Gulf of Maine Seabird Working Group

36th Annual Summer Meeting

August 13, 2020

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Contents

Meeting minutes compiled by
Paula Shannon, National Audubon Society

Introduction

The Gulf of Maine Seabird Working Group (GOMSWG) is a collaborative effort among state and federal 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.

The 2020 seabird breeding season encountered additional challenges due to the COVID-19 pandemic that delayed staff arrivals and restricted overall staffing on seabird colonies throughout the Gulf of Maine. Through creativity and flexibility, colony managers were still able to protect colonies and collect data at a majority of traditionally managed sites.

Due to the pandemic, the 2020 GOMSWG meeting was held virtually, via Zoom. Meeting activities included summaries of island activities, reported in geographical order from Canada south to Massachusetts. A table with 2020 GOMSWG census results will be distributed concurrently with this report.

Island and Site Reports

NOVA SCOTIA

Lobster Bay

The Brothers Islands Wildlife Management Area (North Brother Island)

A. d'Entremont, T. D'Eon (Island Stewards) J. McKnight (ECCC-CWS) and S. Craik (Université Sainte-Anne)

Tern Census

The tern census was conducted on North Brother Island on 14 June with five observers. We surveyed all suitable nesting habitat by making systematic sweeps through the nesting area and placed wooden craft sticks in each nest upon discovery to avoid counting individual nests more than once. We only followed ROST nests initiated during peak nesting, therefore the number of COTE and ARTE nests are combined in the total below in Table 1.

Table 1. Number of tern nests found on North Brother Island from 2020-2015

Year	COTE	ARTE	ROST	LETE
2015	687		35 (year end: 42)	-
2016	619		42 (year end: 52)	-
2017	141[1]		24[1]	-
2018	74[1]		2[1]	-
2019	372	35	47 (year end: 52)	-
2020	664		49[2]	-

[1] Colony was abandoned post-census due to heavy predation

[2] The count of 49 nests includes a nest attended by a hybrid COTE x ROST pair

Productivity

We were unable to assess fledge success due to pandemic restrictions.

Table 2. Breeding parameters for Common, Arctic, and Roseate terns on North Brother Island in 2020.

Species	Clutch size	Hatching success	Fledging success	Nests monitored
COTE			-	0
ARTE			-	0
ROST	1.3 (49)[3]	0.86	-	47

[3] Includes the nest attended by a hybrid COTE x ROST

Predator Activities and Control Efforts

No predator control measures were undertaken on North and South Brother in 2020 due to pandemic restrictions. South Brother was visited on June 14 to destroy gull nests, but given advanced stage of development, eggs were not destroyed.

Common Eiders

We documented four Common Eider nests on North Brother Island with a total of 16 eggs. Hatching success is unknown.

Other Notes

After abandoning North Brother Island in 2017 due to intense predation by American Crows (and a few great Black-backed Gulls) and scattering to a handful of islands in 2017 and 2018, the terns retuned in force to North Brother Island in 2019 and again in 2020. We surveyed islands throughout Lobster Bay during the peak nesting period in 2019 and 2020 but did not document breeding evidence of ROST elsewhere.

NEW BRUNSWICK

Machias Seal Island

Sarah Durham, Island Supervisor/PhD student - University of New Brunswick; Quinn Carvey, Tabatha Cormier, and Melina Watson field technicians

Tern Census

A formal census was scheduled to be completed in the 2020 season however upon the crew's arrival on July 4th, 2020 no terns were present on the island.

Table 1. Estimated Number of Tern Nests on MSI (formal census in 2014 and 2018).

2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
175	75	50	90	187	150	175	300	476	500	0

Productivity

No terns successfully nested on island during the 2020 season.

Table 2. Breeding parameters for Common, Arctic, and Roseate terns on Machias Seal Island in 2020. Data for 2019 shown in parentheses.

Species	Clutch Size	Hatching Success	Fledging Success	Nests Monitored
COTE	NA (2.44)	NA (0.55)	NA (0.11)	NA (9)
ARTE	NA (1.63)	NA (0.55)	NA (0.25)	NA (151)
ROST	NA	NA	NA	NA

Tern Provisioning

No tern provisioning occurred during the 2020 season.

Table 3. Principal prey items (percent) in tern chick diet on Machias Seal Island in 2020. *n* is the total number of prey items identified. Data for 2019 shown in parentheses.

Prey Item	COTE	ARTE	ROST
n	NA (NA)	NA (229)	NA
Herring	NA (NA)	NA (1.7)	NA
Hake	NA (NA)	NA (44.1)	NA
Sandlance	NA (NA)	NA (0)	NA
Butterfish	NA (NA)	NA (0.4)	NA
Pollock	NA (NA)	NA (0)	NA
Stickleback	NA (NA)	NA (7.9)	NA
Euphausiid	NA (NA)	NA (7.4)	NA
Larval fish	NA (NA)	NA (6.1)	NA
Other	NA (NA)	NA (32.3)	NA

Predator Activities and Control Efforts

Non-lethal gull control was continued this year, using paintball guns to deter individuals actively hunting and kleptoparasitizing alcids in the colony. The paintball gun did not prove to be effective as the gulls had already established territories prior to our arrival. A laser pointer (Bird Control Group Handheld 200) could not be used this season as a nonlethal gull control tool as we were advised it was not legal to do so in Canada. A total of four nests were found on island this season two of which had one egg each that we destroyed via the shake and poke method. Two of the nests had chicks with one nests successfully fledging 3 chicks and one nests successfully fledging at least 1 chick.

Common Eiders

Counts were conducted weekly starting on July 14th. Our highest count was a total of 55 individuals (1 male and 54 females) on July 14th. Our highest count of ducklings was on July 22nd with 26 ducklings counted.

Alcids: Atlantic Puffin

A formal ATPU census was not conducted during the 2020 season. Upon the crew's arrival in early July we determined 117 out of 154 (76%) productivity burrows to be active with fledge success (# of fledged or potentially fledged chicks per active burrow) calculated at 74% (± 5%). However, these estimates are likely highly inflated as they are based only on nests that were active upon the crew's arrival. As such, we most likely missed many nests that were active and then subsequently failed prior to our arrival on island. True occupancy, mean hatch, and mean lay are unknown due to the delayed season. A total of 87 chicks in productivity burrows were banded with the final check of all productivity burrows being completed on August 12th and 13th. An additional 311 chicks from non-productivity burrows were also banded. A total of 72.57 hours of ATPU chick provisioning stints were conducted. Food was relatively stable throughout the season with diet consisting mainly of hake early in season and then switching to haddock and herring mid-season.

Alcids: Razorbills

A formal RAZO census was not conducted during the 2020 season. Upon the crew's arrival in early July we determined 56 out of 95 (58.9 %) productivity burrows to be active with fledge success (# of fledged or potentially fledged chicks per active burrow) calculated at 80% (± 4%). However, like the Puffins, these estimates are likely highly inflated as they are based only on nests that were active upon the crew's arrival. As such, we most likely missed many nests that were active and then subsequently failed prior to our arrival on island. True occupancy, mean hatch, and mean lay are unknown due to the delayed season. A total of 36 chicks in productivity burrows were banded with an additional 43 chicks from non-prod burrows being banded. A total of 45.45 hours of RAZO chick provisioning stints were conducted with diet consisting mainly of herring and hake.

Alcids: Common Murre

COMU numbers remain high. From July 9th to July 14th a minimum of 620 active nests were estimated. A total of 111 chicks were banded this year and a total of 32.45 hours of COMU chick provisioning stints were conducted with diet consisting mainly of herring and haddock.

Table 4. Breeding parameters for Atlantic Puffins and Razorbills on Machias Seal Island in 2020. Data for 2019 shown in parentheses.

	n	**Mean Lay**	**Mean Hatch**	**Burrow Occupancy**	**Hatching Success (hatch/ active nest)**	**Nest Success (fledge/ active nest)**	**Linear Growth Rate (mass)**
ATPU	117 (75)	Unknown (May 12)	Unknown (June 21)	Unknown (0.74)	Unknown (0.67)	0.74 (0.49)	X (9.0)
RAZO	56 (67)	Unknown (May 17)	Unknown (June 21)	Unknown (0.71)	Unknown (0.66)	0.80 (0.49)	X (1.9)

Table 5. Principal prey items (percent) in alcid chick diet on Machias Seal Island in 2020. *n* is the total number of prey items identified. Data for 2019 shown in parentheses.

Prey Item	**ATPU**	**COMU**	**RAZO**
n	3249 (4979)	311 (400)	211 (314)
Herring	11.6 (1.2)	55.9 (8.3)	12.8 (36.9)
Hake	43.7 (31.9)	2.3 (1.8)	57.3 (32.8)
Haddock	29.1 (13.4)	23.5 (10.0)	4.7 (1.0)
Sandlance	0.5 (4.2)	0.3 (1.8)	7.6 (7.0)
Butterfish	3.2 (0.6)	1.0 (2.5)	0.5 (0.0)
Squid	0.8 (2.0)	1.3 (7.3)	1.4 (1.0)
Euphausiid	0 (0.7)	0 (0.3)	0 (0.6)
Larval fish	1.2 (12.2)	0.3 (1.3)	2.8 (5.7)
Rock Gunnel	0 (0)	1.3 (17.0)	0.5 (0)
Other	9.9 (33.9)	14.1 (26.3)	12.3 (14.6)

MAINE

Petit Manan Island

Joe Cleaves & Amanda McFarland: Island Technicians – Maine Coastal Islands NWR, USFWS

Tern Census

During the GOMSWG census on June 15 and 16, 2020, we counted 1,217 active tern nests, including 56 nests in productivity plots. After applying the Lincoln correction index of 1.072 on all nests outside of productivity plots, we estimate 1,301 pairs of terns nested on PMI in 2020. This season's estimate is lower than the 2019 estimate (1,302 pairs) by 0.08%, or one tern pair. We identified 387 nests to species (28%), however, used the average ratios from 2018 and 2019 to calculate ratios of interior habitats. Common tern dominated shorelines and mixed interior habitats were uniquely calculated. The interior species ratio at PMI in 2020 was 41% ARTE and 59% COTE, while shoreline was entirely COTE, with the exception of 3 ARTE nests. We estimate 352 ARTE pairs and 949 COTE pairs nested in 2020. The overall colony-wide ratio was 27% ARTE and 73% COTE. Additionally, we counted 36 common eider nests and 548 laughing gull nests during the census, with a corrected laughing gull count of 589 (7.5% applied).

Table 1. Number of nests found on Petit Manan Island during the GOMSWG census window from 2015-2020.

Year	COTE	ARTE	LAGU	COEI
2015	706	481	620	62
2016	574	384	543	60
2017	657	431	605	46
2018	906	371	766	47
2019	937	365	656	45
2020	949	352	589	36
New species ratio method used starting in 2018				

Tern Productivity

COTE productivity was 0.78 chicks fledged per nest and ARTE productivity was 0.67 chicks fledged per nest. Prey availability appeared to be consistent throughout the season, with the exception of a higher frequency of stickleback and butterfish observed throughout July. Notably low feeding rates were observed this season, and were likely a contributing factor to chick mortality. Weather was often detrimental to chick health for the majority of July. One stretch of inclement weather from June 29th to July 1st resulted in 11 plot chick deaths and many more colony-wide.

Table 2. Breeding parameters for common and Arctic terns on Petit Manan Island in 2020 (2019 number are in parenthesis).

Species	Clutch Size	Hatching success	Fledging success	Productivity	Nests monitored
COTE	1.96 (2.03)	84.4% (76.1%)	47.7% (54.9%)	0.78 (0.85)	23 (33)
ARTE	1.67 (1.71)	71.7% (79.2%)	55.8% (55.7%)	0.67 (0.77)	36 (44)

Arctic Tern Metapopulation Project

As part of the Arctic tern metapopulation project, we re-sighted 74 adult Arctic terns and banded 75 new birds, all chicks. In addition, we resighted one common tern with a field-readable band intended for an Arctic tern.

Tern Provisioning

We conducted provisioning observations for 9 common tern nests and 7 Arctic tern nests for a total of 215 observation hours (48.5 Arctic tern and 166.5 common tern) and observed 131 prey deliveries (21 Arctic tern and 110 common tern). Hake was the primary prey for both tern species this field season, contributing to 65.4% of common tern diet and 52.4% of arctic tern diet. On average, common tern adults delivered 0.66 prey items per nest per hour while Arctic terns delivered 0.43 items per nest per hour. Stickleback and butterfish were observed in late July, although the majority of fledglings were able to ingest them.

Table 3. Principal prey items (%) in tern chick diets on Petit Manan Island in 2020.

Species	ARTE	COTE
Herring	0%	20%
Hake	52.4%	65.4%
Sandlance	0%	0%
Butterfish	9.5%	5.5%
Pollock	9.5%	5.5%
Stickleback	0%	1.8%
Invertebrate	0%	1.8%
Stickleback	0%	1.8%
Unknown Fish	28.6%	0%

Predator Control

We discouraged avian predators from perching on the island throughout the season using bird deterrents including pyrotechnics, bird spikes, reflective tape, decoys, and a laser. Peregrine falcons were the most frequent avian predator, first appearing in late May, and observed several times per week until the end of the season. Peregrines visited PMI an average of 0.93 times per day, a total of 79 visits over the 85-day field season. We observed the falcons predate 21 terns (14 adults and 7 fledglings), but found at least six

more fledgling remains from unobserved attacks. In addition to terns, we also witnessed predation of two adult laughing gulls and one shorebird by peregrines.

Bald eagles were also regular visitors to the island, but mainly preyed on the laughing gull colony or used the breakwater as a perch between attacks on Green Island. Bald eagles visited the island 53 times, succeeding in predating 15 laughing gulls and 1 herring gull on PMI. During the census, we oiled the eggs in 279 laughing gull nests and destroyed 269 additional nests. Lethal removal of avian predators thought to be tern or kleptoparasitism specialists also occurred and included: two adult laughing gulls, one adult herring gull, and one adult great black-backed gull. Several potential egg predators were observed during the season, including a green heron, a pair of great blue herons, and migrating ruddy turnstones. We used human presence to deter herons, shorebirds, and gulls from predating eggs.

Table 4. Gull control measures by species at Petit Manan Island in 2020.

Species	# Nests destroyed	# Shot
Herring Gull	0	1
Great Black-backed Gull	0	1
Laughing Gull	548 (279 oiled)	2

Alcids

The highest alcid counts for the season were 200 Atlantic puffins (July 26th), 71 razorbills (June 17th), 18 common murres (June 7th) and 225 black guillemots (June 9th). Many ATPU sod burrows were active but unreachable and have unknown fates as a result. The linear growth rate of 19 ATPU chicks was 8.27 grams/day. Of the 5 razorbill pairs observed consistently loafing or entering burrows on PMI, only 3 nests were located and only 2 fledged a chick. Dense vegetation made locating guillemot burrows difficult. Many guillemot chicks had not fledged yet when the crew left the island, but productivity is estimated to be a minimum of 1.33 pairs. Only two BLGU chick deaths were observed, both before 10 days of age. Although common murres were observed loafing and performing courtship behavior on the island, there was no evidence of any breeding attempts in 2020.

Table 5. Active alcid nests and reproductive success at PMI, 2020.

	Burrows Monitored	Hatch Success	Productivity
ATPU	37	92%	0.81
RAZO	3	66%	0.66
BLGU	46	92%	1.30

No census was conducted for alcids this season due to COVID-19 restrictions. In addition to daily counts and productivity monitoring for a subset of nests, we re-sighted alcid bands and captured adult alcids by grubbing. This season, we re-sighted 51 Atlantic puffins, including 11 recaptured adults, and banded 30 new puffins (4 adults and 26 chicks). Puffin chick banding will continue throughout August. We banded our one remaining razorbill chick before fledging. Finally, we banded 63 black guillemots (3 adults and 60 chicks), and recaptured one adult. Guillemot chick banding will also continue throughout August.

Petrels

Leach's storm-petrels were observed during nocturnal stints and heard throughout the season. Multiple new and previously used burrows were located but no census was conducted due to COVID-19 restrictions. Occupancy of some burrows was confirmed by locating fresh whitewash and chicks through grubbing and use of burrow-scopes.

Other Research

Stable Isotope/Fecal Sampling: We were able to collect 5 COTE, 4 ARTE, 4 BLGU, 13 ATPU, 1 RAZO, 20 LAGU, and 1 COEI eggs for stable isotope analysis (working with NE Climate Adaptation Center). We also collected 62 fecal samples from common and Arctic terns as well as alcids which were used to compare the diet of chicks to adults, and to compare diet among the species. The Refuge is working with Cornell University to conduct the DNA analysis of tern and alcid fecal samples to determine diet composition.

Ship Island

Report prepared by Sara Williams, Wildlife Biologist, Maine Coastal Islands NWR, USFWS
Andy Eckerson - Island Supervisor
Percy Ulsamer - Island Technician

Tern Census

This season the island experienced temporary abandonment on June 8, which caused the failure of most nests laid at the beginning of the season. The colony returned after a week and a half of abandonment (June 8-June 18) and re-nested in typical numbers, although much later in the season than usual. The GOMSWG census was conducted on June 17 and no correction factor was applied. Out of the 361 nests counted, we estimated only 54 nests (15%) were active and the rest were abandoned. A second census was conducted on July 6, and all 301 nests were active. We estimate a minimum of 355 pairs of common terns nested on Ship Island in 2020. This is the third consecutive season of abandonment behavior at Ship Island: complete abandonment in 2018; abandonment for the majority of June followed by late colony establishment in 2019; normal behavior followed by a 10-day period of abandonment and successful re-nesting in 2020.

Table 1. Number of tern nests found on Ship Island during the GOMSWG census window from 2015-2020.

Year	COTE	Notes
2015	680	
2016	684	
2017	620	
2018	519	All nests were abandoned after the census
2019	9 active, 14 abandoned	Total estimated pairs = 427
2020	54 active, 307 abandoned	Second census on July 6 = 301 new and active nests Total estimated pairs= 355

Tern Productivity

We monitored 33 nests in four productivity plots from July 20 to August 4. Plots were removed on August 4 due to high winds and tides predicted for the remnants of hurricane Isaias. For productivity, only chicks that were 15 days or older at the last check were counted as "fledged". Three estimates of clutch size were calculated: 2.1 eggs/nest during the GOMSWG census (N=361, June 17), 2.2 eggs/nest during the second census (N=301 July 6), and 2.27 eggs/nest in productivity plots (N=33).

Table 2. Breeding parameters for Common Terns on Ship Island in 2020.

Species	Clutch Size	Hatching success	Fledging success	Productivity	Nests monitored
COTE	2.27	78.7%	54.2%	0.97	33

Tern Provisioning

Provisioning data was collected from July 20-August 14. The feeding rate was 1.67 feedings per hour, (484 feedings during 290.5 nest hours at 16 nests. The majority of the diet items fed to chicks were Atlantic herring, invertebrates, and sandlance. Herring was the most common diet item fed to chicks and a majority of the fish which had an average of 1.64 culmen length. Pollock, Hake, and butterfish were also observed being fed to chicks during provisioning stints.

Table 3. Principal prey items (percent) in tern chick diet on Ship Island in 2020.

Prey item	COTE
Herring	67.6
Hake	1.03
Sand Lance	9.69
Butterfish	1.24
Pollock	0.62
Stickleback	0
Invertebrate	2.06
Unknown	9.87

Predator Activities and Control Efforts

Mink and owl traps were deployed proactively at the start of the season, and the number of traps increased as the season progressed. An average of 17 mink traps were deployed daily (110 conibear traps), 2 Swedish Goshawk traps (one with 4 live chukar quail as bait), and 11 owl traps (padded foothold traps). Terns started exhibiting abandonment behavior on June 8, and the remains of four adult terns were found during this time (June 3, 6, and two on the12th). Night stints were conducted by the crew from June 8-26th. The adjacent gull and eider island Trumpet Island was disturbed the nights of June 9 (few birds were seen on the island the next day), June 14, and June 18. It is most likely a great-horned owl caused terns to abandon Ship Island, however no owls were trapped or seen. The crew observed multiple 64 predation attempts of tern fledglings by at least one great black-backed gull from August 1-14th. This gull did not land when hunting, and was not dissuading by the Agrilaser lite or being chased away. The laser, chasing/yelling, and displaying dead gulls successfully kept gulls off Ship Island most of the season

Peregrine falcon visits did not occur until early July when the colony was fully established. Peregrine falcon visits increased sharply in August with up to five visits a day. The peregrine killed at least 6 terns and 2 shorebirds from early July to August 14 (21 recorded visits). To deter gulls from loafing on the beach, we scared them off by waving our hands and yelling as well as using an Agrilaser lite® laser. Bald eagles were frequently observed preying on the gulls, eiders, and cormorants on East and West Barge, and Trumpet Island.

Common Eiders

The first common eider nest in recent history (since tern restoration) was found on Ship this season, but was abandoned.

Habitat Management

Gravel tern plots were weeded throughout the summer, and approximately 50-60 nests were located in the plots by July 31 (42 were counted on July 6). The crew also collected vegetation data during incubation and chick rearing for a sheep grazing, and this year was the first year of "pre-grazing" data collection. The crew collected data from random points within the tern management area, common tern nests, and grazing exclosures. The first week of surveys was from June 17-27 and the second was July 20-27.

Seal Island National Wildlife Refuge

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

Tern Census

This season we were not able to conduct a census due to the COVID-19 pandemic and necessary staffing limitations (Table 1).

Table 1. Adjusted number of tern nests found on Seal Island NWR from 2013-2020.

Year	COTE	ARTE
2015	1,345	902
2016	1,309	949
2017	1,064	733
2018	1,204	829
2019	1,293	776
2020	No census	No census

Tern Productivity

Tern productivity was monitored in both fenced productivity plots and unfenced feeding study plots. Productivity was below average for both Common and Arctic Terns on SINWR and lower for both species compared to 2019 (Table 2).

Table 2. Tern productivity on Seal Island NWR in 2020. Data for 2019 shown in parentheses.

Species	Mean clutch size	Mean hatch	Productivity	Nests monitored
COTE	1.81 (1.83)	1.42 (1.58)	0.72 (0.96)	78 (71)
ARTE	1.68 (1.73)	1.38 (1.52)	0.72 (0.85)	53 (29)

Tern Provisioning

Arctic Tern nests were observed for 527 cumulative nest-hours, with an average feeding rate was 1.5 feedings per nest per hour. Common Tern nests were observed for 720 cumulative nest-hours, with an average feeding rate of 1.2 feedings per nest per hour. Hake, herring, stickleback, and euphausiid were the most common prey items fed to Common and Arctic Tern chicks and made up over 60% of chick diet for both tern species (Table 3).

Table 3. Principal prey items (percent of diet) in tern chick diet on Seal Island NWR in 2020. Total number of prey items observed n=769 for ARTE and n=866 for COTE.

Prey item	ARTE %	COTE %
Hake	41.0	30.9
Euphausiid	16.0	10.5
Stickleback	4.4	10.2
Herring	1.6	10.1
Goose Barnacles	3.4	0.2

Predator Activities and Gull Control Efforts

Gull predation was observed nearly daily, usually just before dusk along the eastern bight in Area 1 and occasionally in the tern colony in Area 1. Gull control efforts included poking eggs in all gull nests found during a gull census on June 8, as well as the culling of individual predatory gulls. Control efforts are summarized in Table 4. Low numbers of Laughing Gulls were observed daily, however no nests were found and high counts were notably lower this season compared to the last few years.

Table 4. Gull control measures by species at Seal Island NWR in 2020.

Species	# Nests destroyed	# Shot
Herring Gull	154	7
Great Black-backed Gull	25	1
Laughing Gull	0	0

Atlantic Puffins

This season due to staffing limitations associated with COVID-19, we did not conduct a puffin census. Puffin productivity was monitored at 73 burrows. Hatching success was 0.88 chicks hatched per egg and productivity was 0.76 chicks fledged per pair (Table 5).

Table 5. Atlantic Puffin hatch success and productivity at Seal Island NWR from 2015-2020.

	# Burrows monitored	Hatch Success	Productivity
2015	62	0.94	0.81
2016	67	0.88	0.57
2017	68	0.91	0.89
2018	63	0.92	0.60
2019	71	0.89	0.85
2020	73	0.88	0.76

Prey items delivered to puffin chicks were recorded from late June through early August, with a total of 1655 prey items identified during 87 observation hours. The dominant prey species in chick diet this season were haddock and hake at 46% and 42% respectively. Butterfish and sandlance were the next most common prey items at 3% each.

Black Guillemots

Black Guillemot productivity was monitored at 43 burrows. Average clutch size was 1.86, average hatch success was 0.88 and productivity was 1.02 chicks fledged per pair.

Razorbills

This season we conducted both a Razorbill census and productivity monitoring. Over the course of the nesting season we identified a minimum of 79 nests. This was an increase of 19 burrows from the 60 that were identified in 2019. Productivity this season was 0.58 and hatch success was 0.88.

Cormorants

On June 20, 27 Great Cormorant and 26 Double-crested Cormorant nests were counted from photos taken by John Drury. However, we believe that additional nests may have laid by both species after this date. A high count of 63 Great Cormorant chicks was observed on August 16, with an estimate of 2.3 chicks fledged per pair.

Matinicus Rock

Kaila Ritchie, Island Supervisor – National Audubon Society Seabird Restoration Program

Tern Census

The GOMSWG census was not conducted on Matinicus Rock in 2020 due to staffing restrictions related to the COVID-19 pandemic.

Table 1. GOMSWG Tern Census results on Matinicus Rock, 2015-2020.

Year	COTE	ARTE	LAGU
2015	206	701	0
2016	167	621	30
2017	166	600	3
2018	268	717	1
2019	327	764	4
2020	No census	No census	No census

Tern Productivity

Tern productivity was monitored in both fenced productivity enclosures and unfenced feeding study plots. We followed 50 Arctic Tern nests. The mean clutch size of these nests was 1.70. Arctic Terns fledged 0.74

young per nest which is near the long-term average from 1999-2019. We followed 27 Common Tern nests. The mean clutch size was 1.81. Common Terns fledged 0.88 young per nest which is just below the long-term average of 0.90 young per nest from 1999-2019.

Table 2. Breeding parameters for Common and Arctic terns on Matinicus Rock, 2020.

Species	Mean Clutch size	Hatching success	Productivity	Nests monitored
COTE	1.81	0.88	0.85	27
ARTE	1.70	0.80	0.74	50

Tern Provisioning

During Arctic Tern chick provisioning observations we recorded a total of 943 feeds. Of these feeds we identified 18 different prey items. The more common prey items were hake, followed be amphipods and euphausiids. We observed 371 Common Tern feeds which were composed of 14 prey items, with the most common being hake and pollock, followed by stickleback and amphipods.

Table 3. Principal prey items (percent) in tern chick diet on Matinicus Rock in 2020. *n* is the total number of prey items observed.

Prey item	ARTE	COTE
Hake	34.6 (n = 326)	37.5 (n = 139)
Amphipod	25.9 (n = 244)	6.7 (n = 25)
Euphausiid	10.5 (n = 99)	4.0 (n = 15)
Stickleback	1.9 (n = 18)	7.5 (n = 28)
Isopod	1.7 (n = 16)	1.1 (n = 4)
Haddock	1.5 (n = 14)	3.0 (n = 11)
Herring	1.3 (n = 12)	4.0 (n = 15)
Pollock	0.2 (n = 2)	11.6 (n = 43)

Predator Activities and Control Efforts

A Peregrine Falcon was on several occasions in early August successfully predating terns. A pair of Common Ravens have also been observed on the northern tip of the island, however there has been no direct observations of predation. Due to a collection of eggs shells as well as pellets with eggshells and membranes that were discovered on the island, it seems the ravens were targeting Razorbill and Black Guillemot eggs. On a few occasions Herring Gulls and Great Black-Backed Gulls were observed flying through the colony, particularly in foggy weather.

Many Laughing Gulls were found nesting on Matinicus Rock this season, and early efforts to deter nesting were not possible due to a much later than normal arrival date for the crew. We targeted laughing gull nests in two areas on the island where high densities occurred. In order to reduce productivity within these areas we located and oiled nest contents for 79 nests in late June. Later these nests were destroyed. There were substantially more Laughing Gulls nesting on the island than in the past 4 years (since early-season efforts to deter Laughing Gulls were implemented). Even with control efforts, at least 30 Laughing Gull fledglings were observed around Matinicus Rock at the end of August.

Atlantic Puffins

Puffin hatch success was 0.77 hatched per nest (n= 64) and productivity was 0.60 chicks fledged per nest, slightly above the 10-year average on Matinicus Rock of 0.59. Through observing chick provisioning throughout the season we were able to observe 458 bill loads and identified 16 different prey items. The majority of the prey items were haddock (43%, n = 798), hake (39%, n = 739), and butterfish (6%, n = 109).

Razorbills

We monitored 30 Razorbill nests. Razorbill productivity was 0.57, which is lower than the mean over the last 3 years of 0.64. Through observations of chick provisioning throughout the season we identified 196 bill loads. Prey items consisted mostly of hake (71%, n = 255) and herring (13%, n = 46), followed by haddock (5%, n = 17), sandlance (3%, n = 11), and butterfish (3%, n=12).

Black Guillemots
Mean clutch size was 1.85 (n=34) and productivity was 0.61 chicks fledged per nest, right around average of 0.62 from the past 10 years. Heavy rainfall events in mid-July negatively affected 36% of monitored burrows as 48% of overall failed eggs and 40% of overall chick deaths occurred directly following these rainfall events.

Leach's Storm Petrels
Hatching success was 0.89 (n=132). Productivity estimates will be finalized after final site visit in September.

Common Murre
A minimum of 12 murre eggs were observed in June with at least 7 chicks hatched and fledged by late-July. This was the third consecutive year that Common Murres successfully bred on Matinicus Rock.

Manx Shearwater
Manx Shearwaters were seen on the water occasionally throughout the season in groups of as many as three, and were heard calling from the southwest quarter of the island. Six active burrows were confirmed this year and two chicks were banded.

Notable Birds
Rare bird sightings include a Sooty Tern and South-Polar Skua.

Metinic Island

Emma Paton & Sequoia Dixson, Island Technicians – Maine Coastal Islands NWR, USFWS

Tern Census
On June 17, we counted 910 tern nests during the Gulf of Maine Seabird Working Group (GOMSWG) census. After applying a Lincoln Index Correction Factor of 1.052 to the raw count and adding 61 productivity plot nests, we estimated a corrected total of 1,019 tern pairs at Metinic in 2020. This is the largest nesting population since restoration began in 1998. We identified the species of 22% of the nests (n=224) and calculated a 630 pairs common terns and 389 pairs Arctic terns.

Table 1. Number of tern nests found on Metinic Island during the GOMSWG census window from 2015-2020.

Year	COTE	ARTE	ROST
2015	706	481	0
2016	290	317	0
2017	331	295	0
2018	522*	320*	0
2019	515*	316*	0
2020	630*	389*	0
*new species ratio method used			

Tern Productivity
Productivity was lower than 2019 for both Arctic and common terns. We suspect that productivity was lower due to extended fog events from late June to early July and less food available than in 2019.

Table 2. Breeding parameters for common and Arctic terns on Metinic sland in 2020 (2019 number are in parenthesis).

Species	Clutch Size	Hatching success	Fledging success	Productivity	Nests monitored
COTE	1.96 (2.25)	81.8% (90%)	50% (46%)	0.80 (0.93)	45 (40)
ARTE	1.63 (1.71)	92.3% (85.4%)	63.9% (91.4%)	0.96 (1.33)	24 (24)

Tern Provisioning

During chick provisioning observations, we watched seven common tern nests for 100 hours and recorded 67 feedings (0.67 feedings/hour/per nest), and observed nine Arctic tern nests for 176 hours and saw 184 feedings (1.04 feedings/hour/per nest). Dominant food items delivered to common tern chicks were herring (28.4%) and unidentified fish (26.9%). The most abundant food brought to Arctic terns were inverts (41.9%) followed by unidentified fish (16.3%). Although feeding rates for Arctic terns declined slightly compared to 2019, the average size of prey items increased or remained the same for all prey species observed. Common tern feeding rates decreased but overall average prey size increased. Common tern diet averaged 96% fish and Arctic tern diet averaged 53% fish. We observed a higher percentage of butterfish delivered to chicks during a brief period in the end of July. Linear growth rates were similar to previous years (6.0g/day) for Arctic terns and (6.3g/day) for common terns. The average linear growth from 2015-2020 was 5.7g/day for Arctic terns and 5.7g/day for common terns.

Table 3. Principal prey items (%) of tern chick diets on Metinic Island in 2020.

Prey Item	COTE	ARTE
Herring	28.4%	14.7%
Hake	11.9%	13.6%
Hake/herring	19.4%	3.8%
Sand Lance	1.5%	--
Butterfish	3.0%	1.1%
Pollock	0%	0%
Stickleback	0%	0%
Invertebrate	1.5%	41.9%
Unknown Fish	26.9%	16.3%

Predator Activities and Control Efforts

The rate of predation on tern eggs (3.8% of 130 nests monitored) prior to the GOMSWG census was lower than in recent years. A peregrine falcon visited the colony several times in June and late July, and killed at least 11 terns. More predation is suspected due to frequent visits and signs of predation where we determined the peregrine falcon to be roosting. A single merlin was observed hunting in and around the tern colony throughout the season and is known to have taken at least 15 tern chicks. The merlin visited the colony multiple times a day from late June until late July. It was observed successfully hunting on multiple occasions and signs of merlin predation were found in the intertidal area. Although laughing gulls did not breed on Metinic in 2020, they were observed disturbing the colony and kleptoparasiting terns in late July. We lethally controlled three herring gulls in 2020. We oiled two great black-backed and 207 herring gull nests this season. A great horned owl was heard near the forest once, but is not believed to have predated any terns. We removed 42 eastern garter snakes from the tern colony, including one found in a productivity plot (although it is not believed to have predated any chicks or eggs).

Table 4. Gull control measures by species at Metinic Island in 2020.

Species	# Nests destroyed	# Shot
Herring Gull	207	3
Great Black-backed Gull	2	0
Laughing Gull	0	0

Black Guillemots

We located 46 guillemot burrows on USFWS property, and determined an 84% hatch rate out of 32 burrows checked by July 24. Out of the 17 burrows we routinely monitored, two burrows completely failed and both were believed to have been predated. We found the first chick on July 1st. As of the last burrow check on July 24th, 70% of chicks from monitored burrows (n=16 chicks) and 70% of chicks island wide (n=26 chicks) were at least 10 days old and still alive. We banded 20 chicks.

Leach's Storm-Petrels
Due to limitations on this year's season we did not conduct a petrel census on Metinic, but we did confirm 43 burrows by call back at night. We confirmed a burrow with one chick on July 27th.

Common Eiders
We conducted a common eider census in conjunction with the gull census on the north end of Metinic Island from May 27th to May 31st. We identified 36 nests during the census by finding a nest, finding an incubating female, or flushing a female out of a patch of dense vegetation. The census did not include the forest interior, but we observed several hens frequenting this area throughout the season. We observed the first eider ducklings on June 3rd, and we continued to see ducklings throughout the season as they approached the fledging stage. The largest crèche was observed in South Cove on June 29th and included 56 ducklings and 53 hens.

Incidental Sightings
We documented 89 species of birds on Metinic in 2020, and confirmed breeding for 14 species.

Sheep
Sheep graze Metinic from September through May, and are kept on the south side of the island during the breeding season. When the round up was conducted on May 17th, at least 10 sheep were missed. One group consisting of 3 ewes and 4 lambs attempted to enter the colony multiple times. We chased and harassed them. On June 9th, five sheep were successfully rounded up to the southern end of the island. Soon after we suspected one ewe and two lambs made their way around the edge of the fence and joined the escaped sheep on the north side. We then continually had two ewes and four lambs attempting to go into the colony. In late July we noticed that the sheep were going into the colony late at night and we were unable to prevent this. Despite their constant presence on the northern end, we do not believe sheep affected the breeding success of the tern colony in 2020.

Eastern Egg Rock

Kay Garlick-Ott, Island Supervisor – National Audubon Society Seabird Restoration Program

Census
During the island-wide Common Tern nest count on June 15, 1048 nests were counted. The addition of productivity nests, feeding study nests, and a Lincoln index of 1.0272 brought the total to 1156 nests, which is 89 nests higher than 2019 estimates. During the Laughing Gull nest count on June 15 and 20, 1174 nests were located. In spite of the increase in the number of Laughing Gulls nests from 2018 and 2019, the cumulative 2020 total of 1174 remains lower than the 1500+ nests counted over the last two decades. Arctic and Roseate Tern nests were identified between June 1 and June 20. The census count of Roseate Terns was 80, which is seven nests higher than the 2019 census count. 3 B-wave nests were identified, one within and two outside the census window, bringing the season total to 82. 77 Arctic Tern nests were identified during the census window, which marks a seven nest increase since 2019's count of 70.

Table 1. GOMSWG census results on Eastern Egg Rock, 2015-2020.

Year	COTE	ARTE	ROST	LAGU
2015	894	75	77	1943
2016	852	76	78	1973
2017	886	76	104	1729
2018	1021	86	82	1
2019	1067	70	73	333
2020	1156	77	80	1174

Tern Productivity

Common Tern productivity was calculated from 79 nests in both fenced productivity plots and unfenced feeding study plots. This year, productivity measured between 0.27 and 0.49 chicks fledged per nest, a range that factored in the high levels of predation on the colony leading to 25 study chicks disappearing after day 15. 0.27 represents a productivity estimate if chicks over day 15 were predated, whereas 0.49 assumes that chicks over day 15 persisted in the colony outside of the fenced plots. Roseate Tern productivity was calculated from a sample of 68 unfenced nests. Roseate Terns fledged 1.02 chicks per nest. Due to this season's reduced crew size, Arctic Tern productivity was not monitored, although hatching success was still determined. Arctic Tern mean hatch was low this year at 0.60, potentially due to high levels of gull and mallard predation.

Table 2. Tern productivity on Eastern Egg Rock in 2020. Data for 2019 shown in parentheses.

Species	Mean clutch size	Mean hatch	Productivity	Nests monitored
COTE	2.28 (2.04)	1.80 (1.58)	0.27-0.49 (1.13)	79 (69)
ARTE	1.67 (1.74)	0.60 (0.98)	- (0.40)	42 (53)
ROST	1.83 (1.43)	1.68 (1.20)	1.02 (1.10)	68 (83)

Tern Provisioning

Fourteen Common Tern nests were observed over a total of 363 nest hours with an average feed rate of 1.2 feedings per nest-hour. Hake was the most frequently fed prey item, comprising 47.8% of feedings, followed by herring at 30.2%. Five Arctic Tern nests were observed for around 22 nest hours with an average feed rate of 0.72 feedings per nest-hour. Hake comprised most of the diet at 87.5%, followed by Atlantic saury at 6.3%. Eight Roseate Tern nests were observed over 255 hours, averaging 1.0 feedings per hour. Hake was the most frequently observed prey item at 38.7% followed by herring at 39.5%, and pollock at 3.8%. The lower number of observation hours compared to past years may be attributed to a combination of reduced staffing and increased chick mortality.

Table 3. Principal prey items in tern chick diet on Eastern Egg Rock in 2020.

COTE		**ROST**		**ARTE**	
Prey Item	**%**	**Prey Item**	**%**	**Prey Item**	**%**
Hake	47.8	Herring	39.5	Hake	87.5
Herring	30.2	Hake	38.7	Atlantic Saury	6.3
Unknown	3.2	Pollock	3.8	Fish Scrap	6.3
Euphausid	1.6	Sandlance	2.3	-	-

Common and Roseate Tern provisioning was additionally monitored during the courtship period. Common Terns were observed over the course of eight stints, for a cumulative total of 24 observer hours. Feedings were comprised primarily of herring at 49.5%, followed by hake at 18.3. Roseate Terns were observed over the course of seven stints and 22 observer hours. Herring made up 81.1% of adult courtship feeding, followed by hake at 8.1%.

Table 4. Principal prey items in observed adult courtship feedings on Eastern Egg Rock in 2020.

COTE		**ROST**	
Prey item	**%**	**Prey Item**	**%**
Herring	49.5	Herring	81.1
Hake	18.3	Hake	8.1

Predator Activities and Control Efforts

Herring Gulls were the predominant tern predator this season, similar to 2019. Three Herring Gulls were lethally removed. An additional two Herring Gulls, one adult and one juvenile, were found dead in the boulder piles on the perimeter of the island. Great Black–backed Gulls did not exert much predation pressure on the colony this year. A juvenile Peregrine Falcon visited the island eight times, and was

observed predating several Laughing Gull chicks, as well as a Black Guillemot adult. Bald Eagles and Yellow-Crowned Night Herons visited the island with higher frequency later in the season, but were not seen to successfully predate any terns or eggs.

In spite of the late arrival due to coronavirus-related logistics, a variety of efforts were made to deter Laughing Gulls from nesting on the island. 8 Laughing Gull effigies were hung up around the island on a brief visit before May 24 and early in the season, the crew participated in carcass walks in the early evenings and paired these walks with whooping noises and an air siren. Weekly buffer zone walks were conducted, and nests were destroyed when encountered. All nests counted during census were oiled.

A family of mallards was observed predating common tern nests near the cabin, although the extent of its foraging range is believed to include the entire perimeter of the island. A mother and three chicks would eat eggs in rapid succession, often leaving nests messy and covered in yolk upon departure.

Table 5. Gull control measures at Eastern Egg Rock in 2020.

	GBBG	HERG	LAGU
Gulls Shot	0	3	0
Nests Destroyed	0	3	1174

Atlantic Puffins

There were a minimum of 173 active puffin burrows on the island, which is likely an underestimate that can be attributed to reduced observation coverage throughout the peak chick provisioning period. Hake comprised the majority of puffin diet at 65.1%. Haddock was the second most prevalent prey species observed at 22.2%, which is notably higher than in previous years. The first chick feeding (estimated first hatch) was observed on May 30.

Black Guillemots

Productivity was monitored for Black Guillemots at 28 nests. Mean clutch size was 1.89 and productivity was 0.75 chicks fledged per nest, lower than the 2019 productivity estimate of 1.19.

Leach's Storm-petrels

Leach's Storm-petrels productivity was monitored at 48 nests across three plots. Hatching success was 0.75, which is higher than the 0.60 hatching success reported in 2019. Nests are still being monitored for fledging success.

Visitors

The number of visitors to Eastern Egg Rock in 2020 was significantly reduced due the coronavirus pandemic. Three National Audubon SRP employees based locally in Bremen, Maine helped the team with census on June 15, and a later visit was made by Drs. Steve Kress and Don Lyons and a team of reporters for an interview with CNN.

Pond Island National Wildlife Refuge

Michael Rickershauser, Island Supervisor – National Audubon Society Seabird Restoration Program

Tern Census

Tern census was conducted on June 17. The unadjusted count for Common Terns (COTE) was 1,367 nests. An additional 66 COTE study nests were being followed at the time of census. The Lincoln Index was 1.015. The adjusted count of 1,453 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 3 Arctic Tern (ARTE) nests and 2 Roseate Tern (ROST) nests. Over the course of the season there were a total of 9 ARTE nests, 4 of which failed before the census date and are not included in the census, and 2 of which was laid after the census date.

Table 1. Number of tern nests on Pond Island NWR from 2015-2020.

Year	COTE	ROST	ARTE
2015	685	0	6
2016	773	1	6
2017	942	0	8
2018	1,065	2	11
2019	1,159	0	7
2020	1,453	2	3

Productivity

COTE productivity was determined by following 62 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 2.03 with a mean 1.71 hatched per nest and 0.79 fledged per nest. 9 ARTE nests were monitored. ARTE mean clutch size was 1.56, with a mean hatch of 0.56, and productivity of 0.45 chicks fledged per nest. Two ROST nests were monitored. ROST mean clutch size was 2.00, with a mean hatch of 1.33 and a productivity of 1.0 (See Table 2).

Table 2. Breeding parameters for Common, Arctic, and Roseate terns on Pond Island in 2020. Data for 2019 shown in parentheses.

Species	Clutch size	Hatched per nest	Fledged per nest	Nests monitored
COTE	2.03 (2.00)	1.71 (1.68)	0.76 (1.46)	62 (71)
ARTE	1.56 (1.58)	0.56 (1.17)	0.45 (1.17)	9 (13)
ROST	2.00 (1.00)	1.33 (0.50)	1.0 (0.50)	2 (2)

Tern Chick Provisioning

Chick provisioning studies were conducted by observing 18 COTE nests from hatching through fledging. There were 1387 total feedings observed during 636 nest hours, resulting in a feeding rate of 2.18 feedings per hour. The principal prey species delivered were sandlance and herring. Euphausiid comprised a much larger portion of the diet than in 2019 (5.37% versus 2.93%).

Table 3. Principal prey items in COTE chick diet on Pond Island in 2020. Data for 2019 shown in parentheses.

Prey item	Number of Items	% of diet
Sandlance	634 (458)	38.24 (25.99)
Herring	557 (590)	33.59 (33.48)
Hake	95 (134)	5.73 (7.60)
Euphausiid	89 (52)	5.37 (2.93)

Predator Activities and Control Efforts

Pond Island was subject to several predators during the 2020 season.

Juvenile and adult Peregrine Falcons (PEFA) visited the island every few days through mid-June, when visits began occurring daily. Visits occurred at an increasing rate through the remainder of the season, with some days having a near continuous presence. Around the same time, the PEFA were observed perching in the trees on neighboring Wood Island instead of returning up river as they had earlier in the season. On several occasions throughout the season PEFA landed within the colony but flushed immediately when approached by island staff. The majority of COTE predation this season is attributed to PEFA.

Depredation from Great Black-backed Gulls (GBBG) and Herring Gulls (HERG) was minimal throughout most of the season. Over the course of a few days in mid-July, there was a significant increase in HERG predation on near-fledgling COTEs. We were able to cull a single HERG on July 16 and placed the carcass at a popular loafing area. No further gull predation was observed. While there has been past success in using the Agrilaser as a deterrent, we found its effective use situational at best. Success was heavily reliant

on foggy, overcast to achieve a meaningful range as well as the individual bird's disposition. No gulls nested on the island.

Bald Eagles (BAEA), were typically seen nearby on Wood Island. BAEA visits to Pond Island were rare and mostly on the southern end of the island where they appeared to be hunting Common Eider (COEI) chicks.

American Crows (AMCR) were often seen in the marsh area of the island on the south end. Common Eider (COEI) eggs were seen predated throughout the island. AMCR, along with other gulls, were our prime suspects for the high predation rate of COTE eggs around the southern beach/dunes area early in the season. Attempts to confirm using camera traps were unsuccessful.

COEI chicks were seen on the water in through the latter half of the season, usually 1 to 2 dozen on any given day, but their numbers decreased as the season progressed. GBBG and HERG predation was the most likely cause although it was rarely observed.

Jenny Island

Ben Becker, Island Supervisor – National Audubon Society Seabird Restoration Program

Tern Census

The annual Gulf of Maine Seabird Working Group (GOMSWG) census was conducted on June 16. A total of 1,301 Common Tern nests were counted, with clutches ranging between 1 and 4 eggs. A Lincoln index mark/recapture correction of 1.031 was applied to the uncorrected count. The addition of 68 productivity nests and 24 feeding study nests brought the total to 1,433 nests (Table 1). Twenty-one Roseate Tern nests were also active during the GOMSWG census window. No additional B-wave nests were laid after the census window. One Arctic Tern nest was discovered during census.

Table 1. GOMSWG census results on Jenny Island, 2015-2020.

Year	COTE	ROST
2015	1,268	15
2016	1,122	13
2017	1,298	22
2018	1,426	24
2019	1,618	21
2020	1,433	21

Tern Productivity

For Common Terns, five productivity plots containing 69 nests and three feeding study plots with 24 nests were monitored to determine productivity. 21 Roseate Tern nests were monitored for productivity. Common Tern productivity was 0.68 chicks fledged per nest, which was a marked decrease from 2019, when it was 1.33. This decrease is likely attributed to a scarcity in high-quality food throughout the breeding season, as well as a severe weather event at the end of June. Intense Peregrine Falcon predation likely contributed to a decrease in productivity, directly and indirectly. Roseate Tern productivity was 0.99, a small decrease from 2019 (Table 2).

Table 2. Tern productivity on Jenny Island in 2020. Data for 2019 shown in parentheses.

Species	Mean clutch size	Mean hatch	Productivity	Nests monitored
COTE	2.16 (2.12)	1.88 (1.78)	0.68 (1.33)	93 (76)
ROST	1.81 (1.76)	1.38 (1.24)	0.99 (1.10)	21 (21)

Tern Provisioning

Tern chick provisioning was monitored at three feeding study plots with 18 Common Tern nests. A total of 1102 feedings were observed during 903 nest observation hours. Atlantic herring constituted the majority of observed feedings (35%; Table 3). Hake (including white hake and four-bearded rockling) made up another 18.7% of the feedings.

Table 3. Principal prey items in COTE chick diet on Jenny Island in 2020.

Prey item	Number of Items	% of Diet
Herring	386	35.0
Hake	206	18.7
Euphausiid	81	7.4

One feeding study plot with 5 Roseate Tern nests was monitored in 2020. A total of 272 feedings were observed during 252 nest-observation hours. Sandlance constituted the majority of observed feedings at 33.1% (Table 4), which is more than double that in 2019. Herring was the second most common item at 17.6%. Hake (including white hake and four-bearded rockling), was a close third, which accounted for 16.2% of observed feedings.

Table 4. Principal prey items in ROST chick diet on Jenny Island in 2020.

Prey item	Number of Items	% of Diet
Sandlance	90	33.1
Herring	48	17.6
Hake	44	16.2

Predator Activities and Control Efforts

Large gulls were not a significant problem in the 2020 field season. Though many Herring and Great Black-backed Gulls were seen following lobster boats around the island, only a limited number were typically seen loafing on the northern sand spit and southern intertidal zone. Consistent effort to discourage large gulls was made throughout the season. Great Black-backed Gulls were seen preying on eider chicks on occasion, and both Great Black-backed and Herring Gulls were very occasionally observed preying on tern chicks and fledglings. A Herring Gull nest was found during the census, however it was long abandoned after the adults had been disturbed upon the crew's arrival in early June. No Great Black-backed Gulls nested on the island.

Though Laughing Gulls have nested on Jenny Island in the past, no signs of nesting were found on the island this season. Laughing Gulls were a significant nuisance to the nesting terns on the island, with numbers ranging from 1-10 daily throughout the season. No chicks or eggs were seen to have been predated by Laughing Gulls, however because food was noticeably scarce this year compared to past years, the harassment and kleptoparasitism of food-carrying tern adults by Laughing Gulls was significant enough that one Laughing Gull was removed from the colony. Unfortunately, displaying the carcass as well as repetitive attempt to scare the gulls away had no noticeable effects in discouraging Laughing Gull presence.

Great Horned Owl predation contributed to tern mortality in 2020, with signs of predation and nocturnal abandonment observed in early June. The owl was successfully caught and transferred off the island to a rehabilitator on June 5, and was later released in Willimantic, Maine.

Peregrine Falcon predation was very apparent during the 2020 season. One individual was identified based on plumage (one juvenile throughout the season). Throughout the chick-rearing part of the season, multiple disembodied wings and heads of fledged and unfledged chicks, characteristics of falcon kills, were discovered regularly on the North and Eastern shores when any direct predation events weren't witnessed.

Minimal Black-crowned Night Heron predation may have occurred in 2020. Multiple deceased chicks were found with wounds in one area of the island on June 27, but the cause of death was never confirmed.

Ruddy Turnstone predation was not directly observed, but occasional cracked, empty eggshells with small bill-shaped holes in them were found around the edges of the island on several occasions, especially during late May and early June, and these were attributed to Ruddy Turnstones.

Common Eiders
Nine Common Eider nests were found during the 2020 GOMSWG census, compared to four in 2019. One Mallard nest was also discovered.

Outer Green Island

Nadia Swanson, Island Supervisor – National Audubon Society Seabird Restoration Program

Tern Census
The 2020 Gulf of Maine Seabird Working Group (GOMSWG) tern census was conducted on June 14. Due to restrictions of time and personnel relating to COVID-19, a partial-island census was completed and then extrapolated. 14 out of the 22 census units were surveyed. The average percentage of nests on the portion of the island that was surveyed has remained relatively the same for the past five years, at 77.4% of the count total, so count results were extrapolated to the whole island to get a more accurate nest estimate. With the extrapolation and addition of the 82 productivity nests, 1725 Common Tern nests were counted. With the new method used to collect data and the shortage of personnel, the Lincoln Correction Index that was calculated was quite high (1.103) and is not believed to be an accurate reflection of missed nests. Therefore a range of results was considered. If a more typical Lincoln Correction Index of 1.03 is applied, it yields 1775 total nests. If the calculated index of 1.103 was applied it would result in 1894 nests. Therefore, we had at least 1725 nests (if no correction factor is applied) with as many as 1894 nests. The actual nest number likely falls somewhere in between, and 1775 is considered to be a reasonable estimate. Outer Green is yet again the largest tern colony in Casco Bay and the largest colony of Common Terns in Maine. At the time of the GOMSWG census, there were no known Arctic Tern or Roseate Tern nests, and none were found later in the season.

Table 1. GOMSWG annual census results on Outer Green Island, 2015-2020

Year	COTE	ROST	ARTE
2015	1353	0	0
2016	1367	0[1]	0
2017	1434	0	0
2018	1553	0[2]	0
2019	1717	0	0
2020	1775[3]	0	0

[1] One ROST nest was laid after 20 June 2016
[2] Four ROST nests were laid after 20 June 2018
[3] Census estimate extrapolated from partial count

Tern Productivity
The average number of eggs per nest was 2.12 (n=76) of which an average of 1.93 hatched. The first recorded hatch was on June 13, and peak hatch lasted from approximately June 17-22. The average number of chicks fledged per nest (productivity) was 0.74. This is the lowest productivity since 2008 and third lowest in the history of the island.

Table 2. Outer Green Island annual Common Tern productivity, 2015-2020

Year	N	Mean Clutch	Mean Hatch	Productivity
2015	69	2.03	1.83	1.36
2016	65	2.40	2.12	1.26
2017	69	2.13	1.93	1.45
2018	83	2.16	1.87	1.14
2019	75	2.12	1.81	1.32
2020	76	2.12	1.93	0.74

Tern Provisioning

Chick provisioning was observed at 24 Common Tern nests over 71 stints totaling 212.25 hours. A total of 1042 feedings to chicks over 1037.25 nest-hours were recorded for an average feeding rate of 1.0 items per hour. The most frequently observed prey item was hake which made up 29.8% of the observed diet, followed by herring, which made up 28.3% of the observed diet. Interestingly, there were also two observation stints where Gooseneck Barnacles were seen being fed to chicks. This is perhaps indicative of the poor food year they experienced.

Predation

Although many predators made an appearance on Outer Green Island this season, not all were actively threatening the colony. Possibility of a mink and a Black-Crowned Night Heron occurred but did not have much impact. It is important to note that the 2020 crew did not arrive on the island until June 13, so any adult or egg predation that occurred earlier in the season was not noted. Loud noises such as clapping, yelling, and air horns were used consistently throughout the season as negative re-enforcement techniques to scare off all predators.

A Peregrine Falcon visited the colony 17 days throughout the 56 day season. Occasionally there would be multiple visits in a day. It was unclear whether or not each visit resulted in a tern death. Both adult and juvenile falcons were observed. Later in the season evidence of Peregrine Falcons were seen more often, along with more evidence of fledgling deaths. On August 2, a survey of Junk of Pork showed evidence of falcon kills that were taken there to be consumed.

During the GOMSWG census, one Herring Gull nest was found with three eggs near South Point and was destroyed. Gull predation was not particularly evident but still was suspected of occurring. About 27% of chick loss was due to the chicks going missing at an age too young to be considered fledged. Roundneck Sexton Beetles (*Nicrophorus orbicollis*), also known as carrion beetles or burying beetles, were found on the island burying dead chicks, and this may account for some of the missing corpses, but it is possible that predation was a factor in this percentage of missing chicks as well. Efforts to cull predatory gulls yielded varying results. After the first gull was shot, gull presence on the island dropped for about a week, and then slowly returned to normal. The second gull removal was not as effective in deterring others. Both dead gulls were displayed on the south end of the island where gull presence was highest.

Table 3. Outer Green Island predator control efforts, 2020

Species	No. of Nests Destroyed	No. of Gulls Shot
Herring Gull	1	2
Great Black-backed Gull	0	0

Weather Events

There were several notable weather events that occurred this season. The main event was a storm that occurred on the June 29. This, in combination with the 22 days of fog during the season, was fatal to many chicks. 21% of the chicks on the island died during this weather event (if one extrapolates from the death toll in the feeding study and productivity study plots).

Black Guillemots (*Cepphus grylle)*

There are currently 22 numbered guillemot burrow sites that are still usable on the island. At least 20 of these burrows were active and 18 of them were monitored for productivity. The average clutch size was 1.89 and the average number of eggs hatched per nest was 1.28. On the last check of the season 16 of the 23 hatched chicks had fledged. All but two were extremely probable to fledge within the next few days, and all that were still alive at the end of the season were presumed to have fledged due to the healthy growth of the chicks. Estimated productivity was 1.22 chicks fledged per pair.

Stratton Island

Rochelle Streker, Island Supervisor – National Audubon Society Seabird Restoration Program

Tern Census

An island-wide Common Tern nest count was conducted on June 14. Arctic and Roseate Tern nests were found and counted throughout the season. Roseate Terns decreased slightly from 2019 levels to a total of 114 nests during the GOMSWG census. Arctic Terns nests decreased slightly from 9 in 2019 to 5 in 2020; however, an additional 7 nests were found after the census window had closed, bringing the total number of Arctic nests on Stratton in 2020 to 12 nests. The Common Tern nest count of 1,074 nests was corrected with a Lincoln index of 1.01 to 1,085 nests, and the addition of 74 productivity and feeding study nests brought the total count to 1,159 nests. No Least Terns nests were found on Stratton in 2020, either during the census or after the census window.

Table 1. GOMSWG census results on Stratton Island, 2015-2020.

Year	COTE	ARTE	ROST	LETE
2015	1395	12	108	81
2016	825	4	86	69
2017	1127	2	119	93
2018	1206	8	128	122
2019	1244	9	125	96
2020	1159	5	114	0

Tern Productivity

Tern productivity was determined from both fenced and unfenced plots. The 74 nests in the Common Tern plots fledged 0.76 chicks per nest. Roseate Tern productivity was 1.16 chicks fledged per nest for the 89 nests followed. From the 12 Arctic Tern nests followed, only 1 chick was seen after 15 days so productivity was not estimated.

Table 2. Tern productivity on Stratton Island, 2015-2020.

	2015	2016	2017	2018	2019	2020
COTE						
Mean clutch	2.09	2.40	2.32	2.20	2.01	2.41
Mean hatch	1.72	2.25	1.98	1.92	1.59	1.93
Productivity	0.89	1.0	0.63	0.53	1.13	0.76
ROST						
Mean clutch	1.83	1.88	1.88	1.96	1.68	1.57
Mean hatch	1.48	1.28	1.59	1.70	1.42	1.36
Productivity	1.38	1.01	1.03	1.29	1.28	1.16

	2015	2016	2017	2018	2019	2020
ARTE						
Mean clutch	1.83	-	2.00	2.00	1.82	1.58
Mean hatch	1.08	-	1.00	0.25	1.18	1.08
Productivity	0.25	0	0.5	0.13	0.73	-
LETE						
Mean clutch	-	-	-	1.82	1.89	-
Mean hatch	-	-	-	-	0.96	-
Productivity	0	0.2	~0.02	-	-	-

Tern chick provisioning

14 Common Tern nests were observed with a total of 258 feedings. Chick diet primarily consisted of sandlance, hake, and butterfish, comprising 21.3%, 18.2%, and 11.2% of deliveries, respectively. 36.8% of prey items were not identified to species. 16 Roseate Tern nests were observed with a total of 874 feedings. Diet primarily consisted of sandlance and hake, at 37.8% and 17.2%, respectively. 41.1% of prey items were not identified to species.

Predation

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 are normally poked early in the season, but due to COVID-19 nest control was not conducted this year. 4 Herring Gull nests were destroyed on Bluff Island on June 27. 2 Great Black-backed Gull nests were found and destroyed on Stratton Island, while 1 was destroyed on Little Stratton. One Herring Gull nest was destroyed on Stratton.

Night-heron disturbance was minimal in 2020. On June 15 a predated egg was found with the characteristic slash pattern of night-heron predation, but no other signs of predation were found then or in subsequent checks. On August 1, the last Arctic Tern nest, which was quite isolated, was also found to be predated with the characteristic slash pattern. No other signs of predation were found.

Wading Birds

The census of the wading bird colony on Stratton Island was not conducted this year due to COVID and a late start date.

Common Eiders

No eider census was conducted this year.

American Oystercatchers

An American Oystercatcher nest with 3 eggs was found in the tern colony on June 8, but was later abandoned. One pair of American Oystercatcher was assumed to be nesting on Little Stratton based on behavior, and was confirmed when they were spotted with 3 fledglings on July 3. One additional pair of American Oystercatchers was assumed nesting on East Beach due to behavior, however neither a nest or chicks were confirmed.

Black Guillemots

Six active Black Guillemot burrows were confirmed in 2020, with 5 on Stratton Island and 1 on Bluff Island. A high count of 42 adult Black Guillemots was recorded on June 27.

Double-crested Cormorants

Double-crested Cormorant nests were not censused on Bluff Island due to COVID-19 and a late start date. A high count of 220 adult Double-crested Cormorants was recorded on Bluff Island on June 27.

Visitors
Stratton Island was closed to visitors this year due to COVID-19 and staffing restrictions; however, approximately 35 visitors still landed on Stratton and Little Stratton in 2020, mostly recreationists on paddleboards, kayaks, and jet skis, and all left after being told that the island was closed for the breeding season.

Notable Birds

- Tricolored Heron, 1 seen in the rookery on June 20
- Atlantic Puffin, 2 seen off the eastern shore on June 30
- Razorbill, 1 seen off the eastern shore on July 4 and 5
- Piping Plover, 1 seen on July 19

2020 Maine State Synopsis of Nesting Least Terns

On June 15th a coordinated least tern census documented a minimum of 258 least tern pairs within the state of Maine. During the count on June 15th, 130 least tern pairs nested at Crescent Surf and 128 nested on Higgins Beach. On July 27th, 7 nests were observed on Seawall Beach. Crescent Surf produced a minimum of 65 fledglings, Higgins Beach produced a minimum of 50, and Seawall Beach produced 0. State productivity was estimated to be about 0.44 fledglings per pair. Overall this was a successful year for the terns. Our pair count was lower than in previous years, although we suspect this is not a true indication of population change but an artifact of repeated early season nest wash outs at Crescent Surf beach.

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)

	WELLS	LAUDHOLM FARM	CRESCENT SURF	GOOSE ROCKS	WESTERN BEACH	STRATTON ISLAND	HIGGINS	RAM ISLAND	SEAWALL	POPHAM	REID STATE PARK	TOTAL
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)
2018	0	21*(0)	43*(19)	2**(0)	4**(0)	122*(5 0)	10**	0	0	0	0	186*(69)
2019	0	0	156* (31)	0	35*0)	84*(14)	21*+ (16)	0	0	0	0	296*(61)
2020	0	0	130* (65)	0	0	0	128* (50)	0	7(0)	0	0	258*(115)

[ ] colony deserted

***** simultaneous count at all occupied nesting sites during window count, not a site specific high nest count, only these numbers used in total. In 2017, after window count, colonies moved around substantially due to predation issues, in 2018 a synchronized count was not possible as the CS colony was disrupted and colonies never really synched up.

**** nesting outside of the window count and not included in state total**

Laudholm Farm Beach, Wells

Helen Manning, Technician and Kate O'Brien, Wildlife Biologist - Rachel Carson NWR

Population Estimate: 0 pairs nested at Laudholm in 2020.

Comparison: 21 pairs nested at Laudholm in 2018 but all nests were predated by a fox after the electric net fence failed. There were no pairs nesting at Laudholm in 2019.

Predator Control: Predator control was not conducted at Laudholm Farm Beach.

Crescent Surf Beach, Kennebunk

Helen Manning, Technician and Kate O'Brien, Wildlife Biologist - Rachel Carson NWR

Population Estimate: 130 pairs were nesting during the walking nest count census conducted on June 15th.

Two fledgling counts were conducted on July 16th and 29th where a minimum of 65 fledglings were observed. There were at least three significant overwash events, with multiple smaller events. Due to this, a large portion of the colony had to re-nest multiple times throughout the season. In addition, great horned owls were present and preyed upon several fledglings and at least one adult.

Comparison: Crescent Surf Beach saw its most successful years in 2015, 2013, and 2012 with productivity of 1.04, 0.76, and 0.79 respectively. 2011, 2009, and 2008 were decent years with productivities between 0.5-0.6. Productivity was poor in 2017, 2016, and 2014, and was also poor from 2003-2007.

Predator Control: USDA Wildlife Services removed specialist predators from the Crescent Surf Beach area throughout the breeding season. An electric net fence was also set up around the colony though was not working properly for a large portion of the season.

Goose Rocks Beach, Kennebunkport

Maine Audubon

Population Estimate:

Comparison:

Predator Control:

Western/Ferry Beach, Scarborough

Maine Audubon

Population Estimate: Least terns were observed here in 2020 but did not nest.

Comparison:

Predator Control:

Stratton Island

National Audubon Society

Population Estimate: Least terns did not nest on Stratton this year. It is not known why as the habitat appeared to be unchanged. The tern crew got out there later than usual, and it is possible an early colony was disrupted.

Comparison:

Predator Control:

Higgins Beach, Scarborough

Maine Audubon

Population Estimate: Higgins had great year for least terns, with 128 nests producing 50 fledglings. There was a dedicated volunteer base to assist with colony management.

Comparison: 128 nests is the highest nest count ever recorded for Higgins. The last time Higgins produced over 50 fledglings was in 2004.

Predator Control: Higgins Beach used an electric net fence to keep predators out of the colony.

Seawall Beach, Phippsburg

Maine Audubon

Population Estimate: A late season survey documented 7 nests however they were predated.

Comparison:

Predator Control:

Popham Beach State Park, Phippsburg

Maine Audubon

Population Estimate:

Comparison:

Predator Control:

NEW HAMPSHIRE

Isles of Shoals

White and Seavey Islands

Liz Craig, Program Manager / co-PI, Shoals Marine Laboratory
Jenn Seavey, Program co-PI / SML Executive Director, Shoals Marine Laboratory
Aliya Caldwell & Beckley Stearns, Seabird Technicians, Shoals Marine Laboratory

Tern Census

Common Terns

- COTE census was conducted on June 12th through 17th, 2020
- Unadjusted census:
    - 629 nests on White Island
    - 2,522 nests on Seavey Island
    - Lincoln Indices were calculated for White Island and Seavey Island (divided into sections with indices ranging from 1.00 to 1.06 on White and 1.00 to 1.09 on Seavey)
- Adjusted census:
    - 665.5 nests on White Island
    - 2,614.3 nests on Seavey Island
    - **Total estimated population was 3,280** (up from 2,900 in 2019). Highest census count for COTE since program began in 1997 (previous max was 3,210 in 2017).

Roseate Terns

- 96 ROST nests were established on Seavey Island within the census window (before 18 June 2020; up from 61 in 2019)
- B-wave ROST nests brought season total to 108 (up from 80 in 2019).

Arctic Terns

- 1 ARTE nest was established by 18 June 2020 on White Island.

Table 1. Number of tern nests found on White and Seavey islands from 2015-2020

Year	COTE	ROST	ARTE
2015	2,686	68	2
2016	2,985	83	3
2017	3,210	92	2
2018	2,175	55	1
2019	2,900	61	1
2020	3,280	96	1

Productivity

Common Terns

- 11 fenced plots (~10x12 ft) containing 70 nests plus
- Nests were monitored until chicks reached "fledge" age (15 days)
- Productivity was moderate in comparison to previous years likely due to unfortunate timing of storms (immediately after hatch) and abundance of unsuitably large prey (herring and butterfish) provisioned to chicks

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 2015-2020. Only nests with known outcomes were used for ROST & ARTE calculations.

Species	Year	Clutch size	Hatching success	Fledging success	Nests monitored
COTE	2015	2.04	1.52	1.10	188
	2016	2.25	1.56	0.80	247
	2017	2.00	1.81	0.35	62
	2018	1.84	1.38	0.45	45
	2019	2.11	1.61	0.85	66
	2020	2.19	1.86	0.57	70
ROST	2015	1.58	1.20	0.93	74
	2016	1.69	1.23	0.94	83
	2017	1.60	1.23	0.91	87
	2018	1.18	0.86	0.82	64
	2019	1.72	1.36	1.02	61
	2020	1.64	1.43	0.91	94
ARTE	2015	1.33	0.67	0.33	3
	2016	2.00	1.00	0.50	2
	2017	2.00	1.50	1.00	2
	2018	1.00	1.00	1.00	1
	2019	1.00	1.00	0.00	1
	2020	1.00	0.00	0.00	1

Tern Provisioning

- 57 COTE nests were monitored for diet.
- A remote observation camera was used to record video of each nest every 1-2 days from 16 June 2020 onwards. Complementary provisioning data were collected by observers in blinds to compare to camera observations. Data from camera recordings will be collected in fall 2020.

- Diet items included herring, hake, sand lance, butterfish, cunner, mummichog, lumpfish, goosefish, Acadian redfish, mackerel, stickleback, silverside, Atlantic moonfish, pipefish, pollock, flying gurnard, flounder, rockling, white sucker, squid, shrimp, euphausiid, amphipod, praying mantis, ant, grasshopper, dragonfly, and moth.
- Partnering with a genetics lab at Cornell Lab of O (Dr. Gemma Clucas) to conduct DNA metabarcoding of feces to determine diet to species level.

Predator Activities and Control Efforts

Muskrats:

- Due to predation issues in previous years, muskrats were trapped at their den on Seavey using conibear traps. One muskrat trapped (down from 9 in 2019).

Gulls:

- No gull nesting attempts on White or Seavey in 2020.
- Used human presence, as well as pyrotechnics to dissuade gulls from lingering and predating.
- 157 pyrotechnics were used between 12 May and 5 August (up from 47 in 2019)
- Lethal control: removed 2 GBBG (1 injured and loafing on colony, 1 actively predating colony) and 2 HERG (1 injured and loafing on colony, 1 actively predating colony). Dissected stomach of actively predating HERG and found remains of tern chick.

Other Avian:

- RUTU from the end of May through early June and again in late July and early August.
- PEFA were seen on 6 occasions from May through early August (down from 11 in 2019); the colony responded by mobbing and pursuing. Confirmed predation of one ROST chick and one COTE chick.

Other Mammalian:

- No other mammalian predators were observed on White or Seavey islands between 12 May and 8 August 2020.

Other Nesting Species

- Common Eider: at least 34 nests (2 on White and 32 on Seavey; up from 13 in 2019)
- Spotted Sandpipers: at least 5 nests (1 on White and 4 on Seavey)
- Song Sparrow
- AMOY – Lunging Island
- BLGU confirmed on Appledore (7)

Research:

- Collected GPS locations for all censused nests in the ArcCollector app to improve the spatial resolution of nesting data. Evaluating spatial distribution of birds and nest site selection wrt habitat characteristics.
- Continued application and evaluation of hypersaline spray for habitat management.
- Tern fecal collection (for DNA metabarcoding) and visual diet observations conducted to determine diet.
- Exploration of historic tern diet data and reproductive success/growth wrt fisheries data.
- Exploration of butterfish presence in diet over time and implications for growth/survival of chicks.
- Exploration of microplastic ingestion by terns via fecal and forage fish analysis.
- Put GPS tagging and boat-based fish sampling on hold due to COVID-19 (to be continued in 2021).

MASSACHUSETTS

Monomoy National Wildlife Refuge

Eileen McGourty, Fish and Wildlife Biologist - USFWS
Sarah Dibbet, Plover Intern – Northwoods Stewardship Center for USFWS

Minimoy Island

Tern Census

In 2020, a census was completed on June 17th. Two common tern nests were noted with eggs and 14 empty scrapes. No black skimmers, roseate terns, least terns, or big gulls nested on Minimoy. Staff visits to the island were minimal due to COVID-19 pandemic related staff shortages and productivity data was not collected.

Table 1. Number of tern nests found during census window on Minimoy from 2016-2020. Numbers in parentheses reflect nests found outside of the census window.

Year	COTE	ROST	LETE
2016	0	0	0 (3)
2017	0	0	0
2018	0 (1)	0	0
2019	1	0	0
2020	2	0	0

North Monomoy Island

Tern Census

In 2020, a census was not conducted on North Monomoy Island due to the COVID-19 pandemic and staff shortages.

Table 2. Number of tern nests found during census window on North Monomoy from 2016-2020. Numbers in parentheses reflect nests found outside the census window.

Year	COTE	ROST	LETE
2016	0 (2)	0	0
2017	0	0	0
2018	0	0	0
2019	No census	No census	No census
2020	No census*	No census*	No census*

*Census not conducted due to the COVID-19 pandemic.

Gull Census

In 2020, though great black-backed gulls and herring gulls were observed nesting on North Monomoy on 17 July, gull nests were not counted this field season. Gull census is conducted every five years and the most recent census was completed in 2018. The nest gull census is anticipated to be in 2023.

Wading Bird Census

In 2020, though many wading birds were observed nesting on North Monomoy Island, a wading bird census was not conducted.

Table 3. Number of wading bird nests found on North Monomoy from 2016-2020 during census window.

Year	BCNH	GREG	SNEG	GLIB
2016	No census	No census	No census	No census
2017	185	25	99	3
2018	225	27	94	1
2019	252	48	94	0
2020	No census*	No census*	No census*	No census*

*Census not conducted due to the COVID-19 pandemic.

South Monomoy Island

Tern Census

Common Terns

In 2020, though plenty of common tern and laughing gull nests were observed, the annual South Monomoy Island tern and gull census was not conducted due to the COVID-19 pandemic and staff shortages. This is the first time since 2003 that the tern census was not conducted on South Monomoy Island.

Roseate Terns

A full census was not conducted on South Monomoy Island. Numbers reported are minimal numbers observed during a single visit to the tern colony on 16 July. The visit into the colony was limited to a few hours and only a small portion of the colony was covered. During the visit chicks from at least three different nests were observed and based on chick ages these nests were documented during the A-count window. One nest was found with a single egg and was counted during the B-count window. Productivity data on the nesting roseate terns was not collected this year due to COVID-19 pandemic staff shortages.

Least Terns

In 2020, a full least tern census was not conducted. The north end of South Monomoy Island was not monitored during the census window and this is the area in past years were large numbers of least terns would attempt to nest. Least tern activity was documented later in the field season on the north end in the connection area but no nests were found, just several scrapes. Two small colonies were observed on the south end of the island, one at the south tip and one between Lighthouse Beach landing and Powder Hole. A partial A-period census was conducted on16 June at the south tip colony in which thirty incubating adults were counted. On 17 June, a total nest count was conducted in the colony between Lighthouse Beach landing and Powder Hole and nine nests were documented. No B-period census was conducted. Productivity was not monitored.

Table 4. Number of tern nests and laughing gull nests found on South Monomoy from 2016-2020. Numbers in parentheses reflect nests found outside the census window.

Year	COTE *	ROST	LETE	LAGU
2016	10505	12 (2)	839	2738
2017	11723	11 (7)	773	2714
2018	13472	30	499	3272
2019	14343	4 (8)	12**	3659
2020	No census***	0(4)***	39***	No census***

*Adjusted estimate based on Lincoln Index.

**It is estimated that there were 268-285 pairs of terns present during the census window prior to the official June 20th count but abandoned most nesting attempts due to predator activity.

***Full census not conducted due to COVID-19 pandemic. Numbers are minimal numbers.

Productivity

In 2020, productivity data was not recorded due to the COVID-19 pandemic and staff shortages. Productivity may have been impacted this year due to a mortality event that mainly involved hatch year common terns. In late July reports of sick birds began on the outer cape. Over the course of about two weeks, 19 sickly birds from Chatham to Provincetown were brought to a local wildlife rehabilitation center.

Birds were washing up in the surf, seeking shade under beach chairs, stumbling and exhibiting droopy wings. Most birds brought to the center were emaciated and dehydrated and did not survive. It is unknown if these birds were from South Monomoy Island or other nearby colonies. On 29 July, staff made a trip to the South Monomoy Island colony to see if there were sick birds within the colony. Approximately a dozen hatch year terns were noted stumbling or with droopy wings. Over 200 hatch year common terns were dead within the colony. Six carcasses were sent to the National Wildlife Health Center, four collected from South Monomoy Island and two from Morris Island. We are currently awaiting results. The only weather related event that occurred during that time was a heat wave that lasted several days.

Table 5. Breeding parameters for common and roseate terns on South Monomoy Island in 2020. Data for 2019 shown in parentheses.

Species	Clutch size	Hatching success	Fledging success	Nests monitored
COTE	No data*	No data*	No data*	No data*
ROST	No data*	No data*	No data*	No data*

*Data not recorded due to the COVID-19 pandemic and staff shortages.

Table 6. Common and roseate tern productivity on South Monomoy Island from 2015 - 1019.

Year	COTE Hatch Success	COTE Reproductive Success (fledglings/pair)	ROST Hatch Success	ROST Reproductive Success (fledglings/pair)
2016	90.7	1.96	70.83	1.00
2017	87.5	1.53	72.22	1.36
2018	82.6	1.10	62.16	0.73
2019	89.2	1.01	88.9	0.83
2020	No data*	No data*	No data*	No data*

*Data not recorded due to the COVID-19 pandemic and staff shortages.

Tern Provisioning

No provisioning data was conducted during the 2020 field season.

Predator Activities and Control Efforts

Predators that were present during the 2020 field season included coyote, northern harrier, greater black-backed gull, laughing gull, herring gull, crow, grackle, and black-crowned night heron. Two sets of coyote tracks were continually seen throughout the season along the beach. It is believed that one pair of coyotes were on the island for the majority of the nesting season. Early season removal of one coyote den was conducted in May. One male and three pups were removed, and one female escaped predator control efforts. Control activities were not conducted during the nesting season and predator monitoring did not occur during the 2020 season due to staff shortages related to the COVID-19 pandemic.

Appendix A: 2020 GOMSWG Attendees

Name	Affiliation
Brad Allen	Maine Department of Inland Fisheries and Wildlife
Mark Baran	Common Murre Restoration Project
Ben Becker	National Audubon Society
Rose Borzik	National Audubon Society
Joe Cleaves	MCINWR, PMI Is
Gemma Clucas	Cornell Lab of Ornithology
Elizabeth Craig	Shoals Marine Laboratory
Kate Devlin	former University of New Brunswick
Sarah Durham	University of New Brunswick
Eddy Edwards	Maine Coastal Islands NWR
Rebecca Esch	former Seal Islander
Tracey Faber	National Audubon Society
Coco Faber	National Audubon Society SRP
Clare Flynn	National Audubon Society
Walter Gamble	Pond Island supporter
Anne Gamble	Pond Island supporter
Kay Garlick-Ott	National Audubon Society
Natasha Gownaris	Gettysburg College
Julia Gulka	Biodiversity Research Institute
Dan Hayward	Former White & Seavey
Tiffany Huenefeldt	National Audubon Society
William Kennerley	National Audubon Society
Stephanie Koch	USFWS, Monomoy NWR
Steve Kress	
Jesse Lewis	National Audubon Society
Ayla Liss	National Audubon Society
Amber Litterer	BiodiversityWorks (Martha's Vineyard)
Don Lyons	National Audubon Society
Heather Major	University of New Brunswick
Helen Manning	Rachel Carson National Wildlife Refuge
Amanda McFarland	
Eden Michaels	National Audubon Society
Kirk Michaud	USDA APHIS Wildlife Services
Kate O'Brien	USFWS
Mikayla Ockels	NAS SRP
Emma Paton	MCINWR, Metinic Island
Michael Rickershauser	National Audubon Society
Kaila Ritchie	National Audubon Society
Pete Salmansohn	Former NAS
Emily Sandly	National Audubon Society

Name	Affiliation
Susan Schubel	National Audubon Society
Lauren Scopel	University of New Brunswick
Paula Shannon	National Audubon Society
Kayla Smith	BiodiversityWorks (Martha's Vineyard)
Zeke Smith	National Audubon Society
Beckley Stearns	Shoals Marine Lab/White and Seavey Islands Tern Tech
Rochelle Streker	National Audubon Society
Mark Suchewski	National Audubon Society
Kelsey Sullivan	Maine Department of Inland Fisheries and Wildlife
Becky Suomala	NH Audubon
Nadia Swanson	National Audubon Society
Percy Ulsamer	MCINWR, Ship Is
Morgan Walter	National Audubon Society
Linda Welch	USFWS
Sam Wells	National Audubon Society
Sara Williams	Maine Coastal Islands NWR
Keenan Yakola	NAS SRP
Laura Zitske	Maine Audubon