



Rhode Island Naturalist

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Observations on the colonization of the invasive tunicate *Didemnum* sp.

BY LINDA A. AUKER AND CANDACE A. OVIATT

An invasive tunicate (Figure 1), referred to presently as *Didemnum* sp. (the organism has not yet been identified to species), has been observed in Narragansett Bay since 2000, when it was found

at Coasters Harbor Island in Newport during a rapid assessment survey (Pederson et al. 2001). These tunicates, also called ascidians, have been observed at the University of Rhode Island (URI) Graduate School of Oceanography (GSO) dock since 2002, when Dr. Christopher Deacutis (URI) photographed the dock pilings and noticed *Didemnum* sp. colonizing the pilings above the low water line. *Didemnum* is considered a strong competitor with the ability to rapidly colonize a substrate (Coutts 2002), and it prefers hard substrate, like dock pilings, over soft sediment (Bullard et al. 2007).

The ecology of *Didemnum* sp. is poorly known, and the effects of its introduction to an ecosystem have not been studied in detail. There may be competition for space and food between *Didemnum* sp. and native species (Stachowicz 2004), especially the Blue Mussel (*Mytilus edulis*), a

primary food source for important species in Narragansett Bay, e.g., Tautog and Common Eider (Olla et al. 1974). The tunicate frequently overgrows adult mussels, often to the point where the ability of the mussel to open its valves is restricted (personal observation). As part of a larger study of *Didemnum* sp. distribution in Narragansett Bay, we conducted a six-month study at the GSO dock in 2005. We compared *Didemnum* percent cover and recruitment timing to that of *M. edulis*, and also to two other colonial tunicates present in the bay, *Botrylloides violaceus* and *Botryllus schlosseri*.

Dr. Robert Whitlatch of the University of Connecticut has used 100-cm² polyvinyl chloride (PVC) panels attached to PVC pipes suspended from floating docks to quantify recruitment of newly settled organisms at different sites in Long Island Sound (Whitlatch and Osman 2005). For our study in Narragansett Bay, the same types of panels were used, which were hung from the GSO dock ladder. Four of these panels—referred to as community panels—were used to examine changes in percent cover of *Didemnum* sp., *B. violaceus*, and *B. schlosseri* over a six-month period. Panels were photographed once per month from May to October in 2005. Photographs were then used to measure percent cover of each of the three colonial ascidians using an image analysis program, Scion Image. All other

organisms (i.e., *Mytilus edulis*) were identified and counted. The average rates of growth of each *Didemnum* sp., *B. violaceus*, and *B. schlosseri* on individual panels were calculated as cm²/day.

Identical panels to those used in the community assemblage study were suspended along with the community panels to measure recruitment. They were replaced once a week and analyzed under a dissecting microscope. All sessile animals were counted and identified using Bullard and Whitlatch (2004), and the counts were averaged by month.

Didemnum sp. and *Mytilus edulis*

Recruitment of Blue Mussels at the GSO site peaked in June, but fell back to very low levels in July (Figure 2). *Didemnum* sp. began to recruit at this time and eventually abundances peaked in September. On the community panels, adult mussels were visible only in August, and occurred at relatively low levels (Figure 3). *Didemnum* was first visible in August, followed by substantial increase in September and a maximum in October.



Providing Ecosystem Science and Information

A Message From the Editor

We missed getting out the Fall/Winter 2006 issue of *Rhode Island Naturalist*. To compensate, this issue is larger than usual (e.g., there are five research articles instead of our usual three). The focus of the issue is on invasive species, following what we did in the 2006–2007 Mark Gould lecture series and our March 2007 Annual Conference.

You will note that some of our continuing features are missing. There is no EIMS article, since the Survey no longer has a formal Ecological Inventory, Monitoring, and Stewardship Program or staff. Lisa Gould's "Invasives Beat," which she began in 2005, ended as such with Lisa's departure for North Carolina last year. "Notes from Field and Study," a column that Rick Enser revived from the old *Narragansett Naturalist* in our November 2003 issue, has fallen victim to Rick's retirement and departure for Vermont. We need the help of you—the members of the RI Natural History Survey and readers of *Rhode Island Naturalist*—to continue providing a quality publication. As Peter Paton's message on page 20 points out, the Survey has a remarkably dedicated and hard-working staff, but there are only three of them. Everyone else involved is a volunteer.

We need your contributions to future issues of *Rhode Island Naturalist*. We re-designed our format a few years ago for increased visibility and enhanced focus on scientific research. We now lead off with Scientific Reports, and are especially interested in your contributions there. This is the perfect time to dust off that half-finished note in the back of your desk drawer. We are also looking for your contributions in these other areas:

- Articles that would fit into either the "Notes from Field and Study" or "Invasives Beat" theme.
- Reviews of recent books related to natural history (plants, animals, habitats, geology, hydrology, soils, etc.);
- Articles on Rhode Island natural history collections;
- "Focus On" pieces featuring one of the RINHS member organizations;
- Any other information you think would be pertinent to the Rhode Island ecological/natural history community.

We publish two issues per year, in spring/summer and fall/winter. Copies of recent issues can be viewed or downloaded at our web page — <http://www.rinhs.org> (go to "Web Publications," then "RI Naturalist"). For a copy of our author's guidelines, contact me at rkennedy@gso.uri.edu or the RINHS office at info@rinhs.org. Or, please contact me if you have any other questions about submitting an article.

Robert D. Kenney, editor

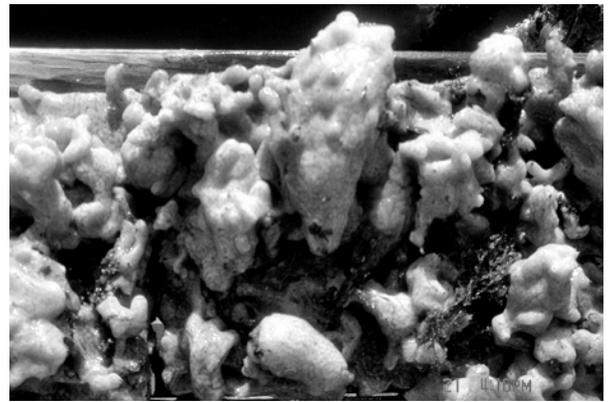


Figure 1. *Didemnum* sp. growing on a settlement panel hung from the URI GSO dock in 2005.

Didemnum sp. and other colonial tunicates

Didemnum percent cover over the six-month period was compared to other colonial tunicates (*Botrylloides violaceus* and *Botryllus schlosseri*) on the community panels (Figure 4). *B. violaceus* was first present in June, and *B. schlosseri* appeared in July at slightly higher coverage. *Didemnum* sp. appeared in August, as the other two species decreased slightly, and became strongly dominant in September and October. *Didemnum* sp. appeared later in the season and had the highest growth rate (1.03 ± 0.82 cm²/day), compared to *B. violaceus* (0.06 ± 0.58 cm²/day) and *B. schlosseri* (0.00 ± 0.70 cm²/day) during each of their time present on the panels (3 months, 5 months, and 4 months, respectively); most or all of the growth by *Botrylloides* and *Botryllus* was offset by overgrowth of *Didemnum*. Comparing recruitment for the three colonial tunicates, *Botrylloides* and *Botryllus* showed peak recruitment rates one month earlier than *Didemnum*, in August, and in substantially lower numbers (Figure 5).

Mytilus edulis provides a secondary substrate for other species that grow attached to hard surfaces (Lindsey et al. 2006, Miyamoto and Noda 2004). Overgrowth of *M. edulis* by *Didemnum* sp. was observed on all panels, and it was clear that *Didemnum* used the mussel as a substrate. The decrease of adult mussels on the community panels was most likely due to overgrowth by the tunicate. However, recruitment panels also showed a significant decline in recruitment of Blue Mussels as *Didemnum* began to settle on panels. It warrants further study to determine if the decline of the mussel recruitment was due solely to *Didemnum* sp. recruitment increase, or if there were additional factors that may have affected *M. edulis* recruitment.

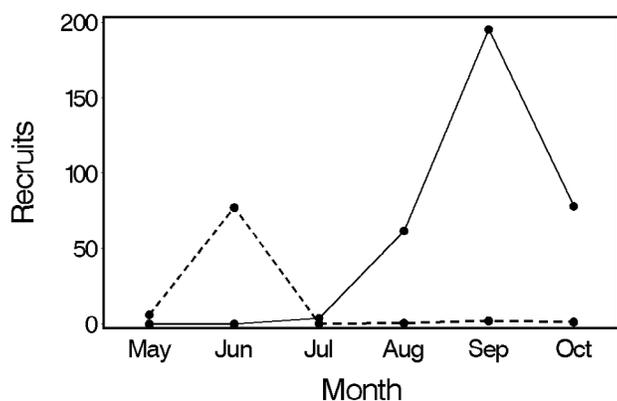


Figure 2. *Mytilus edulis* recruitment (dashed line, numbers of settled larvae per 100-cm² panel) peaks then declines earlier than *Didemnum* sp. recruitment (solid line).

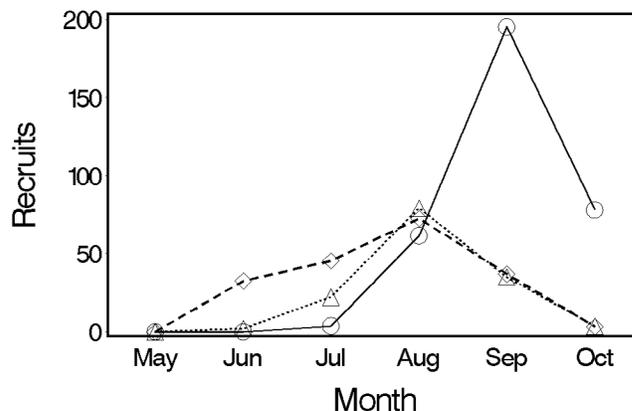


Figure 5. The peak recruitment (numbers of settled larvae per 100-cm² panel) of *Didemnum* sp. (solid line and circles) at the GSO dock occurred a month later (and in greater abundance) than both *Botrylloides violaceus* (dashed line and diamonds) and *Botryllus schlosseri* (dotted line and triangles).

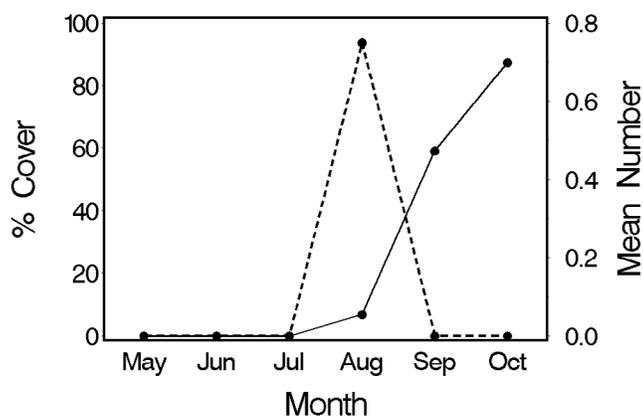


Figure 3. *Mytilus edulis* (dashed line, mean number of adults per 100-cm² panel) appeared during the month of August on the community panels and declined thereafter, as *Didemnum* sp. percent cover (solid line) increased. This decrease in visible mussels on the panels was most likely attributed to overgrowth by the tunicate.

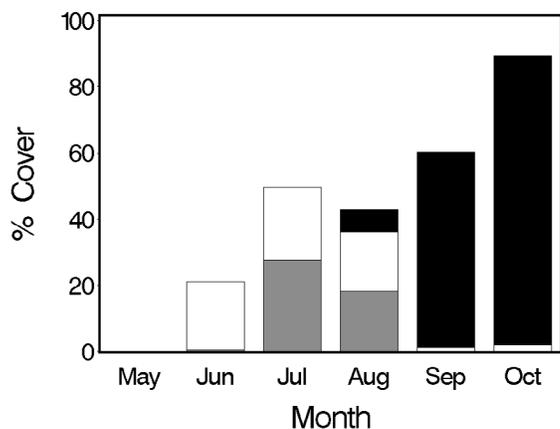


Figure 4. *Didemnum* sp. (black bars) became the dominant colonial tunicate on the community panels during September and October (*Botrylloides violaceus* = white bars; *Botryllus schlosseri* = gray bars).

Didemnum sp. did not avoid competitors like *B. violaceus* and *B. schlosseri* and soon overtook them at the GSO dock. Competitive success depends on the types of species interacting rather than the size of the colonies (Nandakumar and Tanaka 1997), and smaller colonies of *Didemnum* were able to compete with larger colonies of other tunicates. *Didemnum* exhibits toxic properties and low pH, which may serve as further advantage to strong colonization (Bullard et al. 2007).

Didemnum took a longer period of time to establish itself as a dominant species in New England fouling communities than *B. violaceus*, though they were introduced at about the same time in the late 1970s (Dijkstra et al. 2007). During the past few years, however, increasingly warmer temperatures in Narragansett Bay may have allowed *Didemnum* sp. to spread more rapidly and compete more strongly with the other colonial tunicates (Stachowicz et al. 2002). It is clear that its recruitment peak was simultaneous with the temperature peak in Narragansett Bay during 2005 and the warmer summer of 2006 yielded more *Didemnum* recruits than the previous summer (L. Auker, unpublished data).

Since *Didemnum* sp. shows competitive advantage over other species, there is a danger of its potential to successfully invade other parts of the bay. If one species has a competitive advantage over each of the others, then

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eventually it takes over all the sites in a system (Durrett and Levin 1998). Bullard et al. (2007) concluded that this tunicate “may be of particular concern for shellfish, and thus the aquaculture industry, as colonies can completely overgrow the siphons of epifaunal and infaunal bivalves and lead to their death,” not to mention the threat of reducing viable fish habitat.

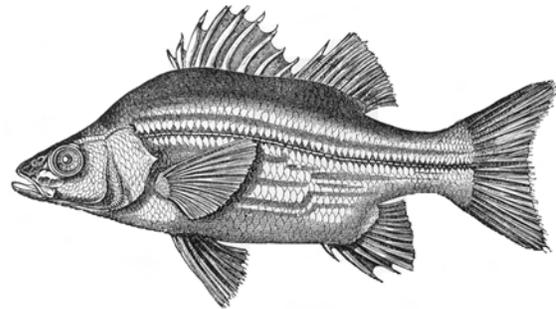
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Linda Auker completed her M.S. degree at the URI Graduate School of Oceanography, where she wrote her thesis on the distribution and ecology of Didemnum sp. in Narragansett Bay, and is now a Ph.D. student at the University of New Hampshire. Dr. Candace Oviatt, Linda's M.S. thesis advisor, is a Professor of Oceanography at the University of Rhode Island.



Phragmites australis: It's Not All Bad

BY LAURA A. MEYERSON

Rhode Island, like most other states in the U.S., has increasing numbers of invasive species (Figure 1). *Phragmites australis* (Common Reed) is an invader and yet it presents us with what seems to be a paradox. Introduced *Phragmites australis* is a non-native species that is one of the most prominent invaders of coastal marsh systems in the U.S. and is ubiquitous in Rhode Island. Yet there is also a non-aggressive native strain in Rhode Island and elsewhere that seems to be declining and is becoming a cause for conservation concern (Meyerson et al. in press). Introduced *Phragmites* is a very successful colonizer that has produced a suite of

ecological changes—some of which are considered beneficial and others that are not. Therefore, as we learn more about this species, we begin to realize that responsible management is perhaps not as straightforward as once thought.

Phragmites is a robust, perennial emergent grass found on every continent with the exception of Antarctica (Tucker 1990). In North America, introduced *Phragmites* has a wide range of tolerance for environmental conditions and can grow in fresh, brackish, and salt marsh systems (Marks et al. 1994). It establishes new stands both by seed and dispersal of rhizome fragments, but expansion of existing stands is primarily vegetative. *Phragmites* can produce large quantities of seeds, but germination rates are variable and generally low (Galinato and van der Valk 1986). The slow decomposition of its detritus can significantly reduce the availability of nutrients, light, and space, making the survival or establishment of other plants unlikely (Meyerson 2000, Figure 2).

Native *Phragmites* populations that historically were abundant are now rare in the Northeast. The few remnant native

Phragmites populations that persist in New England salt marshes are under great threat from the continued expansion of introduced *Phragmites*. Native *Phragmites* typically is smaller in stature, grows in mixed-plant communities, and has a lower stem density than introduced *Phragmites*, although populations with high stem densities can occur (Meadows 2006). Native *Phragmites* is typically less aggressive and appears to have a lower tolerance for salinity and flooding (Vasquez et al. 2005).

Different studies have found varying impacts of introduced *Phragmites* on plant and animal communities. For example, the outcomes of several studies suggest that detrimental effects of *Phragmites* on fish communities are ubiquitous among young-of-the-year residents, with potentially important implications for long-term population sustainability and secondary production. Hunter et al. (2006) found that in the mid-Atlantic, the stage of *Phragmites* invasion (i.e., early, middle, late) influences habitat quality for *Fundulus* spp. As an invasion progresses, habitat quality for *F. heteroclitus* (Common Mummichog) and *F. luciae* (Spotfin Killifish) appears to decline and may even result in the extirpation of the less common *F. luciae* in mid-Atlantic coastal marshes. At the same time, adult resident fishes have been documented with the same densities among *Phragmites* and non-*Phragmites* stands unless

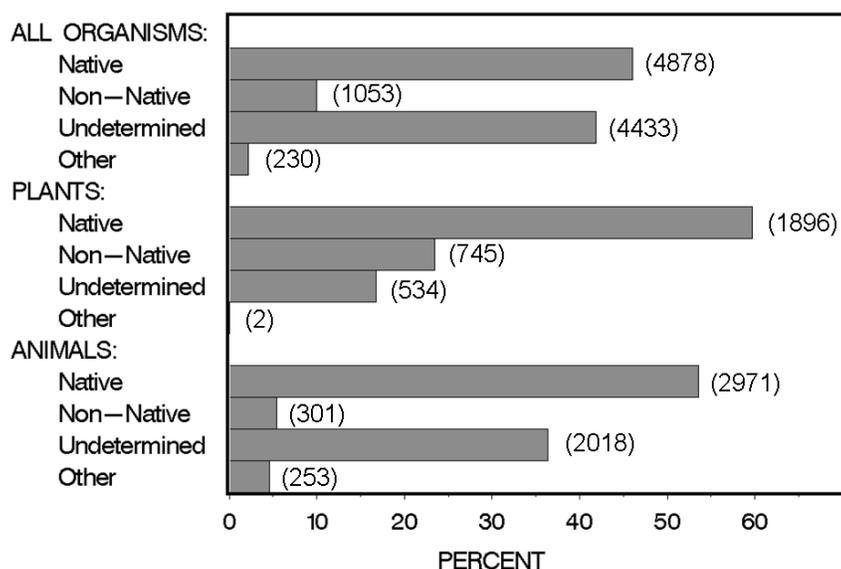


Figure 1. The percent of organisms (numbers of species in parentheses), within each category, documented in Rhode Island by their assigned status of native, non-native, undetermined, or other. “Non-native” includes organisms introduced to Rhode Island from other parts of North America as well as from other continents. “Undetermined” includes species whose nativity status has not yet been determined. “Other” includes non-breeding visitors (e.g., migratory birds that do not breed in the state) and species that may be present in both native and non-native forms. For all documented organisms in Rhode Island, approximately 10% are known to be non-native. When categories are further refined, the percent of non-native plants in Rhode Island is about 23% and non-native animals about 5%. It should be noted that significant data gaps exist in Rhode Island and elsewhere, particularly for taxa such as invertebrates, fungi, and pathogens. Therefore, as more taxa become better surveyed, these numbers are likely to shift. (Data Source: Rhode Island Natural History Survey Biota of Rhode Island Information System [BORIIS])



Figure 2. Introduced *Phragmites* (right) grows in fresh to very brackish marsh systems. *Phragmites* is an aggressive competitor and can replace native species like native *Typha latifolia* (Broadleaf Cattail, left). (Drawing by Elizabeth Farnsworth)

there is demonstrable impact on hydrology and microtopography (Able and Hagan 2000, 2003; Able et al. 2003; Fell et al. 2003; Meyer et al. 2001; Osgood et al. 2003). For coastal marsh restoration, this result implies that physical setting can be restored and food web function can be maintained without needing to completely eradicate *Phragmites* stands. Other studies have shown little or no effect of *Phragmites* on animal communities and some even suggest benefits. For example, Mclary (2004) found that the abundance of Ribbed Mussels (*Geukensia demissa*) was greater in introduced *Phragmites* than in *Spartina alterniflora* (Smooth Cordgrass) stands in an urban habitat. Clearly much of the evidence remains open to debate and suggests the need for further study.

Restoration of degraded coastal systems has become increasingly important for habitat protection as pressures mount from development, population growth, and global climate change. In Narragansett Bay, for example, 65% of remaining coastal wetlands have been identified as candidates for restoration because of ditching and tidal restrictions (Tiner et al. 2003). In general, restoration outcomes for systems invaded by *Phragmites* have been variable. Some restoration efforts have successfully reached plant community goals or

have restored underlying physical marsh processes, while others have failed to prevent *Phragmites* reinvasion or have not increased productivity. Furthermore, mitigated and created wetlands frequently serve as unintentional nurseries for introduced *Phragmites*. Constructed tidal wetlands are engineered to encourage growth of native species, but *Phragmites* often establishes and spreads to the exclusion of these other species (Havens et al. 2003). As a consequence, wetlands lost to development are replaced by created wetlands dominated by *Phragmites*. However, there is good news about what can be accomplished by a *Phragmites* restoration. A recent study suggests that utilization of *Phragmites* relative to *Spartina* may vary by trophic group. For example, *Phragmites* invasions may cause arthropod food webs to become detritus-based instead of plant-based because the herbivore assemblages the arthropods depend on are largely absent. This is reversed, however, once salt marsh vegetation is restored (Gratton and Denno 2005, 2006).

An existing gap in knowledge is whether or not the native and introduced strains of *Phragmites* can interbreed. In multiple sites, native and introduced *Phragmites* grow together. Despite this overlap, no evidence has been detected for interbreeding between the native and introduced strains. This is surprising given that they are considered to be the same species. However, recent work indicates the potential for interbreeding in the wild by the two subspecies with overlapping flowering periods, since greenhouse experiments have produced hybrid seed (Meyerson and Viola unpublished data).

Somewhat ironically, after extensive resources have been devoted to controlling and eradicating introduced *Phragmites*, there is a groundswell to protect the remaining stands of native *Phragmites*, particularly in areas such as the northeastern U.S. A reasoned, science-based debate is urgently needed on this issue so that better management can be undertaken. Because current knowledge on the ecology of native *Phragmites* is limited, management strategies that would promote the growth of native *Phragmites* over the introduced form cannot yet be implemented. The rhizomes of native *Phragmites* tend to be small relative to the introduced type, are more sparsely distributed, and can undergo intense competition from the high diversity of wetland plants in oligohaline and tidal freshwater marsh systems—all factors which are likely to inhibit the natural spread of native *Phragmites*. To date, native *Phragmites* has not been used in marsh restoration efforts so its ability to survive and prosper in restored systems is unknown. More basically, we do not yet understand which native populations should be used in marsh restoration, which habitats are most suited for native *Phragmites*, and what other native plants would best suit a marsh system that was intended to encourage the growth of

native *Phragmites*. In the absence of growth information on native *Phragmites*, the precautionary principle should be applied to prioritize preservation of remaining stands of native *Phragmites*.

Although introduced *Phragmites* is an aggressive invader and managing these invasions is a high priority, the impacts of this species are still not fully understood and warrant further study. Native populations of *Phragmites* are rare and many are in need of protection so that we do not lose our native strains. Identification of native *Phragmites* requires a small amount of training and sharp-eyed naturalists, and ultimately confirmation of the plant's genetics through testing. Learning to distinguish between these two strains is key to responsible management and to preserving our native biological diversity.

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A Different Sort of Invader: The Second Manatee to Visit Rhode Island

BY ROBERT D. KENNEY

In the summer of 2006, Rhode Island's Narragansett Bay was one stop on the summer vacation of an animal that was far from its native habitat. While it did not really qualify as an invasive species, it was certainly rare and unusual, but not quite unprecedented. The visitor in question was a Florida Manatee.

Sirenians

Manatees are members of the mammalian order Sirenia, which includes the marine and fresh-water species known collectively as “sea cows” (Reynolds and Odell 1991). There are four living sirenian species in two families. Three species of manatees (Family Trichechidae) occur in the tropical Atlantic—the African Manatee (*Trichechus senegalensis*) of west African coastal waters, estuaries, and rivers; the Amazonian Manatee (*T. inunguis*) of the Amazon River system of South America; and the West Indian Manatee (*T. manatus*) of the tropical Americas. The other living species is the Dugong (*Dugong dugon*; Family Dugongidae) of the tropical Indo-Pacific. A fifth species, Steller's Sea Cow (*Hydrodamalis gigas*), was a sub-Arctic dugongid found only around the Commander Islands in the western Bering Sea. It was first discovered in 1741 during the North Pacific explorations of Capt. Vitus Bering, who had been commissioned by Russian Empress Anna Ivanovna. The newly discovered mammal was one of many species recorded in the journals of the voyage by naturalist Georg Wilhelm Steller. The last surviving Steller's Sea Cow was killed and eaten only 27 years later, setting some sort of dubious record for the shortest time between discovery and extinction.

Sirenians are fully aquatic, with many adaptations similar to those seen in the whales and dolphins (Order Cetacea). In fact, sirenians were long considered to be odd, herbivorous cetaceans (e.g., Hamilton 1839), but the two groups are not at all closely related. Sirenians are included with the elephants (Order Proboscidea) and hyraxes (Order Hyracoidea) in a group of mammals that split off early in the evolution of mammals and radiated in Africa, known as the Afrotheria (Murphy et al. 2001, Reyes et al. 2003, Scally et al. 2001).

Cetaceans are related to the even-toed hoofed mammals (Order Artiodactyla), most closely to hippopotamuses, within a lineage of mammals that largely radiated in the Northern Hemisphere. Sirenian adaptations for an aquatic lifestyle include a more or less fusiform body, absence of hair except for well-developed vibrissae or whiskers on the muzzle, loss of the hind limbs, forelimbs modified into paddle-like flippers, and swimming powered by a horizontally flattened tail (Figure 1). Dugongs have tails expanded into lateral flukes like a whale, while manatee tails are broad and rounded like a very large ping-pong paddle. All sirenians are obligate herbivores, feeding primarily on seagrasses and also on submerged and floating aquatic vegetation.

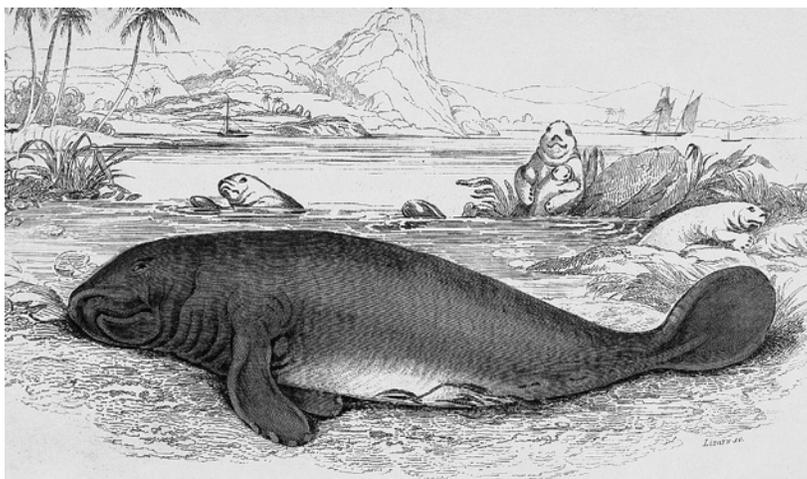


Figure 1. Engraving of West Indian Manatees from Robert Hamilton's 1839 monograph on "Amphibious Carnivora" (seals, sea lions, and walrus) and "Herbivorous Cetacea" (manatees and dugong). Note the depiction of a nursing mother and calf in the background.

West Indian Manatees are large, rotund, docile, and slow-moving, ranging in length from 2.5 to 4.5 m (Jefferson et al. 1993, Wynne and Schwartz 1999). The common name comes from the Carib word “manati,” meaning a woman's breast (Reynolds and Powell 2002). Manatees have a single pair of nipples located under the flippers (i.e., in their “armpits”), and a nursing mother and calf present a quite human-like image (Figure 1). The body is tapered and somewhat streamlined, with a relatively small head. The skin is relatively smooth, hairless, and uniformly gray or gray-brown, often with distinctive scars from boat collisions. The eyes are small and deep-set, and the fleshy muzzle is covered with stiff vibrissae. The only teeth present, except for vestigial incisors that are resorbed soon after birth, are 5–7 molars in each upper and lower jaw, which are replaced from the rear and drop out at the front of the row when worn (Caldwell and Caldwell 1985, Husar 1978). The skull and other bones are very dense and heavy, perhaps adapted to serve as internal “dive weights.” The forelimbs are relatively long and flexible, with blunt, rounded ends and elephant-like nails. The forelimbs are often used in feeding, in conjunction with

the nearly prehensile upper lips, for manipulating vegetation into the mouth.

West Indian Manatees occur in warm subtropical and tropical waters of the western North Atlantic (Caldwell and Caldwell 1985, Husar 1978, Reynolds and Powell 2002). They are primarily found in freshwater systems, estuaries, and shallow, nearshore, coastal waters. The species ranges from the southeastern U.S. to Central and northern South America, the Caribbean, and the West Indies. The manatees found in Florida are recognized as a distinct subspecies, the Florida Manatee (*Trichechus manatus latirostris*). Florida Manatees aggregate in the winter in warm-water locations like outfalls from power plants, sewage treatment facilities, and industries, as well as freshwater springs, and disperse in the summer to feeding grounds as far north as the Chesapeake (Reynolds and Odell 1991, Reynolds and Powell 2002).

“Chessie”

Our 2006 visitor was not the first Florida Manatee known to make it as far as Rhode Island. That honor belongs to an adult male known as “Chessie” (named for the location of his initial capture) who came to our shores eleven years earlier, in 1995. “Chessie” was first observed in a Chesapeake Bay tributary as winter approached in 1994 (ORG 2003). Because of concerns that he might not be able to survive as temperatures declined, he was captured, transported to Florida, equipped with a radio transmitter that could be tracked by satellite, and released. When the weather warmed the following spring, he departed from Florida and

headed north along the coast. “Chessie” did not make his expected left turn into Chesapeake Bay, but continued north past New Jersey into New York Harbor and then into Long Island Sound. He traveled the entire length of the Connecticut and South County, Rhode Island shores before finally reaching Point Judith on the 16th of August. Though it was a very interesting occurrence from a scientific standpoint, it was also quite confounding, since RINHS had just completed what we mistakenly thought was the final draft of the mammal checklist for the *Biota of Rhode Island* vertebrates volume (August et al. 2001). At that point, “Chessie” apparently saw the error of his ways, because he turned around and started back home. He eventually lost the tag near New Haven, Connecticut, but was sighted in Virginia on 23 September and recognized back in his normal winter habitat in Florida in November. He made at least one more trip north, but not as far—he was seen again in Virginia in 2001 (USGS 2006).

A second Florida Manatee headed our way three years after Chessie’s visit, but did not quite reach Rhode Island. This animal was seen in Montauk Harbor at the eastern end of Long Island for about a week in late July of 1998 (Kim Durham, Riverhead Foundation for Marine Research and Preservation, pers. comm.), but the local residents apparently had the good sense not to name it “Monty.”

“Tappie”

The manatee that visited us in the summer of 2006 was in fact the third individual to wander as far north as southern New England in just over a decade. This animal traveled from place to place for a month and a half, leaving a trail of sighting reports in its wake (Figure 2, Hamilton and Puckett 2006, and many media reports). It was first reported in Ocean City, Maryland on the 11th of July. It was then seen in Delaware Bay on 14 July and at Barnegat Inlet, New Jersey on 22–23 July. Next it lingered for about a week in the Hudson River, from the 1st to the 8th of August. Analysis of photos showed that it was definitely a different animal and not “Chessie” again. It (the gender is not known) was sighted repeatedly—off Manhattan and Harlem and also more than 40 km upriver north of the Tappan Zee Bridge in Westchester County (where the media christened it “Tappie”). The next sighting was far to the east, in Quissett Harbor near Woods Hole, Massachusetts, on 17 August, before it turned around and started on the return trip. Tappie was seen on the 19th in Westport, Massachusetts, and then decided to take a tour of Narragansett Bay.

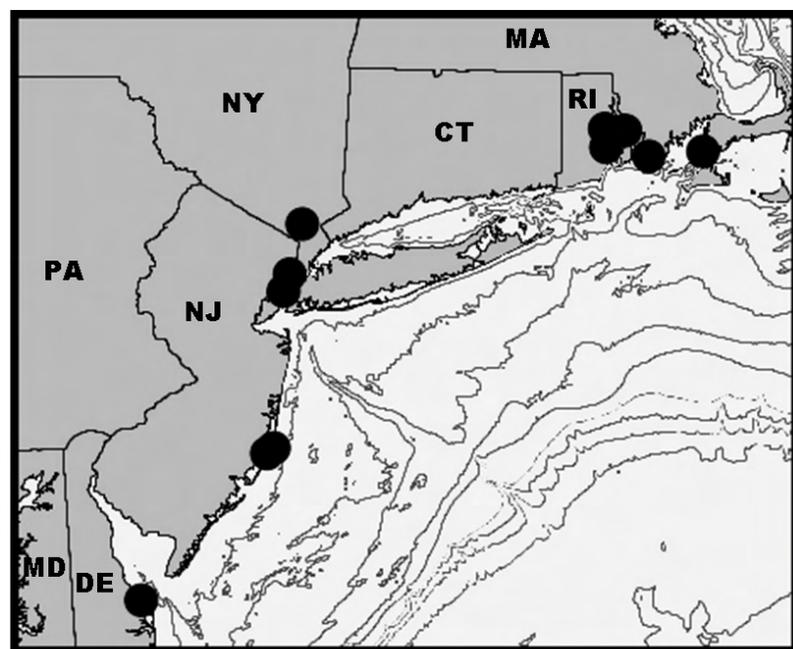


Figure 2. Locations in the northeastern U.S. visited by a wandering Florida Manatee in July to September 2006.

“Tappie” began his or her Rhode Island visit by kicking off a minor media frenzy—drinking from a storm drain for a Channel 10 television camera

in a marina in Greenwich Bay on 20 August. The wayward manatee then made a brief appearance in Wickford harbor on Tuesday the 22nd. That initiated an entirely different kind of excitement, because the next demolition at the old Jamestown Bridge was scheduled for Wednesday the 23rd. We already had marine mammal/protected species observer teams scheduled, but we had not planned for the possibility of a manatee in the area. The explosion was delayed for about 45 minutes in order to get a helicopter on scene with two experienced marine mammal observers from the Naval Undersea Warfare Center in Newport. The helicopter crew searched the vicinity of the bridges and along both shores, including shallow coves and bays, but did not locate the manatee. We are confident that “Tappie” was not injured by the explosion, since it turned up one more time the following weekend in Bristol Harbor. Our visitor was not seen again, and was assumed to have headed back home toward Florida. There was one last unconfirmed sighting, heading south, in Barnegat Bay, New Jersey in September.

There have now been three Florida Manatees who have strayed north to our region over eleven years, and two of them have visited Rhode Island. Are we just seeing the vanguard of an increasing manatee presence in the north? Temperatures are clearly getting warmer, which suggests that there could be an increasing potential to see manatees, and maybe other species from warmer climes to our south, as global warming continues to push the thermometer higher. The possibility exists that we might face some interesting questions in the foreseeable future. What does a natural resource manager do when an endangered one-ton marine mammal that eats 100 kilograms of vegetation each day starts munching through an Eelgrass restoration project?

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RINHS Hosts the 31st A.L. Andrews Foray

BY NORTON G. MILLER AND DOUGLAS GREENE

Thirty-three bryologists and lichenologists, beginners to experts, from two countries (USA, Canada) and eight states (Connecticut, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, and Vermont) assembled on 15 September 2006 in West Greenwich at the W. Alton Jones Campus of the University of Rhode Island to inventory moss, liverwort, and lichen diversity in three nearby natural areas during the following Saturday and Sunday. Kira Stillwell and David Gregg of RINHS organized itineraries to the study sites, obtained permits, and kept everyone comfortable and well fed during the entire gathering.

This, the first Andrews Foray in Rhode Island, was a special opportunity to contribute to a catalog of Rhode Island bryophytes and lichens maintained by RINHS, build local interest in bryology and lichenology, and extend to Rhode Island what is known about these organisms from other parts of the Northeast. Previous Forays have been to places elsewhere in New England, and in New York, Pennsylvania, and New Jersey, with a focus on areas that are poorly known botanically.

Andrews Forays have been held each year since 1976 during a weekend in the middle of September. The name commemorates A. LeRoy Andrews (1878–1961), a Professor of Germanic Philology at Cornell University, who also practiced bryology at a high level of achievement throughout his entire adult life. Andrews's knowledge of German and the Scandinavian languages allowed him to develop a deep understanding of bryophyte species concepts as they came to be applied in northern and northwestern Europe, a region that harbors many bryophytes also present in the eastern United States. Andrews specialized in the taxonomy of the peat moss genus *Sphagnum*, as well as other taxonomically challenging genera, and he did much to consolidate an over-abundance of narrowly defined species worldwide and evaluate the North American flora against the much better known European. Further information on his life and accomplishments can be found in Steere (1962).

It may seem odd that lichenologists and bryologists gather together in the field to study organisms that are so substantially separated evolutionarily, but in fact lichens and bryophytes are roughly the same size, grow in similar habitats, and are distributed in nature on the basis of many of the same ecological principles. In the United States, in recognition of this, the American Bryological and Lichenological Society promotes the study of bryophytes and lichens by organizing national meetings, publishing journals, and engag-

ing in other activities that make bryological and lichenological information widely available.

Much less is known about the bryophyte flora of Rhode Island than nearby states. Although Olney (1845, 1846, 1847) and Bennett (1888) published early lists of Rhode Island mosses and liverworts, more recent studies are few, and there are no current checklists of bryophyte species known to occur in the state. Brown University botany professor J. Franklin Collins (1863–1940) began to list the mosses that had come to his attention as occurring in Rhode Island and other New England states in the botanical journal *Rhodora* (Collins 1906, 1908), but only one installment of a projected series was published under his name. However, A. LeRoy Andrews (1906) presented a list of Rhode Island peat mosses as part of the series, as did the leading North American hepaticologist of the time, A. W. Evans (1903, 1923), for the liverworts. Some of the records in Olney (1846, 1847) were on the authority of William S. Sullivant, the first major specialist in moss taxonomy in the United States. The Swiss-American bryologist Leo Lesquereux, who worked on mosses for many years with Sullivant and later independently, contributed information to the Bennett catalog (1888). There are many interesting records in these early publications, but the nomenclature is often out of date. Moreover, for the species noted, specimen vouchers (if they exist) need to be studied to evaluate the records with reference to taxonomic concepts now in use.

Collins was an ardent field botanist, and he collected mosses widely in Rhode Island (Fernald 1942, Snell 1942). For the most part, however, the specimens remained unstudied at his death (Fernald 1942). Collins's bryophyte collection was bequeathed to Harvard University and is kept in the Farlow Herbarium. It is still unworked. The archives of the Gray Herbarium Library at Harvard hold a large collection of Collins' papers.

Studies of Rhode Island lichens are scattered in the literature, and there are many collections of Rhode Island lichens in herbaria. This dispersed information has never been consolidated. Edward Tuckerman (1817–1886), the father of North American lichenology, collected Rhode Island lichens; his unpublished journal is in the collection of Amherst College in Massachusetts. Bennett (1888) compiled the first lichen list for Rhode Island. It reported 194 species and varieties. Many species names that Bennett used are out of date or are synonyms of other names. Lincoln Ware Riddle (1880–1921) published on Rhode Island lichens (Riddle 1909a, b), and

R. Heber Howe, Jr. (1875–1932) collected lichens throughout New England including Rhode Island (Howe 1913, 1914). Intertidal lichens of the northeastern United States were published by Taylor (1982) and by Arup (1994) for *Caloplaca* species on seashore rocks, both adding much new information about Rhode Island's marine lichen flora.

The first modern lichen flora for Rhode Island (Flenniken 2003) treats macrolichens only, but it has contributed greatly to what is known about Rhode Island's lichen diversity. When Rhode Island specimens in North American and European herbaria are evaluated, the state's lichen tally is certain to increase. In addition, noteworthy lichens and bryophytes have been found recently during the annual RINHS Bio-Blitzes.

Given a scarcity of modern bryological and lichenological information about Rhode Island, it was with anticipation that explorations were undertaken at the Marion Eppley Wildlife Refuge of the Audubon Society of Rhode Island in South Kingstown, Audubon's Long Pond Woods and adjacent tracts owned by The Nature Conservancy (TNC) and the RI Dept. of Environmental Management in Hopkinton, and TNC's Lime Rock Preserve in Lincoln. The first two sites are in southern Rhode Island, the last near the northeastern corner of the state. All three proved to be rich in bryophytes and lichens. This reflects varied habitats in and among the three natural areas, which include peatlands, pond margins, streams and streamside peaty or mineral soil and rock, upland secondary oak-pine forest, lowland wet coastal Atlantic White Cedar-Red Maple-Tupelo swamp forest (with epiphytes on tree boles and bases), granite boulder jumbles, shaded clefts in granite bedrock, dry rocky uplands, marble and slate ledges and bluffs, trailside soil banks, and a scattering of anthropogenic habitat, such as cedar shingles of a cabin roof.

Only a short summary of what was discovered by participants at the three study sites is presented here. A list of the bryophytes registered by various contributors will be published after the collections are fully identified. The final lichen list for the Andrews Foray is also being compiled. Both should be ready for printing before the end of 2007.

So far, however, results of the 31st Foray include 92 species of mosses (13 of these are peat mosses) and 21 liverworts. About 20% seem not to have been reported before as members of the Rhode Island flora, but we do not wish to place too much emphasis on this estimate, because no modern checklist for Rhode Island exists. Noteworthy mosses found were *Homalotheciella subcapillata*, *Isopterygiopsis puchella*, *Pseudotaxiphyllum dis-*

tichaceum, *Schwetskeopsis fabronia*, *Sphagnum platyphylum*, *Thelia lescurii*, and *Thuidium allenii*. Most of these are at or near their northern range limits and are generally considered to be rarities in New England, although *S. platyphylum* is a peat moss of an essentially northern distribution. But, because so little is known about the mosses of Rhode Island, some of them may prove to be more widespread in the state. Likewise, the liverworts *Leucolejeunea clypeata* and *Metzgeria crassipilis* have not been reported before from Rhode Island, using the checklist of Evans (1923) as a frame of reference. These, too, are basically southern species of likely rarity in the Northeast.

The final lichen tally is incomplete, but many are new to Rhode Island and New England. The fruticose macrolichen, *Stereocaulon pileatum*, though expected, was found in Rhode Island for the first time. A crustose calcicole, *Verrucaria* sp., new to New England, was collected at the Lime Rock Preserve. A uncommon rock tripe, *Lasallia pensylvanica*, while not new to Rhode Island, was found near Ell Pond. *Ochrolechia yasudae*, *Hypocenomyce scalaris*, *Physcia pumilior*, *Segestria eptalea*, *Lepraria caesiella*, *Cladonia petrophila*, *Anisomeridium polypori*, and *Biatora printzenii* are some species newly recorded for the state. We estimate that 135 lichen species were collected during the Foray.

We hope these comments and the results of the 31st Andrews Foray will stimulate others, particularly resident Rhode Island botanists, to undertake additional studies



Participants in the 31st Andrews Foray at the Alton Jones Environmental Education Center (from left to right). Kneeling—Aissa Feldmann, Marnie Reeve, Nan Williams, Kay Hajek, Pat Ledlie, John Guccion, Elizabeth Lay, Deb Lievens, Elizabeth Kneiper. Standing in front—Ellen Kracauer Hartig, Ted Gordon, Cloe Chunn, Ed Miller, Tom Harrington, Laura Briscoe, Roman Olszewski, Gail Beatty, Jean Kekes, Betsy Newcomer, Hilda White. Standing in back—Juan Sanchez, Norton Miller, Heather Miller, Dick Andrus, Bill Buck, Michael Alcamo, Matt Distler, Keith Bowman, Dick Harris, Bill Olson, Doug Greene. Missing—Bob Ingalls, Tom Phillips.

of the bryophyte and lichen floras of the state. This effort should involve locating and verifying Rhode Island specimens already in regional and national herbaria, study of the collections of Collins and other unworked specimens, and much more field exploration. The geographic location of Rhode Island correlates with the northern limit in New England of many lichens and bryophytes, which makes the state of special phytogeographic interest. Estimates of the number of lichen species occurring in Rhode Island run as high as 500. We anticipate that the state's bryophyte flora consists of at least 300 species.

Developing an authoritative catalog of bryophytes and lichens of Rhode Island, with voucher specimens noted, is a worthy project that fits comfortably within the mission of the Rhode Island Natural History Survey. The two-volume illustrated flora by Howard Crum and Lewis Anderson (1981) is perhaps the best book available for the identification of Rhode Island mosses. There is no comparable work for liverwort identification, although the keys in Evans and Nichols (1908) are useful to beginners, even though the nomenclature is dated. Lichens can be identified in Rhode Island using several resources. Brodo et al. (2001) has superb illustrations of many of Rhode Island's micro- and macrolichens and identification keys. Flenniken (1999, 2003) covers nearly all macrolichens found in Rhode Island. Brodo (1968, web update at http://www.huh.harvard.edu/collections/lichens/Long_Island_Update.html), although written primarily for Long Island, has good keys for coastal New England crustose lichens, as well as ecological notes. An excellent on-line list of references useful to advanced lichenologists can be found at <http://www.huh.harvard.edu/collections/lichens/guide/index.html>. These and other resources facilitate the identification of bryophytes and lichens and help the beginner get started. But, much work remains to be done to achieve a satisfactory understanding of the State's lichen and bryophyte diversity.

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Banding Birds at Kingston Wildlife Research Station: The 39-Year Legacy of Douglas Kraus

B Y P E T E R P A T O N

Dr. Douglas L. Kraus (1913–2000) was a chemistry professor at URI whose true passion was ornithology. Doug was a remarkably keen birder who spent over 73 years in the field documenting bird migration through Rhode Island (Ferren and Enser 1998). His field observations included at least ten species not previously recorded in the State. In 1950, he acquired an 84-acre property in Kingston and established a bird banding station outside of his home in 1956. He ran a mist-netting operation on his property from 1956 through 1994. As far as I can tell, his efforts represent the longest running bird-banding operation in North America. His 39-year legacy of meticulous notes on the thousands of birds he banded over the years was an incredible accomplishment by this mild-mannered amateur ornithologist. Dr. Kraus was recognized for his contributions to our understanding of birds in Rhode Island by the Rhode Island Natural History Survey when he received the 1998 Distinguished Naturalist Award.

Doug typically operated about four mist nets daily outside of his home from early August through early November every fall. In 1998, he donated his property to the Audubon Society of Rhode Island and he also drafted a cooperative agreement with the University of Rhode Island to officially establish the “Kingston Wildlife Research Station” (KWRS) (see the “Focus On” article on page 17). Since the fall of 1998, ornithologists from Department of Natural Resources Science at URI have been banding birds at KWRS using ten mist nets. From the time that URI became involved with KWRS, two graduate students, Barbara Pierce (2003) and Jay Osenkowski (2002), have conducted substantial parts of their graduate research at the Station.

It is astounding to me that Doug was able to operate mist nets daily every fall while maintaining a heavy teaching load as a chemistry professor. Doug was an extremely dedicated ornithologist who kept accurate records of every bird that he captured. Most importantly to me and others following in his footsteps, he maintained accurate records of how long the nets were opened every morning, which has allowed us to quantitatively assess changes in capture rates over time.

Dr. Kraus’s legacy to the scientific community undoubtedly is his long-term banding records. From 1960 through 1994, Doug banded a remarkable 23,568 birds representing

113 species (Table 1). Since the mist nets he operated were generally close to the ground (approximately 3 m tall and 12 m long), not surprisingly the ten most common species he captured tended to be birds found lower in the under-story, including Gray Catbird (14.1% of captures), White-throated Sparrow (11.3%), Yellow-rumped (Myrtle) Warbler (8.0%), Common Yellowthroat (6.2%), American Redstart (5.5%), Dark-eyed Junco (4.7%), Black-capped Chickadee (4.4%), Blue-winged Warbler (3.1%), Eastern Towhee (2.6%), and Song Sparrow (2.3%).

Over time, he captured quite a few uncommon species in his mist nets. Golden-winged Warblers are increasingly scarce in the region as their populations decline throughout their range, and the two hybrids of Blue-winged X Golden-winged Warblers (Brewster’s and Lawrence’s Warblers) are rare in Rhode Island. The Marsh Wren he captured was out of place in uplands near his house. Finally, the Broad-winged Hawk and Great Horned Owl must have gotten his adrenaline pumping when he first walked up the nets, as they are much more of a challenge to take out of nets than a catbird.

Since Doug started banding birds in 1956, the habitat around his house has changed dramatically. The land was formerly a farm that has become much more forested. Early successional habitats have slowly matured into deciduous woodlands at KWRS, thus species that prefer grasslands and old field habitats that were captured in the 1960s (e.g., Bobolink, Field and Savannah Sparrow, Brown Thrasher) are much rarer now.

Doug’s banding records track changes in the distribution of birds in the region. For example, two southern species that gradually have spread north are Northern Cardinal, which was first captured at KWRS in 1962, and Tufted Titmouse, first captured in 1967 (Osenkowski 2002). I think it is hard for most Rhode Island birders today to realize that these two ubiquitous species only reached the State about 40 years ago.

The most troubling trends documented by Doug’s efforts have been the decline in the overall capture rates of birds at KWRS. Since the early 1970s, capture rates have declined from over 3 birds per net hour to just over 0.5 birds per net hour during the past 6 years (Osenkowski 2002). This suggests that the abundance of birds may have declined by a factor of 5 or 6 since Doug started his fieldwork. This is probably not a surprising finding to birders who have spent time in the field during fall migration in southern New England over the past 40 years. The huge waves of warblers that used to be commonplace during fall migration are rarely encountered these days.

Most importantly in my mind, Dr. Kraus was a steward of the land and an avid conservationist. His passion and love of birds made him realize, as did John Terborgh (1989) that

“Things are going wrong with our environment, even the parts of it that are nominally protected. If we wait until all the answers are in, we may find ourselves in a much worse predicament than if we had taken notice of the problem earlier. By waiting, one risks being too late; on the other hand, there can be no such thing as being too early.” Doug took action by donating his property to the Audubon Society of Rhode Island. Thus, his land will be protected in perpetuity and his legacy will continue for future generations (of birds and people).

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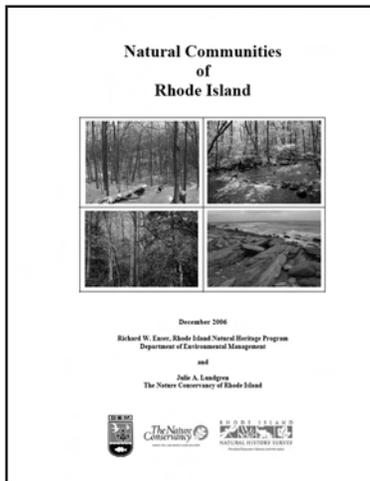
Table 1. Summary of the total numbers of birds captured by Douglas Kraus at Kingston Wildlife Research Station from 1960 to 1994.

Species	Number	Species	Number	Species	Number
American Woodcock	11	Winter Wren	29	Common Yellowthroat	1460
Sharp-shinned Hawk	5	Golden-crowned Kinglet	187	Mourning Warbler	38
Broad-winged Hawk	1	Ruby-crowned Kinglet	404	Connecticut Warbler	34
American Kestrel	1	Blue-gray Gnatcatcher	1	Kentucky Warbler	1
Mourning Dove	4	Swainson's Thrush	222	Northern Waterthrush	149
Black-billed Cuckoo	15	Veery	448	Ovenbird	392
Yellow-billed Cuckoo	2	Hermit Thrush	346	Canada Warbler	263
Barn Owl	3	Wood Thrush	284	Hooded Warbler	63
Great Horned Owl	1	American Robin	312	Wilson's Warbler	40
Yellow-bellied Sapsucker	2	Gray Catbird	3330	Yellow-breasted Chat	68
Red-bellied Woodpecker	1	Northern Mockingbird	20	Scarlet Tanager	78
Downy Woodpecker	154	Brown Thrasher	174	Summer Tanager	1
Hairy Woodpecker	5	Cedar Waxwing	27	Dickcissel	3
Northern Flicker	50	Tennessee Warbler	30	Rose-breasted Grosbeak	60
Eastern Wood-Pewee	21	Nashville Warbler	60	Northern Cardinal	235
Trail's Flycatcher	109	Orange-crowned Warbler	5	Eastern Towhee	602
Least Flycatcher	72	Blue-winged Warbler	728	Chipping Sparrow	42
Yellow-bellied Flycatcher	78	Brewster's Warbler	6	Field Sparrow	143
Eastern Phoebe	83	Lawrence's Warbler	2	American Tree Sparrow	31
Great Crested Flycatcher	15	Golden-winged Warbler	12	Grasshopper Sparrow	1
Philadelphia Vireo	19	Northern Parula	24	Savannah Sparrow	4
White-eyed Vireo	102	Yellow Warbler	14	Song Sparrow	551
Red-eyed Vireo	319	Chestnut-sided Warbler	230	Lincoln's Sparrow	20
Yellow-throated Vireo	7	Magnolia Warbler	131	Swamp Sparrow	323
Blue-headed Vireo	34	Cape May Warbler	33	Fox Sparrow	44
Blue Jay	137	Blackburnian Warbler	11	White-crowned Sparrow	12
Barn Swallow	4	Black-throated Blue Warbler	88	White-throated Sparrow	2656
Tree Swallow	21	Cerulean Warbler	2	Dark-Eyed Junco	1110
Purple Martin	16	Black-throated Green Warbler	33	Baltimore Oriole	118
Black-capped Chickadee	1043	Yellow-rumped Warbler	1883	Bobolink	1
Tufted Titmouse	207	Palm Warbler	20	Red-winged Blackbird	8
Brown Creeper	25	Palm Warbler (western race)	12	Common Grackle	3
White-breasted Nuthatch	64	Prairie Warbler	28	Brown-headed Cowbird	12
Red-breasted Nuthatch	5	Blackpoll Warbler	260	American Goldfinch	207
Marsh Wren	1	Bay-breasted Warbler	16	Pine Siskin	1
Carolina Wren	77	Black-and-White Warbler	488	House Finch	48
House Wren	358	American Redstart	1290	Purple Finch	397
		Worm-eating Warbler	38	Grand Total	23,568

Terborgh, J. 1989. *Where Have the Birds Gone? Essays on the Biology and Conservation of Birds That Migrate to the Tropics*. Princeton University Press, Princeton, NJ. Table 1. Summary of the total numbers of birds captured by Douglas Kraus at Kingston Wildlife Research Station from 1960 to 1994.

Rhode Island Natural Community Classification: A Guide for Preserving the State's Biodiversity

B Y R I C H A R D E N S E R



The Rhode Island Natural History Survey has recently introduced a new web-based publication, an updated and revised version of the Rhode Island Natural Community Classification by Richard W. Enser and Julie A. Lundgren. This classification serves as a biological milestone for Rhode Island. In addition to other Survey publications, which collectively document the state's biodiver-

sity in organismal catalogs (flora, vertebrates, beetles, etc.), the classification of natural communities provides a basis for understanding how the state's biota is distributed across the Rhode Island landscape. The classification not only identifies naturally-occurring communities, but by omission identifies those that are not part of the state's "natural" history. Such information is critical to conserving the native biological diversity of the state.

A *natural community* is an assemblage of organisms, their physical environment, the interactions among them, and the processes that affect them. In general, plants and animals form communities based on the physical characteristics of the land. These include climate, topography, soil, bedrock, proximity to the ocean, and probably the greatest determinant, hydrology. As such, a natural community is the biological expression of the physical characteristics of site, each community grading into another when there is a significant difference in one or more characters. The soil may become sandier, or more saturated, or more alkaline, and the species composition changes accordingly to include those species best adapted to the different conditions. As its name implies, a classification of natural communities is a way to categorize the assemblages that naturally occur on the landscape, i.e., the communities that would develop and perpetuate without human interference.

Site characteristics provide the building blocks of communities, but the ultimate agent determining the appearance and composition of communities is disturbance. Natural disturbance occurs in many forms, including fire, flooding, hurricanes, tornadoes, wind, ice, and animal activity, and all communities are molded by at least one of these phenomena. For example, a review of the Rhode Island classification reveals that at least 25 natural communities are considered maritime; i.e., they are subject to disturbance events related to their proximity to the ocean. Maritime communities are continually subjected to disturbance, whether by daily tidal inundation, occasional wind-driven salt spray, or sporadic high-intensity storms. However, away from the coast, the role of disturbance in shaping community structure is less frequent, and usually less violent.

Ecologists have long-argued the concept of the so-called "climax" community, or the ultimate expression of a landscape that has reached maturity through the process of succession. However, most communities never achieve this theoretical end stage, but rather exhibit a long-lasting appearance that is governed by the local disturbance regime. As expressed by Tom Wessels in *Reading the Forested Landscape*, disturbance is the force that counters the successional growth of ecosystems. Rhode Island sits within the biome known as the Eastern Deciduous Forest and without disturbance, either human or natural, the land would eventually succeed to mature forest. (This truism was vividly displayed by the return of the forest following abandonment of farms in the early 1900s, when human causes of disturbance were greatly reduced.) However, disturbance in its various forms generally prevents most of the land from attaining its theoretical climax. Instead, communities often reach a *disclimax* stage where the appearance and species composition is controlled by repeated, often cyclic disturbance. A good example is a Pitch Pine barren which is dominated by fire-tolerant plants. Repeated burning will maintain the structure of barrens indefinitely, but if fire is controlled or otherwise prevented the community will resume its successional march to a forest more typical of the region, usually dominated by deciduous trees.

Determining the role of natural disturbance in shaping the southern New England landscape has been difficult given the great alterations wrought by humans, especially since European settlement. But a recent reassessment of paleoecological, archeological, and historical evidence by David Foster and Glenn Motzkin (2003) has concluded that the predominating natural disturbance regime in this region consists of frequent low-intensity events (wind, ice, insects, etc.) and infrequent broad-scale or higher-intensity disturbances (hurricanes, tornadoes, and downbursts). Naturally-occurring fires, caused by lightning strike, are rare events in this region, and reinterpretation of historic data has also found little evidence to support the hypothesis that fire was an ecological

tool used extensively by pre-Columbian Native Americans. Based on their assessment, the authors interpret a disturbance ecology for southern New England that overwhelmingly favors forested communities, and that even across the coastal region (including the offshore islands of Nantucket, Martha's Vineyard, and Block Island) woodlands of oak, pine, and other hardwoods were widespread, with heath and grassy areas restricted to the coastal fringe.

The Rhode Island Natural Community Classification follows this interpretation. It does not recognize a natural grassland community, except for the small (<0.5 acre) grassy patches that develop on exposed coastal knolls, primarily on Block Island. Naturally-occurring shrub-dominated communities are principally palustrine (freshwater) shrub swamps, perpetuated by periodic flooding, and maritime shrublands maintained by ocean tides, winds, and salt spray. Therefore, conservationists whose goal is perpetuating the natural biological diversity of Rhode Island must first recognize that the disturbance regimes in this region support forest communities that would, without the interference of humans, cover more than 95% of the land.

Many current land management practices, some of which are employed to benefit so-called "early successional" species, run counter to the natural successional patterns and disturbance ecologies inherent to this region. Maintained by human disturbance in the form of mowing and other mechanical means, these "artificial" communities contain a higher percentage of non-native species, in some cases becoming overwhelmed by invasives.

It is apparent that plants and animals typically found in open lands were much reduced in the pre-Columbian landscape. Most were opportunistic, inhabiting the narrow coastal strips of shrubland, or the temporary habitat patches within interior forests created by wind throw or beaver activity. Some did not become members of the regional biota until vast acreages of open land were created by European colonists. Although there is merit in selectively preserving and managing some open areas as testament to our relatively recent historic use of the land, conservation of Rhode Island's biological diversity should clearly be directed toward those habitats and species that once thrived here on the natural landscape. Within this context, conservation should favor forest-interior species, for this group is in the greatest danger of being lost from Rhode Island due to extensive conversion and fragmentation of forests, caused not only by sprawling development but also by poor management decisions.

The natural community classification can provide the basis for developing a conservation strategy more in tune to the natural ecology of Rhode Island. Although some individual species also deserve focus, the perpetuation of the communities that naturally comprise the Rhode Island landscape

goes further to guarantee the survival of all the state's native biota. Such a protection effort relies on a scope of management that is more "hands-off," allowing natural rather than anthropogenic processes to sustain or restore communities, favoring the gradual progression of succession rather than suppressing succession at some early, artificial stage. This approach is not only more in harmony with the natural scheme, but requires fewer resources (monetary and labor) to carry out. Every ecologist should display a bumper sticker, "Succession Happens," and adopt its message as a guiding principle.

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Richard Enser recently retired as Coordinator of the RIDEM Natural Heritage Program, and is a former member and past president of the RINHS Board of Directors. "The Natural Communities of Rhode Island" can be found on the RINHS website (www.rinhs.org) under "Web Publications."

Focus on RINHS Organizational Members: The Kingston Wildlife Research Station

BY FREDERICK E. GOFF

The adage "a bird in the hand is worth two in the bush" is especially true at the Kingston Wildlife Research Station. The station represents a close collaboration between two RINHS organizational members—the property is owned by the Audubon Society of Rhode Island and the research is conducted by scientists and students from the URI College of the Environment and Life Sciences, Department of Natural Resources Sciences. The nearly 85-acre Audubon property, which sprawls south from Mooresfield Road, near the URI Kingston campus, is a hidden haven for research into birds' migratory habits, population trends, and general health.

Audubon counts the property within its 9,500-acre refuge network. It maintains the land through projects such as restoration of the orchard, which was completed late in 2006.

The acreage, originally donated to Audubon by the late Dr. Douglas Kraus, is the site for what many believe is the oldest bird research station in the United States. There, Dr. Kraus began the netting of birds and recording of pertinent data in 1956 (see the research article on page 14 summarizing Dr. Kraus' results).

According to Scott Ruhren, Audubon's senior director of conservation, "The land is ideally suited for bird habitat and subsequent research because of the forest's mix of swamp-land and dry terrain. Layers of deciduous hardwoods, such as maples and oaks, along with a dense understory of shrubs and vines provide an ideal resting spot for migrating birds."

A visit to the research station reveals a serene wildlife habit, interrupted only by the former home of Dr. Kraus. Residing there now is Dan Cooper, URI biologist at the Kingston Wildlife Research Station. Cooper conducts much of the daily scientific work that is accomplished at the station under the supervision of Dr. Peter Paton, associate professor and chair of the URI Department of Natural Resources Science. URI associate professor Scott McWilliams rounds out the scientific research team.

Audubon and the university agreed on the collaboration in 1998. Each year since, the capturing of birds and recording of data has begun in early August and has continued until the end of October. This timeframe takes into account the varied species that move through the area on their migration southward.

"We are currently looking closely at trends in capture rate of species that require open or brushy habitat, rather than forest," said Cooper. "Because so many open fields and farms have been lost in the Kingston area, and in southern New England generally, many familiar species once regularly captured and sighted around the station no longer occur, such as Brown Thrasher, Field Sparrow, and Indigo Bunting."

"At the same time, the long-term data set is useful for tracking the arrival of colonizing species such as Tufted Titmouse and Northern Cardinal, which were not present here historically, but are now very common," he added.

Ten mist nets are set in strategic locations around the property. Collection and recording begins shortly after dawn and continues until mid-morning. Netted birds might experience some anxiety when entangled, but the process is harmless, and the URI team is experienced in the gentle and safe handling of specimens. Once extricated from the nets in the field, the birds are quietly placed in soft cloth bags. They are then carried to a small, rural out-building that serves as the hub of data collection.

The researchers assess the general physical condition of every bird, noting species, age, and sex first as well as weight and feather condition. They also observe how much fat the bird is accumulating during migration, which is visible to the

trained eye through the skin around the neck. Finally, an identification band is placed on the bird's leg. The bird is then released. If a particular bird has been captured previously, in Kingston or elsewhere, it already will be wearing a band. In this case, the data comparison will indicate, among others factors, how much weight the specimen has gained or lost.

As in any human interaction with wildlife, not every day is predictable. "On a cold morning last October, I walked up to our first net behind the house, expecting to find a catbird or a chickadee. Instead, I found a Sharp-shinned Hawk glaring at me. My assistant held its razor-sharp talons while I held its head still and worked it free. We banded it and actually saw it in the yard a couple of days later," Cooper related.

Many of the station's captures are of Gray Catbirds, White-throated Sparrows, and Yellow-rumped Warblers. However, after nearly five decades of banding, there have been some unusual birds recorded. One of the most exciting visitors has been a male "Lawrence's Warbler," which is a unique hybrid of Blue-winged Warbler, which is quite common, and Golden-winged Warbler, which is rare in this locale. The team dubbed the bird "Larry," then recorded his data and banded him. Identified through his leg band, Larry has now returned to the Kingston station for three consecutive years.

As part of the partnership between the university and Audubon, the research team provides an annual summary to Audubon. The full range of data is further employed by URI researchers and is made available to Audubon staff.

Lawrence Taft, Audubon's executive director and Survey advisor and former board member, stated, "The Society views the Kingston station as a wonderful asset on several levels. The property serves as rich conservation land for wildlife habitats. Also, the work at the station provides helpful information about birds in our area through the diligent efforts of Peter Paton and his researchers. The project is an ongoing example of cooperation between URI and the Audubon. And lastly, the land and station stand as testimony to Dr. Kraus and his dedication to nature and science."

Of course, this ongoing source of insightful knowledge would not have been possible were it not for Doug Kraus's early interest in birds, his fastidious record keeping and, ultimately, the extremely generous bequest of his acreage to the Audubon Society of Rhode Island. Doug was a longtime supporter of the Audubon Society. During some 60 years he was active in many capacities—as a stalwart member, as one of the Board of Directors, as Finance Committee chairman, and, certainly, as an expert ornithologist.

A graduate of Brown University, Kraus became active with Audubon while a college student in the 1930s. He remained involved during his tenure as a professor of physical

chemistry at URI. Kraus purchased the land that now serves as the research station in 1950 as his home and personal wildlife refuge. He once told Audubon, “It was a typical old farm. There was no electricity, no running water, an outhouse...I learned that one field had last been plowed in 1905.” From these rustic beginnings, Kraus made his home and soon began to pursue his passion for birds, their habits, and their characteristics. When recollecting some his favorite birds—Purple Finches, Brown Thrashers, Eastern Towhees, Eastern Bluebirds and others—Kraus theorized that habitat changes, both locally and in wintering areas, might be partially responsible for some of the population declines he observed in his later years.

It was Kraus’s desire that his research be continued. Combined with his love of nature and respect for the Audubon Society and its mission, he chose to leave his land to Audubon through estate planning.

“Doug had one of the longest running bird-banding stations in the country,” said Dr. Paton. “We [URI] started in 1998...using nets exactly where he had his, maintaining the core of his operation, but we were able to add some more nets because we had more manpower. This is just continuing Doug’s work.”

Kraus passed away at home—on his beloved property—in 2000. Since his death, however, his dream of ongoing research and preservation of his land has been realized. The university carries on Kraus’s scientific tradition while Audubon shoulders the task of protecting the property and its natural habitats.

Rick Goff is a public relations and marketing consultant from Rumford, Rhode Island who has worked with Audubon for several years. This article originally appeared in the September-October 2006 edition of the Audubon Society of Rhode Island Report and has been modified and reprinted by permission of the Audubon Society of Rhode Island.

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President's Message



I think that most people do not realize what it takes to sustain a productive non-profit organization such as the Rhode Island Natural History Survey. Times are extremely difficult for many non-profits these days, with several local environmental non-profits experiencing problems. Financing the Survey's staff and programs can be turbulent at times, but in the end is worth the effort. Without our staff, the Survey as we know it would cease to exist. Thus, the Survey's continued success is driven primarily by our dedicated staff.

David Gregg, Executive Director, has done an extraordinary job during the past year working with local stakeholders and other interested parties. David had to fill a large void when Lisa Gould stepped down as Executive Director, and he had a steep learning curve coming in to this position, as the Survey is a complex organization. He has become an articulate leader for the Survey, making people, agencies, foundations, and vital committees throughout Rhode Island aware of our mission and key programs. His efforts in turn have generated funds necessary to sustain us. We are fortunate to have such a capable person running the organization.

Kira Stillwell, Program Administrator, is exceptional. She is the engine that keeps us running. Among her critical duties, Kira oversees daily operations in the office, makes sure that the Survey's programs operate smoothly, and handles book sales. The Board strongly believes that programs (the Mark Gould Lecture Series, Annual Conference, and BioBlitz) are the backbone of the Survey, as these events are where the general public and members get to hear about cutting-edge natural history research being conducted throughout the region. Kira and the Board have done a marvelous job managing excellent programs that are drawing increasingly larger crowds.

Erik Endrulat, Data Manager, plays a critical role in designing, updating, and maintaining the numerous electronic databases managed by the Survey. Erik has become a master at database management. The Survey's database now represent the most comprehensive, accurate, and up-to-date natural history database for Rhode Island, and thus it has become a vital resource under Erik's leadership. Evidence of the strength of this database was a recent grant from The Rhode Island Foundation for continued support of Erik's position. These databases include the Biota of Rhode Island, which summarizes natural history information about the State's fauna (847 vertebrates and 3,535 invertebrates) and flora (2,364 vascular plants, 294 non-vascular plants, and 1,412 fungi). In addition, the Survey maintains the Rhode Island Natural Heritage Program database of over 500 rare organisms and natural communities, based on over 2,000 observation records. The Natural Heritage Program is part of NatureServe, a Natural Heritage network that includes every U.S. state, some Canadian provinces, and some Latin American countries. For more information on these databases, I urge you visit the Survey's website at www.rinhs.org.

Finally, I want to thank the Survey's Board of Directors for all the effort that they put into making the Survey such an outstanding consortium of individuals and organizations interested in the natural history of Rhode Island. The Board as a group meets monthly to discuss ongoing issues and operations at the Survey. Without their efforts, the Survey would not exist. In particular, I want to highlight some exceptional volunteers on the Board who have devoted countless hours to the Survey—Bob Kenney (Secretary and editor of *Rhode Island Naturalist*), Joyce Valentine-Kenney (Treasurer), Marilyn Mas-saro (Vice-President), and Todd McLeish (who runs the RINHS Speakers Bureau).

I am looking forward working with the Survey's Board and staff in the coming year. The financial outlook for the Survey is promising. I am excited to attend events sponsored by the Survey because they always are educational and entertaining—I urge you attend as well. In addition, the Survey is now involved in a number of projects that will impact Rhode Island's natural resources for years to come, thus I am energized about those projects. In closing, I want to thank the Sharpe family for their continued support of the Survey and their overwhelming interest in developing strategies for stewardship of Rhode Island's natural resources. The Sharpes' support has been vital to the existence of the Survey.

Rhode Island Collections: The Sturtevant Bird Collection at Norman Bird Sanctuary

BY MARILYN R. MASSARO AND ROBERT D. KENNEY

The Norman Bird Sanctuary (NBS) in Middletown, Rhode Island, currently houses a significant collection of historical bird specimens—the Sturtevant Bird Collection. The collection is housed in unheated space in the barn, and NBS has plans for converting that space for other uses. Consequently, they are interested in finding an alternative repository for the collection. Toward that end, three representatives of the Survey (Kim Gaffett, David Gregg, and Marilyn Massaro) visited the collection on 9 January 2007.



Figure 1. John James Audubon's painting of Carolina Parakeets on Cocklebur (from *The Birds of America*, 1827–1838).

The collection's dates are approximately 1880–1904, squarely during the peak period of historically intense collecting activity. The specimens originated primarily from the private holdings of Edward R. Sturtevant, and

also from the collection of LeRoy King. Fewer specimens originated from the Jamaica Plain Nature Club in Massachusetts. Specimens traceable to one of these three sources bear original printed tags with the names of these sources. A comparatively small portion of the collection (mostly mounts) has no associated data. The Sturtevant and King specimens were collected in Newport County, mostly in Newport or Middletown. Among the Sturtevant birds were specimens collected by R. H. Howe. Howe and Sturtevant were co-authors of *Birds of Rhode Island* in 1899 and a supplement in 1903, which stand as the only detailed, annotated monograph on the state's avifauna published to date. The Sturtevant collection has historical significance for contributing voucher specimens for those volumes.

The collection represents four very well-known naturalists of that era. Edward Sturtevant (1875–1939) was a lifelong resident of Aquidneck Island; he was born in Newport and died in Middletown. He graduated from MIT in 1898 and received an M.S. from Harvard in 1907. He was a physics teacher at Saint Georges School in Newport. Reginald Heber Howe, Jr. (1875–1932) was born in Quincy, Massachusetts, graduated from Harvard in 1901, and was awarded a doctorate by the Sorbonne in 1912. He taught at the Middlesex School in Concord from 1901 to 1920, where he established the Thoreau Museum of Natural History. He published extensively on birds, lichens (see the research article on the Andrews Foray on page 11), and odonates, and also on mammals and amphibians. Some of the Jamaica Plain specimens were collected by Charles Johnson Maynard (1845–1929), prominent naturalist, collector (best known

Table 1. Systematic enumeration of the Sturtevant Bird Collection specimens.

Podicipediformes (grebes)	4
Ciconiiformes (herons, bitterns)	14
Anseriformes (ducks, geese, swans)	25
Falconiformes (hawks, falcons, etc.)	9
Gruiformes (cranes, rails)	12
Charadriiformes (shorebirds)	101
Columbiformes (doves)	3
Psittaciformes (parrots)	1
Cuculiformes (cuckoos)	6
Strigiformes (owls)	8
Caprimulgiformes (nightjars)	1
Apodiformes (swifts, hummingbirds)	5
Coraciiformes (kingfishers)	3
Piciformes (woodpeckers)	14
Passeriformes (songbirds)	277

as a shell collector), and author (birds, butterflies) from Newton, Massachusetts. Most of Maynard's specimens (both birds and mammals) are housed in Harvard's Museum of Comparative Zoology in Cambridge, Massachusetts. LeRoy King (1857–1895) was a lawyer by training but never practiced. A member of Newport's prominent King family, he was president of the Redwood Library and Athenaeum at the time of his death. He also first appears as a member of the Newport Natural History Society in its Proceedings of 1884–85, serving as the Society's vice president from 1886 until his passing in 1895. These dates are coincident with dates of collection noted on his specimens.

The NBS collection totals 483 specimens, the vast majority being passerines and shorebirds (Table 1). One particular specimen to point out is the single psittaciform in the collection—the extinct Carolina Parrot or Parakeet, *Conuropsis carolinensis* (Figure 1). NBS has a systematic card catalog for the collection, with an annotated card for each specimen. Most of the specimens are study skins stored in three standard-size, modern, metal zoology cabinets. The rest of the specimens are whole taxidermy mounts. Some

are stored in older and smaller metal “Cambridge Can” style cases. Additional mounts are currently exhibited in the upper level of the barn in the Sanctuary’s interpretive museum space, which focuses on birds observable at the refuge.

Given the value of these specimens as a historically important Rhode Island collection, we hope that some organization that houses natural history collections and/or exhibits will be able to take it over. If necessary, the collection could be subdivided into its several components. Although a Massachusetts repository might be interested in the Jamaica Plain specimens, the other specimens should remain in Rhode Island if possible. The Museum of Natural History, Roger Williams Park, Providence, could offer enclosed, climate-controlled metal cabinet storage as a last resort for some of the more historically significant Rhode Island specimens, i.e., the Sturtevant, Howe, and King study skins only. Due to the lack of climate control in the collection’s current location and some observed evidence of insect infestation, fumigation would be mandatory before any transfer. Any and all offers of assistance or suggestions would be welcomed. Contact Marilyn Massaro at (401) 785-9457 x248 or m.massaro@musnathist.com.

Marilyn Massaro is Curator of Collections at the Museum of Natural History, Roger Williams Park; Vice-President of the RINHS Board of Directors and Chair of the Collections Committee; and a member of the Rhode Island Historical Records Advisory Board. Bob Kenney is an Associate Marine Research Scientist and Adjunct Professor at the URI Graduate School of Oceanography, Secretary of the RINHS Board of Directors, editor of Rhode Island Naturalist, and a “closet” historian.

The moniker fits: Mr. Nature. Disregard the fact that the Mr. Nature sign on Chris Nerone’s door at the University of Rhode Island (URI) is from a health food store in Los Angeles (motto, “good nuts are good health” ... honest), the name fits perfectly. This native of Bristol, Rhode Island has earned the title Mr. Nature by enthusiastically sharing his vast knowledge of the natural history of our state with everyone lucky enough to have taken a course from him or gone on a walk with him. An article in the Providence Journal announcing Chris as the recipient of the 2002 Rhode Island State Award from the New England Wildflower Society also found the name Mr. Nature to be the perfect binomial to describe this year’s winner of the Rhode Island Natural History Survey (RINHS) Distinguished Naturalist Award.

After graduating in 1968 with a B.S. in mathematics, Chris returned to school to acquire formal training in what had become his passion: botany. He graduated with an M.S. in Botany in 1990 from URI. His research specialty was plant physiology and he has used that knowledge extensively to excite others about the intricacies of plant life.

Professionally, Chris has been a member of the Departments of Botany and Biological Sciences at URI for more than 25 years. During the academic year, his primary responsibility is run-

Christopher Nerone, Mr. Nature RINHS Distinguished Naturalist, 2007

BY KEITH KILLINGBECK AND PETER PATON



Christopher Nerone. Photo: Sara Stevens.

ning all the labs for introductory courses in the Department of Biological Sciences on the Kingston Campus. He also teaches introductory biology courses at the Providence Campus during the evenings. However, it is in the summer months that his true passion blooms, teaching Field Botany and Taxonomy, BIO 323. This 4-week course meets four evenings per week and provides students the opportunity to learn about the flora of Rhode Island from a master.

Chris is an outstanding educator. Glowing remarks abound from the students who have taken his summer-session Field Botany and Taxonomy course. If you ever have had the pleasure of accompanying Chris on one of his field trips, you know why students love spending time in the field with him. In a region of the country known for its abundance of talented naturalists, Chris stands out among them as one New England’s most enthusiastic, fun-loving, knowledgeable naturalists. He is literally a fountain of knowledge about the flora of southern New England. Not

only that, but he also has a wealth of knowledge about the fauna of southern New England, so much so that “plant labs” and “plant walks” truly become “natural history sessions.”

Perhaps even more importantly, Chris gets others excited about natural history. He has a booming voice, a great sense of humor, an infectious laugh, and the skills to make students excited to be in the field and learn about the flora and fauna around them. We know one of the highlights for undergraduates is the chance to get to know Chris, as he is such a wonderful person. At the end of each course, he invites all the students over to his house for a feast, where he feeds all the students and provides them with the opportunity for a fond farewell. Most students hate to have the class end. Few mentors forge such strong bonds with their students. This relationship is truly the mark of an exceptional educator.

Chris is also an accomplished scientist who has published three articles (two co-authored with R. G. Sheath) and whose chief expertise is the taxonomy

and physiology of plants. He has incredible field skills and is often sought after by other scientists for his expertise. For example, when the Weekapaug Foundation for Conservation needed a botanist to help survey its lands, Chris was hired to supervise all botanical surveys on approximate 1,000 acres of land. There he identified 519 species representing approximately 25% of the flora of Rhode Island, even though the parcel of property studied was a mere 0.15% of the land area of the state. During these surveys, Chris discovered nine rare plant species, as designated by the Rhode Island Natural Heritage Program.

Because Chris has a deep passion for the flora of the region, he jumps at every opportunity to pass his knowledge along to the public. This is reflected in the fact that he has led innumerable field trips throughout the state for conservation organizations such as the Rhode Island Wild Plant Society and the Rhode Island Chapter of The Nature Conservancy. These trips fill up fast, as people always anticipate the high quality of the lessons in store for

them. As anyone who has had the distinct pleasure of partnering with Chris on walks and workshops can attest, his ability to capture the attention of an audience is uncanny. Chris’s enthusiasm is contagious and many botanists throughout the region have gained their passion for the flora of Rhode Island by spending time in the field with Chris.

The RI Natural History Survey received an unprecedented number of letters nominating Chris for the 2007 Distinguished Naturalist Award. All praised Chris for his contagious exuberance. That exuberance is often revealed in a resounding, signature laugh that alerts those within earshot that a Neronian classroom, formal or otherwise, is in session. Lessons are being learned, and friendships are being formed. As one student so eloquently put it, one gets the strong sense that Chris “is not just teaching, but bestowing you with a very personally meaningful gift.” Those gifts are the reason that Christopher Nerone is the 2007 RINHS Distinguished Naturalist.

Updated RINHS Checklist of Rhode Island Butterflies Available

The Rhode Island Natural History Survey has incorporated the latest research on Rhode Island’s butterflies into a new *Checklist of Rhode Island Butterflies*. The new checklist includes all species of butterflies recorded from Rhode Island and incorporates the latest information on rare sightings and historical records. The new list replaces a checklist published in 1994 and incorporates numerous advances in butterfly identification and nomenclature as well as new data on Rhode Island sightings. For a limited time, hard copies of the new list will be available free from the Natural History Survey: send a self-addressed stamped envelope to RINHS, P.O. Box 1858, Kingston, RI 02881. The list, formatted for easy home printing, can also be downloaded for free as an Adobe PDF from www.rinhs.org.

The checklist includes information on 128 species of butterflies. Species are listed by scientific and common name, and entries include information on species’ rarity and conservation status as well as frequently encountered alternative names. The checklist, which folds neatly to pocket size, can be tucked into a field guide to help with identifications by narrowing the choice of possible species. The checklist includes space for field notes.

The checklist was prepared by lepidopterist Harry Pavulaan and Survey Executive Director David Gregg. Pavulaan has performed the most comprehensive research on the identification, biology, and history of Rhode Island butterflies. He is the author of numerous scholarly and popular articles, technical papers, and web projects on butterflies and moths of North America. Gregg has studied butterflies of coastal southern New England as a hobby for 30 years.

Gil George, Field Botanist/Geologist Extraordinaire, RINHS Posthumous Distinguished Naturalist, 2007

BY BILL NICHOLS, PETER LOCKWOOD, AND KEITH KILLINGBECK

Gil George, field botanist/geologist extraordinaire and author of the Rhode Island Botanical Survey Check List, is the recipient of the 2007 Rhode Island Natural History Survey Posthumous Distinguished Naturalist Award. Gil was a professional mapmaker by training, but became enthralled with minerals and plants after he retired. It is his intense dedication to the geology and botany of the state that earned this ardent natural historian the respect and thanks of amateurs and professionals alike.



Gil George. Photo: Peter Lockwood.

Gil began his retirement years as a dedicated, amateur mineralogist, a background that would serve him well when examining the relationships between landscape features and the location of rare plants. As one of the founding members of the New England Micro-mineralogy Society, he traveled throughout New England and southeastern Canada in search of minerals. One of Gil's rare mineral specimens was put on display at the Smithsonian Museum of Natural History in Washington, D.C. He eventually donated his entire micro-mineral collection to Harvard University.

In the mid-1980s his attention shifted from mineralogy to botany. Over the next 12 years, Gil volunteered nearly all of his time conducting plant inventories in Rhode Island while fostering the pursuit of plant taxonomy and botanical discovery among both newcomers and veterans. As a result of his fieldwork, Gil significantly contributed to our understanding of Rhode Island's flora. He found several hundred new populations of state-listed rare plants and discovered several species never

before seen in Rhode Island. As Kathy Barton recalls, Gil "inundated the RI Natural Heritage Program with his finds." From his hundreds of plant surveys and the notable contributions of botanists before him, Gil wrote and published the Rhode Island Botanical Survey Checklist. By 1999, the year Gil died, he had completed the tenth edition of this important book.

Gil was a remarkably intelligent man with an impressive ability to recall information. Although he might also merit an award for the most creative (and original) pronunciation of Latin binomials, he could rattle off species lists for a particular location from memory. In fact, he often would create his species lists from memory when he was at home after a day in the field. Being the generous sort that he was, Gil would often give credit for a botanical find to whoever his field companion was on a given day.

Armed with good humor, fortitude, and stamina, Gil was a great partner in the field. His tenacity is legend. Late one spring, Gil purchased an expensive full-body insect net to wear over his field

clothes. The expectation was that this insect-armor would protect him against a deer tick population that was predicted to be especially high. Between Gil's inevitable bushwhacking and Rhode Island's notorious, informal distinction as the "Bullbrier State," the insect net never stood a chance. It was ripped to shreds in less than a day. Gil found the whole affair quite humorous and would often bring it up, poking gentle fun at himself.

Gil sat on the committees of several conservation-related

organizations, including the Rhode Island Wild Plant Society (RIWPS). He was one of the 13 original RIWPS trustees, president in 1989 and 1990, Plant Inventory Coordinator for several years, and designed the artwork for the original logo of the RIWPS newsletter. Gil led numerous field trips and conducted plant surveys throughout the state that not only benefited our understanding of Rhode Island's flora but that also raised money for the RIWPS education fund.

Gil also worked closely with The Nature Conservancy, Rhode Island Natural Heritage Program, Audubon Society of Rhode Island, U.S. Fish and Wildlife Service, Boy and Girl Scouts of Rhode Island, and several land trusts. Many private citizens with an interest in knowing what plant species occurred on their property also benefited from his botanical skills. Gil also assisted with plant inventories for Massachusetts Audubon and wrote the "New Hampshire Botanical Survey Checklist" for the New Hampshire Natural Heritage Bureau. In recognition of his tremendous contributions, Gil received the "Volunteer of the Decade" award

from The Nature Conservancy, one of many awards he received from various organizations over the years for his dedication to plant conservation.

Gil had the ability to teach and to instill in others a deep respect for the environment. He enlivened botanical discussion and provided learning opportunities for all those expressing an interest. Gil was also a knowledgeable microscopist and photographer and was one of the first field botanists to appreciate and promote the immense potential of digital photography for site documentation. Several of his “students” and those he otherwise inspired have gone on to make significant contributions to the field of plant conservation.

In the early afternoon of Sunday, 5 December 1999, the three of us saw Gil for the last time in the Rosewood Manor Nursing Home in Providence. Gil was heavily sedated, his body ravaged by cancer, and had no chance of seeing the miniature Christmas tree, the “never too old to party” balloon, or the bottle of sparkling cider we brought him. We each said our private good-byes, then retired to the curb of the Brook’s parking lot across the street to steep ourselves in paper cups of cider, and memories of Gil. It was there that we reveled in one Gil George story after another, and it was there that we each discovered that all of us somehow knew that Gil heard our final good-byes. Gil never made it past the following morning. The memories of that afternoon are powerful still, and we attribute that to Gil: good persons evoke powerful memories.

One of Gil’s oft-used phrases was “there is so much we don’t know.” True enough, but he always worked hard to make that statement less true than it was the day before. The contributions Gil George made to geology, botany, and plant conservation in Rhode Island have more than earned him the title of Distinguished Naturalist.

Bioblitz 2007



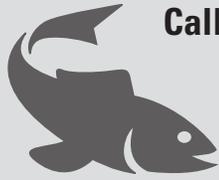
The eighth Rhode Island BioBlitz was held June 1st & 2nd at the 777-acre Trustom Pond National Wildlife Refuge in South Kingstown. Dry weather, a well-managed, ecologically diverse location, and wonderfully warm and helpful hosts made it one of our most successful BioBlitzes ever. One hundred forty-seven scientists and volunteers turned out and helped to document 998 species. The count was especially noteworthy for including 26 species on the state Natural Heritage list. Given the site, of course the birds were extraordinary. The 99 species observed included the federally listed Piping Plover as well as the Least Tern, Least Bittern, Glossy Ibis, Seaside Sparrow, Willow Flycatcher, Northern Parula, and many other all-stars. We had our strongest contingent of

entomologists in years and they helped identify 390 species of insect. The extraordinary count of 198 moth species was largely the work of Mark Mello, director of research at the Lloyd Center for Environmental Studies in Dartmouth, Mass., who was able to make it to BioBlitz for the first time in several years. The fungus and lichen count (108 species) benefited from a strong team that included Doug Greene, Noel Rowe, and Don Flenniken, among others. Once again, Don drove from Ohio to attend—thanks, Don. The vascular plants did not do as well as they did in 2006. Partly this is due to the coastal location, but we were also without two of our perennial botanists, Lisa Gould and Rick Enser, and we were unfortunately cross-scheduled with the Wild Plant Society’s annual spring plant sale. In the end we found 291 vascular plants.

We owe a great debt to the U.S. Fish & Wildlife Service and the Friends of the National Wildlife Refuges of RI for their fantastic hospitality. The staff and volunteers put in a great deal of work and were indispensable for the success of the event. There were contributions of staff by agencies including RIDEM, USDA-NRCS, Narragansett Bay National Estuarine Research Reserve, URI and many others. Thank you to Matt Largess and Largess Forestry, Inc., for their financial support. Thanks, finally, to the scientists and volunteers who worked so hard to find what we found and give everything a name. The site for next year’s BioBlitz is still to be determined. Contact us if you would like to make a suggestion.



Photos: Russ Waldron.



Call for Proposals

RINHS and The Nature Conservancy of Rhode Island will soon issue a call for proposals for the John Wald Science Grants.

These small grants are made to support research addressing RINHS and TNC priorities. This year we are interested in research on Rhode Island's marine and coastal species and ecosystems, particularly research that sheds light on the status and trends of species, community diversity, or ecological health or methodological research addressing the same subject. A more fully developed call for proposals will be released by the grant review committee in the fall. Contact RINHS about your interest and we will be sure you receive a copy. This grant program is funded by an endowment created in memory of the late John Wald, an editor, writer, photographer, and outdoorsman.

Events Calendar

Thursday, September 27th. Weaver Auditorium, Coastal Institute, URI Kingston Campus. 5:30 PM: **RINHS Annual Meeting** 6:30 PM: Food and Fellowship 7:30 PM: **Mark D. Gould Memorial Lecture Series, Jack Ridge, Professor of Geology, Tufts University.** Subject: Dating deglaciation in New England.

Saturday, October 13th. Nettie Jones Nature Preserve, URI W. Alton Jones Campus, West Greenwich. 10:00 AM to 12 Noon: **1st Annual Lisa Lofland Gould Native Plant Program.** Walks and demonstrations on native rarities and Japanese Barberry control. Refreshments at 10:00 AM, Presentation at 10:30 AM.

Wednesday, December 5th. Weaver Auditorium, Coastal Institute, URI Kingston Campus. 7:30 PM. **Mark D. Gould Memorial Lecture Series, Shepard Krech III, Professor of Anthropology and Environmental Studies, Brown University.** "Birds and New England Native People: The Traditional Relationship." The 2nd Annual Used Natural History Book Sale begins at 6:30 PM. Donations needed, contact RINHS.

Thursday, March 20, 2008. RINHS 13th Annual Ecology of RI Conference at the URI Bay Campus. All day.

Dates for Gould Lectures 3 & 4 still pending.

BioBlitz 2008. Site and date to be determined, stay tuned!

Weaving the Web: Electronic Resources

In keeping with this issue's theme, we are focusing on Web resources on invasive species, highlighting a few selected sites at the local, regional, national, and international level. Of course, this barely scratches the surface of the on-line information and resources available. A recent Google search on "invasive species" generated 1,760,000 hits.

Rhode Island Invasive Species Portal: The portal is one component of the Rhode Island Natural History Survey's growing on-line Biodiversity Center—"designed to provide an resource for scientists, naturalists, and all individuals interested in better understanding invasive species in Rhode Island." Browsers can find the latest news on invasives, an event calendar, links to extensive resources, a discussion forum, opportunities to contribute your own observations and data, and a link to the RI Invasive Species Council, a collaborative outreach program of the Survey, RI Agricultural Experiment Station, and URI Cooperative Extension. <http://www.rinhs.org/invasives/>

Invasive Plant Atlas of New England: IPANE is a partnership of the University of Connecticut (Dept. of Ecology and Evolutionary Biology, Libraries, and Center for Geographic Information and Analysis), the Silvio O. Conte National Fish and Wildlife Refuge, and the New England Wildflower Society (see Lisa Gould's first "Invasives Beat" column in our Spring 2005 issue). The project managers are Les Mehrhoff and John Silander from UConn. IPANE provides a comprehensive, continually updated on-line database of invasive and potentially invasive plants in New England, with a focus on the early detection of, and rapid response to, new invasions. Users on the site can browse species lists, read species accounts, view photos, generate distribution maps, report sightings, and sign up for IPANE volunteer training sessions or other activities. <http://www.ipane.org>

National Invasive Species Information Center: NISIC was established in 2005 at the National Agricultural Library (NAL) to serve as a reference gateway to information, organizations, and services about invasive species, covering Federal, State, local, and international sources. The Web site is a collaboration of NAL, the U.S. Geological Survey, National Biological Information Infrastructure, and National Invasive Species Council. There are more than 12,000 links to external resources. <http://www.invasivespeciesinfo.gov/>

Invasive Species Information Node: ISIN is a data management portal for invasive species within the National Biological Information Infrastructure (NBII). The site is

developed and maintained by the Center for Biological Informatics of the U.S. Geological Survey. The mission is to create an early detection and rapid response information system for the control of invasive species in the United States. Resources include: links to regional invasive species efforts; a Global Invasive Species Database with printable species profiles, identification tools, distribution maps, occurrence data, and a mapping and reporting system for scientists and other citizens to report invasive species occurrences. <http://invasivespecies.nbi.gov/>

Aquatic Nuisance Species (ANS): The U.S. Fish and Wildlife Service's Branch of Invasive Species maintains this web site summarizing USFWS information and programs concerning aquatic invasive species. FWS activities include prevention, detection and monitoring, rapid assessment and response, control, and public education and outreach. There are links on the site to report observations of ANS, find contacts within each region, and download informational pamphlets and copies of relevant laws and regulations. <http://www.fws.gov/contaminants/ANS/ANSSpecies.cfm>

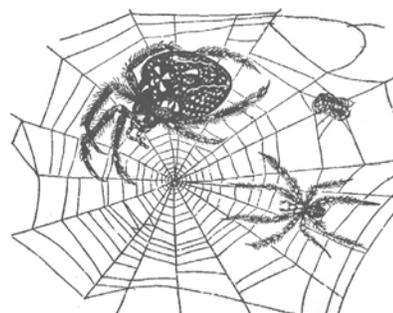
Aquatic Nuisance Species 2: The U.S. Environmental Protection Agency's Office of Wetlands, Oceans, and Watersheds (OWOW) also maintains a web site on invasive species and their threats to aquatic ecosystems. Invasive species represent the second leading cause of species extinction and loss of biodiversity in aquatic environments worldwide, cause considerable economic effects, and dramatically alter ecosystems supporting commercial and recreational activities. A major concern of EPA and a focus of the web site is the introduction of invasive species through transport between water bodies in ship ballast water. http://www.epa.gov/owow/invasive_species/

Invasive Species Specialist Group: Invasive species are clearly recognized as a threat at a global level. The Invasive Species Specialist Group (ISSG) is part of the Species Survival Commission (SSC) of The World Conservation Union (IUCN). ISSG includes 146 scientific and policy experts on invasive species from 41 countries. ISSG is based in Auckland, New Zealand, and has three regional sections in North America, Europe, and South Asia. ISSG provides advice on threats from invasives and control or eradication methods to IUCN members, conservation practitioners, and policy-makers. They focus primarily on invasive species that cause biodiversity loss, with particular attention to those that threaten oceanic islands. Resources offered on the web site include a global database, invasive species guidelines, downloadable workshop proceedings and other publications, a newsletter (*Aliens*) and listserv (*Aliens-L*), and links to other sources of information. <http://www.issg.org>

Global Invasive Species Initiative: Non-governmental organizations are also deeply involved in invasive species

management and information sharing. GIS is an effort by The Nature Conservancy to mitigate the damage to native biodiversity from human introductions of non-native invasive species. Their web site is designed to help conservationists deal most effectively with invasive species, with such resources as basic information, prevention strategies, control methods, photo archives, news and alerts, and links to other resources. <http://www.nature.org/initiatives/invasivespecies/>

Stop the "Alien" Attack: This site from the National Audubon Society features their campaign to minimize the impacts of invasives on U.S. biodiversity and ecosystems. Part of their campaign is pushing the last 14 states that have not yet done so to ban the possession and sale of snakehead fish—aggressive predators that could decimate native fish populations. The web site has basic invasive species information, links to national and regional information sources, recent news, summaries of threats to habitats and to birds, and watch lists and species accounts for 69 bird populations threatened by invasive species. <http://www.audubon.org/campaign/invasives/index.shtm>



Benefits of membership in the Rhode Island Natural History Survey

For Individual, Family, and Student Members

Rhode Island Naturalist, the newsletter
 Participation in the RINHS List-Serve
 10% discount on all publications
 Discount on annual conference fee
 20% discount on subscription to the journal *Northeastern Naturalist*

For Organizational Members

Rhode Island Naturalist, the newsletter
 Participation in the RINHS List-Serve
 Listing in Annual Conference Program
 10% discount on all publications
 1 free registration at annual conference
 20% discount on subscription to the journal *Northeastern Naturalist*

Our Mission

- * To facilitate and coordinate the gathering and dissemination of information on RI's biota, ecological communities, and geological systems;
- * To enhance communication among RI's natural scientists, educators, and decision makers;
- * To provide sound scientific data that can be used to help make informed management decisions;
- * To foster the preservation of RI's natural history collections; and
- * To provide educational outreach.

Wanted:

Donations for used natural history book sale

Francis Bacon said, "Some books are to be tasted, others to be swallowed, and some few to be chewed and digested." Bring us your unwanted books—lightly licked, spat up, or pooped out—and we will make sure they reach their best, highest use at our second annual used book sale, an hour before the December 5 Mark Gould lecture (see page 26). Donations may be tax deductible and proceeds from the sale benefit RINHS. Donations can be dropped off during office hours at Room 101, Coastal Institute Kingston, or call RINHS to make another arrangement. And be sure to come early to the lecture December 5 to find your next "alimentation."

To Contact Us...

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