

BOWDOIN COLLEGE

BOWDOIN SCIENTIFIC STATION

BRUNSWICK, MAINE 04011

1991 Annual Report

Since the Last Annual Report

1991 saw the publication of L. Keith Ingersoll's book, Wings over the Sea: The Story of Allan Moses (Goose Lane Editions, Fredericton, New Brunswick). Besides chronicling the life of Grand Manan's greatest naturalist, the book is also the story of how Kent Island came to be protected and the Bowdoin Scientific Station established 56 years ago. When Ernest Joy shot a vagrant Yellow-nosed Albatross off Machias Seal Island, he set into motion an improbable series of events. Allan Moses, the preparer of the specimen, turned the bird over to the American Museum of Natural History, which led to his being included on an expedition to the Belgian Congo, headed by J. Sterling Rockefeller, to collect the rare Grauer's Broadbill. The mission was a success, and a grateful Rockefeller rewarded Moses by purchasing Kent Island to save its eider population. A few years later, a group of Bowdoin undergraduates set up a field station on the island, and in 1935 Rockefeller donated the island to Bowdoin College. To complete the circle, Ernest Joy was hired as the field station's first caretaker. Copies of Ingersoll's book may be obtained from the Grand Manan Museum (Grand Harbour, NB, EOG 1X0) for \$16.00 (Canadian).

Several Grand Manan neighbors supplied additional historical lore about Kent Island. Gerald Anderson, who lived on the island in 1927 and still traps muskrats there each spring, recalled his daily chore of delivering milk to a group of Passamaquoddy Indians from Eastport, Maine, who camped on Plank Beach each summer while hunting seals. At that time, according to Anderson, the Three Islands school, whose foundation is still visible among the skunk currants on the north end of Kent Island, had 17 students. Howard Ingalls introduced us to some of the intrigues of Three Island history. Was the burning of the Cooks' camp on Hay Island simply an accident, or was it arson inspired by a feud over weir-fishing rights? Who was it who introduced muskrats to Grand Manan in the mid-1930s, and how did they get over to Kent Island so quickly? Was there any connection between the elimination of raccoons on Kent Island -- allegedly by introduction of a virus -- and the great Grand Manan house cat die-off of the 1930s?

The New England Consortium for

Undergraduate Science Education (NECUSE) awarded the Bowdoin Scientific Station a grant to support the research of an undergraduate student from an institution other than Bowdoin. Becky Elden, a junior at Mt. Holyoke College, was selected from more than 20 applicants to carry out her study of Boreal Chickadees (see below). She provided just the sort of intellectual outbreeding that the NECUSE program hoped to foster.

In 1991 three recent Bowdoin graduates whose honors theses in biology were conducted at the Bowdoin Scientific Station were awarded prestigious Graduate Fellowships from the National Science Foundation and admitted into highly competitive PhD programs: Corey Freeman ('91, Cornell University), Peter Hodum ('88, University of California-Davis), and Cheryl Schultz ('91, University of Washington). Joanna Leary ('89), another Kent Island alumna, also began graduate work last year at the Utah State University.

The Summer of 1991

Once again the caretaker team of Russell Ingalls and Mark Murray ('75) made the Bowdoin Scientific Station function like a well-oiled machine. Russell and the *Fundy Girl* safely transported students, faculty, visitors, food, fuel, mail, and other necessities between Seal Cove and Kent Island from April until October. As we come to rely more on the Del Quay Dory (whaler) for censusing neighboring islands and making short trips to Grand Manan, Russell offers frequent tutelage in navigating the waters of the Bay of Fundy. One day, when our departure from Grand Manan was unexpectedly delayed, we were guided back to Kent Island on a moonless night by Russell's flashlight and radio directions.

Mark opened the field station on April 29 and closed it five months later, on October 5. Besides keeping equipment and vehicles running, Mark completed the project of reroofing the island's buildings with the help of his apprentice in insular polytechnology, Jake Carbine ('93). The Basin lab, the Radio Shack, the main outhouse, even the old cow barn received replacement roof boards and a covering of asphalt shingles, and the Radio Shack got a face-lift of fresh paint and a new door. After gradually sinking into the Basin for a

number of years, the Captain Gillette wharf house is about to be resurrected and used for storage and boat repair. Assisted by various brave souls, Mark cleared out years of debris, removed the rotting floor boards, prepared the sills for jacking the building up to higher ground, and scrubbed the walls and floors with a power washer. "Clean enough to eat off," claims Mark, although anyone who remembers the thriving barn swallow colony on the second story may have little appetite. A protected lean-to will be added on the building this spring to allow the swallows to renest. The major construction project of the summer was the replacement of 52 feet of the wharf, a job that required the brains and brawn of everyone willing to sink pilings, pound spikes, and reconfigure the twisted cribbing. We were especially grateful to Chris Filardi ('89) who unintentionally arrived during the wharf construction.

Two biology classes took field trips to the Bowdoin Scientific Station in 1991. A group of ornithology students and I timed our trip for the beginning of the spring migration during Reading Period. Waves of early warblers (Palm, Yellow-rumped, Black-throated Green) and sparrows (White-crowned, White-throated) abounded, tailed by numerous raptors. In September 13 students in my ecology class spent several days on Kent Island mist-netting late migrants and identifying plants and fungi. An equal number of first-year students visited the field station on a late August preorientation trip.

Research in 1991

• Leach's Storm-Petrel

In the words of Bob Ricklefs (University of Pennsylvania), "Leach's Storm-Petrel continues to prove an excellent model system for studying seabird ecology and life histories, and it is rapidly becoming one of the best known of all birds." No one has pondered petrels longer than Chuck Huntington, who for the 38th consecutive year studied survival, mate fidelity, and reproductive success in storm-petrels. Last summer his collaboration with Bob Mauck, a graduate student at Ohio State University, began in earnest, with the help of their field assistant, Michele Greet ('93). Bob, Chuck, and Michele entered decades of data into a personalized relational data base, which Bob is spending the off-season analyzing. Bob is also using a battery of observations and experiments to test the hypothesis that parental

effort in birds increases with age, as predicted by life history theory. One such approach is ptilochronology, a technique that involves examining the growth rates of experimentally induced replacement feathers; in theory, more rapid feather growth by older birds would indicate their capability for higher energy expenditure. Another index of reproductive investment is egg size. So far Bob has not found age to be correlated with feather growth rate, egg volume, or nestling feeding rates, although older birds do breed earlier than younger birds.

The American Ornithologists' Union has recently embarked on a major project to summarize and publish as a series the definitive life histories of "The Birds of North America." Each account is to be written by specialists on that particular species. Chuck and Bob have been invited to tackle Leach's Storm-Petrel.

Bob Ricklefs continued his own long-term studies of Leach's Storm-Petrel, with some new angles. Working with his graduate student Paul Sievert and field assistant Nancy Yorinks, Bob was interested in determining how diet affects the growth rate and fledging success of nestlings. In a repetition of an experiment conducted by Paul last year, the diets of nestlings were supplemented in the field with water differing in salt concentration, and the birds' weight gain and the salinity of their blood and nasal secretions were measured. The data are currently being analyzed. A second group of nestlings were hand-reared in the lab and fed diets differing in total energy and proportion of lipid. The experiment ran aground when some of the chicks showed unexpected growth problems, possibly due to toxins in the freeze-dried plankton used as a food base. Initial results indicate, however, that storm-petrels require a high lipid diet. Finally, Bob's group sampled blood from nestlings at ages 54, 57, 60, and 63 days to monitor changes in levels of thyroid hormone as part of a study of the development of endocrine function.

Lidya Skrynnikova, an undergraduate from the University of Leningrad (now St. Petersburg), USSR (now Russia), overcame visa problems and was able to determine hatching dates for Bob Ricklefs's project by daily monitoring of a series of nest burrows. In the process, she discovered a high degree of "egg-neglect," periods during which one incubating parent left the nest without being replaced by the other parent. Despite inattention that would have killed the embryos of most bird species, neglected

storm-petrel eggs had good hatching success, although egg-neglect appeared to extend the incubation period.

- Herring Gulls

One way to measure marine pollution is to take repeated samples of hydrocarbons and other toxic compounds across the ocean. A more efficient and biologically meaningful way is to let seabirds do the sampling. Species like Herring Gulls directly incorporate marine pollutants into their tissues and show physiological symptoms of ingestion of toxins. Since the late 1970s Glen Fox of the Canadian Wildlife Service has directed a team of researchers in a comparison of the physiology and contaminant residue levels in gulls of the Great Lakes basin and the Bay of Fundy; Kent Island serves as a "clean" control. Last summer Deborah Jeffrey and Kim Williams from the Canadian Wildlife Service, and Keith Grasman, a graduate student at Virginia Polytechnic Institute, undertook what Dr. Fox describes as "the most comprehensive wildlife biomarker sampling program ever undertaken in the world." At Kent Island they collected Herring Gull eggs, chicks, and adults for a wide array of biochemical, physiological, and histopathological analyses. Lidya spent part of her summer at Kent Island marking gull nests and determining hatching dates in preparation for Keith's pilot project on immune function in 28-day old chicks. Notes Dr. Fox, "This is the first documentation of immune suppression in free-living wildlife and, more particularly, a sentinel species.... Although Herring Gull reproduction has returned to normal [in response to environmental cleanup efforts], most colonies in the [Great Lakes] basin are still suffering from chemically induced biochemical and physiological abnormalities.... Kent Island plays a crucial role in the program." Dr. Fox's numerous publications based in part on research at the Bowdoin Scientific Station are listed at the end of this Report.

- Savannah Sparrows

It will be some years yet before I can legitimately call our research on the population biology and behavioral ecology of Savannah Sparrows a "long-term" study, particularly given the tough standards set by Chuck, Bob Ricklefs, Bob Cunningham and Glen Fox. We scrutinized sparrow social life closely for a fifth breeding

season, and the research took some novel directions. "We" were Josh Weinstein ('91), Jeff Sevigny ('92), and I, with a guest appearance by Geoff Trussell ('90, now a graduate student at the University of New Hampshire), who, while I was away in early June, returned as acting Director of the field station. A legendary sparrow nest-finder, Geoff instructed Josh and Jeff in the difficult art. As a result, our coverage of the reproductive efforts of individual birds, each of which sports a unique combination of colored plastic bands, has never been more complete. Although the population showed a slight decline in size from earlier years, we banded 93 adults, 95 juveniles, and 283 nestlings of known parentage.

Perhaps I should have said "suspected" parentage. Jeff's honors thesis relies on DNA fingerprinting to determine who the biological parents of nestlings are and how common the incidence of "extra-pair fertilizations" is. The technique basically involves taking a small blood sample from the bird's brachial vein, isolating the genetic material, and separating DNA fragments of characteristic size on a gel exposed to an electric current. The result sort of looks like a commercial bar code, with maternal and paternal contributions giving every nestling a unique "fingerprint." Working with David Westneat at the University of Kentucky, whose lab he visited in July, and with Bill Steinhart at Bowdoin, Jeff is currently analyzing the samples. So far he has found that as many as 25% of all nestlings are sired by someone other than the territorial male.

We have discovered over the past few years that about 30% of the females in the population lay two clutches a year; older females are more likely to be double-brooded. Still, we were surprised to find last summer that one six-year old female successfully fledged three broods.

- Tree Swallows

For her honors thesis, Amy Lewis ('92) is studying the demography of Tree Swallows, and she spent the summer banding birds and collecting data on basic breeding biology. Making use of original data provided by Raymond Paynter ('47), Reid Harris (who studied at Kent Island in 1977 and 1978), Joe Williams (1981-2), and more recent Bowdoin undergraduates (1987-90), Amy aims to analyze long-term trends in population size and reproductive characteristics such as the timing of egg-laying, clutch size,

incubation period, and fledging success. Her interest is in proximate influences on reproduction, that is, variables such as climate. Therefore, she is taking advantage of another long-term project on the island, Bob Cunningham's meteorological study, to examine the influence of changing patterns of precipitation and temperature (see below) on swallow demography and reproduction. As on nearby Grand Manan and White Head Island, the Tree Swallow population dropped to a five-year low in 1991, with only 53 (of about 100) nest boxes occupied.

- Boreal Chickadees

Those of us who work on Savannah Sparrows ceaselessly complain about the difficulty in finding their nests, but sparrows are child's play compared to Boreal Chickadees. Only people with sharp eyes, low frustration levels, and mountainous work ethics should even consider studying the maddeningly cryptic birds, which may explain why so little has been published about their life histories. Becky Elden (Mt. Holyoke, '92) took on the challenge, color-banding the archipelago's entire adult population (five birds) and discovering two nests. The home ranges of individual Boreal Chickadees are extraordinarily large compared to other small songbirds, particularly island birds (c. 5 hectares vs. 1/4 hectare or less), and their social organization is puzzling, with adults forming small flocks of fluctuating membership and territorial trespass common and hardly contested, if at all. At least one pair of chickadees fledged two broods, which had not previously been documented in this species. Tom Grubb donated a half dozen nest boxes used in the classic studies of Great Tits in England, but so far the Boreal Chickadees prefer to nest in cavities in rotting spruces.

- Bird Populations

We used spot-mapping to census songbirds in an 11-hectare plot of spruce-fir forest for the third consecutive year in an effort to monitor population trends, especially for migratory species that spend the winter in the tropics. Population estimates in 1991 were similar to those from previous breeding seasons, although several species (e.g., Black-capped Chickadees, Magnolia Warblers) were entirely absent.

Population turnovers seem to be an ordinary feature of islands like Kent Island. The conservation implications of such observations, however, are ominous because large forest tracts worldwide are becoming fragmented into island-like patches where we can expect local extinctions. The question is whether they will be balanced by colonization in an increasingly fractured landscape.

Several unusual birds passed through the archipelago during the summer. We spied a blue-phase Snow Goose on Sheep Island (possibly released?) and a Yellow-crowned Night-Heron in the basin. A Goshawk nested on the north end of Kent Island. The oddest sighting was an immature Fork-tailed Flycatcher, normally found only in Central and South America, who spent 10 days in early June on the island in the company of migrating Eastern Kingbirds.

- Marine Invertebrates

With most of the rest of us focusing on birds, Sarah Haggerty ('91) and Amy Johnson (Bowdoin College) broadened our perspectives by taking on a little known taxon, marine polychaete worms. The main emphasis of their study was reproduction in the clam worm, Nereis virens, a species best known to fishermen as bait. At Kent Island the species is common in oxygen-poor muddy sediments outside the basin, where Sarah characterized the entire marine invertebrate community and introduced us to such exotic wildlife as bamboo worms, acorn worms, lugworms, and burrowing sea anemones.

- Meteorology

For only the third time since Ernest Joy kept year-round records in the 1940s, Bob Cunningham managed to gather weather data for the entire period from May into October. The summer of 1991 was the second-warmest since 1938; only 1990 had a higher average temperature, by a mere 0.05° C. Last summer we recorded the hottest temperature on Kent Island since 1945; the mercury reached a blistering 26.4° C (79.5° F) on May 25. The frequency of fog was well below normal, occurring on only 21% of summer days, compared to a 50-year average of 33%. Rainfall was also very low. Only 1.1 cm (2.8 inches) fell between May 8 and July 13, which precipitated a serious water shortage.

Showers were rationed to one every 12 days (we all remained friends nonetheless). Bob continued his study of the chemistry of fog in collaboration with Dick Jagels and Jobie Carlisle (University of Maine at Orono) and with the aid of field computers. Fog acidity levels last summer never reached the extraordinarily low pH of 2.3 seen in 1990, perhaps because of what Bob calls "the poor fog season."

Important new sensors were added to the automatic data loggers to complement the sensors that measure fog pH, fog water collection rates, airspeed at ground level and 10 meters, and solar radiation. At 10-minute intervals from June 9 until August 25 we also monitored wind direction, which is crucial for determining the trajectories of fog masses and interpreting pH values. Thermal probes provided temperature readings at the standard level of 1.5 meters as well as inside a ground-level Savannah Sparrow nest and a Tree Swallow box. The surprising result of simultaneous temperature readings was the degree to which temperatures at ground levels exceed air temperature. For example, on one sunny day in June when air temperature was only 14° C (57° F), the temperature in the Savannah Sparrow nest reached 38° C (101° F). Interestingly, as average air temperatures rose during the summer, ground nest temperatures fell because the increasingly dense vegetation blocked solar radiation and raised humidity.

Kent Island survived Hurricane Bob and the subsequent storm that damaged President Bush's home in Kennebunkport, but the enormous swells created by the storms devastated herring weirs throughout the Grand Manan Archipelago, causing millions of dollars of losses for local fishermen.

Kent Island Life

The Club Dingleberry was the locale for two original "still films" (one of them a world premiere) created by Peter Cunningham. Using a trio of slide projectors and every spare bed sheet on the island, Peter showed striking parallel images of New York City graffiti and skyscrapers matched with treasures combed from Kent Island's beaches and lobsterboats tied together in Grand Harbour. Music composed by Lisa Cunningham accompanied the show. Maybe it was Peter's influence that inspired the creation of a John Kent sculpture out of found objects, the hands-down winner of last summer's annual

Dominion Day/Fourth of July beach cleanup in the category of "most artistic." For the occasion, we dined around the campfire. Before dessert, a cake decorated with an American flag, we assembled for a group photograph. Seeing his chance, the Herring Gull who habitually sits on the widow's watch atop the dorm swooped down and gobbled a dozen stars and several stripes.

I presented a more conventional slide show on the history of Kent Island at the Annual Meeting of the Grand Manan Museum. (It was that night that Josh, Jeff, Sarah and I kissed the ground of Kent Island at midnight after wandering disoriented in the total darkness around the Three Island harbor in the whaler for nearly an hour.) Communications with the mainland have reached new heights with the arrival of a cellular phone. We use it only to make important phone calls, though, and still rely on VHF radio to receive messages from Russell and Angie's house.

Besides volleyball, home-run derby, hacky-sack, and the "hidey game," last summer's recreation included touch football, hearts, and even a few rubbers of bridge with Susie and Bob Mauck. Our cook was Jake, who fed us well. After dinner entertainment was frequently intellectual, with research seminars by Bob Mauck, Keith Grasman, and University of Chicago graduate student Dan McShea, as well as each of the undergraduates. Saturday nights were reserved for listening to "the Café Boeuf" on NPR's American Radio Company of the Air. The now-traditional end-of-the-summer ballad to departing students was entitled "Silhouettes in the fog." Sung to the tune of "Silhouettes on the shade," the song dated Genie and me -- none of the students had ever heard of it.

We hosted a variety of visitors last summer, including birding tours organized by Field Guides and Victor Emanuel Nature Tours, the New Brunswick Federation of Naturalists led by Hal Hines (who took advantage of his morning on the island to add numerous plant species to the flora list), environmentalist and author Dorcas Miller, graduate students Tom Good (University of New Hampshire) and Reuven Yosef (Ohio State University) and his family, Doug and Sandy Gill (University of Maryland), the Piersons, Kate and Louise Huntington, and other family and friends.

Once again the island was alive with children: Seth and Nina Murray, Emily and Alex Wheelwright, and Katy Mauck, with visits by Theron, Chris, and Megan Ingalls and Tom and Ollie Cannell, escorted by their father, Peter ('76),

former Director of the Bowdoin Scientific Station.

Kent Island T-Shirt

The Bowdoin Scientific Station has a new commemorative T-shirt, featuring a silhouette of a storm-petrel flying across an outline of the island. The shirts come in two colors and a variety of sizes for adults and children. If you would like to purchase one, please send a check made out to the Kent Island Fund for \$10 per T-shirt (see enclosed form).

If you are able to add to your check a contribution to the Kent Island Fund, it would be much appreciated. Mark reports that the small dinghy that we depend on is "nothing but one big patch." Like much of the physical plant and equipment on the island, it needs to be replaced. At a time when Bowdoin College's finances are stretched to the breaking point and a number of the College's programs are being eyed to see if they are dispensable, it seems ever more important for Kent Island alumni to express in a tangible way the value of the Bowdoin Scientific Station in the curriculum, in conservation, and in scientific research.

Additions to the List of Publications from the Bowdoin Scientific Station

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