Laskeek Bay Research

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2008-2009

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Tony Gaston

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LASKEEK BAY RESEARCH

16

LASKEEK BAY CONSERVATION SOCIETY
SCIENTIFIC REPORT, 2008 and 2009

Edited by

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Taken by Jake Pattison

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LASKEEK BAY CONSERVATION SOCIETY

The Laskeek Bay Conservation Society is a volunteer group based in the Queen Charlotte Islands. The society is committed to increasing the appreciation and understanding of the natural environment through:

Sensitive biological research that is not harmful to wildlife or its natural habitat

Interpretation and educational opportunities for residents of and visitors to the Queen Charlotte Islands

Since 1990, the Society has operated a field research station at East Limestone Island and is carrying out a diverse long-term monitoring, research and interpretation program in the surrounding islands and waters of Laskeek Bay. We actively involve volunteers from our island communities, many other locations in British Columbia, as well as from overseas. For further information contact:

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BACKGROUND

The goals and objectives of the Society are:

1. *To undertake and support research and long term monitoring of wildlife populations of the marine and terrestrial ecosystems of Haida Gwaii, especially the Laskeek Bay area.*

2. *To provide opportunities for non-scientists, especially students and local residents of Haida Gwaii, to participate as volunteers in our field programs, and to offer training to impart necessary field research skills.*

3. *To promote better understanding of the marine and terrestrial ecosystems of Haida Gwaii, especially the Laskeek Bay area, by providing information to youth, local residents, and to the public in general in the form of publications, meetings, and exhibits.*

4. *To promote the conservation of native species and to develop public awareness of the changes caused by introduced species to Haida Gwaii.*

5. *To support and assist other programs aimed at providing better knowledge, management and conservation of ecosystems on Haida Gwaii.*

INTRODUCTION

The scientific work of the Laskeek Bay Conservation Society has been carried out each summer on East Limestone Island and adjacent islands and in the waters of Laskeek Bay since 1990. Much of the work has been conducted in collaboration with researchers and management agencies having ongoing interests in the ecology and conservation of Haida Gwaii. The research program is coordinated and directed by a Scientific Advisory Committee that works closely with the Society's Board of Directors to develop research that is relevant to the conservation needs of Haida Gwaii and consistent with the goals of the Society.

Research activities include population monitoring of marine birds and marine mammals and ecological research on intertidal invertebrates, plants, and forest birds. The Society is a participant in the Research Group on Introduced Species, an umbrella organization devoted to studies of exotic species in Haida Gwaii and their impact on indigenous ecosystems. Research in Laskeek Bay focuses especially on the impacts of introduced mammals, including deer, raccoons and squirrels. The Society has recently initiated a program to record and eradicate alien plants on Laskeek Bay islands.

Our research program is designed to provide long-term information on the biology and ecology of Haida Gwaii ecosystems. Ongoing monitoring, using simple, standard techniques that enable year-to-year comparisons to be made, and allowing the direct participation of volunteers, is the cornerstone of the Society's approach. By monitoring a variety of indicator species in ocean, inter-tidal and terrestrial ecosystems, we can obtain an overall measure of their health. Because marine waters may be subject to cyclical or directional changes operating at the scale of decades, such observations become most valuable when they are tracked consistently over many years. Such long-term monitoring is becoming increasingly important in the context of global climate change.

ACKNOWLEDGEMENTS

The Laskeek Bay Conservation Society would like to thank the following groups and individuals for their generous contributions:

- BC Gaming Commission
- BC Hydro
- Canadian Wildlife Service (Environment Canada)
- Coast Sustainability Trust
- Gwaii Haanas National Park Reserve and Haida Heritage Site
- Gwaii Trust
- Maple Leaf Adventures & Bluewater Adventures
- Mountain Equipment Co-op
- Northern Savings Credit Union
- Northwest Invasive Plant Council
- School District #50 & The Community Links Program
- Science Horizons Program (Environment Canada)

Thanks also to the following individuals and groups who gave generously of their time and services to the Society:

- Dr. Tony Gaston & Jean-Louis Martin for advice and guidance during the season
- LBCS Directors for their time and efforts
- Staff and volunteers at East Limestone Island
- Haida Fisheries Program for assisting with transport of equipment and supplies
- The m/v Gwaii Haanas & crew for help with freight delivery
- Lynn Lee & Léandre Vigneault of m/v Victoria Rose for transport of gear to and from field camp
- Project Limestone teachers, students and parents for their dedication to this outdoor program
- Researchers and Crew on Reef Island
- Haida Gwaii Watchmen for their hospitality during our visits to Skedans, Tanu and Hotsprings Island, for the great tours of the village sites and for their interest in our projects

SCIENCE ADVISORY COMMITTEE, 2008-2009

CONTENTS


Moresby I.
Cumshewa Inlet
Skedans Is.
Louise I.
E. Limestone I.
Low I.
Reef I.
Talunkwan I.
Kunga I.
Tanu I.

Laskeek Bay

EAST LIMESTONE ISLAND FIELD STATION: REPORT ON THE 2008 FIELD SEASON

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Black Oystercatchers on Reef Island, Photo: Jen Rock

SUMMARY

Laskeek Bay Conservation Society's 19th field season brought 26 volunteers and eight visitor groups (4 schools, 2 tours) to the island. Ancient Murrelet funnel work continued and the number of chicks counted was the lowest recorded to date. We monitored Black Oystercatcher breeding activity in Laskeek Bay and in sections of Gwaii Haanas where we found 19 and 58 territories containing eggs or chicks, respectively. During our surveys we re-sighted 14 banded adult oystercatchers, the oldest of which was 14 years old. Glaucous-winged gull numbers were similar to previous years with 290 nests counted at four colonies in Laskeek Bay. Pigeon Guillemots continue to breed in the nest boxes on Limestone and Fork-tailed Storm Petrel activity is suspected to be increasing. Our peak count of Marbled Murrelets from sea surveys was 164 on 29 June. More Humpback whales were reported than in recent years and groups of Killer whales were followed on three occasions. We monitored fourteen Wildlife Trees containing fifteen nests: one Brown Creeper, two Hairy Woodpecker, two Chestnut-backed Chickadee and ten Red-breasted Sapsuckers. On East Limestone Island we also confirmed nesting by Common Ravens, Northwestern Crows, Bald Eagles and we suspect Peregrine Falcons. One of our rare plants, Menzies' pipsissewa was found blooming after several years of unknown whereabouts.

Overall 2008 marked another terrific season on ELI. We are concerned with the continued decline in Ancient Murrelet numbers and predation surveys suggest that predators may be an important factor affecting this small breeding colony. We will continue to carefully consider the potential negative impacts that humans interactions may be have on the Ancient Murrelet population however it is also important to note that we are likely the only defence that burrow nesters on Limestone have against the ongoing threat of raccoons.

EDUCATION AND INTERPRETATION PROGRAM

LBCS continues its commitment to raising public awareness of local conservation issues on Haida Gwaii and to providing members of the public of all ages the opportunity to participate in field research. With this goal in mind, the society runs programs that allow volunteers, students and visitors to visit East Limestone Island and learn about our research.

Project Limestone

This was the 18th year of Project Limestone, a program that brings students from island communities to participate in Ancient Murrelet monitoring work. Students participate in an interpretive tour during the afternoon which introduces them to the island, the research and camp life. Students then assist with the capture of Ancient Murrelet chicks from 10:30 pm to 2:30am, before spending the remainder of the night in the visitor interpretation centre and returning to their camp at nearby Vertical Point in the morning. The program is very popular among students, and many return year after year. One student this season had visited seven times in the past!

Six groups from four schools visited the island this year, representing 44 students and 12 staff. GM Dawson (Masset) came on 15 May, Living and Learning School (Queen Charlotte) on 18 May and two groups came from Queen Charlotte Secondary School: the juniors on 21 May and the seniors on 23 May. Anges L. Mathers School (Sandspit) also brought groups to the island on 26 and 27 May. Since the start of Project Limestone in 1991, 517 students have visited the island.

Volunteers

Since the beginning volunteers have played an important role in the operation of the East Limestone field camp. Volunteers work alongside field staff and contribute time and energy to the many tasks that keep camp running smoothly, while at the same time participating in research activities and learning about Limestone Island and the surrounding area. The generous contribution of time and energy by the volunteers continues to be a very important part of operations on the island.

Twenty six volunteers visited the island this year and contributed a total of 164 volunteer days to projects, both on island and in the surrounding area. Sixteen volunteers were new to the island and 10 had spent time previously on the island. All volunteers stayed for a week, with the exception of 5 members of the hardworking set-up crew who were on island for 3 days. Thirteen volunteers came from Haida Gwaii, four from other places in British Columbia, and the others from Ontario, Washington, Belgium, France, Germany and Australia.

Visitors

The Limestone visitor program provides opportunities for tour groups to visit the island, participate in an interpretive tour and learn about the research. In providing this opportunity it is the society's intent to raise public awareness and appreciation of local conservation issues. The majority of visitors are from off-island and are on ecotourism trips in Gwaii Haanas. They are generally enthusiastic about the opportunity to learn more about the island's ecology and about Ancient Murrelets.

Two groups, representing 25 guests (4 crew) visited the island this season. Both groups were from *s/v Island Roamer* and visits occurred 23 and 25 May. The first group included a film crew from Global TV who were filming for a series on Haida Gwaii.

The research camp on nearby Reef Island was up and running again this year (April-

June). Akiko Shoji, with Motomi Yoneda, Kyle Elliot, and Kerry Woo continued work on Akiko's Master's project on Ancient Murrelets which she began in 2007.

Field Staff

Jen Rock (Camp Supervisor / Biologist) and Jake Pattison (Assistant Biologist / Interpreter) returned to the island for another season. This was Jen's 5th year working on the island and Jake's 4th. This year's field season ran from 3 May to 18 July, totalling 11 weeks (76 days).

Haida Gwaii Watchmen

We enjoyed several visits to Skedans, Tanu and Hotsprings during the course of the season. Many thanks to the watchmen at these sites for their hospitality: meals, knowledge and humour. Thanks also for the great tours of the village sites and in turn, the interest in our projects. Hope to see all of you again in future seasons.

RESEARCH AND MONITORING PROGRAMS

Ancient Murrelets

Synthliboramphus antiquus

Monitoring activities

Compared to the research conducted in earlier years our Ancient Murrelet monitoring in 2008 was scaled back to minimize our impact on the breeding population that has been exhibiting a downward trend in numbers across years. As in 2007, no adults were captured and no chicks banded. North Cove was left entirely undisturbed and night time visits to the island were limited to school groups. In 2008 our monitoring activities consisted of chick capture work, gathering ground counts, point counts and predation transects. By adopting a less intrusive approach to monitoring LBCS hopes to minimize our impact on the birds and continue to collect important information concerning population changes, breeding success and the overall condition of birds.

Chick capture work

Beginning 7 May we monitored four funnels (number 5 to 8) at Cabin Cove to record information on chick departures. For each chick that arrived at a funnel we recorded the date of departure, time of departure, funnel number and chick mass. As in previous years we carried out chick trapping between 22.30h and 2.30h, adjusting start times after 19 May to 23.00h to accommodate for longer day length. The first night of chick departures was 12 May and, following the usual protocol, nightly trapping continued until the first two consecutive nights when no chicks arrived at any of the funnels, this year 3 June (Fig. 1). A total of 125 chicks arrived at funnels 5 to 8 and compared to the last two years that these funnels have been in use (funnel 7 and 8 were added in 2006), the number of chicks departing the ELI colony this year was low (Table 1).

Funnels 5 and 6 have been monitored since chick capture work was initiated in 1990. This season marked the lowest number of chicks from funnels 5 and 6 (92 chicks, Table 2, Fig. 2). Compared to previous years, both first and peak nights of chick departures in 2008 were normal. However, the peak count of only 13 chicks was low and departures terminated relatively early (Table 2).

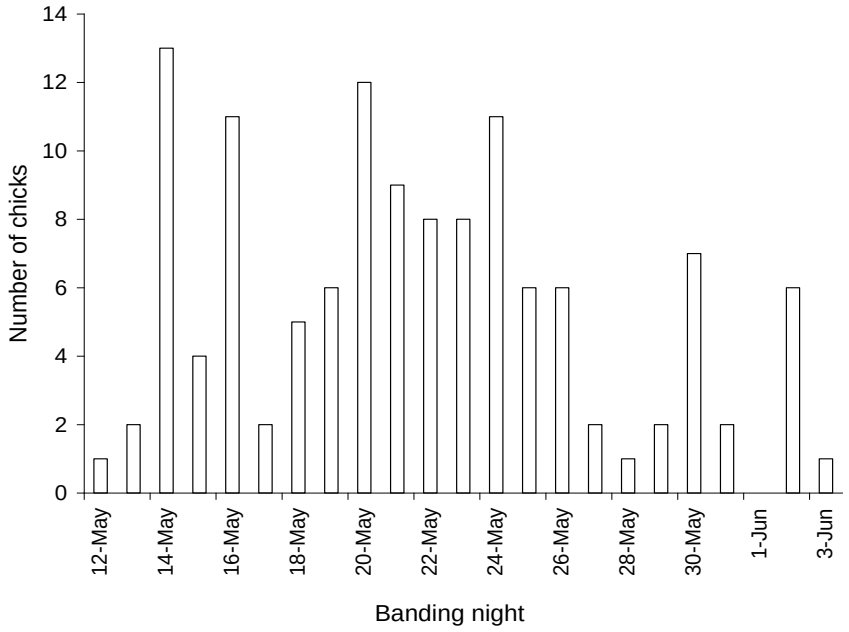


Figure 1
Nightly chick numbers caught at funnels 5 to 8 during 12 May - 3 June 2008

Table 1
Summary of chick departures, peak nights and totals from funnels 5 to 8 on Limestone Island in 2006 to 2008

Year	First night with chicks	Peak night	Peak count	Last night	Total days	Total chicks
2006	10-May	21-May	24	30-May	21	197
2007	15-May	4-Jun	16	12-Jun	29	166
2008	12-May	14-May	13	3-Jun	23	125

Table 2
Summary of chick departures, peak nights and total captures at funnels 5 and 6 on Limestone Island, 1990 to 2008

Year	1st night with chicks	Peak night	Peak count	Last night	Total days	Total chicks
1990	13-May	20-May	28	15-Jun	33	361
1991	10-May	25-May	22	05-Jun	26	232
1992	14-May	22-May	29	02-Jun	19	246
1993	12-May	18-May	39	04-Jun	23	268
1994	08-May	20-May	29	06-Jun	29	238
1995	11-May	23-May	18	12-Jun	32	187
1996	11-May	18-May	17	07-Jun	27	199
1997	13-May	28-May	22	05-Jun	23	186
1998	11-May	20-May	23	20-Jun	40	195
1999	11-May	21-May	22	09-Jun	29	166
2000	11-May	21-May	22	06-Jun	26	201
2001	11-May	19-May	21	15-Jun	35	191
2002	09-May	21-May	33	01-Jun	23	183
2003	11-May	21-May	19	03-Jun	23	167
2004	08-May	16,17-May	15	01-Jun	24	134
2005	07-May	19, 23-May	12	05-Jun	29	152
2006	10-May	21-May	20	31-May	21	149
2007	15-May	04-Jun	16	12-Jun	28	103
2008	13-May	20,22,23-May	8	03-Jun	21	92
Average ± SD	11-May ± 2.1days	21-May ± 4.1days	22 ± 7 chicks	7-Jun ± 5.6 days	27 ± 5 days	192 ± 61 chicks

Gathering grounds

Before flying in to the colony at night Ancient Murrelets aggregate at specific areas on the water located near their breeding sites known as 'gathering grounds'. To monitor daily attendance at the Limestone I. gathering ground we conducted 10 minute counts of birds gathering each evening on the waters west of Low Island, opposite the East Limestone Island colony. Counts were conducted from 6 May to 20 June. The number of Ancient Murrelets attending the gathering grounds peaked on 15 May when 241 birds were counted. On average we counted 53.4 ± 59.7 (SD) birds on the water each night with numbers tapering off significantly by early June.

Point counts

To monitor nightly adult attendance in the colony we conducted point counts after funnel work (at approximately 02.30h) and recorded the number of birds calling and the number of calls made over a five minute period from 21 May to 5 June. The maximum number of birds that we heard calling was five, counted on the nights of 25 May and 3 June while the maximum number of calls heard was 92, counted on 27 May.

We are hoping that point count and gathering ground count data can be used as a measure of colony attendance and in turn that these data will help us to interpret annual changes chick departure numbers.

Recaptured birds

Although there is no directed effort to capture adult birds on ELI, on occasion adult Ancient Murrelets land in front of staff during funnel work and when this happens we check the adult for bands. This year we opportunistically caught three banded birds, all of which were banded on Limestone as adults in years: 2000, 1999 and 1994. These individuals were at least 10, 11 and 16 years old, respectively.

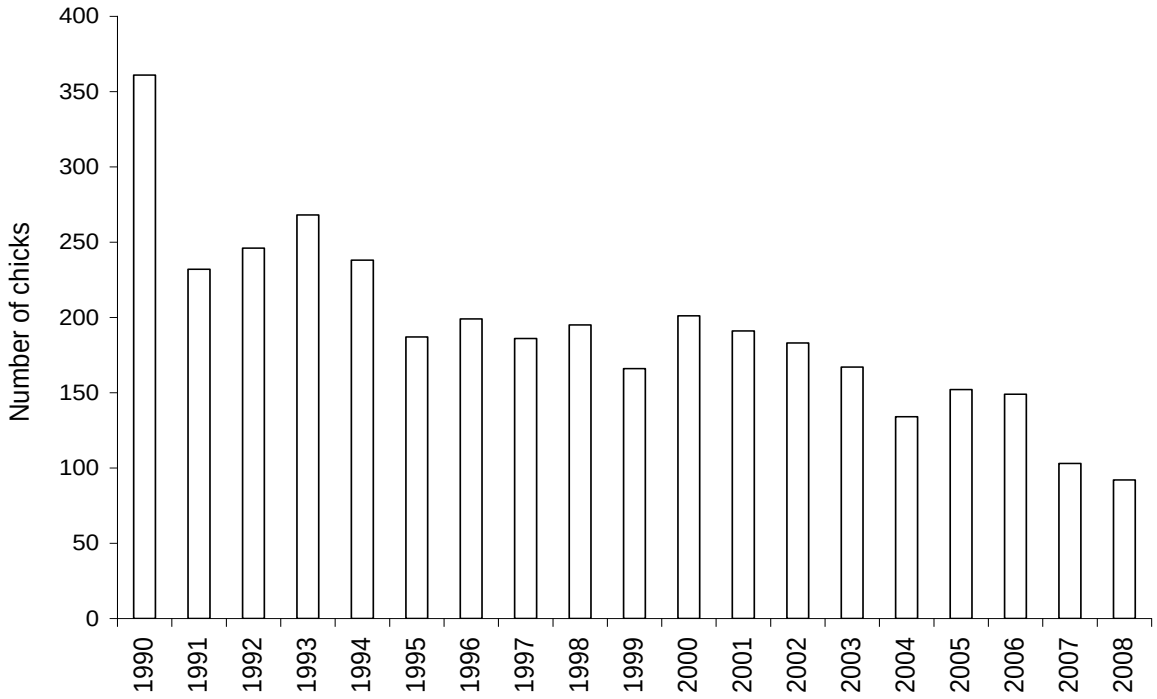


Figure 2
Numbers of Ancient Murrelet chicks caught at funnels 5 and 6 from 1990 to 2008

Recovered bands

Throughout the season we make a point to look for bands among the remains of dead Ancient Murrelets left by predators. In 2008 we recovered one band from a dead bird that was originally banded as an adult on ELI in 2002, meaning that this bird was at least 8 years old.

Recapture and band recovery data provide valuable insights into population parameters and life history for example, last year on Reef I. researchers recaptured a bird that was 22 years old which is, so far, the oldest Ancient Murrelet known.

Predation transects

To generate an estimate of the number of Ancient Murrelets killed by predators we counted the remains of birds located along five, 20m wide strip-transects once per week. We cleared the transect area of remains on 7 May and conducted 5 weekly surveys counting new carcasses and feather piles. From these totals we determined that the minimum number of predated Ancient Murrelet adults was 259 [extrapolating our estimates from the transect area (1.6 ha) to the colony area (12.55 ha)]. This number is slightly higher than 2007 when 220 adult

predations were estimated[†]. Bald Eagles *Haliaeetus leucocephalus*, Common Ravens *Corvus corax*, Peregrine Falcons *Falco peregrinus pealei* and River otters *Lutra canadensis* are all natural predators that breed on ELI and likely contribute to the predations we recorded.

Population trends

The number of Ancient Murrelet chicks departing the Limestone colony continues to decline (Fig. 2) and this trend is consistent with the 2006 colony census that estimated ± (SE) 509 ± 132 breeding pairs compared to 1273 ± 254 in 1995 (Lemon, Laskeek Bay Research:15). LBCS is very concerned about this downward population trend and we are hoping to gain a better understanding of what factors may be contributing to this decline. Census reports from neighbouring colonies indicate that the number of breeding birds at other sites are stable or increasing (Lemon Laskeek Bay Research: 15) so it appears that the issue is specific to ELI.

One factor that could explain this trend is predation. The 2006 colony census recorded similar predation rates on adult birds as in 1995 despite a more than 50% decline in population, thus indicating an increase in predation on the remaining birds (Lemon, Laskeek Bay Research:15). Based on our predation transects we estimated that between 2007 and 2008 at least 479 adult Ancient Murrelets were predated at the ELI colony. Early studies in Laskeek Bay show that birds killed by predators include a proportionately high number of prospecting birds versus breeders (Laskeek Bay Research: 3), thus predation could play an important role in shaping the population at this small colony.

[†] The 2007 predation estimate reported in 'Laskeek Bay Research:15' differs from this estimate because in 2007 predation results were calculated by including feather piles and carcasses as well as the number of wings. Including only feather piles (and not wings) is thought to be a more accurate estimate considering that feather piles and wings could belong to the same bird and thus using both as a measure to count individual birds could result in overestimating mortality associated with predation.

Black Oystercatchers

Haematopus bachmani

Occupancy and reproductive success

LBCS has been monitoring breeding activity of Black Oystercatchers in Laskeek Bay since 1992. Beginning in early June we regularly visit known breeding territories and scan for new active sites, looking for occupied nests to count and measure eggs and chicks. We survey from Cumshewa I. to the Lost Islands in Gwaii Haanas and in 2008 we found 36 sites occupied by adult birds, of which 19 were active with either eggs or chicks at some point in the season. Ten sites produced chicks, 14 altogether, nine of which we banded.

As in 2006 and 2007, in 2008 we extended our surveys to include a portion of the northeast section of Gwaii Haanas National Park Reserve and Haida Heritage Site (Gwaii Haanas). These surveys were initiated in 2004 and carried out for three consecutive years to establish baseline data for the region and now, this initiative will be repeated every two years. As in previous years we visited BLOY breeding sites extending from the south end of Laskeek Bay through to Ramsay I. in Juan Perez Sound. We surveyed breeding sites from 14 to 17 June and again on 9 and 12-14 July. We found 64 sites occupied by adult birds and of these, 58 were active with either eggs or chicks at some point in the season and 32 produced chicks: 46 altogether. No chicks were banded inside Gwaii Haanas.

Birds that we banded received a combination of bands including a uniquely numbered metal band and two colour bands that indicate either the year the bird was banded or the general area of the nest site from which the bird was caught. We always scan shorelines for banded adult birds because banding information can help us

understand more about dispersal and life history of these birds. This season we re-sighted 14 banded birds (Table 3) one of which was banded as a chick in 1994, meaning it was 14 years old.

Table 3
Banded Black Oystercatchers re-sighted in Laskeek Bay in 2008

Band Combination (left – right)	Location seen / Nest site	Year Banded	Banded as Adult or Chick
UB-BK/M	Reef I. / REE-1	2006	chick
W-DB/M	Reef I. / REE-1*	2006	chick
UB-M	Skedans I. / SKE-6	unknown	-
AL-BK/M	Skedans I. / SKE-6	2000	adult
UB-BK/M	South Low I. / SLW-1	2000	Chick or adult
UB-W/M	South Low I./ SLW-4	1994	chick
UB-R/M	South Low I./ SLW-5	2003 or 2004	chick
UB-OR/M	Lost I. / LOS-2	2004	chick
W-Y/M	Reef I., group of 8 birds		
UB-R/M	Reef I., group of 8 birds	2003 or 2004	chick
UB-M	Reef I., group of 8 birds	unknown	-
UB-M	Kingsway Rk., group of 12 birds	unknown	-
UB-M	Tar I. / EM-560-4-2	unknown	-
UB-Or/M	Ramsay Islets, loafing	2004	chick

Band codes: UB = unbanded (birds can lose bands), BK = black, M = metal, W = white, AL = aluminium, R = red, OR = orange, Y = yellow.* seen after territory was abandoned.

Diet

Black Oystercatcher chicks feed on invertebrates and the shell remains of their prey can be found within the breeding territory. We collected and counted invertebrate remains found at breeding sites to determine chick diet composition for nests located in Laskeek Bay. The average chick diet determined from five nest sites showed that chick diets comprised 54% limpets, 17% mussels and 12% chitons. These results are similar to chick diet composition described in previous years (Fig.3).

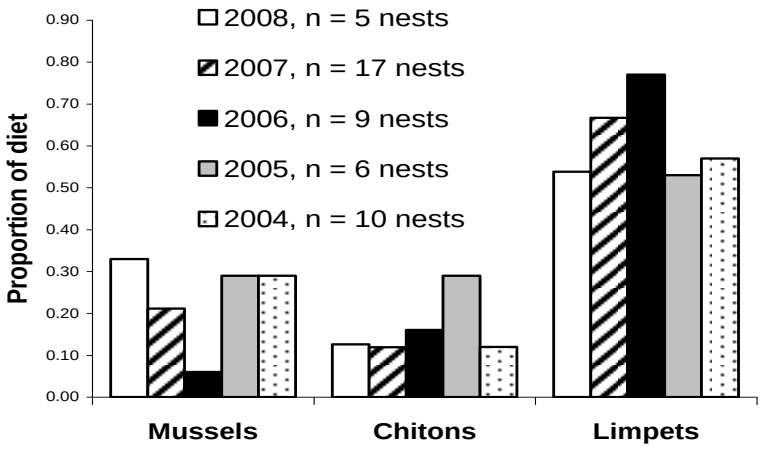


Figure 3
Invertebrate prey remains identified at Black Oystercatcher nest sites in Laskeek Bay, 2004 to 2008

Glaucous-winged Gulls
Larus glaucescens

LBCS has been censusing gull colonies in Laskeek Bay since 1992. Between 22 and 29 June we visited islands in Laskeek Bay where Glaucous-winged gulls have historically nested to count the number of active nests (containing either eggs or chicks). Similar to previous years Lost Is. supported the largest number of breeding pairs with 236 active nests, followed by Kingsway with 47 active nests. We counted six nests at Low I. and one nest at Skedans Is. All together 290 nests were found in Laskeek Bay which is above the average of (± SD) 255.2 ± 72.5 nests counted across years.

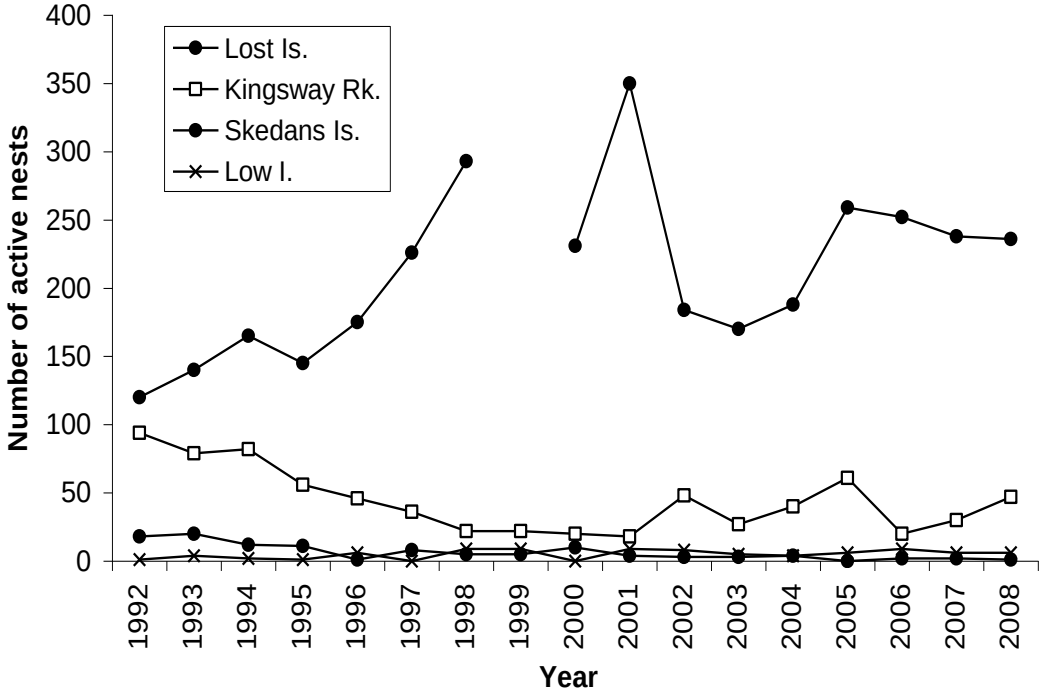


Figure 4
Number of active Glaucous-winged Gull nests (containing chicks or eggs) at four colonies located in Laskeek Bay, 1992 to 2008

Pigeon Guillemots *Cepphus columba*

Ten wooden Pigeon Guillemot nest boxes were set up at Lookout Point in 2001 and at the end of each season we check their contents to determine occupancy rates, to measure eggs and to band chicks. This year seven of the nest boxes were occupied (Fig 5.), five contained chicks (total: seven chicks banded) and 2 contained eggs (total: three eggs measured).

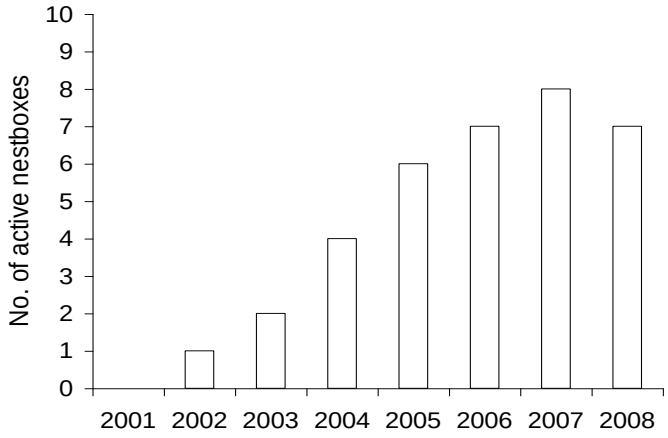


Figure 5
Number of Pigeon Guillemot nest boxes containing either chicks or eggs at East Limestone Island, 2001 to 2008

Cassin's Auklets and Fork-tailed Storm Petrels

Ptychoramphus aleuticus and Oceanodroma furcata

Cassin's Auklets and Fork-tailed Storm Petrels are burrow nesting seabirds that visit their breeding colonies at night. Small populations of both species have historically nested on ELI but the number of breeding pairs has fluctuated across years, in part due to predation by introduced raccoons. LBCS is interested in the status of the breeding populations of these birds on ELI and each year we attempt to obtain some index of breeding effort on the island.

We monitored Cassin's Auklet breeding activity at two sites on East Limestone I. in 2008 including the East Coast plots and the Lookout Point. We conducted regular checks for knockdowns at burrow and nest box entrances in an effort to identify which cavities were being used regularly. At the East Coast plots (north and south) we monitored 24 natural burrows in addition to 44 nest boxes that were installed in 2007, plus 2 older boxes that were already in place. At the Lookout Pt. area we monitored 25 nest boxes that were installed last year. Typically it takes several years before seabirds will nest in new nest boxes and this year none of our nest boxes were active. Out of the 24 natural burrows that we checked regularly, 18 had knock-down activity at least twice during the season and most burrows contained signs of breeding activity such as fresh droppings or feathers at the entrance.

We did not conduct any regular visits to the burrows located at Cassin's Tower this year because we wanted to reduce our disturbance to the Bald Eagles nesting there. Early in the season we counted 53 burrows on Cassin's Tower, likely occupied by Cassin's Auklets or Fork-tailed Storm Petrels.

Storm petrel activity on ELI appears to be on the increase. Birds were heard almost every night during Ancient Murrelet work and there was noticeably more activity in Cabin Cove than in previous years.

At-Sea Surveys

To examine the abundance and distribution of marine birds and mammals in Laskeek Bay we conduct regular boat surveys that follow a series of 100m wide strip transects. Unfortunately, especially rough boating conditions throughout the 2008 season limited our ability to carry out as many surveys as we intended and we completed

only two near shore surveys and one Hecate Strait survey.

Near shore surveys

The primary aim of these surveys is to record the locations of Marbled Murrelet *Brachyramphus marmoratus* because they are red listed by the province and designated threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The peak number of Marbled Murrelets counted was 164 on 29 June. Numbers of Marbled Murrelets seemed to increase across the season, apparently peaking in July when unfortunately, we were not able to complete a survey. Marbled Murrelets were especially numerous in Breaker Bay. Apart from Marbled Murrelets, we recorded ten bird species including Pigeon Guillemots, Pelagic Cormorants *Phacrocorax pelagicus*, Pacific Loons *Gavia pacifica*, Rhinoceros Auklets *Cerorhinca monocerata*, Harlequin Ducks *Histrionicus histrionicus*, Black Oystercatchers, Ancient Murrelets, Glaucous-winged Gulls, Long-tailed Ducks *Clangula hyemalis* and White-winged Scoters *Melanitta fusca*.

Hecate Strait surveys

We require especially calm conditions to conduct offshore surveys that take us several miles out in to the Hecate Strait. This survey provides an opportunity to spot species that are typically pelagic and consequently less often seen near the coast. During our sole trip in to the Hecate Strait this season we saw six species of birds: Sooty Shearwaters *Puffinus griseus*, Cassin's Auklets, Rhinoceros Auklets, Common Murres *Uria aalga*, Ancient Murrelets and Black Turnstones *Arenaria melanocephala*.

Marine Mammals

Each day we record all marine mammal sightings (Table 4) that result from sea watches, sea surveys or opportunistic encounters. Compared to the last five years we did not report very many different types of marine mammals this year (Table 4) and this may be explained by consistent rough sea conditions that occurred throughout the field season that may have reduced the chance of sightings.

Table 4
Total counts of marine mammals reported by ELI crew from sea surveys, sea watches and opportunistic encounters, 2004 to 2008†

Species (common name)	*Scientific name*	*2008*	*2007*	*2006*	*2005*	*2004*
Dall's porpoise	*Phocoenoides dalli*	0	0	0	1	0
Northern elephant seal	*Mirounga angustirostris*	0	0	0	0	0
Fin whale	*Balaenoptera physalis*	0	0	0	0	0
Grey whale	*Eschrichtius robustus*	0	0	1	1	1
Harbour porpoise	*Phocoena phocoena*	0	1	4	3	12
Humpback whale	*Megaptera novaeangliae*	261	203	91	15	19
Killer whale	*Orcinus orca*	18	26	4	11	13
Minke whale	*Balaenoptera acutorostrata*	1	3	1	0	2
Pacific white-sided dolphin	*Lagenorhynchus obliquidens*	0	81	365	8	0
California sea lion	*Zalophus californianus*	0	4	0	1	1

†Harbour seal *Phoca vitulina* and Steller's sea lion *Eumetopias jubatus* sightings are not reported here.

Humpback whales

This season marks an all time high for the number of humpback whales recorded in Laskeek Bay (Table 4). As in 2007, May brought daily reports of humpbacks and during one sea watch from Lookout Point we counted 63 individuals. Most days we could hear whales blowing, tail lobbing and even vocalizing as they fed. Our most spectacular encounter took place in Juan Perez Sound when one individual breached clear out of the water four times in a row!

Killer whales

Killer whales were encountered three times this season and each time we followed the groups in our boat to obtain photos for identification. We take photos of the dorsal fin and saddle patch from the left side of the animal because individuals can be distinguished based on these features. Group sizes ranged from three to six and two of the groups included a small juvenile.

Steller's sea lions

We regularly count sea lions that haul out at both on rocks to the southeast of Reef I. and on the easternmost point of Skedans Is. This year the maximum number of individuals recorded at both haul-outs was 537 individuals at the Reef I on 17 May and 98 at Skedans on the same day. Typically our highest counts occur during the early part of our field season (April or May) and this year 17 May was our earliest visit to the haul-outs.

Researchers in Alaska sometimes brand Steller's sea lions to mark individuals for identification. This year we spotted one branded individual: F1229 on 29 June located at the Skedans haul-out. Interestingly, this was not the first time that we have reported this sea lion in the area: in 2000 it was spotted at Reef Island rocks.

Wildlife Trees

Cavity nesting birds rely on dead, standing trees for breeding sites and this year on Limestone we located 14 snags, containing 15 nests: one Brown Creeper *Certhia americana*, two Hairy Woodpecker *Dendrocopus villosus*, two Chestnut-backed Chickadee *Poecile rufescens* and ten Red-breasted Sapsuckers *Sphyrapicus rubra* (Table 5). One tree (#107) contained two nests, one occupied by a pair of Chestnut-backed Chickadees and the other by Red-breasted Sapsuckers.

Table 5
Wildlife tree activity on East Limestone Island in 2008. †

Tree #	Cavity Nester	Tree Species	Fledge Date
17	RBSA	Ss	18-June
33	RBSA	Ss	20-June
45	RBSA	Ss	11-June
113	RBSA	Hw	18-June
112	RBSA	Hw	18-June
72	RBSA	Ss	20-June
111	RBSA	Hw	18-June
86	RBSA	Hw	14-June
118	RBSA	Ss	22-June
107	RBSA	Ss	14-June
107	CBCH	Ss	18-June
120	CBCH	Ss	18-June
119	BRCR	Cedar	18-June
117	HAWO	Ss	06-June
103	HAWO	Hw	18-June

†RBSA = Red-breasted Sapsucker, CBCH = Chestnut-backed Chickadee, NOFL = Northern Flicker, HAWO = Hairy Woodpecker, BRCR = Brown Creeper, Ss = Sitka spruce, Hw = Western hemlock

The Laskeek Bay Conservation Society first started monitoring cavity nesters in 1992, on a fairly opportunistic basis but since 1995 the crew has been collecting data more systematically and putting a concerted effort towards locating all active trees each season. This long-term data set offers interesting information about tree use across years and allows us to determine how often particular snags are used by cavity nesters. For example, our three 'oldest' trees that were active this season were first recorded as active in 1993, 1995 and 1996 respectively (Table 6). Each of these trees has been home to at least three different bird species across the years (Table 6), reminding us that these rotten snags represent important breeding habitat for a variety of bird species over time.

Table 6
History of cavity nesting activity by bird species† at wildlife trees #17, #33 and #45 on East Limestone Island

	Wildlife Tree #		
Year	17	33	45
1993	RBSA		
1994			
1995		RBSA	
1996	RBSA	RBSA	RBSA
1997	CBCH	RBSA	
1998		NOFL	
1999	RBSA	RBSA & HAWO	
2000	RBSA	RBSA	RBSA
2001		RBSA	RBSA
2002	RBSA		RBSA
2003	RBSA		RBSA
2004	RBSA	RBSA	RBNU
2005	RBSA		CBCH
2006	NOFL		RBSA
2007			RBSA
2008	RBSA	RBSA	RBSA

†RBSA = Red-breasted Sapsucker, CBCH = Chestnut-backed Chickadee, NOFL = Northern Flicker, HAWO = Hairy Woodpecker

NATURAL HISTORY

Daily Bird Checklist

Throughout the field season we keep a daily record of all birds heard or seen. We noted 58 different species across the season with peak counts of 35 species recorded on 17 May and 11 July. Among the less common species reported were Red-necked Grebes *Podiceps grisegena*, Sooty shearwaters, Red-breasted Mergansers *Mergus serrator*, Whimbrels *Numenius phaeopus*, Northern Flicker, Western Sandpiper *Calidris mauri* and Short-billed Dowitcher *Limnodromus griseus.*

Birds of Prey

In 2008 Common Ravens, Northwestern Crows *Corvus caurinus*, Bald Eagles and we

suspect Peregrine Falcons nested on East Limestone Island. Common Ravens nested in the same tree as in 2007 and by 31 May at least two chicks are thought to have fledged from this nest. A good view of the nest was near impossible to achieve because it was located high up, among dense branches. No Northwestern Crow nest was found but two young fledglings were spotted in late June on the SW side of the island. We suspect that the nest was located somewhere along the Ridge Trail area, not necessarily visible because of the cliffs.

Bald Eagles nested on Cassin's Tower this season (BAEA nest #5). On 25 May we saw two downy chicks in the nest and by 11 July the two young birds were feathering in and looking healthy. Peregrine Falcons were heard and seen regularly throughout the field season, almost exclusively near the cliffs on the SW side of the island and we suspect the birds were breeding but were unable to locate the nest among the dense vegetation.

Plants

Flowering plants on ELI are restricted to areas where browsing deer cannot reach them and throughout the field season we keep a lookout for first bloom dates of the various wildflowers on the island. We also try to keep track of the rare plant species that occur on Limestone, the presence of which is attributed to the limestone substrate that is relatively uncommon in the archipelago. This year we were especially excited to find blooming plants of showy Jacob's ladder *Polemonium pulcherrimum* and Menzies' pipsissewa *Chimaphila menziesii*. These two rare plant species are known to occur on ELI however they have not been located every year.

River Otters *Lontra canadensis*

In most years the ELI crew has reported regular sightings of river otters on the island. This year was no different and reports of single adult otters were relatively common. However, on 25 June seven adults were seen swimming off the SW side of the island and a juvenile otter could be heard nearby. To our knowledge seven is the most adult otters noted on the island at any one time.

Introduced Species

Sitka Black-tailed Deer
Odocoileus hemionus

Humans introduced deer to Haida Gwaii in the early 1900s to provide a new source of food. Because deer are virtually free from predators in the archipelago their population is robust and their subsequent browsing pressure is having significant effects on the local vegetation, effectively altering the forest community (see: http://www.rgisbc.com – Research Group on Introduced species). We are able to illustrate this story to people by visiting the three 20m x 20m deer exclosures present on the ELI. Inside the exclosures we find plants that otherwise are consumed by deer and are mostly absent from the forest understory, for example, hemlock saplings, sword fern, young huckleberry, salal, salmonberry and lady fern. Deer have reached almost all of the islands in the archipelago and can travel relatively easily by swimming. This season we watched three deer make their way from neighbouring Louise I. to ELI.

Raccoons *Procyon lotor*

Raccoons were introduced to the islands in the 1940s to supplement the dwindling fur resources after sea otter populations were decimated. At this time raccoons are considered among one of the principle threats to ground nesting birds in Haida Gwaii. Raccoons eat seabird adults, chicks and eggs, all of which are particularly vulnerable to raccoons because most have evolved free from mammalian predators and subsequently have no natural defence.

Conservation officers visited the ELI area in March to look for raccoons on the Limestone Islands and adjacent areas on Louise. It is critical that these early efforts to control raccoons are continued because Ancient Murrelets first arrive at their

breeding colonies in March and by the time the ELI crew arrives in late April / early May, raccoons present on the island would likely already have seriously affected the colony.

Throughout the Ancient Murrelet breeding season we survey ELI by foot to look for signs of raccoon activity. When tides and weather permit we also conduct night time boat surveys around the East and West Limestone coastlines, extending to the shore on opposite Louise I. This year we completed one boat survey on 30 May. There was no compelling evidence to suggest that raccoons were active on Limestone this season. Dug up burrows were found throughout the season but this type of behaviour is not necessarily evidence of raccoon presence and we suspect that river otters and perhaps, in some cases, ravens, may be responsible.

Red Squirrels *Sciurus vulgaris*

Squirrels were introduced to the islands in 1947 to facilitate cone gathering for the forestry industry. Squirrels have known negative effects on terrestrial birds and consume eggs and nestlings (see: http://www.rgisbc.com – Research Group on Introduced species). In 2007 we re-instated squirrel surveys on ELI to measure the annual abundance of squirrels on the island. We are interested in describing annual fluctuations in squirrel populations on ELI which may in turn help us to understand direct and indirect consequences of this introduced species.

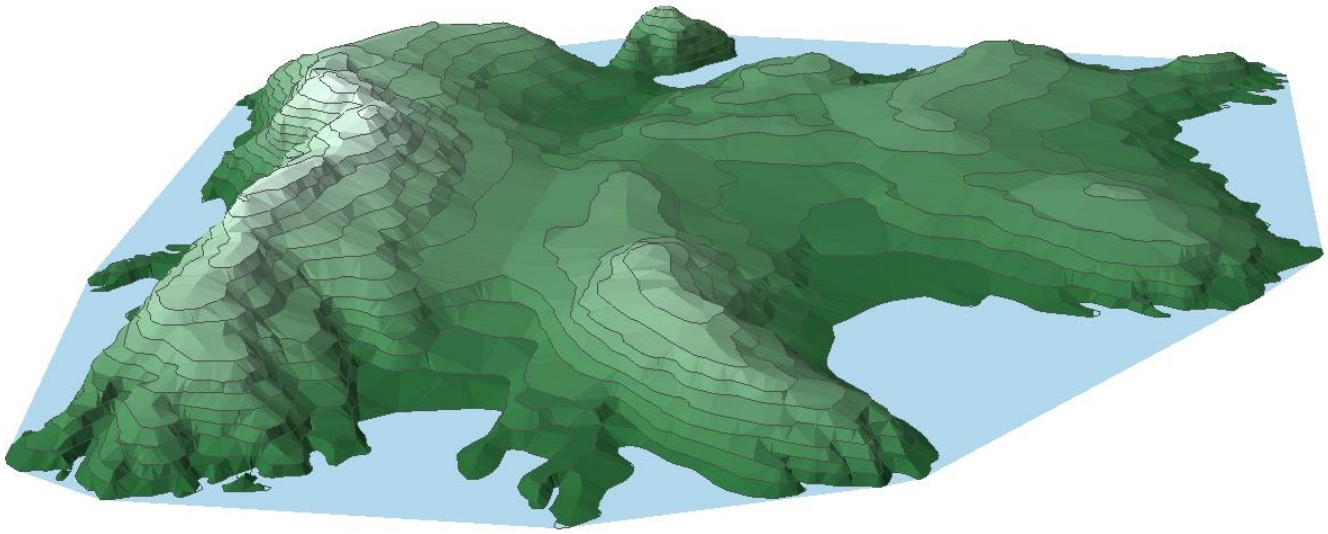
CONCLUSION

This year marked the 19th season on Limestone and without the dedication of our directors, staff, volunteers and visitors the 2008 field program would not have been a success. We leave the season with ongoing concerns about the decline in the number of Ancient Murrelets breeding on East Limestone Island and with questions regarding what factors are contributing to this decline.

Predation could explain the downward population trend underway on ELI although it is not clear what role each predator group plays. Ancient Murrelets are preyed on by birds of prey and river otters that breed on the island and it is possible that raccoon predation in previous years may be having lasting effects.

We have not ruled out the possibility that our monitoring practices may affect breeding birds and we will continue to weigh our decisions carefully between protecting the birds and carrying on with our long-term studies. It is important to note however, that the human presence on ELI is likely the sole defence that this small breeding population has against predation by introduced raccoons.

As far as our other monitoring programs, 2008 marked a very successful year in which we continued to build on our long-term data sets, establishing baselines and describing annual trends. Thanks to everyone that was involved in 2008, we are looking forward to 2009!



3D Model of East Limestone Island Derived from Contour Map
By: Kelly Runyon

EAST LIMESTONE ISLAND FIELD STATION: REPORT ON THE 2009 FIELD SEASON

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Ancient Murrelet family on the water, Photo: Jake Pattison

SUMMARY

This marks Laskeek Bay Conservation Society's 20th field season on East Limestone Island, Laskeek Bay. The season ran from 1 May to 14 July, bringing 26 volunteers and 11 visitor groups (6 school groups, 5 tours) to the island. The number of Ancient Murrelet chicks trapped in funnels this season was the lowest on record and there was again evidence of raccoon predation in the murrelet colony. We found 35 occupied Black Oystercatcher territories in Laskeek Bay, 24 with chicks or eggs at some point in the season. We banded 12 oystercatcher chicks and re-sighted 22 birds banded in previous years, the oldest banded in 1994. We censused Glaucous-winged Gull colonies in Laskeek Bay, and found three active with a total of 256 nests containing eggs or chicks. Pigeon Guillemots used 9 of the 10 nest boxes at Lookout Pt, and four of the Cassin's Auklet nest boxes installed in 2007 were active, although all were subsequently abandoned. We completed four sea-surveys and recorded a maximum count of 172 Marbled Murrelets on 8 July. We recorded more harbour porpoises than in recent years and fewer humpback whales. Killer whales were encountered on four different occasions. Fourteen wildlife trees were monitored, containing nests of 10 Red-breasted Sapsuckers, 2 Chestnut-backed Chickadees, 1 Hairy Woodpecker, and 1 Brown Creeper. Peregrine Falcons successfully fledged two chicks and Common Ravens also had two young. A Belted Kingfisher nest was located on the South side of the island. We located the tufted saxifrage *Saxifraga cespitosa*, a rare plant last recorded on the island in 1913. A pilot project began this season to address the problem of invasive plants on Limestone and on the surrounding islands.

EDUCATION AND INTERPRETATION PROGRAM

LBCS continues to involve the public in educational and interpretive programs with the goal of raising awareness of local conservation issues and the natural history of Laskeek Bay. Students, volunteers and visitors are invited to visit our research camp on Limestone Island, learn about our research projects and to assist in some of the monitoring work. The society's commitment to environmental education and public involvement is one of its key mandates.

Project Limestone

Project Limestone has for 19 years brought local students to Limestone Island to participate in Ancient Murrelet *Synthliboramphus antiquus* research. The students are led on an interpretive walk across the island and given an introduction to our research programs. A walk to Lookout Point allows the students to learn more about the natural history of the area ending with a panoramic view of Laskeek Bay. The group then assists with the Ancient Murrelet work from 10:30 pm to 2:30 am, which involves capturing the chicks and weighing them before releasing them near the ocean. The group then spends the remainder of the night in the Visitor's cabin before heading back to Vertical Point the next morning.

Seven groups with a total of 42 students and 15 adults visited Limestone Island this year. The groups represented four local schools: Anges L. Mathers School (Sandspit) on 14 and 15 May; Living and Learning School (Queen Charlotte) on 17 and 18 May; Queen Charlotte Secondary School on 20 and 23 May; and G.M. Dawson (Masset) on 25 May.

Volunteers

Volunteers generally stay for one week and work alongside field staff contributing their time and energy to the many different tasks that are required throughout the season. These tasks include research as well as general camp maintenance and chores. This is a unique opportunity for the public to get involved in long-term monitoring work while living in a remote field camp on Haida Gwaii.

A total of 26 volunteers visited the island this year contributing 203 volunteer days to projects, both on Limestone and on surrounding islands. Three of the volunteers had previously been on Limestone Island, either as volunteers, or with Project Limestone. The majority of volunteers stayed for one week, with the exception of two who stayed for two weeks, and two who stayed for twelve days. Volunteers came from a variety of places: five from Haida Gwaii; ten from elsewhere in BC; four from Ontario; one from the United States; and others from Sweden, Germany, Switzerland, Belgium, France and Australia. Berry Wijdeven of Tlell also spent a week on Limestone Island gathering video for the 20th Anniversary Symposium in October. Executive Director, Christine Pansino and summer intern, Leigh Joseph also came down to help with closing up camp.

Visitors

The LBCS visitor program provides opportunities for tourist groups to visit the island, participate in an interpretive tour and learn about the research that we are involved in. Through this program, LBCS aims to raise public awareness and appreciation of local conservation issues. Most visitor groups that stop on Limestone are part of ecotourism excursions in nearby Gwaii Haanas National Park.

Four groups visited the island this season with a total of 33 guests and 5 crew. The *Island Roamer* (Bluewater Adventures) had two separate tours on 22 and 24 of May, and both the *Maple Leaf* and Moresby Explorers had tours on 29 May.

The Reef Island field camp was also up and running this year with Drs Tony Gaston and Jean-Louis Martin, Soizic LeSaout, Akiko Shoji, Malcolm Hyatt and Kyle Elliot working there for varying lengths of time between late April and July.

Staff

LBCS Staff this year consisted of Christine Pansino (Executive Director), Jake Pattison (Camp Supervisor/Biologist), Ainsley Brown (Assistant Biologist/Interpreter) and Leigh Joseph (Summer Intern).

RESEARCH AND MONITORING PROGRAMS

Ancient Murrelets

Synthliboramphus antiquus

Monitoring Program

Since 2007 LBCS has focused on reducing the impact of research related activities on the Ancient Murrelet colony. North Cove continues to be off limits during the breeding season, and our activities at Cabin Cove involve only weighing and releasing chicks. In this way we are confident that we are having an absolute minimum impact on departing chicks, while still gathering information on population trends and condition of chicks on departure. We hope that future comparisons between population trends in North Cove and Cabin Cove will shed light on the impact of our presence in the colony.

Chick capture work

Four chick-capture funnels (numbers 5-8) were monitored in Cabin Cove beginning on 7 May. Funnels were checked at a regular interval (10-15 minutes) and we recorded date, time, location (funnel number) and mass for each departing chick. Funnel protocol is kept constant across years so that the number of chicks departing gives a consistent index of the overall breeding population. Funnels were monitored nightly from 22:30-2:30 for the period of 7-19 May and 11:00-2:30 after 19 May to compensate for increasing day length. Capture work ends after two consecutive nights with no chick captures in any of the funnels. This season the first chicks arrived on the night of 10 May and the last on 29 May. In total, 104 chicks were captured in funnels 5 to 8 (Fig. 1). The peak night of departures (16 chicks captured) occurred 18 May. The number of chicks recorded this season was the lowest to date (Table 1).

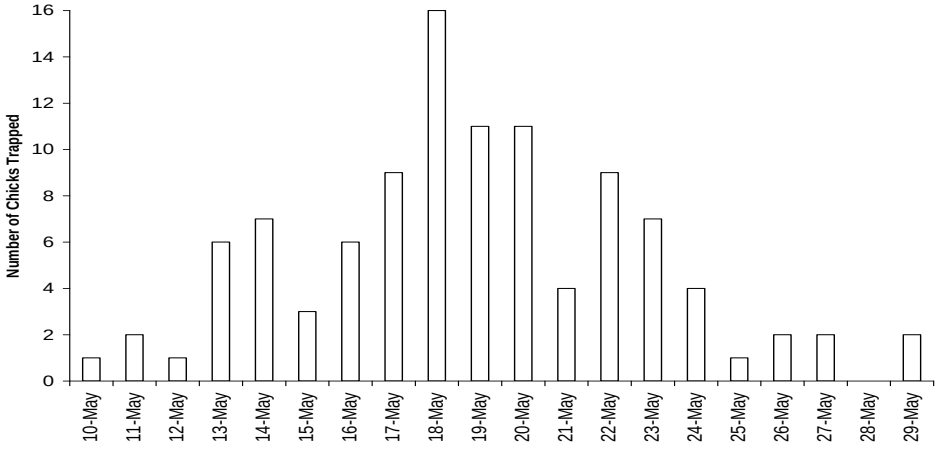


Figure 1
Nightly chick captures, Funnels 5-8, East Limestone Island, 10-29 May 2009

Table 1
Summary of chick departures, peak nights and totals for funnels 5 to 8 on East Limestone Island 2006 to 2009

Year	*First night with chicks*	*Peak night*	*Peak count*	*Last night*	*Total days*	*Total chicks*
2006	10-May	21-May	24	30-May	21	197
2007	15-May	4-Jun	16	12-Jun	29	166
2008	12-May	14-May	13	3-Jun	23	125
2009	10-May	18-May	16	29-May	20	104

Funnels 5 & 6

As of this season, funnels 5 and 6 have been monitored continuously for 20 years, and are therefore our primary means of assessing the long term population trend in the Cabin Cove area of the colony. The location of the funnels has not changed during this period and therefore represents the same geographic area of the colony year to year. One consideration is that there is potential for the colonized area to shift over time in relation to the funnels and with this in mind funnels 7 and 8 were installed in 2006 flanking funnels 5 and 6. So far there is no indication of a major shift in the colony area, rather an overall decline in numbers across the whole colony.

There were a total of 66 chicks captured this season in funnels 5 and 6 which is the lowest to date (Fig. 2). This season was similar to others in terms of first chick arrivals and the peak night occurred relatively early on May 18 (Table 2). Chick captures ended very early this season and total days with chicks was very reduced this season in comparison with the past (Table 2).

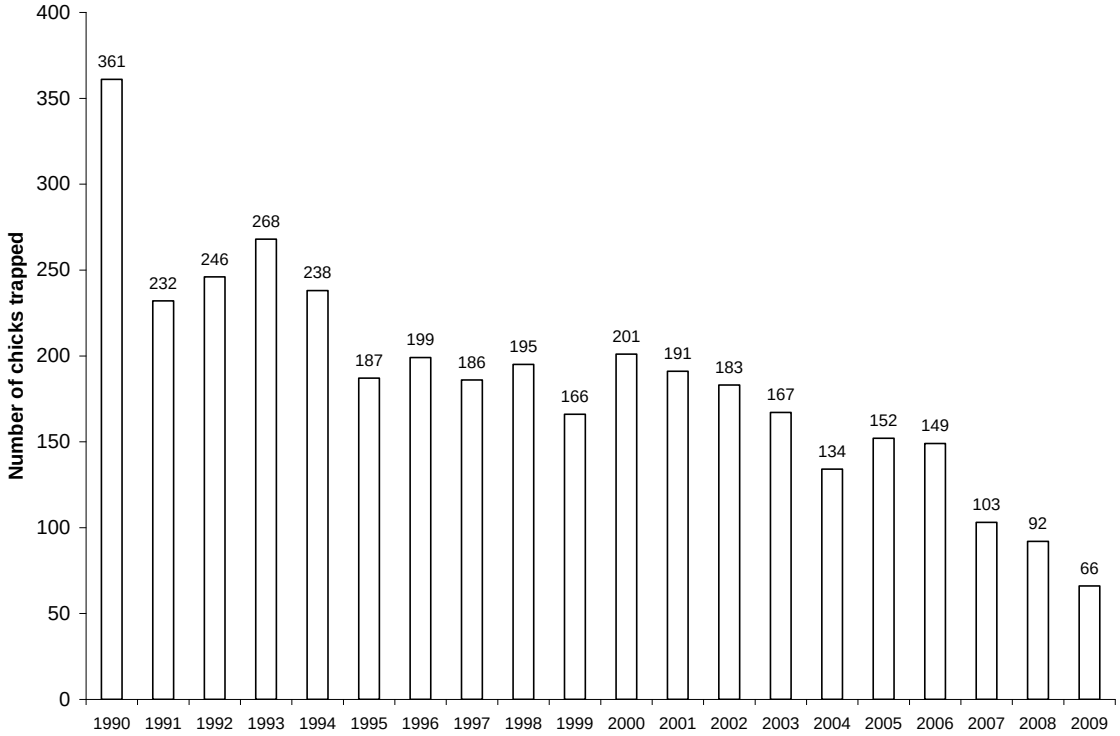


Figure 2
Total Ancient Murrelet chick captures at funnels 5 and 6 East Limestone Island, 1990-2009

Table 2
Summary of chick departures, peak nights and totals from funnels 5 and 6 on ELI 1990 to 2009

Year	1st night with chicks	Peak night	Peak count	Last night	Total days	Total chicks
1990	13-May	20-May	28	15-Jun	33	361
1991	10-May	25-May	22	05-Jun	26	232
1992	14-May	22-May	29	02-Jun	19	246
1993	12-May	18-May	39	04-Jun	23	268
1994	08-May	20-May	29	06-Jun	29	238
1995	11-May	23-May	18	12-Jun	32	187
1996	11-May	18-May	17	07-Jun	27	199
1997	13-May	28-May	22	05-Jun	23	186
1998	11-May	20-May	23	20-Jun	40	195
1999	11-May	21-May	22	09-Jun	29	166
2000	11-May	21-May	22	06-Jun	26	201
2001	11-May	19-May	21	15-Jun	35	191
2002	09-May	21-May	33	01-Jun	23	183
2003	11-May	21-May	19	03-Jun	23	167
2004	08-May	16,17-May	15	01-Jun	24	134
2005	07-May	19, 23-May	12	05-Jun	29	152
2006	10-May	21-May	20	31-May	21	149
2007	15-May	04-Jun	16	12-Jun	28	103
2008	13-May	20,22,23-May	8	03-Jun	21	92
2009	12-May	18,19-May	10	29-May	19	66
Average ± SD	11-May ± 2.0 days	21-May ± 4.1 days	21 ± 7.7 chicks	6-Jun ± 5.6 days	27 ± 5.5 days	186 ± 66 chicks

Gathering grounds

Ancient Murrelets enter and leave the breeding colony at night and in late afternoon and evening the birds gather on the water in areas called gathering grounds, where they wait until it is sufficiently dark. Both breeding and non-breeding birds are thought to gather and in these areas and important social interactions also take place. The Limestone Island gathering ground is located between Low Island and Limestone and this season, as in the past, we conducted standardized 10 minute counts of the birds on the grounds between 2 May and 20 June. The peak count occurred on 22 May this season with a total of 183 birds observed. Counts averaged 32.7 ± 36 (SD) this season which is lower than in previous seasons and mirrors the decline in chick numbers.

Point counts

We conducted point counts in the colony area to monitor the activity of adult birds. Five minute counts were made at approximately 2:30 each night for the period of 21-31 May. Our maximum count occurred on 23 May (12 individuals; 80 calls), but most nights were much quieter. No calls were recorded during the 31 May count.

Band Recoveries & Recaptures

Recapture of adult birds was phased out in 2003, however we still opportunistically capture adult bird that are trapped in funnels or are otherwise easily captured as we check funnels. We also scan feather piles, raven pellets and other predation remains looking

for bands. There were no band recoveries or recaptures this season on Limestone, however the crew on nearby Reef Island recaptured a bird, originally banded on Reef, that is a minimum of 25 years old and by far the oldest known member of the species (this same bird was also captured in 2007). They also recaptured a bird from Limestone, now breeding on Reef, which is 17 years old.

Predation transects

To estimate predation rates in the colony, we checked for predation remains along 5 fixed, 20m wide transects. Transects were cleared of remains of 5 May and checked weekly until 9 June, for a total of five surveys. During surveys we removed, or otherwise marked remains, to avoid double-counting on subsequent surveys. Transects cover 1.6 ha of the total 12.6 ha area that the colony is estimated to occupy. Based on this season's predation transects, a minimum of 102 adult murrelets were estimated to have been killed by predators in the colony area over the 5 weeks period. This estimate is conservative, as it is based only on feather piles and carcasses and excludes wings which are potentially associated with feather piles. This estimate is lower than in previous years, and anecdotal observations also pointed toward fewer predation remains in the forest than in past years. Native predators on Ancient Murrelets include Common Ravens *Corvus corax*, Peregrine Falcons *Falco peregrinus*, Bald Eagles *Haliaeetus leucocephalus*, and river otters *Lutra Canadensis* all of which were present on Limestone this season. Raccoon *Procyon lotor* presence was again confirmed on the island, based on findings along the predation transects (discussed later under 'introduced species').

Population trends

The number of departing Ancient Murrelet chicks continues to decline (Fig 2). The colony census completed in 2006 estimated ± (SE) 509 ± 132 breeding pairs compared to 1273 ± 254 pairs estimated in 1995. Considering that chick numbers have declined by 56% since 2006 (based on funnels 5 and 6) indicates that the current breeding population may be very small indeed. Neighbouring colonies such as Reef Island are stable and we therefore conclude that this is a situation specific to Limestone. LBCS is very concerned about this downward trend and is trying to gain a better understanding of the contributing factors.

Black Oystercatchers

Haematopus bachmani

Background

LBCS has been monitoring the breeding population of Black Oystercatchers in Laskeek Bay since 1992. Oystercatchers are large, conspicuous shorebirds that are easily studied because of the relative ease with which nesting sites can be found. Because they are entirely dependent on the intertidal system, these birds are also thought to be a good indicator species for the health of intertidal ecosystems. Each season we attempt to locate all breeding Oystercatchers within Laskeek Bay between Cumshewa Island and Lost Islands by visiting known territories and scanning for new territories.

Site occupancy and reproductive success

Our first visits to oystercatcher sites began on 13 June, somewhat later this year than in the past. We visited all sites known to have been active in past years and also scanned for new active sites. We found 35 territories being occupied by adult birds. Of these, 24 had eggs or chicks at some point during the season. The earliest eggs were found on 13 May and most likely hatched by the third week in June, although we found relatively young chicks at several sites in early July. Eighteen sites hatched chicks (32 total) and we were able to band 12 chicks.

Banding and re-sighted birds

Birds banded in previous years have a combination of one metal band on the right leg that carries a unique number as well as a colour band combination that indicates the year of banding as well as the area where the bird was banded. Metal bands are

permanent, while the plastic bands tend to be lost over time. All oystercatchers seen during the course of the season were checked for bands as this gives us information on the age and dispersal of these birds (Table 3). Oystercatchers are long-lived and on three occasions we sighted a bird banded in 1994. There were a total of 22 banded birds sighted this season, the largest number to date. As expected, the number of re-sighted birds has increased over the years that the banding program has been running (Fig. 3). This season's sightings included a group of 10 birds, 6 of which were banded.

Table 3
Banded Black Oystercatchers re-sighted in Laskeek Bay in 2009

Band Combination (left – right)	Location seen / Nest site	Year Banded	Banded as Adult or Chick
UB-BK/M	REE-1	2000	Adult or chick
UB-R/M	REE-2	2003 or 2004	Chick
UB-M	LOW-3	Unknown	-
UB-BK/M	SKE-6	2000	Adult or chick
UB-M	SKE-6	Unknown	-
AL-BK/M	SKE-6	2000	Adult
UB-BK/M	SLW-1	2000	Adult or chick
UB-R/M	SLW-1	2003 or 2004	Chick
UB-W/M	SLW-8	1994	Chick
UB-M	KNG-3	Unknown	-
UB-OR/M	LOS-2	2004	Chick
M-Y (?)	Lookout Pt, seen by volunteer	Unknown	-
W-Y/M	Reef sea lion haulout	2007	Chick
AL-UB	Reef, S. side	Unknown	-
W-Y/M	Louise, opposite WLI. Group of 10	2007	Chick
W-Y/M	Louise, opposite WLI. Group of 10	2007	Chick
W-LG/M	Louise, opposite WLI. Group of 10	2008	Chick
UB-R/M	Louise, opposite WLI. Group of 10	2003 or 2004	Chick
UB-R/M	Louise, opposite WLI. Group of 10	2003 or 2004	Chick
UB-W/M	Louise, opposite WLI. Group of 10	1994	Chick
W-Y/M	W. Limestone Island	2007	Chick
UB-W/M	S. Low Island	1994	Chick

Band codes: UB = unbanded (birds can lose bands), BK = black, M = metal, W = white, AL = aluminium, R = red, OR = orange, Y = yellow, LG = light green.

Diet

Oystercatchers feed their chicks hard-shelled invertebrates which they bring intact to the breeding territory. We collected prey remains from 15 sites in Laskeek Bay in order to quantify average diet composition being fed to the chicks. Limpets were the primary prey item (80%), followed by mussels (15%) and chitons (5%). These three items made up more than 99% of the diet, consistent with what has been found in past years.

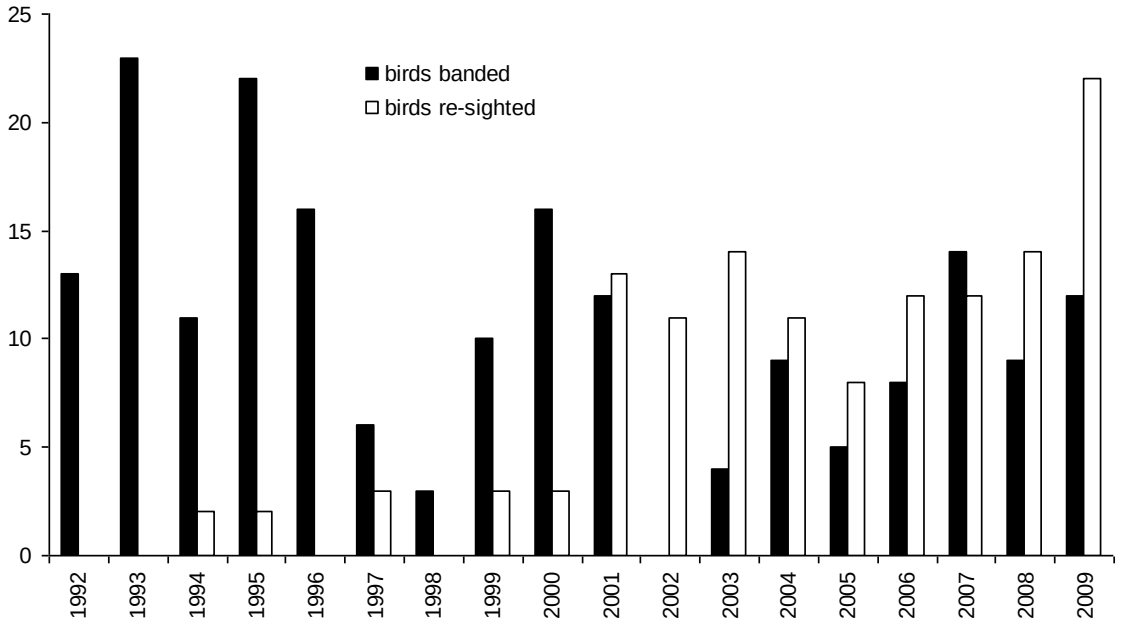


Figure 3
Number of Black Oystercatcher banded and re-sighted, Laskeek Bay, 1992-2009

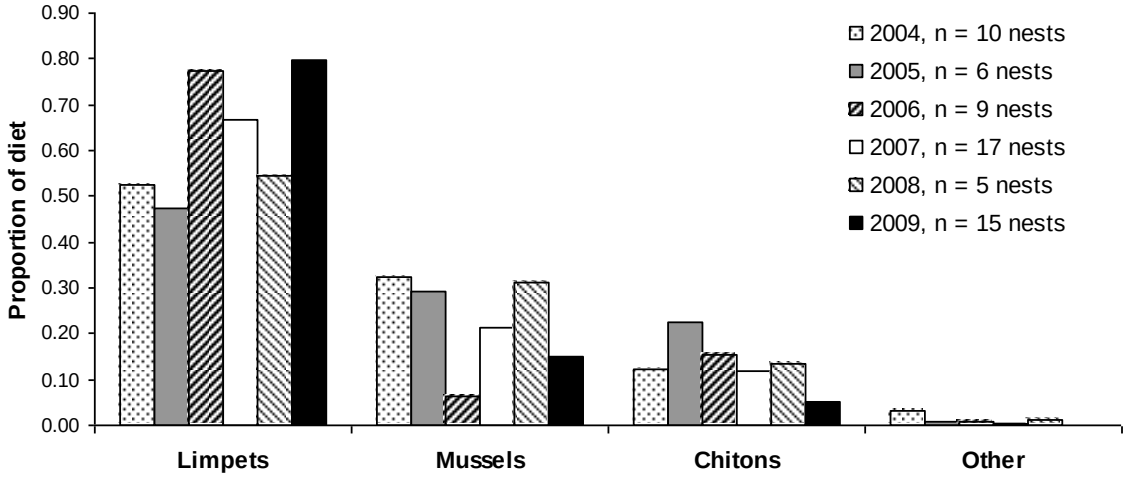


Figure 4
Black Oystercatcher chick diets from prey items collected at nest sites in Laskeek Bay 2004-2009

Glaucous-winged Gulls
Larus glaucescens

Since 1992, LBCS has been censusing gull colonies within Laskeek Bay (Fig. 4). We visited sites that had nesting gulls in the past and also kept an eye out for signs of new activity. Between 13 and 25 June we visited occupied colonies and counted the number of active nests. Lost Island, the largest colony in the area had a total of 224 active nests (20 June), followed by Kingsway Rock with 36 nests (18 June) and Low Island with 6 nests (14 June). In total we counted 266 nests on these three colonies containing either 1 egg (8% of nests), 2 eggs (23%), 3 eggs (67 %), or chicks (2%). We did not find activity at Skedans Islands, Cumshewa Island or at any other locations. The total number of nests counted this season is greater that the long-term average (±SD) of 256 ± 73.

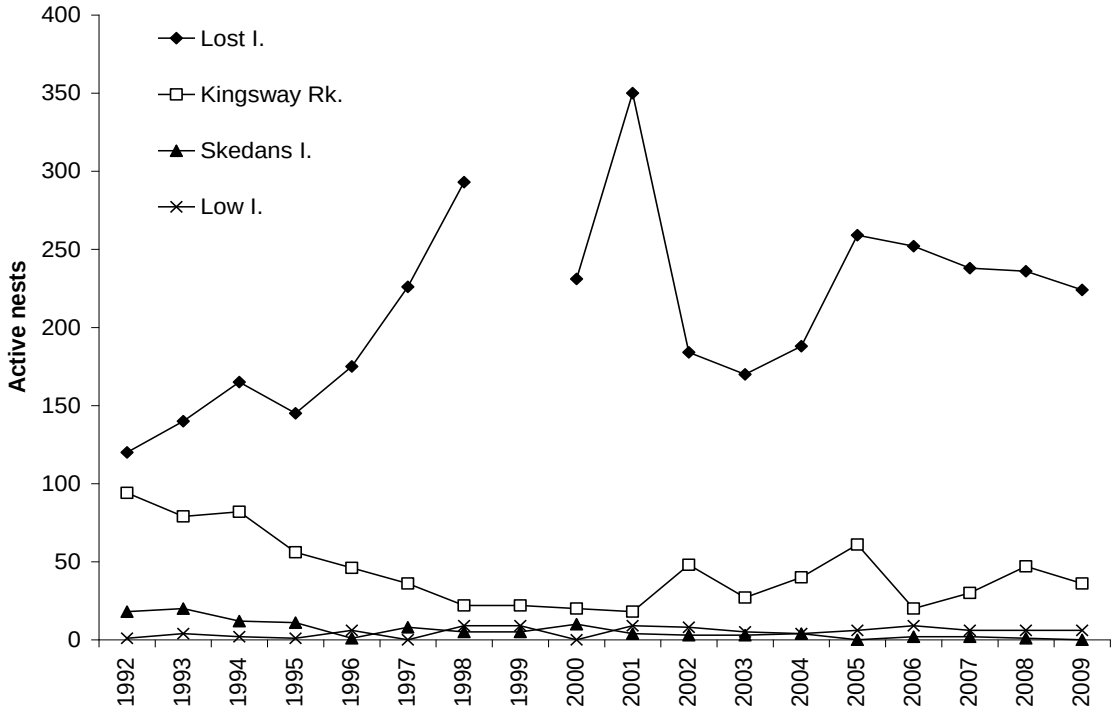


Figure 4
Glaucous-winged Gull nests containing eggs or chicks at four colonies in Laskeek Bay, 1992-2009

Pigeon Guillemots *Cepphus columba*

Ten nest boxes for Pigeon Guillemots were installed at Lookout Point on Limestone Island in 2001 and the use of the boxes has increased steadily (Fig. 5). We checked the boxes on 7 May to make sure that the boxes were intact and contained enough gravel. Box P1 had two eggs at this time, which is the earliest that we have ever noted eggs. Boxes were checked again at the end of the season (13 July), and we found 9 boxes active, containing either chicks (7 boxes) or dead chicks (2 boxes). Thirteen chicks were banded, and we noted that they were larger than chicks in previous years.

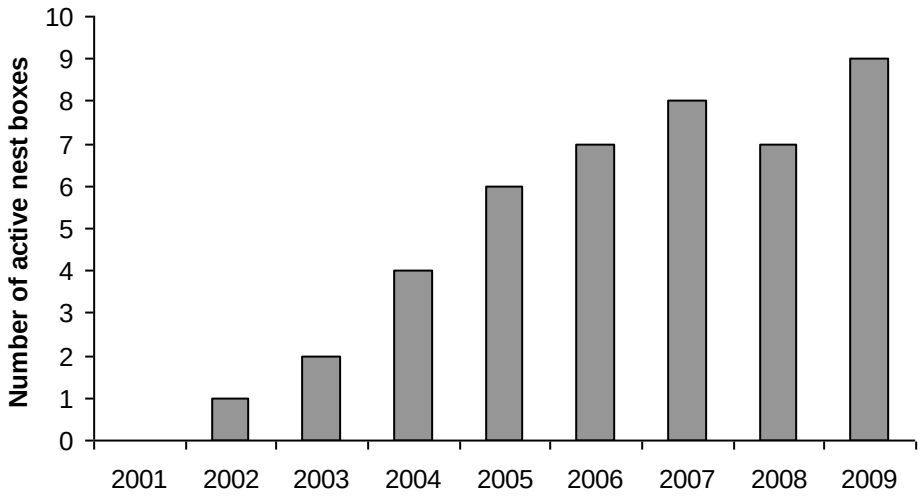


Figure 5
Use of nest boxes by Pigeon Guillemots, East Limestone Island, 2001-2009

Cassin's Auklets and Fork-tailed Storm Petrels

Ptychoramphus aleuticus and *Oceanodroma furcata*

Small populations of Cassin's Auklets and Fork-tailed Storm Petrels breed on Limestone Island. Like Murrelets, these species are nocturnal burrow nesters and are only active in the colony by night. Breeding activity on the island has fluctuated over the years, party attributed to predation by introduced raccoons. Each season we monitor several locations on the island for breeding activity in order to obtain an index of the breeding population.

This season we monitored Cassin's Auklet breeding activity at Lookout Point and the East Coast plots. Knock-down sticks were placed at the entrances of all known burrows (natural nest cavities) and nest boxes (artificial nest cavities) early in the season and we returned regularly to monitor activity. At the East Coast plots (North and South) we monitored a total of 46 nest boxes: 44 boxes installed in 2007 and 2 old boxes. At Lookout Point we monitored 25 boxes, also installed in 2007. We saw activity in the new nest boxes for the first time this season, with boxes #19, #30 & #31 active at East Coast N. plot and box #5 active at the S. plot. We checked these active boxes for chicks beginning on 17 May and then weekly thereafter as all the boxes had incubating birds during the first check. A chick was present in #19 on June 4, but was dead the following week. The other boxes were all abandoned before chicks hatched. An adult was incubating in box #5 until at least 30 June. One of the old boxes (#17) was also active at the S. plot, but we were unable to access the nest cavity. We also monitored a total of 29 burrows at the East Coast site. Of these 15 were consistently active, and we could hear chicks in several of them. We monitored three active burrows at Lookout Point. No nest boxes were active in this location.

At Cassin's Tower we set up knock-down sticks on all potential burrows on 30 May and then re-checked on 2 July. Based on appearance of the burrow (active burrows look well used and are smelly) as well as knock-down evidence, we counted 44 active burrows. These burrows were likely

occupied by either Cassin's Auklets or Fork-tailed Storm Petrels. The amount of Storm petrel activity this season was similar to the past two years based on the number of days the species was recorded in the daily bird checklist (2009 = 31, 2008 = 28, 2007 = 34).

Sea Surveys

Boat surveys are conducted throughout the season to monitor the distribution and abundance of marine birds and mammals encountered along pre-determined 100m wide strip-transects in Laskeek Bay. The objective of the surveys is to develop a strong baseline data-set for marine wildlife in the Laskeek Bay area as well as to specifically monitor the abundance and distribution of Marbled Murrelets *Brachyramphus marmoratus*, a forest canopy nesting seabird that is provincially red listed and designated as threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). These surveys have been conducted since 1991 and represent a very important dataset within the province. We completed three near shore and one Hecate Strait survey this season.

Near shore surveys

These surveys cover the inshore waters as far North as Cumshewa Island and South to Haswell Island. We completed surveys on 9 May, 4 June, and 8 July. We counted 12 species: Marbled Murrelets, Pigeon Guillemots, White-winged Scoters *Melanitta fusca*, Pelagic Cormorants *Phalacrocorax pelagicus*, Red-necked Grebes *Podiceps grisegena*, Common Loons *Gavia immer*, Ancient Murrelets, Pacific Loons *Gavia pacifica*, Rhinoceros Auklets *Cerorhinca monocerata*, Cassin's Auklets, Glaucous-winged Gulls and Harlequin Ducks *Histrionicus histrionicus*. Our peak count of Marbled Murrelets occurred on the 8 July when we counted 172 flying or on the water within the transects.

Hecate Strait surveys

This survey takes us approximately 5 nautical miles into Hecate Strait, and allows us to see species that tend to stay farther from shore. We were only able to complete one Hecate Strait survey this season. During the survey on 21 June we sighted 9 species, including Sooty Shearwaters *Puffinus griseus*, Cassin's Auklets, Black-legged Kittiwakes *Rissa tridactyla*, Pacific Loons, Rhinoceros Auklets, Marbled Murrelets, Ancient Murrelets and Pigeon Guillemots.

Marine Mammals

We kept a daily record of all marine mammal sightings, with the exception of harbour seals *Phoca vitulina* and Steller's sea lions *Eumetopias jubatus*. These species are counted at specific haulouts during sea surveys in order to keep an index of population trends. The results of this season's sightings are summarized in Table 4.

Table 4
Total counts of marine mammals from sea surveys, sea watches and other sightings, 2004-2009†

Species (common name)	*Scientific name*	*2009*	*2008*	*2007*	*2006*	*2005*
Dall's porpoise	*Phocoenoides dalli*	0	0	0	0	1
Northern elephant seal	*Mirounga angustirostris*	0	0	0	0	0
Fin whale	*Balaenoptera physalis*	0	0	0	0	0
Grey whale	*Eschrichtius robustus*	0	0	0	1	1
Harbour porpoise	*Phocoena phocoena*	10	0	1	4	3
Humpback whale	*Megaptera novaeangliae*	102	261	203	91	15
Killer whale	*Orcinus orca*	14	18	26	4	11
Minke whale	*Balaenoptera acutorostrata*	0	1	3	1	0
Pacific white-sided dolphin	*Lagenorhynchus obliquidens*	334	0	81	365	8
California sea lion	*Zalophus californianus*	0	0	4	0	1

†Harbour seal *Phoca vitulina* and Steller sea lion *Eumetopias jubatus* sightings are not reported here. Sightings do not necessarily reflect number of individuals, e.g. in 2009 the same group of Orcas was re-sighted several times.

Humpback whales

There were fewer humpbacks in Laskeek Bay this season in comparison with the last two years. Most of our sighting took place in the first two weeks in May and then became less frequent. The most interesting humpback encounter this season occurred during camp start-up on May 1 when we heard some incredibly loud above-water vocalizations being produced by a group of whales near the Skedans Islands. These sounded identical to fog-horn blasts and due to the very calm conditions they were heard very clearly on Limestone Island approximately 4 miles away.

Killer whales

We sighted killer whales on four occasions this season. The first three encounters, 16-17 June, consisted of several sightings of the same group of individuals. We were able to identify bulls T162 and T163, accompanied by 5 smaller individuals. One small individual had a very large and distinctive hump/deformity in front of the dorsal fin. We took ID photographs of this group to contribute to the killer whale database at the Pacific Biological Station in Nanaimo. A group of two individuals was seen from Lookout Point on 3 July, however we were not able to get photographs.

Steller's sea lions

There are several sea lion haulouts in Laskeek Bay. The largest of these is on the East end of Reef Island and there are smaller haulouts on the Skedans Islands and Helmet Island. We regularly count the number of individuals on the Reef and Skedans haulouts. The maximum numbers counted this season were 468 at Reef and 137 at Skedans Islands (both on 9 May). This season we saw one marked individual, 404R, at the Reef Island haulout.

Wildlife Trees

Wildlife trees (dead standing snags used by cavity nesting birds) were monitored opportunistically from 1990-94, and since 1995 there has been a systematic effort each year to cover the island thoroughly looking for active trees. Through this monitoring program, LBCS has amassed a long term data set on tree use across many years, showing the importance of these trees as habitat for cavity nesting species. A total of 123 wildlife trees have been identified over the past twenty field seasons. The nest history of the five longest active trees monitored this season is presented in Table 5.

Table 5
History of activity by cavity nesting bird species† at wildlife trees #10, #16, #17, #33 and #45 on East Limestone Island

	Wildlife Tree #				
Year	**10**	**16**	**17**	**33**	**45**
1992	RBSA				
1993		RBSA	RBSA		
1994					
1995				RBSA	
1996		HAWO	RBSA	RBSA	RBSA
1997			CBCH	RBSA	
1998				NOFL	
1999			RBSA	RBSA & HAWO	
2000		RBSA	RBSA	RBSA	RBSA
2001	RBSA			RBSA	RBSA
2002	CBCH	RBSA	RBSA		RBSA
2003	CBCH		RBSA		RBSA
2004			RBSA	RBSA	RBNU
2005	RBSA		RBSA		CBCH
2006	RBSA		NOFL		RBSA
2007	RBSA				RBSA
2008			RBSA	RBSA	RBSA
2009	CBCH	RBSA	RBSA	RBSA	RBSA

†RBSA = Red-breasted Sapsucker, CBCH = Chestnut-backed Chickadee, NOFL = Northern Flicker, HAWO = Hairy Woodpecker

This season beginning in early May we began to visit wildlife trees looking for signs of activity. We had a total of 14 active trees this season, three of which were newly identified this year. Ten trees were occupied by Red-breasted Sapsuckers *Sphyrapicus rubber*, two by Chestnut-backed Chickadees *Peocile rufescens*, one by Hairy Woodpeckers *Picoides villosus*, and one by Brown Creepers *Certhia americana* (Table 6).

Table 6
Wildlife tree activity on East Limestone Island in 2009 †

Tree #	Cavity Nester	Tree Species	Fledge Date
10	CBCH	Ss	June 5
16	RBSA	Hw	June 13
17	RBSA	Ss	June 18
33	RBSA	Ss	June 20
45	RBSA	Ss	June 11
95	RBSA	Hw	Tree Fell
103	HAWO	Hw	June 11*
106	RBSA	Ss	June 15*
107	RBSA	Ss	June 15
112	RBSA	Hw	June 13
113	RBSA	Hw	June 22*
121	RBSA	Hw	June 13
122	CBCH	Ss	June 16
123	BRCR	Ss	June 28

†RBSA = Red-breasted Sapsucker, CBCH = Chestnut-backed Chickadee, NOFL = Northern Flicker, HAWO = Hairy Woodpecker, BRCR = Brown Creeper, Ss = Sitka spruce, Hw = Western hemlock
*Fledge dates approximate.

NATURAL HISTORY

Daily Bird Checklist

We keep a daily record of all the bird species seen or heard within Laskeek Bay. Sixty-two species were recorded in 2009, with the peak count of 40 species on 4 June. Bald Eagles, Black Oystercatchers and Winter Wrens *Troglodytes troglodytes* were recorded on all days. The less frequently sighted species this season included Whimbrel *Numenius phaeopus*, Leach's Storm Petrel *Oceanodroma leucorhoa*, Tufted Puffin *Fratercula cirrhata*, Yellow-billed Loon *Gavia adamsii*, Red-throated Loon *Gavia stellata*, Greater White-fronted Goose *Anser albifrons*, Common Merganser *Mergus merganser*, Red-breasted Merganser *Mergus serrator*, Red-necked Grebe, Wandering Tattler *Heteroscelus incanus*, Sooty Shearwater and Red-tailed Hawk *Buteo jamaicensis*.

Raptors & Corvids

Like cavity nesting birds we make a concerted effort through the season to keep track of other nesting birds including Bald Eagles, Peregrine Falcons, Common Ravens and Northwestern Crows *Corvus caurinus*.

We did not have any confirmed Bald Eagle nests this season. Although eagles were frequently observed at the Cassin's Tower nest (BAEA #5), there was no sign of chicks in the nest unlike the past few years. We observed other eagle's nests on Skedans Islands, Reef Island, S. Low Island, and Lost Islands with large chicks by the end of June. Peregrine Falcons raised two chicks on the cliff at the South side of the island. The ledge being used is the same one that was used in the past. We first observed chicks on the ledge on 31 May and they had most of their adult feathers by the end of June, fledging sometime before 12 July when they were seen flying with their parents at Lookout Point.

The Common Raven nest near the deer exclosures was again active this season. Young could be heard in the nest after 4 May and they fledged approximately 26 May when they were first observed flying with their parents. Northwestern Crows were again suspected to be breeding along the ridge near Cassin's Tower. Although we did not locate a nest we observed behaviour

consistent with nesting and heard young crows later in the season.

Other Birds

During the season we also encountered the nests of some other bird species. In 2009 LBCS is contributing to the BC Breeding Bird Atlas, and the details of opportunistic sightings that we collect in the Laskeek Bay Area are forwarded to their organization. This season we found nests belonging to Rufus Hummingbird *Selasphorus rufus*, Hermit Thrush *Catharus guttatus*, Winter Wren and Belted Kingfisher *Ceryle alcyon*. The kingfisher nest was not actually observed as it was high on a cliff West of Cassin's Tower, but we observed the adults bringing fish to the area and could hear chicks begging for food.

Plants

There are relatively few wildflowers and berry bushes left on Limestone Island as a result of heavy browsing by introduced deer. Most flowering plants are now found restricted to cliff areas where the deer cannot reach them. Through the season we kept a record of the dates on which particular species were first observed in bloom. A number of rare plants are present on Limestone due to the unique limestone geology which is uncommon on the rest of the islands. Menzies' pipsissewa *Chimaphila menziesii*, showy Jacob's ladder *Polemonium pulcherrimum*, few-flowered shooting star *Dodecatheon pulchellum* and Richardson's geranium *Geranium richardsonii* were all seen in bloom this season. We also located a very small colony of tufted saxifrage *Saxifraga cespitosa* in Boat Cove (position N 52° 54.569' W 131° 37.053'±3m WGS 84 Datum), which we believe to be the first record on the island since Newcombe made a collection there in 1913. This species is widespread on the mainland, but has been found in only two other locations on Haida Gwaii.

There are a number of invasive plants that are established on Limestone Island including bull thistle *Cirsium vulgare*, Canada thistle *Cirsium arvense*, prickly sow-thistle *Sonchus asper*, and wall lettuce *Lactuca muralis*. This season we conducted a pilot project to identify the extent of invasive plants in Laskeek Bay and to reduce the density of invasive plants on Limestone Island. A concerted effort was made to pull out accessible patches of thistle and wall lettuce that we found on the island, and we will revisit these areas next season to assess the effectiveness of the treatments. It should be noted that due to the presence of these plants on cliffs and their ability to disperse over long distances it is unlikely that permanent eradication will ever be feasible.

Introduced Species

Sitka Black-tailed Deer

Odocoileus hemionus

Deer were intentionally introduced to Haida Gwaii in 1878 to provide food for local people. Because they have no major predators on the islands, the deer population has reached very high density and has dramatically impacted plant communities, particularly in the forest understory. LBCS is a partner in the Research Group on Introduced Species (RGIS, www.rgisbc.com) which has carried out extensive research on this topic in Laskeek Bay as well as the rest of Haida Gwaii. On Limestone Island, we maintain three 20m x 20m deer exclosures that dramatically demonstrate the impact of deer browsing on native vegetation. The interior of the exclosures contain abundant red huckleberry *Vaccinium parvifolium*, salmonberry *Rubus spectabilis*, salal *Gaultheria shallon*, ferns and young cedar that are almost entirely absent from areas accessed by deer.

This season we put up a small deer exclosure around a pair of large huckleberry bushes near the main trail. These old bushes are dying of old age all over the island and we hope that this new exclosure will demonstrate how these old bushes can

regenerate from their base if relieved of browsing pressure.

Raccoons *Procyon lotor*

Raccoons were introduced in the early 1940s to provide local trappers with a source of employment. Raccoons (and also rats) are one of the largest threats to ground nesting seabirds on Haida Gwaii. With few defenses against mammalian predators, birds such as Ancient Murrelets, Cassin's Auklets and Fork-tailed Storm Petrels are very vulnerable to raccoon predation and are likely to experience rapid decline where these predators become established on colonies.

Raccoon predation is an ongoing concern on Limestone Island. During 1990 and 1991 there was considerable raccoon presence on the island and very high rates of predation. Based on predation rates observed during earlier visits to the island, it is reasonable to assume high levels of predation for the period of 1983-1989 as well (see LBCS Science Report #3 for further discussion). Raccoons were removed from the colony in 1992 and predation rates dropped dramatically. Raccoons were again present in 1993, 1994 and were suspected in 1995 and 2001. More recently a raccoon was removed from the island in 2007.

Raccoon presence was again confirmed on Limestone Island in 2009. From 1-11 May we scanned for signs of digging and scat as well as clearing the predation transects, but found nothing unusual. During the predation transects on 12 May we located fresh diggings and partly consumed carcasses characteristic of raccoon predation. At one of the diggings we retrieved hair that was later positively identified as raccoon. Raccoon scat, containing murrelet remains, was also located in the same area on 1 June. We did not complete any night-time shoreline surveys this season as we did not have a night-hunting permit in place. However, the camp supervisor spent approximately 22 hours surveying shoreline and colony areas at night in an attempt to locate the raccoon and keep it up a tree until daylight. We also set four live traps (two in cabin cove, two in boat cove) and kept them baited from 26 May until early July. As in past years, the traps did not prove to be effective, highlighting the difficulty in effectively removing raccoons from even such as small island as Limestone.

Due to the large raccoon population on Louise Island it seems likely that raccoons will continue to disperse to Limestone Island in future years. It is therefore very important to initiate spring surveys for raccoons to eliminate them on the breeding colony before birds begin breeding in early April. By the time field camp opens in early May raccoons, if present, can already have had considerable impact.

Red Squirrels *Sciurus vulgaris*

Squirrels were introduced to Haida Gwaii in 1950, perhaps to aid in cone gathering for the forest industry. Squirrels may have been introduced to Limestone directly at this time. In any case, squirrels are well established on Limestone and are known to be a nest predator on various songbird species (see www.rgisbc.com). Since 2007 we have been completing squirrel surveys on Limestone Island to measure the annual abundance of squirrels on the island. Over time we hope to describe population cycles of this introduced species and gain a better understanding of the consequences of squirrel presence.

Beaver *Castor canadensis*

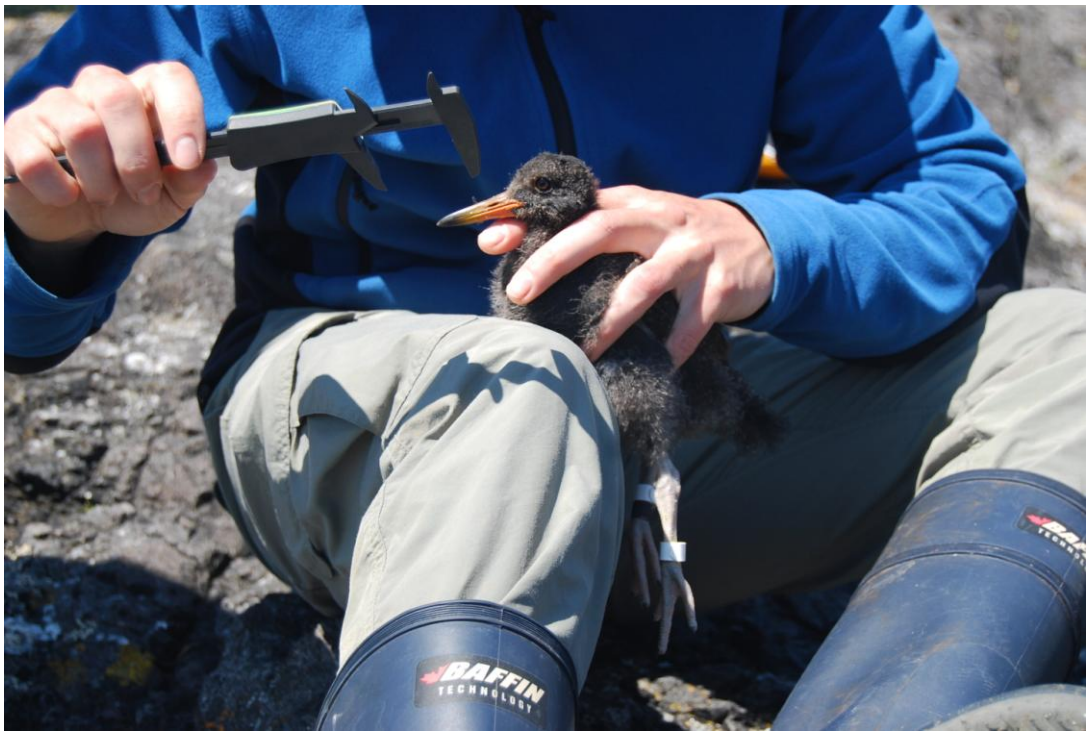
Beavers were introduced to Graham Island in 1936 in response to requests by local trappers. Since then they have become widespread on Graham, particularly in Naikoon Provincial Park. They are also present on Moresby and have been sighted on Louise Island. This season we found a huckleberry bush that had been chewed off at the base bearing the tooth marks and characteristic angled cut of beavers. This

appeared to have taken place several years ago, and we suspect that the beaver did not spend much time on the island. A willow tree, felled and stripped by beaver, was located on the Skedans Islands in 2005. This scattered evidence suggests that dispersing beavers will swim even to these smaller islands for short periods of time.

CONCLUSION

This season was a landmark achievement for Laskeek Bay Conservation Society: twenty years of research and environmental education in Laskeek Bay. Since 1990 we have been focusing on developing baselines and long-term data sets for the marine and terrestrial ecosystems of Laskeek Bay, as well as allowing volunteers, students and visitors the chance to visit our research camp. The society remains dedicated to long-term monitoring and engaging the public in addressing local conservation issues.

We continue to document serious decline in Ancient Murrelet population breeding on Limestone Island, likely as a result of predation by raccoons as well as other less understood factors. We continue to place great emphasis on reducing the impact of our research activities while still maintaining our commitment to long-term monitoring of the population with hopes of more fully understanding the reasons for this decline. Our presence on the island may well be the sole defence that Ancient Murrelets have against raccoons, and therefore the importance of raccoon eradication on the island, particularly early in the season cannot be overstated. The lessons that we learn on Limestone Island will be of great importance when considering the prospects of other colonies threatened by introduced raccoons and rats as they continue to disperse throughout the many islands of Haida Gwaii.



Banding and measuring Black Oystercatcher chick
Photo: Hussein Alidina

SIGHTING OF BANDED BRANDT'S CORMORANT *PHALACROCORAX PENICILLATUS* ON HAIDA GWAII

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Brandt's Cormorant *Phalacrocorax penicillatus* is one of three species of cormorant found along the west coast of North America. Highest breeding concentrations occur along the California and Oregon coasts, where rich upwellings from the California Current are strong during spring and summer. Five breeding colonies, all on Vancouver Island, are known in Canada, although never more than two have been active in any given year (Campbell et al. 1990). Brandt's Cormorant is suspected of occasionally breeding on Sartine Island (Vermeer 1976), although this has never been confirmed. It has also occasionally bred as far north as south east Alaska (Wallace and Wallace 1998).

Brandt's Cormorant is unusual in that after the breeding season, when the effects of the California Current upwelling diminish, many migrate northwards along the coast, some as far as Prince William Sound, Alaska. On Haida Gwaii it is commonly seen during winter and early spring, but by late April most have returned to their breeding grounds (Campbell et al. 1990). In Laskeek Bay it has been recorded in most years since research began in 1984 (Gaston and Jones 1991; Gaston 2003), although few sightings have been made since 2004 (Laskeek Bay Conservation Society, unpublished data). The lack of sightings in recent years is probably a reflection of the later opening of field camps, rather than any trend in abundance. Most sightings have been in March and April but sightings in May and June have also been recorded. In this note we document the occurrence of a banded subadult Brandt's Cormorant as well as a number of adults in breeding plumage at Reef Islet, Laskeek Bay.

Figure 1
Brandt's Cormorants observed among Steller sea lions on Reef Islet, Laskeek Bay on 15 April 2008. Note white tufts on the breeding adults. Photo: W. Szaniszlo

On 15 April 2008, we conducted a survey of Steller sea lions *Eumetopias jubatus* at the haulouts in Laskeek Bay. Animals hauled out on the rocks were photographed by WS using a Nikon D70 digital camera with an 80 – 400 mm f4.5-5.6 ED AF zoom lens. While doing so, we noted and photographed seven cormorants, some of which had unusual tufts of white feathers extending back from the side of the head. When we examined these photographs in greater detail on a laptop computer we found that three of the birds had a bright blue gular pouch with pale yellowish feathers posterior of the pouch, as well as tufts of white feathers on their head and/or wings, indicating that they were Brandt's Cormorants in breeding plumage (Fig. 1). The remaining four cormorants in the photographs had a browner plumage suggesting that they were sub-adults. We also noted that one of the sub-adults carried a yellow band on its right

leg and a metallic band on its left leg (Fig. 2). This combination of bands is consistent with Brandt's Cormorants banded as nestlings on South Farallon Island (latitude 37° 41' N, longitude 123° 00' W), California in 2006 (R. Bradley, personal communication).

Figure 2
Close up of Brandt's Cormorants photographed on Reef Islet, Laskeek Bay, 15 April 2008. Note the yellow and silver bands on the legs of the second bird from the left. Photo: W. Szaniszlo.

Brandt's Cormorant nesting activities on the Farallon Islands have been monitored and young have been banded for nearly four decades (Wallace and Wallace 1998). In a study spanning the years 1971 to 1982, 399 first year Brandt's cormorants were banded and their dispersal monitored. After fledging, most moved northward along the coast to northern California and Oregon where they spent the winter. A small number of banded birds were recovered in B.C. but none were further north than the north end of Vancouver Island (Campbell et al. 1990, Gaston et al. 2008). To the best of our knowledge, our sighting marks the furthest north record for a bird banded on the Farallones.

Brandt's cormorants are relatively common visitors to Haida Gwaii during winter and sightings have often included birds in breeding plumage. By April however, breeding birds are beginning to return south, and only non-breeding birds are seen during May and June. This is consistent with studies on Farallon Island, which have found that males usually arrive back at breeding colony by late April to early May, while females do not return until early to mid May (Wallace and Wallace 1998). Hence, for breeding birds to be seen in Laskeek Bay in mid April 2008 may not be unusually late. In fact, nesting activities on the Farallones were very late in 2008, and reproductive success was low (R. Bradley, personal communication), so this apparent tardiness in returning to the colony may have actually been typical of most breeding cormorants that year. In previous years, disruptions in breeding activities such as this were usually associated with an El Niño event, which influences nutrient-rich upwellings and causes declines in prey abundance (Wallace and Wallace 1998; Wilson 1991). However, La Niña conditions prevailed between August 2007 and May 2008 (NOAA Climate Prediction Center. http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/lanina/), so this does not explain the late season and poor reproductive success.

We thank A. Gaston and R. Bradley for their assistance in tracking down where this Brandt's cormorant was banded.

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Orcas off Vertical Point, Laskeek Bay
Photo: Harvey Thommasen

DIVE BEHAVIOUR OF TWO SYMPATRIC, PLANKTIVOROUS ALCIDS

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Although the dive behaviour of the larger alcids has been well-described (over twenty articles on the dive behaviour of Thick-billed Murres alone), the dive behaviour of planktivorous alcids has never been described using time-depth recorders, with the exception of some limited data on the Little Auk *Alle alle*. This is a major gap in our knowledge of the auks, as the majority of alcids are planktivorous. A dozen species of small, planktivorous alcids (*Aethia*, *Cyclorhynchus*, *Ptychoramphus* and *Synthliboramphus* spp.) dominate the North Pacific seabird community. In the largely plantivorous genus *Synthliboramphus*, three of the four species are considered Threatened, yet the at-sea behaviour of all four species is very poorly known (Gaston and Jones 1998).

To learn something about the dive behaviour of two species of planktivorous alcids, Ancient Murrelet Synthliboramphus antiquus and Cassin's Auklet *Ptychoramphus aleuticus*, we initiated a preliminary study at Reef Island, Haida Gwaii, BC. In May 2008, we attached time-depth-temperature recorders (Lotek 1100s) to three Ancient Murrelet and one Cassin's Auklet and maximum-depth recorders to four Ancients Murrelets and two Cassin's Auklets. All birds were incubating. The devices recorded for 55 hours.

Maximum dive depth averaged 32 ± 3 (SD) m for murrelets and 28 ± 1 m for auklets. The auklet made 218 dives in one day, averaging 46 ± 20 s (max = 87 s) in duration. The murrelets made 568 dives per day, averaging 23 ± 12 s (max = 60 s) in duration. An earlier study showed that auklets averaged 28 m (max = 43 m) during chick-rearing with most of the time spent between 3 and 13 m.

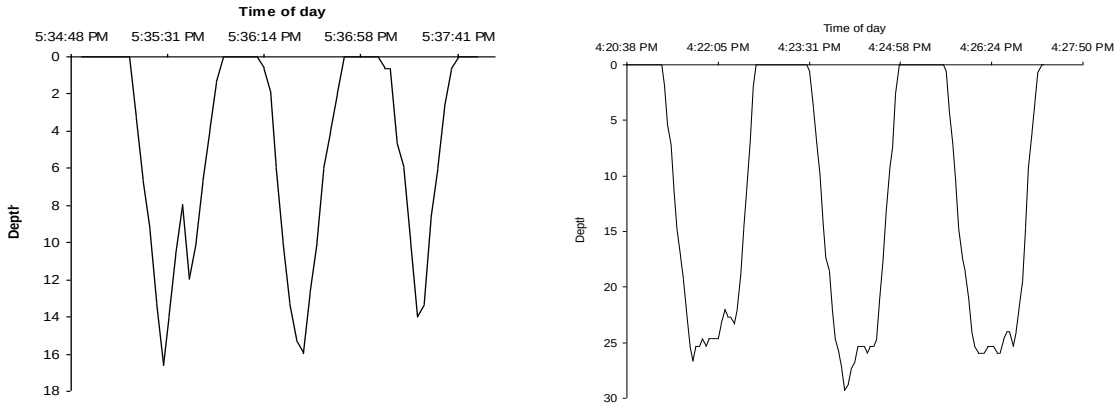

Figure 1
Typical dive profiles for a (a) murrelet and (b) auklet. Note the difference in vertical scale.

Dive profiles for the Ancient Murrelets were usually V-shaped. The dives were very similar to those associated with Razorbills *Alca torda* and Rhinoceros Aukets *Cerorhinca monocerata* feeding on sandlance and Thick-billed Murres feeding

on pelagic prey, especially sandlance *Ammodytes* spp., amphipods and larval fish (Benvenuti *et al.* 2001, Kuroki *et al.* 2003, Elliott et al. 2008). We suggest that the murrelets were feeding predominately on planktonic larval fish, especially sandlance, and euphasiids. Stomach contents from Langara Island during early incubation were also dominated by euphasiids, while those later in the year were dominated by larval sandlance (Sealy 1975).

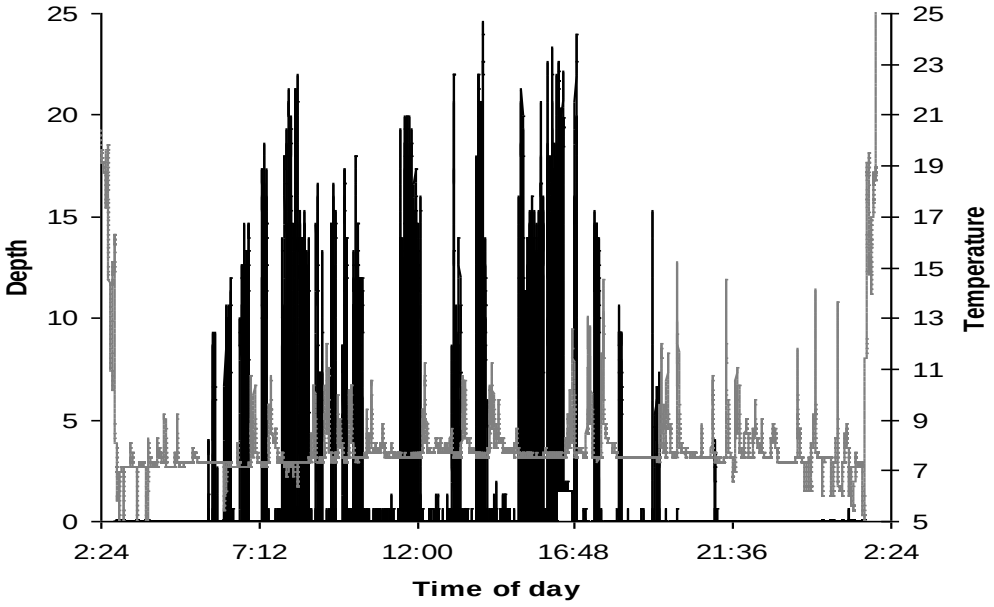

Figure 2
A day in the life of a Cassin's Auklet. Temperature shown in grey, depth in black. The large number of short flights makes it difficult to determine a foraging range.

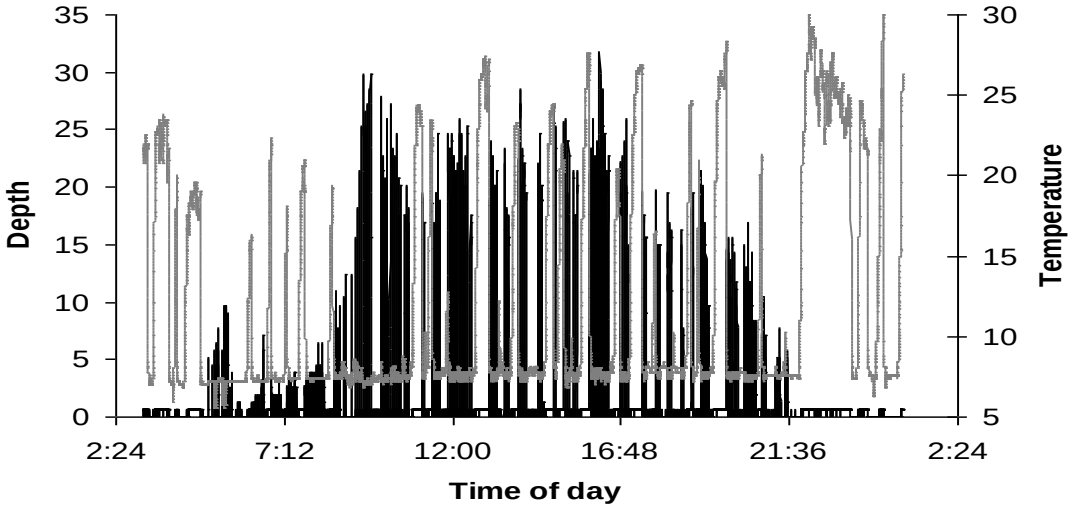

Figure 3
A day in the life of an Ancient Murrelet. The logger suggests that the bird may have returned to the colony around 22:00—it did not actually switch over with its mate until 24 hours after the last time shown here.

Dive profiles for Cassin's were usually more U-shaped, with a flatter bottom, punctuated by wiggles. The ragged bottoms, with several wiggles, were similar to those associated with *Spheniscus* penguins feeding on schooling fish (Simeone and Wilson 2003). In that case, each wiggle represents a prey capture event (90% accuracy). We assumed that auklets were feeding predominately on schooling fish, as has been suggested from studies of adult regurgitations (Vermeer *et al*. 1985, Burger and Powell 1990).

In comparison to penguins, the maximum depths and dive profiles of 200g planktivorous alcids were very similar to 3 kg penguins (Takahashi *et al*. 2004). Thus, despite very differing morphology (smaller size, ability to fly), alcids appear to have similar dive abilities and foraging tactics for capturing marine prey as penguins at the other end of the world. The dive behavior reported here is similar to that described for Dovekies in Greenland: maximum depth of about 26 m, average depth 10 m; average duration 52 s; most dives V-shaped; return flight times of 21 mins (Egevang *et al.* 2006).

To examine oxygen stores, we collected muscle (n = 5) and blood (n = 10) samples from non-breeding Ancient Murrelets and incubating Cassin's Auklets. Hemoglobin content and buffering capacity was high while myoglobin stores were low. The high blood oxygen levels and buffering capability suggests that these small divers are under strong selection to extend dive duration. In keeping with the longer dive durations and shorter surface pauses despite smaller size, auklets had relatively higher oxygen stores, except in the legs. Nonetheless, higher oxygen stores could also be due to the murrelets being non-breeders and the auklets being breeders.

Table 1
Comparison of respiratory blood chemistry in Cassin's Auklet, Ancient Murrelet and Thick-billed Murre

Species	***Cassin's Auklet***	***Ancient Murrelet***	***Thick-billed Murre*[1]**
Hematocrit	55 ± 2	50 ± 2	53 ± 2
Hemoglobin content (g/dL)	20.7 ± 0.6	19.6 ± 1.3	18.0 ± 1.8
Buffering capacity (μmol NaOH per unit pH)	72 ± 2	64 ± 2	
Myoglobin concentration –breast (g/dg)	10.6 ± 0.3	10.0 ± 0.2	19 ± 1
Myoglobin concentration –legs (g/dg)	8.0 ± 0.4	9.4 ± 0.5	
Myoglobin concentration –heart (g/dg)	6.3 ± 0.3	6.1 ± 0.9	

[1]Value for Thick-billed Murre *Uria lomvia* from Croll et al. 1992

Future research could include comparing the hematocrit values between non-breeding and incubating murrelets to see if oxygen levels differ between periods, obtaining oxygen stores for a non-diving Charadriiform bird (i.e. Black Oystercatcher *Haematopus bachmanni*) and obtaining a larger sample of dive records, perhaps by using 2.8g devices. Devices that record for >48 h would be particularly useful.

We conclude that time-depth recorders can provide valuable information about the prey items, prey capture tactics and foraging parameters (foraging radius, dive depths) of planktivorous alcids. Knowledge of how birds use the marine environment is important to develop marine conservation strategies that benefit seabirds. For example, the Gwaii Haanas National Marine Conservation Area, adjacent to the National Park and Reef Island, is currently in the planning phase; knowledge of what areas auklets and murrelets utilize could be useful for selecting areas to protect that maximize benefit to these birds.

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A STUDY OF INVASIVE ALIEN PLANT DISTRIBUTION IN LASKEEK BAY

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INTRODUCTION

The following report outlines the Invasive Alien Plant Project for Laskeek Bay conducted in 2009. The report includes a brief background and description of the project, the methodology and results from 15 site surveys, and a discussion of the implications of invasive plants in relation to deer browsing. The project was funded by the Northwest Invasive Species Plant Council (NWIPC) and conducted by Laskeek Bay Conservation Society staff Christine Pansino (Executive Director), Jake Pattison (Camp supervisor / biologist), Ainsley Brown (Biologist / interpreter) and Annie McKenzie (volunteer).

BACKGROUND

Introduced plant species are of concern because of their ability to out-compete native species, due to biological and genetic adaptations that make them successful in foreign environments. These adaptations favour their growth, occasionally with the complete loss of native species. Laskeek Bay contains a host of non-native invasive species including wall lettuce *Lactuca muralis*, Canada thistle *Cirsium arvense*, bull thistle *Cirsium vulgare*, and prickly sow thistle *Sonchus asper*. There are many other non-native species in this area but these four were selected as the focus of this study due to their invasive nature.

Staff and volunteers of Laskeek Bay Conservation Society annually monitor rare plants on East Limestone Island and adjacent islands in Laskeek Bay. In 2002, an inventory of the rare plants on East Limestone Island was compiled by Joanna Smith. Plants such as cut-leafed anemone *Anemone multifida* and Richardson's geranium *Geranium richardsonii* were identified and are restricted on Haida Gwaii to East Limestone Island (Smith, 2003). A complete list of plant species identified on the islands of Laskeek Bay was published in 2006 (Gaston et al. 2006). In 2007, the most current inventory of plants on East Limestone Island was completed by Mike Cheney in partnership with the NWIPC as part of the BC Invasive Alien Plant Program. The results of these surveys indicate that the diversity of rare and uncommon plants on East Limestone Island make this island one of the most important locations for plants on Haida Gwaii. Invasive alien plants out-compete many native species and as a result are at least partially responsible for declines in native plant populations in Laskeek Bay.

PROJECT DESCRIPTION

Goals/Objectives

The goal of this project was threefold: (1) to inventory Laskeek Bay for occurrences of the four invasive alien species of concern, (2) to implement mechanical treatments and (3) to monitor the area for future infestations of these species.

Project Location

The location of this project was Laskeek Bay, Haida Gwaii, British Columbia. Laskeek Bay includes East Limestone Island, West Limestone Island, Reef Island, the Low Islands, the Skedans Islands (all part of a BC Wildlife Management Area), plus Haswell Island and Vertical Point on Louise Island (both Provincial Crown Land). Laskeek Bay is located just north of Gwaii Haanas National Park and Haida Heritage Site, making it a key location for potential invasive species entry into the park. Laskeek Bay is located on the eastern side of Haida Gwaii in the Coastal Western Hemlock Zone, wet Hypermaritime sub-zone.

METHODS

East Limestone Island, West Limestone Island, Reef Island, the Low Islands, the Skedans Islands, Haswell Island and Vertical Point were visited to determine the presence or absence of the invasive plants of interest. Due to lack of time, only East Limestone Island was completely inventoried and treated (where possible). Visits to the other islands provided general information on the invasive plants present although no treatment was conducted.

Staff and volunteers surveyed the islands to determine the location of the invasive plants of concern. It was determined that these plants were mainly present along the edge of the forest and did not commonly grow in the forest interior. An area with invasive plants with more than 10 plants in a 10 x 10m area was defined as an Invasive Alien Plant Site and Invasive Plant Inventory Record form was completed. Areas with less than 10 plants per 10 x 10m were not defined as sites due to lack of time. The invasive plants in these areas were still removed; however, no forms were completed. Photo documentation was also collected for all sites.

All invasive plants that could be pulled were removed for each site, except for those that were located in areas that could not be safely reached. Plants without flowers were pulled and left to decompose on the rocks. Plants with flowers were deposited in the ocean. All completed forms were then entered into the IAPP database.

RESULTS

Fifteen Site and Invasive Plant Inventory Record forms were completed; 14 for East Limestone Island. All of the sites were located along the edge of the forest in exposed areas. See Appendix 1 for a list of site identification numbers provided by NWIPC, site coordinates as well as the slope, aspect and elevation.

The most common species were *Cirsium vulgare* found in 14 sites, followed by *Cirsium arvense* present in eight sites. *Lactuca muralis* was identified in three sites. *Sonchus* species were identified in five sites. A complete list of the area, distribution and density for each invasive plant site can be found in Appendix 2.

East Limestone Island

All four invasive species of concern were identified on East Limestone Island. These invasive species were concentrated on the southeast side of East Limestone Island; no sites were identified along the west side and only one site on the north side. The most common invasive species on East Limestone Island was *Cirsium vulgare.* The south side of the island contained the most invasive plants due to the exposed cliffs and sun. A large plot (approximately 30x30m) of thistles on the south side was also removed. These thistles were identified as *Cirsium brevistylum.* No site form was recorded for this plot.

Other Islands in Laskeek Bay

All other islands in Laskeek Bay were visited to determine if invasive species were present and to what extent they had spread. Due to lack of time, a complete survey of these islands was not possible and no removal was performed. The information collected from these islands will provide baseline information so that we can decide where to focus our efforts in following years.

Haswell Island contained *Cirsium vulgare, Sonchus* species and *Senecio vulgaris* along the southeast side of the island. The northeast side of the island was not surveyed. The Lost Islands were visited on 20 June and *Cirsium vulgare* was identified on the western part of the gull colony. There were approximately 30 plants in a 5 x 5m area. No other invasive plants were observed on the Lost Islands. The Skedans Islands were visited on 13 June: *Cirsium vulgare* was present on the east end of the islands. Vertical Point was visited on 25 June; there were several *Cirsium vulgare* individuals along the beach near the camp. No invasive plant species were seen on Low or South Low islands. All four invasive plants of concern were identified on Reef Island. West Limestone Island was visited on 30 June; both *Cirsium vulgare* and *Cirsium arvense* were found consistently along the edge of the forest on the south side of the island. There was no sign of *Lactuca muralis*.

Table 1
Invasive plants identified in Laskeek Bay

Island	Invasive Plants
East Limestone Island	*Lactuca muralis* *Cirsium arvense* *Cirsium vulgare* *Sonchus asper* *Cirsium brevistylum*
Haswell Island	*Cirsium vulgare* *Sonchus* species *Senecio vulgaris*
Lost	*Cirsium vulgare*
Skedans	*Cirsium vulgare*
Vertical Point	*Cirsium vulgare*
Low	None
South Low	None
Reef	*Lactuca muralis* *Cirsium arvense* *Cirsium vulgare* *Sonchus asper*
West Limestone Island	*Cirsium vulgare* *Cirsium arvense*

DISCUSSION

Invasive plants are prevalent in Laskeek Bay. As we do not know when these plants first colonized the region it is difficult to know how their distribution has changed over the years. By collecting this information, we will be able to determine if their distribution is changing and new areas are being colonized.

One of the goals for removing invasive plants is to allow native, non-invasive plants an area to grow. However, due to the presence of deer on most of the islands in Laskeek Bay, a large portion of native vegetation has been browsed. Sitka Black-tailed Deer were introduced to the islands in the early 1900's as a source of meat for residents. However, the deer population increased rapidly in the absence of natural predators on the islands (no coyotes, wolves or cougars) and many of the smaller islands were colonized (Pojar et al. 1980). Currently, the only islands in Laskeek Bay without deer are the Lost Islands, Low and South Low islands. These islands are too small and far away from Louise Island for deer to regularly swim there. Deer recently colonized the Skedans Islands and are already having a noticeable effect on the vegetation (J-L. Martin, pers. comm., 2009).

Invasive species are more likely to colonize islands where deer are present (Gaston et al., 2006). Most fringe vegetation on the islands of Laskeek Bay has already been browsed. Although invasive plants generally inhabit these fringe areas, they contain sharp spines that inhibit browsing by deer. Ideally, by removing invasive plants, native plants will be able to grow. However, because the deer are browsing this native vegetation, it is uncertain if native plants will be able to re-establish. By monitoring the effects of invasive plant removal, we will be able to determine how great of an impact mechanical treatments have on these islands.

CONCLUSION

It is important to record the current distribution and density of invasive plant species in Laskeek Bay in order to study how these change over time. Although the effects of the deer on the native vegetation are substantial, without invasive plant removal, the invasive plants may continue to multiply and spread, colonizing new areas.

Public education was an important outcome of this project. Twenty volunteers participated in the project, many of whom were from different countries. By teaching people the negative impacts of invasive plants and techniques for removal, we are creating awareness of these issues worldwide.

The third phase of the project will need to be completed in subsequent years: monitoring the area for future infestations of these species. Each site will need to be visited to determine if the methods of removal were effective and whether native plants were able to recolonize these areas. It would also be valuable to re-visit the other islands in Laskeek Bay and remove the invasive plants that were identified this year.

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Appendix 1
Site Coordinates, Slope, Aspect and Elevation

Site #	Site ID (IAPP Database)	Location - description	UTM Coordinates		Slope (%)	Aspect (degrees)	Elevation (m asl)
			Easting	Northing			
1	254988	ELI – Cabin cove	0324596	5865253	60	180	12
2	254998	ELI – Cabin cove	0324492	5865217	5	0	9
3	255000	ELI – End of Ridge trail	0324425	5864767	100	180	38
4	255001	ELI – Cabin cove	0324543	5865302	10	90	20
5	255002	ELI – Cabin cove	0324559	5865315	85	180	23
6	255003	ELI – North shore Cassin's	0324579	5865332	5	180	35
7	255004	ELI – North Cove	0324354	5865549	50	90	12
8	255005	ELI – Crow Valley	0324523	5864906	1	120	2
9	255006	ELI – Lookout Point	0324676	5865039	5	90	20
10	255007	ELI – South Cliffs	0324057	5864974	100	210	5
11	255009	ELI – South Cliffs	0324190	5864891	100	210	2
12	255010	ELI – South Cliffs	0324266	5864844	100	210	10
13	255011	ELI – South Cliffs	0324256	5864848	10	210	5
14	255012	ELI – South Cliffs	0324308	5864837	100	210	15
15	255013	Haswell – Southeast side	0319127	5860124	66	140	5

Appendix 2
Invasive Species Area, Distribution and Density for Each Site

Site #	Invasive Species	Area (Ha)	Distribution (see App 3)	Density (plants/m^2)
1	*Cirsium vulgare*	0.001	8	>10
2	*Lactuca muralis*	0.0012	6	>10
	Cirsium vulgare	0.0012	4	>10
3	*Cirsium vulgare*	0.04	4	2-5
4	*Lactuca muralis*	0.0002	3	>10
	Cirsium vulgare	0.0001	2	<=1
5	*Cirsium arvense*	0.001	7	2-5
	Cirsium vulgare	0.005	7	6-10
6	*Cirsium vulgare*	0.01	7	<=1
	Sonchus species	0.0001	1	<=1
7	*Cirsium vulgare*	0.001	2	2-5
8	*Lactuca muralis*	0.4	4	2-5
	Cirsium arvense	0.4	4	2-5
	Cirsium vulgare	0.4	4	2-5
9	*Cirsium vulgare*	0.05	5	2-5
	Cirsium arvense	0.05	5	2-5
10	*Cirsium vulgare*	0.05	4	2-5
	Cirsium arvense	0.05	4	6-10
11	*Sonchus* species	0.002	9	>10
	Cirsium arvense	0.002	2	<=1
12	*Cirsium vulgare*	0.04	4	6-10
	Cirsium arvense	0.04	4	6-10
	Sonchus species	0.04	1	<=1
13	*Cirsium vulgare*	0.016	7	2-5
	Cirsium arvense	0.016	7	2-5
	Sonchus species	0.016	7	2-5
14	*Cirsium vulgare*	0.04	8	>10
	Cirsium arvense	0.04	5	2-5
15	*Cirsium vulgare*	0.2	5	<=1
	Sonchus species	0.05	5	<=1
	Senecio vulgaris	0.01	4	<=1

Appendix 3
Distribution Codes (used in Appendix 2)

Code	Description
1	Rare individual, a single occurrence
2	Few sporadically occurring individuals
3	Single patch or clump of a species
4	Several sporadically occurring individuals
5	A few patches or clumps of a species
6	Several well-spaced patches or clumps
7	Continuous uniform occurrence of well-spaced individuals
8	Continuous occurrence of a species with a few gaps in the distribution
9	Continuous dense occurrence of a species

Menzies' pipsissewa found blooming beside cabin, East Limestone Island
Photo: Leigh Joseph

TUFTED SAXIFRAGE *SAXIFRAGA CESPITOSA* FOUND BLOOMING ON EAST LIMESTONE ISLAND

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Tufted saxifrage *Saxifraga cespitosa* is a widely distributed circumpolar species common in mainland British Columbia and other mountainous regions of North America. The species is rare on the Queen Charlotte Islands (Haida Gwaii), and is known only from several isolated locations: Towustasin Hill (Juskatla Inlet), South Low Island (Laskeek Bay) and East Limestone Island (Laskeek Bay) (Calder and Taylor 1968). The only record from East Limestone Island dates to a collection made by C. F. Newcombe in 1913 (Calder and Taylor 1968).

A small colony of *S. cespitosa* was observed flowering on E. Limestone Island on 10 May 2009 (Fig 1). The plants were located on an outcrop in Boat Cove just to the West of a much more obvious colony of *Polemonium pulcherrimum* (position N 52° 54.569' W 131° 37.053'±3m WGS 84 Datum). The colony consisted of approximately five tightly clumped plants growing on relatively bare limestone substrate 3 m above the high water mark. Calder and Taylor (1968) located *S. cespitosa* growing on a similar limestone outcrop on nearby South Low Island in 1964. It is interesting to observe this typically alpine species persisting at isolated sea-level sites on Haida Gwaii.

Figure 1
***Saxifraga cespitosa* growing on limestone outcrop, East Limestone Island, May 2009**
Photo: Jake Pattison

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