Annual Report of the Bowdoin Scientific Station 1998

Since the Last Annual Report

On January 1, 1948, Ernest Joy inaugurated a new guest book for Kent Island. Fifty-one years later, the worn brown ledger (signed by most readers of the Annual Report of the Bowdoin Scientific Station) is almost full. The first entry is that of Raymond Paynter, Bowdoin alumnus ('47), former Field Director of the Bowdoin Scientific Station (1946-8), and current Curator of Birds at Harvard's Museum of Comparative Zoology. The second signature is Chuck Huntington's. The guest book shows that Chuck has spent a part of every month of the year on Kent Island, a distinction shared by Ernest Joy, Bob Cunningham, and not too many other hearty souls since Florence Brown's house in the north field burned to the ground in 1926. Curious about the biology of Kent Island during the winter, I took advantage of a sabbatical leave to experience a bit of January, February and March on the island. Bob Mauck (Kenyon College) and Chuck joined me on the late January trip. On the crossing from Seal Cove to the island, Russell Ingalls took us dragging for sea urchins, known locally as "sea eggs." With just a few gulls soaring soundlessly through clear frigid skies over the tawny bare fields and Common Eiders nowhere to be seen, Kent Island felt familiar but strangely unfamiliar at the same time. It was, in Bob's words, "sort of like seeing your wife with a wig on." By late March, when I returned, the gulls were hurling full-throated. Five hundred Brant grazed on eelgrass in Three Islands Harbor, and there were huge flocks of American Robins and Dark-eyed Juncos. Despite five inches of lingering snow, Song Sparrows and Winter Wrens were singing.

The Summer of 1998

Russell Ingalls opened the station shortly before I took myself out in the Ernest Joy out on May 26. The summer crew of students led by Chuck and Bob Cunningham appeared the next day on Russell's boat, Misty Maid. That night, high water wasn't until 1 AM so we reassembled at the wharf after midnight to unload food, belongings, and scientific gear in the dark. Kevin Haskins ('99) served ably as handyman and helped coordinate chores on the island. Our group project was to scrape and paint the trim, doors and windows of the Radio Shack and Shop. Over the last decade, the Shop has gradually been slumping eastward, so Russell organized a gang to pry the building up with a weir top-pole, and refurbished the foundation blocks. At the end of the summer, once the Savannah Sparrows had finished nesting in the grass, Russell barged over his tractor and mower. For the first time in 50 years, the north field and much of the south field were mowed to keep raspberries, blackberries and white spruces from encroaching.

At the end of the summer, Russell took us out on a memorable whale-watching expedition. Midway between Grand Manan and Nova Scotia we were surrounded by a pod of nine Right Whales, which represented more than 5% of the world's population of the endangered species.

Research in 1998

-Leach's Storm-Petrels

Chuck Huntington completed his 44th summer chasing Leach's Storm-Petrels. Besides banding nestlings and new recruits to the population and collecting information on longevity and reproductive success, Chuck and his field assistant Hilde Petersen ('00) recorded foot injuries in the birds. About two-thirds of all adults have injuries of some sort, from pinholes in their webs to the loss of an entire foot. Small holes usually heal over time, but lost claws are

not replaced. Not surprisingly, older birds are more battle-scarred, but males are no more likely than females to have foot injuries, despite the fact that males presumably do most of the excavation of burrows. Incidentally, Chuck was warmly portrayed in a 1998 article in Birders' World entitled "The Professor."

In his December 25, 1998 Quoddy Times column, "Confessions of a Naturalist," Brian Dalzell quoted excerpts from Herrick's 1871 account of the birds of Grand Manan. Many of Chuck's former field assistants will identify with what the 19th century naturalist wrote about the Leach's Storm-Petrel: "it is nothing of a feat to dig four or five hundred eggs in a single day; but the most energetic oologist would scarcely undertake a second day's work, as the first would have worn off his fingernails, and demoralized his hands and arms."

Katie O'Reilly (University of Portland) began her research on Kent Island's Leach's Storm-Petrels in 1996, taking advantage of Chuck's marked population to measure how the birds' adrenocortical response to stress changes with age. She returned in 1998 to continue her work with the assistance of Julie Kurkinen ('99, U. Portland). High levels of the hormone corticosterone have been associated with mobilization of glucose stores, increased feeding behavior, and "escape" behavior. However, chronic elevation of corticosterone inhibits reproductive behavior and immune function. Because an elevated stress response may enhance survival (and future reproduction) at the expense of present reproduction, Katie hypothesized that younger birds would have a higher stress response than older birds. The stress response (measured by the increase in plasma levels of corticosterone between 3 and 30 minutes after capture) was negatively correlated with age in 1996 but not in 1998. (This is why less intrepid researchers prefer one-year studies.) Baseline levels of corticosterone were positively correlated with age in both years, however. Males and females had similar levels of corticosterone in response to capture stress, as predicted in storm-petrels because both sexes have equal and obligate parental care. Julie measured known-age chicks on alternate days to construct growth curves for estimating the age of chicks of unknown birth date. As part of her honors thesis, Julie is currently using molecular tools to determine the sex of storm-petrels from DNA isolated from red blood cells. If successful, the technique will be useful because storm-petrels are difficult to sex except just after egg-laying.

After reading the 1997 Annual Report, Don Griffin (Professor Emeritus, Harvard University), who conducted landmark homing experiments on Kent Island in 1938, suggested a more parsimonious explanation for the ancient wind-up Victrola we found in the attic of the Radio Shack. I'd assumed that it was he who'd left it behind after using it to spin storm-petrels and disorient them, but he wonders, "Could it have been used for making music?" I suppose I should have thought of that.

-Savannah Sparrows

Kim Tice ('00), my field assistant, proved to be a talented nest finder and bird-bander. Together we found 85 nests within our 7-hectare study area. The exceptionally early spring had an unexpected positive effect on nesting success in Savannah Sparrows, at least if the following hypothesis is correct. To time their northward migration, most temperate zone songbirds cue in mainly on day length, which is independent of the weather; in 1998 the sparrows nested pretty much on schedule, perhaps a few days early. Plant growth, on the other hand, responds to temperature, and in 1998 the vegetation on Kent Island was 7-10 days ahead of normal. The leaves of blueflag iris and one-leaf rein orchis had already emerged by May 31, for example. By the time the sparrows built their nests, the vegetation was exceptionally high, and the high levels of nest predation typical early in the season never occurred, presumably because the birds' nests were more effectively concealed. Having just published a paper with Bob Mauck demonstrating that Savannah Sparrows on Kent Island never breed with relatives, I came upon an Oedipal two-year-old male mated with his mother, the first case of incest recorded in this population. Still, with more than 1100 pairings documented so far, this is a much lower rate of inbreeding than one would expect by chance. Meredith Swett's ('99) honors thesis may have uncovered how birds recognize kin: certain elements of

their song are inherited or learned from their fathers. The next step in our study will be to determine if females avoid mating with males whose songs are similar to the females' fathers.
In a variety of shorebirds and songbirds, individuals that invest relatively heavily in caring for young tend to have low levels of both corticosterone and testosterone. Since 1996, Katie and I have teamed up to test whether the same negative correlation between parental care and hormone levels exists in male Savannah Sparrows, which show a range of parental behavior. Males active in nestling-feeding proved not to have significantly different levels of testosterone or corticosterone than males offering less parental care. However, males did have significantly higher levels of corticosterone than females during all stages of breeding (mate-guarding, incubation, and nestling-feeding). Corticosterone levels did not change during the reproductive cycle in either sex, but testosterone levels were elevated in males when they were guarding mates. Interestingly, fledgling males (<40 days old) had levels of testosterone similar to adult males during the incubation and nestling-feeding stages. Fledglings exhibited no sex differences in corticosterone levels, which were similar to adult females but significantly lower than adult males.
Corey Freeman-Gallant ('91) completed an analysis of blood parasites in Savannah Sparrows. Avian malaria (Plasmodium) was completely absent on Kent Island and on Outer Wood Island, uncommon but present in Black's Harbour, and more common farther south. As for other parasites, a seven-year-old male sparrow had eight Rabbit Ticks (Haemaphysalis leporispalustris) on his head. Rabbit Ticks on songbirds are known to carry the Lyme disease spirochaete, but fortunately the ticks seldom bite humans.

-Tree Swallows

Although Kent Island's Tree Swallow colony has plummeted from more than 100 active nests a decade ago, it has held relatively steady over the last few years. Twenty-eight nest boxes were occupied in 1996, 30 in 1997, and 33 in 1998, so we may be witnessing a gradual recovery of the population. Amy Ray ('98) found that only 20 nests fledged young, which is fairly typical for these aerial-feeding insectivores under marginal conditions. To test whether older, more experienced swallows were more proficient at incubation than one-year-olds, Amy placed Hobo temperature sensors in nests to monitor incubation patterns. Compared to one-year-olds, older females had longer incubation shifts (12.8 vs. 10.7 minutes), spent more of the day on the nest (67% vs. 58%), and did not allow their nest temperatures to fall as low during their briefer absences (19.3o vs. 16.3o C).
Other swallow populations are not faring well on Kent Island. For a second summer in a row, no Rough-winged Swallows nested on the island, and for the first time in decades, Cliff Swallows were absent. Barn Swallows continue to nest in dwindling numbers, with about 10 pairs breeding on Three Islands. The decline in swallow numbers is not restricted to Kent Island. While at Machias Seal Island for our annual visit to the puffin and tern colonies, we learned that neither Tree Swallows nor Barn Swallows bred on the island in 1998.

-Yellow Warblers

Kevin followed up on last summer's study by Peter Ingram ('99). Seven of the nine nests he followed were in white spruce trees, which would be an unusual place for Yellow Warblers to nest on the mainland. Using Hobo temperature sensors and direct observations, Kevin discovered that females sometimes had incubation shifts averaging nearly one hour. Apparently, frequent feeding of the incubating female by her mate allows such lengthy shifts. Experiments with artificial Brown-headed Cowbird eggs placed in five Yellow Warbler nests confirmed Peter's findings that the warblers do not eject them or abandon parasitized nests. Kevin estimates that about 50 pairs of Yellow Warblers nest on Kent Island.

-Seabirds

Kim Mawhinney and Tony Diamond (University of New Brunswick) have recently assessed the population density of Common Eiders, Herring Gulls and Great Black-backed Gulls around Kent Island and elsewhere in the Bay of Fundy. Drawing on 10 years of data from aerial surveys and nest counts, they estimate that about 9000 pairs of eiders breed in the area, a population size that has remained relatively constant since 1987 but that dwarfs the small number of eiders breeding during the 1930s. Approximately 5400 pairs of Herring Gulls and 1800 pairs of Great Black-backed Gulls breed on islands in the Bay of Fundy. Historically, Herring Gull populations were substantially higher whereas Great Black-backed Gulls were scarcer.

Debbie Jeffrey (Canadian Wildlife Service) returned to gather data for Glen Fox's long-term study of the effect of environmental contaminants on Herring Gulls. This summer she brought Lori Fox and Karen as field assistants. Kyle Loring ('98) conducted an experiment to test whether false eye-spots taped to the back of a hard hat truly deter Herring Gulls from dive-bombing. To my surprise, after exposing himself to daily systematic walks through the gull colony, he found no difference in the frequency of attacks or the number of direct hits with or without eye-spotsóit appears that we may have been fooling ourselves into thinking that the eye-spots conferred some protection. He did document, however, that most attacks come from behind (60%) or the side (35%) vs. the front.

-Bird Populations

It's odd to have two species of wrens on Kent Island, but last summer we had three. Winter Wrens, common as ever, were joined by a lone male House Wren, who spent June and July singing incessantly and stuffing Tree Swallow boxes with bare spruce twigs and spider egg cases (the latter a sexually selected advertisement of paternal feeding ability?). More unusual was the male Carolina Wren who overwintered on the island (perhaps the same individual that first appeared the previous July?); he was singing at the north end in late March, and remained throughout the summer. Another uncommon bird, a Tricolored Heron, showed up in the Basin for just one day, June 3. One of the first birds I saw when I arrived on the island May 26 was a Red-headed Woodpecker, which was sitting on a swallow box in the north field. The bird, well out of its normal range, disappeared the next day. There were spectacular migrant "fallouts" on May 29 and June 2, with Philadelphia Vireos, Wilson's Warblers, and Mourning Warblers. Bald Eagles (which had begun nesting on Hay Island by late March) and Merlins were seen almost daily throughout the summer; the latter left piles of sparrow feathers in their favorite hunting area south of the lime kiln. For the second year in a row, shorebirds were slow in arriving and few in numbers. There were only scattered flocks by late July. The Peregrine Falcon that frequented Three Islands for much of July fed heavily on eider ducklings.

-Plant and fungus ecology

Dave Moeller, a graduate student from Cornell University, undertook a detailed study of the reproductive ecology of blueflag iris in an effort to understand the evolution of breeding systems in island plants. His analyses so far suggest no differences in fruit set between plants that were experimentally self-pollinated and those that were outcrossed on Kent Island or the two mainland sites (Blacks Harbour and Back Bay, NB). Moreover, there was no difference between sites for those treatments, which suggests little variation in breeding system among islands and mainland populations, contrary to expectation. At every site, the unavailability of pollinators limited fruit set: hand-outcrossed plants had higher fruit set than controls (85-94 % vs. 31-47%). Reproductive success appeared to decrease through the flowering period on Kent Island: flowers that opened between June 8 and 14 had 64% fruit set, compared to 47% fruit set from July 1-2, and 28% fruit set from July 14-16. Interestingly, early in the season bumblebeesópresumably the most effective pollinators of irisesówere abundant on Kent Island's irises, whereas later in the season they switched to other flowers; late-flowering irises were visited chiefly by seaweed flies (Coelopidae), which carried little or no pollen. Autogamy (fruit set in the absence of pollinators) occurred with low frequency (18% on Kent Island, 5% in Blacks

Harbour, and 0% in Back Bay).
A number of mushrooms that were conspicuously absent in 1997 were abundant in 1998, including Amanita muscaria, Boletus edulis, and B. badius.

-Marine Ecology

Kyle and Paul Nguyen ('98) studied the role of disturbance in maintaining species diversity in the intertidal zone. After removing all algae and invertebrates from 25 quadrats (25x25 cm square) at various sites around the island, they monitored recolonization. The first species to appear were filamentous red algae; green algae were also quick to colonize bare patches. Kyle and Paul also quantified the percent cover of intertidal organisms around the entire island. The elaborate wave meters they brought to measure wave exposure worked, sort of: within a few tides, the wild Bay of Fundy waters carried off all of the meters from exposed sites.

-Insect and Spider Ecology

In 1997, Kyle Apigian ('98) documented differences in habitat use by a guild of ground beetles (Carabidae). The beetles have subsequently been identified. Kent Island has 16 species of ground beetles representing 11 genera: Agonum retractum, Bembidion wingatei, Calathus ingratus, C. gregarius, C. opaculus, Calosoma frigidum, Carabus granulatus hibernicus, C. nemoralis, Chlaenus sericeus, Harpalus rufipes, Notiophilus biguttatus, Platynus decentis, Pterostichus adestrictus, P. coracinus, P. pensylvanicus, and Sphaeroderus stenostomum.
Chris Thompson of the U.S. Systematic Entomology Laboratory has recently completed the identification of the last of Justin Schuetz's ('93) Kent Island fly collection:

DIPTERA
Anthomyiidae
Alliopsis sp. (apparently an undescribed species)
Botanophila betarum Lintner
Delia platura Meigen
Fucellia tergina Zetterstedt
Pegomya sp.
Pegoplata aestiva Meigen
Dolichopodidae
Hydrophorus sp.
Rhagionidae
Rhagio sp.
Scathophagidae
Ceratinostoma ostiorum Curtis
Scathophaga furcata Say
Scathophaga intermedia Walker
Scathophaga stercoraria L.
Syrphidae
Lejops (Polydontomyia) curvipes Wiedemann
Melanostoma mellinum L.
Platycheirus (Caroposcalis) obscurus Say
Sericomyia militaris Walker
Sphaerophoria sp.
Sphaerophoria contigua Macquart
Sphaerophoria philanthus Meigen
Sphegina rufiventris Loew
Toxomerus marginatus Say
Tabanidae
Hybomitra sp.

In addition to working on sparrows, Kim undertook the challenge of censusing Kent Island's spiders and establishing a reference collection. Kim was able to distinguish at least 30 species from a dozen families, although the final tally of this taxonomically difficult group is likely to be appreciably higher. With the help of arachnologist Dan Jennings, we identified the following spiders: Alopecosa aculeata, Pardosa fuscula, P. groendlandica (the common wolf spider often seen among the cobbles on the east beach, carrying their young on their backs), P. moesta (abundant in the fields) (Lycosidae); Thanatus sp. (Philodromidae); Phidippus sp., Salticus scenicus (Salticidae); Tetragnatha sp. (Tetragnathidae); and Xysticus emertoni (Thomisidae). On foggy mornings, Kent Island's fields are thick with the dew-bejewelled webs of two species that have not yet been identified, a funnel-web spider (Agelinidae) and a tiny bowl-and-doily spider (Linyphiidae). Spiders identified only to family included representatives of Amaurobiidae, Araneidae, Clubionidae (found inside the neatly folded leaves of blueflag iris), and Theridiidae.

-Mammals

A young 13-foot female Minke Whale grounded on the southeastern shore of Hay Island on May 30. By the time we reached her, she was dead. Researchers from the North Head Whale Research Institute boated over to take measurements and samples. Unlike the Right Whale that washed up on a Kent Island beach in 1994, this one was small enough and far enough away that it didn't nauseate us when the wind shifted. During our late January visit, the island was crowded with Muskrats; it was impossible to walk a few hundred meters without coming across a half-dozen. Snowshoe Hares, on the other hand, seemed in January to be in a low phase of their population cycle, so it was a good opportunity to put into action a management plan to reduce their numbers further. (The hares were introduced to Hay Island in 1956 despite Chuck's objections; since then, they have caused increasing damage by grazing virtually all tree seedlings except those of white spruce.) Russell and I went out to the island in late March with Tom Skaling ('62), Rick Elsaesser, and Bob Naegely, who brought along a pair of hunting dogs and munitions. Oh, and permits, which were easy given that Snowshoe Hares are classified as "nuisance wildlife" in New Brunswick. Tom had spent nearly five months alone on the island during the winters of 1980 and 1982. Twenty-four hares were "removed," and during the summer we trapped nine more, which we estimate must be about half of the current population. The aim is to hold hare numbers to a minimum for at least several years, so that a cohort of young trees can become established to replace those that have blown over or died during the last few decades.

-Meteorology

As usual, Bob Cunningham (MIT, retired) spear-headed the organization of weather record-keeping. Besides the standard twice-daily observations, a Campbell datalogger continuously monitors temperature, wind speed and direction, solar radiation, precipitation, fog interception, and fog pH. All three summer months were at least 0.6o C warmer than the 30-year average; in fact, Bob has documented a marked warming trend since the 1960s. Late June was uncharacteristically foggy, whereas July was sunnier than usual. Noting that the well was very low on August 17, Bob figured that "it might well have gone dry if the island had been occupied during the first half of August." In July, Bob presented a paper at the International Council on Fog and Fog Collection in Vancouver based on 60 years of studying fog on Kent Island.

Artist-in-Residence

Francesca Maddaluno ('00) was the summer's Artist-in-Residence. She introduced us to the use of charcoal powder and compressed charcoal for drawing still-lifes of found objects (bones, rocks, feathers), and continued Kristen Hand's ('97) tradition of enriching island life with

art. Francesca's main project was illustrating a field guide to the most frequently encountered species on Kent Island, particularly birds, butterflies, flowers, lichens, and marine invertebrates, with text contributed by individual researchers.

Kent Island Life

Our garden was not an overwhelming success, alas. As soon as we arrived, we planted lettuce, broccoli, basil and zucchini seedlings in the cold frame, but an infestation of cutworms (Noctuidae) immediately decimated them. Coincidentally, last year was also an especially big year for June beetles. Bob Cunningham had spoken of an outbreak some years back where the beetle larvae undercut the grass so thoroughly that the wind rolled up great pieces of loose sod. The same thing happened in 1998, as a 15-foot diameter patch exfoliated on the lawn.
Vegetarians outnumbered carnivores but Hilde, our spectacular cook, managed to keep everybody happy with stir-fries, calzones, quiches, fresh-baked bread and plenty of desserts. To get out of her last night of cooking, Hilde bet Kyle that she wouldn't do her laundry all summer. She won, and Kyle had to cook Spam pizza. Kevin's mastery on the guitar provided evening entertainment in the Club Dingleberry. With accompaniment on guitar by Amy (and sometimes me), he led us through the Rise Up Singing songbook and inspired our end-of-the-summer song, sung to the tune of "Dirty Ol' Town." Kevin also played wonderful Irish "session tunes" on fiddle, joined by Louise Huntington during her visit. Cora Kevin, one of Clara Dixon's Albion College field assistants from the late 1960s, returned for her 30th reunion and brought her daughter Kale. Cora recalled for us the famous summer of '67, when thick fog was recorded on 63 days. Jonathan Oxley, a New Brunswick graduate student working on Leach's Storm-Petrels in Nova Scotia, spent a day in the field with Chuck. Other visitors included Steward Steffey ('01), Becky Koulouris (Environmental Studies, and bearer of much appreciated fresh fruit and activities), and Francesca's mother Rosa. Emily and Alex Wheelwright each spent just two weeks each on the island, but long enough to take part in fierce games of pinochle and sleep-overs on the wharf (needless to say, Katie was the instigator of both activities). We also played homerun derby, soccer and volleyball, knitted, and decorated Ukrainian eggs. Kyle and Hilde helped everybody get buff with a regular late night Fitness Club.
Inspired perhaps by 1997's summer Christmas feast, somebody hatched the plan of celebrating Halloween early, complete with tricks and treats for everybody. The highlights were Paul's gift of a hardhat with fake antlers and a bull's eye (a reference to an "unintentional" hunting accident on Grand Manan some years earlier); a National Enquirer mock-up of Genie as Elvis's girlfriend, left open in the outhouse; and the stuffing of my locker with spruce branches while House Wren songs were played. The students dressed up in the spirit of their research projects (irises bagged in wedding veils, mist nets with Yellow Warblers, spiders, storm-petrel burrows, etc.); Weez and Chuck impersonated Genie and me. The Dingleberry was a venue for another dance, this year with a 1980s theme.
Ten students from my Ecology class, plus Chuck and University of California-Davis graduate student Alexis Blackmer, closed the station for the season after our field trip September 18-20. The whales we see most commonly on most ferry crossings are Fins and Minkes, so we were pleased to see several Humpback Whales on the way to Grand Manan.

Addenda to the List of Publications from the Bowdoin Scientific Station

More than 140 articles have been published in peer-reviewed journals based on research on Kent Island. Papers with an author who was an undergraduate at the Bowdoin Scientific Station are indicated by asterisks. Numbers in parentheses represent Contribution Numbers from the Bowdoin Scientific Station. The complete list of publications can be found here.

Wheelwright, N.T., and R.A. Mauck. 1998. Philopatry, natal dispersal and inbreeding avoidance in an island bird population. Ecology 79: 755-767. (121)
Jagels, R., R. Cunningham, J. Carlisle, and M. Day. 1998. Documented 50-year change in

acidity and chemistry of New England fog. Proceedings of the First International Conference on Fog and Fog Collection, Vancouver, Canada. (143)
Cunningham, R.M. 1998. Fog studies in the Bay of Fundy over a span of 60 years. Proceedings of the First International Conference on Fog and Fog Collection, Vancouver, Canada (138).
Nevitt, G. 1998. Foraging by sea birds on an olfactory landscape. American Scientist 46-53-87.
**Freeman-Gallant, C.R. 1998. Fitness consequences of male parental care in Savannah sparrows. Behavioral Ecology 9: 486-492. (127)
**Wheelwright, N.T., T.M. Smith, and R.A. Zink. Self-pollination in an island plant community. American Midland Naturalist (in review). (120)
**Freeman-Gallant, C.R., and N.T. Wheelwright. Offspring condition and survivorship in Savannah Sparrows: implications for the measurement of adult fecundity. Journal of Animal Ecology (in review). (128)
**Freeman-Gallant, C.R. and M. D. Rothstein. Apparent heritability of parental care in Savannah Sparrows. Auk (in review). (141)
**Futamura, C.W., and N.T. Wheelwright. The distribution of mosses on Kent Island, New Brunswick. Northeastern Naturalist (in review). (139)
**K. Apigian, and N.T. Wheelwright. Habitat associations of ground beetles (Carabidae) on an island in the Bay of Fundy. Canadian Entomologist (in review). (142)
Templeton, J.J., and N. T. Wheelwright. 1998. Age-specific foraging skills: when do fledgling Savannah Sparrows learn to forage independently? International Society for Behavioral Ecology. (abstract)
O'Reilly, K.M. 1996. Age is negatively correlated with the adrenocortical response to capture stress in breeding Leach's Storm Petrels. American Zoologist 36: 126A. (abstract)
O'Reilly, K.M. 1997. Corticosterone elevation during autumn migration in semipalmated sandpipers and western sandpipers. American Zoologist 37. (abstract)
O'Reilly, K.M., J.A. Kurkinen, and A.R. Savage. 1998. The effect of age and gender on the adrenocortical response to stress in Leach's Storm-Petrels. Pacific Seabirds. (abstract)
O'Reilly, K.M., A.R. Savage, and N.T. Wheelwright. 1998. Sex and age differences in the adrenocortical response to stress and testosterone levels in Savannah Sparrows during the breeding cycle. American Zoologist 38. (abstract)

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January 8, 1999

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