EAST LIMESTONE ISLAND FIELD STATION
FIELD SEASON REPORT 2020

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Laskeek Bay
CONSERVATION SOCIETY

Summary

This was the Laskeek Bay Conservation Society's 31st field season on East Limestone Island (ELI), Laskeek Bay, Haida Gwaii. The season ran from 29 April to 2 July. It was a different field season than normal, due to COVID-19 restrictions; the season was three weeks shorter (two weeks less on the end and a week off in the middle), there were no interns, visitors or students, only two volunteers (they volunteered for the whole season) and no Project Limestone. Most of our usual programs continued, though some in a reduced fashion.

Ancient Murrelet (ANMU) chick departures were very low again and started on the night of 14 May. Remote cameras were used to monitor all ANMU funnels with a total of 31 chicks photographed in the Cabin Cove funnels during the standard monitoring time. An additional 4 chicks were photographed after the standard end to monitoring time of 02:30. Adult Ancient Murrelet activity seemed low this season, similar to last year. No raccoons were detected on the island during a shoreline survey in February or on remote baited cameras used throughout the field season.

Black Oystercatcher surveys were conducted only in Laskeek Bay this year, and 50 occupied territories were documented. Glaucous-winged Gull censuses were conducted at two colonies in Laskeek Bay and 187 active nests were found. In the Pigeon Guillemot (PIGU) nestboxes, 19 of 30 (63%) were active, containing, during the nest box check, 12 chicks and 18 eggs. We retrieved eight of the 15 geolocaters that were attached to adult PIGU's during the 2019 field season. Two Cassin's Auklet chicks were measured and weighed in nestboxes; one fledged before our departure. Four near-shore sea surveys were completed, during which a total of 217 Marbled Murrelet sightings were recorded.

Marine mammal sightings included 15 Humpback Whales, 3 Grey Whales, 15 Pacific White-sided Dolphins, 11 Harbour Porpoises and 3 sightings of groups of Orcas.

Sixteen wildlife trees were occupied, including two by Tree Swallows (first nests recorded on the island). Red-breasted Sapsucker sapwells were monitored again this season; 29 person hours were spent monitoring, several interactions between Red-breasted Sapsuckers (RBSA) and squirrels were observed and there were 13 hummingbird sightings at the sapwells. A Common Raven nest and three Bald Eagle nests were active.

This was the second season since the initiation of our Restoration Project, which focusses on the reduction of Deer numbers on the island and various monitoring programs were continued; vegetation plots, songbird point counts, tree growth monitoring and invasive plant monitoring. Marine debris was documented and removed from one beach on Reef Island (Reef South Beach) and one on East Limestone Island (Crow Valley Beach).

Table of Contents

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 in science. The field station at East Limestone Island has been in operation for 31 consecutive field seasons and over this period LBCS has developed diverse long-term monitoring and public education projects in Laskeek Bay, Haida Gwaii. Normally, volunteers assist researchers with data collectionin 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.

In 2020, due to the global pandemic of COVID-19, LBCS's field season operated for a shorter time period (eight weeks) and with a limited crew (both employees and volunteers).

Education and interpretation program

LBCS provides opportunities for public involvement in research and monitoring activities through Project Limestone (our school program), our volunteer program, and interpretive tours. Normally, 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 Haida Gwaii.
Unfortunately, due to restrictions related to COVID-19, there were no on-island educational or interpretive programs offered in 2020.

Project Limestone

Project Limestone normally brings local elementary and high school students, to East Limestone Island to learn about natural history and participate in Ancient Murrelet research.

This year, due to COVID-19 restrictions, there was no Project Limestone.

Volunteers

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

This year, because of Covid-19, we had only 2 volunteers who volunteered for the whole field season.

They contributed 65 volunteer days each to projects on East Limestone Island and other areas of Laskeek Bay. The volunteers were the Pilgrim Family (Annemarie, Merel and Kai {1.5 years old – he did take care of a couple of things}).

Visitors

The LBCS visitor program normally provides an opportunity for private and commercial groups to visit East Limestone Island and participate in an interpretive tour. Unfortunately, due to restrictions related to COVID-19, there were no visitors to East Limestone Island.

Staff

LBCS staff this year were Neil Pilgrim, Lead Biologist/Camp Supervisor; Taro Oike, Field Assistant/Boat Driver; and Judy Hilgemann, Executive Director.

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 East Limestone Island for a four to six-week period.

This year, due to Covid-19 restrictions, there were no student interns.

Research and monitoring programs

Research Partnerships & Special Projects

LBCS assists other researchers and organizations with various projects in the Laskeek Bay area and other areas of Haida Gwaii. In Laskeek Bay this season, we collaborated with the Canadian Wildlife Service (CWS) on research into the annual movement of

Pigeon Guillemots. See the PIGU section for more details. Also, working under a CWS contract, we collected Black Oystercatcher and Glaucous-winged Gull egg shells to be used for DNA analysis. These collections were made on our scheduled BLOY surveys as well as on the GWGU colony census.

In other areas of Haida Gwaii, LBCS completed two contracts to retrieve Geolocator (GLS) devices from Leech's and Fork-tailed Storm Petrels for the CWS. The GLS tags were attached to the birds by CWS in the summer of 2019. The retrievals took place at Petrel Island (just north of Hippa Island) and Rock Islet (Skincuttle Inlet). The LBCS crew spent nine days in each location, retrieving 30% of GLS tags on Petrel Island and 40% on Rock Islet.

Ancient Murrelets *Synthliboramphus antiquus*

In 2017, remote camera monitoring became one of the primary methods of monitoring for Ancient Murrelet (ANMU) chicks departing from East Limestone Island. In 2017 and 2018 the cameras were used throughout the ANMU season with manual monitoring being conducted every second night. Given the success of camera monitoring in 2017 and 2018, in 2019, manual monitoring was discontinued and camera monitoring became the sole means of monitoring chick departure. This freed up staff and volunteers to undertake other activities. In 2020, camera monitoring was conducted on all funnels (Cabin Cove funnels 5,6,7 and 8).

In 2020, the first chick to arrive in the Cabin Cove funnels was on the night of 14 May and the last chick was seen in the early morning of 3 June. The highest number of chicks to be monitored on one night was 4, this occurred on four different nights (20, 21, 24, and 25 May).

Chick Capture Trends

The Cabin Cove total for 2020 was 31 chicks, including only chicks captured on camera during the time when we would normally be monitoring (22:30 to 02:30), to be consistent with previous years (Figure 1). The total including chicks that were photographed after 02:30 in the morning was 35.

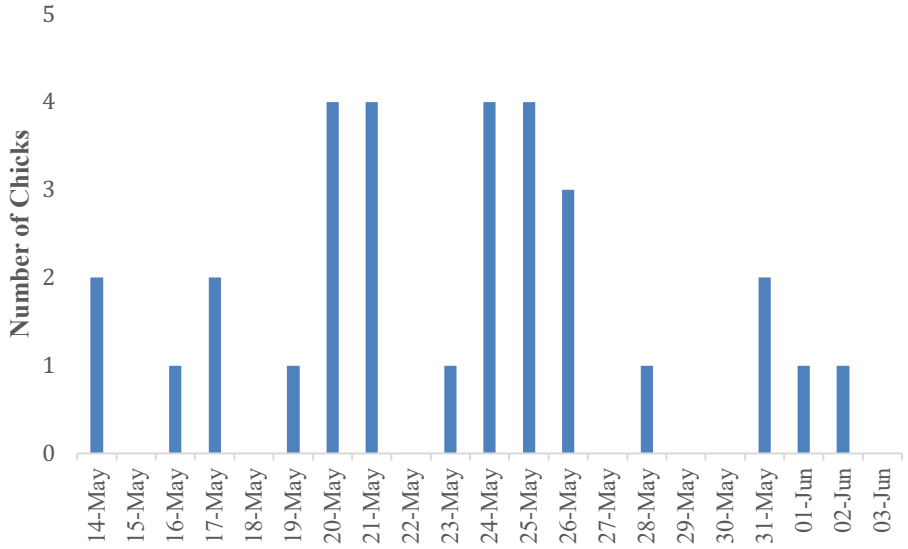

Figure 1. 2020 nightly chick records, funnels 5-8. Chicks photographed within the funnels before 02:30 are shown here. The date refers to when the monitoring night began, even if chicks were caught in the early morning of the next day.

The number of chicks recorded this season in funnels 5-8 was lower than last year: 31 chicks this season compared to 34 last season (Table 1). The continuing downward trend of chick departure numbers is of concern.

Table 1. Summary of chick departures, peak nights and totals for funnels 5 to 8 on East Limestone Island, 2006 to 2020. Chick numbers include only chicks captured or photographed within the funnels, and before 02:30 in the morning.

Year	*First night with chicks*	*Peak night*	*Peak count*	*Last night*	*Total nights*	*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
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
2016	18-May	25, 29-May	5	19-June	32	36
2017	16-May	20-May	5	10-June	26	28
2018	11-May	17-May	6	17-June	37	39
2019	11-May	19-May	6	11-June	36	34
2020	14-May	20,21,24,25 -May	4	3-June	28	31

Funnels 5 and 6

As of this season, funnels 5 and 6 have been monitored continuously for 31 years, and are the primary means of assessing the long-term population trend in the Cabin Cove colony area. Funnels 7 and 8 were installed in 2006 flanking funnels 5 and 6 to see if the colony area had shifted. This year there were more chicks in funnels 5 and 6 (17 chicks) than funnels 7 and 8 (14 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. Similar to the past five years, funnel 6 had a much higher number of chicks (13) than funnel 5 (4). The total chick number is slightly lower than the past five years, and much lower than years previous to that (Figure 2). This year, the first chicks arrived in funnels 5 and 6 on 16 May and peak night (4 chicks) occurred on 20 and 21 May (Table 2).

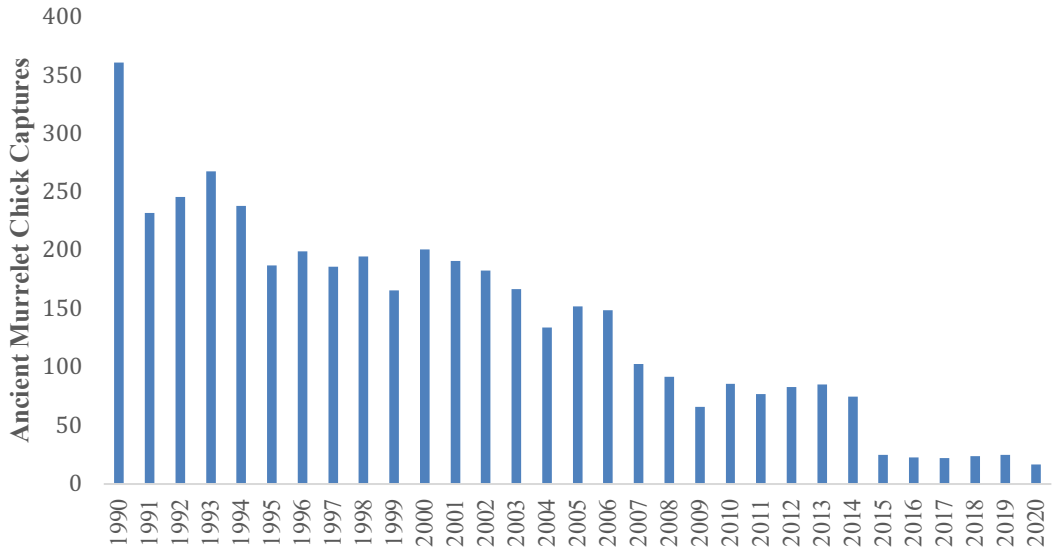

Figure 2. Total Ancient Murrelet chick captures at funnels 5 and 6, 1990-2020. These totals include only chicks captured before 02:30 in the morning.

Table 2. Summary of chick departures, peak nights and totals from funnels 5 and 6 on East Limestone Island, 1990 to 2020.

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	08-May	21-May	16	02-Jun	25	86
2011	11-May	21-May	9	09-Jun	30	77
2012	13-May	22-May	12	31-May	19	83
2013	13-May	22-May	11	01-Jun	20	85
2014	11-May	18-May	12	02-Jun	23	75
2015	11-May	17, 24 - May	4	06-Jun	27	25
2016	18-May	25-May	5	19-Jun[1]	32	23
2017	16-May	20-May	5	10-Jun[1]	26	22
2018	11-May	17-May	6	17-Jun[1]	37	24
2019	11-May	19-May	6	11-Jun[1]	36	25
2020	16-May	20, 21-May	4	03-Jun[2]	28	17
Average	11-May	21-May	17	06-Jun	28	137
SD	2.5 days	3.7 days	9.1 chicks	5.9 days	5.5 days	86.4 chicks

[1]The final night of monitoring in 2016, 2017, 2018 and 2019 was obtained using a different method from previous years, due to low chick numbers and use of cameras for monitoring. See text for details.
[2]The final night of monitoring was decided prior to the field season in order for the crew to schedule a week out of camp.

Other ANMU monitoring

Point counts

In past years (1990-2018), point counts were conducted 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 on some manual monitoring nights. In 2019, an automated recording unit (ARU) was set-up in the same location where the point counts were conducted. In 2020, this allowed the collection of ANMU, Cassin Auklet and Fork-tailed Storm Petrels calls from 23:00 to 04:00 on 58 nights, from 3 May to 29 June.

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 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 East Limestone Island gathering ground is located between Low Island and East Limestone Island. Between 3 May and 4 June, we conducted standardized 10-minute counts of birds on the gathering grounds (two counts of 5 minutes each). The highest count occurred on 7 May, with a total of 44 Ancient Murrelets observed. The maximum this year was lower than the maximum in 2019 (104 birds) and 2018 (51 birds), but greater than 2017 (22 birds). The average gathering ground count in 2020 was 7.9 ± 12.7 Ancient Murrelets, higher than last year (6.7 ± 15.6) as well as 2018 (4.2 ±10.0) and 2017 (4.6 ± 5.1), but less than the three years prior to that (14.5 ± 15.7 in 2016, 30.3 ± 31.8 in 2015 and 20.7± 23.0 in 2014). Gathering ground counts were completed on 27 evenings this season. They could not be completed on six nights due to poor weather conditions. The last gathering ground count was completed on 4 June, rather than the usual 20 June, because the crew left East Limestone Island for their time off on that date.

Summary: Population Trends

The breeding population of Ancient Murrelets on East Limestone Island has been declining over time. The number of departing chicks in funnels 5 and 6 declined by 56% between 2006 and 2009, likely due to the presence of raccoons in 2007 and 2009. Chick numbers increased slightly after 2009 and seemed to have stabilized in these two funnels, up until the 2015 season when there was a 67% decline in chick numbers from the previous year. The continued low number of chicks in 2016 (8% decline from 2015), 2017 (13% decline from 2015), 2018 (4% decline from 2015) and 2019 (0% decline from 2015) is concerning. In 2020, the number of chicks was lower than in 2019 and is a 32% decline from 2015. In 2015, it was speculated that the dramatic decline from 2014 to 2015 could have been a temporary poor breeding year due to high sea surface temperatures throughout the previous winter. With six years of very low chick numbers we are concerned that the combination of poor feeding conditions, changes in habitat on East Limestone Island due to blowdown, and sporadic raccoon predation in the past, have worked together to decrease recruitment of new breeders to the East Limestone Island colony, and we are now seeing the result as a rapidly declining population on this island.

Black Oystercatchers *Haematopus bachmani*

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 ecosystem, these birds are also thought to be a good indicator species for the health of intertidal life. LBCS has been monitoring the breeding population of Black Oystercatchers in Laskeek Bay annually since 1992 (except for 2011).

LBCS conducted Black Oystercatcher surveys only in Laskeek Bay this year (Figure 3), and the results from the two surveys are summarized below. We have also been conducting extensive surveys of Black Oystercatchers in Gwaii Haanas for Parks Canada, but those surveys were cancelled this year due to COVID-19 restrictions. Methodology for shoreline surveys and territory visits are detailed in the Gwaii Haanas Black Oystercather Survey reports, and will not be repeated here. Survey maps of the Laskeek Bay area are produced by Gwaii Haanas and included as an appendix in the Gwaii Haanas reports.

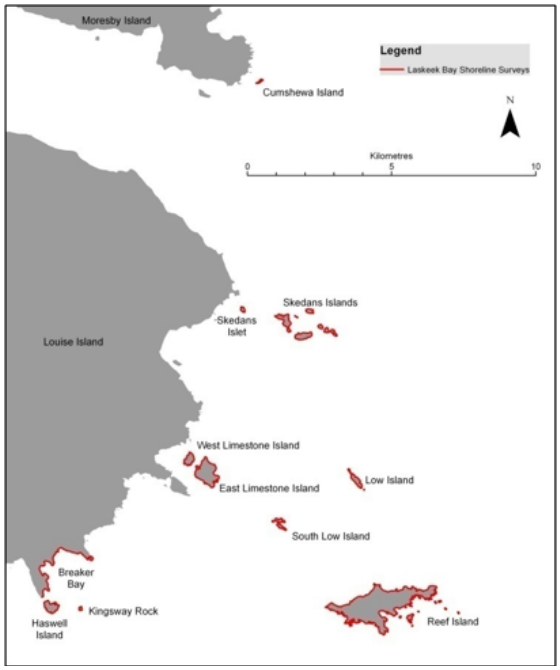

Figure 3. All shorelines outlined in red represent shoreline segments surveyed for Black Oystercatchers (Lost Islands not shown).

Site occupancy and reproductive success

Oystercatcher territories were visited in Laskeek Bay in late May (27 - 31 May) and again in late June (24 - 28 June). The islands that we survey every year are Cumshewa Island, Lost Islands, East and West Limestone Islands, Reef, Low and South Low, Skedans Islands (including the small islet in front of the village site), Kingsway Rock, Haswell Island, and a section of the Louise Island shoreline between Haswell Island and Nelson Point (Fig. 3). We visited and searched on foot all territories 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 unless activity was observed. 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 and for non-territorial birds. All islands were visited during the first survey and during the second survey all islands were visited with the exception of the Lost Islands. We weighed and measured eggs and measured chicks at territories where they were present.

Of the 64 territories visited on foot, 50 were occupied (44 had warm eggs [100 eggs total] and none had chicks) during the first survey. During survey 2, we found 4 territories with eggs (6 eggs total) and 17 territories with chicks (25 chicks total). We also survey the shoreline of islands to search for new territories and non-territorial birds (birds that are away from their territory or non-breeders). We found 4 new territories (included in the total of 64 territories visited on foot) in Laskeek Bay, and had 15 non-territorial sightings of oystercatchers comprising 38 birds (some of which could be the same birds sighted multiple times).

Banding and re-sighted oystercatchers

Black Oystercatcher chicks are banded in most years in Laskeek Bay. When banding occurs, the chicks are banded with one metal band on the right leg that carries a unique number. Oystercatchers banded in the years before 2013 have a combination of colour-bands on the left and right leg that indicates the year of banding as well as the general location where the bird was banded. Metal bands are permanent, while the plastic bands seem to be lost over time. In 2013, we began banding chicks with field-readable alphanumeric (A-N) codes on plastic bands, instead of colour combinations, because the unique code allows identification of the individual bird from a distance. The A-N bands have white characters on a dark blue background. In 2017, we tried using a new type of A-N plastic band, because we noticed several very worn plastic bands from earlier years, on which the combination is now un-readable. In 2019, it was decided to discontinue using the A-N bands as the new bands selected in 2017 had already become mostly unreadable. In 2020, no chicks were banded.

All oystercatchers observed during the season were checked for bands, as this gives us information on their age and dispersal. Eighteen banded birds were seen in Laskeek Bay during the two 2020 surveys (Table 3). Banded individuals at breeding territories were assumed to be the same individuals on subsequent visits and repeated sightings are not included in the table. There were five birds with colour or alphanumeric bands that were re-sighted in Laskeek Bay this year.

Table 3. Banded Black Oystercatchers re-sighted in Laskeek Bay in 2020

Band Combination (Left – Right)[1]	Location Seen /Nest Site	Year Banded
UB-UB/M	REE-11	Unknown
UB-UB/M	REE-4	2013 or 2014[2]
UB-UB/M	REE-1	Unknown
UB-UB/M	SKE-12	Unknown
UB-UB/M	Skedans Islands	Unknown
UB-UB/M	LOW-13	Unknown
UB-UB/M	LOS-11	Unknown
AN-DG/M	Low Island	2017
UB-UB/M	ELI-4	Unknown
UB-UB/M	SLW-8	Unknown
AN-Br/M	SLW-5	2016
UB-UB/M	KNG-4	Unknown
AN-Br/M	SLW-1/SLW-6	2016
UB-UB/M	REE-1	Unknown
AN-UB/M	CUM-1	Unknown
UB-UB/M	SKE-15	Unknown
UB-UB/M	KNG-8	Unknown
UB-R/M	Breaker Bay, Louise Is.	2019

[1]Band codes: UB = unbanded (birds can lose bands), M = metal, Or = orange, W = white, DG = Dark Green, R = Red, Bk = Black, Br = Brown, Y = Yellow, DB = dark blue, AN = Alpha numeric
[2]Banded as a chick.

Oystercatcher Chick Diet

Oystercatchers feed their chicks hard-shelled invertebrates, which they bring intact to the breeding territory. In order to quantify average diet composition fed to chicks, we collect a sample of fresh prey remains where they are present. In 2020, prey was collected from 19 unique territories in Laskeek Bay.

Limpets were the primary prey (70.3%), followed by mussels (19.3%), abalone (5.4%) and chitons (4.8%) (Figure 4). These four prey items made up 99.8% of the diet. These numbers are fairly consistent with what has been found in past years; in 2019 these four prey items made up 99.0% of the diet.

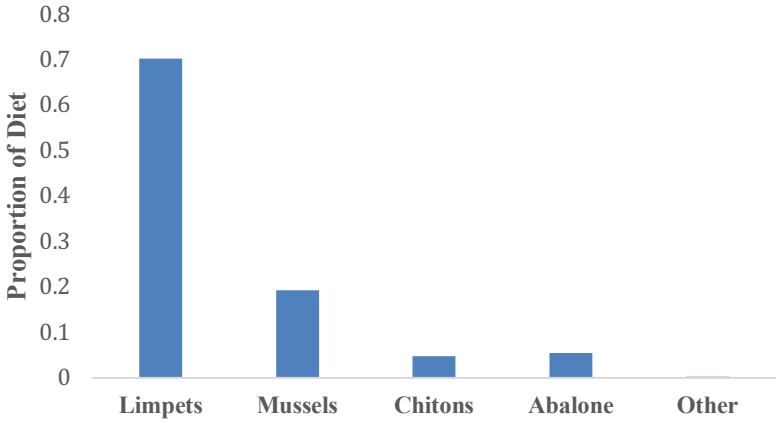

Figure 4. Black Oystercatcher chick diet from prey collections in Laskeek Bay, 2020.

Glaucous-winged Gulls *Larus glaucescens*

LBCS has been censusing gull colonies within Laskeek Bay since 1992 (Figure 5). This year, we visited the known colonies on Kingsway Rock, Low Island, Cumshewa Island, Skedans Islands and Lost Islands. At each of the colonies visited, the number of active nests (those containing either eggs or chicks) was recorded, as well as the number of empty nests. No nests and very few gulls were seen on Skedans Islands and Cumshewa Island. Very few gulls were seen on Low Island, but one nest with a single egg was found. Lost Islands, the largest colony in the area, had 144 active nests on 14 June, while Kingsway Rock had 43 nests on 17 June (total 187 active nests). All nests contained only eggs: 1 egg (7 % of nests), 2 eggs (12 %), or 3 eggs (81 %). The total number of active nests counted this season (187), in these 2 colonies, was below the long-term average of 246.4 ± 54.3 (SD).

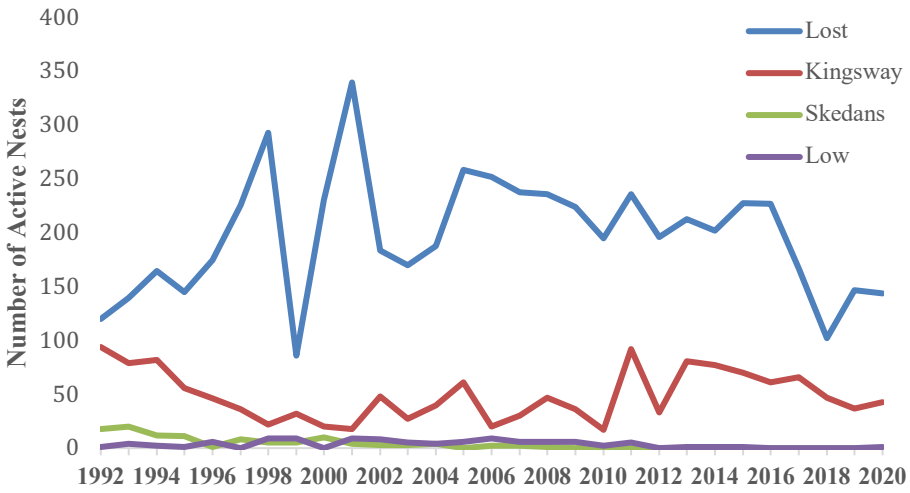

Figure 5. Glaucous-winged Gull nests containing eggs or chicks at four colonies in Laskeek Bay, 1992-2020

Pigeon Guillemots *Cepphus columba*

There are 30 Pigeon Guillemot (PIGU) nest boxes at Lookout Point on the east side of East Limestone Island. Ten boxes were initially installed in 2001 with another 18 boxes being added in 2010. In 2019, 10 new boxes with slightly different design were brought into the area. Eight of these boxes replaced old boxes in poor condition.

This season, 19 (63%) of our nestboxes were occupied at the time of our departure on 2 July, the boxes contained a total of 12 chicks and 18 eggs.

Geolocator Project

Currently, there is no information on where Pigeon Guillemots, breeding in Haida Gwaii, spend the winter. In 2019, LBCS began a collaboration with the Canadian Wildlife Service (CWS) on research into the annual movement of Pigeon Guillemots. The CWS contracted us to attach 15 geolocator tags to adult guillemots in 2019 and then to retrieve them in the 2020 field season.

Geolocators (also known as GLS tags or geologgers) are miniature archival light level loggers for tracking birds. They record the time of sunrise and sunset daily and from this information, the location of the animal each day can be determined. To retrieve the data, birds must be recaptured, the tags removed and the data archive downloaded. The accuracy of light level geolocation is appreciably less than provided by GPS tags and is usually assumed to have an error of about 150 km. However, it can be enough to provide useful timing and movement data, allowing the identification of important wintering and stopover areas.

The nest boxes, on Lookout Point, provide the guillemots with reliable nest sites that can be used, often by the same birds, year after year. They allow LBCS staff to recapture birds with minimal disturbance to remove the geolocaters. In 2020, eight of the 15 geolocators placed on adult guillemots in 2019 were retrieved. The devices have been sent to the Canadian Wildlife Service for analysis and the information gained from this will be reported at a later date.

Pigeon Guillemots diet project

In 2016 we began opportunistically photographing Pigeon Guillemots with fish in their bills. Guillemots bring fish to their young carried externally, in the bill. The parents often sit on the water before they enter their nest sites to feed their chicks, which gives us a great opportunity to photograph the fish they are carrying (Fig. 6). From these photographs we will be able to catalogue the type and size of fish that guillemots in Laskeek Bay are foraging on, and may be able to track changes in the fish they are foraging on over time. In 2020, due to the field season ending earlier than in a normal year (COVID-19 restrictions), guillemots only began to be sighted with prey in their bills a few days before

the field crew's departure and no prey photographs were obtained. We hope to analyse photographs from earlier years this winter.

Figure 6. Pigeon Guillemots with prey items

Cassin's Auklets and Fork-tailed Storm Petrels

Ptychoramphus aleuticus and *Oceanodroma furcata*

Small populations of Cassin's Auklets and storm petrels breed on East Limestone Island. Like Ancient Murrelets, these species are burrow nesters and are only active above ground at night. Breeding activity on the island has fluctuated over the years, which is partly attributed to predation by introduced raccoons.

In late May, Cassin's Auklet nestboxes were checked for occupancy at both Lookout Point and at the East Coast plots; 41 at the East Coast plots (North and South), and 24 at Lookout Point. Two boxes had signs of activity, both contained incubating adults. Once the adults were no longer incubating, a chick was found in each of the boxes. One auklet chick successfully fledged before the field crew's departure and the other was getting close, but was still in the nestbox, at the end of the season.

The amount of Fork-tailed storm-petrel activity this season has yet to be determined. Prior to 2019, FTSP calls were recorded during ANMU point counts. In 2019, these were discontinued and replaced with an automated recording unit that records the ANMU, FTSP and the CAAU. The ARU was used again in 2020. In the future, these recordings will be analyzed and the level of Fork-tailed storm-petrel activity will be determined.

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 Cumshewa Island and south to Haswell Island. Four near-shore surveys were completed this year: 8 May, 20 May, 13 June, and 23 June. On these surveys, we counted 21 species: Ancient Murrelet, Black Oystercatcher, Cassin's Auklet, Common Loon, Double-crested Cormorant, Glaucous-winged Gull, Great Blue Heron, Harlequin Duck, Herring Gull, Long-tailed Duck, Marbled Murrelet, Northern Shoveler, Pacific Loon, Pelagic Cormorant, Pigeon Guillemot, Rhinoceros Auklet, Red-necked Grebe, scaup species, Surf Scoter, White-winged Scoter, and Yellow-billed Loon.

The highest Marbled Murrelet count was during the 8 May survey, when we recorded 92. During the other surveys we counted a total of 125 Marbled Murrelets; 41 on 20 May, 34 on 13 June, 50 on 23 June. These numbers are lower than those recorded on five 2019 surveys (an exceptional year for MAMU); 120, 111, 131, 274 and 45.

Hecate Strait surveys

This survey takes us due east from Reef Island into Hecate Strait, and then back towards the Skedans Islands. It allows us to record species that tend to stay farther from shore. No Hecate surveys were conducted in 2020.

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*). Harbour Seals and Steller's Sea Lions are counted at specific haul-outs during sea surveys in order to keep an index of population trends.

Along with recording incidental sightings, we do standardized surveys of marine mammals during sea watches from Lookout Point, during at-sea surveys, and by doing a 5-minute scan and count of marine mammals from Cabin Cove each evening approximately two hours before sunset. The evening 5-minute count was initiated in 2014, and ends on 20 June, when the ANMU gathering ground count ends. The results of this season's total sightings are summarized in Table 4.

In 2018, an attempt to standardize sea watch times was made; sea watches were scheduled three times per week, from 07:00-08:00. These three hours per week were coupled with another one or two one-hour sea watch sessions that were completed opportunistically. This schedule was kept in 2019, but in 2020, due to time constraints, was less rigorously followed.

Table 4. Total counts of marine mammals from sea surveys, sea watches, and incidental sightings, 2010-2020†. Data since 2014 includes sightings during the 5-minute evening count. Numbers do not necessarily reflect number of individuals, as individuals may be recorded more than once.

Common name	Scientific name	2020	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010
Northern elephant seal	*Mirounga angustirostris*	0	0	0	0	2	0	0	0	0	0	0
California sea lion	*Zalophus californianus*	0	1	0	0	0	0	4	0	0	1	1
Humpback whale	*Megaptera novaeangliae*	15	122	36	22	112	13	347	12	14	193	86
Fin whale	*Balaenoptera physalis*	0	0	0	0	0	0	0	0	0	0	0
Grey whale	*Eschrichtius robustus*	3	5	1	2	3	0	0	1	1	1	0
Minke whale	*Balaenoptera acutorostrata*	0	2	2	2	9	4	3	6	2	1	0
Killer whale	*Orcinus orca*	8	36	36	45-60	47	50	26	16	13	49	11
Harbour porpoise	*Phocoena phocoena*	11	16	27	14-15	7	13	31	7	4	19	0
Dall's porpoise	*Phocoenoides dalli*	0	0	0	0	0	0	0	0	0	8	0
Pacific white-sided dolphin	*Lagenorhynchus obliquidens*	15	0	13	0	30	0	0	0	0	0	46

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

Humpback Whales

There were fewer Humpback whale sightings this year in Laskeek Bay, than in 2019. The sightings of Humpbacks were evenly spread throughout season; there was no peak of sightings early in the season (migration).

Orca

There were three sightings of Killer Whales in Laskeek Bay this season. We were able to take ID photographs during one of these encounters. Our ID photographs are sent to the Killer Whale database at the Pacific Biological Station in Nanaimo.

Steller's Sea Lions

There are several sea lion haul-outs in Laskeek Bay. The largest of these is on islets off the east end of Reef Island. There are also smaller winter haul-outs on the Skedans Islands, Cumshewa Rocks, and Helmet Island. We regularly count the number of individuals on the Reef and Skedans haul-outs. The maximum number counted this season was 346 individuals at Reef (8 May) and 78 at Skedans (8 May).

Other species

Other less-common marine mammal species that were sighted this season: Pacific White-sided Dolphins (~15 individuals in 1 sightings), and Grey Whales (3 individuals in 2 sightings).

Wildlife Trees

The Society has been monitoring cavity-nesting birds on East Limestone Island since 1990. Wildlife trees (dead standing snags) 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 186 wildlife trees have been identified over the past 31 field seasons.

This year we found a total of 16 active trees, containing nests of five different species. Eight new trees were identified. Eleven nests were occupied by Red-breasted Sapsuckers (RBSA) (Figure 7), one by Chestnut-backed Chickadees (CBCH), one by Hairy Woodpeckers (HAWO), one by Brown Creepers (BRCR) and two by Tree Swallows (TRSW; Table 5). This was our first record of a tree swallow nest in our 31 years of observing wildlife trees. The nests were found in cavities, excavated by woodpeckers, with greatly different characteristics (one tall with little decay, the other short with much decay). One of the cavities was in a previously numbered tree and the other in a tree newly recorded this year.

The number of Red-breasted sapsucker nests (11) was similar to numbers over the past decade, but less than in some earlier years when up to 22 active sapsucker trees were found.

Figure 7. Red-breasted Sapsucker on a branch near its cavity nest on East Limestone Island

Table 5. Wildlife tree activity on East Limestone Island in 2020. Minimum fledge date is the last day activity was observed at the nest, maximum fledge date is the first day that no activity was observed in a half-hour continuous watch of the nest.

Tree #	Cavity Nester[1]	Tree Species[2]	Fledge Date (earliest)	Fledge date (latest)
109	RBSA	Spruce	15-Jun	17-Jun
116	CBCH	Spruce	01-Jun	14-Jun
132	TRSW	Spruce	Still active when crew departed ELI (2 July)	
150	RBSA	Hemlock	Possible nest failure (active 3 May, no activity 12 May)	
161	RBSA	Spruce	24-May	03-Jun
164	RBSA	Hemlock	17-Jun	20-Jun
165	RBSA	Spruce	01-Jun	15-Jun
170	RBSA	Spruce	01-Jun	14-Jun
179	BRCR	Spruce	17-Jun	20-Jun
180	HAWO	Spruce	19-May	01-Jun
181	RBSA	Spruce	22-Jun	26-Jun
182	RBSA	Hemlock	01-Jun	15-Jun
183	TRSW	Spruce	Still active when crew departed ELI (2 July)	
184	RBSA	Hemlock	01-Jun	15-Jun
185	RBSA	Hemlock	15-Jun	17-Jun
186	RBSA	Spruce	22-Jun	26-Jun

[1]RBSA = Red-breasted Sapsucker, NOFL = Northern Flicker, HAWO = Hairy Woodpecker, CBCH = Chestnut-backed Chickadee.
[2]Spruce = Sitka spruce, Hemlock = Western hemlock.

Sapwell Monitoring

In 2019, we began to monitor Red-breasted Sapsucker sapwells. Sapwells were found opportunistically while the staff and volunteers travelled around the island during other projects, mainly the wildlife tree monitoring program. While monitoring wildlife trees, we noted where the sapsuckers went after leaving the nest and often found a sapwell tree. in the area where the bird had flown. It was then marked with flagging tape, and mapped.

In 2020, twenty active sapwell trees were monitored; 14 that were active in 2019, as well as six newly identified trees: all were Western Hemlocks. A total of 29 person-hours were spent monitoring sapwell trees. During these sessions, many visits by sapsuckers were documented and there were seven sightings of squirrels (five feeding at the sapwells, two not feeding) and three interactions between squirrels and sapsuckers. Rufous Hummingbird was the only other species of bird seen using sapwells, being observed a total of 13 times at multiple different sapwell trees during the monitoring sessions.

Raptors and Corvids

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

This year we had 3 active Bald Eagle (BAEA) nests on East Limestone Island; two in the NW section of the island (BAEA-10 and BAEA-9) and one at Cassin's Tower (BAEA-5). The nests BAEA-9 and -10 were regularly seen with an adult on or near the nest, but the chicks were never actually seen (these nests are very difficult to see into). Adults were still being seen at those nests until our departure from the island. At BAEA-5 two chicks were initially spotted, though as the season progressed only one chick was seen in a more developed state. This led us to believe that one chick may have perished. The remaining chick did not fledge before our departure.

Peregrine Falcons have nested on East Limestone Island discontinuously since research began in 1990. The nest has always been on the south cliffs, although the position has shifted somewhat between years. During the first nine years (1990-1998), an active nest was observed in all years except 1992. During the next eight years (1998-2006) there was no nesting activity observed. For the next seven years (2007-2013) there was an active nest every year, generally with 2-3 young observed. In 2014 and 2015, eggs were observed in the nest, but no young and in 2016, 2017, 2018 and 2019 chicks were observed in the nest and fledglings were later seen. In 2020, no activity was observed.

As in past years, one pair of Common Ravens (CORA) nested on the island. This year, the nest was at a new site (CORA-5); a very large Sitka Spruce found at the junction of the Connector Trail and the Spruce Trail. Two chicks were observed in the nest on 5 May, and then three were observed near the nest on 14 May. On 19 May, no chicks were observed in or near the nest but soon after 3 juveniles and 2 adults were observed in Boat cove, and for the rest of the season we regularly observed them around the island.

Daily Bird Checklist

Throughout the field season, we keep a daily record of all bird species seen or heard within Laskeek Bay. We recorded a total of 63 species over 57 days. Many species were recorded almost every day, for example: Common Raven, Black Oystercatcher, Bald Eagle, Pigeon Guillemot, Red-breasted Sapsucker, Pacific-slope Flycatcher, Golden-crowned Kinglet, Hermit Thrush, and Pacific Wren. Many less frequently observed species were recorded this year as well, such as the Yellow-billed Loon, Red-necked Phalarope, Sandhill Crane, Semipalmated Plover and Short-billed Dowitcher.

Blowdown

Since 2011, when winter winds blew down a significant portion of the forest on East Limestone Island, we have been monitoring the regeneration of the forest in these

blowdown areas by taking photos from the same locations each year (Figure 8). We have established 6 photo points, mostly in the north and central part of the island, but including one directly behind the camp in Cabin Cove.

(a) (b)

(c)

Figure 8. Photos taken looking west along the main trail, in (a) 2011, the first field season after the blowdown events, (b) five years later in 2016 and (c) this year, 2020

Rare Plants and Vascular Plant Blooming Records

There are relatively few wildflowers and berry bushes left on East 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.

A number of rare plants are present on East Limestone Island due to the unique limestone geology that is uncommon on the rest of Haida Gwaii: showy Jacob's ladder (*Polemonium pulcherrimum*), Richardson's geranium (*Geranium richardsonii*), and cut-leafed anemone (*Anemome multifida*). In 2020, showy Jacob's ladder and cut-leafed anemone were found to be blooming, on the cliffs in Boat and Anemone Cove.

Every field season we keep a record of the dates on which all vascular plant species are first observed in bloom. For example, this year we recorded sightings of blooming Small Flowered Blue-eyed Mary (*Collinsia parviflora*), Siberian Miner's-lettuce (*Claytonia sibirica*), Hairy Rockcress (*Arabis hirsute*) and red columbine (*Aquilegia formosa*).

CONSERVATION

Restoration Project

In 2019, LBCS began a restoration project that will help East Limestone Island return to a state approaching a pre-deer era (based on what is seen on deer free islands). A central plank in this plan is to encourage regular deer hunting on East Limestone Island, with the hope that this will substantially lower deer browsing pressure. Once regular deer hunting on the island has been established, we should be able to document the return of the native vegetation on East Limestone Island, creating an increase in biodiversity and a more resilient ecosystem.

The main aspects of the monitoring program were implemented in the 2019 field season prior to the commencement of the regular hunting of deer on East Limestone Island.

This Restoration Project has created an effective monitoring program for native vegetation, the browsing effects of Deer, and songbird richness and abundance, as well as a monitoring program for the distribution and density of invasive alien plants.

Vegetation Plots

East Limestone Island contains habitat suitable for many types of grasses, forbs, ferns, shrubs and trees. This vegetation has changed over time due to the presence of the invasive Sitka Black-tailed Deer. In order to capture change in the vegetation structure as hunting pressure is established and deer numbers decrease, we have begun to record every plant species present, as well as estimate abundance and cover in 11 vegetation plots around the island; vegetation plots are located strategically in different areas of the island: Sitka Spruce/Western Hemlock forest (2 plots), Shoreline (4 plots–N, S, E, W), Alder forest East (1 plot), Alder forest South (1 plot), Cedar forest (1 plot) and blowdown (2 plots). The plots have a 10-meter radius (large plot) with a subplot (using the same center point as the large plot) of 3.6 m. The large plot will be used to measure species richness and the subplot used to estimate abundance and cover. The information will be recorded annually for as long as the project continues.

Songbird Point Counts

Many species of songbirds are found on East Limestone Island with different species occupying various habitats. The introduction of deer has negatively affected the abundance and distribution of flowering plants, limiting both foraging and nesting habitats for many songbirds. This has most likely led to lower levels of both songbird richness and abundance. We are now conducting point counts in all of the vegetation plot areas to record the presence, location and abundance of various species of songbirds on the island, in order to monitor change in songbird distribution and abundance as deer hunting becomes a regular event.

In the 2020 field season, three point counts were conducted in each vegetation plot. Each point count was administered over a two-day period between 06:00 and 08:30. The dates of the point counts were: 14-15 May, 31 May - 1 June and 16-17 June.

Tree Growth

Sitka Black-tailed Deer have a marked effect on tree growth on East Limestone Island, the result being that it can take much longer for a tree on ELI to escape the browsing limit of the deer when compared to a place where deer are less abundant. In order to monitor and record the growth rate of trees that are within the browsing limit (<1.5m) of the deer, in 2019 ten saplings of three common tree species (Sitka Spruce, Western Hemlock, Western Red Cedar) on ELI that were <1.5m in height, were selected. The total height of the sapling and the longest lateral branch are measured and these measurements will be recorded annually. Unfortunately, sometime between the 2019 measurements and the 2020 measurements, seven saplings (two Western Hemlock and five Western Red Cedar) had been removed, some possibly eaten by the deer. Other saplings of the same species were identified, measured and used as replacements for those that were removed. Measurements were taken on the all the remaining saplings.

Invasive Plant Monitoring

Invasive plants are plants that have been introduced to an area from elsewhere and have the ability to reproduce rapidly. They often quickly take over habitat that would otherwise be available to native plant species. Invasive plants that have become established on East Limestone Island include Bull Thistle (*Cirsium vulgare*), Canada Thistle (*Cirsium arvense*), Prickly Sow-thistle (*Sonchus asper*), Wall Lettuce (*Lactuca muralis*) and Marsh Cudweed (*Gnaphalium uliginosum*).

After a three-year invasive plant removal project on ELI, it was found that the effort exerted did no provide the desired rewards. During the removal program, a number of plots were selected for invasive removal. Of these plots, ten were selected to be monitored without further removal (with some exceptions: seed heads of *Cirsium* species were, at times, clipped). The ten plots that were selected had the most consistent records and contained the most common invasive plants on ELI. We recorded the abundance and richness of invasive plants on these plots in 2020.

Introduced Mammals

Sitka Black-tailed Deer *Odocoileus hemionus*

Deer were intentionally introduced to Haida Gwaii in 1878, and on several occasions between 1911 and 1925, to provide game meat for local people (Gaston *et al*. 2008). 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 with the Research Group on Introduced Species

(RGIS), which has carried out extensive research on this topic in Laskeek Bay as well as on the rest of Haida Gwaii.

RGIS has completed a four-year program, project BAMBI (Behavioral Adjustments to Mitigate Biodiversity loss), a study that 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, thermal motion-activated cameras were used to remotely track deer on East Limestone Island. In past years cameras would also be set-up on Reef Island, but due to the limited ELI field season resulting from COVID-19 restrictions, no cameras were set-up there in 2020. This year on East Limestone Island, 12 cameras were set up around the island between 21 February and 25 June. The pictures were sent to RGIS for analysis.

Although project BAMBI is over, we continue to record sightings of tagged deer on East Limestone Island for RGIS. The date/time, location, tag colour/number, and sex were recorded along with any behavioral notes. This year, the only deer sighted with ear tags was number 5. This deer is now ten years old; it was captured and tagged in July 2011 as a yearling buck.

On East Limestone Island, there are now two deer exclosures, one that was built several years prior to the blow-down in 2010 and another one was built in March of 2015. The older exclosure, having survived the blowdown with only minor damage, contains vegetation that was established prior to the blowdown. This 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 newer exclosure is close to the main trail, in the blowdown at the centre of the island. The difference in growth within this exclosure to the area adjacent is also quite apparent, with many huckleberry bushes, wildflowers, and healthy spruce, hemlock and cedar saplings growing within the exclosure. We are also noticing that a consequence of the blowdown is the creation of many small refugia for plants on top of upturned roots.

Raccoons *Procyon lotor*

Raccoons were introduced in the early 1940s to provide local trappers with a source of employment (Gaston *et al*. 2008). Raccoons 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 East 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 East Limestone since 2009.

Due to the large raccoon population on Louise Island it seems likely that raccoons will continue to disperse to East Limestone Island in future years. It is therefore very important to continue undertaking 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 year. On 21 February, a crew set up four thermal motion 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 East Limestone Island 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 3 May. No raccoons were photographed during this time.

On 21 and 23 February, a crew conducted two nights of spotlight surveying of the shoreline of East Limestone Island, West Limestone Island and the adjacent shoreline of Louise Island. During this approximately three-hour survey, no raccoons were sighted on East or West Limestone Island. On Louise Island, nine raccoons were sighted, four of which were killed; 21 February - 3 sighted, two killed, 23 February - 6 sighted, two killed.

Monitoring for raccoons continued throughout the field season, with one camera that was baited and checked regularly. Boat Cove was monitored continuously from 21 February until 1 July, and North Cove, Cabin cove and Crow Valley from 21 February to 3 May. Based on experiments with baited cameras in locations where raccoons are present, they are attracted to the baited cameras for an extended period of time. However, we did not record any photographs of raccoons at the wildlife cameras so we are almost certain they were not present on East Limestone Island this season.

Red Squirrels *Sciurus vulgaris*

Squirrels were introduced to Haida Gwaii in 1950 to aid in cone gathering for the forest industry (Gaston *et al*. 2008). Squirrels may have been introduced to East Limestone Island directly at this time. Squirrels are now well established on East Limestone Island and are known to be a nest predator on various songbird species (Martin and Joron 2003).

Since 2007, we have been conducting squirrel surveys on East Limestone Island 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. Eight squirrel surveys were completed this season.

Marine Debris Removal

In 2016, we began documenting, collecting, and removing marine debris from several beaches in Laskeek Bay. In 2019, two beaches were selected to become long-term monitoring sites; the south beach on Reef Island and the Crow Valley beach on East Limestone Island. The type of survey conducted is an accumulation survey, which is based on National Oceanic and Atmospheric Administration (NOAA) protocols. The Crow valley beach has been surveyed and has had debris removed annually since 2016, this was continued in 2020. Very little debris was removed this year. This was the second year for debris surveys and removal on for the south beach on Reef Island and large amounts of plastic and other debris was removed, although considerably less than in 2019.

CONCLUSION

This season was our 31st 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. Unfortunately, in 2020, no visitors or students could visit the island and only a few volunteers were possible: despite this, the season was a success. The society remains dedicated to long-term monitoring and engaging the public in addressing local conservation issues.

Between the years 2006-2009 we documented a very serious decline in Ancient Murrelet numbers on East Limestone Island. Since 2015 we have again experienced another major decline in chick numbers in the Cabin Cove area (from 110 chicks in 2014 to 31 chicks in 2020). What brought on this change is not clear: changes in sea surface temperatures which in turn modify food sources, loss of habitat or degradation of 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 as our main restoration initiative. In 2019, we decided to discontinue manual monitoring and move to complete automation of ANMU monitoring. This has allowed us to be less invasive with the ANMU, as well as giving us the ability to direct more person hours to other projects.

Invasive plants and animals are degrading the various habitats on ELI. These same problems are evident on many islands in the Haida Gwaii Archipelago. The restoration plan begun in 2019 will help to give us a better understanding of these effects and how

controlling the deer population can effect change, as well as hopefully, a return to what the island would have been like in pre-deer era. In 2020, some change was observed in the vegetation but several more years will have to pass before we will have collected enough data to sufficiently confirm any change that may be occurring.

The lessons that we learn from our research on East Limestone Island are of great importance. In every monitoring program LBCS conducts we are collecting quantifiable data that will allow us, and others, to conduct analysis that will produce information that can inform managers, researchers and the general public. We hope that continuing our core long-term monitoring programs will help to document and understand broader scale changes.

ACKNOWLEDGEMENTS

Laskeek Bay Conservation Society would like to thank all those organizations who provide financial support to our programs. In the 2020 field season, these included:

- Gwaii Trust
- BC Gaming
- Canadian Wildlife Service
- Environment Canada

We would also like to thank the individuals and businesses who support us throughout the year, with great service, donations and assistance in many forms. We especially thank:

- Skidegate Haida Immersion Program
- Haida Gwaii Higher Education Society
- Queen Charlotte Visitor Information Centre
- Moresby Explorers
- Highlander Marine Services
- Tony Gaston
- Gordon Horner
- Fraser Earle
- Fran Fowler
- Hilary Mann
- Margaret Lougheed
- Colin French
- Sandra Price
- Jeremy Poortvliet

Finally, we thank:

- Our staff and volunteers (Merel, Annemarie and Kai) at East Limestone Island
- LBCS Directors and science advisors for their time and efforts
- Dr. Tony Gaston for advice and guidance during the season
- Jean-Louis Martin and the Research Group on Introduced Species

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