.3125	0.0625	0.125	0	0.034375	*	0.125	0.25	0.0625	0.171875
67	0.140625	0	0.1875	0.0625	0	*	0	0.4375	0.0625	0
68	0.397059	0	0.25	0.25	0	0.992647	0	0.625	0.375	0.03125
69	0.3875	0	0.0625	0	0.0625	*	0	0.125	0.0625	0.1875
70	0.54375	0.052083	0	0.0625	0.03125	*	0.15625	0	0.0625	0.03125
Tanu Island sites										
59	0.71875	0.125	0.6875	0.25	0.2925	*	0.75	1	0.5	0.63375
60	*	0.357143	0.486111	0	0.140625	*	1.25	0.625	0	0.15625
61	0.399457	0.1875	0	0	0	1.43139	0.25	0	0	0.0625
62	*	0.25	0.25	0.125	0.03125	.	0.5625	0.4375	0.375	0.09375
63	0.205357	0	0	0	0	0.684524	0	0.09375	0.4375	0.243056
64	1.41544	0	0.441176	0.0625	0	2.12316	0.0625	0.705882	0.0625	0.03125
73	*	*	0.941176	0.125	0.25	*	*	1	0.125	0.34375
74	*	*	0.125	0.0625	0.15625	*	*	0.125	0.0625	0.21875
Upper Juan Perez Sound sites										
36	0	0	0	0	0	0.128289	0	0	0	0
37	0	0	0	0	0	*	0	0.214286	0	0.03125
38	0.365625	0	0.0625	0.25	0.101562	*	0.4375	0.4375	0.75	0.203125
39	0	0	0	0	0	0.375566	0.125	0	0.1875	0.070313
40	0	0	0	0	0	*	0	0	0	0
41	0	0.0625	0	0	0.0625	*	0.0625	0.0625	0	0.0625
44	0.0625	0	0.125	0	0	3.125	0.0625	0.3125	0	0.03125
45	0.128788	0.1875	0.0625	0.25	0	1.54545	0.3125	0.3125	0.5	0.0625
46	0	0	0	0	0	1.6707	0.055556	0.3125	0	0.03125
47	*	0	*	*	*	*	0	*	*	*
48	0.54375	0.375	0.125	0.0625	0.125	1.63125	0.9375	0.375	0.25	0.145833
49	1.63125	0.421875	0.7	0.333333	0.140625	*	0.492188	0.816667	1.70833	0.234375
50	0.5625	0.75	0.3125	0.4375	0.09375	*	1.125	0.375	0.5625	0.21875
51	0.675	0	0.4375	0.3125	0.234375	*	0	0.5	0.375	0.234375
52	0	0	0	0	0	0	0	0	0	0.0625
53	1.21875	0	0	0	0	*	0	0	0	0
54	0	0.076923	0.409091	0.1875	0.078125	0.25	0.769231	1.15909	0.4375	0.203125
55	3.525	0.0625	0.25625	0.5625	0.09375	*	0.5625	2.17813	0.875	0.34375
56	0.3625	0.125	0.5	0.4375	0.09375	*	1.1875	1	1.25	0.46875
57	0.13125	0	0	0	0	*	0	0	0	0
58	0.118421	0	0	0	0	1.65789	0	0.083333	0	0

Appendix 2. Legal exposed abalone density by site and mature exposed abalone density by site for all sample years. * indicates no sample or no length data.

	Legal (>100 mm) abalone density					Mature (>70 mm) abalone density				
SITE	1979	1984	1987	1990	1994	1979	1984	1987	1990	1994
Lower Juan Perez Sound sites										
42	1.2453	0	0.125	0.0625	0.017188	11.519	0	0.6875	0.1875	0.034375
43	0.9375	0	0	0	0	*	0.1875	0.0625	0.125	0.015625
Skincuttle Inlet sites										
22	0	0	0	0	0	*	0	0	0	0.03125
23	0.1125	0.275	0.208333	0.125	0.03125	*	0.6875	0.625	0.3125	0.03125
24	0.403846	0.067708	0.1875	0	0.041667	0.75	0.677083	1	0.375	0.25
25	0.1125	0.288462	*	*	*	*	0.519231	*	*	*
26	0.50625	0.451613	0.863281	0.25	0	0.5625	1.80645	2.05859	1	0.25
27	0.15625	0	0.0625	0.0625	0.03125	0.416667	0	0.0625	0.0625	0.0625
28	0.066576	0	0	0	0	0.266304	0	0.0625	0	0.064815
29	0	0	0	0	0	*	0	0.0625	0.0625	0.03125
30	0	0	0	0	0	*	0	0	0	0.125
31	0.0875	0.277778	0.6875	0.0625	0.1875	*	0.5	0.875	0.1875	0.21875
32	0.447222	0	0	0	0	4.28056	0	0.125	0.0625	0
33	1.10204	0.3125	0.375	0	0.59375	2.5102	0.75	0.625	0.0625	1.03125
34	0.257895	0.1875	0.0625	0	0	1.74079	0.8125	0.3125	0.0625	0.178571
35	0.03125	0.3125	0.125	0	0.1875	*	0.375	0.5	0	0.3125
72	*	*	0.875	*	*	*	*	1	*	*
Carpenter Bay sites										
10	0.0625	0.057292	0.28125	0.1875	0.3125	0.6875	0.515625	0.50625	0.3125	0.34375
11	0.0625	0	0	0	0.03125	0.1875	0	0.125	0.0625	0.15625
12	0.1	0.0625	0.09375	0.0625	0	*	0.1875	0.1875	0.3125	0.125
13	0	0	*	*	*	0.3125	0	*	*	*
14	0.925	0.0625	0	0	0	*	0.4375	0.1875	0.8125	0.277778
15	0.127358	0	0	0	0	2.03774	0.1875	0.0625	0.0625	0.53125
16	0.197115	0	*	*	*	1.3141	0	*	*	*
17	0.059375	0	0	0	0	*	0.0625	0.210938	0	0.28125
18	0.4375	0.375	0.041667	0.0625	0.197368	1.1875	0.8125	0.208333	0.1875	0.361842
19	0	0	0	0	0	*	0	0.0625	0.0625	0.21875
20	0	0	0	0	0.0625	0.5	0.75	0.066667	0.25	0.4375
21	0.234375	0	0	0	0.03125	*	0	0	0	0.03125
Kunghit Island sites										
1	0	0.118056	0.1875	0.375	0.125	0.8125	1.00347	0.75	1.625	0.34375
2	0	0.107143	0.111842	0.3125	0	*	0.375	0.838816	0.6875	0
3	1.21875	0.214286	0.053571	0.125	0.159314	*	0.375	0.267857	0.8125	1.27451
4	*	0	0.145833	0	0	*	0	0.291667	0	0
5	*	0	*	*	*	*	0	*	*	*
6	*	0.071429	0	*	*	*	0.214286	0	*	*
7	*	0.0625	0	0.0625	0.0625	*	0.125	0	0.1875	0.15625
8	*	0	*	*	*	*	0.0625	*	*	*
9	*	0.0625	*	*	*	*	0.3125	*	*	*
71	*	*	0.3125	0.125	0.125	*	*	0.3125	0.1875	0.1875
79	*	*	*	0.125	0	*	*	*	0.25	0.03125

Appendix 3. Pre-recruit abalone density by site and new recruit abalone density by site for all sample years. * indicates no sample or no length data.

	Pre-recruit (92-99 mm) abalone density					New recruit (100-106 mm) abalone density				
SITE	1979	1984	1987	1990	1994	1979	1984	1987	1990	1994
Cumshewa Inlet sites										
75	0.070313	*	0	0	0	0.140625	*	0	0	0
76	0.130682	*	0	0.0625	*	0.392045	*	0	0.0625	*
77	0.125	*	0	*	0	0.0625	*	0	*	0
78	0.125	*	0	0	0.03125	0	*	0	0	0
Selwyn Inlet sites										
65	*	0	0.125	0.0625	0	*	0	0	0	0
66	*	0.0625	0.0625	0	0	*	0	0	0	0.034375
67	*	0	0	0	0	*	0	0.125	0.0625	0
68	0.132353	0	0.125	0	0	0.132353	0	0.125	0.0625	0
69	*	0	0	0	0	*	0	0.0625	0	0
70	*	0	0	0	0	*	0.052083	0	0.0625	0
Tanu Island sites										
59	*	0.25	0.1875	0.0625	0.11375	*	0	0.5	0.0625	0.065
60	*	0.297619	0.069444	0	0	*	0.059524	0.069444	0	0
61	0.366168	0	0	0	0.03125	0.16644	0.0625	0	0	0
62	*	0.125	0	0.1875	0	*	0	0.0625	0	0.03125
63	0.068452	0	0	0	0.069444	0.205357	0	0	0	0
64	0.386029	0	0.088235	0	0.03125	0.386029	0	0.088235	0	0
73	*	*	0.058824	0	0.03125	*	*	0.176471	0.0625	0
74	*	*	0	0	0	*	*	0	0	0
Upper Juan Perez Sound sites										
36	0	0	0	0	0	0	0	0	0	0
37	*	0	0	0	0	*	0	0	0	0
38	*	0	0.0625	0.125	0.033854	*	0	0	0.125	0
39	0	0	0	0	0	0	0	0	0	0
40	*	0	0	0	0	*	0	0	0	0
41	*	0	0	0	0	*	0	0	0	0.0625
44	0.3125	0	0.125	0	0	0.0625	0	0.0625	0	0
45	0.193182	0.0625	0.0625	0.0625	0	0	0.1875	0	0.1875	0
46	0.379704	0.055556	0	0	0	0	0	0	0	0
47	*	0	*	*	*	*	0	*	*	*
48	0.241667	0.3125	0	0	0.020833	0.241667	0.125	0.0625	0	0.041667
49	*	0.070313	0	0.3125	0.0625	*	0.140625	0.175	0.166667	0.046875
50	*	0.1875	0.0625	0.0625	0.03125	*	0.125	0.0625	0	0.0625
51	*	0	0.0625	0.0625	0	*	0	0.0625	0	0.015625
52	0	0	0	0	0	0	0	0	0	0
53	*	0	0	0	0	*	0	0	0	0
54	0	0.076923	0.272727	0	0.015625	0	0	0.136364	0.125	0.015625
55	*	0.0625	0.448438	0.1875	0.0625	*	0	0.192188	0.3125	0.0625
56	*	0.125	0.125	0.375	0.0625	*	0	0.25	0.1875	0.09375
57	*	0	0	0	0	*	0	0	0	0
58	0.473684	0	0	0	0	0	0	0	0	0

Appendix 3. Pre-recruit abalone density by site and new recruit abalone density by site for all sample years. * indicates no sample or no length data.

	Pre-recruit (92-99 mm) abalone density					New recruit (100-106 mm) abalone density				
SITE	1979	1984	1987	1990	1994	1979	1984	1987	1990	1994
Lower Juan Perez sites										
42	2.4906	0	0.0625	0.125	0	0.933976	0	0.125	0	0.017188
43	*	0.0625	0	0	0	*	0	0	0	0
Skincuttle Inlet sites										
22	*	0	0	0	0	*	0	0	0	0
23	*	0.34375	0.208333	0.0625	0	*	0.06875	0.069444	0	0
24	0	0.067708	0.125	0	0.0625	0.230769	0.067708	0.0625	0	0.020833
25	*	0	*	*	*	*	0.115385	*	*	*
26	0	0.645161	0.664062	0.25	0.09375	0.1125	0.258065	0.199219	0.125	0
27	0.15625	0	0	0	0.03125	0.052083	0	0	0	0.03125
28	0	0	0	0	0	0.066576	0	0	0	0
29	*	0	0	0	0	*	0	0	0	0
30	*	0	0	0	0	*	0	0	0	0
31	*	0.222222	0.125	0	0	*	0.111111	0.25	0.0625	0.03125
32	0.894444	0	0	0	0	0.191667	0	0	0	0
33	0.306122	0.1875	0.125	0	0.1875	0.55102	0.0625	0.25	0	0.21875
34	0.193421	0.0625	0.0625	0	0	0.064474	0.1875	0.0625	0	0
35	*	0	0.1875	0	0.03125	*	0.0625	0.0625	0	0.03125
72	*	*	0.0625	*	*	*	*	0.0625	*	*
Carpenter Bay sites										
10	0.0625	0.057292	0.1125	0	0.03125	0	0	0.05625	0.125	0.03125
11	0.0625	0	0	0	0	0.0625	0	0	0	0.03125
12	*	0.0625	0	0	0.03125	*	0.0625	0	0.0625	0
13	0.0625	0	*	*	*	0	0	*	*	*
14	*	0.1875	0	0	0.034722	*	0	0	0	0
15	0.318396	0.0625	0	0	0.0625	0.127358	0	0	0	0
16	0.394231	0	*	*	*	0.197115	0	*	*	*
17	*	0	0	0	0.0625	*	0	0	0	0
18	0.1875	0	0	0	0.032895	0.1875	0.0625	0	0.0625	0.06579
19	*	0	0	0.0625	0	*	0	0	0	0
20	0.0625	0.1875	0	0.0625	0.15625	0	0	0	0	0.03125
21	*	0	0	0	0	*	0	0	0	0.03125
Kunghit Island sites										
1	0.0625	0.236111	0.0625	0.5	0.0625	0	0	0.1875	0.3125	0.0625
2	*	0.053571	0.223684	0.125	0	*	0	0.055921	0.3125	0
3	*	0.107143	0	0.5	0.35049	*	0.107143	0.053571	0.125	0.127451
4	*	0	0	0	0	*	0	0.145833	0	0
5	*	0	*	*	*	*	0	*	*	*
6	*	0	0	*	*	*	0.071429	0	*	*
7	*	0.0625	0	0	0.03125	*	0	0	0	0
8	*	0.0625	*	*	*	*	0	*	*	*
9	*	0.125	*	*	*	*	0.0625	*	*	*
71	*	*	0	0	0.03125	*	*	0	0	0
79	*	*	*	0	0	*	*	*	0.125	0

APPENDIX 4: DIVING STATION LOG
ABALONE RESURVEY
QUEEN CHARLOTTE ISLANDS

VESSEL: CSS Vector SITE: 001 DIVER:

FISHERIES STATISTICAL: region 0 area 02 sub-area 19

LOCATION: Heater Harbour

1994 MAY 28 (PDT) TIME:START: 08:46 FINISH: 09:45

DEPTH FROM DATUM: MAX: 03.4 meters TIDE START: 1.1 meters

EXPOSURE: Ground Swell Normal SURVEY DESIGN: 32 quadrats

SUBSTRATE TYPE: BRK./BLD. SLOPE: 10 degrees

	DOMINANT ALGAE SPECIES NAME	%COVER UP TO		SPECIES NAME	%COVER UP TO
CANOPY	Nereocystis luetkeana	10	!	--	0
BOTTOM	Desmarestia sp.	10	!	--	0
TURF	--	0	!	--	0
ROCKS	Lithothamnion sp.	90	!	--	0

REMARKS: previous survey site

SPECIES NAME	DEPTH FROM DATUM	QUADRAT NUMBER	TOTAL SPECIES COUNT	COUNT UNDER ROCKS	COUNT ON ROCKS
ABALONE	.	001	003		3
ABALONE	.	002	001		1
ABALONE	.	003	001		1
ABALONE	.	004	000		0
ABALONE	.	005	002		2
ABALONE	.	006	001		1
ABALONE	.	007	000		0
ABALONE	.	008	000		0
ABALONE	.	009	001		1
ABALONE	.	010	000		0
ABALONE	.	011	000		0
ABALONE	.	012	001		1
ABALONE	.	013	001		1
ABALONE	.	014	000		0
ABALONE	.	015	000		0
ABALONE	.	016	000		0
ABALONE	.	001	000		0
ABALONE	.	002	000		0
ABALONE	.	003	001		1
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	000		0
ABALONE	.	007	000		0
ABALONE	.	008	000		0
ABALONE	.	009	000		0
ABALONE	.	010	000		0
ABALONE	.	011	000		0
ABALONE	.	012	000		0
ABALONE	.	013	001		1
ABALONE	.	014	000		0
ABALONE	.	015	002		2
ABALONE	.	016	000		0

APPENDIX 4: DIVING STATION LOG
ABALONE RESURVEY
QUEEN CHARLOTTE ISLANDS

VESSEL: CSS Vector SITE: 002 DIVER:

FISHERIES STATISTICAL: region 0 area 02 sub-area 19

LOCATION: Heater Harbour

1994 MAY 28 (PDT) TIME:START: 08:52 FINISH: 09:28

DEPTH FROM DATUM: MAX: . meters TIDE START: . meters

EXPOSURE: Occasional Current SURVEY DESIGN: 32 quadrats

SUBSTRATE TYPE: BLD./CBL./GRV./SHL. SLOPE: 10 degrees

	DOMINANT ALGAE SPECIES NAME	%COVER UP TO		SPECIES NAME	%COVER UP TO
CANOPY	Macrocystis integrifolia	10		--	0
BOTTOM	--	0		--	0
TURF	--	0		--	0
ROCKS	Lithothamnion sp.	90		--	0

REMARKS: previous survey site

SPECIES NAME	DEPTH FROM DATUM	QUADRAT NUMBER	TOTAL SPECIES COUNT	COUNT UNDER ROCKS	COUNT ON ROCKS
ABALONE	.	001	000		0
ABALONE	.	002	000		0
ABALONE	.	003	000		0
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	000		0
ABALONE	.	007	000		0
ABALONE	.	008	000		0
ABALONE	.	009	000		0
ABALONE	.	010	002		2
ABALONE	.	011	000		0
ABALONE	.	012	001		1
ABALONE	.	013	000		0
ABALONE	.	014	000		0
ABALONE	.	015	000		0
ABALONE	.	016	000		0
ABALONE	.	001	000		0
ABALONE	.	002	002		2
ABALONE	.	003	000		0
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	000		0
ABALONE	.	007	000		0
ABALONE	.	008	000		0
ABALONE	.	009	000		0
ABALONE	.	010	000		0
ABALONE	.	011	000		0
ABALONE	.	012	000		0
ABALONE	.	013	002		2
ABALONE	.	014	000		0
ABALONE	.	015	000		0
ABALONE	.	016	000		0

APPENDIX 4: DIVING STATION LOG
ABALONE RESURVEY
QUEEN CHARLOTTE ISLANDS

VESSEL: CSS Vector SITE: 003 DIVER:

FISHERIES STATISTICAL: region 0 area 02 sub-area 19

LOCATION: Heater Harbour

1994 MAY 27 (PDT) TIME:START: 15:55 FINISH: 16:18

DEPTH FROM DATUM: MAX: 05.1 meters TIDE START: 4.1 meters

EXPOSURE: Ground Swell Normal SURVEY DESIGN: 32 quadrats

SUBSTRATE TYPE: BLD. SLOPE: 40 degrees

	DOMINANT ALGAE SPECIES NAME	%COVER UP TO		SPECIES NAME	%COVER UP TO
CANOPY	--	0	!	--	0
BOTTOM	Desmarestia sp.	20	!	Pterygophora californica	40
TURF	articulated corallines	20	!	--	0
ROCKS	Lithothamnion sp.	50	!	--	0

REMARKS: previous survey site

SPECIES NAME	DEPTH FROM DATUM	QUADRAT NUMBER	TOTAL SPECIES COUNT	COUNT UNDER ROCKS	COUNT ON ROCKS
ABALONE	.	001	002		2
ABALONE	.	002	003		3
ABALONE	.	003	008		8
ABALONE	.	004	000		0
ABALONE	.	005	012		12
ABALONE	.	006	002		2
ABALONE	.	007	004		4
ABALONE	.	008	000		0
ABALONE	.	009	005		5
ABALONE	.	010	009		9
ABALONE	.	011	000		0
ABALONE	.	012	000		0
ABALONE	.	013	000		0
ABALONE	.	014	000		0
ABALONE	.	015	001		1
ABALONE	.	016	000		0
ABALONE	.	001	000		0
ABALONE	.	002	000		0
ABALONE	.	003	000		0
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	000		0
ABALONE	.	007	000		0
ABALONE	.	008	000		0
ABALONE	.	009	000		0
ABALONE	.	010	000		0
ABALONE	.	011	000		0
ABALONE	.	012	000		0
ABALONE	.	013	000		0
ABALONE	.	014	002		2
ABALONE	.	015	000		0
ABALONE	.	016	004		4

APPENDIX 4: DIVING STATION LOG
ABALONE RESURVEY
QUEEN CHARLOTTE ISLANDS

VESSEL: CSS Vector SITE: 004 DIVER:

FISHERIES STATISTICAL: region 0 area 02 sub-area 19

LOCATION: Heater Harbour

1994 MAY 27 (PDT) TIME:START: 14:05 FINISH: 14:35

DEPTH FROM DATUM: MAX: 03.5 meters TIDE START: 2.7 meters

EXPOSURE: Moderate Exposure SURVEY DESIGN: 32 quadrats

SUBSTRATE TYPE: BLD./CBL./GRV./SHL. SLOPE: 20 degrees

	DOMINANT ALGAE SPECIES NAME	%COVER UP TO		SPECIES NAME	%COVER UP TO
CANOPY	Nereocystis luetkeana	50		--	0
BOTTOM	Pterygophora californica	10		Phyllospadix sp.	10
TURF	--	0		--	0
ROCKS	Lithothamnion sp.	80		--	0

REMARKS: previous survey site

SPECIES NAME	DEPTH FROM DATUM	QUADRAT NUMBER	TOTAL SPECIES COUNT	COUNT UNDER ROCKS	COUNT ON ROCKS
ABALONE	.	001	000		0
ABALONE	.	002	000		0
ABALONE	.	003	000		0
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	000		0
ABALONE	.	007	000		0
ABALONE	.	008	000		0
ABALONE	.	009	000		0
ABALONE	.	010	000		0
ABALONE	.	011	000		0
ABALONE	.	012	000		0
ABALONE	.	013	000		0
ABALONE	.	014	000		0
ABALONE	.	015	000		0
ABALONE	.	016	000		0
ABALONE	.	001	000		0
ABALONE	.	002	000		0
ABALONE	.	003	000		0
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	000		0
ABALONE	.	007	000		0
ABALONE	.	008	000		0
ABALONE	.	009	000		0
ABALONE	.	010	000		0
ABALONE	.	011	000		0
ABALONE	.	012	000		0
ABALONE	.	013	000		0
ABALONE	.	014	000		0
ABALONE	.	015	000		0
ABALONE	.	016	000		0

APPENDIX 4: DIVING STATION LOG
ABALONE RESURVEY
QUEEN CHARLOTTE ISLANDS

VESSEL: CSS Vector SITE: 007 DIVER:

FISHERIES STATISTICAL: region 0 area 02 sub-area 19

LOCATION: Luxana Bay

1994 MAY 27 (PDT) TIME:START: 09:48 FINISH: 10:54

DEPTH FROM DATUM: MAX: 03.5 meters TIDE START: 0.2 meters

EXPOSURE: Moderate Exposure SURVEY DESIGN: 32 quadrats

SUBSTRATE TYPE: BLD./CBL./GRV./SHL. SLOPE: 10 degrees

	DOMINANT ALGAE SPECIES NAME	%COVER UP TO		SPECIES NAME	%COVER UP TO
CANOPY	Macrocystis integrifolia	20		--	0
BOTTOM	Laminaria sp.	10		Desmarestia sp.	10
TURF	articulated corallines	30		--	0
ROCKS	Lithothamnion sp.	60		--	0

REMARKS: previous survey site

SPECIES NAME	DEPTH FROM DATUM	QUADRAT NUMBER	TOTAL SPECIES COUNT	COUNT UNDER ROCKS	COUNT ON ROCKS
ABALONE	.	001	000		0
ABALONE	.	002	000		0
ABALONE	.	003	000		0
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	000		0
ABALONE	.	007	000		0
ABALONE	.	008	000		0
ABALONE	.	009	000		0
ABALONE	.	010	000		0
ABALONE	.	011	000		0
ABALONE	.	012	001		1
ABALONE	.	013	000		0
ABALONE	.	014	000		0
ABALONE	.	015	000		0
ABALONE	.	016	000		0
ABALONE	.	001	000		0
ABALONE	.	002	000		0
ABALONE	.	003	000		0
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	000		0
ABALONE	.	007	000		0
ABALONE	.	008	001		1
ABALONE	.	009	000		0
ABALONE	.	010	000		0
ABALONE	.	011	000		0
ABALONE	.	012	001		1
ABALONE	.	013	001		1
ABALONE	.	014	000		0
ABALONE	.	015	001		1
ABALONE	.	016	000		0

APPENDIX 4: DIVING STATION LOG
ABALONE RESURVEY
QUEEN CHARLOTTE ISLANDS

VESSEL: CSS Vector SITE: 010 DIVER:

FISHERIES STATISTICAL: region 0 area 02 sub-area 17

LOCATION: Carpenter Bay

1994 MAY 28 (PDT) TIME:START: 14:37 FINISH: 15:15

DEPTH FROM DATUM: MAX: 02.7 meters TIDE START: 2.7 meters

EXPOSURE: Well Sheltered SURVEY DESIGN: 32 quadrats

SUBSTRATE TYPE: BLD./CBL./GRV./SHL. SLOPE: 10 degrees

	DOMINANT ALGAE SPECIES NAME	%COVER UP TO		SPECIES NAME	%COVER UP TO
CANOPY	Macrocystis integrifolia	10		--	0
BOTTOM	--	0		--	0
TURF	articulated corallines	10		--	0
ROCKS	Lithothamnion sp.	60		--	0

REMARKS: previous survey site

SPECIES NAME	DEPTH FROM DATUM	QUADRAT NUMBER	TOTAL SPECIES COUNT	COUNT UNDER ROCKS	COUNT ON ROCKS
ABALONE	.	001	000		0
ABALONE	.	002	000		0
ABALONE	.	003	000		0
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	002		2
ABALONE	.	007	000		0
ABALONE	.	008	000		0
ABALONE	.	009	000		0
ABALONE	.	010	000		0
ABALONE	.	011	000		0
ABALONE	.	012	000		0
ABALONE	.	013	002		2
ABALONE	.	014	000		0
ABALONE	.	015	000		0
ABALONE	.	016	001		1
ABALONE	.	001	002		2
ABALONE	.	002	001		1
ABALONE	.	003	000		0
ABALONE	.	004	000		0
ABALONE	.	005	001		1
ABALONE	.	006	000		0
ABALONE	.	007	000		0
ABALONE	.	008	000		0
ABALONE	.	009	001		1
ABALONE	.	010	000		0
ABALONE	.	011	001		1
ABALONE	.	012	000		0
ABALONE	.	013	000		0
ABALONE	.	014	000		0
ABALONE	.	015	000		0
ABALONE	.	016	000		0

APPENDIX 4: DIVING STATION LOG
ABALONE RESURVEY
QUEEN CHARLOTTE ISLANDS

VESSEL: CSS Vector SITE: 011 DIVER:

FISHERIES STATISTICAL: region 0 area 02 sub-area 17

LOCATION: Carpenter Bay

1994 MAY 28 (PDT) TIME:START: 15:48 FINISH: 16:26

DEPTH FROM DATUM: MAX: 04.2 meters TIDE START: 3.8 meters

EXPOSURE: Ground Swell Normal SURVEY DESIGN: 32 quadrats

SUBSTRATE TYPE: BRK./BLD. SLOPE: 20 degrees

	DOMINANT ALGAE SPECIES NAME	%COVER UP TO		SPECIES NAME	%COVER UP TO
CANOPY	--	0		--	0
BOTTOM	Pterygophora californica	0		Phyllospadix sp.	0
TURF	--	0		--	0
ROCKS	--	0		--	0

REMARKS: previous survey site

SPECIES NAME	DEPTH FROM DATUM	QUADRAT NUMBER	TOTAL SPECIES COUNT	COUNT UNDER ROCKS	COUNT ON ROCKS
ABALONE	.	001	000		0
ABALONE	.	002	001		1
ABALONE	.	003	000		0
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	000		0
ABALONE	.	007	000		0
ABALONE	.	008	000		0
ABALONE	.	009	000		0
ABALONE	.	010	001		1
ABALONE	.	011	000		0
ABALONE	.	012	000		0
ABALONE	.	013	000		0
ABALONE	.	014	000		0
ABALONE	.	015	000		0
ABALONE	.	016	000		0
ABALONE	.	001	000		0
ABALONE	.	002	000		0
ABALONE	.	003	000		0
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	000		0
ABALONE	.	007	001		1
ABALONE	.	008	000		0
ABALONE	.	009	001		1
ABALONE	.	010	000		0
ABALONE	.	011	000		0
ABALONE	.	012	000		0
ABALONE	.	013	000		0
ABALONE	.	014	000		0
ABALONE	.	015	000		0
ABALONE	.	016	001		1

APPENDIX 4: DIVING STATION LOG
ABALONE RESURVEY
QUEEN CHARLOTTE ISLANDS

VESSEL: CSS Vector SITE: 012 DIVER:

FISHERIES STATISTICAL: region 0 area 02 sub-area 17

LOCATION: Carpenter Bay

1994 MAY 28 (PDT) TIME:START: 13:18 FINISH: 14:09

DEPTH FROM DATUM: MAX: 05.8 meters TIDE START: 1.4 meters

EXPOSURE: Strong Tidal Flows SURVEY DESIGN: 32 quadrats

SUBSTRATE TYPE: BRK.(SMO) SLOPE: 30 degrees

	DOMINANT ALGAE SPECIES NAME	%COVER UP TO		SPECIES NAME	%COVER UP TO
CANOPY	--	0	!	--	0
BOTTOM	--	0	!	--	0
TURF	--	0	!	--	0
ROCKS	Lithothamnion sp.	90	!	--	0

REMARKS: previous survey site

SPECIES NAME	DEPTH FROM DATUM	QUADRAT NUMBER	TOTAL SPECIES COUNT	COUNT UNDER ROCKS	COUNT ON ROCKS
ABALONE	.	001	000		0
ABALONE	.	002	001		1
ABALONE	.	003	000		0
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	000		0
ABALONE	.	007	000		0
ABALONE	.	008	000		0
ABALONE	.	009	000		0
ABALONE	.	010	000		0
ABALONE	.	011	000		0
ABALONE	.	012	000		0
ABALONE	.	013	000		0
ABALONE	.	014	000		0
ABALONE	.	015	000		0
ABALONE	.	016	000		0
ABALONE	.	001	000		0
ABALONE	.	002	002		2
ABALONE	.	003	000		0
ABALONE	.	004	000		0
ABALONE	.	005	001		1
ABALONE	.	006	000		0
ABALONE	.	007	001		1
ABALONE	.	008	000		0
ABALONE	.	009	000		0
ABALONE	.	010	001		1
ABALONE	.	011	000		0
ABALONE	.	012	000		0
ABALONE	.	013	001		1
ABALONE	.	014	000		0
ABALONE	.	015	000		0
ABALONE	.	016	000		0

APPENDIX 4: DIVING STATION LOG
ABALONE RESURVEY
QUEEN CHARLOTTE ISLANDS

VESSEL: CSS Vector SITE: 014 DIVER:

FISHERIES STATISTICAL: region 0 area 02 sub-area 17

LOCATION: Carpenter Bay

1994 MAY 28 (PDT) TIME:START: 13:09 FINISH: 14:06

DEPTH FROM DATUM: MAX: 03.4 meters TIDE START: 1.5 meters

EXPOSURE: Ground Swell Normal SURVEY DESIGN: 32 quadrats

SUBSTRATE TYPE: BRK.(CRV) SLOPE: 20 degrees

	DOMINANT ALGAE SPECIES NAME	%COVER UP TO	SPECIES NAME	%COVER UP TO
CANOPY	Macrocystis integrifolia	10	Nereocystis luetkeana	10
BOTTOM	Laminaria sp.	10	--	0
TURF	--	0	--	0
ROCKS	Lithothamnion sp.	80	--	0

REMARKS: previous survey site

SPECIES NAME	DEPTH FROM DATUM	QUADRAT NUMBER	TOTAL SPECIES COUNT	COUNT UNDER ROCKS	COUNT ON ROCKS
ABALONE	.	001	000		0
ABALONE	.	002	000		0
ABALONE	.	003	000		0
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	000		0
ABALONE	.	007	000		0
ABALONE	.	008	000		0
ABALONE	.	009	000		0
ABALONE	.	010	001		1
ABALONE	.	011	000		0
ABALONE	.	012	000		0
ABALONE	.	013	000		0
ABALONE	.	014	000		0
ABALONE	.	015	000		0
ABALONE	.	016	000		0
ABALONE	.	001	000		0
ABALONE	.	002	000		0
ABALONE	.	003	000		0
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	000		0
ABALONE	.	007	001		1
ABALONE	.	008	001		1
ABALONE	.	009	000		0
ABALONE	.	010	004		4
ABALONE	.	011	002		2
ABALONE	.	012	000		0
ABALONE	.	013	001		1
ABALONE	.	014	000		0
ABALONE	.	015	000		0
ABALONE	.	016	000		0

APPENDIX 4: DIVING STATION LOG
ABALONE RESURVEY
QUEEN CHARLOTTE ISLANDS

VESSEL: CSS Vector SITE: 015 DIVER:

FISHERIES STATISTICAL: region 0 area 02 sub-area 17

LOCATION: Carpenter Bay

1994 MAY 28 (PDT) TIME:START: 14:36 FINISH: 15:29

DEPTH FROM DATUM: MAX: 03.7 meters TIDE START: 2.7 meters

EXPOSURE: Moderate Exposure SURVEY DESIGN: 32 quadrats

SUBSTRATE TYPE: BLD./CBL./GRV./SHL. SLOPE: 60 degrees

	DOMINANT ALGAE SPECIES NAME	%COVER UP TO	SPECIES NAME	%COVER UP TO
CANOPY	--	0	--	0
BOTTOM	Pterygophora californica	30	Phyllospadix sp.	10
TURF	articulated corallines	30	--	0
ROCKS	Lithothamnion sp.	50	--	0

REMARKS: previous survey site

SPECIES NAME	DEPTH FROM DATUM	QUADRAT NUMBER	TOTAL SPECIES COUNT	COUNT UNDER ROCKS	COUNT ON ROCKS
ABALONE	.	001	002		2
ABALONE	.	002	005		5
ABALONE	.	003	001		1
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	002		2
ABALONE	.	007	005		5
ABALONE	.	008	002		2
ABALONE	.	009	000		0
ABALONE	.	010	000		0
ABALONE	.	011	000		0
ABALONE	.	012	004		4
ABALONE	.	013	000		0
ABALONE	.	014	001		1
ABALONE	.	015	001		1
ABALONE	.	016	000		0
ABALONE	.	001	000		0
ABALONE	.	002	003		3
ABALONE	.	003	000		0
ABALONE	.	004	000		0
ABALONE	.	005	001		1
ABALONE	.	006	000		0
ABALONE	.	007	000		0
ABALONE	.	008	001		1
ABALONE	.	009	001		1
ABALONE	.	010	000		0
ABALONE	.	011	000		0
ABALONE	.	012	001		1
ABALONE	.	013	001		1
ABALONE	.	014	000		0
ABALONE	.	015	000		0
ABALONE	.	016	000		0

APPENDIX 4: DIVING STATION LOG
ABALONE RESURVEY
QUEEN CHARLOTTE ISLANDS

VESSEL: CSS Vector SITE: 017 DIVER:

FISHERIES STATISTICAL: region 0 area 02 sub-area 17

LOCATION: Carpenter Bay

1994 MAY 28 (PDT) TIME:START: 09:10 FINISH: 10:03

DEPTH FROM DATUM: MAX: 05.3 meters TIDE START: 1.8 meters

EXPOSURE: Moderate Exposure SURVEY DESIGN: 32 quadrats

SUBSTRATE TYPE: BRK.(SMO) SLOPE: 20 degrees

	DOMINANT ALGAE SPECIES NAME	%COVER UP TO	SPECIES NAME	%COVER UP TO
CANOPY	--	0	--	0
BOTTOM	Pterygophora californica	10	Phyllospadix sp.	10
TURF	--	0	--	0
ROCKS	Lithothamnion sp.	00	--	0

REMARKS: previous survey site

SPECIES NAME	DEPTH FROM DATUM	QUADRAT NUMBER	TOTAL SPECIES COUNT	COUNT UNDER ROCKS	COUNT ON ROCKS
ABALONE	.	001	000		0
ABALONE	.	002	000		0
ABALONE	.	003	001		1
ABALONE	.	004	010		10
ABALONE	.	005	000		0
ABALONE	.	006	001		1
ABALONE	.	007	000		0
ABALONE	.	008	000		0
ABALONE	.	009	000		0
ABALONE	.	010	000		0
ABALONE	.	011	000		0
ABALONE	.	012	000		0
ABALONE	.	013	000		0
ABALONE	.	014	000		0
ABALONE	.	015	000		0
ABALONE	.	016	000		0
ABALONE	.	001	000		0
ABALONE	.	002	000		0
ABALONE	.	003	000		0
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	000		0
ABALONE	.	007	000		0
ABALONE	.	008	000		0
ABALONE	.	009	000		0
ABALONE	.	010	000		0
ABALONE	.	011	000		0
ABALONE	.	012	000		0
ABALONE	.	013	000		0
ABALONE	.	014	000		0
ABALONE	.	015	000		0
ABALONE	.	016	001		1

APPENDIX 4: DIVING STATION LOG
ABALONE RESURVEY
QUEEN CHARLOTTE ISLANDS

VESSEL: CSS Vector SITE: 018 DIVER:

FISHERIES STATISTICAL: region 0 area 02 sub-area 17

LOCATION: Carpenter Bay

1994 MAY 29 (PDT) TIME:START: 09:20 FINISH: 10:05

DEPTH FROM DATUM: MAX: 03.5 meters TIDE START: 2.3 meters

EXPOSURE: Ground Swell Normal SURVEY DESIGN: 32 quadrats

SUBSTRATE TYPE: BRK./BLD./CBL. SLOPE: 10 degrees

	DOMINANT ALGAE SPECIES NAME	%COVER UP TO	SPECIES NAME	%COVER UP TO
CANOPY	Macrocystis integrifolia	10	--	0
BOTTOM	Pterygophora californica	10	--	0
TURF	articulated corallines	10	--	0
ROCKS	Lithothamnion sp.	50	--	0

REMARKS: previous survey site

SPECIES NAME	DEPTH FROM DATUM	QUADRAT NUMBER	TOTAL SPECIES COUNT	COUNT UNDER ROCKS	COUNT ON ROCKS
ABALONE	.	001	002		2
ABALONE	.	002	001		1
ABALONE	.	003	000		0
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	000		0
ABALONE	.	007	000		0
ABALONE	.	008	000		0
ABALONE	.	009	003		3
ABALONE	.	010	000		0
ABALONE	.	011	000		0
ABALONE	.	012	000		0
ABALONE	.	013	002		2
ABALONE	.	014	001		1
ABALONE	.	015	003		3
ABALONE	.	016	002		2
ABALONE	.	001	000		0
ABALONE	.	002	001		1
ABALONE	.	003	001		1
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	000		0
ABALONE	.	007	000		0
ABALONE	.	008	000		0
ABALONE	.	009	003		3
ABALONE	.	010	000		0
ABALONE	.	011	000		0
ABALONE	.	012	000		0
ABALONE	.	013	000		0
ABALONE	.	014	000		0
ABALONE	.	015	000		0
ABALONE	.	016	001		1

APPENDIX 4: DIVING STATION LOG
ABALONE RESURVEY
QUEEN CHARLOTTE ISLANDS

VESSEL: CSS Vector SITE: 019 DIVER:

FISHERIES STATISTICAL: region 0 area 02 sub-area 17

LOCATION: Carpenter Bay

1994 MAY 28 (PDT) TIME:START: 16:10 FINISH: 16:48

DEPTH FROM DATUM: MAX: 05.2 meters TIDE START: 3.8 meters

EXPOSURE: High Tide Surge Only SURVEY DESIGN: 32 quadrats

SUBSTRATE TYPE: BRK.(CRV) SLOPE: 80 degrees

	DOMINANT ALGAE SPECIES NAME	%COVER UP TO	SPECIES NAME	%COVER UP TO
CANOPY	--	0	--	0
BOTTOM	Phyllospadix sp.	10	--	0
TURF	articulated corallines	10	--	0
ROCKS	Lithothamnion sp.	00	--	0

REMARKS: previous survey site

SPECIES NAME	DEPTH FROM DATUM	QUADRAT NUMBER	TOTAL SPECIES COUNT	COUNT UNDER ROCKS	COUNT ON ROCKS
ABALONE	.	001	000		0
ABALONE	.	002	000		0
ABALONE	.	003	002		2
ABALONE	.	004	000		0
ABALONE	.	005	001		1
ABALONE	.	006	000		0
ABALONE	.	007	000		0
ABALONE	.	008	000		0
ABALONE	.	009	006		6
ABALONE	.	010	000		0
ABALONE	.	011	001		1
ABALONE	.	012	002		2
ABALONE	.	013	001		1
ABALONE	.	014	000		0
ABALONE	.	015	002		2
ABALONE	.	016	004		4
ABALONE	.	001	000		0
ABALONE	.	002	000		0
ABALONE	.	003	000		0
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	000		0
ABALONE	.	007	000		0
ABALONE	.	008	000		0
ABALONE	.	009	000		0
ABALONE	.	010	000		0
ABALONE	.	011	000		0
ABALONE	.	012	000		0
ABALONE	.	013	001		1
ABALONE	.	014	002		2
ABALONE	.	015	006		6
ABALONE	.	016	001		1

APPENDIX 4: DIVING STATION LOG
ABALONE RESURVEY
QUEEN CHARLOTTE ISLANDS

VESSEL: CSS Vector SITE: 020 DIVER:

FISHERIES STATISTICAL: region 0 area 02 sub-area 14

LOCATION: Collison Bay

1994 MAY 29 (PDT) TIME:START: 10:45 FINISH: 11:30

DEPTH FROM DATUM: MAX: 05.0 meters TIDE START: 0.8 meters

EXPOSURE: Occasional Current SURVEY DESIGN: 32 quadrats

SUBSTRATE TYPE: BRK./BLD./CBL. SLOPE: 10 degrees

	DOMINANT ALGAE SPECIES NAME	%COVER UP TO		SPECIES NAME	%COVER UP TO
CANOPY	--	0	!	--	0
BOTTOM	--	0	!	--	0
TURF	--	0	!	--	0
ROCKS	Encrusting algae	20	!	--	0

REMARKS: previous survey site

SPECIES NAME	DEPTH FROM DATUM	QUADRAT NUMBER	TOTAL SPECIES COUNT	COUNT UNDER ROCKS	COUNT ON ROCKS
ABALONE	.	001	000		0
ABALONE	.	002	000		0
ABALONE	.	003	000		0
ABALONE	.	004	000		0
ABALONE	.	005	001		1
ABALONE	.	006	002		2
ABALONE	.	007	000		0
ABALONE	.	008	001		1
ABALONE	.	009	002		2
ABALONE	.	010	000		0
ABALONE	.	011	001		1
ABALONE	.	012	000		0
ABALONE	.	013	000		0
ABALONE	.	014	000		0
ABALONE	.	015	003		3
ABALONE	.	016	000		0
ABALONE	.	001	001		1
ABALONE	.	002	000		0
ABALONE	.	003	000		0
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	000		0
ABALONE	.	007	003		3
ABALONE	.	008	000		0
ABALONE	.	009	002		2
ABALONE	.	010	000		0
ABALONE	.	011	000		0
ABALONE	.	012	001		1
ABALONE	.	013	006		6
ABALONE	.	014	000		0
ABALONE	.	015	000		0
ABALONE	.	016	000		0

APPENDIX 4: DIVING STATION LOG
ABALONE RESURVEY
QUEEN CHARLOTTE ISLANDS

VESSEL: CSS Vector SITE: 021 DIVER:

FISHERIES STATISTICAL: region 0 area 02 sub-area 14

LOCATION: Collison Bay

1994 MAY 29 (PDT) TIME:START: 10:42 FINISH: 11:40

DEPTH FROM DATUM: MAX: . meters TIDE START: . meters

EXPOSURE: -- SURVEY DESIGN: --

SUBSTRATE TYPE: -- SLOPE: 0 degrees

	DOMINANT ALGAE SPECIES NAME	%COVER UP TO		SPECIES NAME	%COVER UP TO
CANOPY	Macrocystis integrifolia	60		--	0
BOTTOM	Pterygophora californica	30		Desmarestia sp.	30
TURF	--	0		--	0
ROCKS	Lithothamnion sp.	80		Hedophyllum sessile	20

REMARKS: previous survey site

SPECIES NAME	DEPTH FROM DATUM	QUADRAT NUMBER	TOTAL SPECIES COUNT	COUNT UNDER ROCKS	COUNT ON ROCKS
ABALONE	.	001	000		0
ABALONE	.	002	000		0
ABALONE	.	003	000		0
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	000		0
ABALONE	.	007	000		0
ABALONE	.	008	000		0
ABALONE	.	009	000		0
ABALONE	.	010	000		0
ABALONE	.	011	000		0
ABALONE	.	012	000		0
ABALONE	.	013	000		0
ABALONE	.	014	000		0
ABALONE	.	015	001		1
ABALONE	.	016	000		0
ABALONE	.	001	000		0
ABALONE	.	002	000		0
ABALONE	.	003	000		0
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	000		0
ABALONE	.	007	000		0
ABALONE	.	008	000		0
ABALONE	.	009	000		0
ABALONE	.	010	000		0
ABALONE	.	011	000		0
ABALONE	.	012	000		0
ABALONE	.	013	000		0
ABALONE	.	014	000		0
ABALONE	.	015	000		0
ABALONE	.	016	000		0

APPENDIX 4: DIVING STATION LOG
ABALONE RESURVEY
QUEEN CHARLOTTE ISLANDS

VESSEL: CSS Vector SITE: 022 DIVER:

FISHERIES STATISTICAL: region 0 area 02 sub-area 15

LOCATION: Skincuttle Inlet

1994 MAY 30 (PDT) TIME:START: 13:24 FINISH: 14:15

DEPTH FROM DATUM: MAX: 03.7 meters TIDE START: 0.8 meters

EXPOSURE: Ground Swell Normal SURVEY DESIGN: 32 quadrats

SUBSTRATE TYPE: BRK.(CRV) SLOPE: 20 degrees

	DOMINANT ALGAE SPECIES NAME	%COVER UP TO		SPECIES NAME	%COVER UP TO
CANOPY	Nereocystis luetkeana	50	!	--	0
BOTTOM	Desmarestia sp.	20	!	Pterygophora californica	20
TURF	--	0	!	--	0
ROCKS	Lithothamnion sp.	70	!	--	0

REMARKS: previous survey site

SPECIES NAME	DEPTH FROM DATUM	QUADRAT NUMBER	TOTAL SPECIES COUNT	COUNT UNDER ROCKS	COUNT ON ROCKS
ABALONE	.	001	000		0
ABALONE	.	002	000		0
ABALONE	.	003	000		0
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	000		0
ABALONE	.	007	002		2
ABALONE	.	008	000		0
ABALONE	.	009	000		0
ABALONE	.	010	000		0
ABALONE	.	011	000		0
ABALONE	.	012	000		0
ABALONE	.	013	000		0
ABALONE	.	014	000		0
ABALONE	.	015	000		0
ABALONE	.	016	000		0
ABALONE	.	001	000		0
ABALONE	.	002	000		0
ABALONE	.	003	000		0
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	001		1
ABALONE	.	007	000		0
ABALONE	.	008	000		0
ABALONE	.	009	000		0
ABALONE	.	010	000		0
ABALONE	.	011	000		0
ABALONE	.	012	000		0
ABALONE	.	013	000		0
ABALONE	.	014	000		0
ABALONE	.	015	000		0
ABALONE	.	016	000		0

APPENDIX 4: DIVING STATION LOG
ABALONE RESURVEY
QUEEN CHARLOTTE ISLANDS

VESSEL: CSS Vector SITE: 023 DIVER:

FISHERIES STATISTICAL: region 0 area 02 sub-area 15

LOCATION: Skincuttle Inlet

1994 MAY 30 (PDT) TIME:START: 14:42 FINISH: 15:21

DEPTH FROM DATUM: MAX: 01.3 meters TIDE START: 1.6 meters

EXPOSURE: Moderate Exposure SURVEY DESIGN: 32 quadrats

SUBSTRATE TYPE: BLD./CBL./GRV./SHL. SLOPE: 10 degrees

	DOMINANT ALGAE SPECIES NAME	%COVER UP TO	SPECIES NAME	%COVER UP TO
CANOPY	Macrocystis integrifolia	00	--	0
BOTTOM	--	0	--	0
TURF	--	0	--	0
ROCKS	Lithothamnion sp.	50	Hedophyllum sessile	20

REMARKS: previous survey site

SPECIES NAME	DEPTH FROM DATUM	QUADRAT NUMBER	TOTAL SPECIES COUNT	COUNT UNDER ROCKS	COUNT ON ROCKS
ABALONE	.	001	000		0
ABALONE	.	002	000		0
ABALONE	.	003	000		0
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	000		0
ABALONE	.	007	000		0
ABALONE	.	008	000		0
ABALONE	.	009	000		0
ABALONE	.	010	000		0
ABALONE	.	011	000		0
ABALONE	.	012	000		0
ABALONE	.	013	000		0
ABALONE	.	014	000		0
ABALONE	.	015	000		0
ABALONE	.	016	000		0
ABALONE	.	001	000		0
ABALONE	.	002	000		0
ABALONE	.	003	000		0
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	000		0
ABALONE	.	007	000		0
ABALONE	.	008	000		0
ABALONE	.	009	000		0
ABALONE	.	010	000		0
ABALONE	.	011	000		0
ABALONE	.	012	001		1
ABALONE	.	013	000		0
ABALONE	.	014	000		0
ABALONE	.	015	000		0
ABALONE	.	016	000		0

APPENDIX 4: DIVING STATION LOG
ABALONE RESURVEY
QUEEN CHARLOTTE ISLANDS

VESSEL: CSS Vector SITE: 024 DIVER:

FISHERIES STATISTICAL: region 0 area 02 sub-area 15

LOCATION: Skincuttle Inlet

1994 MAY 30 (PDT) TIME:START: 15:47 FINISH: 16:25

DEPTH FROM DATUM: MAX: 03.4 meters TIDE START: 2.4 meters

EXPOSURE: High Tide Surge Only SURVEY DESIGN: 48 quadrats

SUBSTRATE TYPE: BRK.(SMO) SLOPE: 10 degrees

	DOMINANT ALGAE SPECIES NAME	%COVER UP TO		SPECIES NAME	%COVER UP TO
CANOPY	Macrocystis integrifolia	30	!	--	0
BOTTOM	--	0	!	--	0
TURF	articulated corallines	40	!	--	0
ROCKS	Lithothamnion sp.	60	!	--	0

REMARKS: previous survey site

SPECIES NAME	DEPTH FROM DATUM	QUADRAT NUMBER	TOTAL SPECIES COUNT	COUNT UNDER ROCKS	COUNT ON ROCKS
ABALONE	.	001	000		0
ABALONE	.	002	000		0
ABALONE	.	003	000		0
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	000		0
ABALONE	.	007	000		0
ABALONE	.	008	000		0
ABALONE	.	009	000		0
ABALONE	.	010	000		0
ABALONE	.	011	001		1
ABALONE	.	012	000		0
ABALONE	.	013	000		0
ABALONE	.	014	000		0
ABALONE	.	015	000		0
ABALONE	.	016	000		0
ABALONE	.	001	000		0
ABALONE	.	002	000		0
ABALONE	.	003	000		0
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	000		0
ABALONE	.	007	000		0
ABALONE	.	008	000		0
ABALONE	.	009	000		0
ABALONE	.	010	000		0
ABALONE	.	011	000		0
ABALONE	.	012	000		0
ABALONE	.	013	000		0
ABALONE	.	014	000		0
ABALONE	.	015	000		0
ABALONE	.	016	000		0

continued
APPENDIX 4: DIVING STATION LOG
ABALONE RESURVEY
QUEEN CHARLOTTE ISLANDS

VESSEL: CSS Vector SITE: 024 DIVER:

FISHERIES STATISTICAL: region 0 area 02 sub-area 15

LOCATION: Skincuttle Inlet

1994 MAY 30 (PDT) TIME:START: 15:47 FINISH: 16:25

DEPTH FROM DATUM: MAX: 03.4 meters TIDE START: 2.4 meters

EXPOSURE: High Tide Surge Only SURVEY DESIGN: 48 quadrats

SUBSTRATE TYPE: BRK.(SMO) SLOPE: 10 degrees

	DOMINANT ALGAE SPECIES NAME	%COVER UP TO		SPECIES NAME	%COVER UP TO
CANOPY	Macrocystis integrifolia	30	!	--	0
BOTTOM	--	0	!	--	0
TURF	articulated corallines	40	!	--	0
ROCKS	Lithothamnion sp.	60	!	--	0

REMARKS: previous survey site

SPECIES NAME	DEPTH FROM DATUM	QUADRAT NUMBER	TOTAL SPECIES COUNT	COUNT UNDER ROCKS	COUNT ON ROCKS
ABALONE	.	001	000		0
ABALONE	.	002	000		0
ABALONE	.	003	000		0
ABALONE	.	004	002		2
ABALONE	.	005	000		0
ABALONE	.	006	000		0
ABALONE	.	007	003		3
ABALONE	.	008	000		0
ABALONE	.	009	000		0
ABALONE	.	010	000		0
ABALONE	.	011	001		1
ABALONE	.	012	002		2
ABALONE	.	013	000		0
ABALONE	.	014	002		2
ABALONE	.	015	001		1
ABALONE	.	016	000		0

APPENDIX 4: DIVING STATION LOG
ABALONE RESURVEY
QUEEN CHARLOTTE ISLANDS

VESSEL: CSS Vector SITE: 026 DIVER:

FISHERIES STATISTICAL: region 0 area 02 sub-area 15

LOCATION: Unknown Location

1994 MAY 30 (PDT) TIME:START: 13:31 FINISH: 14:33

DEPTH FROM DATUM: MAX: 04.5 meters TIDE START: 1.0 meters

EXPOSURE: Moderate Exposure SURVEY DESIGN: 32 quadrats

SUBSTRATE TYPE: BRK./BLD. SLOPE: 40 degrees

	DOMINANT ALGAE SPECIES NAME	%COVER UP TO	SPECIES NAME	%COVER UP TO
CANOPY	Macrocystis integrifolia	20	--	0
BOTTOM	Laminaria sp.	10	Agarum sp.	10
TURF	Ulva sp.	20	articulated corallines	40
ROCKS	Lithothamnion sp.	60	--	0

REMARKS: previous survey site

SPECIES NAME	DEPTH FROM DATUM	QUADRAT NUMBER	TOTAL SPECIES COUNT	COUNT UNDER ROCKS	COUNT ON ROCKS
ABALONE	.	001	001		1
ABALONE	.	002	000		0
ABALONE	.	003	000		0
ABALONE	.	004	000		0
ABALONE	.	005	001		1
ABALONE	.	006	000		0
ABALONE	.	007	000		0
ABALONE	.	008	000		0
ABALONE	.	009	005		5
ABALONE	.	010	000		0
ABALONE	.	011	000		0
ABALONE	.	012	000		0
ABALONE	.	013	000		0
ABALONE	.	014	000		0
ABALONE	.	015	000		0
ABALONE	.	016	003		3
ABALONE	.	001	001		1
ABALONE	.	002	000		0
ABALONE	.	003	000		0
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	000		0
ABALONE	.	007	000		0
ABALONE	.	008	000		0
ABALONE	.	009	000		0
ABALONE	.	010	000		0
ABALONE	.	011	000		0
ABALONE	.	012	000		0
ABALONE	.	013	000		0
ABALONE	.	014	000		0
ABALONE	.	015	000		0
ABALONE	.	016	000		0

APPENDIX 4: DIVING STATION LOG
ABALONE RESURVEY
QUEEN CHARLOTTE ISLANDS

VESSEL: CSS Vector SITE: 027 DIVER:

FISHERIES STATISTICAL: region 0 area 02 sub-area 15

LOCATION: Skincuttle Inlet

1994 MAY 30 (PDT) TIME:START: 15:00 FINISH: 15:43

DEPTH FROM DATUM: MAX: 04.4 meters TIDE START: 1.8 meters

EXPOSURE: Moderate Exposure SURVEY DESIGN: 32 quadrats

SUBSTRATE TYPE: CBL./GRV. SLOPE: 10 degrees

	DOMINANT ALGAE SPECIES NAME	%COVER UP TO	SPECIES NAME	%COVER UP TO
CANOPY	--	0	--	0
BOTTOM	--	0	--	0
TURF	--	0	--	0
ROCKS	Lithothamnion sp.	20	--	0

REMARKS: previous survey site

SPECIES NAME	DEPTH FROM DATUM	QUADRAT NUMBER	TOTAL SPECIES COUNT	COUNT UNDER ROCKS	COUNT ON ROCKS
ABALONE	.	001	000		0
ABALONE	.	002	000		0
ABALONE	.	003	000		0
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	000		0
ABALONE	.	007	000		0
ABALONE	.	008	000		0
ABALONE	.	009	000		0
ABALONE	.	010	000		0
ABALONE	.	011	000		0
ABALONE	.	012	000		0
ABALONE	.	013	000		0
ABALONE	.	014	000		0
ABALONE	.	015	000		0
ABALONE	.	016	000		0
ABALONE	.	001	000		0
ABALONE	.	002	000		0
ABALONE	.	003	000		0
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	000		0
ABALONE	.	007	000		0
ABALONE	.	008	001		1
ABALONE	.	009	001		1
ABALONE	.	010	000		0
ABALONE	.	011	000		0
ABALONE	.	012	000		0
ABALONE	.	013	000		0
ABALONE	.	014	000		0
ABALONE	.	015	000		0
ABALONE	.	016	000		0

APPENDIX 4: DIVING STATION LOG
ABALONE RESURVEY
QUEEN CHARLOTTE ISLANDS

VESSEL: CSS Vector SITE: 028 DIVER:

FISHERIES STATISTICAL: region 0 area 02 sub-area 15

LOCATION: Skincuttle Inlet

1994 MAY 30 (PDT) TIME:START: 10:32 FINISH: 11:43

DEPTH FROM DATUM: MAX: 02.3 meters TIDE START: 2.6 meters

EXPOSURE: High Tide Surge Only SURVEY DESIGN: 32 quadrats

SUBSTRATE TYPE: BRK.(CRV) SLOPE: 20 degrees

	DOMINANT ALGAE SPECIES NAME	%COVER UP TO		SPECIES NAME	%COVER UP TO
CANOPY	Nereocystis luetkeana	10	!	--	0
BOTTOM	Pterygophora californica	30	!	Laminaria sp.	10
TURF	articulated corallines	20	!	--	0
ROCKS	Lithothamnion sp.	80	!	--	0

REMARKS: previous survey site

SPECIES NAME	DEPTH FROM DATUM	QUADRAT NUMBER	TOTAL SPECIES COUNT	COUNT UNDER ROCKS	COUNT ON ROCKS
ABALONE	.	001	004		4
ABALONE	.	002	004		4
ABALONE	.	003	000		0
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	000		0
ABALONE	.	007	000		0
ABALONE	.	008	000		0
ABALONE	.	009	001		1
ABALONE	.	010	000		0
ABALONE	.	011	000		0
ABALONE	.	012	000		0
ABALONE	.	013	002		2
ABALONE	.	014	000		0
ABALONE	.	015	000		0
ABALONE	.	016	002		2
ABALONE	.	001	003		3
ABALONE	.	002	000		0
ABALONE	.	003	001		1
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	001		1
ABALONE	.	007	000		0
ABALONE	.	008	002		2
ABALONE	.	009	003		3
ABALONE	.	010	000		0
ABALONE	.	011	005		5
ABALONE	.	012	000		0
ABALONE	.	013	000		0
ABALONE	.	014	000		0
ABALONE	.	015	000		0
ABALONE	.	016	000		0

APPENDIX 4: DIVING STATION LOG
ABALONE RESURVEY
QUEEN CHARLOTTE ISLANDS

VESSEL: CSS Vector SITE: 029 DIVER:

FISHERIES STATISTICAL: region 0 area 02 sub-area 15

LOCATION: Copper Islands

1994 MAY 30 (PDT) TIME:START: 10:20 FINISH: 11:03

DEPTH FROM DATUM: MAX: 02.7 meters TIDE START: 2.1 meters

EXPOSURE: Ground Swell Normal SURVEY DESIGN: 32 quadrats

SUBSTRATE TYPE: BRK.(SMO) SLOPE: 10 degrees

	DOMINANT ALGAE SPECIES NAME	%COVER UP TO		SPECIES NAME	%COVER UP TO
CANOPY	--	0		--	0
BOTTOM	Pterygophora californica	10		Egregia menziesii	10
TURF	articulated corallines	10		--	0
ROCKS	Lithothamnion sp.	10		--	0

REMARKS: previous survey site

SPECIES NAME	DEPTH FROM DATUM	QUADRAT NUMBER	TOTAL SPECIES COUNT	COUNT UNDER ROCKS	COUNT ON ROCKS
ABALONE	.	001	000		0
ABALONE	.	002	001		1
ABALONE	.	003	001		1
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	000		0
ABALONE	.	007	003		3
ABALONE	.	008	000		0
ABALONE	.	009	000		0
ABALONE	.	010	000		0
ABALONE	.	011	000		0
ABALONE	.	012	001		1
ABALONE	.	013	000		0
ABALONE	.	014	000		0
ABALONE	.	015	000		0
ABALONE	.	016	001		1
ABALONE	.	001	000		0
ABALONE	.	002	000		0
ABALONE	.	003	000		0
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	000		0
ABALONE	.	007	000		0
ABALONE	.	008	000		0
ABALONE	.	009	000		0
ABALONE	.	010	000		0
ABALONE	.	011	000		0
ABALONE	.	012	000		0
ABALONE	.	013	000		0
ABALONE	.	014	000		0
ABALONE	.	015	003		3
ABALONE	.	016	001		1

APPENDIX 4: DIVING STATION LOG
ABALONE RESURVEY
QUEEN CHARLOTTE ISLANDS

VESSEL: CSS Vector SITE: 030 DIVER:

FISHERIES STATISTICAL: region 0 area 02 sub-area 14

LOCATION: Collison Bay

1994 MAY 30 (PDT) TIME:START: 08:49 FINISH: 09:40

DEPTH FROM DATUM: MAX: 03.0 meters TIDE START: 3.4 meters

EXPOSURE: Ground Swell Normal SURVEY DESIGN: 32 quadrats

SUBSTRATE TYPE: BRK.(SMO) SLOPE: 20 degrees

	DOMINANT ALGAE SPECIES NAME	%COVER UP TO		SPECIES NAME	%COVER UP TO
CANOPY	Nereocystis luetkeana	10		--	0
BOTTOM	Laminaria sp.	20		Pterygophora californica	10
TURF	articulated corallines	10		--	0
ROCKS	Lithothamnion sp.	40		--	0

REMARKS: previous survey site

SPECIES NAME	DEPTH FROM DATUM	QUADRAT NUMBER	TOTAL SPECIES COUNT	COUNT UNDER ROCKS	COUNT ON ROCKS
ABALONE	.	001	001		1
ABALONE	.	002	000		0
ABALONE	.	003	001		1
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	001		1
ABALONE	.	007	000		0
ABALONE	.	008	000		0
ABALONE	.	009	000		0
ABALONE	.	010	000		0
ABALONE	.	011	000		0
ABALONE	.	012	000		0
ABALONE	.	013	000		0
ABALONE	.	014	000		0
ABALONE	.	015	000		0
ABALONE	.	016	001		1
ABALONE	.	001	000		0
ABALONE	.	002	000		0
ABALONE	.	003	000		0
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	000		0
ABALONE	.	007	000		0
ABALONE	.	008	001		1
ABALONE	.	009	000		0
ABALONE	.	010	004		4
ABALONE	.	011	000		0
ABALONE	.	012	000		0
ABALONE	.	013	000		0
ABALONE	.	014	000		0
ABALONE	.	015	001		1
ABALONE	.	016	007		7

APPENDIX 4: DIVING STATION LOG
ABALONE RESURVEY
QUEEN CHARLOTTE ISLANDS

VESSEL: CSS Vector SITE: 031 DIVER:

FISHERIES STATISTICAL: region 0 area 02 sub-area 14

LOCATION: Poole Inlet

1994 MAY 29 (PDT) TIME:START: 16:32 FINISH: 17:12

DEPTH FROM DATUM: MAX: 06.3 meters TIDE START: 2.7 meters

EXPOSURE: Moderate Exposure SURVEY DESIGN: 32 quadrats

SUBSTRATE TYPE: BRK./CBL./GRV. SLOPE: 10 degrees

	DOMINANT ALGAE SPECIES NAME	%COVER UP TO		SPECIES NAME	%COVER UP TO
CANOPY	Macrocystis integrifolia	80	!	--	0
BOTTOM	Laminaria sp.	10	!	Cymathere sp.	10
TURF	--	0	!	--	0
ROCKS	Encrusting algae	20	!	--	0

REMARKS: previous survey site

SPECIES NAME	DEPTH FROM DATUM	QUADRAT NUMBER	TOTAL SPECIES COUNT	COUNT UNDER ROCKS	COUNT ON ROCKS
ABALONE	.	001	000		0
ABALONE	.	002	000		0
ABALONE	.	003	000		0
ABALONE	.	004	001		1
ABALONE	.	005	000		0
ABALONE	.	006	000		0
ABALONE	.	007	000		0
ABALONE	.	008	000		0
ABALONE	.	009	000		0
ABALONE	.	010	000		0
ABALONE	.	011	001		1
ABALONE	.	012	000		0
ABALONE	.	013	002		2
ABALONE	.	014	001		1
ABALONE	.	015	000		0
ABALONE	.	016	001		1
ABALONE	.	001	000		0
ABALONE	.	002	003		3
ABALONE	.	003	001		1
ABALONE	.	004	000		0
ABALONE	.	005	000		0
ABALONE	.	006	000		0
ABALONE	.	007	000		0
ABALONE	.	008	000		0
ABALONE	.	009	000		0
ABALONE	.	010	000		0
ABALONE	.	011	000		0
ABALONE	.	012	000		0
ABALONE	.	013	000		0
ABALONE	.	014	000		0
ABALONE	.	015	000		0
ABALONE	.	016	000		0