

BOWDOIN COLLEGE

BOWDOIN SCIENTIFIC STATION

BRUNSWICK, MAINE 04011

1988 Annual Report

Since the Last Annual Report

The 1987 Annual Report of the Bowdoin Scientific Station triggered a spate of wonderful letters from Kent Island alumni/ae filled with memories of summers spent on the island. It was delightful to hear previously unrecorded details of Kent Island's history, such as descriptions of the flavor of gull eggs prepared by Carrie, Ernest Joy's housekeeper, or the attempt to control the island's gull population by introducing raccoons. A pair of anecdotes revealed unexpected ties between the Bowdoin Scientific Station and two great institutions in evolutionary ecology: Barro Colorado Island and Ernst Mayr.

Bill Gross, the Bowdoin Scientific Station's first Field Director, recounted the tale of his visit as a teenager to Barro Colorado Island, the Smithsonian Institution's premiere tropical field station in Panama. Several years later, on his first trip to Kent Island, he and his father, Bowdoin ornithology professor Alfred Gross, recognized that this boreal island, like its tropical counterpart, held promise as a biological field station. The Bowdoin Scientific Station thus came to be modeled after Barro Colorado Island. Burt Whitman, a member of the "Kent Island Expedition of 1934" along with Bill Gross, related that it was Harvard Professor Ernst Mayr who persuaded Alfred Gross that "someone really ought to study those storm-petrels on Kent Island." Bill Gross, Chuck Huntington, Bob Ricklefs and many others have followed Mayr's good advice. Thank you for your responses to last year's Annual Report.

We were saddened to learn that the man who donated Kent Island to Bowdoin College in 1936 passed away in May, 1988. John Sterling Rockefeller's gift came with the stipulation that the island be used only for scientific purposes and remain a bird sanctuary, and 50 years later he was "very

pleased" by the station's achievements in research and wildlife conservation. In our final conversation last spring, he was curious as always about research on Leach's storm-petrels and expressed his satisfaction at the recovery of the common eider population resulting from the protection of their breeding colony.

This fall the Bowdoin Scientific Station was invited to become a member of the Organization of Biological Field Stations. Kent Island thus joins 91 private and university/college-affiliated field stations worldwide with a common interest in the development of research and education in field biology.

The Summer of 1988

Peter Talmage assured me it would work. I assured the National Science Foundation it would work. But privately I wondered. Solar power on an island in the Bay of Fundy? During a summer that turned out to be one of the foggiest in Bob Cunningham's memory? What would be the civil penalties for misleading a federal granting agency? In fact, the NSF-supported project to provide electricity for the Bowdoin Scientific Station has proven successful beyond our expectations. Peter (Talmage Engineering, Kennebunkport), caretaker Bob Tate, carpenter Paul Perkins, and a host of researchers spent three hectic days installing the photovoltaic system. Nine inconspicuous panels generate enough electricity on all but the most obscure days to power a small computing center in the Club Dingleberry (two Macintosh SE's and a printer); DC lights for the dorm, shop, and Warden's house (no more wrestling with Coleman lanterns and burning highly refined fossil fuel); and equipment such as centrifuges, electronic balances, power tools, battery rechargers, etc.). Peter also designed a luxurious 40-gallon solar-heated shower and a 500-gallon elevated cedar

storage tank to provide a backup supply of water for drinking and fire-fighting. (No one need fear that life on Kent Island has become totally cushy; there are still plenty of deprivations to build character, as those who spend several chilly and fog-bound months there will testify.)

The grant also allowed the station to purchase binoculars, telescopes, and two "data loggers," which are sophisticated portable computers that can be programmed to take measurements of temperature, windspeed, wind direction, humidity, solar radiation, and other variables at second-intervals simultaneously at numerous sites. The buildings on the island received a much-needed coat of white paint, thanks to a work-crew led by Bob Tate. We have acquired a new building, a small house-boat formerly known as the "muskrat-trapper's shack," which has been shingled and converted to researcher's quarters, and sits now on the eastern shore of the basin. Dave Barbour, Bowdoin's Director of Physical Plant, visited the island in June with Herb Wilson and conducted a thorough inspection of all of the buildings at the station. Bowdoin students Sue MacDonald ('89) and Chris Filardi ('89) worked halftime during the summer as carpenters, electricians, landscapers, and indispensable all-round handypersons in addition to conducting their own research. Their work extended the 50-meter quadrat trail system now in place over much of the central fields into a 6-hectare section of the dense spruce-fir forest on the north end of the island, opening up the area for future studies of the population dynamics of migratory warblers.

The station still needs funds to build an adequate research laboratory. Larry Clark of the Monell Chemical Senses Center, who spent part of August at Kent Island investigating storm-petrels' sense of smell (see below), expressed the problem well, if with some understatement. "Unfortunately," he wrote, "working in the paint shed did not provide the most conducive environment for olfactory work." Luckily, Bob Cunningham has established a special fund for building a lab, with generous support from the Gross family and the Eberstadt Foundation. Plans are to seek additional funds from NSF.

Research Projects in 1988

As in 1987, the major research projects at the Bowdoin Scientific Station in 1988 dealt with Common Eiders, Leach's Storm-Petrels, Savannah Sparrows, Tree Swallows, and climate.

- Common Eiders -- Once again Peter Walsh, a Ph.D. candidate from Yale University, was the first to appear on Kent Island in late April as he continued his research on social behavior and population structure in Common Eiders. Assisted by Merissa Irwin (Beloit College '89), Peter collected blood samples from adult ducks and ducklings which he intends to analyze using DNA fingerprinting. The technique should reveal who is really related to whom and explain a variety of behaviors he suspects may be occurring, such as females dumping their eggs in other ducks' nests, copulating with males other than their mates, and guarding the offspring of their sisters. Peter also began research on the relationship between parasite-load and nesting density.

- Leach's Storm-Petrels -- Leach's Storm-Petrels were the most popular birds to study last summer. Chuck Huntington's investigation of storm-petrels entered its 34th year. Between May and October he made numerous trips to the island to determine survivorship, reproductive success, nest-site selection, and mate choice in his study population. Chuck's bird-banding program established two longevity records this year with the highlight being the return of "Prince Phillip," a male storm-petrel known to be at least 32 years old. A Black Guillemot recovered by Chuck last summer with an age of at least 15 years set another longevity record for a North American bird species. Margot Downs ('91), Chuck's field assistant, helped with the monumental task of entering decades of Chuck's data into files for computer analysis. Incidentally, the August 1988 issue of Yankee magazine featured Chuck in an article entitled "A student of underground sea birds."

Bob Ricklefs, Professor of Biology at the University of Pennsylvania, and his

graduate student Nina Stoyan worked with Corey Freeman ('91) on a multi-faceted study of storm-petrel development. For several years Ricklefs has been monitoring the growth of chicks in about 30 nests along Petrel Path to determine seasonal and annual variation in parental feeding behavior. Last summer his group hand-reared storm-petrels on diets that differed in energy and oil content. Chicks on high energy diets and chicks on low lipid diets grew larger than controls. Other parts of the research focused on the development of the immune system in nestling storm-petrels (which, like other seabirds, seem remarkably free of blood parasites despite their colonial breeding) and the measurement of blood hormones. Just before fledging nestling storm-petrels show an increase in thyroxine levels in the blood; because body temperature simultaneously rises, Ricklefs is exploring the possibility of hormonal regulation of metabolism during the period of pre-fledging weight loss, when chicks metabolize a considerable amount of their accumulated body fat and drop in weight to the level of their parents.

Haven Wiley, Professor of Biology at the University of North Carolina, returned in August with his wife, Minna, and children, Keith and Aleta, to unriddle the significance of storm-petrel vocalizations. Haven discovered that a component of the "chatter" call (the familiar complex call given in flight or in nest burrows) can be used by researchers and presumably storm-petrels to distinguish individuals. Using carefully balanced play-back experiments, Haven showed that the call is important in recognizing mates and possibly in challenging nest intruders.

As a follow-up to his earlier overland homing experiments, SUNY-Albany graduate student Bill Johnson spent the field season attempting to attach lightweight radio transmitters to storm-petrels' backs in order to find out whether the birds used olfaction to find their way over unfamiliar terrain. A difficult problem, he discovered, was the trade-off between distance of transmission and weight of the apparatus; transmitters with an adequate reception range proved to be too heavy for the birds to carry without affecting the very behavior Bill was trying to study. Larry Clark and Bryn Mawr graduate

student Cindy Smeraski used a very different approach to get at the question of olfactory sensitivity in storm-petrels. Tom Grubb's dissertation research on Kent Island suggested that olfaction played an important role in foraging, homing, and sociality in storm-petrels, but it was not known how sensitive their sense of smell was. Armed with computerized electrophysiological equipment, Larry and Cindy employed behavioral conditioning techniques in the lab at the Bowdoin Scientific Station to determine olfactory thresholds for natural and artificial odors. Their conclusion, in Larry's words, was that "petrels are pretty darn sensitive, possibly approaching dogs or humans -- which are some of the best noses around."

- Savannah Sparrows -- During the second year of my study of the population biology and behavioral ecology of Savannah Sparrows, Cheryl Schultz ('91), Corrie Detweiller ('91) and I banded nearly 500 sparrows, including nestlings from more than 100 nests. We've found that roughly 45% of adults and 12% of fledglings return to Kent Island between years. That means that we can start to decipher genetic relationships between mates and neighbors. We discovered, for example, that male sparrows defending adjacent territories and vying for the same females sometimes turn out to be brothers. The study is leading towards an assessment of the costs and benefits (in terms of survival and production of offspring) of individual variation in habitat selection, investment in reproduction, and mate choice. A preliminary analysis of our data shows no correlation between male parental effort and the size (and presumed health) of his offspring. Females are evidently quite capable of raising nestlings unassisted, which is not unexpected since about 40% of the males are polygamous. There is a definite trend, however, towards smaller fledglings and clutch sizes as the season progresses.

We joined forces with Joe Williams (Research Associate at the University of Arizona) and Peter Bergstrom (Assistant Professor, Washington and Lee University) to quantify the costs of incubation in Savannah Sparrows in a harsh, high-latitude

environment. Joe brought to Kent Island his expertise in the use of radioisotopes (specifically, doubly-labeled water) to determine the metabolic rate of female sparrows under natural conditions. At the same time we observed the behavior of incubating birds and measured their physical environment by using copper models and data loggers with thermocouples. Corrie, a dual chemistry/biology major, followed through on the study by writing a grant proposal that allowed her to spend two weeks at Joe's lab in Tucson completing the biochemical analyses of blood samples from seven female sparrows.

- Tree Swallows -- Joanna Leary ('88) was responsible for the second year of the Bowdoin Scientific Station's participation in an international, collaborative study of the influence of insect abundance on clutch size in Tree Swallows. Besides banding adults and their nestlings in more than 100 nest boxes, she sampled aerial insects twice daily. There are two big hatches of insects (mostly midges), one in mid-June just as the first swallow nestlings hatch, and a second in late July, shortly after the fledglings have become independent. Joanna also conducted an experiment to determine why swallows typically lay 5-6 eggs (rather than, say, 3 or 8 eggs). By manipulating clutch size in 30 nests, she demonstrated that experimentally enlarged clutch sizes resulted in reduced fledgling weight and survival compared to experimentally reduced clutches. Control nests were intermediate.

- Climate -- Bob Cunningham and University of Maine researchers Dick Jagels and Jobie Carlisle, assisted by Kent Island veteran Sue MacDonald ('89), collected fog samples for their comparative study of fog acidity and chemistry in northeastern North America. The results are sobering once again. Fifteen samples were extremely acidic, with an average pH of 3.5 last summer. Combined with data from earlier studies by Bob and others, such low pH values represent a tenfold increase in acidity since 1939, due mostly to rising nitrate emissions.

Bob is working on a related project of equal importance for understanding

environmental pollution. By analyzing weather charts, he has been able to reconstruct weather trajectories over a period of several days and relate the routes air masses take to the acidity of their fog. For example, southerly summer winds at Kent Island usually portend fog, but trajectories that originate in the Caribbean produce fog banks that are much less acidic (pH 5.8) than trajectories that sweep up the congested Atlantic coast (pH 3.4).

Kent Island Life

We tried a culinary experiment last summer which by most accounts was a great success. Instead of hiring a fulltime cook, the undergraduates took weekly turns as chefs. Chris's portions were the most ample, Cheryl's baking the most ambitious, Corey's efforts the most uncomplaining, and Margot's recipes the most gourmet.

A high point of the 1988 research season was the return of Doug Gill for the first time since he spent a summer at the Bowdoin Scientific Station in 1965. It was Doug's experience as an undergraduate at Kent Island that launched his illustrious career in ecology and earned him his current position as Professor of Biology at the University of Maryland. Some readers of this report may recall posted on the wall of the dorm a black-and-white photograph of an unshaven youth brandishing a net-covered hula hoop on the back of Myhron Tate's boat. That was Doug attempting to capture shearwaters at sea. When Doug, Peter Hodum ('88), Blinn Dorsey ('88), and I made a trip to Kent Island in early May, we unearthed the original hoop and persuaded Doug to pose with it in front of the dorm. Twenty-three years later he has lost little of his original form.

Jan and Liz Pierson also came back to Kent Island last summer, bringing their children Elspeth and Anna, and lending their considerable skills as ornithologists to the Savannah Sparrow project and the censusing of migratory shorebirds.

In an effort to develop closer ties between Kent Island and Grand Manan Island, I gave a slide show about research at the Bowdoin Scientific Station at the annual meeting of the Grand Manan Museum and

another to a tenth grade science class at the high school. Later in the summer, six of the students visited the station with their teachers. (One of the students left the island bloodier but wiser after an encounter with a vicious Herring Gull....)

The final trip of the season occurred during October break. A dozen ecology students, Visiting Assistant Professors of Biology Robert and Ellen Dawley, their son, Nathan, Chuck, Emily and Alex Wheelwright, and I spent three good days at the station before Bob Tate closed it down for the season.

Additions to the List of Publications from the Bowdoin Scientific Station

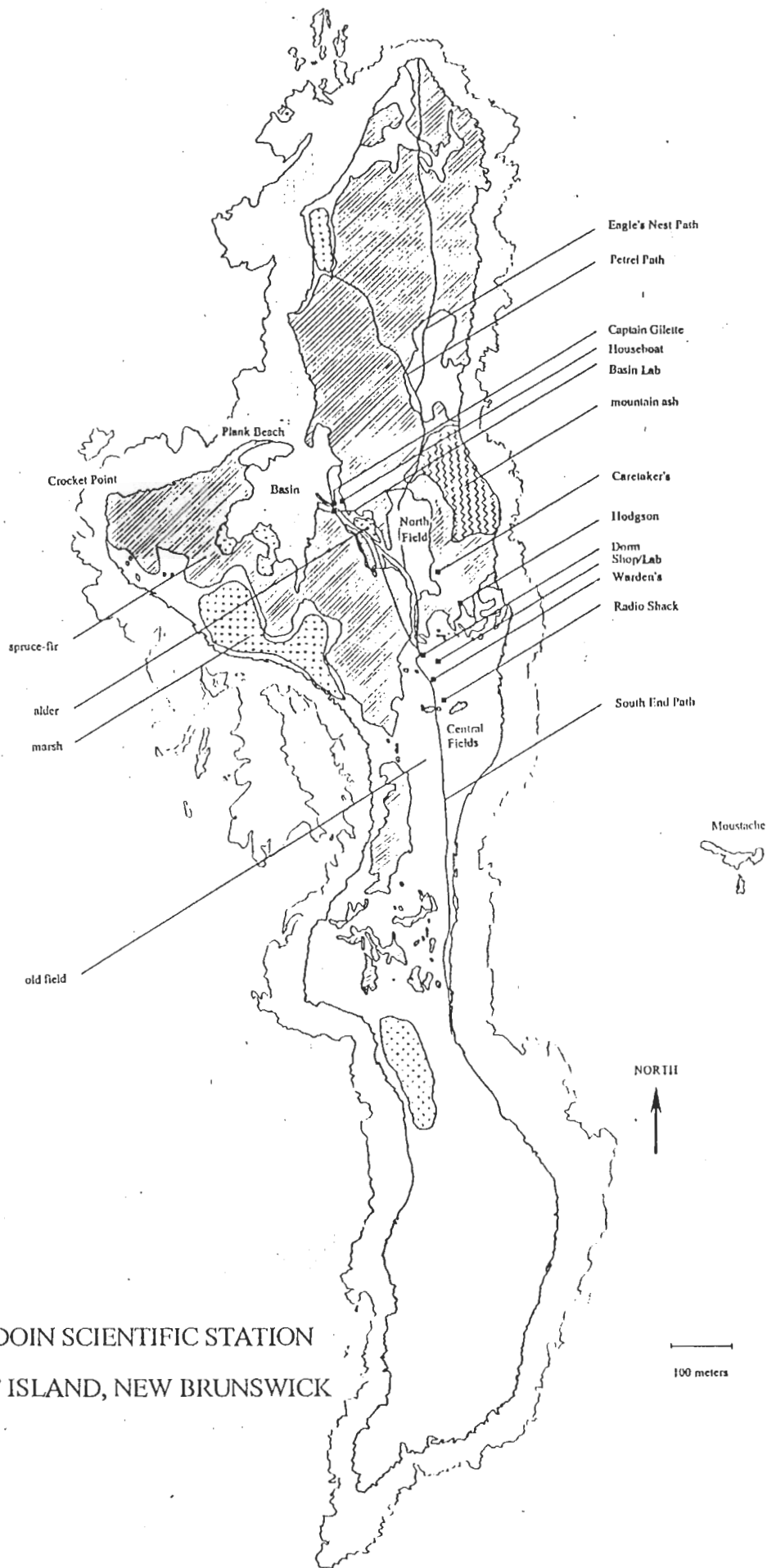
Research at the Bowdoin Scientific Station has resulted in the publication of more than 80 scientific articles in peer-reviewed journals. Students who received their first experience in field biology as undergraduates at Kent Island have been authors on 45% of all publications based on research at the Bowdoin Scientific Station. During the compilation of the list of publications from the Bowdoin Scientific Station in last year's Annual Report of the Bowdoin Scientific Station the following titles were overlooked or accepted for publication after the report was written.

- Gobeil, R.E. 1968. The double scratch in the genus Passerculus. *Wilson Bulletin* 80: 334-335.
- Rothstein, S.I. 1973. Plastic particle pollution of the surface of the Atlantic Ocean: evidence from a seabird. *Condor* 75: 344-345.
- Maddox, G.D., and P.F. Cannell. 1982. The butterflies of Kent Island, Grand Manan, New Brunswick. *Journal of the Lepidoptera Society* 36: 264-268.
- Burt, E.H., Jr., and W. Chow. 1983. "Facing in" is not general to all gulls nesting on cliffs. *Canadian Field Naturalist* 97: 222-224.
- Ricklefs, R.E., A.R. Place, and D.J. Anderson. 1987. An experimental investigation of the influence of diet quality on growth in Leach's Storm-Petrel. *American Naturalist* 130: 300-305.

- Cunningham, R.M., and F. Sanders. 1987. Into the teeth of the gale: the remarkable advance of a cold front at Grand Manan. *Monthly Weather Review* 115: 2450-2462.
- Rahn, H., and C.E. Huntington. 1988. Eggs of Leach's storm petrel: O₂ uptake, water loss, and microclimate of the nest. *Comparative Biochemistry and Physiology* 91: 519-521.
- Williams, J.B. 1989. Field metabolism of Tree Swallows during the breeding season. *Auk*. In press.
- Pierson, E.C., C.E. Huntington, and N.T. Wheelwright. 1989. Homing experiment with Leach's Storm-Petrel. *Auk*. In press.

The Annual Report of the Bowdoin Scientific Station is being sent to Bowdoin alumni who were Biology majors, to visitors to and friends of the station, to past and present researchers, and to members of the Bowdoin Scientific Station Site Advisory Committee. If you would rather not receive the report, or if you know of someone whom we have omitted from the mailing list, please jot a note on the enclosed postcard and drop it in the mail.

Nathaniel T. Wheelwright
Director, Bowdoin Scientific Station
28 December 1988



BOWDOIN SCIENTIFIC STATION
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