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## EAST LIMESTONE ISLAND FIELD STATION

### FIELD SEASON REPORT 2015



#### SUMMARY

This was the Laskeek Bay Conservation Society's 26<sup>th</sup> field season on East Limestone Island, Laskeek Bay, Haida Gwaii. The season ran from 1 May to 11 July, bringing 18 volunteers and a total of 99 visitors to the island, including 43 students and 12 teachers/chaperones who came with Project Limestone. Ancient Murrelet chick departures at Cabin Cove were the lowest recorded to date, and are a serious concern. Adult Ancient Murrelet activity appeared normal. No raccoons were detected on the island, during 3 shoreline surveys in March and 1 in June, or on remote baited cameras throughout the field season. Black Oystercatcher surveys were conducted in both Laskeek Bay and in Gwaii Haanas. Glaucous-winged Gull censuses were conducted in colonies in Laskeek Bay and 299 active nests at 3 colonies were found. Pigeon Guillemots use of the 27 nest boxes at Lookout Point was high, but eggs and chicks had all been abandoned by the end of the field season. There were 4 Cassin's Auklet chicks that were measured and weighed in nestboxes and 3 chicks had fledged by 10 July. Three near-shore sea surveys were completed and Marbled Murrelet counts were higher than 2014, and slightly lower than 2013. Two Hecate Strait sea surveys were completed. Marine mammal sightings this season included 13 Humpbacks, 4 Minke whales, 13 Harbour porpoises and 10 sightings of small groups of Killer whales. 14 wildlife trees were active: 6 with Red-breasted Sapsuckers, 2 with Chestnut-backed Chickadees, 2 with Hairy Woodpeckers, 2 with Brown Creepers, 1 with both a Red-breasted Sapsucker and Red-breasted Nuthatch, and 1 with both a Red-breasted Sapsucker and Northern Flicker. A Common Raven nest and a Bald Eagle nest were active and produced young. Another Bald Eagle nest and the Peregrine Falcon nest had signs of activity, but no young were observed.

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**TABLE OF CONTENTS**

**EDUCATION AND INTERPRETATION PROGRAM.....2**  
    **Project Limestone.....3**  
    **Volunteers .....3**  
    **Visitors.....3**  
    **Staff.....4**  
    **Student Interns .....4**  
    **Other Research Projects .....4**  
**RESEARCH AND MONITORING PROGRAMS.....4**  
    **Ancient Murrelets *Synthliboramphus antiquus*.....4**  
    **Black Oystercatchers *Haematopus bachmani* .....10**  
    **Glaucous-winged Gulls *Larus glaucescens*.....13**  
    **Pigeon Guillemots *Cephus columba* .....14**  
    **Cassin’s Auklets and Fork-tailed Storm Petrels .....15**  
    **Sea Surveys .....16**  
    **Marine Mammals .....17**  
    **Wildlife Trees.....18**  
**NATURAL HISTORY .....19**  
    **Daily Bird Checklist .....19**  
    **Raptors and Corvids .....19**  
    **Plants .....20**  
    **Introduced Species .....20**  
**CONCLUSION .....22**  
**ACKNOWLEDGEMENTS .....24**

**INTRODUCTION**

Laskeek Bay Conservation Society (LBCS) is a non-profit organization committed to increasing appreciation and understanding of the natural environment through biological research, interpretive programs and public involvement. The field station at East Limestone Island has been in operation for 26 consecutive field seasons and over this period LBCS has developed diverse long-term monitoring and public education projects in Laskeek Bay. Volunteers assist researchers with data collection in order to study the abundance, distribution, and life history of wildlife in Laskeek Bay. This information helps us understand the fluctuations in marine and terrestrial ecosystems and gives a baseline against which we can describe changes in the future due to introduced species, marine pollution, global climate change, extreme weather events, and other threats to coastal ecosystems.

**EDUCATION AND INTERPRETATION PROGRAM**

LBCS provides opportunities for public involvement in research and monitoring activities through Project Limestone, our volunteer program, and interpretive tours. Students, volunteers, and visitors come to our field camp and participate in the projects that are occurring throughout the season. By bringing people to our camp and encouraging participation in research activities, we hope to increase public awareness of local conservation issues, and increase public knowledge of the natural history of Laskeek Bay.

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## **Project Limestone**

Project Limestone brings local students to Limestone Island to learn about natural history and participate in Ancient Murrelet research. The students are led on an interpretive tour, which crosses the island and ends at Lookout Point. They learn about the natural history and geography of the area, and are introduced to the various projects that we run. They assist with the Ancient Murrelet monitoring work from 10:30 pm to 2:30 am. The students learn about Ancient Murrelet life history as they help to capture, weigh, and release chicks. Along with participating in Ancient Murrelet night work, the students have time to observe and learn about the birds and introduced species on Limestone Island, scan Laskeek Bay for marine mammals, and help to check Cassin's Auklet nest boxes for activity.

This year 6 groups from 4 different schools camped on Louise Island opposite West Limestone Island, spent one night in the research camp on East Limestone Island, and returned to their camp the next morning. There were a total of 43 students from grades 3 to 12, and 12 teachers / chaperones. The first student group was from George M. Dawson (Masset) on 16 May. The Living and Learning School (Queen Charlotte) arrived on 17 May. Two groups of students came from Queen Charlotte Secondary School, on 20 and 22 May, and two groups came from Tahayghen Elementary (Masset) on 24 and 25 May. Project Limestone began in 1991, and to date 709 students have visited the island as part of this program, some multiple times

## **Volunteers**

Volunteers play an important role in the operation of the field camp on Limestone Island. They generally stay for one week, and help staff with research and monitoring projects, camp maintenance, and daily chores. Volunteer contributions of time and energy are essential to keep the field camp going and to continue long-term data collection. LBCS provides a unique opportunity for the general public to be involved in long-term research in a remote field camp.

This year we had 19 volunteers who contributed 127 volunteer days to projects on Limestone, in other areas of Laskeek Bay, and in Gwaii Haanas. Most volunteers stayed for one week. Six volunteers had visited or volunteered on the island previously. Other than 1 volunteer from Newfoundland, all volunteers were from British Columbia this year: 12 were from Haida Gwaii, and 6 from other parts of BC.

## **Visitors**

The LBCS visitor program provides an opportunity for tour groups to visit Limestone Island and receive an interpretive tour of the island from a staff member. While visitors walk across the island, they are introduced to the natural history of the area and to the monitoring and research projects that we conduct. LBCS aims to bring about greater understanding of the natural world and increased awareness of local conservation issues through the visitor program.

Generally, visitor groups who stop on Limestone Island are partaking in ecotourism excursions into Gwaii Haanas. This year, although we had fewer scheduled sailboat tours, we had a variety of other visitors. We had visits from 3 tour groups: *Moresby Explorers* on 8 May, *Gnoses* on 8 June, and the *Mapleleaf* on 7 July. Other visitors were a film crew from UNIS, brought by *Moresby Explorer* and a Parks Canada Staff member on 13 May, the crew of the *Gnoses* on 19 May, 4 visits from previous LBCS staff members and their families, and two kayakers on 8 July.

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In total there were 44 visitors to the island throughout the field season, 99 including the school groups.

### **Staff**

LBCS staff this year were Vivian Pattison, Camp Supervisor, Ellen Hunter Perkins, Assistant Biologist/Interpreter, and Alan Moore, Field Camp Coordinator. Jake Pattison joined the staff as supervisor for the first Gwaii Haanas Black Oystercatcher survey at the beginning of June.

### **Student Interns**

In 1998, LBCS began a program that provides students in biology or environmental studies with an opportunity to gain valuable hands-on field experience as an intern on Limestone for a four to six week period. This year's interns were Gabriella Zagorski, Isla Davidson and Sara McDonald. Gabriella, a student from the University of Guelph, Ontario, contributed 3 weeks to projects on Limestone Island and in Laskeek Bay. Isla, a student at the University of Exeter in Cambridge, UK, was in the field camp for 4 weeks (including 5 days of BLOY survey work in Gwaii Haanas). Sara, from the University of the Fraser Valley, BC, spent 3 weeks in camp (including 5 days of BLOY survey work in Gwaii Haanas). Sara also worked in the Queen Charlotte office for a week, assisting with data entry and report writing. In total the interns this season contributed 77 days to field and office work.

### **Other Research Projects**

LBCS assists with other research and monitoring projects in Laskeek Bay and the surrounding area. In previous years we have assisted with Project BAMBI, a four-year study focused on understanding deer behaviour and how it changes in response to predation risk. This project, an initiative of the Research Group on Introduced Species (RGIS), was completed last season, and RGIS did not conduct any field work in Laskeek Bay this season. See section below on Introduced Species for information on how LBCS continues to support this project.

In early May, LBCS provided logistical support and staff for a project on Reef Island led by the Canadian Wildlife Service (CWS). One CWS staff member (Glen Keddie) and one LBCS staff member (Jake Pattison), along with 2 volunteers, spent 7 days on the island. Two Ancient Murrelet burrow plots containing 25 burrows had been set up on the south-east side of the island in 2014. In 2014, adults from the burrows were banded with geolocators, small devices that track the location of the bird throughout the year. This season, the geolocators had to be retrieved in order to download the data. In 2015, 9 geolocators were successfully retrieved during the trip in early May. LBCS staff and volunteers from Limestone Island also went back to the burrows later in the season to determine if any eggs had been abandoned. Of the 14 burrows that had eggs in May, 2 burrows contained 1 egg each that had not hatched, and 1 burrow contained 4 abandoned eggs.

## **RESEARCH AND MONITORING PROGRAMS**

### **Ancient Murrelets** *Synthliboramphus antiquus*

#### *Chick capture work*

The monitoring of chick-capture funnels 5-8 in Cabin Cove began on 7 May. Funnels were closed nightly to capture departing chicks from 22:30-02:30 for the period of 7-19 May and 23:00-02:30

after 19 May to compensate for increasing day length. Funnels were checked at regular 15 minute intervals and the date, time, location (funnel number) and mass for each departing chick was recorded. Funnel protocol is kept constant across years so that the number of chicks departing gives a consistent index of the overall breeding population. Capture work ends after two consecutive nights with no chick captures in any of the funnels.

This season the first chick arrived the night of 11 May, and the last on 6 June. The arrival of chicks was very spread out this year, and there was not a clear cluster of nights with higher numbers of chicks, although peak night of departures (7 chicks captured) occurred on 20 May. A total of 42 chicks were manually captured in funnels 5 to 8, and the season total was 44 including 2 chicks that were captured on camera while staff and volunteers were unable to monitor (Fig. 1). Between 29 May and 3 June, chick monitoring was conducted with only infrared cameras as staff were away from the island completing a Black Oystercatcher survey in Gwaii Haanas.

Chick numbers recorded this season in funnels 5-8 were significantly lower than last year (110 chicks) and this is the largest percentage decline in a single year since we began monitoring. While other previously steep declines have always been associated with raccoon predation, there have not been any raccoons on East Limestone since 2009. Thus this low number is of significant concern. Although the total number of chicks this season is the lowest to date, observations and point counts indicated that there were still many adult birds in the colony.

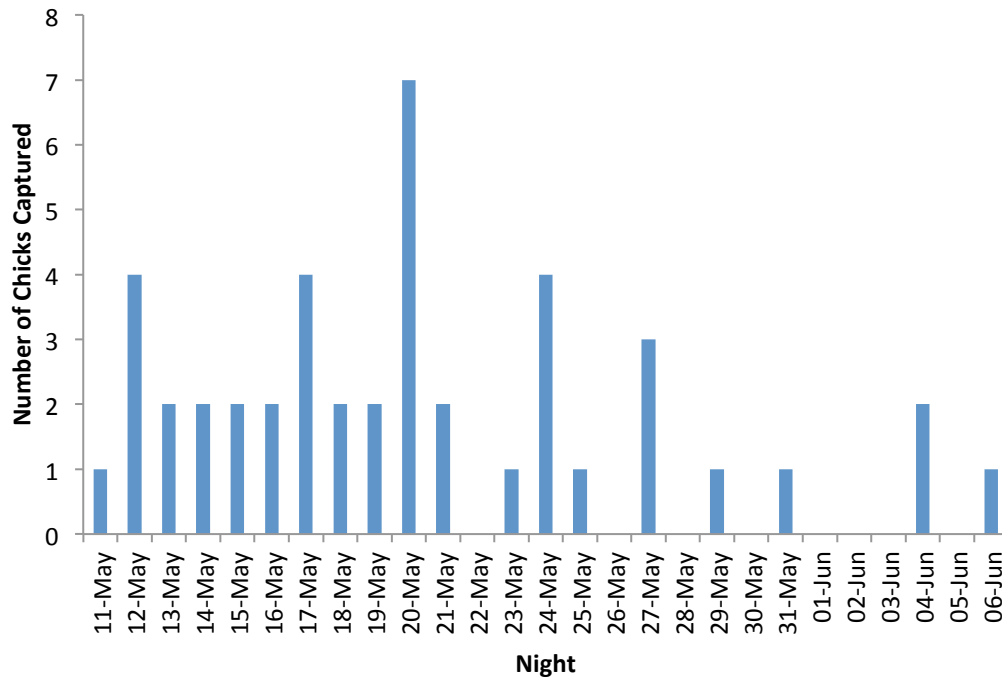


Figure 1. Nightly chick captures, Funnels 5-8, East Limestone Island, 11 May – 6 June 2015. Chicks between 29 May and 3 June were only captured on Reconyx Infrared Cameras as staff were off the island conducting a Black Oystercatcher survey in Gwaii Haanas.

Table 1. Summary of chick departures, peak nights and totals for funnels 5 to 8 on East Limestone Island, 2006 to 2015.

<i>Year</i>	<i>First night with chicks</i>	<i>Peak night</i>	<i>Peak count</i>	<i>Last night</i>	<i>Total days</i>	<i>Total chicks</i>
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
2010	8-May	21-May	19	2-June	26	121
2011	11-May	15-May	11	9-June	30	106
2012	12-May	17, 22-May	14	31-May	20	110
2013	13-May	21-May	15	1-June	20	136
2014	11-May	18, 19-May	15	2-June	23	110
2015	11-May	20-May	7	6-June	27	44

*Cabin Cove Funnels 5 & 6*

As of this season, funnels 5 and 6 have been monitored continuously for 26 years, and are the primary means of assessing the long-term population trend in the Cabin Cove colony area. The location of the funnels has not changed during this period and therefore represents the same geographic area of the colony year to year. The forest in this area has changed in this time, due to a large blowdown event in 2010/2011. There was significant blowdown in the area within funnel 5, but funnel 6 was much less affected. Funnels 7&8 were installed in 2006 flanking funnels 5&6 to see if the colony area had shifted. This year there were more chicks in funnels 5&6 (26 chicks) than funnels 7&8 (17 chicks), which is consistent with past trends, suggesting that the densest part of the Cabin Cove colony is still being captured by funnels 5 and 6.

A total of 25 chicks were captured this season in funnels 5 and 6 which is considerably lower than the number captured in 2014 and 2013, and much lower than the previously lowest recorded number of chicks in 2009 (66 chicks; Fig. 2). This year, the first chicks arrived in these funnels on 11 May and peak night (4 chicks) occurred on 17 and 24 of May (Table 2). Chick captures continued until 6 June for a total of 27 nights of chick capture work (Table 2).

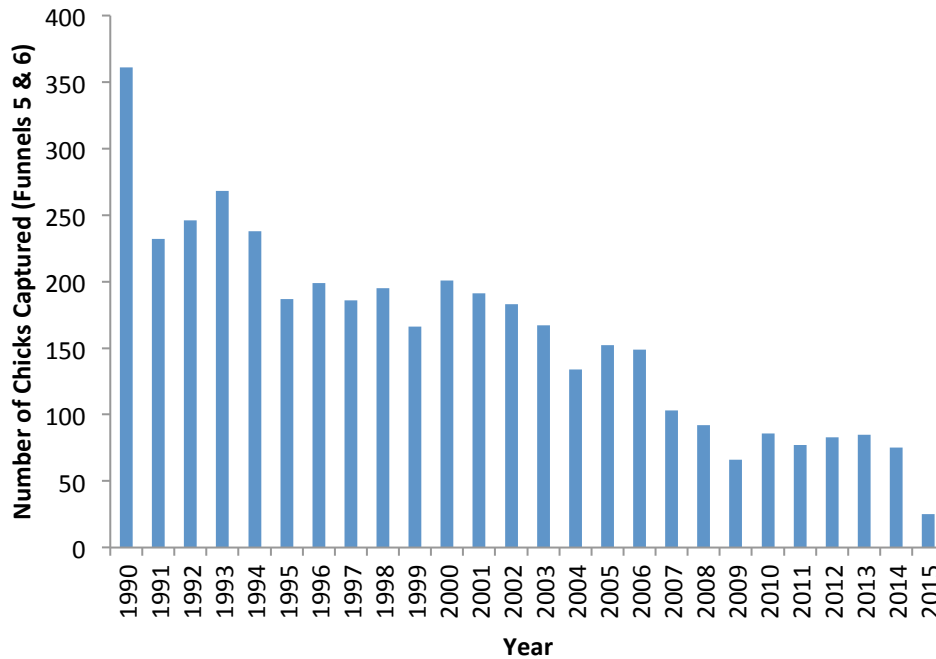


Figure 2. Total Ancient Murrelet chick captures at funnels 5 and 6 East Limestone Island, 1990-2015.

Table 2. Summary of chick departures, peak nights and totals from funnels 5 and 6 on East Limestone Island, 1990 to 2015.

Year	1st night with chicks	Peak night	Peak count	Last night	Total days	Total chicks
1990	13-May	20-May	28	15-Jun	34	361
1991	10-May	25-May	22	05-Jun	27	232
1992	14-May	22-May	29	02-Jun	20	246
1993	12-May	18-May	39	04-Jun	24	268
1994	08-May	20-May	29	06-Jun	30	238
1995	11-May	23-May	18	12-Jun	33	187
1996	11-May	18-May	17	07-Jun	28	199
1997	13-May	28-May	22	05-Jun	24	186
1998	11-May	20-May	23	20-Jun	41	195
1999	11-May	21-May	22	09-Jun	30	166
2000	11-May	21-May	22	06-Jun	27	201
2001	11-May	19-May	21	15-Jun	36	191
2002	09-May	21-May	33	01-Jun	24	183
2003	11-May	21-May	19	03-Jun	24	167
2004	08-May	16,17-May	15	01-Jun	25	134
2005	07-May	19, 23-May	12	05-Jun	30	152
2006	10-May	21-May	20	31-May	22	149

2007	15-May	04-Jun	16	12-Jun	29	103
2008	13-May	20,22,23-May	8	03-Jun	22	92
2009	12-May	18,19-May	10	29-May	20	66
2010	8-May	21-May	16	2-June	25	86
2011	11-May	21-May	9	9-June	30	77
2012	13-May	22-May	12	31-May	19	83
2013	13-May	22-May	11	1-June	20	85
2014	11-May	18-May	12	02-Jun	23	75
2015	11-May	17,24 - May	4	06-Jun	27	25
Average ± SD	11-May ± 2 days	21-May ± 3.8 days	19 ± 8.3 chicks	5-Jun ± 5.4 days	27 ± 5.5 days	160 ± 76 chicks

#### *North Cove Funnels*

North Cove funnels 1-4 were heavily impacted by the blowdown events of 2010/11. Only funnel 4 and a small portion of funnel 3 remain intact. This year we monitored only funnel 4, using an infrared motion activated camera (Reconyx PC900). The camera was set at the mouth of the funnel on 4 May and left in place until 15 June. A wooden chute, designed to direct the chicks towards the camera and slow them down, was installed at the funnel mouth in front of the camera. A total of 11 chicks were recorded between the night of 11 May and 2 June with peak departures of two chicks on 11, 15, 18, and 22 May. Similar to last year, this total is much lower than 2013, when 41 chicks were recorded departing from funnel 4. Although it is a very low number compared to 2013, funnel 4 did not experience the large drop in chick numbers from 2014 to 2015 that was noted in the Cabin Cove funnels, as the 2015 North Cove chick number was only lower than 2014.

#### *Camera Monitoring*

This year, two Reconyx infrared cameras were set up at funnels 5 and 6, in addition to the one in North Cove funnel 4. They were set up in a similar manner to the funnel 4 camera. These cameras are used to get an idea of how many chicks pass by the camera but do not get photographed. This will allow us to assess the accuracy of using only cameras for monitoring chick departure numbers at funnels, as we are doing presently in North Cove. At funnel 5, 50% of the chicks that passed by the camera were captured on camera (4 out of 8 chicks). The steep slope of the funnel 5 chute could have led to this low number of chicks captured on camera; on 27 May we leveled out the wooden chute in funnel 5 and no more chicks were missed by this camera (however, only one chick was caught in funnel 5 after this change). At funnel 6, 100% of the chicks were photographed; however, most chicks were manually captured before they had an opportunity to be photographed (only 2 chicks passed the camera during monitoring hours and both were photographed).

In the future we might consider using the cameras for early and late season monitoring (early May and early June). We also could use the cameras for monitoring an extended period in the early morning; we normally end monitoring each night at 02:30, but with cameras we can continue to capture photos of the chicks that depart later in the night, giving a better estimate of colony size. This year, the camera in funnel 6 caught the first chick of the season at 4:49 am on the night of 9 May, two nights earlier than we manually captured a chick. Also, we were able to use the cameras at funnel 5, 6, and 7 to continue our monitoring during the Gwaii Haanas BLOY survey, between 29 May and 3 June. The camera at funnel 5 caught photos of two chicks while we were away from the island, on the nights of 29 May and 31 May. These chicks were added



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into the season total, as they both left the colony before 02:30, and would therefore have been captured manually if we had been monitoring (Tables 1 and 2). This year, at funnels 5 and 6, there was only 1 chick that departed the colony later than 02:30, at 4:49. This is 12.5 % of the total number of chicks captured on camera (8 photos total). At funnel 4 in North Cove, 3 chicks out of 11 total (27%) were photographed departing the colony later than 02:30.

It is important to assess the accuracy of this camera monitoring technique by continuing to use cameras at the same time as manual capture. Issues that need to be addressed if the cameras are to be used as the only method of monitoring include standardizing camera settings and the methods of camera setup. This season the settings on all cameras were recorded, but this has not been done in the past. An important variable is the speed at which photos are taken. All cameras are now being set on “rapidfire”, which means the camera will take photos as fast as possible, which is essential for recording departure of very fast-moving chicks. Rapidfire speed depends on both image quality settings and quality of the camera card, and therefore is not always consistent. There have also been some issues with photo analysis. For example, if two chicks arrive at the camera at, or close to, the same time, it is not possible to determine if there are 1 or 2 chicks. Monitoring using cameras will continue in the next few seasons to determine the accuracy of this method.

#### *Gathering grounds*

Ancient Murrelets enter and leave the breeding colony only at night. In late afternoon and evening the birds gather on the water in areas called gathering grounds, where they wait until it is sufficiently dark before entering the colony. Both breeding and non-breeding birds are thought to gather in these areas and engage in important social interactions. The Limestone Island gathering ground is located between Low Island and Limestone Island. Between 2 May and 20 June we conducted standardized 10 minute counts of birds on the gathering grounds. The highest count occurred on 19 May, with a total of 120 birds observed. The highest count of birds last year was also 120 birds on 6 May. Counts averaged ( $\pm$ SD)  $30.3 \pm 31.8$  this season, a similar average to last season ( $20.7 \pm 23.0$ ).

#### *Point counts*

We conducted point counts in the colony area to monitor the activity of adult birds in the forest at night. Five minute counts were conducted in Cabin Cove at approximately 02:30 each night for the period of 21 May to 8 June, but not between 29 May and 3 June. The maximum number of birds counted was 25, producing 69 calls. This occurred on the last day of monitoring, 8 June. The average number of birds counted this year ( $\pm$ SD) was  $12 \pm 7$ , and the average number of calls was  $63.7 \pm 35.4$ . This is higher than 2014, when average number of birds was  $7 \pm 5$ , and average number of calls was  $37.7 \pm 25.4$ . This supports our observations that although there were fewer chicks this season, it did not seem as though there were fewer adults.

#### *Band Recoveries & Recaptures*

Recapture of adult birds on Limestone ended in 2003. However, we still opportunistically capture adult birds that are trapped in funnels. Of the 14 adult birds that were picked up and inspected for bands during the 2015 season, none had bands. We also scan feather piles, raven pellets and other predation remains looking for bands, but no bands were recovered this year.

#### *Predation transects*

In previous years we checked for predation remains along 5 fixed, 20m wide transects. These transects were heavily impacted by blow-down and have not been monitored since 2011. See the ‘Raccoons’ section below for a description on the use of cameras to detect the presence of raccoons.

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### *Population Trends & Social Attraction*

The breeding population of Ancient Murrelets has been declining over time (Fig 2). The number of departing chicks in funnels 5&6 declined by 56% between 2006 and 2009, likely due to the presence of raccoons in 2007 and 2009. The last census of the colony was completed in 2006 and estimated  $509 \pm 132$  breeding pairs compared to the estimate of  $1273 \pm 254$  in 1995. Chick numbers had increased slightly since 2009 and seemed to have stabilized in these two funnels, up until this season when there was a sharp decline in chick numbers (Fig 2). The large decline in chicks this year is concerning, and it will be interesting to see if the population recovers to the rather consistent numbers seen from 2010 to 2014. We suspect that the lower number of chicks this season could be related to anomalously high sea surface temperatures that have been observed in the North Pacific, and that caused mass mortality of Cassin's Auklets in the winter of 2014/2015. This may be affecting the Ancient Murrelet's food source and consequent ability to produce offspring.

The number of chicks exiting the colony in the North Cove funnel 4 area has been declining since it was last monitored in 2010, suggesting breeding birds are moving elsewhere, possibly due to the extreme blow-down that took place in North Cove. In 2013, chick numbers, based on photo monitoring, had only declined by ~20% since 2010, but in the last two years, the number has declined by ~75 %.

In 2015 we continued the social attraction work that began in 2011. Sounds of Ancient Murrelets calling in the colony, recorded on Langara Island, were broadcast from two megaphones, located behind the cabin and on the East Coast trail. Playback occurred on 16 nights between 0:00-02:30, from 7 May to 7 June. They were not played on nights with school groups on the island and for several nights when dead batteries or problems with the CD players turned the megaphones off earlier. Adult murrelets are frequently observed in close proximity to the megaphones when they are broadcasting.

### **Black Oystercatchers *Haematopus bachmani***

#### *Background*

Oystercatchers are large, conspicuous shorebirds that are easily studied because of the relative ease with which nesting sites can be located. Because they are entirely dependent on the intertidal system, these birds are also thought to be a good indicator species for this ecosystem. LBCS has been monitoring the breeding population of Black Oystercatchers in Laskeek Bay annually since 1992 (except in 2011).

LBCS conducted Black Oystercatcher surveys in both Laskeek Bay and in Gwaii Haanas in 2015. The Laskeek Bay survey is summarized below. For details on the two surveys within Gwaii Haanas, please consult the separate report entitled "2015 Black Oystercatcher survey in Gwaii Haanas". Methodology for shoreline surveys and territory visits followed the methods outlined in the Gwaii Haanas report. Survey maps of the Laskeek Bay area are produced by Gwaii Haanas and included as an appendix in the Gwaii Haanas report.

#### *Site occupancy and reproductive success*

Oystercatcher territories were visited in Laskeek Bay between mid-June and early July. We visited and searched on foot all territories known to be occupied by breeding pairs in the last three survey years. Territories not active in the last three survey years were scanned during shoreline surveys, but not visited on foot. Shoreline surveys followed the same protocol developed for the Gwaii Haanas surveys and involved scanning shoreline areas from ~50m offshore at 11 km/hr

(2500rpm) to search for new territories. All shoreline segments were completed during the first survey except for Cumshewa Island. During the second survey, due to strong winds, we were unable to complete shoreline surveys of Cumshewa, Reef, Louise, Lost, Low and Haswell Islands, and did not complete the shoreline of the most eastern Skedans Island.

Out of 59 territories visited, 33 were occupied by an alarmed adult pair, or had other conclusive evidence of breeding in 2015 (e.g. eggshell membranes and prey present at scrape). Of these, 28 were active, that is, there were warm eggs or live chicks present on at least one visit. Two new territories were found this year. During the first survey (conducted on 5-12 June), we found 51 eggs and 7 chicks, and during the second survey (3-10 July) we found 6 eggs and 13 chicks. Due to bad weather, many territories during the second survey were not visited (those on Cumshewa and Reef Islands, and some on the Lost Islands).

#### *Banding and re-sighted oystercatchers*

All birds are banded with one metal band on the right leg that carries a unique number. Birds banded in the years before 2013 have a combination of coloured bands on the left and right leg that indicates the year of banding as well as the area where the bird was banded. Metal bands are permanent, while the coloured plastic bands tend to be lost over time. In 2013 and 2014, alphanumeric bands were used instead of colour bands, due to their field readability. In 2015, no banding was done. 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.

There were 11 banded individuals sighted in Laskeek Bay (Table 3) and 5 individuals sighted in Gwaii Haanas (Table 4). As in 2014, a banded adult was seen at REE-4. Last year, the band number was read off the metal band on a bird at this location, with band combination UB-W/M (unbanded on the left leg, white over metal on the right). Reading the number allowed us to look up the age of the bird and year that it was banded. The band combination of the adult seen this year was UB-UB/M. Because it is common for the coloured bands to fall off and for adult birds to use the same territory for subsequent years, we suspect this is the same adult at REE-4, and therefore likely banded in 2009 as a chick. At SKE-14, a new territory this year, a banded adult with an aluminum band on the left leg was seen, indicating that this bird was banded in 2000 or 2001 as an adult bird. This is most likely the same aluminum-banded bird that had been observed at SKE-6 for many years, and was therefore banded in 2000. It was not seen last year, but previously the band number had been read off the metal band, indicating that it was at least 17 years old in 2013, which was the highest recorded age for a Black Oystercatcher at the time. An oystercatcher banded last year at territory REE-12 with band code E4 was seen on both Gwaii Haanas surveys on Murchison Island, travelling with a large group of other birds (Table 4). Another bird banded on Reef Island (at REE-10 in 2013, band code A6) was seen paired up at a new territory on Alder Island during the first Gwaii Haanas survey, and during the second Gwaii Haanas survey was again seen on Alder Island (Table 4).

Table 3. Banded Black Oystercatchers re-sighted in Laskeek Bay in 2015.

<b>Band combination (Left - Right)<sup>1</sup></b>	<b>Location seen / Nest site</b>	<b>Year Banded</b>	<b>Banded as Adult or Chick</b>
W-UB/M	ELI-4	Unknown	-
UB-UB/M	KNG-3	Unknown	-
UB-UB/M	LOW-1	Unknown	-
UB-UB/M	REE-1	Unknown	-
UB/M-UB	REE-11	Unknown	-

UB-UB/M	REE-4	<sup>2</sup> 2009	Chick
UB-UB/M	REE-6	Unknown	-
UB-UB/M	SKE-12	Unknown	-
AI-UB/M	SKE-14	<sup>2</sup> 2000	Adult
UB-UB/M	SKE-14	Unknown	-
W-UB/M	<sup>3</sup> East Limestone Island	Unknown	-

<sup>1</sup>Band codes: UB = unbanded (birds can lose bands), M = metal, Or = orange, W = white, LG = Light Green, R = Red, Bk = Black, Br = Brown, Y = Yellow, DB = dark blue, AI = Aluminum

<sup>2</sup>Likely banded in this year, based on previous banded bird sightings at these locations.

<sup>3</sup>Likely from territory ELI-4

Table 4. Banded Black Oystercatchers re-sighted in Gwaii Haanas, 2015.

Survey	Band combo (Left - Right) <sup>1</sup>	Location seen / Nest site	Year Banded	Banded as Adult or Chick
1	UB-DB/ M	560-3-1	2006	Chick
1	A6-A6/ M	400-6-1	<sup>2</sup> 2013	Chick
1	E4-E4/ M	Murchison Island	<sup>3</sup> 2014	Chick
1	W-W/ M	LOS-13	<sup>4</sup> 2009	Chick
1	UB-UB/ M	LOS-11	Unknown	Unknown
2	UB-DB/M	560-3-1	2006	Chick
2	A6-A6/M	Alder Island	2013	Chick
2	E4-E4/M	Murchison Island	2014	Chick
2	UB-DB/M	535-1-1	2006	Chick
2	W-W/M	LOS-13	2009	Chick

<sup>1</sup>Band codes: UB = unbanded (birds can lose bands), M = metal, OR = orange, DB = dark blue, W = white, LG = light green.

<sup>2</sup>Banded at territory REE-10

<sup>3</sup>Banded at territory REE-12

<sup>4</sup>This colour combination was used in 1994 as well, but unlikely that it was banded in 1994, because plastic colour bands do not usually last this long

#### *Oystercatcher Chick Diet*

Oystercatchers feed their chicks hard-shelled invertebrates which they bring intact to the breeding territory. We collected prey remains from 10 territories in Laskeek Bay this year in order to quantify average diet composition fed to chicks. Limpets were the primary prey (63%), followed by mussels (22%), and chitons (13%; Fig. 3). These three prey items made up 98% of the diet, consistent with what has been found in past years. In Gwaii Haanas, prey remains were collected from 33 territories, where diet composition was similar to that of Laskeek Bay (Fig. 3).

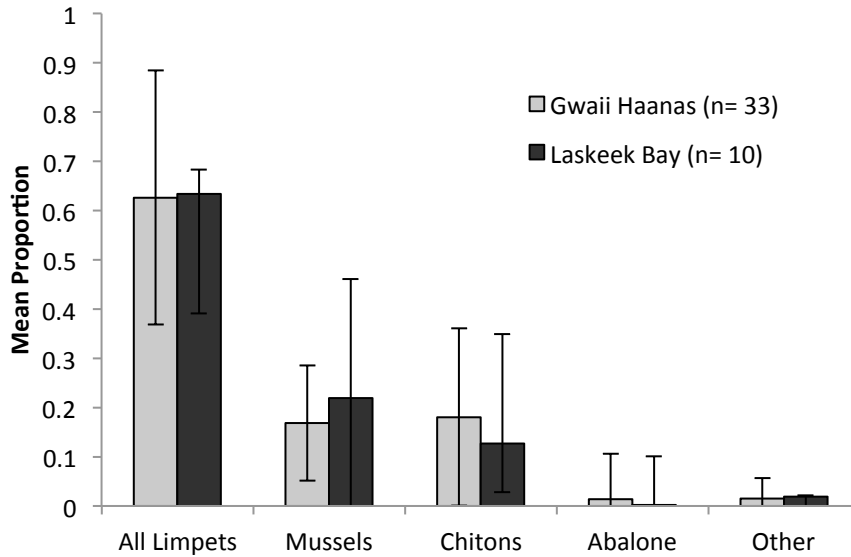


Figure 3. Black Oystercatcher chick diet from prey collections in Laskeek Bay and Gwaii Haanas 2015. Error bars are  $\pm$ SD. Other includes whelks, crabs, urchins, turban snails, barnacles, and isopods.

### **Glaucous-winged Gulls *Larus glaucescens***

Since 1992, LBCS has been censusing gull colonies within Laskeek Bay (Fig. 4). This year, we visited the known colonies on Kingsway Rock, Low Island, and Lost Islands. No gulls were seen by boat at the Skedans Islands therefore this area was not searched on foot. GWGU pairs were observed on Reef Island by boat during the BLOY survey. At each of the colonies visited the number of active nests (those containing either eggs or chicks) was recorded. Lost Island, the largest colony in the area, had a total of 228 active nests (22 June), followed by Kingsway Rock with 70 nests (17 June) and Low Island with 1 nest (8 June). In total we counted 299 nests on these three colonies containing 1 egg (6.7% of nests), 2 eggs (17.3%), or 3 eggs (75 %). 7 nests on Lost Islands were found with hatched chicks. The total number of nests counted this season (299) was above the long-term average ( $\pm$ SD) of  $260.7 \pm 64.6$ .

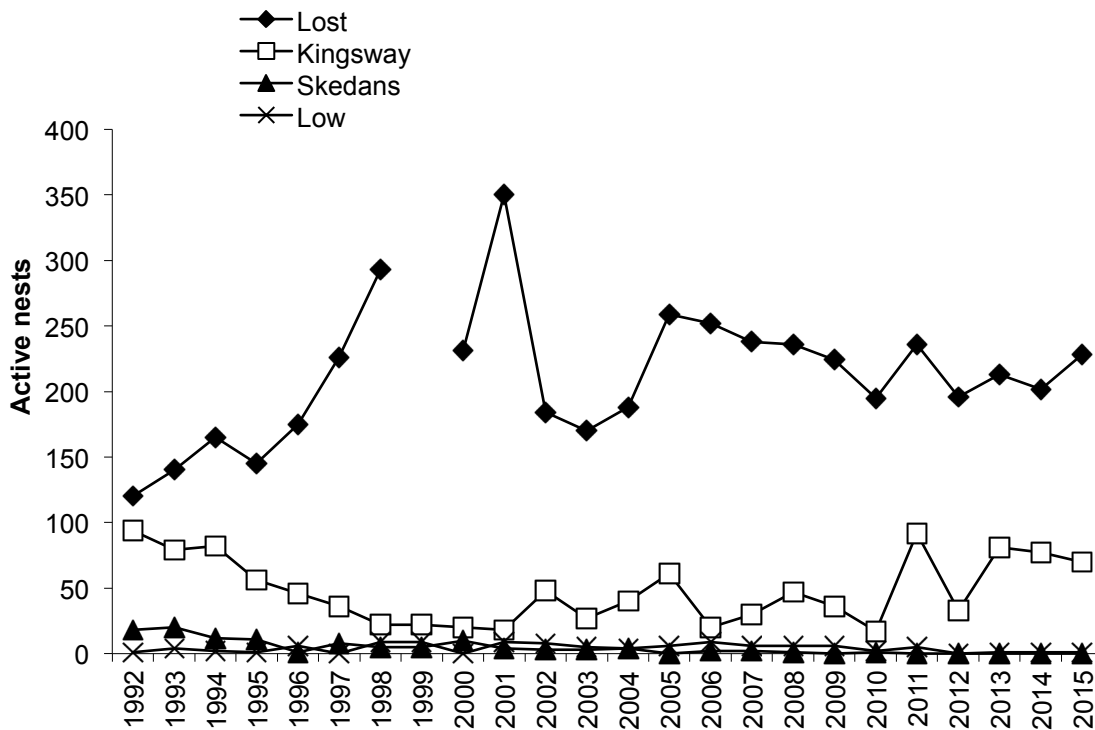


Figure 4. Glaucous-winged Gull nests containing eggs or chicks at four colonies in Laskeek Bay, 1992-2015.

### Pigeon Guillemots *Cepphus columba*

As of 2015, there are 27 Pigeon Guillemot nest boxes at Lookout Point. Boxes #1-10 were installed in 2001 and boxes #11-28 in 2010. Nest box #3 went missing during the winter of 2013.

Boxes were checked at the end of the season (3 July), to determine if they contained eggs or chicks. Of the 27 boxes 11 were occupied with either cold eggs or dead chicks (Figure 5). One box contained an adult but there were no eggs, chicks, or egg membranes in that nestbox, and the adult vacated the nestbox upon our arrival. All of the nestboxes appeared to be abandoned. 9 nestboxes contained eggs, and although an adult was seen sitting on 2 of the eggs on 30 June, all eggs were cold when we measured them. 8 nestboxes contained no eggs or chick, but did contain fresh egg shell and/or egg membrane. 1 nestbox contained 2 dead chicks, and 2 other dead chicks were found on top of another nestbox. 8 nestboxes had no evidence of a breeding attempt. The reason that the eggs and chicks were abandoned is unknown. Overheating in the boxes is a possibility, as we had exceptionally warm weather throughout May and into June. Other possibilities are predation, or poor breeding success due to the anomalously warm sea temperatures seen last winter. We will continue to monitor the nestboxes next season to see if we can determine a likely cause.

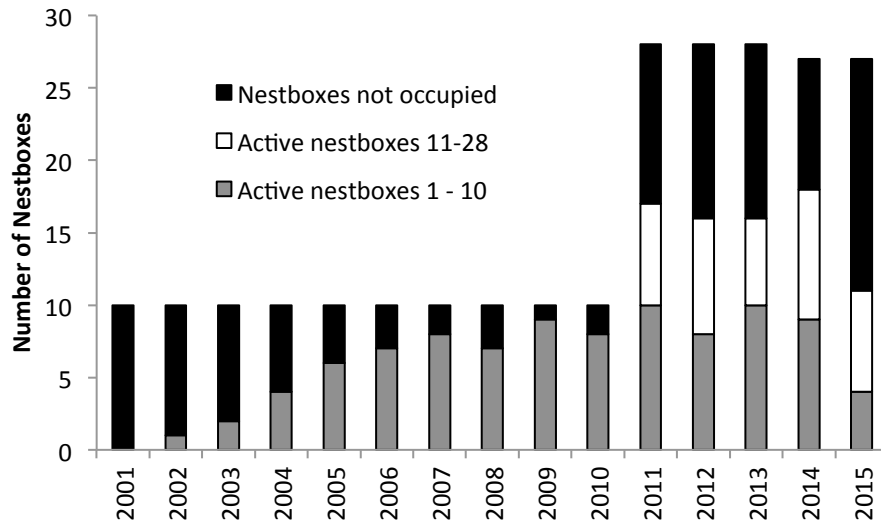


Figure 5. Nestbox use between 2001 and 2015 by Pigeon Guillemots at Lookout Point on East Limestone Island. Although there was evidence of breeding in nestboxes in 2015, all eggs and chicks seemed to be abandoned.

### Cassin’s Auklets and Fork-tailed Storm Petrels

*Ptychoramphus aleuticus* and *Oceanodroma furcata*

Small populations of Cassin’s Auklets and storm petrels breed on Limestone Island. Like Ancient Murrelets, these species are nocturnal burrow nesters and are only active in the colony at night. Breeding activity on the island has fluctuated over the years, which is partly attributed to predation by introduced raccoons. In previous seasons we monitored several locations on the island for breeding activity and noted increasing activity in recent years. This year we completed a natural burrow census on Limestone Island and found 101 Cassin’s Auklet burrows that appeared to be in use this year. The eastern shoreline was searched, between the eastern end of North Cove and Cassin’s Tower (the most southerly point of the island); most burrows were located on Cassin’s Tower, at Lookout Point, and at the East Coast nestbox plots, although there were lower densities of burrows interspersed between these locations. The next complete burrow census will be carried out in four years to monitor long-term Cassin’s Auklet activity on Limestone.

Cassin’s Auklet nestboxes were monitored again this year at both Lookout Point and at the East Coast plots. Knock-down sticks were placed at the entrances of all nest boxes early in the season and were checked every 4-5 days. A total of 41 nest boxes were monitored at the East Coast plots (North and South), and 24 at Lookout Point. In late May, nestboxes with multiple consecutive records of knockdown activity were checked for chicks. Interestingly, one nestbox that had signs of activity early in the season but no Cassin’s Auklet chick, when checked in early July contained 2 hatched Ancient Murrelet eggshells.

Despite the loss of large numbers of Cassin’s Auklets over the winter all along the Pacific coast of North America, four boxes contained chicks on Limestone Island: three at the East Coast North Plot (# 4, 9, 25) and one at Lookout Point (#7). Chicks were weighed at 5-7 day intervals. By 8 July, three chicks had fledged and one remained. Over the winter of 2014/2015 an estimated

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50,000 to 100,000 predominantly juvenile Cassin's Auklets washed up on beaches along the coast from California, through BC, and as far north as Alaska. The die-off is thought to be associated with warmer North Pacific waters, which affects the Cassin's Auklet food source, and caused starvation. We did not notice a dramatic change in breeding success this year on Limestone, but it will be interesting to see if we notice a decline in the coming years, as the past winter's juveniles reach breeding age.

The amount of Fork-tailed storm-petrel activity this season was about average, based on the number of days the species was recorded in the daily bird checklist (2015= 30, 2014 = 47, 2013=30, 2012= 32, 2011 = 30, 2010 = 36, 2009 = 31, 2008 = 28, 2007 = 34). Petrels were heard frequently at night during the murrelet season, particularly in the area northeast of funnel 6 and near Lookout Point. This season we also heard many petrels very close to the cabins in Cabin Cove, generally in the forest above funnel 7. It should be noted that we are only recording these nocturnal birds when we are awake at night, during Ancient Murrelet season. This is generally only during the month of May, or if someone happens to hear one later in the season at night.

### **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 these 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 Marbled Murrelet dataset within the province.

#### *Near-shore surveys*

Near-shore surveys cover the inshore waters as far north as Cumsheewa Island and south to Haswell Island. Three near-shore surveys were completed this year: 9 and 20 May and 21/23 June. On these surveys we counted 20 species: Bald Eagle, North-western Crow, Marbled Murrelet, Pigeon Guillemot, White-winged Scoter, Pelagic Cormorant, Common Loon, Ancient Murrelet, Rhinoceros Auklet, Harlequin Duck, Long-tailed Duck, Glaucous-winged Gull, Black Oystercatcher, Red-necked Grebe, Common Murre, Fork-tailed Storm Petrel, Brant, Double-crested Cormorant, Common Loon, and Pacific Loon.

A total of 75, 91, and 21 Marbled Murrelets were counted on the 9 May, 20 May, and 21/23 June surveys, respectively. However, the 21/23 June survey was not completed due to poor weather, so the number is from a much smaller transect area. The shoreline between Limestone Island and Haswell Island, an area where many Marbled Murrelets are usually seen, was not surveyed. These numbers are higher than the May 2014 surveys, when the first survey totaled 26, and the second 43, but are lower than 2013 when the Marbled Murrelet numbers from four nearshore surveys were 115, 175, 101, and 125.

#### *Hecate Strait surveys*

This survey takes us approximately five nautical miles into Hecate Strait, and allows us to record species that tend to stay farther from shore. We completed two Hecate Strait surveys this year, on 12 May and 14 June. On these surveys we counted 13 Species: Sooty Shearwater, Cassin's Auklet, Rhinoceros Auklet, Common Murre, Ancient Murrelet, Glaucous-winged Gull, Common Loon, Pigeon Guillemot, Fork-tailed Storm Petrel, Marbled Murrelet, Pelagic Cormorant, and White-winged Scoter.



## Marine Mammals

We kept a daily record of all marine mammal sightings, with the exception of Harbour seals (*Phoca vitulina*) and Steller's sealions (*Eumetopias jubatus*). These species are counted at specific haulouts during sea surveys in order to keep an index of population trends.

Along with recording incidental sightings and sightings during sea watches and sea surveys, we do a 5 minute scan and count of marine mammals from Cabin Cove. This is done in combination with the ANMU gathering ground count, each evening approximately two hours before sunset. The results of this season's total sightings are summarized in Table 5.

Table 5. Total counts of marine mammals from sea surveys, sea watches, and other sightings, 2006-2015<sup>†</sup>. Data for 2014 and 2015 include sightings during the 5 minute evening count.

Species (common name)	Scientific name	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006
Dall's porpoise	<i>Phocoenoides dalli</i>	0	0	0	0	8	0	0	0	0	0
Northern elephant seal	<i>Mirounga angustirostris</i>	0	0	0	0	0	0	0	0	0	0
Fin whale	<i>Balaenoptera physalis</i>	0	0	0	0	0	0	0	0	0	0
Grey whale	<i>Eschrichtius robustus</i>	0	0	1	1	1	0	0	0	0	1
Harbour porpoise	<i>Phocoena phocoena</i>	13	31	7	4	19	0	10	0	1	4
Humpback whale	<i>Megaptera novaeangliae</i>	13	347	12	14	193	86	102	261	203	91
Killer whale	<i>Orcinus orca</i>	50	26	16	13	49	11	14	18	26	4
Minke whale	<i>Balaenoptera acutorostrata</i>	4	3	6	2	1	0	0	1	3	1
Pacific white-sided dolphin	<i>Lagenorhynchus obliquidens</i>	0	0	0	0	0	46	334	0	81	365
California sea Lion	<i>Zalophus californianus</i>	0	4	0	0	1	1	0	0	4	0

<sup>†</sup>Harbour seal *Phoca vitulina* and Steller's sea lion *Eumetopias jubatus* sightings are not reported here. Sightings do not necessarily reflect number of individuals, as individuals may be recorded more than once.

### *Humpback whales*

There were very few humpback sightings this year in Laskeek Bay compared to last year, when it was not uncommon to see more than 40 humpbacks in a single one hour sea watch (Table 5).

### *Killer whales*

There were ten sightings of killer whales in Laskeek Bay and during trips into Gwaii Haanas this season. We were able to take ID photographs during four of these encounters. Our ID photographs are sent to the killer whale database at the Pacific Biological Station in Nanaimo. One group was seen twice, first at Vertical Point and later by Ramsay Island, with 1 bull, 2 calves, 1 female and two other mid-sized whales. We were not able to ID the bull with this group. We were able to ID two other bulls: T162, travelling alone between Titul Island and Lost Island, and T070, travelling along the northeast shore of Ramsay Island with a mother and one, possibly two, calves, and two or three other medium sized whales.

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### *Steller's sealions*

There are several sealion haulouts in Laskeek Bay. The largest of these is on the east end of Reef Island. There are also smaller haulouts on the Skedans Islands, Cumshewa Rocks, and Helmet Island. We regularly count the number of individuals on the Reef and Skedans haulouts. The maximum number counted this season was 336 individuals at Reef (9 May) and 60 at Skedans Islands (5 May). Occasionally we sight branded sea lions that have been individually marked by researchers in the United States. On 20 May we saw one branded individual, F1019 (a bull). No California Sea Lions were seen this year.

### *Other species*

Two other marine mammal species were sighted this season: Minke whales and harbour porpoises. Four Minke whales were seen in Laskeek Bay this season, and 13 harbour porpoises in Laskeek Bay and Gwaii Haanas.

## **Wildlife Trees**

LBCS has been monitoring cavity nesting birds on Limestone Island since 1990. Wildlife trees (dead standing snags used by cavity nesting birds) were monitored opportunistically from 1990-1994, 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 158 wildlife trees have been identified over the past 26 field seasons.

This year we found a total of 14 active trees, occupied by five different species. Six new trees were identified. Eight nests were occupied by Red-breasted Sapsuckers (RBSA), two by Chestnut-backed Chickadees, two by Hairy Woodpeckers, one by Northern Flickers, and one by Red-breasted Nuthatches (Table 6). Interestingly, a Northern Flicker and a Red-breasted Sapsucker were found nesting in separate cavities in the same tree. Flickers have nested every year since the blowdown event of 2010/2011, but prior to that were very infrequent. This could indicate a preference for the more open forest, or could indicate an increase in food supply (insects). Wildlife tree #109 has been active for the last 5 years with a Red-breasted Sapsucker pair. The number of Red-breasted sapsucker nests (8) is consistent with recent years, but less than in some previous years when up to 22 active RBSA trees were found.

Table 6. Wildlife tree activity on East Limestone Island in 2015. †

Tree #	Cavity Nester	Tree Species	Fledge Date (min)*	Fledge date (max)*
51	CBCH	Hw	25-May	8-Jun
109	RBSA	Ss	23-Jun	27-Jun
113	RBSA	Hw	5-Jun	7-Jun
132	RBSA	Ss	5-Jun	12-Jun
136	HAWO	Ss	27-May	5-Jun
149	RBSA	Ss	17-Jun	19-Jun
150	RBSA	Hw	13-Jun	16-Jun
151	CBCH	Ss	26-May	5-Jun
153	HAWO	Ss	28-May	3-Jun
154	NOFL	Ss	5-Jun	11-Jun
154	RBSA	Ss	5-Jun	11-Jun
155	RBSA	Hw	19-Jun	21-Jun
155	RBNU	Hw	27-May	5-Jun
156	RBSA	Ss	7-Jun	12-Jun
157	BRRCR	Ss	24-May	5-Jun
158	BRRCR	Ss	5-Jun	7-Jun

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

\*For min and max, fledging may have occurred on any day between the given dates.

## NATURAL HISTORY

### Daily Bird Checklist

Throughout the field season, we keep a daily record of all bird species seen or heard within Laskeek Bay. The peak number of species was 37 on 8 May. There were a total of 65 species recorded over 64 days. Many species were recorded almost every day: Common Raven, Northwestern Crow, Black Oystercatcher, Red-breasted Sapsucker, Bald Eagle, Pelagic Cormorant, Glaucous-wing Gull, Pigeon Guillemot, Hairy Woodpecker, Pacific-slope Flycatcher, Hermit Thrush, Varied Thrush, Orange-crowned Warbler, Townsend's Warbler, and Pacific Wren. Many less frequently observed species were recorded this year as well, such as Red-tailed Hawk, Sharp-shinned Hawk and Sooty Grouse. Migratory duck species including large groups of Green-winged Teals and White-winged Scoters, and several Long-tailed Ducks, were observed, and shorebirds such as the Black Turnstone and Western Sandpiper were also sighted. Additionally, we had a record of a Great Blue Heron, very rarely seen in Laskeek Bay. It was sighted multiple times, on the beach along the southwest shore of Limestone, and roosting in a tree in the middle of the island.

### Raptors and Corvids

As with cavity nesting birds, we make a concerted effort through the season to keep track of other nesting birds on Limestone Island, including Bald Eagles, Peregrine Falcons, Common Ravens and Northwestern Crows.

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This year we had one Bald Eagle nest on Cassin's Tower with two chicks. Another nest was new this season. It is in a large spruce in North Cove funnel 4, and was used on occasion by Bald Eagles this season, but no chicks were seen there during the field season and adults were only guarding the nest on occasion.

We checked the Peregrine Falcon nest on the south cliffs but it did not produce young this year. The nest was checked several times between May and July; adults were sometimes seen at the nest and in adjacent trees, and there was one abandoned egg in the nest. Peregrine Falcons have nested on Limestone Island discontinuously since research began in 1990. During the first 9 years (1990-1998), an active nest was observed in all years except 1992. During the next 8 years (1998-2006) there was no nesting activity observed. For the 7 years prior to 2014 (2007-2013) there was an active nest every year, generally with 2-3 young observed. In 2014, there were also abandoned eggs observed in the nest. The nest has always been on the south cliffs, although the position has shifted somewhat between years.

As in past years, one pair of Common Ravens nested on the island. The nest was in the new nest site that was found in 2013 (CORA-3). One chick was seen once in the nest and then heard around the island after fledging in late May.

## 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 or the top of uprooted tree stumps, above the deer's grazing height. Throughout the season we keep a record of the dates on which particular species are first observed in bloom. For example, this year we recorded sightings of blooming northern rice-root (*Fritillaria camschatcensis occidentalis*), salal (*Gaultheria shallon*), monkey flower (*Mimulus guttatus*), and red columbine (*Aquilegia formosa*); these species tend to be common in areas with no deer, but are only seen on inaccessible cliff locations on Limestone Island.

A number of rare plants are present on Limestone Island due to the unique limestone geology that is uncommon on the rest of Haida Gwaii. These plants are showy Jacob's ladder (*Polemonium pulcherrimum*), Richardson's geranium (*Geranium richardsonii*), and cut-leafed anemone (*Anemone multifida*). Showy Jacob's ladder and cut-leafed anemone were found to be blooming by early to mid-June. Again, northern starflower (*Trientalis arctica*) was seen blooming in North Cove by the banding shed. The 2014 discovery of northern starflower was the first record of this flower in Laskeek Bay.

Invasive plants that have become established on Limestone Island include bull thistle (*Cirsium vulgare*), Canada thistle (*Cirsium arvense*), prickly sow-thistle (*Sonchus asper*), and wall lettuce (*Lactuca muralis*). Cudweed (*Gnaphalium uliginosum*) was detected on the island for the first time in 2013 and was recorded again this year. In 2014 we acquired funding for some minor invasive weed removal on Limestone Island. In 2014 staff and volunteers pulled out several large patches of bull thistle and in 2015 walked the trails and removed as many easily accessible thistles as possible.

## Introduced Species

### Sitka Black-tailed Deer *Odocoileus hemionus*

Deer were intentionally introduced to Haida Gwaii in 1878 and in several years between 1911 and 1925 to provide game meat 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

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communities, particularly in the forest understory. LBCS is a partner in the Research Group on Introduced Species (RGIS, [www.rgisbc.com](http://www.rgisbc.com)) which has carried out extensive research on this topic in Laskeek Bay as well as on the rest of Haida Gwaii.

RGIS has recently finished a four year program, project BAMBI (Behavioral Adjustments to Mitigate Biodiversity loss). This study looked at how the deer of Haida Gwaii have adapted to life in the absence of predators, and the role that fearless behaviour plays in helping deer maintain high densities on islands with severely browsed understories. This season infrared and motion activated cameras were used to remotely track deer on Limestone and Reef Islands. On Limestone, 10 cameras were set up around the island between 20 March and 2 May. The same 10 cameras were moved to Reef Island on 5 May and retrieved between 20 and 22 June. The pictures were sent to RGIS for analysis.

Although project BAMBI is over, we continue to record deer sightings on Limestone Island for RGIS. The date/time, location, tag colour/number, collar and sex were recorded along with any behavioral notes. This year, deer with ear tags labeled 1, 5, 6, 11, 16, 21 and 29/9 were seen (deer seen in 2014 were 1, 5, 6, 16, 17, 21, 29/9, and 30). Tagged deer 11 was seen this year but not last year. 17 and 30 were seen last year, but not seen this year. From 9-15 September 2014 the RGIS deer capture team were on East Limestone Island. They captured four deer, all with tags (5, 6, 9/29, 30). Unlike previous years, deer captures were very slow on the island.

On Limestone Island, there are now two deer exclosures, one remaining since the blow-down in 2010 and a new one which was built on 22 March of 2015. The older deer exclosure did not receive any further damage in the last winter and it is full of shrubs, saplings, and ferns, continuing to highlight the contrast between browsed and unbrowsed areas. The understory vegetation (huckleberry, salal, ferns, and young trees) inside this exclosure is almost entirely absent from areas that deer can access. The new exclosure is close to the main trail, in the blowdown at the centre of the island. It will be interesting to see the difference in growth within this exclosure, in an area with no canopy cover. We are also noticing that a consequence of the blowdown is the creation of many small refugia for plants on top of turned up roots.

### **Raccoons** *Procyon lotor*

Raccoons were introduced in the early 1940s to provide local trappers with a source of employment. Raccoons (as well as rats) are one of the largest threats to ground and burrow 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 typically experience rapid declines where these predators become established in colonies.

Raccoon predation is an ongoing concern on Limestone Island and drops in Ancient Murrelet numbers have been closely correlated with raccoon presence. 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, and raccoon presence was confirmed again in 2009. No raccoons have been confirmed present on Limestone since 2009.

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

This year, cameras were set up and surveys took place early in the season. Between 19 and 23 March, a crew set up four infrared cameras baited with cans of sardines. They were set up in Boat Cove, Cabin Cove, North Cove and Crow Valley. Anemone Cove and Boat Cove are likely spots where raccoons crossing to Limestone from Vertical Point could be intercepted, and Cabin Cove is within the known Ancient Murrelet colony. The cameras were in place continuously until the staff arrived to begin nighttime Ancient Murrelet work on 1 May. No raccoons were photographed. On 19, 20, and 21 March, a crew conducted evening and nighttime shoreline spotlight surveys of East Limestone, West Limestone and the adjacent shoreline of Louise Island. During the three nights of hunting for raccoons, no raccoons were sighted on East or West Limestone. On Louise Island, 4 were definitely killed, and a 5<sup>th</sup> was likely killed, but it was unconfirmed.

Monitoring for raccoons continued throughout the field season, with one camera that was baited and checked regularly (this camera was removed from 29 May until 3 June for use monitoring an Ancient Murrelet funnel during the Gwaii Haanas BLOY). Boat Cove was monitored from 19 March until 5 July, North Cove 15 June to 5 July, Crow Valley 6 June to 5 July and Cabin Cove 15 June to 8 July. On East Limestone there was some suspected raccoon activity at Crow Valley on 6 June, due to prey remains that looked to be from raccoon predation. In the past when raccoons are present in an area, they are attracted to the camera bait for an extended period of time, but we did not see any raccoons at our baited camera stations. We also conducted a night time shoreline survey for raccoons on 6 June and searched for other signs of raccoon predation on the island. Raccoons were not seen or photographed on East Limestone Island this season, and we now believe the predation remains were from river otters.

#### **Red Squirrels** *Sciurus vulgaris*

Squirrels were introduced to Haida Gwaii in 1950 to aid in cone gathering for the forest industry. Squirrels may have been introduced to Limestone directly at this time. Squirrels are now well established on Limestone and are known to be a nest predator on various songbird species (see [www.rgisbc.com](http://www.rgisbc.com)).

Since 2007, we have been conducting squirrel surveys on Limestone to measure the annual abundance of squirrels. Over time we hope to describe population cycles of this introduced species and gain a better understanding of the consequences of squirrel presence. 7 squirrel surveys were completed this season, and numbers of squirrels seemed to be higher than in the past few years.

## **CONCLUSION**

This season was our 26<sup>th</sup> year of research, monitoring, and environmental education in Laskeek Bay. Since 1990, LBCS has focused on developing baselines and long-term data sets for the marine and terrestrial ecosystems of Laskeek Bay, as well as providing 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.

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Between the years 2006-2009 we documented a very serious decline in Ancient Murrelet numbers on East Limestone Island. Again this year we have experienced another major decline in chick numbers in the Cabin Cove area (from 110 chicks in 2014 to 44 chicks in 2015). What brought on this change is not clear: changes in sea surface temperatures which in turn modify food sources, loss of habitat or worse quality habitat in the remaining forest due to blowdown, and increased predation are all plausible explanations. Since raccoons are detrimental to Ancient Murrelet colonies, we will continue to monitor for and remove raccoons from the area. We will also continue the social attraction techniques that have been shown to be effective in other colonies, to assist the recovery of the Limestone Island colony.

The lessons that we learn from our research on Limestone Island are 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. LBCS hopes to continue to implement and incorporate island restoration techniques in future field seasons, such as invasive plant control, raccoon monitoring, and social attraction. We are participating in the development of a bio-security plan to address some of the ongoing issues of introduced species. We are also beginning to discover the possible impacts of changes in climate as warmer oceans change the patterns of marine species. We hope that continuing our core long-term monitoring programs will help to document and understand these broader scale changes.

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