

Summary of 2015 Field Season

A combination of favorable weather, ample food supply and successful limited lethal predator control resulted in a very successful breeding season for all monitored species on Machias Seal Island (MSI) in 2015. The start of ATPU breeding was delayed, and this year's mean ATPU lay date is 10 days later than the 20-year average (13 May). In past seasons,



delayed breeding has been associated with poor chick survival and low productivity for alcids breeding on MSI, but happily this was not the case in 2015. A formal census was completed for both ATPU and RAZO for the first time since 2011. The results highlighted the changing demographics on MSI, showing a marked increase in RAZO nesting pairs and a decrease in ATPU nesting pairs. Terns had their most successful year on MSI since 2001, though numbers of nesting pairs remain low. The terns' aggressive behavior and incessant vocalizations and chatter once made them a dominant feature in the MSI landscape, but that ceased following the collapse of the tern colony in 2006. The 2015 breeding season saw a return of bold nest guarding and predator mobbing that indicates a healthy tern colony. The crew was very busy with tagging projects this season, deploying and recovering a variety of tag types, including geolocator, GPS and nano-tags, on ATPU, RAZO and Leach's Storm-Petrels.

The crew this year comprised two field technicians, Jenn Symons and Michelle Valliant, and was supervised by Stefanie Collar. MSc. student Stephanie Symons continued her study of foraging distribution during chick rearing, and deployed GPS tags on ATPU and RAZO. The crew arrived on May 10, along with camp set-up volunteers Ed Czerwinski, Evan Dracup and Jesse Webb. The crew was visited several times by Dr. Tony Diamond, as well as Kyle Elliot, Dorothy Diamond and Laura Tranquilla, all of whom assisted with various tagging projects carried out this season. Dr. Diamond, Stefanie Collar and Stephanie Symons attended the GOMSWG meeting on August 10, and the season ended on August 18 when the crew closed down the field camp, assisted by Lauren Scopel, Tony Einfeldt and Ed Czwierinski.

Alcids

Commonly, crew arrival coincides with the start of egg-laying, but the delayed onset of alcid breeding in the 2015 season gave the crew a unique perspective on the process of courtship and nest preparation not often observed on MSI. The highlight of the early season were dramatic wheeling flights of RAZO circling the island, slowly settling on the peripheries of the colony to display and call to one another. As breeding began in earnest, it was obvious that the loafing spots around the island were dominated by RAZO, rather than ATPU; it was clear that an alcid census was needed to quantify the apparent shifts in colony size.



The ATPU nesting census was conducted June 16 and 17. There were 137 active burrows and 220 total burrows, a 62% rate of occupancy. This is down from the overall average of 76% occupancy. The numbers sampled extrapolate to over 5000 pairs or 22% below the average 2000-2011. The areas of the island most heavily occupied by ATPU mirror those from the 2011 census, but number of total burrows is lower by about 20%. The RAZO census was conducted June 19 and 20. There were 170

total burrows (161 eggs, 4 broken eggs, 5 chicks), extrapolating to 2550 nests, representing a 30% increase over the last census in 2011, an increase of over 5 times since the first census in 2000. RAZO occupancy was slightly higher in 2015 compared with 2011, with the increase in nesting concentrated in the southwest section of the colony. Additionally, 4 burrows formerly occupied by ATPU were taken over by RAZO in 2015, and there is concern that the increase in RAZO nesting pairs may be partly responsible for the decline in ATPU nesting on MSI. The alcid censuses were performed using staggered quadrats (ATPU) or 2m-wide transects (RAZO) over each east-west gridline of our 30x30m grid system. Nesting totals are extrapolated from the counts.

The alcid diet was predominately sand lance throughout the season, and chick rearing seemed to coincide well with sand lance growth. ATPU particularly focused on sand lance throughout chick rearing. Early chick provisioning consisted of large bills-full of larval sand lance, and as chicks grew, adults began to offer larger metamorphosing sand lance, and finally very large adult sand lance. This pattern was observed at other seabird colonies throughout the Gulf of Maine in 2015. Though sand lance was very important in RAZO diet, hake and herring also figured prominently. Despite high occupancy rates, adequate hatching success and high growth rates, RAZO fledging success was low. This is likely at least partly attributable to nest depredation by gulls, as many smaller chicks disappeared from RAZO burrows during the season. ATPU had high growth rates and excellent chick survival this season, and fledging success was high.



There was no formal COMU census this year, but the number of COMU breeding on MSI seems to be increasing, as they occupy more ‘caves’ and are encroaching upon nesting areas used exclusively by RAZO. The crew banded 57 COMU chicks, all in good condition. There were 71 COMU eggs and 72 chicks counted in July, for a total of 145 nests in 18 caves, but this is certainly an underestimate as it was conducted after

peak fledging, and is lower than found in previous years. The details of alcid productivity, growth and (identified) diet are described below. Diet data are % by number, not biomass.

	Monitored Burrows	Mean Lay	Mean Hatch	Burrow Occupancy	Hatching Success (hatch/active nest)	Nesting Success (fledge/active nest)	Linear Growth Rate (mass)
ATPU	98	23 May	3 July	0.68	0.81	0.75	8.0 grams/day
RAZO	85	22 May	27 June	0.75	0.66	0.48	7.5 grams/day

	n	Hake	Larval	Euphausiid	Sandlance	Herring	Butterfish	Other
ATPU	1618	2.1	24.8	0.8	64.9	2.1	0.2	4.7
RAZO	1108	11.2	19.0	0.2	48.3	12.4	1.0	7.9

	n	Herring	Butterfish	Gadoid	Sandlance	Squid	Rock Gunnel	Other
COMU	114	49.1	10.5	25.0	7.0	6.1	2.6	2.7

Terns

The May 10 arrival of the crew to MSI was unusual because of the relatively small number of alcids attending the island, and the relatively high number of terns. As early as May 12 terns were seen landing on the island and engaging in courtship behaviors, and quickly began establishing nests. The first egg was found May 25, and mean lay date was June 6. The first chick hatched June 18, but mean hatch date was June 30. Some nests were depredated by gulls the first week of June, including 5 productivity nests, but there was an island-wide second wave of nesting during the second week of June. Unlike past years, the terns were aggressive towards predators and people alike, and were often seen mobbing marauding HERG, GBBG and PEFA.



This renewed nest defense activity, coupled with predator control, abundant forage and a relatively storm-free July led to a remarkably successful breeding season for the terns! There were 49 ARTE nests monitored within productivity plots and the core of the island. COTE were also seen nesting on the island, though not within the productivity plots. The number of chicks hatched per nest was the highest since 2002, and fledging success was the highest on MSI since 2001. The tern diet was also

predominately larval and metamorphosing sand lance, with hake being the second most frequent prey item. Many of the nests observed during feeding watches hatched two chicks, and for the first time since 2003, productivity nests successfully fledged two chicks (n=5)! A tern census was not conducted this year, but it is estimated that there were up to 150 attempted nests island-wide, with a probable species distribution of 94% ARTE and 6% COTE, similar to last year.

Estimated Tern Nests on MSI (formal census in 2014 only)

2011	2012	2013	2014	2015
75	50	90	187	150

Diet (% by number, not biomass) for ARTE on MSI

n	Herring	Hake	Krill	Butterfish	Sand lance	Larval	Other
288	26.7	26.7	2.4	0.7	36.8	21.9	10.1

Other: sticklebacks, gadoids

Breeding Success of ARTE on MSI

Year	n	Clutch Size	Chicks hatch/nest	Chicks/nest alive at Day 15	Chicks/nest alive at Day 20	Fledglings/nest
2003	100	1.51(0.54)	0.94	0.70	0.56	0.50
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	42	1.68 (0.53)	0.57	0.11	0.08	0.08
2015	49	1.71 (0.54)	1.00	0.70	0.66	0.65

Predator Control

Non-lethal gull control was conducted this year using paintball guns, with very limited success. Gulls specializing on raiding seabird nests quickly grew accustomed to the non-lethal measures, making them largely ineffectual. For the third consecutive year, lethal gull control was conducted by a contracted predator control specialist on May 29-30, June 6-7 and June 13-14, fulfilling the quota of 15. There was a decline in egg depredation for 3-5 days following each session of lethal control, but nest depredation continued throughout the season. Gull Rock (0.25 km away) was visited twice during the season, on June 4 and June 14. In all, 13 gull nests, 12 HERG and 1 GBBG, were found and a total of 41 eggs were shaken and poked. Only 1 gull nest was found on MSI this season, a HERG nest with 2 eggs, both of which were shaken and poked. This season, MSI was visited often by Laughing gulls (LAGU), with several pairs landing and prospecting in the NE corner of MSI. LAGU are a predatory nuisance at other seabird colonies, and were discouraged from remaining on MSI, but were not observed depredating other seabirds.

Tagging effort

This season, in addition to the usual productivity data collection, the crew was involved in various tagging projects. In 2014, 31 geolocators were deployed on breeding alcids, and thirteen of these were successfully retrieved, 10 from ATPU (38% of deployed) and 3 from RAZO (60% of deployed). The tags were in good condition, though 4 ATPU tags had chunks of seaweed tangled within the zip-tie attachments upon recovery. The tag attachment



method likely allowed this fouling, as there was a sizable gap between the zip-tie and the field readable band. Vegetation was not found in any of the recovered RAZO tags. The attachment method was altered for the geolocators deployed on alcids this season, to eliminate vegetation entanglement and improve retrieval success. The crew deployed 5 types of tags on RAZO, ATPU and LHSP at MSI this season. Geolocators were deployed on both 16 RAZO and 17 ATPU in an effort to determine alcid wintering distribution and diving activity; nanotags were deployed on 20 RAZO in collaboration with Rob Ronconi to investigate RAZO wintering distribution along the Eastern coast of North America; geolocators were also attached to 16 incubating adult LHSP to gather data on foraging locations and mercury levels (from blood samples of 6 adults) during the breeding season.

Other Species

No formal census was conducted for Common Eiders (COEI) this season, but it is estimated that nesting numbers on MSI was low this year (< 50). Gulls were often seen depredating COEI nests early in the season. COEI ducklings were first seen in mid-June, and were still present around the island in early August, both small, newly-hatched ducklings and pre-fledgers. LHSP were also breeding on MSI, and 23 active nests were opportunistically grubbed for banding and geocator tag deployment for a collaborative project with CWS. Northern gannets (NOGA) were present throughout the season, with 1-3 loafing on the south end of the island almost every day between mid-May and August. They were often seen displaying and occasionally seen carrying nesting material, but no nesting attempts were made.

