

Gulf of Maine Seabird Working Group
33rd Annual Summer Meeting

Hog Island, Bremen, Maine
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Introduction

The Gulf of Maine Seabird Working Group (GOMSWG) is a collaborative effort among state and federal agencies, national and state Audubon agencies, universities, non-governmental organizations, and private citizens that have been working to monitor, manage, and restore populations of colonial nesting seabirds in the Gulf of Maine for over 30 years. Despite this combined effort, many seabird populations still face significant threats and challenges from predators, declining availability of prey species, climate change, sea level rise, human disturbance, invasive species, and threats during migration. Many of the management agencies are also facing declining budgets that challenge our ability to manage the colonies. It is through our combined effort and sharing of knowledge that seabirds stand the best chance of overcoming the challenges they now face.

Meeting activities involved island reports from Canada to Massachusetts, followed by three afternoon presentations. A table with 2017 GOMSWG census results will be distributed concurrently with this report.

ISLAND AND SITE REPORTS

CANADA

Machias Seal Island

Mark Dodds, Island Supervisor/MSc student - University of New Brunswick; Mark Baran, MSc student - University of New Brunswick; Collette Lauzau, field technician

A comparatively stable and abundant prey source this year allowed for a successful breeding season on Machias Seal Island, particularly for Atlantic puffins. Hake and larval sandlance were the predominant prey species available, with an increased proportion of haddock and adult sandlance seen later in the season.

Terns

Terns breeding on MSI had another successful season, fledging chicks for the fourth successive year since the colony collapse in 2006. A total of 86 ARTE nests were monitored this season. We estimate that island-wide there were approximately 300 tern nests. It is likely that a significant number of the unmonitored nests fledged chicks, as we observed numerous unbanded fledglings flying around the island towards the end of the season. Terns were already present on MSI when the crew arrived on May 13.

Table 1. Estimated Number of Tern Nests on MSI (formal census in 2014 only).

2010	2011	2012	2013	2014	2015	2016	2017
175	75	50	90	187	150	175	300

Productivity

86 ARTE nests with a total of 163 eggs were monitored this season. The first tern egg was encountered on May 25, and mean lay date was June 4. The majority of egg predation occurred in mid-June, with 65 eggs depredated within the month. Mean hatch date was June 2, and hatching success was 0.39 (the lowest since 2004). Low hatching success was likely cause by high egg predation early in the season. 62 of 163 monitored eggs (38%) were taken, compared to 10% in 2016. A possible explanation for this perceived increase in predation rate is that more nests in the rocky outer habitat of the island were monitored this year than in previous years. The majority of egg predation recorded this year occurred in this exposed habitat, as opposed to the interior of the island.

Although prey availability was stable throughout the season, inclement weather in mid and late June resulted in the loss of many 'B' and 'C' chicks from our monitored nests. A total of 33 chicks fledged (alive at day 15), with 25 monitored nests raising 1 chick to fledge and 4 monitored nests raising 2 chicks to fledge. The fledge success for monitored nests this season was 0.52 fledge/nest (to day 15). Although COTE were consistently seen on the island throughout the summer, no COTE nests were observed in our productivity plots.

Table 2. Breeding Success of ARTE on MSI in 2004, 2005, 2014, 2015, 2016, 2017.

Year	n	Clutch Size	Hatching Success	Chicks/nest alive at Day 15	Chicks/nest alive at Day 20	Fledglings/nest
2004	170	1.42 (0.50)	0.84	0.38	0.30	0.05
2005	183	1.42 (0.50)	0.57	0.03	0.02	0.01
2014	69	1.68 (0.53)	0.57	0.11	0.08	0.08
2015	51	1.69 (0.55)	0.56	0.72	0.66	0.66
2016	54	1.52 (0.60)	0.68	0.55	0.46	0.44
2017	86	1.88 (0.74)	0.39	0.52	0.47	0.36

Tern Provisioning

We completed 65.4 hours of ARTE chick provisioning stints on a total of 9 nests in 3 separate plots. No COTE chick provisioning stints were conducted. Prey availability remained consistent throughout the season, with larval sandlance and hake as the predominant prey items.

Table 3. Diet (% by number, not biomass) for terns on MSI.

	n	A	E	H	HD	LA/S	S	T	M/I	Other	Unk
ARTE	632	1.11	3.32	13.92	1.58	53.64	5.85	0.95	1.90	0.95	16.77

**Other" includes lumpfish, polychaete, herring, stickleback, and fish scraps.

Predator Control

Non-lethal gull control was continued this year, using paintball guns and hazing of loafing individuals. A contracted predator control specialist conducted lethal gull control and visited the island three times: May 29-June 1, June 14-16, and July 9-10. A total of 14 gulls were removed; 9 HERG and 5 GBBG. Gull Rock, an adjacent island with a persistent breeding colony of HERG and GBBG, was visited four times during the season: June 4, June 15, July 14, and August 11. A total of 13 gull nests, all HERG, were found and destroyed by shaking and poking eggs. A total of 50 eggs were destroyed. No gull nests were found on MSI this year.

Alcids

No formal ATPU census was conducted this year. A total of 134 burrows were monitored for productivity this season. A comparatively stable and abundant food source this season allowed for a successful ATPU breeding season, particularly in comparison to last season. Linear growth rate this season was 7.6 g/day, much higher than that of 1.8 g/day in 2016. A total of 147.28 hours of ATPU chick provisioning stints were conducted. Mark Baran began the preliminary work for his MSc project and successfully deployed 29 GLS tags on adult ATPU.

No formal RAZO census was conducted this year. A total of 72 burrows were monitored for productivity this season. Linear growth rate was 5.32 g/day compared to 4.34 g/day in 2016. A total of 86.75 hours of RAZO chick provisioning stints were conducted. Mark Dodds began preliminary work for his MSc project and successfully deployed 21 GLS tags on adult RAZO.

COMU numbers remain high, with an increase in occupied nesting area observed this year; 3 new "caves" were added, with one "cave" observed to be inactive. On July 3 a minimum of 325 active nests were estimated. A total of 58 chicks and 10 adults were banded this year; GLS tags were deployed on all 10 adults. A total of 69.33 hours of COMU chick provisioning stints were conducted.

Table 4. Breeding success of alcids on MSI in 2017.

	Monitored Burrows	Mean Lay	Mean Hatch	Burrow Occupancy	Hatching Success (hatch/ active nest)	Nest Success (fledge/ active nest)	Linear Growth Rate (mass)
ATPU	134	May 14	June 24	0.80	0.74	0.68	7.6
RAZO	72	May 19	June 23	0.77	0.74	0.57	5.32

Table 5. Diet (% by number, not biomass) for ATPU, RAZO, and COMU on MSI.

	n	H	HD	LA/S	Q	R	S	T	Other	Unknown
ATPU	7713	22.95	11.46	32.72	0.31	0.27	17.04	0.47	0.79	13.99
RAZO	1645	5.78	0.18	80.36	0.06	4.19	4.32	0.30	0.55	1.58
COMU	458	1.09	14.19	5.90	5.68	14.63	1.09	8.30	6.11	43.01

**"Other" includes Euphausiid, pollock, rock eel, polychaete, lumpfish, larval hake, redfish, and fish scraps.

Other Species

No formal COEI census was conducted this year. Counts were conducted weekly with a high of 211 individuals (106 males, 105 females) on May 25. Ducklings were first seen in mid-June, and were still present around the island in early August, both small, newly-hatched ducklings and pre-fledge. Our highest count was on July 14 with 50 ducklings.

Northern Gannets were observed on the island the day of arrival (5 - May 13) and had been seen on the island throughout early May, according to the lighthouse keepers. Our highest count was 21 on June 16. Main loafing areas appear to be consistent with reports from previous years and include a large rock within 15m SW of Visitor Blind 1, a large rock within 15m NW of VB2, and a rock ledge on the west side of the. These appeared to be prospective nesting areas with at least one pair occupying each area. May 15 was the first confirmed sighting of nesting material being brought to the SW loafing spot, and had been an observed behaviour for most days during the first half of the season. Nesting material was brought to all three loafing areas. The first confirmed egg was observed on the nest NW of VB2 on June 11. Steps were taken to avoid work in that area of the colony in order to mitigate disturbance of the nest. An adult was observed on the nest every day until June 14, and the nest was confirmed to be empty on June 15. The egg was found cracked at the base of the rock. No signs of depredation were confirmed; the egg was likely rolled out of the nest accidentally. No other active nests were observed on the island. Gannets were observed loafing, displaying, and even copulating at the nest site, however they did not relay. Two pairs had been consistently seen sitting on nesting material and loafing on the western rock ledge, as well as copulating, however no eggs were confirmed. No Gannets were observed loafing on the island after early July.

An Ancient Murrelet was seen on the water off the east side of the island on May 21. A student from a UMaine wildlife class photographed the bird.

A Bridled Tern was seen on the island on July 6. Ralph Eldridge (Canadian Coast Guard lighthouse keeper) photographed the bird.

MAINE

Petit Manan Island

Bradford Bower: Island Supervisor – USFWS

Micaela Griffin, Kelby Leary, and Jenna Lutes: Island Interns - USFWS

Census

The GOMSWG census was conducted on June 15 and 16, 2017. We recorded 1006 tern nests and with a Lincoln's correction index of 1.017, we estimated 1088 nesting pairs of terns nesting on Petit Manan Island in 2017. This was 11.9% higher than last season's census results (958 pairs). The colony consisted of 62% common terns (657 nests), 38% Arctic terns (431 nests), and 0 roseate terns. This was determined by applying the species ratio to the corrected nest count. To calculate the species ratio, we identified the species of 252 tern nests, or 23.2% of the nesting colony. Additionally, 46 common eider nests and 605 laughing gull nests (7.5% correction factor) were counted during the census.

Table 1. Number of tern nests found on Petit Manan Island from 2007-2017

Year	COTE	ROST	ARTE
2007	1343	5	1038
2008	1307	4	1255
2009	1374	4	1268
2010	912	2	688
2011	1138	0	558
2012	1186	2	758
2013	817	2	616
2014	670	0	533
2015	706	0	481
2016	574	0	384
2017	657	0	431

Tern Productivity

Reproductive success for both tern species was higher than the previous 10 years for common terns and eight years for Arctic terns. Common tern productivity was 1.32 chicks fledged per nest and Arctic tern productivity was 0.93 chicks fledged per nest. Prey availability appeared to be consistent throughout the season, with a brief period of low availability between July 8th and July 10th. Weather also appeared to be consistent, with two periods of dense fog, one in late-June, and one in mid-July, each lasting for 4 or more days.

Table 2. Breeding parameters for seabirds nesting on Petit Manan Island, 2007-2017. Might need to delete earlier years to make this fit

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
COTE											
# of Nests	1343	1307	1374	912	1138	1186	817	670	706	574	657
N											34
Mean Clutch Size	1.70	1.83	1.93	1.7	1.72	1.90	1.77	1.94	2.09	2.04	2.33
Mean Hatch Success	64.8%	85.3%	85%	47.9%	72.3%	78.8%	62%	61.4%	85.1%	92.7%	92.4%
Mean Fledge Success	76.7%	71.6%	56%	31.0%	36.1%	65.1%	48%	45.2%	68.4%	54.9%	65.8%
Mean Chicks Fledged/Nest	0.76	1.12	0.90	0.43	0.40	0.98	0.51	0.54	1.22	1.04	1.32
ARTE											
# of Nests	1038	1255	1268	688	558	758	616	533	481	384	431
N											40
Mean Clutch Size	1.53	1.55	1.68	1.6	1.46	1.73	1.49	1.70	1.87	1.53	1.67
Mean Hatch Success	51.9%	75.3%	78%	21.6%	56.8%	73.7%	66%	30.9%	81.7%	71.4%	64.7%
Mean Fledge Success	62.8%	81.3%	54%	20%	24.5%	70%	30%	63.3%	62.1%	64.4%	67.3%
Mean Chicks Fledged/Nest	0.45	0.95	0.70	0.21	0.22	0.89	0.35	0.33	0.94	0.71	0.78
ROST											
# of Nests	5	4	4	2	0	2	2	0	0	0	0
Mean Chicks Fledged/Nest	0.20	1.00	0.20	0.00	0	0.25	0	0	0	0	0
LAGU nests*	1350	1363	1171	270	735	811	750	560	620	543	605
ATPU nests	53	93	104	88	46	63	47	73	77	54	58
COEI nests	49	105	101	56	35	67	55	54	62	60	46
*7.5 % correction factor applied to LAGU nest counts											

Arctic Tern Metapopulation Project

As part of the Arctic tern metapopulation project, we re-sighted 79 adult Arctic terns, recaptured 4 adults, and banded 111 new birds (6 adults and 105 chicks).

Tern and Puffin Provisioning

We conducted provisioning observations for 19 common tern nests and 10 Arctic tern nests for a total of 474.3 observation hours (94.7 Arctic tern and 379.6 Common tern) and observed 753 prey deliveries (121 Arctic tern and 632 common tern). Herring was the primary prey for terns this field season, contributing to 33.9% of the diet for Arctic tern chicks and 38.0% of the diet for common tern chicks. On average, common tern adults delivered 1.47 prey items per nest per hour while Arctic terns delivered 1.11 items per nest per hour.

This season we continued the puffin provisioning study initiated in 2015. Data collection in this method, using cameras to take pictures of bill loads for later identification, was limited by the quality of the cameras owned by island technicians. We found this method of provisioning difficult due to the speed in which puffins return to their burrows with prey, and spent long periods of time in blinds with little data to show for it. Instead, we found it more productive to identify puffin prey opportunistically during trapping stints. In total, with both methodologies, we spent 19.08 hours in blinds observing 29 prey deliveries. Hake made up the majority (36.8%) of prey items identified, however our sample size was small and many feedings observed the traditional way consisted of unidentified bill loads.

Table 3. Principal prey items (percent) in tern and puffin chick diet on Petit Manan Island in 2017.

2017	ARTE	COTE	ATPU
Hake	28.1	32.0	36.8
Haddock	0.0	0.3	8.0
Lumpfish	0.0	0.2	0.0
Larval Fish	0.0	1.0	0.0
Invertebrate	10.9	2.7	5.7
Pollock	8.3	5.9	3.4
Squid	0.0	0.2	3.4
Herring	33.9	38.0	11.5
Sandlance	0.8	10.6	3.4
Seasnail	0.0	0.2	0.0
Saury	0.8	0.3	0.0
Scad	0.0	0.0	2.3
Butterfish	0.0	3.2	8.0
Unknown	0.8	3.6	12.6
Unknown Fish	16.5	1.6	0.0
Silverside	0.0	0.5	4.6

Predator Control

We discouraged avian predators from perching on the island throughout the season using bird deterrents. Peregrine falcons became a recurring predator in late July, preying mostly on tern fledglings, sometimes coming multiple times per day. We found the remains of 1 tern taken by the peregrine, and observed the depredation of an additional 4 terns, though peregrine falcon predation is assumed to be higher. Bald eagles were also a regular visitor to the island, but mainly preyed on the laughing gull colony. In addition to harassing the gull colony, the bald eagle was observed depredating 1 common eider, with the remains of an additional 2 adult eiders found. During the census, we oiled the eggs of 389 laughing gull nests and destroyed 174 laughing gull nests. Lethal removal of avian predators thought to be tern or kleptoparasitism specialists also occurred and included: 5 adult laughing gulls and 1 great black-back gull. Evidence of potential owl predation occurred once this season (June 6th), the prey consisting of 1 adult Arctic tern and 2 adult laughing gulls. No mammalian predators were observed this season on Petit Manan Island.

Alcids

The highest alcid counts for the season were 213 Atlantic puffins (June 29th), 106 razorbills (June 8th), 13 common murres (June 11th) and 340 Black Guillemots (May 24th). We estimated the breeding population of Atlantic puffins to be at least 58 pairs based on the number of active burrows (i.e. burrows with either an adult, egg or a chick). This estimate is slightly higher than 2016 (54 burrows) but still lower than 2015 (77 burrows), which may be related to warmer waters in the Gulf of Maine in recent years. Colony-wide puffin hatch success was 96.4%, fledge success in selected productivity burrows was 100% and number of fledged birds/nest was 0.93. We documented 1 active razorbill burrow in 2017 which we are confident reached fledging. Although common murres were observed loafing on the island, there was no evidence of any breeding attempts. Lastly, we estimated that the black guillemot breeding population was 76 burrows, a decrease from last year's 94 burrows. We monitored a subset of the black guillemot population (23 nests) for productivity—weighing and measuring wing cord of chicks every 5 days. For these birds, average clutch size was 1.78, average hatch success was 85.4%, and average number of chicks per pair was 1.35.

In addition to daily counts and productivity monitoring, we re-sighted alcid bands and captured adult alcids by grubbing and setting box traps. This season, we re-sighted 43 Atlantic puffins, recaptured 7 adults, and banded 25 new puffins (12 adults and 13 chicks). We did not re-sight or capture any adult razorbills this season, but we did band 1 razorbill chick. Finally, we recaptured 3 adult black guillemots and banded 38 new birds (1 adult and 37 chicks).

Other Research

This season we continued the Leach's storm-petrel productivity efforts initiated in 2016. We conducted 2 sweeps of the island, 1 during the last week of May and 1 during the first week of August. A recording of the storm-petrel chatter call was played at the entrance of each burrow, in an attempt to elicit a response from an adult. All burrows were grubbed to assess the contents. 75% of burrows elicited a callback response from adult storm-petrels. Many burrows could not be grubbed far enough to reach the nest cavity due to physical constraints, but were considered active if a response was received from the playback. In total, we documented 8 burrows containing chicks, 5 burrows with eggs, and 2 un-grubbable burrows containing at least an adult. We banded 6 adults and 1 chick.

Additionally, 5 common terns were fitted with satellite transmitters that were applied with harnesses. WE also captured, banded and monitored 5 control birds. The nests of all 10 birds were monitored daily to compare behavioral changes of tagged birds through the use of GoPro cameras for 4 hours a day, 2 hours in the morning and 2 hours in the evening. Productivity of each nest was also recorded, and the data was combined with the other 10 productivity plots on the island. Productivity for the tagged birds was 1.0 chicks fledged per nest and the productivity for the control birds was 1.2 chicks fledged per nest. Adults with satellite transmitters will continue to be monitored during migration by the refuge staff.

Ship Island

Morgan O'Connor – Island Supervisor

Amanda Griswold – Island Technician

Census

Ship Island was monitored by a two-person crew from May 18-July 26, 2017. During the GOMSWG census on June 12, we counted 602 common tern nests for a total of 620 nests after applying a Lincoln Index of 1.029.

	Ship Island						
Common Terns	2011	2012	2013	2014	2015	2016	2017
# of Active Nests	105	251	436	405	680	684	620
Mean Clutch Size	2.16	2.20	2.44	2.26	2.16	2.35	1.99
Mean Hatch Success	55.6%	57.1%	72.5%	81%	72.3%	85.6%	27.8%
Mean Fledge Success	24.9%	63.9%	46.4%	72.8%	87.7%	55.4%	70.3%
Chicks Fledged/Nest	0.53	0.82	0.80	1.44	1.45	1.32	0.39

Nesting and Productivity

The first nest was observed on May 24 and terns were continuing to copulate as of July 20. The arrival of a great-horned owl during the time of incubation led the terns to abandon their nests at night for roughly a period of two weeks. The owl was caught on June 25, four days after the start of abandonment, and it was dispatched due to its health and reoccurrence to the colony. Despite some terns returning to their nests in the day, eggs still proved unviable, leading to a significantly low hatch rate of 27.8%. Terns re-nested throughout the season, but it could not be successfully documented. Fair weather coincided with the majority of the hatching and critical rearing stages, allowing the chicks to have an excellent start. However, some chicks' development may have been affected due to lack of incubation- notably several chicks exhibited leg deformities resulting in limited mobility.

Tern Provisioning

We observed 15 common tern nests for a total of 396 hours, during which we observed 738 feedings. Provisioning effort was lower than usual this year, due to later than normal peak hatching caused by abandonment. Average feeding rate was 1.28 feedings per hour. Atlantic Herring composed 80.3% of the feedings, hake 10.7%, larval fish 1.8%, sandlance, and 3.5% unknown. Few butterfish were observed, but only outside of observation areas.

Diet Item	% of COTE Diet						
	2011	2012	2013	2014	2015	2016	2017
Atlantic Herring	24.4	79.4	45.6	60.8	53.1	77.2	80.3
Sandlance	17.3	0.9	20.9	1.0	21.4	4.6	1.8
Crustaceans	--	--	10.5	--	0.9	1.1	--
Pollock	18.1	--	4.3	10.0	4.1	1.1	--
Invertebrates	1.7	1.6	5.7	0.7	0.7	0.7	--
Butterfish	0.4	--	1.7	--	--	--	--
Stickleback	10.7	0.2	1.5	--	0.5	0.3	--
Hake	--	--	1.1	6.6	2.5	6.6	3.7
Unknown	20.5	7.2	--	1.0	16.3	3.1	3.5
Other	--	--	--	--	--	--	--

Predator Control

The most significant predators observed during the 2017 season were the great-horned owl, peregrine falcons, american crows, and bald eagles- the most notable predator being the return of the great-horned owl that was re-located from Ship in 2016. Falcon activity on Ship Island remained stable throughout on 2017, however there were less successful attempts with only 10 confirmed kills. Despite the peregrine falcon visitation, their presence did not seem to disrupt the overall stability of the colony, even with increased tern sensitivity after the owl's visits. Gulls were seldom observed flying low or landing in the colony.

Species	Minimum # of Visits	Minimum # Terns Taken
Peregrine Falcon	50	10
Merlin	1	0
Bald Eagle	27	0
Great-horned Owl	3	2

Mink traps were set early in the season with an average of 17.95 traps maintained throughout the season, but no definitive signs of mink were observed. Gulls were deterred from loafing on any part of the island. One herring and one black backed gull were shot early in the season and displayed, and one herring gull was dispatched due to a broken wing, although it appeared to not have done any damage to the colony yet. Sign of raccoon predation was seen on nearby Trumpet Island, and two raccoons were removed from neighboring Bar Island, but one more was seen. Three raccoon traps were set, but no raccoon sign was seen on Ship in 2017.

Habitat Management

The Refuge created new tern nesting habitat in the spring of 2016 by moving 76 cubic yards of sand and gravel from the intertidal zone to the island's interior. Six inches of material was placed on top of landscape fabric. Terns primarily nest on a narrow sandy beach where they are vulnerable to high tides and storms. Gravel areas were installed in 2014 (283m²) and 2016 (425m²) to immediately provide safe and suitable habitat. Though numbers are lower than expected, a total of 65 common tern pairs nested in gravel areas. Despite weeding in May and June, lambsquarters, ragweed, and black bindweed became abundant in gravel plots during chick rearing in July. These annuals can't be controlled using herbicide when terns are present, and when weeding was terminated vegetation overtook the gravel area. This season one tern chick was found to have died after having its wings stuck in vegetation.

In other areas, the entire island burned in the spring, treated thistle, raspberry, and cow parsnip with herbicide, and continue to battle invasive garlic mustard and garden valerian. The Refuge is considering using sheep and rotational grazing strategy to control vegetation, but is waiting on permitting.

Metinic Island

Ravin Thomasson (*Island Supervisor*) and Aya Pickett (*Technician*)

Common and Arctic Tern Census Results

The Gulf of Maine Seabird Working Group (GOMSWG) census was conducted on June 15, 2017. A total of 522 tern nests were found. A Lincoln Index Correction Factor of 1.095 was applied to the raw count resulting in a total of 572 pairs. After adding nests in productivity plots we estimate 626 tern pairs were actively nesting during the 2017 GOMSWG census. This is an increase of 19 nests from 2016.

To determine species ratio, 154 nests were flagged prior to the census based on the incubating adult. The species ratio was found to be 55% Common Terns and 45% Arctic Terns. After applying the ratio to the corrected tern census total and adding productivity plot nests, we estimate 331 common tern and 295 Arctic tern pairs nested on Metinic in 2017.

Metinic Island					
	2013	2014	2015	2016	2017
COTE					
# of Nests	209	214	343	290	331
Mean Clutch Size	2.8	2.67	2.26	2.43	2.35
Mean Hatch Success	78.6%	84.5%	77.36%	88.24%	90.7%
Mean Fledge Success	27.1%	78.51%	85.37%	42.22%	69.4%
Chicks fledged/Pair	0.76	1.68	1.52	0.90	1.48

ARTE					
	2013	2014	2015	2016	2017
ARTE					
# of Nests	142	257	260	317	295
Mean Clutch Size	2.1	1.90	1.94	1.89	1.94
Mean Hatch Success	89.5%	89.8%	94.74%	89.39%	89.2%
Mean Fledge Success	52.4%	81.1%	86.11%	44.07%	91.6%
Chicks fledged/Pair	1.1	1.39	1.63	0.74	1.58

ROST					
	2013	2014	2015	2016	2017
# of Nests	0	0	0	0	0
Chicks fledged/Pair	-	-	-	-	-

Provisioning

Eight arctic tern and six common tern nests were followed for provisioning studies. 400 feedings occurred during 45 hours of watches for common terns (1.82 feedings/hour per nest), and 488 feedings occurred during 45 hours of Arctic tern watches (2.05 feedings/hour per nest). The primary prey item for both species was hake, which made up 25% of common tern and 31% of arctic tern diets. Small unknown invertebrates (likely amphipods or isopods) were the second most abundant prey item for arctic terns closely followed by sandlance and larval sandlance. Herring was the second most abundant for common terns as they experienced an upswing in the fish during July.

	Total Nests	Feedings/Hour	Herring	Hake	Invert	Sandlance	Larval Sandlance	Butterfish	Unk Fish	Unk
COTE	6	1.82	15.72%	25.06%		13.27%	1.72%	1.49%	43.26%	
ARTE	8	2.05	3.91%	31.4%		1.68%	3.17%	0.98%	58.46%	

Predators

- Gull predation was the greatest threat to tern eggs and chicks. No nests with eggs were verified to be predated by gulls but herring and black-backed were seen flying low through the colony

frequently. Several large chicks were taken by a problem herring gull. Laughing gulls were observed kleptoparasitizing terns on several occasions.

- 37 garter snakes were removed from the island this year. One was found swallowing a savannah sparrow hatchling and another swallowing a small dead tern chick. They have been observed preying upon small live tern chicks in prior years.
- Several crows and ravens were seen near the colony periodically and were observed flying through on several occasions but were not seen predating any eggs or chicks.
- A pair of bald eagles nested on the south end of the island and an immature eagle was seen occasionally as well. None of the eagles were seen pursuing terns.

Black Guillemots

We monitored 13 guillemot burrows and recorded a hatching success of 73%. Fledging rates are estimated to be 1 chick/nest based on the number of chicks that were at least 10 days old and present at the last weighing. 36 chicks were banded, including 16 in productivity burrows. 2 adults were also banded.

Leach's Storm Petrels

We were able to locate at least 41 active Leach's storm-petrel burrows throughout the season. Only one burrow was accessible for productivity. The contents were one egg that was abandoned on our last check of the burrow.

Common Eider

During gull census that was conducted on June 1-3, 9 common eider nests were recorded from the cobble hill south to the trees. The first eider ducklings were observed on May 31. The high count was 30 ducklings in one crèche on June 29, which was also the largest combined hen and duckling count with 24 hens observed. Small crèches containing large ducklings continued to be seen off the north point of the island through the end of the field season in late July.

Incidental Sightings

A total of 96 live bird species were identified on Metinic Island in 2017, including 12 shorebird species and numerous migrant songbirds.

Sheep

Sheep are allowed to graze the entire north end of Metinic outside of the nesting season, but are herded south of an electric fence for the duration of the breeding season. Four sheep appeared on the north end of the island, likely crossed through the intertidal, on June 16. In early July 4 more sheep appeared and were seen daily on the north end of the island. Despite efforts to herd them back across the fence, the sheep remained on the north end for the rest of the season. Daily efforts to herd the sheep back south greatly decreased the amount of egg loss due to trampling. The impact to tern nesting is thought to have been minimal.

Geolocators

Throughout the season the colony was searched for terns with geolocators and none were found.

Seal Island National Wildlife Refuge

Keenan Yakola, Island Supervisor – National Audubon Society Seabird Restoration Program

Tern Census

A partial tern census was conducted on June 14, where 14 of the 30 grid squares were surveyed, due to restricted access to parts of the island. The censused area has been determined to represent, on average, 57% of the total nests in the colony over the last twelve years in which a complete census was performed (1996-2006). The extrapolated total number of tern nests was 1,818. The species ratio of the colony was determined by identifying nests to species within 9 16m radius circles around blinds and in 5 productivity plots. The species ratio was estimated at 40.5% Arctic Terns and 59.5% Common Terns (n=664). These data suggest that the colony decreased in size compared to 2016.

Table 1. Adjusted number of tern nests found on Seal Island NWR from 2012-2017.

Year	COTE	ARTE
2012	1,837	959
2013	1,448	1,039
2014	1,383	855
2015	1,345	902
2016	1,309	949
2017	1,079	739

Tern Productivity

Mean clutch size for both Common and Arctic Terns was lower than in 2016, while productivity was among the highest values recorded for the island (Table 2).

Table 2. Tern productivity at Seal Island NWR in 2017. Data for 2016 shown in parentheses.

Species	Mean clutch size	Mean hatch	Productivity	Nests monitored
COTE	1.75 (2.06)	1.41 (1.82)	1.15 (0.52)	59 (72)
ARTE	1.73 (1.82)	1.57 (1.62)	1.13 (0.79)	30 (34)

Tern Provisioning

14 Arctic Tern nests were observed for 513.5 cumulative hours, with an average feeding rate of 2.36 feedings per nest per hour. 13 Common Tern nests were observed for 474 cumulative hours, with an average feeding rate of 1.64 feedings per nest per hour. Primary prey items were hake, herring, and sand lance (Table 3).

Table 3. Principal prey items (percent of diet) in tern chick diet at Seal Island NWR in 2017.

Total number of prey items observed n=1213 for ARTE and n=778 for COTE.

Prey item	ARTE %	COTE %
Herring	9.40	25.71
Hake	31.00	24.16
Sand lance	23.50	12.47
Euphausiid	5.44	2.57
Unknowns	25.47	28.66

Predator Activities and Control Efforts

A few Herring and Great Black-backed Gulls irregularly took tern eggs early in the season. Gulls were not frequently observed taking fledgling terns. Attempts to remove “specialist” gulls were unsuccessful. Gull control efforts also included poking eggs in all large gull nests found during two gull censuses conducted on May 30-31 and June 22-23. Eggs from 53 GBBG nests and 241 HERG nests were poked (Table 4). Laughing Gulls were observed daily and 5 nests were destroyed in Area 4. To deter further Laughing Gull nesting, three individuals were shot and displayed. Other predators included Peregrine Falcons, Merlins, and Northern Harriers, which were largely observed in the colony towards the end of the season.

Table 4. Gull control measures by species at Seal Island NWR in 2017.

Species	# Nests destroyed	# Shot
Herring Gull	241	1
Great Black-backed Gull	53	0
Laughing Gull	5	3

Atlantic Puffins

A puffin nest census was performed by determining burrow activity within 15 circular plots spaced throughout the main colony in Area 1, as well as at all nesting areas outside Area 1. From observations of incubating adults, eggs, chicks, and feedings, it is estimated that there is a minimum of 506 active

burrows this year. Puffin productivity was monitored at 67 burrows. Hatching success was 0.91 chicks hatched per egg and productivity was 0.86 chicks fledged per pair (Table 5).

Table 5. Atlantic Puffin hatch success and productivity at Seal Island NWR from 2012-2017.

	# Burrows monitored	Hatch Success	Productivity
2012	78	0.74	0.31
2013	69	0.55	0.09
2014	71	0.83	0.75
2015	62	0.94	0.81
2016	67	0.88	0.57
2017	67	0.91	0.86

Prey items delivered to puffin chicks were recorded from late June to early August. The dominant prey species was hake at 47.15% of the diet, followed by herring, sand lance, and haddock (Table 6). Herring and Haddock were more common later in the chick-rearing period.

Table 6. Principal prey items in Atlantic Puffin chick diet at Seal Island NWR in 2017. Total prey items n=1419

Prey item	% of diet
Hake	47.15
Herring	19.10
Sand lance	16.63
Haddock	13.67

Black Guillemots

Black Guillemot productivity was monitored at 39 burrows. Average clutch size was 1.77, average hatched per nest was 1.44, and productivity was 0.92 chicks fledged per pair.

Razorbills

A high count of 100 individuals was observed this season, and 36 active burrows were located.

Cormorants

22 Great Cormorant and 11 Double-crested Cormorant nests were counted in May, though several more pairs of Double-crested Cormorants are believed to have nested. Approximately 60 near-fledging Great Cormorant chicks were counted in August.

Northern Gannets

As in 2016, a single Northern Gannet was observed landing and loafing with the nesting cormorants throughout the summer, from June through August.

Bird Sightings

This season 182 bird species were observed. Highlights included; Kentucky Warbler, Royal Tern, Blue Grosbeak, White-winged Dove, Wilson's Phalarope, all three species of Jaeger, Upland Sandpiper, Lapland Longspur, multiple Green Heron, Black and Least Terns, Purple Martins, Dickcissels and Lark Sparrows, as well as a mini "fallout" of thrushes including at least 9 Gray-cheeked/ Bicknell's Thrush and over 40 Swainson's Thrush. In addition, the resident Red-billed Tropicbird was seen again this year, for the thirteenth year since first being observed on the island in 2005.

Matinicus Rock

Frank Mayer, Island Supervisor – National Audubon Society Seabird Restoration Program

Tern and Laughing Gull Census

The GOMSWG census was conducted on 13-14 June. We estimated a total of 600 Arctic Tern nests, with a Lincoln Index correction factor of 1.024. We directly counted a total of 165 Common Tern nests. During the GOMSWG census we counted 2 Laughing Gull nests.

Table 1. GOMSWG census results on Matinicus Rock, 2012-2017.

Year	ARTE	COTE	LAGU
2012	711	268	557
2013	519	171	579
2014	564	223	689
2015	808	206	0
2016	621	167	30
2017	600	165	2

Tern Productivity

Arctic Terns fledged 0.89 young per nest. Mean clutch was 1.76 for 46 nests. Common Terns fledged 1.57 young per nest, which is the highest number since the study began in 2002. Mean clutch was 2.15 which is lower than last year but still above average for this island.

Table 2. Tern productivity on Matinicus Rock in 2017. Data for 2016 shown in parentheses.

Species	Mean clutch size	Mean hatch	Productivity	Nests monitored
ARTE	1.76 (1.90)	1.34 (1.57)	0.89 (0.88)	46 (42)
COTE	2.15 (2.66)	1.92 (2.34)	1.57 (1.03)	26 (29)

Tern Provisioning

The most common food items in the Arctic Tern chick diet were hake at 33.1%, and sand lance at 29.1% of their total diet. The most common food item in the Common Tern chick diet was sand lance at 44.1% of the diet, followed by hake at 27.9% and moths at 3.9%.

Predator Activities and Control Efforts

A Peregrine Falcon was seen on 12 days from 12 May until 27 August, and Merlins were observed on 15 days throughout the summer. Both were seen eating adult terns at least once during the summer. A Merlin was observed capturing flightless chicks from one of the largest productivity plots on the island on multiple occasions. Were it not for this the ARTE fledglings/nest number would have been higher. We also found several piles of feathers from tern fledglings that were presumably eaten, but this did not seem to have a large effect on the tern colony overall.

Predation of tern chicks or eggs by gulls was only observed on two occasions, both on foggy days by an adult Herring Gull, while kleptoparasitism was only rarely observed this year. No large gulls were found nesting on the island this year. While Laughing Gulls were not observed taking tern eggs or chicks, kleptoparasitism from Laughing Gulls was seen on a handful of occasions late in the season, particularly if the tern was carrying a large butterfish. During census, only 2 Laughing Gull nests were found and destroyed. After the census a total of 11 Laughing Gull nests were found and destroyed, for a total of 13 nests destroyed over the entire season. 7 adult Laughing Gulls were shot from 21 May to 29 July. One Great Black-backed Gull was shot and 12 Herring Gulls were shot.

Common Ravens were occasionally seen about the island and cached Razorbill and Common Eider eggs were sometimes found. If a Raven strayed beyond the Razorbill nesting areas in Area III then we would attempt to scare it away by shooting at it, otherwise we did nothing in order to not disturb the Razorbills.

Atlantic Puffins

Puffin hatch success was 0.90 hatched per nest (n= 76) and productivity was 0.80 chicks fledged per nest. Puffin bill loads delivered to chicks in 2017 consisted mostly of hake (60.8%), sand lance (17.7%), haddock (10.1%) herring (2.2%) and redfish (1.1%).

Razorbills

Razorbill hatch success was 0.81 (n = 60), and productivity was 0.63 chicks fledged per nest, which is the highest ever recorded for this study. The first Razorbill chick was seen on 6 June. Razorbill chick diet consisted primarily of herring (62.8%), sand lance (17.5%), and hake (14.9%).

Black Guillemots

Mean clutch size was 1.66 (n=39) and productivity was 0.89 chicks fledged per nest which is by far the highest since the study began in 2010.

Common Murres

The high count for Common Murres in 2017 was 60. This year, the decoys and sound system were not put in place for the second year in a row. While checking Razorbill productivity nests on 20 May and 6 June, murres were observed coming out from under the rocks near the 3-4-5 rock in Area III. We checked for eggs but none were found although this rock has many places that a human cannot see. On 26 June and 1 July, a murre was observed incubating an egg near the Pandora blind, although this egg never hatched. Finally, a murre was observed carrying a fish, likely a pollock, in Area III on 17 July. No chicks were ever seen or heard.

Leach's Storm Petrels

Hatching success was 0.8 (n=31).

Manx Shearwaters

Manx Shearwaters were seen on the water regularly throughout the season in groups of as many as 14, and were heard calling from the northwest, west central, and southwest areas of the island. We banded three large, fat, and apparently happy chicks from the original burrow near the cannon wheel on the Sunset Strip and from the area below Texas blind.

Notable Birds

The most notable bird of the year was an Ancient Murrelet which we saw on 24 May.

Eastern Egg Rock

Laura Brazier, Island Supervisor – National Audubon Society Seabird Restoration Program

Census

Arctic and Roseate Tern nests were identified between June 3 and June 23, with Roseate Terns increasing from 78 nests in 2016 to 104 nests, and Arctic Terns remaining at 76 nests. It is suspected that this number underestimates the true Arctic Tern nest count, as many nests were found to have been depredated before official counts began. No B-wave Roseate Tern nests were located after the census period. An island-wide Common Tern and Laughing Gull nest count was conducted on June 12-13. Common Tern numbers increased from 2016. During census, 876 tern nests were counted. The subtraction of Arctic Tern nests, along with the addition of the productivity nests, feeding study nests and a Lincoln index of 1.03125 brought the total to 886 Common Tern nests. The number of Laughing Gull nests remained high, at 1753 nests, which is lower than the 2016 season.

Table 1. GOMSWG census results on Eastern Egg Rock, 2012-2017.

Year	COTE	ARTE	ROST	LAGU
2012	817	57	71	2065
2013	831	68	83	2083
2014	698	62	65	1934
2015	894	75	77	1943
2016	852	76	78	1973
2017	886	76	104	1753

Tern Productivity

Common Tern productivity was calculated from 55 nests in both fenced productivity plots and unfenced feeding study plots. Productivity was 1.53 chicks fledged per nest. Arctic and Roseate Tern productivity was calculated from unfenced nests. Roseate Terns fledged 1.29 chicks per nest and Arctic Terns fledged 0.83 chicks per nest. Productivity of all tern species was higher than recorded in 2016.

Table 2. Tern productivity on Eastern Egg Rock in 2017.

Species	Mean clutch size	Mean hatch	Productivity	Nests monitored
COTE	2.07	1.88	1.53	55
ARTE	1.81	1.47	0.83	36
ROST	1.84	1.41	1.29	70

Tern Provisioning

Eleven Common Tern nests were observed over a total of 489 nest-hours with an average feed rate of 1.7 feedings per hour. Hake was the most frequently fed prey item, comprising 37.6% of feedings, followed by herring at 30.2%. Six Arctic Tern nests were observed for a total of 192 nest-hours with an average feed rate of 2.54. Hake was most prevalent prey item comprising 38.2% of diet followed by amphipods at 34.1%. Three Roseate Tern nests were observed over 127 nest-hours, averaging 2.6 feedings per hour. Hake was the most frequently fed item at 52.2%, followed by sand lance at 20.9%.

Table 3. Principal prey items (percent) in tern chick diet on Eastern Egg Rock in 2017.

Prey item	COTE	ARTE	ROST
Herring	30	7	7
Hake	38	38	52
Unknown fish	12	8	13
Invertebrates	0.5	34	0
Sand lance	7	4	21

Predator Activities and Control Efforts

Herring and Great Black-backed Gulls were the predominant tern predators, though neither species attempted to nest. Two Herring Gulls and one Great Black-Backed Gull were shot over the course of the season, as they were seen to be specializing on tern chicks. USFWS personnel performed a Laughing Gull cull on June 8, in which 157 Laughing Gulls were shot. A buffer zone was maintained within 10 meters of tern habitat, in which all Laughing Gull nests were destroyed weekly throughout laying. Due to seemingly decreased numbers of Laughing Gulls after the initial buffer check, all eggs were destroyed during census rather than oiled, which was the common practice in previous seasons.

Table 4. Gull control measures at Eastern Egg Rock in 2017.

	GBBG	HERG	LAGU
Gulls Shot	1	2	157
Nests Destroyed	0	0	1753

Atlantic Puffins

This year there was a minimum of 172 active puffin burrows on the island, which is the highest number recorded on Eastern Egg Rock, and up 22 nests from 2016. Hake comprised the majority of puffin diet at 82.4%. Sand lance was second most prevalent prey species at 8.2%, followed by haddock at 5.8%. Unlike in 2016, where it comprised a large proportion of the puffin diet, redfish only accounted for 2.8% of the puffin chick diet in 2017.

Table 5. Active burrow count for Atlantic Puffins on Eastern Egg Rock, 2012-2017.

ATPU	2012	2013	2014	2015	2016	2017
Active Burrows	104	112	148	150	150	172

Black Guillemots

Productivity was monitored for Black Guillemots for the fifth year in 2017. Thirty nests were followed with a mean clutch size of 1.93 and productivity of 1.11 chicks fledged per nest, which is higher than 0.6 chicks per nest seen in 2016.

Leach's Storm-petrels

Leach's Storm-petrel hatching success was monitored for the third season this year. 49 nests were followed with a hatching success of 0.74.

Other Notes

This summer, Eastern Egg Rock welcomed 85 visitors, primarily media personnel, donors, and teen campers from the Hog Island Camp.

Pond Island National Wildlife Refuge

Shannon Carvey, Island Supervisor – National Audubon Society Seabird Restoration Program

Tern Census

Tern census was conducted on June 14. The unadjusted count for Common Terns (COTE) was 849 nests. An additional 68 COTE study nests were being followed at the time of census. The Lincoln Index was 1.03. The adjusted count of 942 nests, which includes study nests, is the highest number of nests recorded on Pond Island to date (see Table 1).

At the time of census, there were eight Arctic Tern (ARTE) nests and zero Roseate Tern (ROST) nests. During the season, three ROST nests were identified. One ROST nest was depredated before the census window and two nests were found after the census window.

Table 1. Number of tern nests on Pond Island NWR from 2012-2017

Year	COTE	ROST	ARTE
2012	596	0	0
2013	692	0	0
2014	612	0	4
2015	685	0	6
2016	773	1	6
2017	942	0	8

Productivity

COTE productivity was determined by following 70 nests in fenced and unfenced study plots. These nests were followed from egg stage until fledging (fledging determined at 15 days unless later found deceased). Mean clutch size for COTE was 2.47 with a mean 2.10 hatched per nest and 1.68 fledged per nest. Eight ARTE nests were monitored. ARTE mean clutch size was 1.88, hatching success was 1.75, and fledging success was 1.63. Three ROST nests were monitored. ROST mean clutch size was 1.5, hatching success was 1.0, and fledging success was 1.0 (see Table 2). The fledging status of one ROST chick was not determined due to its late-season hatch.

Table 2. Breeding parameters for Common, Arctic, and Roseate terns on Pond Island in 2016. Data for 2016 shown in parentheses.

Species	Clutch size	Hatched per nest	Fledged per nest	Nests monitored
COTE	2.47 (2.66)	2.10 (2.5)	1.68 (1.5)	77 (58)
ARTE	1.88 (2.17)	1.75 (2)	1.63 (1.33)	8 (6)
ROST	1.5 (3)	1.0 (0)	1.0 (0)	3 (2)

Tern Chick Provisioning

Chick provisioning studies were conducted by observing 16 COTE nests from hatching through fledging. An additional five nests were followed for part of the chicks' development. There were 2111 total feedings observed during 943.97 nest hours, resulting in a feeding rate of 2.24 feedings per hour. The principal prey species delivered were sand lance and herring. Lower quality prey items, such as sand shrimp and butterfish, comprised less of the diet than in 2016 (1.18 % versus 11.32% and 0.24% versus 0.64%, respectively). The proportion of Atlantic tomcod delivered increased from 2016, although it is still a small percent of overall diet (see Table 3).

**Table 3. Principal prey items in COTE chick diet on Pond Island in 2017.
Data for 2016 shown in parentheses.**

Prey item	Number of Items	% of diet
Sand lance	839 (476)	39.5 (30.61)
Unknown fish	460 (292)	21.7 (18.78)
Herring	450 (241)	21.2 (15.50)
Unknown	154 (96)	7.3 (6.17)
Hake	31 (142)	1.5 (11.27)
Atlantic tomcod	28 (2)	1.3 (0.13)

Predator Activities and Control Efforts

Pond Island was subject to several predators during the 2017 season. As in past years, Great-horned Owl (GHOW) predation was observed. The GHOW impact was greatest early in the season, when it killed 17 COTE adults. The owl hunted on the island sporadically and despite season-long trapping effort, it was never caught.

In mid-July, after two large depredation events, a mink was discovered on the island. In these two evenings, over 70 COTE chicks were killed. Most chicks were about to fledge or could have fledged recently. Subsequently, mink predation was continuous but kills were less numerous. This coincided with a second wave of COTE hatch on the island and many chicks were found dead from exposure. Nocturnal abandonment of at least part of the colony was observed. In response, 34 conibear traps were deployed and a shotgun was readied for an opportunity to shoot the mink. Unfortunately, we were unable to catch the mink before island closing. Additionally, in late July a Peregrine Falcon (PEFA) killed several recently fledged COTE. Depredation from both Great Black-backed Gulls (GBBG) and Herring Gulls (HERG) was minimal this season. No gulls nested on the island and only one instance of a GBBG taking a tern chick was observed.

Predation also impacted Common Eiders (COEI) this season. Several adult females were found with lacerations on their heads. Bald Eagles (BAEA), which were present on nearby Wood Island, or the GHOW could have caused these injuries while the females were on the nest. American Crows (AMCR) were often seen in the marsh area of the island, in known COEI nest locations. Very few COEI chicks were witnessed on the water and GBBG were seen hunting them.

Jenny Island

Joanna Morelli, Island Supervisor – National Audubon Society Seabird Restoration Program

Tern Census

The annual Gulf of Maine Seabird Working Group (GOMSWG) census was conducted on June 12. A total of 1,153 Common Tern nests were counted, with clutches ranging between 1 and 5 eggs. A Lincoln index mark/recapture correction of 1.0614 was applied to the uncorrected count. The addition of 51 productivity nests and 23 feeding study nests brought the total to 1,298 nests (Table 1).

Twenty-two Roseate Tern nests were also presumed to be active during the GOMSWG census window. A total of 23 nests were found before the census, however one was abandoned quickly after its discovery. One additional B-wave nest was laid after the census window. One pair of Arctic Terns nested on Jenny Island this year on the rocks projecting from the southern tip of the island, the same general location as last season. Prior to this year, Arctic Terns have only nested on Jenny Island thrice: in 2004, 2006, and 2016.

Table 1. GOMSWG census results on Jenny Island, 2012-2017.

Year	COTE	ROST
2012	948	11
2013	946	7
2014	1,120	12
2015	1,268	15
2016	1,122	13
2017	1,298	22

Tern Productivity

For Common Terns, five productivity plots containing 52 nests and three feeding study plots with 19 nests were monitored to determine productivity. 24 Roseate Tern nests were monitored for productivity, a summary of which follows in Table 2.

Table 2. Tern productivity on Jenny Island in 2017. Data for 2016 shown in parentheses.

Species	Mean clutch size	Mean hatch	Productivity	Nests monitored
COTE	2.23 (2.23)	2.01 (1.83)	1.56 (1.24)	71 (71)
ROST	1.54 (1.83)	1.08 (0.78)	0.86 (0.54)	24 (23)

Tern Provisioning

Tern chick provisioning was monitored at three feeding study plots with 19 Common Tern nests. A total of 1309 feedings were observed during 864.58 nest-observation hours, producing an average feeding rate of 1.51 deliveries per hour (compared with 1.86 deliveries per hour in 2016). Average prey size was 51.50 mm, which is larger than 2016. Atlantic herring constituted the majority of observed feedings (49.6%; Table 3). Hake (including white hake and four-bearded rockling) made up another 6.2% of the feedings. In 2015, silverside was seen in much higher amounts than typical; this season produced a spike in the amount of silversides compared to 2016, as well. Butterfish were far more sparse in 2017 compared to 2016 and 2015 (0.5% compared to 1.5%). The amount of invertebrates dropped to a typical low level again in 2017, compared to 2016's high percentage.

Table 3. Principal prey items in COTE chick diet on Jenny Island in 2017.

Prey item	Number of Items	% of Diet
Herring	651	49.6
Unknown fish	193	14.7
Hake or Herring	143	10.9
Sand lance	107	8.2
Hake	81	6.2

One feeding study plot with 4 Roseate Tern nests was monitored in 2017. A total of 224 feedings were observed during 154.55 nest-observation hours, producing an average feeding rate of 1.45 deliveries per hour. Average prey size was 56.42 mm. Herring constituted the majority of observed feedings, differing from 2016's majority of sand lance (24.2%; Table 4). Sand lance made up another 20.2% of the feedings in 2017. Hake (including white hake and four-bearded rockling) constituted another 8.1% of feedings.

Table 4. Principal prey items in ROST chick diet on Jenny Island in 2017.

Prey item	Number of Items	% of Diet
Herring	54	24.2
Hake or Herring	54	24.2
Unknown Fish	46	20.7
Sand lance	45	20.2
Hake	18	8.1

Predator Activities and Control Efforts

Large gulls were not a significant problem in the 2017 field season. Though many Herring and Great Black-backed Gulls were seen following lobster boats around the island, few were seen loafing on the island, and only a limited number of incidences of predation occurred. Great Black-backed Gulls were seen preying the eider chicks and Herring Gulls were observed taking two Common Tern chicks. No Herring or Great Black-backed Gulls nested on the island.

Though Laughing Gulls (*Leucophaeus atricilla*) have nested on Jenny Island in the past, only one nest cup was found on the island early in the season. 3-4 Laughing Gulls were regular visitors to the island throughout the season, and though a small number of predated eggs could have been due to Laughing Gulls, they were not suspected to be significant a cause of chick mortality in 2017. In mid-July and until the end of the season, a mixed flock of 10 adult and juvenile Laughing Gulls were seen loafing on the island.

Multiple Common Tern eggshells were found during the beginning of the season with large, ragged holes in them; it is not clear whether the eggs were predated by corvids or gulls. An estimated 25 eggs predated in this way were found over the course of the season. In terms of corvid predation, one American Crow was seen flying onto the south end of the island on July 4, and one predated egg was found. No other corvid presence was observed, except flying nearby to and from West Cundy Point and Yarmouth Island.

Great-Horned Owl predation was identified upon arrival to the island on May 28. Three feather spreads, an adult Common Tern head, one punctured dead Common Tern adult, and three adult Common Tern bills were found from May 28 to May 29. The Great-Horned Owl was caught with a leg hold trap the night of May 31. The individual was banded and released in The Forks, Maine.

Falcon or Bald Eagle predation was also observed on the island, but not firsthand. Upon arrival on Jenny Island, five sets of Common Tern wings and one set of Common Eider wings were found. In late July, evidence of a falcon or hawk was found as well – one beheaded Common Tern adult was found on its nest, as well as small feather spreads.

Black-Crowned Night Heron predation was not observed during the 2017 season, although a juvenile Black-Crowned Night Heron was seen being chased by the colony on July 20. However, the continual presence of Great-Blue Herons in the middle of the colony was observed – the individuals were always chased off by the colony.

Common Eiders

Common Eiders were counted during the 2017 GOMSWG census, however the majority of the nests on the island hatched before the census and therefore the count was not accurate.

Outer Green Island

Kim Sawyer, Island Supervisor – National Audubon Society Seabird Restoration Program

Tern Census

The 2017 Gulf of Maine Seabird Working Group (GOMSWG) tern census was conducted on Outer Green Island on 14 June. A total of 1342 Common Tern (*Sterna hirundo*) nests were counted. The inclusion of 41 productivity study nests, 24 feeding study nests, and a Lincoln correction index of 1.02 (n=368) resulted in a corrected total of 1434 nests. This is another new record for Outer Green Island, making it the largest tern colony in Casco Bay, Maine for the third year in a row. There were no known Arctic Tern (*S. paradisaea*) or Roseate Tern (*S. dougallii*) nests.

Table 1. GOMSWG annual census on Outer Green Island, 2012-2017

Year	COTE	ROST	ARTE
2012	1034	0	0
2013	1143	0	0
2014	1139	0	0
2015	1353	0	0
2016	1367	0*	0
2017	1434	0	0

*One ROST nest was laid after 20 June

Tern Productivity

The first Common Tern egg was laid on 23 May. The average number of eggs per nest was 2.13 (n=69). The first hatch was on 16 June, and peak hatch lasted approximately from 19-23 June. The average number of eggs hatched per nest was 1.93, and the average number of chicks fledged per nest (productivity) was 1.45.

Table 2. Outer Green Island annual Common Tern productivity, 2012-2017

Year	Mean Clutch	Mean Hatch	Productivity
2012	2.81	2.19	1.42
2013	2.60	2.27	1.15
2014	2.13	1.92	1.42
2015	2.03	1.83	1.36
2016	2.40	2.12	1.26
2017	2.13	1.93	1.45

Tern Provisioning

Chick provisioning was observed at 23 Common Tern nests this season over 1124.5 nest hours. A total of 1832 feedings to chicks were recorded for an average feeding rate of 1.63 items per hour, which is higher than both the 2016 feeding rate of 1.31 items per hour and the 2015 rate of 0.97 items per hour. The most frequently observed prey item was herring species (*Clupeidae sp.*), which made up 44% of the observed diet. Hake species (*Urophycis sp.*) was the second most frequently observed prey item, at 20% of the observed diet.

Predation

Early and late in the season, Ruddy Turnstones (*Arenaria interpres*) were opportunistically depredating eggs. A Peregrine Falcon (*Falco peregrinus*) predated one or two adult terns pre-hatch. Throughout the season, Great Black-backed Gulls (*Larus marinus*) and a few Herring Gulls (*Larus argentatus*) hunted at all times of day in the colony, but increased their predatory activity at dawn and dusk and during poor weather conditions and especially when low tide corresponded with dusk. Deterrence methods included gull walks and attempts at lethal control. No gulls were successfully shot and no nests were found. One Herring Gull was seen with a Common Eider (*Somateria mollissima*) duckling, and an estimate of 2-4 young terns were predated approximately every other day by large gulls during the peak predation period (27 June – 20 July).

Black Guillemots

This year, four new Black Guillemot burrows were found, raising the island total to 27 burrows. A total of 19 burrows were active, and 14 were followed for growth. Three had not hatched upon departing the island, one could not be measured due to accessibility issues and one burrow was abandoned after multiple storm events washed the nest out. The average clutch size was 2.0, as all burrows with a known clutch size had two eggs. The average number of eggs hatched per nest was 1.35, and the estimated productivity (based on healthy chick growth at time of staff departure) was 1.10.

Stratton Island

Zeke Smith, Island Supervisor – National Audubon Society Seabird Restoration Program

Tern Census

An island-wide Common Tern and Least Tern nest count was conducted on June 14, with an additional count of LETE nests on June 15. Roseate Terns increased from 2016 levels to a total of 119 nests during the GOMSWG census, and 120 nests total for the season. This is Stratton's highest count of ROST nests since 2001, when an all-time high of 127 nests was counted. Arctic Terns nests decreased from 4 in 2016 to 2 in 2017, although an additional nest was predated shortly before the census. The Common Tern nest count of 1035 nests was corrected with a Lincoln index of 1.036, to 1072 nests, and the addition of 55 productivity and feeding study nests brought the total count to 1127 nests. This is an increase from 825 nests in 2016. A total of 61 Least Terns nests were counted during the official LETE census on June 14, however an additional 26 nests were found farther down the beach on the following day. As this was still within the census window it brings the total up to 87.

Table 1. GOMSWG census results on Stratton Island, 2010-2017.

Year	COTE	ARTE	ROST	LETE
2010	854	12	35	76
2011	960	11	51	59
2012	1033	0	71	86
2013	1284	3	93	92
2014	1314	8	103	97
2015	1395	12	108	81
2016	825	4	86	69
2017	1127	2	119	87

Tern Productivity

Tern productivity was determined from both fenced and unfenced plots. The 55 nests in the Common Tern plots fledged at a rate of 0.68 chicks per nest. Roseate Tern productivity was 1.03 chicks fledged per nest for the 82 nests followed. Least Terns produced at least 2 fledgling aged chicks in 2017. Although they were never observed within the colony, Black-crowned Night-Herons are suspected to have been a major factor in LETE productivity this year. Of the 4 Arctic Tern nests followed, 2 produced 1 chick each. An additional 3 ARTE chicks were found elsewhere on the island in late June.

Table 2. Tern productivity on Stratton Island, 2011-2017.

	2011	2012	2013	2014	2015	2016	2017
COTE							
Mean clutch	2.50	2.60	2.02	1.95	2.09	2.4	2.29
Mean hatch	2.23	2.40	1.83	1.69	1.75	2.25	1.91
Productivity	1.70	2.04	1.41	1.29	0.89	1.0	0.68
ROST							
Mean clutch	1.94	1.80	1.88	1.49	1.83	1.88	1.88
Mean hatch	1.82	1.45	1.52	1.10	1.49	1.28	1.59
Productivity	1.24	1.32	1.27	0.99	1.38	1.0	1.03
ARTE							
Mean clutch	1.91	-	2.00	2.00	1.83	-	2.00
Mean hatch	1.45	0	0	1.22	1.08	-	1.00
Productivity	0.36	0	0	0.22	0.25	0	.5
LETE							
Mean clutch	1.88	1.96	1.97	1.86	-	-	-
Mean hatch	1.50	1.48	1.65	1.52	-	-	-
Productivity	0.38	0.65	0.72	0.38	0	0.2	0.02

Tern chick provisioning

12 Common Tern nests were observed in 2017 with a total of 381 feedings. Amphipods were the primary prey item offered to chicks, comprising 24.1% of the diet, however most feedings occurred at two nests over the course of a few days in early July. Unidentified fish followed at 22.0%, hake at 13.5%, sand lance at 12.2%, and hake/herring at 7.2%. 10 Roseate Tern nests were observed with a total of 368 feedings. Sand lance made up 44.0% of their diet, with another 30.8% being unidentified fish. Third most common was hake, at 7.7%, while the remainder consisted primarily of unknown prey at 5.6%, hake/herring at 4.2%, and herring at 3.4%. Least Tern feeding studies were conducted by opportunistically identifying fish as they were fed to chicks with no effort made to follow specific nests. A total of 72 feeding were observed before the study was abandoned due to night-heron predation. Unidentified fish were most commonly observed at 40.3%, followed by sand lance at 20.8%, hake at 15.3%, killifish at 12.5%, and unknown prey at 5.6%.

Predation

Herring and Great Black-backed Gulls continue to prey on tern eggs and chicks and to have a devastating impact on Common Eider chick success. As part of an effort to reduce Herring and Great Black-backed Gull populations on Stratton and Bluff Islands, eggs in all gull nests found on Bluff Island were poked, and all gull nests found on Stratton Island were destroyed. 2 Herring Gull nests and 7 Great Black-backed Gull nests were found and destroyed on Stratton Island and 33 Herring Gull and 26 Great Black-backed Gull nests were poked on Bluff Island. 1 Herring Gull was lethally removed from Stratton Island.

At least one Black-crowned Night Heron was responsible for the near total failure of the Least Tern colony this year, and had a small impact on Common Tern productivity as well. Nests in the vicinity of and

including one COTE feeding study were continually predated throughout the season. Attempts were made to remove it from the island but they were not successful.

This year also saw Stratton's first documented case of muskrat predation on tern chicks. On July 13 a dead COTE chick that was relatively untouched save for a missing head was found in the colony, and the following day a muskrat was observed carrying a chick through the same area. Over the next two weeks, 8 COTE and 2 ROST chicks were found dead in the area, all with missing heads. 2 muskrats were trapped in the area and while no new predated chicks were found after their removal, most birds had fledged by this point, making it impossible to know for sure if the target muskrat had been caught.

Wading Birds

A census of the wading bird colony on Stratton Island was conducted on May 19-21. A total of 104 Glossy Ibis, 8 Black-crowned Night Heron, 43 Great Egret, and 51 Snowy Egret nests were found.

Common Eiders

A Common Eider census was not conducted this year.

American Oystercatchers

2 pairs of American Oystercatchers nested on Stratton Island in 2016. A third nest was suspected, as 6 birds were occasionally observed flying together. The two confirmed nests were washed away during a high tide in late June and no attempt to relay was found.

Black Guillemots

4 active Black Guillemot burrows were confirmed in 2016. 3 were near East Beach and a fourth was found on the south side of Gull Meadow. A high count of 25 adult Black Guillemots occurred on July 19.

Double-crested Cormorants

On June 4, 90 Double-crested Cormorant nests were counted on Bluff Island by visual estimate from a boat.

Visitors

In 2017, Stratton Island had 130 documented visitors. Visitors included USFWS and National Audubon personnel for research purposes, 3 Maine Audubon Society field trips, a Prout's Neck Audubon Society field trip, and visiting kayakers and boaters.

Notable Birds

An immature Magnificent Frigatebird was observed attempting to land on Stratton Island on June 12, and an immature Brown Pelican was observed roosting on Bluff Island on June 21 and on Little Stratton on June 23. A Marbled Godwit was seen foraging on Little Stratton on June 27.

2017 Maine State Synopsis of Nesting Least Terns

On June 14th, a coordinated statewide Least Tern census documented a minimum of 250 Least Tern pairs within the State of Maine. During the window count on June 14th and June 15th, 115 Least Tern pairs nested at Crescent Surf while 93 nested on Stratton Island and 48 nested at Western Beach. Least terns also nested at Goose Rocks, and Laudholm beaches. Crescent Surf produced a minimum of 13 fledglings, and Stratton Island produced a minimum of 1. State productivity was estimated to about .076 fledglers per pair. Overall, productivity was abysmal.

Estimate of Least Tern Pairs

	WELLS	LAUDHOLM FARM	CRESCENT SURF	GOOSE ROCKS	WESTERN BEACH	STRATTON ISLAND	HIGGINS	RAM ISLAND	SEAWALL	POPHAM	REID STATE PARK	TOTAL
2003	0	20 (0)	57 (8)	8 (0)	0	-	38 (53)	0	0	0	33 (5)	156 (66)
2004	15 (10)	1 (0)	[50] (3)	0	0	-	45 (54)	0	0	0	50 (2)	146 (69)
2005	0	4 (1)	[52] (7)	0	[40] (3)	18 (9)	[22] (0)	0	[17] (0)	0	0	114 (20)
2006	[1] (0)	0	30 (10)	[25] (1)	0	103 (15)		0	0	0	[1] (0)	134 (26)
2007	1 (1)	0	[37] (1)	[45] (2)	0	113 (10)8	0	0	0	0	0	150* (112)
2008	0	0	92 (52)	2 (0)	[2]	72 (33)	0	0	0	0	0	166* (89)
2009	0	0	102** (62)	[6]** (0)	0	72 (16)	[16] (0)	0	0	0	0	170 (78)
2010	0	[1]**	136** (45)	[18]**	0	76** (5)	0	0	0	0	0	211* (50)
2011	0	0	123* (73)	23* (12)	0	59* (28)	0	0	0	0	0	205* (113)
2012	0	0	99* (78)	0	0	86-92* (72)	0	5 (1)	0	2	0	185-191* (155)
2013	0	0	129* (93)	0	0	92* (79)	0	0	0	3* (0)	0	224* (172)
2014	0	4** (4)	164* (29)	0	0	79* (36)	4* (0)	0	0	2* (?)	0	249* (72)
2015	0	6** (0)	138* (144)	0	0	69* (0)	25* (6)	0	0	14* (3)	0	233* (153)
2016	0	2**(0)	169*(15)	10** (7)	4(0)**	69*(14)	0	0	1(0)*	22(0)**	0	238*(36)
2017	0	1*(0)	115*(13)	4*(0)	48*(5)	87*(1)	0	0	0	0	0	255*(19)

[] colony deserted

Laudholm Farm Beach, Wells

Katrina Amaral and Kate O'Brien, Rachel Carson NWR

Population Estimate

There was 1 active nest during the statewide census period and this was the only nest found at Laudholm. This nest was overwashed at the end of June.

Comparison

In 2015 and 2016, Laudholm produced 0 fledglings; prior to 2015, least terns had not nested at Laudholm since 2005.

Predator Control

No predator control was conducted, although USDA Wildlife Services removed predators at adjacent Crescent Surf Beach.

Crescent Surf Beach, Kennebunk

Katrina Amaral and Kate O'Brien, Rachel Carson NWR

Population Estimate

There were 115 active nests during the statewide least tern census on June 14th. A second count was conducted on June 21st and found 113 nests. High tides around June 25th overwashed many nests, particularly those on the narrow front of the beach. Some eggs were found to be slashed in a manner similar to Black-crowned Night-herons. No night-herons were seen in the area although a Great Blue Heron was photographed on a game camera in the middle of the tern colony (7/17/17). American Crow were observed preying on unexclosed plover nests and it is likely they ate Least Tern eggs as well. Many chicks were observed but most did not fledge. A number of factors likely contributed to this low chick survival. A great-horned owl was first sighted on June 17th over the Little River marsh. For the next 2 months regular owl tracks and feathers were found within the Least Tern colony. Simultaneous beach surveys were conducted on July 18th and August 3rd for fledgling counts of 12 and 1, respectively. Our final estimate is 13 fledglings for a productivity of 0.1.

Comparison

Least terns only fledged 15 chicks from 238 nests in 2016; a mink was the primary cause of failure. In 2015, there were 138 active nests during the statewide least tern census that produced >144 fledglings for a productivity of 1.04. In 2014 there were 138 least tern nests but due to a number of extreme weather events these nests only produced 29 fledglings for a productivity of 0.18. In 2012 and 2013 the productivity was approx. 0.7 on Crescent Surf. Productivity was poor between 2003 and 2007.

Predator Management

USDA Wildlife Services removed specialist predators from the Crescent Surf beach area throughout the breeding season. An electric net fence was used during the breeding season.

Goose Rocks Beach, Kennebunkport

Maine Audubon

Population Estimate

At least seven pairs of Least Terns made nest attempts on the west end of Goose Rocks Beach in 2017 and many Least Terns were observed foraging in the Batson River.

From early June to early July, between five and twenty birds were seen on any one visit. In mid-July, the number of observed birds reached 125, however this was after a predation event and the majority were foraging. The first nest was found on June 6th and there were seven in total by July 10th. On July 17th, all

of the nests appeared to have been predated by fox. Two eggs were found abandoned on August 3rd, and no birds were seen for the remainder of the season.

Comparison

At least 10 pairs of Least Terns made nest attempts on Goose Rocks Beach in 2016 fledgling at least seven chicks. No Least Terns attempted to nest at Goose Rocks Beach from 2012- 2015. In 2011, a season high of 46 birds were documented and produced a minimum of 12 fledglings. In 2010, a small colony set up after failures at Crescent Surf Beach and Stratton Island; however, no chicks survived.

Predator Control

None.

Western/Ferry Beach, Scarborough

Maine Audubon

Population Estimate

There were a minimum of 48 Least Tern nest attempts on Western Beach in 2017. Electric fencing was installed on May 30th, after the colony had begun to nest. At least twelve chicks hatched, and five fledglings were confirmed. Most loss appeared to occur at the nest stage. The beach is a popular loafing site for gulls and crow and fox tracks were observed in the colony, though we were never able to identify the source of the majority of lost nests. Comparison: In 2016, there were at least four nest attempts on Western Beach, with no fledglings produced. Before this, terns had not nested on Western Beach since 2008, and the site had not fledged chicks since 2005 when there was a total of 40 active nests. Prior to 2005, Least Terns had not nested at the site since 1981.

Predator Control

USDA Wildlife Services removed specialist predators from the area throughout the breeding season. An electric net fence was used during the breeding season.

Stratton Island

National Audubon Society

Population Estimate

There were 87 nests recorded during the statewide census on June 14th and 15th. A minimum of one fledgling was produced. For additional information see Stratton Island specific reports.

Predator Control

Yes

Seawall Beach Morse Mountain, Phippsburg

Maine Audubon

Population Estimate

Least Terns were observed foraging along the beach and in the Morse River. There were no nesting attempts in 2017.

Comparison

Least Terns have not attempted to nest on Seawall Beach since 2005. That year, a 17-nest colony was decimated by a fox or coyote.

Predator Management:

None.

NEW HAMPSHIRE

White and Seavey islands

Jennifer Seavey, Principal Investigator – Shoals Marine Laboratory

Liz Craig, Program Manager – Shoals Marine Laboratory

Elizabeth Ford & Taylor Ouellette, Seabird Technicians – Shoals Marine Laboratory

Tern Census

Common Terns

- COTE census was conducted on 18-21 June 2017
- Unadjusted census:
 - 263 nests on White Island
 - 2,595 nests on Seavey Island
 - Lincoln Indices were calculated for White Island (1.027) and Seavey Island (divided into sections with indices ranging from 1.00 to 1.15)
 - 62 additional nests were located in productivity plots on Seavey
- Adjusted census:
 - 270 nests on White Island
 - 2,940 nests on Seavey Island
 - **Total estimated population was 3,210 (the highest census in colony's past 20 years)**

Roseate Terns

- 92 ROST nests were established on Seavey Island by 20 June 2017
- B-wave ROST nests brought season total to 97

Arctic Terns

- 2 ARTE nests were established by 20 June 2017; 1 nest on White Island and 1 nest on Seavey Island

Table 1. Number of tern nests found on White and Seavey islands from 2013-2017.

Year	COTE	ROST	ARTE
2013	2,269	51	2
2014	2,548	69	3
2015	2,686	68	2
2016	2,985	83	3
2017	3,210	92	2

Productivity

Common Terns

- 7 fenced plots (~10x12 ft) containing 62 nests were used to determine COTE productivity
- Productivity was low due to the combination of vegetation, predation by gulls, and stormy weather
- 2017 was the first year that fenced plots were used to estimate productivity. Fenced plots were distributed amongst representative habitat types across the island (rocky edge, high grass, low vegetation, etc.). In the past, unfenced plots were all located in relatively open habitat so that they could be visually observed from blinds. For this reason, we believe that this year's estimate is more accurate than those from past years using unfenced productivity plots. In the future we plan to use slightly larger plots to allow for greater movement of chicks and larger sample size.

Roseate and Arctic terns

- ROST and ARTE nests were monitored individually until chicks reached “fledge” age (5 days for ROST and 15 for ARTE)

Table 2. Breeding parameters for Common, Arctic, and Roseate terns on White and Seavey islands from 2013-2017. Only nests with known outcomes were used for ROST & ARTE calculations.

Species	Year	Clutch size	Hatching success	Fledging success	Nests monitored
COTE	2013	2.32	1.86	1.22	190
	2014	2.12	1.57	0.78	223
	2015	2.04	1.52	1.10	188
	2016	2.25	1.56	0.80	247
	2017	2.00	1.81	0.37	62
ROST	2013	1.64	1.21	1.12	58
	2014	1.45	0.97	0.91	76
	2015	1.58	1.20	0.93	74
	2016	1.69	1.23	0.94	83
	2017	1.60	1.23	0.91	87
ARTE	2013	1.00	2.00	2.00	2
	2014	1.67	1.67	1.30	3
	2015	1.33	0.67	0.33	3
	2016	2.00	1.00	0.50	2
	2017	2.00	1.50	1.00	2

Tern Provisioning

- 12 COTE nests were monitored for diet
- A remote observation camera was used to record video of each nest every 1-2 days from 30 June 2017 onwards. Limited provisioning data were collected by observers in blinds to compare to camera observations. Data from camera recordings will be collected in fall 2017
- Diet items included Atlantic herring, hake, sandlance, butterfish, cunner, silverside, goosefish, lumpfish, mackerel, pollock, banded rudderfish, ants, and moths
- Partnering with a genetics lab at UNH (Drs. Gemma Clucas and Adrienne Kovach) to conduct DNA metabarcoding of feces to determine diet

Predator Activities and Control Efforts

Gulls:

- No gull nesting attempts on White or Seavey in 2017
- Used human presence, as well as pyrotechnics to dissuade gulls from lingering and predating. No lethal gull removal was done
- 36 pyrotechnics were used between 16 May and 3 August.

- As in 2016, a GBBG sub-colony on Appledore Island was observed containing tern remains: 151 individual wings (including 13 banded COTE chicks, 2 banded ROST chicks, and 1 one-year-old ROST). Planning to target this bird on its nest next spring.

Other Avian:

- RUTU from the end of May through mid June and again in late July. No direct observations of egg predation were made, but we believe (based on pattern of egg damage) that RUTU were a significant egg predator this year
- One CANG nest was destroyed in early May
- A juvenile PEFA visited the colony on 4 days in mid June. Terns responded by mobbing the falcon. PEFA caused colony unrest for several days even after its departure, but no apparent abandonment. 1 adult COTE observed predated
- BCNH - observed one evening (7/10) - used pyrotechnics to flush it

Mammalian:

- No evidence of mammals (including muskrats) on White or Seavey in 2017
- Large pile of owl pellets (presumably SNOW) containing muskrat remains were found on Seavey in May

Other Nesting Species

- Both Common Eider (27 nests on 5/16) and Spotted Sandpipers (at least 8 nests) were found nesting on the islands.

Other observations

- Yellow-nosed Albatross (7/4)
- Brown Pelican (7/11)
- Alcids: BLGU (confirmed nesting on Appledore Island), RAZO, ATPU

MASSACHUSETTS

Monomoy National Wildlife Refuge

Kate Iaquinto – Wildlife Biologist, U.S. Fish & Wildlife Service

Devan Blazey – Biological Science Technician, Northwoods Stewardship Center

Kaitlyn Nafziger – Biological Science Technician, Northwoods Stewardship Center

Erin Lefkowitz – Biological Science Intern – Student Conservation Association

Minimoy Island

Tern Census and Productivity

No common, roseate, or least tern nests were found on Minimoy Island this field season. Productivity on Minimoy Island was zero.

North Monomoy Island

Tern Census and Productivity

No common, roseate, or least tern nests were found on North Monomoy Island this field season. Productivity on North Monomoy Island was zero.

Wading Birds

A wading bird census on North Monomoy Island was conducted on May 16th. Observers counted 185 active black-crowned night-heron nests, 99 snowy egret nests, 25 great egret nests, and 3 glossy ibis nests. Productivity was not monitored.

South Monomoy Island

Common Tern Census and Productivity

The annual South Monomoy Island tern and gull census was conducted by a team of refuge staff and volunteers on June 7th, 8th, and 10th. The nesting area is delineated into 60m² grids, and all nests were tallied by grid number. A Lincoln Index was performed at the end of each day to compensate for error, providing a final adjusted estimate of 11,723 nests on South Monomoy Island. A B-census was not conducted; however, based on the number of nests initiated in productivity plots after June 20th, we estimated there to be an additional 2,698 nests in the colony during the B-period.

Common tern reproductive success was excellent, based on results of the 352 A-count nests that were monitored in 42 fenced productivity plots. Reproductive success within the monitored plots was 1.53 fledged chicks per nest attempt. Final productivity calculations were made based singularly on A-period nests.

Table 1. Comparison of productivity information for A-period nesting Common Terns on South Monomoy Island: 2015 to 2017

	2015	2016	2017	Standard Deviation	Standard Error	Sample Size
Average Clutch Size	2.72 eggs/nest	2.57	2.31	0.67	+/- 0.04	352
Average Eggs Hatched Per Nest	2.40 eggs hatched/nest	2.33	1.98	0.89	+/- 0.05	352
Hatching Success	88.3%	90.7%	87.5%			
Fledging Success	61.0%	84.1%	75.8%			
Reproductive Success	1.50 chicks/nest	1.96	1.53	0.82	+/- 0.04	352

Table 2. Number of pairs and reproductive success of Common Terns on South Monomoy Island 2015 to 2017

	2015	2016	2017
Number of Pairs	9203	10505	11723
Reproductive Success	1.50	1.96	1.53

Common Tern Feeding Stints

Staff conducted 45 1-hour long common tern feeding stints from June 27th to July 27th. Seven nests with small to medium chicks were marked with popsicle sticks by the observer. Prey item, length, and recipient were recorded throughout each stint. Refuge staff recorded 418 total feedings during 45 hours of stints. The average recorded length of prey items was 2.13 culmen lengths. Sand lance was the most common prey item, constituting 83.97% of the items observed. Other delivered prey items included herring (4.55%), hake (2.15%), butterfish (1.44%), bluefish (0.96%), and pollock (0.24%). The other 6.7% of prey was attributed to unknown fish and other unknown items.

Common Tern Trapping and Banding

59 adult common terns were trapped or resighted on South Monomoy Island during banding efforts. Of the total captured, 50 were previously banded, eight were affixed with new bands, one had a damaged band removed and replaced. Of the banded adults trapped, 21 were originally banded at Monomoy NWR, 12 at Great Gull Island, MA, 6 at Ram Island, MA, 4 on Bird Island, MA, 3 in Punta Rasa, Argentina, 3 at Penikese Island, MA, and 1 in Plymouth, MA. 7 of the 50 adult common terns were resighted in the

colony in 2017 from plastic field readable (PFR) bands that were affixed during previous work in 2013 and 2014.

Roseate Tern Census and Productivity

Eleven roseate tern nests were counted during the A-census window on South Monomoy Island. Seven new nests were found after June 20th, bringing the total to 18 nesting pairs. This was an increase of four total pairs compared to 2016. A total of 20 chicks hatched, all of which could be considered fledged by GOMSWG standards. Observational stints to find roseate terns were continued until July 26th, but no additional nests were located.

The reproductive success of roseate terns on South Monomoy Island was good, with an overall 100% fledging success rate.

Table 3. Comparison of Productivity Information for Nesting Roseate Terns on South Monomoy Island during A Census Window: 2015 to 2017

	2015	2016	2017	Standard Deviation	Standard Error	Sample Size
Number of Pairs	11	12	11			
Average Clutch Size	2.00 eggs/nest	1.71	1.80	0.63	+/- 0.20	10*
Average Eggs Hatched Per Nest	1.27	1.21	1.30	0.82	+/- 0.26	10*
Hatching Success	63.64%	70.83%	72.22%			10*
Fledging Success	100%	82.35%	100%			10*
Reproductive Success	1.27chicks/nest	1.00 chicks/nest	1.36 chicks/nest	0.81	+/- 0.24	11

*One pair not included due to being found as chicks.

Table 4. Comparison of Productivity Information for Nesting Roseate Terns on South Monomoy Island during B Census Window 2017

	2017	Standard Deviation	Standard Error	Sample Size
Number of Pairs	7			7
Average Clutch Size	1.50	0.55	+/- 0.22	6*
Average Eggs Hatched Per Nest	0.67	0.82	+/- 0.33	6*
Hatching Success	44.44%			6*
Fledging Success	100%			6*
Reproductive Success	0.71 chicks/nest	0.76	+/- 0.29	7

*One pair not included due to being found as chicks.

Roseate Tern Attraction Project

The roseate tern Attraction Project was not implemented in 2017. Due to staffing limitations, sound systems and nesting structures were not installed at the beginning of the season. The project will be continued in 2018 if possible.

Roseate Tern Trapping and Banding

A total of 26 previously banded roseate tern adults were captured with Potter traps or resighted by field readable band in 2017. Seven unbanded adults and 20 newly hatched chicks were banded with dark blue PFRs with white lettering. Chicks were given a PFR on the lower left and stainless steel BBL bands on the lower right, adults were given a PFR on the lower right and a BBL band on the lower left. 17 of the 64 adults affixed with PFRs in the 2014 – 2016 seasons returned to nest in 2017. The bands were reported to the Bird Banding Lab and Jeff Spendelow of the USGS at the culmination of the season.

Staging and Re-sighting

Re-sighting and staging counts of common and roseate terns were conducted by Jeff Spendelow of the USGS, with the assistance of refuge staff during the months of July and August on South Monomoy Island. Staging counts were performed 4 days between July 27 and August 9. Additional counts were also conducted on July 31 on South Beach Island by refuge staff.

Least Tern Census and Productivity

The majority of nesting least terns on South Monomoy Island were found within a single colony on the northern end of the island. Three nests were also discovered on the far southern end of the island. An A-period census was conducted by using an incubating adult count in the main colony on 16 June, the other sites were censused by nest count on 24 and 29 June. A total of 773 nests were counted refuge-wide. No B-period census was conducted. Productivity was not quantitatively monitored; however, it was estimated to be fair overall. Substantial evidence of coyote presence was observed, suggesting a moderate degree of depredation on least tern chicks throughout the season.

Black Skimmer Census and Productivity

Black skimmers were discovered nesting within the South Monomoy tern colony for the first time since 2011. A total of two pairs nested in the southern section of the colony (one during the A-Census window and one during the B-Census) and were able to successfully hatch 5 chicks. Of those that hatched, one chick was observed through fledging and was last seen flying on August 24th at 47 days old, one chick was found dead (cause unknown) at one day old, and three chicks were missing between the ages of 4 and 18 days old. Three of the five skimmer chicks were fitted with stainless steel BBL bands on the lower right leg. Overall, the black skimmers on South Monomoy Island exhibited a relatively low fledging success rate of 20% and a productivity of 0.50 chicks fledged per pair. Calculations are based on the total number of nest attempts (A and B Census) throughout the 2017 season.

Laughing Gull Census and Productivity

A total of 2,714 laughing gull nests were counted during this year's tern census on June 7th, 8th and 10th. This number is fairly consistent with the 2,738 nests found in 2016, and can be compared with the 1,424 nests found in 2015, 983 in 2014, and 974 in 2013. The increase in 2016 was likely due to the controlled burn conducted during the winter of 2015, a lack of nest destruction during the preceding years, and the possible redistribution of laughing gulls throughout the Gulf of Maine from other nest destruction efforts. Although laughing gull productivity was not monitored, it was estimated to be qualitatively poor due to the implementation of nest destruction. To minimize competition for food and nesting area with the terns, 2038 active nests were destroyed within the tern colony area between June 16th and July 13th.

Laughing Gull Kleptoparasitism

Stints were continued this year to monitor the number of kleptoparasitism attempts made by laughing gulls on common terns. Fifty-two kleptoparasitism stints were conducted throughout the colony this year, totaling 50.12 observational hours. Events of kleptoparasitism were recorded during 45 of the 52 stints. A total of 729 kleptoparasitism attempts were observed, with an average of 14.5 attempts per hour. Results show that laughing gulls were successful 35.7% of the time, common terns were successful 25.2% of the time, items were dropped 7.4% of the time, and the outcome was unknown 31.7 % of the time.

Great Black-backed Gull and Herring Gull

Prior to the arrival at South Monomoy of nesting terns and the establishment of field camp, both herring and great black-backed gulls were discovered attempting to nest within the tern colony nesting area. To combat these attempts, staff conducted full colony gull harassments from May 9th to May 17th in order to encourage them to nest elsewhere. Harassments were conducted once every couple of days as needed; however, after the first day of harassments, the number of gulls flushed from the colony declined rapidly. Occasional harassments were continued throughout the season whenever a gull was observed within the tern colony. One great black-backed gull nest was found and destroyed within the colony, and no herring gull nests were discovered within the colony this year. Throughout the season, a total of 11 adult herring gulls and six adult great black-backed gulls were lethally removed from South Monomoy Island. Great black-backed gulls were observed within the colony a total of 18 times, while herring gulls were sighted a total of 60 times. A total of 47 depredated common tern eggs and zero depredated roseate tern eggs were attributed to large gulls throughout the season.

Northern Harrier

Northern Harriers were observed throughout the refuge 15 times during the field season. Of those 15 sightings, only 8 were within the South Monomoy Island tern colony. While no depredations were attributed specifically to Northern Harriers, 12 fledgling deaths were attributed to unknown raptor species.

Coyote

A total of four adult eastern coyotes were lethally removed from the refuge in 2017. Evidence of coyote visits (scat, tracks) was discovered 23 times within the common tern colony (Area A) during the field season, though such observations were sporadic and relatively infrequent. On the whole refuge, evidence of coyote visits (scat, tracks) was observed a total of 60 times. Individuals were sighted on the refuge a total of 6 times, all within the common tern colony. Overall, there was little obvious predation of common and roseate terns that could be linked to coyotes. Other areas of the refuge, however, bore signs of substantial coyote predation on piping plovers, American oystercatchers, and least terns.

American Crow

American crows were observed on South Monomoy Island 3 times in May and June. Only two American Crows were lethally removed from the island.

Common Grackle

While only 5 common tern egg depredations in 2017 were attributed to common grackles, they are generally a significant predator of nesting piping plovers, and potentially least terns, on the island. Fifteen common grackles were lethally removed from South Monomoy Island this year.

Wading Birds

Due to the absence of nesting wading birds on South Monomoy Island since 2007, no census was conducted on this island this year. Four black-crowned night-herons were sighted by staff on South Monomoy throughout the season, and approximately 271 common tern egg depredations were attributed to these wading birds between May 23rd and August 16th. No wading birds were lethally removed from the refuge during the 2017 field season.

Owls

One owl pellet was found and collected in May of 2017. No owls were actually sighted this season, nor were they believed to have been responsible for any recorded depredations.

Peregrine Falcon

Peregrine Falcons were observed visiting the colony a total of four times throughout the field season. The majority of these visits occurred in the months of June and July, markedly increasing in frequency as nesting activities diminished at the end of the season. Peregrine's were observed returning to the colony multiple times on days when visits were observed. Twelve discovered predations of common terns and laughing gulls were attributed to Peregrine Falcons.

Mute Swan

Five mute swans were observed on the refuge during the field season, and all five were lethally removed by USDA staff members at the time of sighting.

AFTERNOON SESSION

Tracking Common Terns with Satellite Tags

Linda Welch, Maine Coastal Islands NWR

Maine Coastal Islands NWR, in collaboration with USFWS R5 Migratory Bird Program, BOEM, and the Avian Research and Conservation Institute equipped five incubating common terns with 2 gram solar satellite tags. We used Teflon tape harnesses to attach the tags, and monitored each nest with GoPro cameras to document potential tagging effects. Productivity for the five tagged birds was similar to control nests, and tracking data showed the birds flying more than 70 km round trips to forage. Two of the tagged birds (both females) departed the nesting colony in early August, staged on Cape Cod for several days, and then flew directly to the north shore of South America. The remaining three birds (all males) eventually made their way to Cape Cod where they staged for 4-6 weeks. Two of the terns had close encounters with multiple hurricanes, apparently flying straight through (or over??) Hurricane Maria. These birds also flew to the north shore of South America. Three tags continued to transmit into the winter and all the birds were foraging along the north shore of Brazil.

Conservation Decoys: Mad River Decoy by Audubon

Tiffany Huenefeldt, Audubon Seabird Restoration Program

Orders for restoration project decoys are processed in the sequence in which they are received with our production season running from December through March. Orders are accepted throughout the year.

<http://projectpuffin.audubon.org/decoys/ordering-and-contact-details>

Email Contact: decoy@audubon.org

Phone: 207-596-5566

Analysis of Roseate Tern and Common Tern Nest Location Data on Stratton Island, Outer Green Island and Eastern Egg Rock – a new partnership with Bowdoin College Environmental Studies Program.

Bob Houston - Biologist/GIS Specialist, USFWS Gulf of Maine Coastal Program

Malcom Groves, Jasper Houston, Ripley Mayfield, Sam Walkes – Students, Bowdoin College

Eileen Sylvan Johnson, PhD – Professor, Bowdoin College

Term Projects/Posters for Bowdoin College Environmental Studies class - Understanding Place: GIS and Remote Sensing.

GIS data for Stratton Island, Outer Green Island and Eastern Egg Rock were provided to four students in an entry level GIS class (Understanding Place: GIS and Remote Sensing) at Bowdoin College. A basic introduction to the data and suggested analysis topics were provided to the students so they could use the data in their term project to produce a poster and term paper. Students produced very insightful and informative posters/papers and used a variety of detailed GIS spatial analysis tools to evaluate the distribution of roseate and common terns on the three islands. Results can be seen on the posters on display today and Bob will present some results at GOMSWG today. We welcome any comments or suggestions for analysis/research with future students in this class.

Sand Lance Workshop

Linda Welch, Maine Coastal Islands NWR

In May 2017, the US Fish and Wildlife Service and the national Marine Fisheries Service convened a two day workshop to enhance the understanding of sand lance's ecological role in the northeast. Sand lance are the primary diet item for terns nesting in the southern Gulf of Maine, and are also consumed by a variety of nesting and migratory seabirds throughout the region. The workshop was attended by over 50 researchers, managers, environmental groups, and commercial fishermen. There were 19 presentations, including two researchers from the UK that updated the group on sand lance harvest in the UK and

corresponding declines in seabirds. Meeting participants are currently working on a white paper to summarize existing knowledge, potential threats, and research needs for sand lance. Please email [Linda Welch@fws.gov](mailto:Linda_Welch@fws.gov) if you would like to be involved or would like more information on this process.

Forage Fish Conservation

Linda Welch, Maine Coastal Islands NWR

Several members of GOMSWG have been actively involved with the New England Fisheries Management Council and National Marine Fisheries Service process to develop a new harvest quota for Atlantic herring. Colony managers throughout the Gulf of Maine contributed tern diet information and annual productivity data to this process. This represents the first time seabirds, as foragers of herring, are being considered in the process. We hope that the new harvest regulations will consider the value of herring as a forage fish, and that the new regulations will ensure that sufficient numbers of herring remain in the system to support all of the consumers.

Appendix A: 2017 GOMSWG Attendees

FIRST NAME	LAST NAME	Organization
Amanda	Adams	Monomoy National Wildlife Refuge
Sam	Albright	
Brad	Allen	Maine Dept of Inland Fisheries & Wildlife
Katrina	Amaral	USFWS/RHC
Mark	Baran	UNB - Machias Seal Island
Brian	Benedict	Maine Coastal Islands NWR Complex
Seth	Benz	Schoodic Institute
Shannon	Blake	National Audubon Society
Devan	Blazey	Monomoy National Wildlife Refuge
Rosalie	Borkik	National Audubon Society
Bradford	Bower	
Hannah	Brazier	
Shannon	Carvey	National Audubon Society
Jackie	Claver	Monomoy National Wildlife Refuge
Annie	Colgan	National Audubon Society
Rock	Delliquanti	National Audubon Society
Katelyn	Depot	National Audubon Society
Matt	Dickey	National Audubon Society
Mark	Dodds	UNB
Alyssa	Eby	National Audubon Society
Adam	Ells	
Mike	Fahay	
Zack	Fait	Maine Audubon Society
Clare	Flynn	National Audubon Society
Elizabeth	Ford	Shoals Marine Laboratory
Peggy	Friar	University of New England
Wray	Gabel	National Audubon Society
Karin	Gafvelin	
Bob	Houston	US Fish & Wildlife Service
Tiffany	Huenefeldt	National Audubon Society
Kate	Iaquinto	Monomoy National Wildlife Refuge
Will	Kennerley	National Audubon Society
Zack	Klyver	Bar Harbor Whale Watch
Michael	Langlois	Maine Coastal Islands NWR Complex
Col	Lauzau	UNB - Machias Seal Island
Erin	Lefkowitz	
Kyle	Lima	

Mark	McCollough	USFWS
Aly	McKnight	USFWS
Megan K.	Miller	
Kaitlyn	Nafzinger	
Taylor	Ouellette	Shoals Marine Laboratory
Richard	Podolsky	Avian Systems
Paula	Shannon	National Audubon Society
Nell	Smith	National Audubon Society
Zeke	Smith	National Audubon Society
Kacey	Srubas	
Bridget	Strejc	National Audubon Society
Illianna	Termuehlen	National Audubon Society
Jessie	Tutterow	National Audubon Society
Linda	Welch	Maine Coastal Islands NWR
Sara	Williams	US Fish & Wildlife Service
Brad	Zitske	MDIFW
Laura Minich	Zitske	Maine Audubon