[redacted]

LASKEEK BAY CONSERVATION SOCIETY

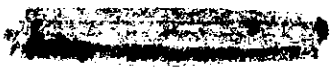
REPORT ON SCIENTIFIC ACTIVITIES IN 1990

#1

A.J. Gaston,

Canadian Wildlife Service, Ottawa K1A 0H3

March 1991



BRIEF STATEMENTS OF ACHIEVEMENTS

(1) Banding of 873 Ancient Murrelet chicks, probably about half of those produced on East Limestone Island in 1990.

(2) Capture of 363 adult Ancient Murrelets on East Limestone Island, including 17 banded there in 1989, and one bird banded as a non-breeder on Reef Island in 1989. The last bird is the first record of a bird trapped as an adult on more than one island, suggesting that Ancient Murrelets prospect more than one colony before settling to breed.

(3) Mapping of seabird distributions, including Marbled Murrelets, in the Skedans Bay/Laskeek Bay area. The area bounded by Louise Island, the Skedans Islands, the Limestone islands, and the Low Islands was estimated to support several hundred Marbled Murrelets during the second half of May.

(4) Detailed observations of raccoon predation on Ancient Murrelets were made. The single male raccoon, present throughout the breeding season, killed many Ancient Murrelets without eating them and dug up many burrows. We estimated that the raccoon was responsible for approximately 25% of Ancient Murrelet kills on East Limestone Island.

BACKGROUND

During 1989-90 a group of conservationists and biologists from within and outside the Queen Charlotte Islands formulated plans for a volunteer programme to carry out biological monitoring and research activities in the Moresby Island area. The study was designed to use simple techniques, which cause a minimum of disturbance to the environment, to allow as many people as possible to gain an appreciation for what is involved in ecological research. In addition, it was hoped that opportunities could be provided for the interpretation of the local ecology to groups of interested visitors.

The scientific work was to continue and extend a programme that had been carried out by the Canadian Wildlife Service during 1984-89, aimed mainly at providing information on the biology and ecology of marine birds. The main species of interest in this work was the Ancient Murrelet, a small diving bird which is more common in the Queen Charlotte Islands than anywhere else in the world. It has decreased substantially over most of its range across the North Pacific, mainly because of predators introduced either deliberately (foxes, raccoons), or accidentally (rats), by people. In the Queen Charlotte Islands, Ancient Murrelets have become much scarcer, or disappeared altogether, on several islands, in one case because of predation by rats. Hence, knowledge about what is happening to Ancient Murrelet populations is important for the conservation of the species, both in Canada, and worldwide.

As well as studying Ancient Murrelets, the former Canadian Wildlife Service programme collected information about the feeding of marine birds and mammals in Laskeek Bay, and adjacent parts of Hecate Strait. In April and May these waters support large numbers of migrant marine birds, including Black-legged Kittiwakes, Sooty Shearwaters, Pacific Loons, and Common Murres. Numbers of kittiwakes and shearwaters fluctuate considerably from year to year, apparently in response to changes in local feeding conditions. Immature kittiwakes remain in Hecate Strait in large numbers in years when conditions for breeding in the Gulf of Alaska are poor. Hence, the events occurring in Laskeek Bay help us to understand patterns of environmental change occurring over much larger areas. By maintaining consistent annual observations of the numbers and age of kittiwakes and other birds feeding in the Laskeek Bay area it should be possible to gain a better understanding of how local events are influenced by wider changes in the ecosystems of the Pacific.

Another species of marine bird for which information is currently sought is the Marbled Murrelet, a bird which nests in old-growth forest, and has therefore suffered from reduction of its breeding habitat by logging activities in many parts of its range. In 1989 the Canadian Wildlife Service carried our boat surveys to determine the numbers of Marbled Murrelets feeding at sea around Louise Island, especially along those stretches of coast where the old growth forest is slated to be felled over the next few years. Repeated surveys of these waters during and after the forest is cut

should provide some indication of the effects of logging on the Marbled Murrelet population.

Most of the work of the Canadian Wildlife Service was carried out on Reef Island, but in 1989 a second camp was also occupied for a period on East Limestone Island, close to Louise Island. For several reasons, this proved to be an easier island on which to work. Hence, the Laskeek Bay Conservation Society decided to make East Limestone the centre of its operations.

ACTIVITIES IN 1990

Activities based on Limestone Island extended from 28 March to 19 June. In March and April a small rustic cabin was erected on the north side of the island, a secure boat mooring was fixed in the cove on the west side (boat cove), and a network of rudimentary trails was cleared by removing major obstructions, and flagged. The amount of clearing was kept to the minimum consistent with the aim of allowing people to move about the colony at night without undue inconvenience. The island was explored and mapped, and prominent features were named.

The camp was occupied continuously from 28 March to 5 April and from 25 April to 19 June. During the earlier visit, several transects were marked out with strings, which were used to sample the area of the Ancient Murrelet colony for evidence of predation. One series of boat surveys for Marbled Murrelets was also carried out. During early May, six funnels were set up, consisting of low fences made from transparent polythene sheets, designed to guide departing Ancient Murrelet chicks to the bottom of each funnel, where they could be captured, banded and sent on their way with the minimum of delay. These funnels were attended nightly from 8 May onwards, from darkness to at least 1 a.m., if no chicks were seen, or to 1 h after the last chick was recorded. Chicks were weighed and banded as they arrived at the catching stations at the seaward end of each funnel, and none was held for more than 5 minutes. During the same period, adult birds were captured on the ground,

mostly as they arrived at the colony, banded, measured, weighed, and inspected for brood patches, and damage to feet and webs.

Transects to estimate the numbers of Ancient Murrelets killed by predators were inspected on 4 April, and at 5 day intervals from 26 April. Each transect was 20 m wide, and ran directly inland from the coast to the limit of the area occupied by Ancient Murrelets. Transects were inspected by two people, walking abreast of one another, 5 m on either side of the guide string. They recorded, and removed, all signs of predation within 10 m on either side of the string. On 4 April three transects were used, on 26-28 April, five, and from 18 May onwards, six. The total distance covered by the five transects used from 26 April was 950 m. The sixth transect, added from 18 May was another 200 m.

Boat transects to estimate the numbers of Marbled Murrelets and other seabirds at sea were conducted from a 4.5 m inflatable boat. The boat was run at a constant speed between landmarks, and the times of the start and end of the run, and of sightings of seabirds were recorded on a tape recorder. The position of each sighting could then be estimated from the time taken to reach the spot. Sightings of birds which were sitting on the water, or which flew up at the approach of the boat, were recorded as on the water, others were recorded as flying. A note was also made when birds were estimated to be more than 200 m from the boat's course. Other observations, of flight directions, or behaviour, were made where appropriate. Boat transects were carried out on four days in April, eight in May and two in June.

In addition to the transects, daily observations were made from Cabin Cove of any marine bird activity visible from shore, and a regular log was kept of casual observations of birds and mammals throughout the area. From 29 April to 7 June a ten minute count of Ancient Murrelets flying over the staging area, to the east of Cabin Cove, was carried out nightly at about one hour before sunset. The count was made through a 25x telescope, fixed so that the navigation beacon on Low Island was at the top edge of the field. This count provided an index of the numbers of Ancient Murrelets waiting to visit the colony that night, and hence provided a warning about how much activity to expect on the colony.

From 17 May onwards the level of activity at 97 burrows was monitored by means of twigs placed across the entrance and checked every morning to see if they had been disturbed by the passage of a murrelet. From 4-12 June those burrows which had shown signs of activity were inspected by either feeling down the entrance tunnel, or digging an access tunnel to the nest chamber. Access tunnels were equipped with hatch-covers. Next year, those burrows found to have been active (52, of which 38 definitely produced chicks) will be inspected from the start of the season to determine the timing of laying. Once the first egg is laid, the start and progress of incubation will be monitored by means of temperature probes placed in the nest cups.

CHICK BANDING AND WEIGHING

The first chicks were captured on the night of 12 May, and the last on 15 June. Ninety percent of chicks were captured over a period of 22 nights, between 13 May and 3 June. The peak of captures occurred on 22 May, when 65 were trapped, and the median date for all captures was 23 May (Table 1, Figure 1). Assuming an incubation period of 32 days, and two days between hatching and departure, the median date of clutch completion was 19 April. As the two eggs are laid 8 days apart, the median date of laying for first eggs was 11 April. Funnel #1 caught the fewest chicks (37), and funnel #6 caught the most (198). The median capture date did not vary significantly among funnels, ranging from 21-24 May.

Studies at Reef Island showed that Ancient Murrelet pairs that laid at least one egg reared an average of 1.54 chicks to departure from the colony. Assuming a similar average on East Limestone Island, the capture of 873 chicks suggests that the catchment area of the funnels contained about 570 breeding pairs of Ancient Murrelets. The total population of the island was estimated as 1200 pairs in 1989. Hence the catchment of the funnels includes about half of the pairs breeding on the island.

The mean weight of chicks captured at departure averaged 27.3 g, with 90% of chicks between 24-30 g (Figure 2). Chick weights averaged more than 28 g at the beginning of the departure period, but chicks captured after 30 May averaged less than 26.5 g (Figure 3). A similar trend was also seen in all years at Reef Island.

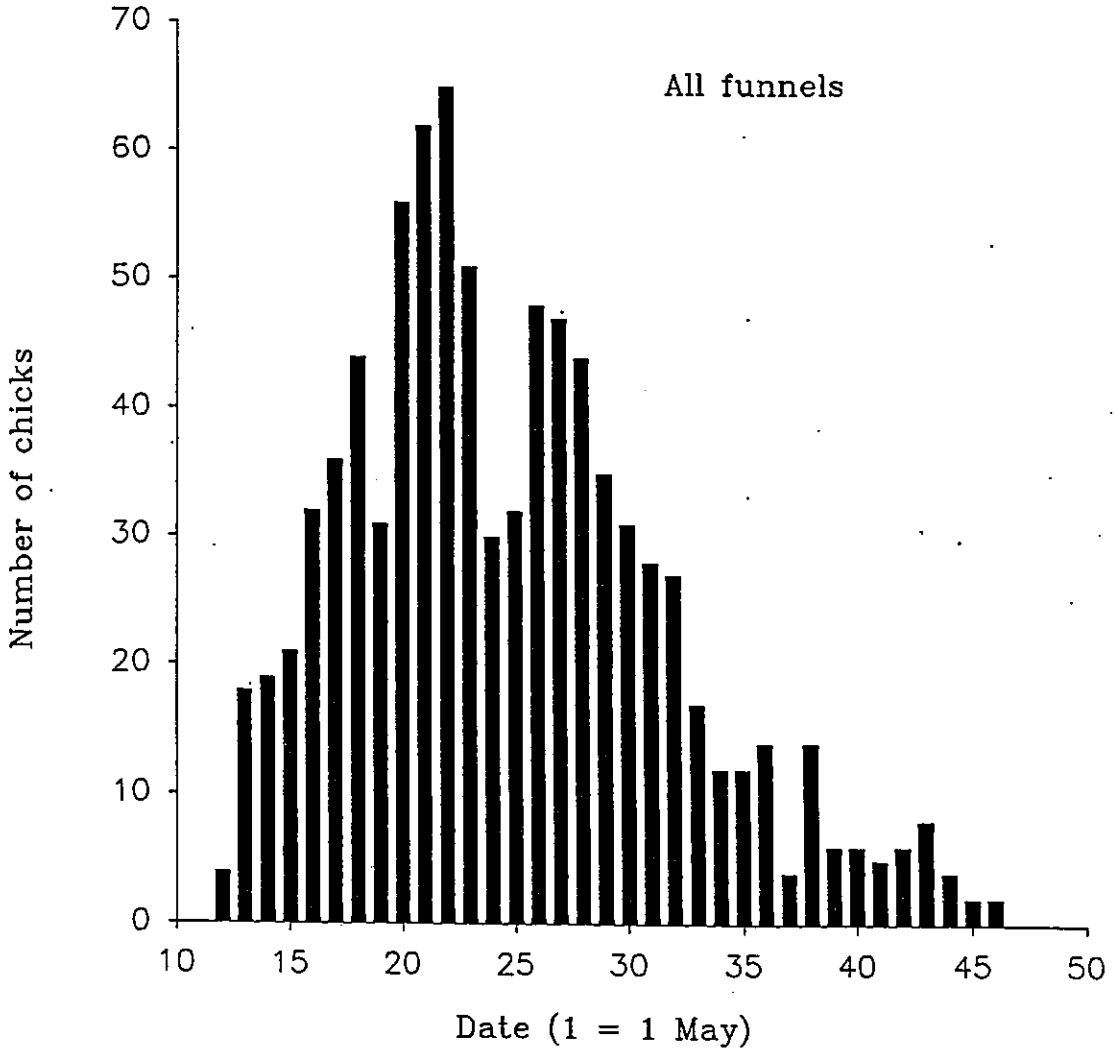


Figure 1. Chicks captured nightly on East Limestone Island in 1990

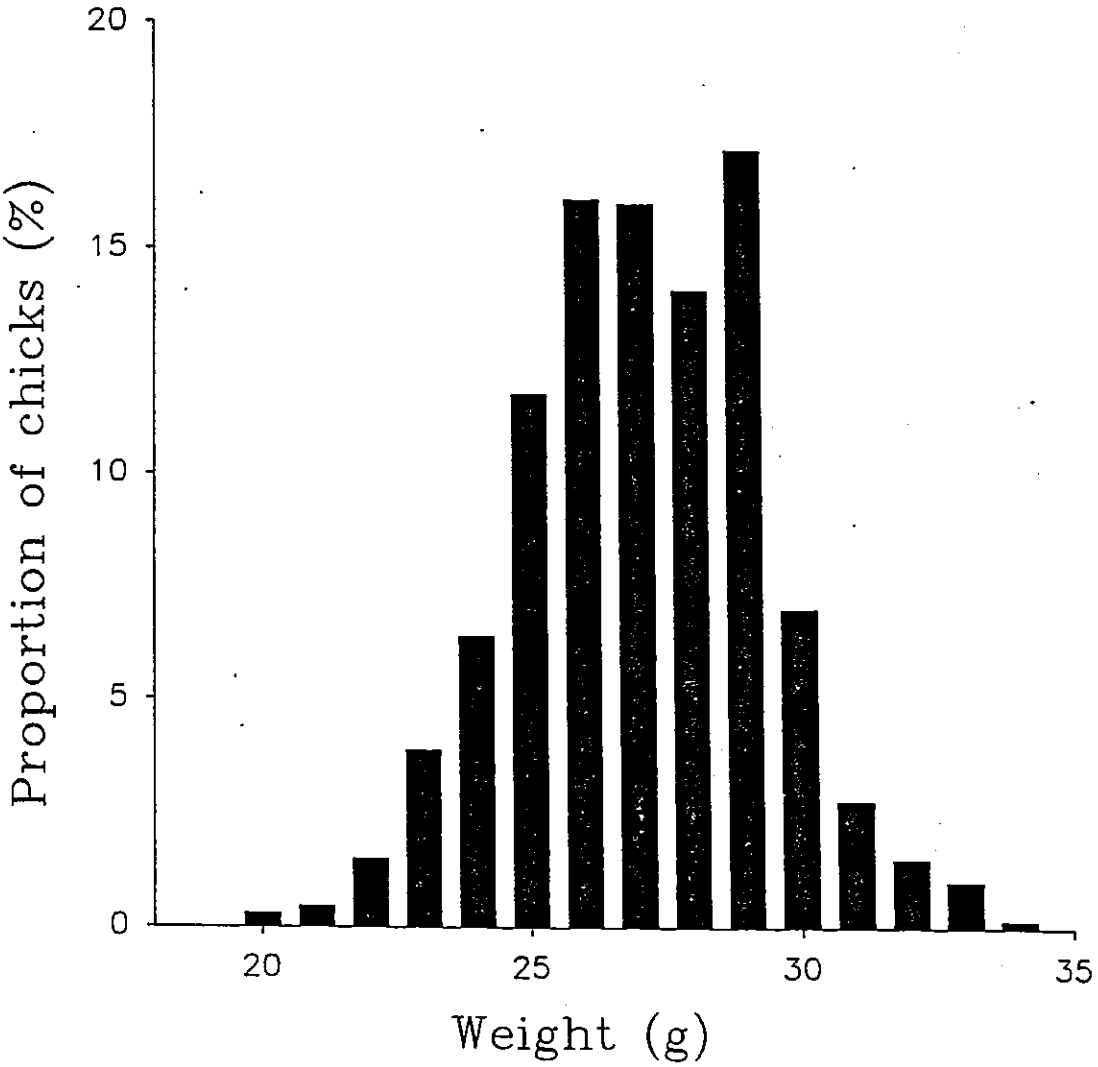


Figure 2. Weights of chicks captured at E. Limestone I. in 1990 (N=688)

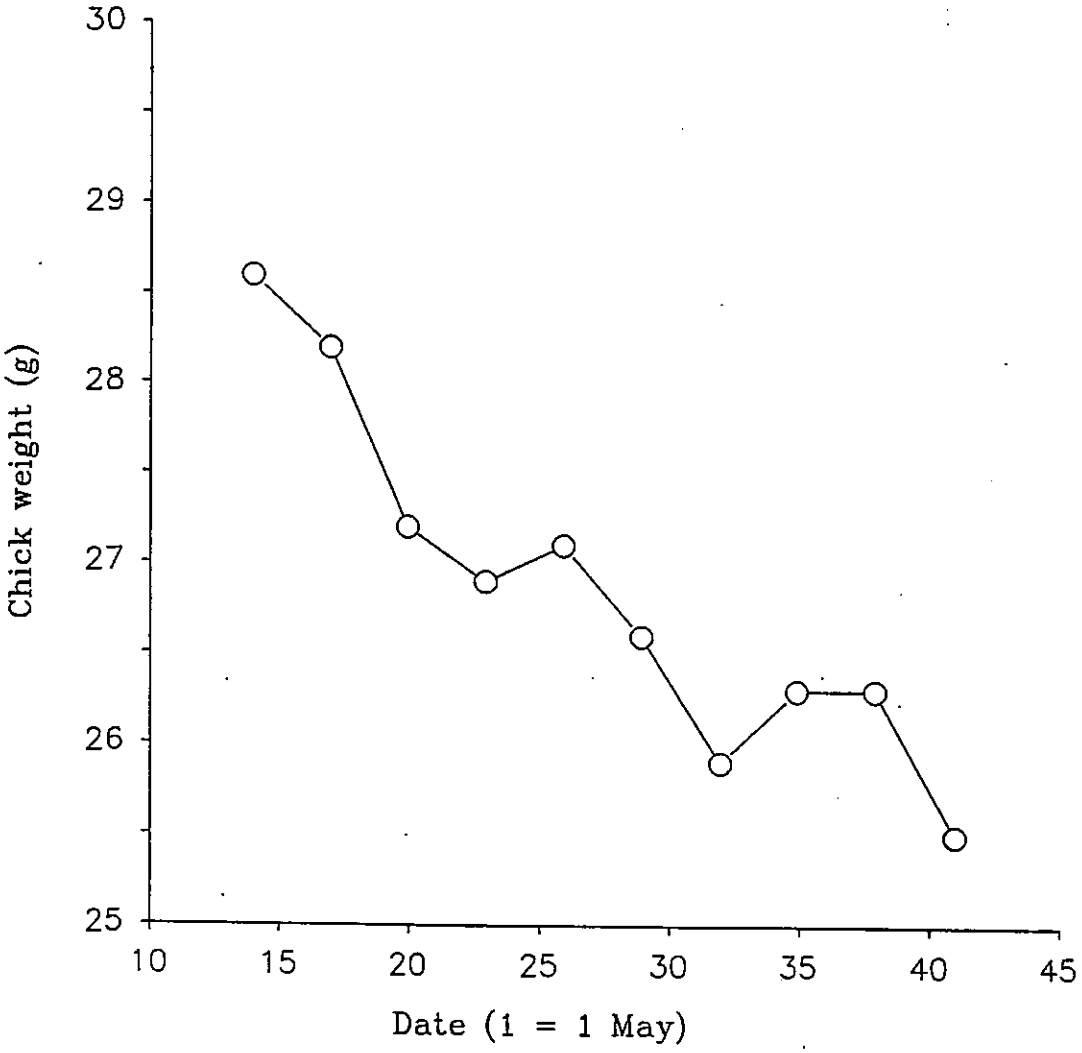


Figure 3. Chick weights at departure in 1990, by three-day periods

Table 1. Numbers of chicks captured on East Limestone Island in 1990

DATE		FUNNEL						TOTAL	CUM. TOTAL
		1	2	3	4	5	6		
May	12-13	0	0	2	2	-	-	4	4
	13-14	0	2	2	7	1	6	18	22
	14-15	0	9	0	0	3	7	19	41
	15-16	3	2	6	2	8	0	21	62
	16-17	4	8	6	1	3	10	32	94
	17-18	0	4	6	9	10	7	36	130
	18-19	5	7	13	6	9	4	44	174
	19-20	2	0	7	6	7	9	31	205
	20-21	4	5	11	8	7	21	56	261
	21-22	4	10	16	16	9	7	62	323
	22-23	3	11	14	9	11	17	65	388
	23-24	0	9	13	6	12	11	51	439
	24-25	1	3	10	4	8	4	30	469
	25-26	1	9	8	2	5	7	32	501
	26-27	1	2	6	11	10	18	48	549
	27-28	0	9	6	8	15	9	47	596
	28-29	3	15	6	0	10	10	44	640
	29-30	0	7	3	12	3	10	35	675
	30-31	0	6	11	5	1	8	31	706
Jun	31-1	0	4	5	8	5	6	28	734
	1-2	2	0	13	6	4	2	27	761
	2-3	0	5	9	0	2	1	17	778
	3-4	0	2	0	5	3	2	12	790
	4-5	0	1	4	4	0	3	12	802
	5-6	0	4	1	3	2	4	14	816
	6-7	0	0	1	0	1	2	4	820
	7-8	1	0	4	2	1	6	14	834
	8-9	1	0	1	1	3	0	6	840
	9-10	0	1	0	2	3	0	6	846
	10-11	0	2	0	0	1	2	5	851
	11-12	0	0	0	1	3	2	6	857
	12-13	1	0	5	0	0	2	8	865
	13-14	1	0	1	0	1	1	4	869
	14-15	0	0	2	0	0	0	2	871
	15-16	-	-	-	-	2	-	2	873

ADULT TRAPPING

Thirty-five birds were trapped during 30 March-4 April, and another 346 from 9 May onwards. They included 17 birds banded on East Limestone Island in 1989, and one banded as a non-breeder on Reef Island in 1989. Another 18 were retraps of birds banded earlier in the 1990 season. None of the birds captured during the earlier period showed any sign of a brood patch. This is not surprising, because brood patches do not begin to develop in either member of the pair until after the female lays the first egg of her clutch. Of the 301 birds trapped in May and June, for which the brood patch was recorded, 56% had a full brood patch, and hence were presumably breeding, and 37% showed no sign of a brood patch, and were therefore non-breeding prospectors. The remainder had incomplete brood patches (<20 mm across), and were probably also non-breeders.

Mean weights of breeders fell from 221 g in the first half of May to 205 g after 25 May; a normal pattern for incubating Ancient Murrelets (Table 2). The weights of non-breeders remained more or less constant, at 192-195 g over the same period. These weights were heavier than the mean weights of 859 non-breeders trapped at Reef Island during 1984-89, perhaps indicating that feeding conditions were very good in 1990.

Table 2. Weights of adults captured on East Limestone island in 1990. Dates given are for the night beginning. Breeders were birds with brood patches >19 mm in diameter

BROOD PATCH	DATES	WEIGHT (g)		
		Mean	s.d.	N
All	30 Mar - 4 Apr	214.5	10.54	31
> 19 mm	8 - 15 May	221.4	20.56	51
	16 - 25 May	217.2	19.52	68
	26 May - 13 Jun	204.9	18.56	28
Nil	8 - 15 May	195.1	17.82	32
	16 - 25 May	195.5	13.33	50
	26 May - 13 Jun	192.0	11.34	25

ATTENDANCE OF ANCIENT MURRELETS ON THE GATHERING GROUNDS

Ancient Murrelets gather offshore in the afternoon and evening before flying in to land on the colony after dark. These aggregations seem to have a social function, as the birds can be seen calling and displaying to one another in a very animated manner. The gathering ground for the birds visiting East Limestone Island is situated 2-3 km east of the island. Evening counts made towards the Low Island light gave an index of the abundance of Ancient Murrelets waiting to attend the colony that night. Counts varied from zero to 171 (Figure 4), being highest during 11-17 May. Numbers were highest in calm weather, decreasing with increasing wind speed (Figure 5), but counts on 6 and 7 June were very low despite calm weather, indicating that numbers of birds had declined substantially by that stage of the season.

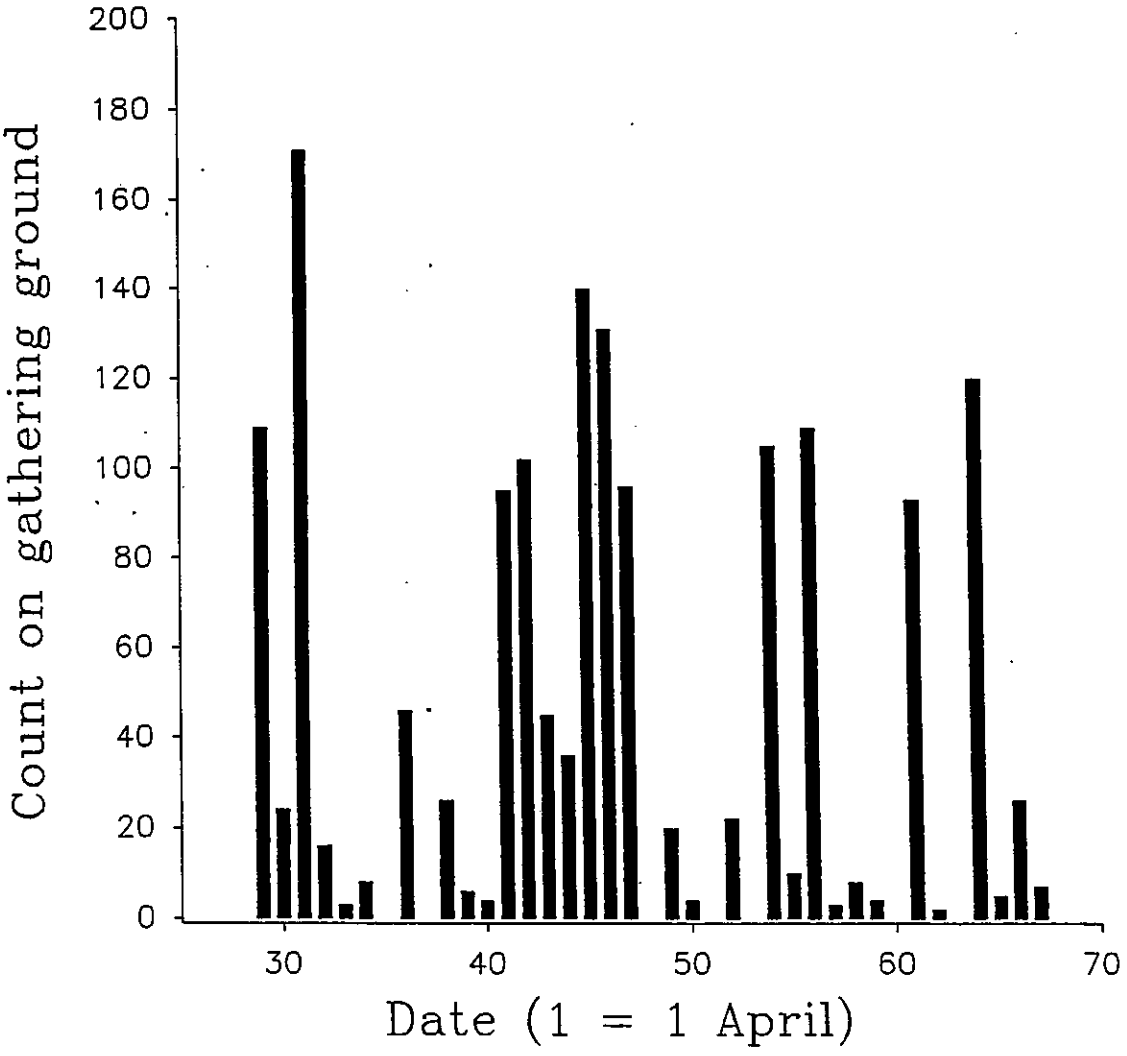


Figure 4. Gathering ground counts from E. Limestone Island in 1990

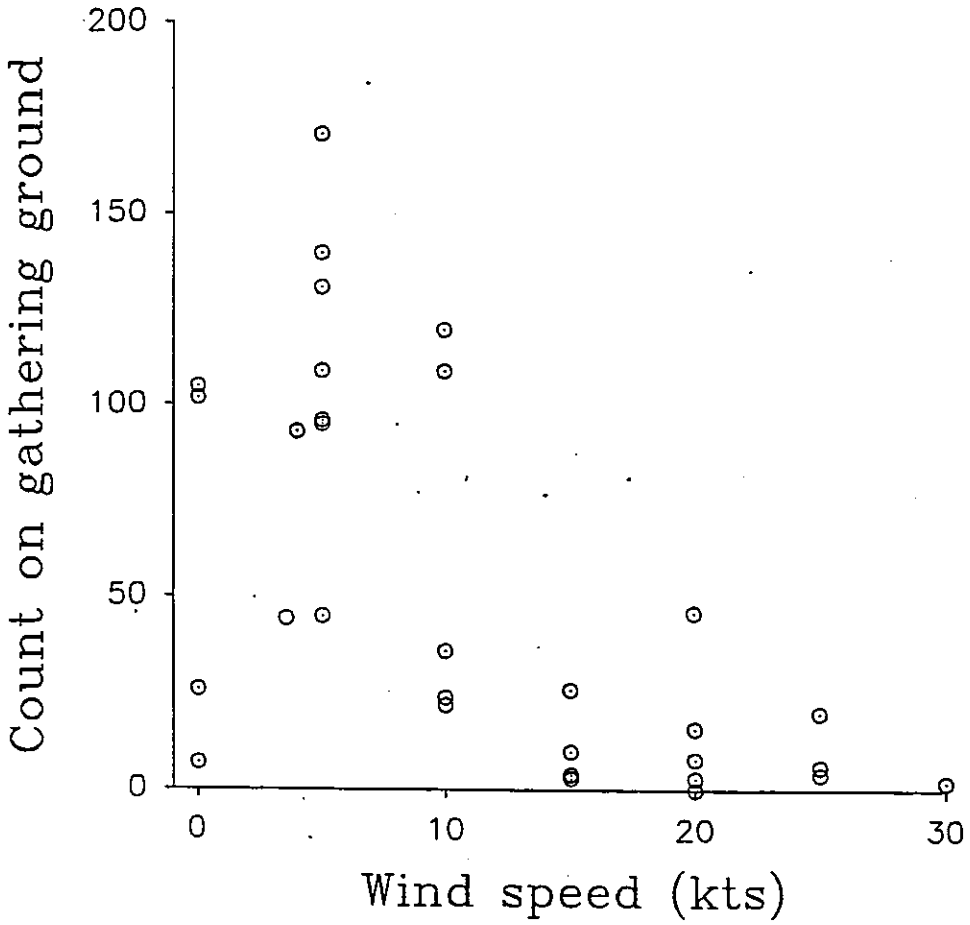


Figure 5. Gathering ground counts in relation to wind speed, 1990

RACCOON ACTIVITIES AND ANCIENT MURRELET PREDATION

Radio-telemetry studies carried out by the B.C. Wildlife Branch showed that at least one raccoon ("Gordo") was present on East Limestone Island throughout the period when the Ancient Murrelets were present. A distinctive style of predation, in which Ancient Murrelets were killed by decapitation and then left uneaten, was seen from 31 March onwards. Altogether, 17 such corpses were located on transects, or during other surveys. Three of these decapitated corpses were found in association with burrows that had been excavated. Thirteen cases were recorded where burrows were excavated and eggs were eaten. Such behaviour has not been seen on colonies where raccoons were not present, although one headless corpse was found on West Limestone Island in 1983, when a raccoon could have been present. We therefore assumed that headless corpses, and burrows dug up where eggs had been eaten, were the work of a raccoon. The distribution of such predations fitted what information we were able to obtain on the raccoon's movements. Raccoon hairs were found in the mouths of some burrows that had been dug out, and fragments of Ancient Murrelet eggs were found in some raccoon scats.

Six raccoon predations were found on transects 1-5 (those covered through most of the season), suggesting that 11% of all predations involved a raccoon. Another six burrows were dug out, but no evidence of predation was found. However, adult birds may have been removed from these burrows and despatched elsewhere. We

did not always find detached feathers associated with corpses. Any burrow containing eggs would almost certainly have contained an incubating bird. Most other predation remains consisted of feather piles, without carcasses, but some of these may have resulted from carcasses scavenged by birds after being killed by a raccoon. If we assume that all burrow diggings involved the death of at least one bird, and that some of the feather piles were the result of scavenged carcasses, then it seems reasonable to think that one or more raccoons was responsible for approximately 25% of all predations in 1990.

Extrapolating our transect results (37 predations/ha, Table 3), suggests that more than 500 Ancient Murrelets were killed over the 14 ha of the colony area. Moreover, some predation remains were also found outside the colony area, and some corpses may have been removed completely by scavengers. For instance, Bald Eagles will swallow Ancient Murrelets whole, judging from remains in their pellets. Although we have no formal estimate of numbers of predation remains over the rest of the island, we estimate at least a further 200. Hence, if the raccoon (or raccoons) was responsible for 25% of predations, then it may have killed more than 150 Ancient Murrelets over the entire season.

On transects 1-5, predation remains accumulated at a fairly constant rate over the course of the season, and the number of new predations found after 24 May was slightly higher than earlier, despite the fact that more than half of family parties had departed by then (Table 3). As breeders probably do not visit the colony

again that season, once they have left with their chicks, the majority of birds killed after 24 May were presumably non-breeders. This was supported by the lengths of depredated wings measured in 1989, which averaged 138.8 mm; closer to the mean for non-breeders than for breeders, according to work carried out on Reef Island.

Table 3. Remains found on predation transects

DATE	TRANSECTS			BIRDS/DAY (1-5)	% BREEDERS REMAINING
	1,2,3	4,5	6		
4 April	2				100
26 April	1	3			100
				1.2	
2 May	0	6			100
				0.6	
7 May	1	2			100
				0.8	
13 May	3	1			100
				1.0	
18 May	4	1	6		80
				1.2	
24 May	2	4	10		47
				0.8	
29 May	2	2	2		23
				1.2	
3 June	4	2	2		10
				0.8	
8 June	2	2	4		5
				2.1	
13 June	7	4	6		1
Totals	28	27	30		

Total area of transects 1-6: 2.3 ha
Number of predations: 85
Hence density, predations/ha: 37.0

The observations of raccoon predation made in 1990 were the first clear evidence that raccoons will kill Ancient Murrelets and dig up their burrows to obtain eggs. The fact that they do not eat most of the birds that they kill suggests that they may kill in excess of their immediate food requirements, making their impact on the seabirds greater than it would be otherwise. Moreover, by digging up burrows they kill breeding birds rather than the non-breeders which suffer most of the mortality elsewhere. This means that their predation will have a greater effect on the population than that of avian predators.

SURVEYS AT SEA

Surveys for Marbled Murrelets and other birds at sea were carried out on 11 dates between 2 April and 9 June. Numbers of Marbled Murrelets seen on two inshore and coastal surveys (Figure 6) were lower in April than in May (Table 4). On 11-13 May the same inshore transect set was replicated at different times of day, starting at 0930, 1245, 1530 and 1845. Counts of Marbled Murrelets on these four surveys did not vary significantly, suggesting that time of day had little effect on the numbers occurring in the survey area.

Numbers of cormorants and ducks were highest on the earlier transects. During early April many large flocks of Pelagic Cormorants, with smaller numbers of Double-crested and Brandt's Cormorants, were seen feeding in the Skedans Bay area, but by May most of these seem to have dispersed elsewhere. Loons were most common in early May. Highest numbers of Pigeon Guillemots were recorded on the only morning survey, on 11 May. These birds generally congregate just offshore from their breeding sites in the morning, dispersing later in the day.

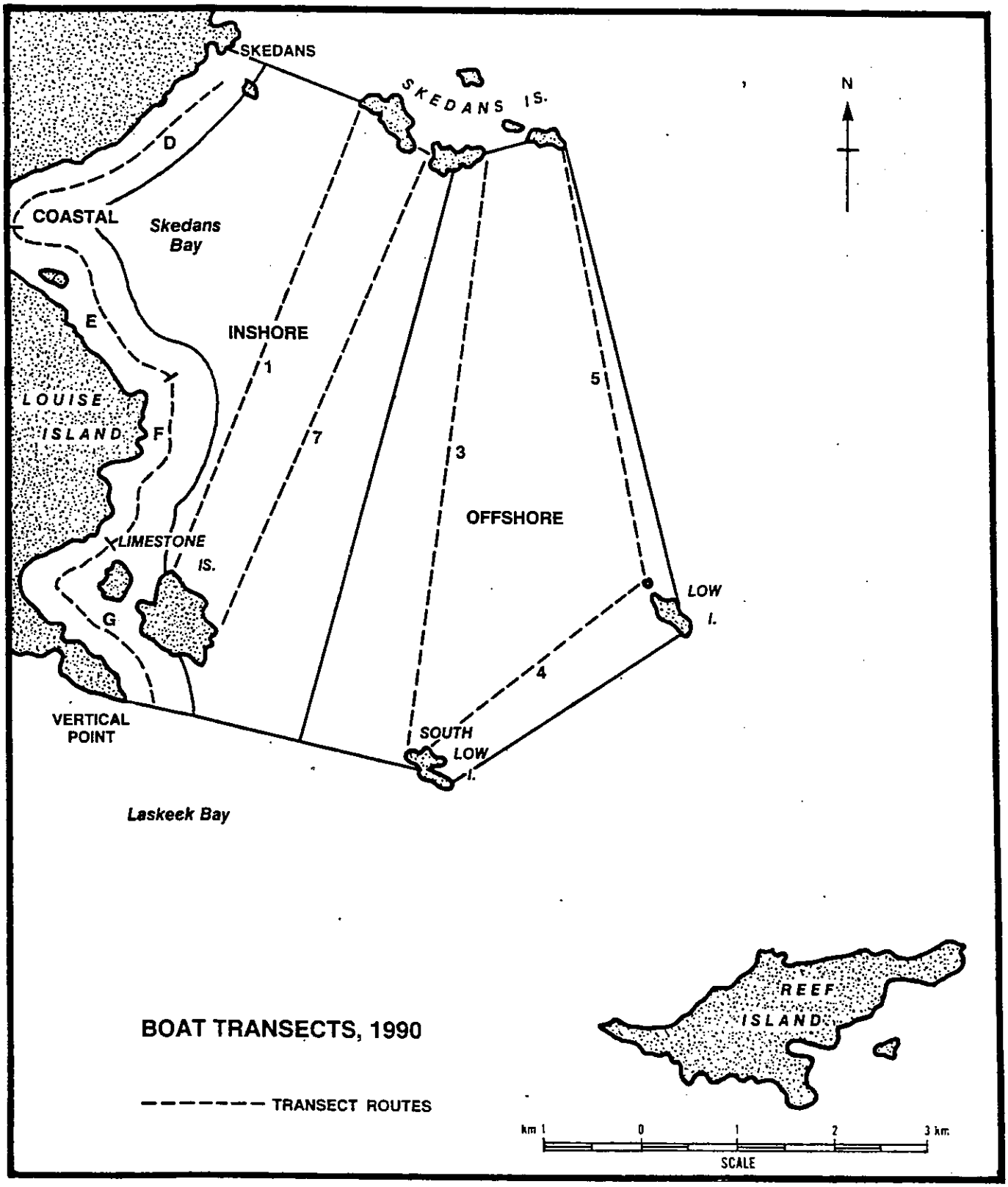


Figure 6. Map of boat transects in the Skedans Bay -- Low Island area

Table 4. Birds seen on boat transects in the Skedans Bay - Laskeek Bay area

SPECIES	2 & 3 Apr		26 & 28 Apr		11 May(0930)		11 May(1245)	
	Coast	Insh	Coast	Insh	Coast	Insh	Coast	Insh
Common Loon	6	2	-	-	-	-	-	-
Pacific Loon	-	-	-	-	-	-	1	-
Red-throated Loon	-	-	-	-	-	-	-	-
Pelagic Cormorant	4	40	60	-	2	-	2	16
D-crested Cormorant	1	-	1	-	-	-	1	-
Mallard	-	-	2	-	-	-	-	-
Great Scaup	-	-	-	-	-	-	5	-
Bufflehead	2	-	-	-	-	-	-	-
Barrow's Goldeneye	2	-	-	-	-	-	-	-
Oldsquaw	17	-	-	-	-	-	-	-
W-winged Scoter	16	10	5	-	2	-	7	-
Surf Scoter	7	-	-	-	-	-	-	-
Harlequin Duck	7	-	-	-	-	-	-	-
Common Merganser	-	-	-	-	1	-	-	-
G-winged Gull	-	2	2	-	4	-	37	60
Herring Gull	-	-	-	-	-	-	-	-
Pigeon Guillemot	7	2	5	6	102	27	13	4
Marbled Murrelet	6	-	38	4	75	4	51	7
Ancient Murrelet	-	-	-	2	-	-	-	-
Cassin's Auklet	-	-	1	-	-	-	-	-
Rhinoceros Auklet	-	-	1	-	-	-	1	-

Table 4. Birds seen on boat transects in the Skedans Bay - Laskeek Bay area (continued)

SPECIES	12 May(1530)		13 May(1845)		21 May		31 May	
	Coast	Insh	Coast	Insh	Coast	Insh	Coast	Insh
Common Loon	1	-	3	-	-	-	-	-
Pacific Loon	4	1	-	-	-	-	1	5
Red-throated Loon	-	-	20	-	-	-	-	-
Pelagic Cormorant	-	3	-	-	1	-	-	-
D-crested Cormorant	-	-	-	-	-	-	-	-
Mallard	-	-	-	-	-	-	-	-
Greater Scaup	-	-	-	-	-	-	-	-
Ring-necked Duck	-	-	-	-	2	-	-	-
Bufflehead	-	-	-	-	-	-	-	-
Barrow's Goldeneye	-	-	-	-	-	-	-	-
Oldsquaw	-	-	-	-	-	-	-	-
W-winged Scoter	-	-	-	-	-	-	1	-
Surf Scoter	-	-	-	-	-	-	-	-
Harlequin Duck	-	-	-	-	-	-	-	-
Common Merganser	-	-	-	-	-	-	-	-
G-winged Gull	63	25	-	50	-	-	-	-
Herring Gull	-	-	-	-	-	-	-	2
Pigeon Guillemot	66	-	5	-	24	1	31	7
Marbled Murrelet	36	27	51	7	40	7	20	41
Ancient Murrelet	-	-	-	-	-	-	2	-
Cassin's Auklet	-	-	-	-	-	-	-	-
Rhinoceros Auklet	-	-	-	1	-	-	-	-

Three surveys were carried out further offshore, between the Skedans Islands and Low Island, on 17 and 23 May and 5 June. The numbers of species observed was lower than on the inshore transects, with Marbled and Ancient Murrelets the only species commonly recorded (Table 5). Numbers of Marbled Murrelets seen were consistently higher on the inshore transects (1,7) than on the offshore transects (3,4,5). Extrapolating the densities observed on coastal, inshore and offshore transects to the areas shown in Figure 6 (roughly, within 1 km of Louise Island, between 1-3 km from Louise Island, and from 3 km out to a line joining the eastern tips of Low Island and the Skedans Islands) suggests that several hundred Marbled Murrelets were present in the area in the second half of May and early June of 1990 (Table 6).

The diversity of species recorded was highest on the coastal transects, run at 400 m from shore, slightly lower on the inshore transects, between 1-3 km from Louise island, and lowest on offshore transects, more than 3 km from Louise island (Figure 7). For the most part, the offshore transects were in deeper water (mainly 25-50 m) than the inshore transects, which were mainly in water about 20 m deep. The number of species recorded on a given transect decreased with the average water depth (Figure 8), presumably because, in deep water, species which fed on the bottom were absent. Figure 9 summarizes the species occurring in each zone in Hecate Strait, based on observations made by the Canadian Wildlife Service during 1984-89, as well as those that we made in 1990. Many offshore species were not recorded in 1990, especially

Black-legged Kittiwakes and Sooty Shearwaters. Both of these species are non-breeding visitors, and are very erratic in their occurrence in Hecate Strait.

Table 5. Birds seen on open water transects in Skedans Bay in 1990. Inshore = transects 1 & 7; Offshore = transects 3, 4 & 5

SPECIES	17 MAY		23 MAY		5 JUNE	
	Insh	Offsh	Insh	Offsh	Insh	Offsh
Pacific Loon	-	5	-	-	-	-
G-winged Gull	-	-	-	2	-	-
Pigeon Guillemot	1	-	1	-	1	-
Marbled Murrelet	59	49	123	42	33	2
Ancient Murrelet	-	-	-	25	-	86

Table 6. Estimates of total numbers of Marbled Murrelets present in the area bounded by the Skedans Islands, the Limestone Islands, South Low Island and Low Island.

Zone	Area (km^2)	Transect (km)	Covered (%)	13-17 May		21-23 May		31 May-5 June	
				Seen	Est.	Seen	Est.	Seen	Est.
Coastal	12.0	12.2	41	51	124	40	98	20	49
Inshore	14.0	10.5	30	59	197	123	410	33	110
Offshore	15.5	13.4	35	49	140	42	120	2	6
Totals	41.5	36.1		159	461	205	628	55	165

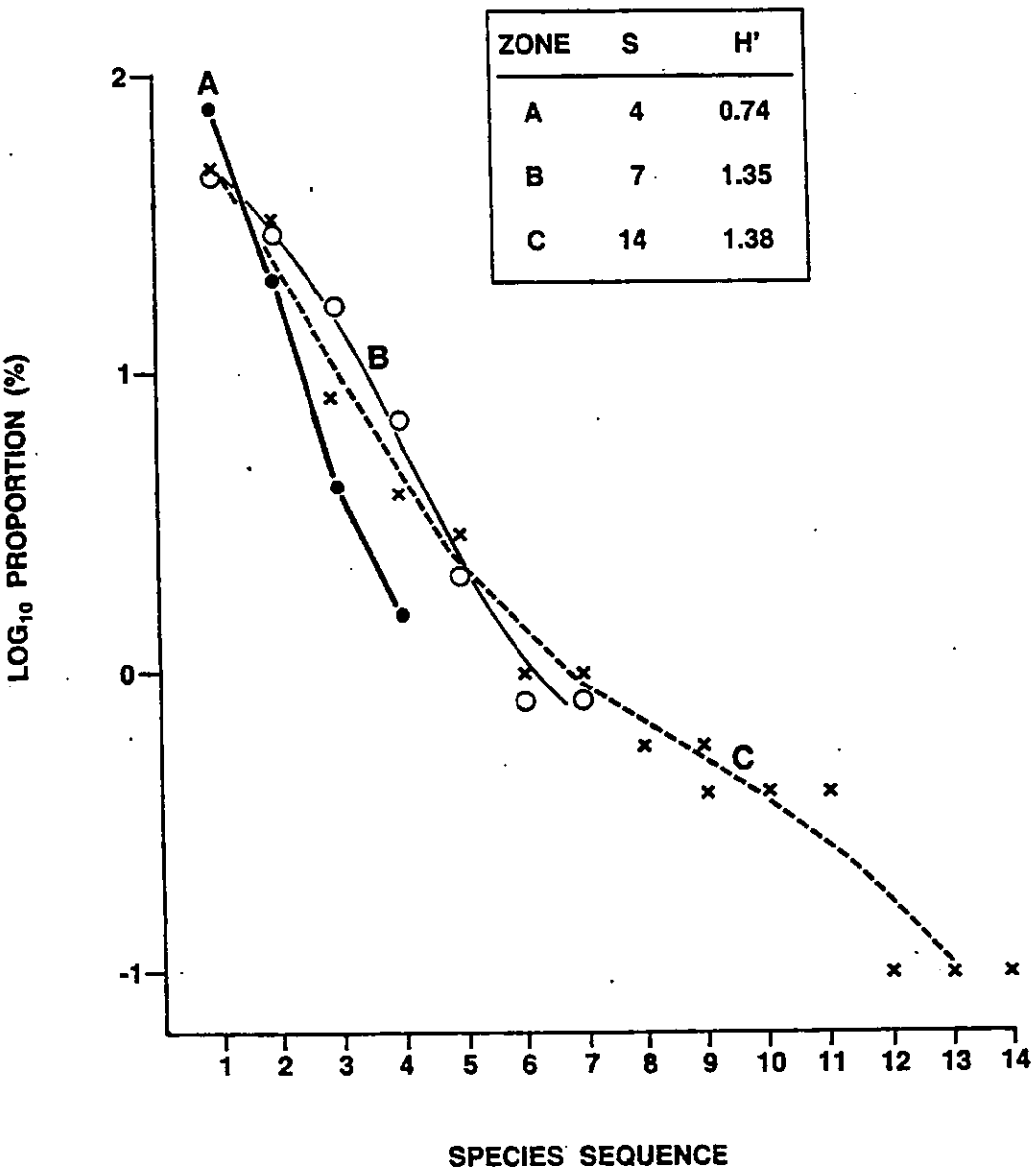


Figure 7. Species abundance (log_{10} proportion) versus rank order, for offshore (Zone A), inshore (B) and coastal (C) transects

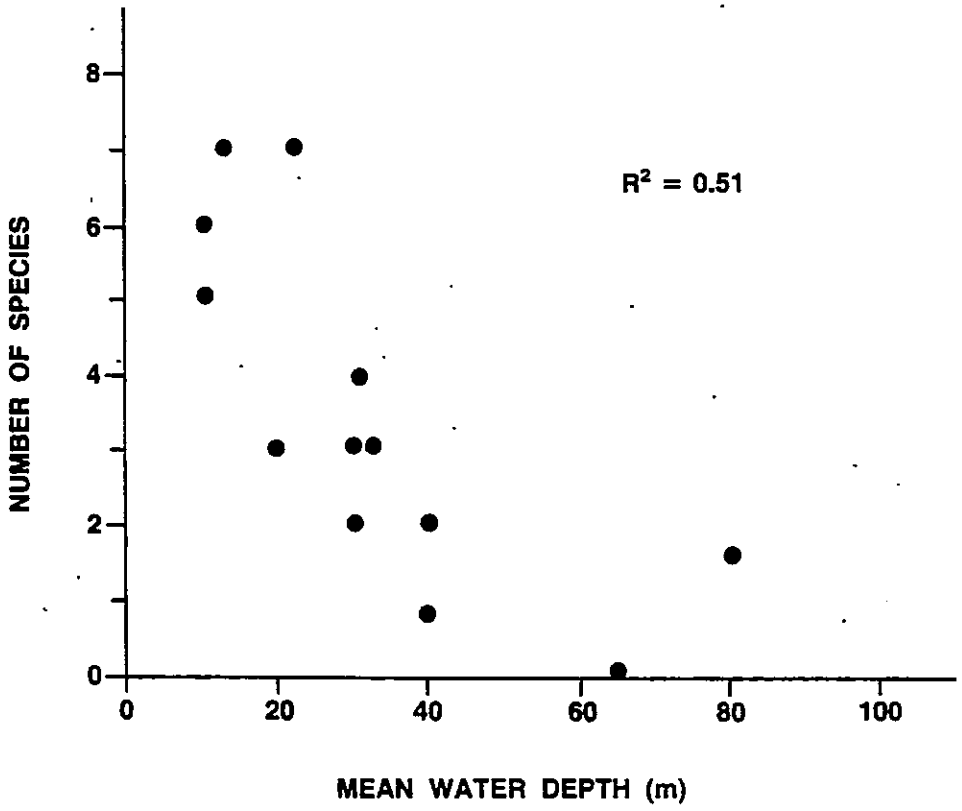


Figure 8. Numbers of species seen per transect in relation to water depth (May)

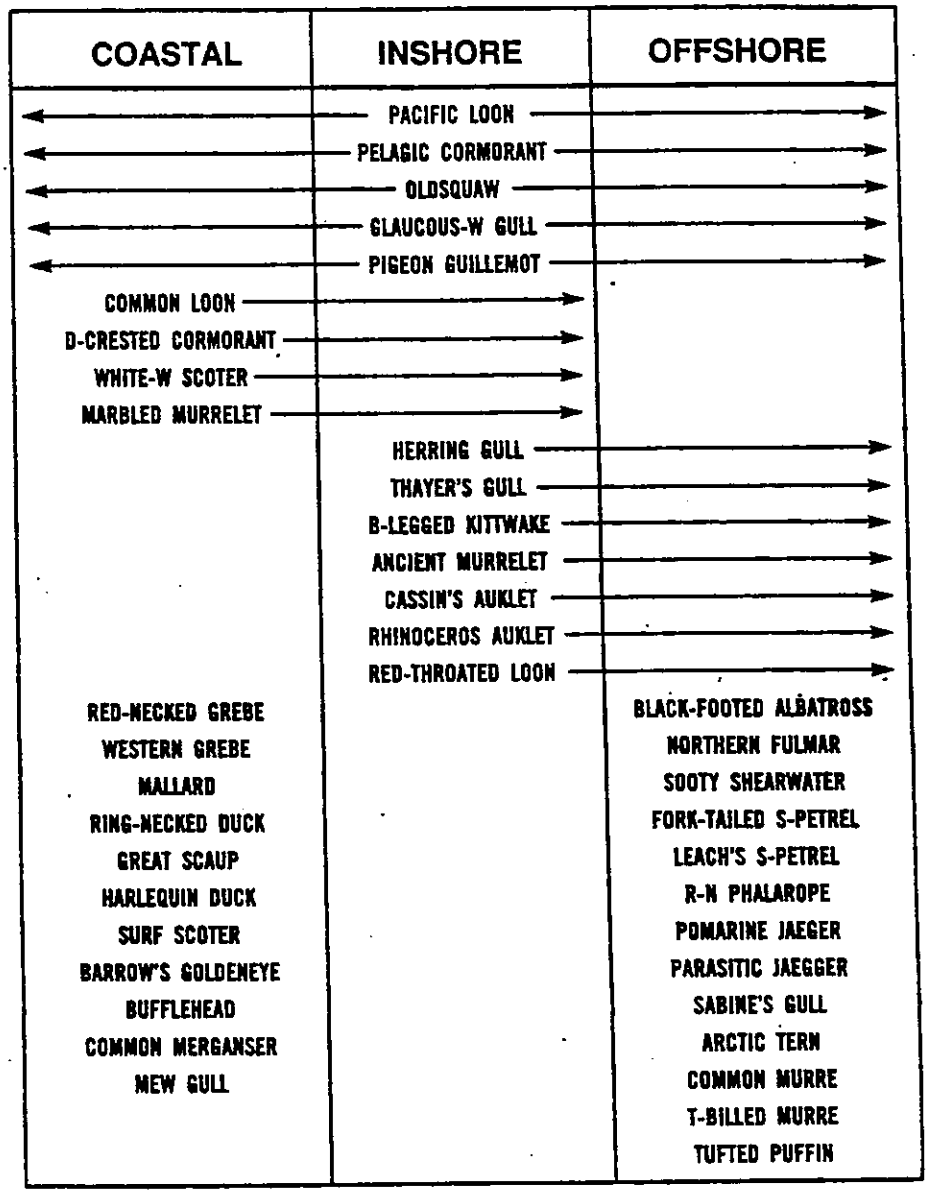


Figure 9. Species seen at different distances from shore in the Laskeek Bay -- Hecate Strait area, 1984-1990

GENERAL BIRD AND MAMMAL RECORDS

Killer Whales. A pod of 3 was seen at Skedans on 16 May, and at Low Island on 5 June. A pod of 4, including a cow and calf, was present in Cabin Cove on 30 and 31 May.

Steller's Sealions. At Skedans Islands 80 were present on 28 April and 2 on 5 June. On the latter date 300-400 were present on the sealion rocks off Reef Island, including 1 bull with a length of polypropylene rope around its neck.

Racoon. A radio-collard male (Gordo) was present throughout the season. A female with two young was seen in June. A separate report on the activities of the raccoons and their effects on Ancient Murrelets has already been produced.

Red Squirrel. Not seen or heard on Limestone island until 29 April.

Yellow-billed Loon. One in summer plumage seen between the Limestone islands on 29 March.

Fork-tailed Storm-Petrel. Heard calling on East Limestone Island on 4 dates in May and June. Remains of one dead were found on 18 May.

Pelagic Cormorant. Very numerous in late March - early April, with 150, in dense rafts of 8-60, offshore from Cabin Cove on 4 April. Numbers seen in May and June were smaller, but 20-30 roosted on the SE cliffs of Limestone island in early May.

Brandt's Cormorant. Only seen on 28-29 March, when up to 4 birds in summer plumage were present in Skedans Bay.

Double-crested Cormorant. Only seen from 28 March - 4 April, when groups of up to 25 were seen around East Limestone Island, and on 22 May, when 2 were present at Skedans.

Pacific Brant. Groups of 100 were seen flying northwards on 1, 2 and 17 May.

Bald Eagle. A nest near the blowdown on East Limestone Island was occupied. One downy juvenile was seen on 15 June.

Northern Goshawk. One, mobbed by a raven, flying over East Limestone island on 30 March.

Red-tailed Hawk. One, chased by crows, over Cabin Cove on 14 May.

Peregrine Falcon. The nest on East Limestone fledged 3 young by 15 June. Two pairs were present on Reef Island. One reared 4 young, but no nesting activity was seen by the other pair, which may have failed before we visited them.

Blue Grouse. One heard drumming in the upper part of Spring Valley on 24-25 May.

Sandhill Crane. A flock was heard flying over East Limestone island on 4 April.

Black Oystercatcher. Three pairs bred on East Limestone island, laying 2,2 and 3 eggs. None was known to have reared young.

Wandering Tattler. One in Cabin Cove on 15 May.

Whimbrel. Twenty flew over on 10 May.

Marbled Murrelet. All birds seen up to 4 April were in winter plumage.

Cassin's Auklet. Calling heard frequently from an area of burrows on headlands to the north of Cabin Cove. On 4 June a half-grown chick was found dead in a burrow.

Tufted Puffin. Several seen between Reef and Limestone islands on 3 June.

Rhinoceros Auklet. Often heard at night in June.

Saw-whet Owl. Heard most nights from late March onwards.

Red-breasted Sapsucker. Nests with young were seen on 21 May and 30 May.

Winter Wren. Singing in late March. Nest built near camp on 1 June.

Swainson's Thrush. First heard on 8 June.

Hermit Thrush. First heard singing on 5 April. A nest with 4 young hatched on 3 June.

Varied Thrush. Heard singing from late March.

Violet-green Swallow. Two at Skedans on 9 June.

Other species recorded (other than those listed in Table 4)

Green-winged Teal
Black Turnstone
Rufous Hummingbird
Hairy Woodpecker
Flicker
Northwestern Crow
Raven
Chestnut-backed Chickadee
Brown Creeper
Townsend's Warbler
Wilson's Warbler
Golden-crowned Kinglet
Fox Sparrow
Song Sparrow
Savannah Sparrow
Dark-eyed Junco
Red Crossbill
Pine Siskin