Science & News from the Rhode Island Natural History Survey

Rhode Island Naturalist

Volume 11 • Number 2 • November 2004

What's Inside…

Estimating Fish Predation by Cormorants in the Narragansett Bay Estuary

BY DEBORAH P. FRENCH MCCAY AND JILL J. ROWE

Cormorant and other seabird populations have increased substantially in the Narragansett Bay Estuary (NBE, including Narragansett Bay, Mount Hope Bay, the Sakonnet River, and the Providence River), and New England in general, in the last few decades because of release of harvest pressure (that severely reduced or exterminated local bird populations in the last century), decrease in pesticide use, and increased protection. Double-crested Cormorant (*Phalacrocorax auritus*) breeding population size in the NBE increased from zero in 1980 to about 2100 pairs in the mid- to late 1990s (Ferren and Myers 1998; Figure 1). Cormorants, being efficient predators of fish, have frequently come into conflict with fisherman and aquaculture. In recent years, increasing populations of cormorants nationwide have led to growing concern from the public and natural resource management professionals about potential impacts of cormorants on various fish resources, prompting the US Fish and Wildlife Service to perform an environmental impact assessment (USDOI-FWS 2001). To assess the potential impact on NBE fish populations, we estimated fish predation rates by cormorants and compared those estimates to harvest rates by fishing and other sources of mortality.

Based on estimated ratios of non-breeders to breeding pairs, the NBE population of the Double-crested Cormorant in the late 1990s was about 11,000 birds, a level where it appears to remain at present. Estimates of numbers of the Great Cormorant (*Phalacrocorax carbo*) in the NBE are not available, but since they primarily migrate through the area in spring and fall and do not breed in NBE, their fish consumption would be much lower than for the Double-crested Cormorant population. About 85% of the Double-crested Cormorants nest in the Sakonnet River, with 34% of the total population nesting at Little Gould Island in the upper part of the Sakonnet River and 51% nesting around Sakonnet Point (Figure 2). The majority of the remainder, 13% of the population, nest at Hope Island in the West Passage of Narragansett Bay. Cormorants fly up to 8–16 km to feed in waters shallower than 8 m. The relatively large population associated with the Sakonnet River nesting colonies most likely feeds in Mount Hope Bay and the Sakonnet River, where shallow-water foraging areas are much more extensive than in nearby waters of the lower East Passage of Narragansett Bay. Thus, predation pressure on fish is likely higher in Mount Hope Bay and the Sakonnet River than in the East and West Passages of Narragansett Bay.

Fish consumption rates per day were estimated for adults and their chicks based on bioenergetic modeling, i.e., by estimating their calorific requirements for metabolism, daily activities, and growth. The amount of fish consumed annually per cormorant in the population (on average) was estimated accounting for breeding rates, chicks hatched per nest, chick growth rate and food needs, survival to fledging, and survival from fledging to fall migration. A full-grown bird consumes about 510 g of fish per day, or 93 kg in the 6 months it resides in the NBE (April to October). An additional 57 kg per breeding adult is consumed by their young before fall migration. The total consumption of fish by the Double-crested Cormorant population in the NBE during April–October was estimated at about 1.2 million kg (2.7 million lb) annually from 1993 to 1997.

Double-crested Cormorants are opportunistic fish eaters, mostly taking fish smaller than 150 mm. For species such as flounders, the fish eaten are young-of-the-year (juveniles). Cormorants also feed on small schooling (e.g., herrings) and bottom (e.g., cunners) species. Commercial and recreational fishermen take fish of much larger sizes that are at least several years old. Because the annual production of small juvenile fish is

RHODE ISLAND NATURAL HISTORY SURVEY

Providing Ecosystem Science and Information

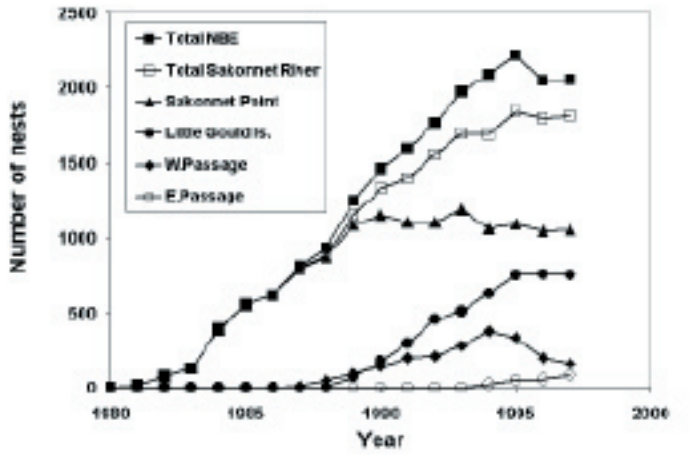


Figure 1. Numbers of Double-crested Cormorant nest sites in the Narragansett Bay estuary (NBE) and individual sections of the estuary, 1980–1997.

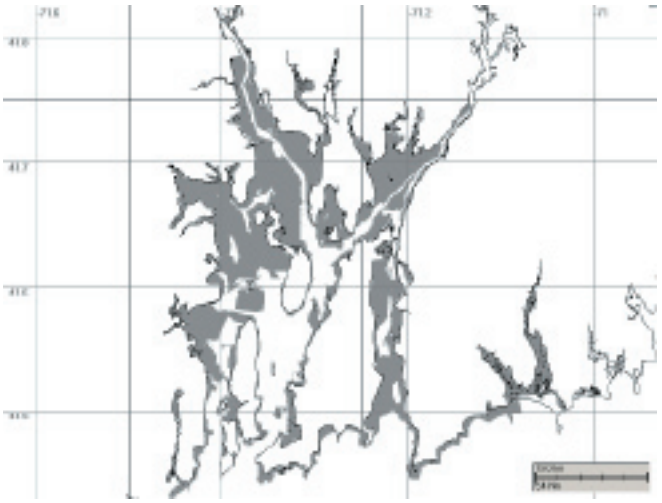


Figure 2. Foraging areas available to Double-crested Cormorants in the Narragansett Bay estuary, defined as waters shallower than 8 m within 16 km of cormorant nesting and roosting sites (shaded).

much higher than that for the older classes, direct comparison of cormorant predation with fishery catches overstates the relative importance of the predation. However, to provide some context, total annual landings of finfish and squid in Rhode Island were about 57 million kg (125 million lb) in the 1990s (DeAlteris et al. 2000).

Winter Flounder are of concern in Rhode Island and New England waters because of the high fishing rates and recent population decline (Gibson 2000). In 67 cormorants sampled by Rhode Island Division of Fish and Wildlife (RIDFW) from the NBE at Hope Island and Sakonnet Point in April–August 1995, 8.7% of stomach contents by weight were Winter Flounder (Mark Gibson, RIDFW, personal communication, April 2003). However, cormorants from Hope Island contained an average of 20% Winter Flounder, while Sakonnet Point cormorants sampled in June of 1995 had been eating Cunner, Butterfish, and Tautog, but not flounders. This difference is likely due to species availability in the foraging areas near where the birds were taken: around Hope Island the shallow (< 8 m) bottom is primarily sandy silt, whereas near Sakonnet Point the shallow-water habitats are mainly rocky and inhabited by Cunner, Tautog, and other reef species.

If the annual fish consumption by cormorants from the NBE in 1993–1997 averaged 8.7% Winter Flounder, the cormorant consumption of Winter Flounder would have been 106,000 kg/yr (234,000 lb/yr) in those years. By comparison, the total (commercial and recreational) Rhode Island catch of Winter Flounder in the 1990s was about 590,000 kg/yr (1.3 million lb/yr; DeAlteris et al. 2000). However,

Juvenile Double-crested Cormorant. Photo by Don Chalfant, Ann Arbor, Michigan (used by permission).

note again that the predation is on small fish, not those sizes caught by fishermen, and the size distribution of Winter Flounder is highly skewed towards small fish, as is typical of exploited fishery species. Thus, the comparison needs to be made to the standing biomass and production rate of small fish (for Winter Flounder and other potential prey species) in the size range taken by cormorants. Such estimates are not available from direct measurement, and must be approximated from models of population size and size-specific mortality rates. We have estimated that cormorants consume on the order of 10% or less of Winter Flounder young-of-the-year in Rhode Island waters. In general, studies to date indicate that the consumption of fish by cormorants is much less significant to local fish populations than is human harvest (USDOI-FWS 2001).

References

DeAlteris, J.T., M. Gibson, and L.G. Skrobe. 2000. Fisheries of Rhode Island. Narragansett Bay Summit 2000, White Paper, Working Draft (4/14/00). Dept. of Fisheries, Animal and Veterinary Science, University of Rhode Island, Kingston, RI. 48 pp.

Ferren, R.L., and J.E. Myers. 1998. Rhode Island's Maritime Nesting Birds. Federal Aid to Wildlife Restoration grant report. R.I. Division of Fish and Wildlife, West Kingston, RI. 222 pp.

Gibson, M.R. 2000. Recent trends in abundance, recruitment, and fishing mortality for winter flounder in Narragansett Bay and Rhode Island coastal waters. Report to the Rhode Island Marine Fisheries Council. RI Division of Fish and Wildlife, Wakefield, RI. 13 pp. + tables & figs.

U.S. Department of Interior, Fish and Wildlife Service (USDOI-FWS). 2001. Draft Environmental Impact Statement: Double-crested Cormorant Management. USDOI-FWS, Washington, DC. 159 pp.

Dr. Deborah French McCay is a Principal with Applied Science Associates (ASA) in Narragansett, specializing in quantitative assessments and modeling of aquatic ecosystems and their responses to pollutants. Jill Rowe is a marine biologist with ASA, specializing in natural resource damage assessment modeling, data management, and GIS mapping and analysis.

Habitat Relationships of Waterfowl Wintering in Narragansett Bay

BY RICHARD MCKINNEY

Narragansett Bay in winter can be a hostile place—cold winds, winter storms, and ice keep most animals and people away from its shores. But many species of waterfowl are right at home in its frigid waters. Twenty-three waterfowl species are regular or occasional winter visitors to the Bay, including 11 of 15 species of sea ducks, a guild of waterfowl that breed in the remote boreal forests of Canada and winter as far south as Chesapeake Bay. Sea ducks spend most of their time during the winter on the water, favoring estuarine and near-coastal areas where they can feed on benthic invertebrates such as snails, mussels, and crabs. Narragansett Bay also hosts substantial numbers of Scaup, Mallard, American Black Duck, and American Wigeon, which take refuge in sheltered harbors and coves.

In the winter of 2001 the U.S. Environmental Protection Agency (EPA) initiated a study to investigate relationships between wintering waterfowl and the variety of habitats present in the Bay, from shallow, salt marsh-dominated coves to mid-Bay open water to rocky headlands that characterize its southern shores. As part of a new initiative to be proactive on human-induced threats to natural ecosystems, EPA is interested in the effects of habitat loss and alteration in coastal areas on resident wildlife species (USEPA 2002). As a preliminary step in this process, I have begun to assess the abundance and species diversity of wintering waterfowl in Narragansett Bay. The immediate goals of the project are to determine what waterfowl species use the Bay, what habitat types are used by different species, and what habitat characteristics are important in sustaining populations of wintering waterfowl.

What waterfowl species use Narragansett Bay habitats?

To determine waterfowl species diversity and abundance, I have conducted a mid-winter Bay-wide survey for the past three years, with the help of a number of field assistants and volunteer birders. We used direct counts (BCMELP 1999, Stott and Olson 1972) to record all waterfowl at 66 survey points that were chosen to provide as complete coverage of the Bay as possible. We found an average of 14,650 total waterfowl per survey, including 17 species of waterfowl that are regular winter inhabitants of the Bay (Table 1). Scaup (there are two species, but they are very difficult to differentiate) are the most numerous wintering waterfowl in the Bay, but their numbers today are lower than those of the mid-1900s, when over 20,000 birds were reported (Ferren, unpublished). The number of Common Eider is lower than that reported during the mid-1990s, which numbered as high as 10,000, and were concentrated near the mouth of the Bay (C. Allin, personal communication). The abundances of both Common Goldeneye and Bufflehead were consistent from year to year within our survey period, and are similar to those reported in the early to mid-1900s (Ferren, unpublished).

Bufflehead, photo by Richard McKinney

What habitats do wintering waterfowl use in Narragansett Bay?

Waterfowl can be found throughout the Bay, but several general habitat types are favored by specific assemblages of species. These general patterns of habitat utilization may be driven by the life-history strategies of the species or by other factors such as competition, predation, or site fidelity (Morrison et al. 1998, Robertson and Cooke 1999, Werner and Hall 1979, Werner et al. 1983). During our surveys we found that waterfowl utilize four general habitat types in Narragansett Bay (Table 2). Dabbling ducks such as American Black Duck and Mallard use salt marshes both at high tide for protection and feeding and at low tide as roost sites. Gadwall, Canada Geese, and Bufflehead use shallow coves that offer easy access to benthic prey and also tend to be better protected from prevailing winter winds. Large flocks of Scaup, as well as Red-breasted Merganser and Common Goldeneye, frequent open water in the middle to lower part of the Bay. Harlequin Ducks and Common Eider are found primarily near rocky headlands at the mouth of the Bay.

Table 1. Mean (± standard deviation) abundance of waterfowl species per mid-winter survey in Narragansett Bay from 2001 to 2004, in order of abundance.

Common Name	Species	Mean (SD)	Primary Habitat
Scaup	*Aythya* spp.	2829 (1056)	Estuarine open water
Canada Goose	*Branta canadensis*	2051 (20)	Shallow coves
Common Goldeneye	*Bucephala clangula*	1803 (735)	Estuarine open water
Common Eider	*Somateria mollissima*	1515 (811)	Rocky headlands
Brant	*Branta bernicla*	1053 (1214)	Shallow coves
American Black Duck	*Anas rubripes*	980 (40)	Salt marsh
Mallard	*Anas platyrhynchos*	784 (759)	Salt marsh
Red-breasted Merganser	*Mergus serrator*	780 (63)	Estuarine open water
American Wigeon	*Anas americanus*	763 (421)	Salt marsh
Bufflehead	*Bucephala albeola*	659 (83)	Shallow coves
Gadwall	*Anas strepera*	395 (152)	Shallow coves
Mute Swan	*Cygnus olor*	387 (193)	Shallow coves
White-winged Scoter	*Melannita fusca*	353 (82)	Estuarine open water
Black Scoter	*Melannita nigra*	128 (99)	Estuarine open water
Harlequin Duck	*Histrionicus histrionicus*	87 (26)	Rocky headlands
Hooded Merganser	*Mergus cucullatus*	58 (35)	Shallow coves
Surf Scoter	*Melanitta perspicillata*	23 (28)	Estuarine open water

What habitat characteristics are important in sustaining populations of wintering waterfowl?

In addition to the Bay-wide survey, we also collected bimonthly census data from November through April at twelve study sites. The data revealed differences in habitat use, even for the same species in the same habitat type. For example, Bufflehead abundance varied across six shallow, salt marsh-dominated coves, from a high of 41 in Coggeshall Cove on Prudence Island to a low of 14 in Watchemoket Cove near Providence (ANOVA, df = 5, F = 7.91, $p < 0.001$). What factors are driving our observed differences in abundance, even between similar habitat types? Overall prey abundance ($r^2 = 0.09$, $p = 0.55$) and habitat area ($r^2 = 0.42$, $p = 0.16$) did not significantly influence abundance; in fact, the number of Bufflehead actually decreased with increasing habitat area. Ongoing studies at these sites indicate that the energetic demands of wintering Bufflehead at these sites are adequately met, and that in theory these habitats could support more birds than are present (McKinney and McWilliams, manuscript in preparation). We therefore began to look for other habitat characteristics that may be influencing patterns of utilization not just by Bufflehead, but also by all waterfowl species in the Bay. To look for habitat characteristics that may be influencing utilization, I used abundance-weighted principal component analysis (AW-PCA), a statistical technique that overlays species abundances on principal component analysis plots of study sites and can give insights into habitat characteristics that may be influencing use. PCA can take a number of habitat and landscape characteristics and reduce them to several dominant characteristics that are then used to describe or group the sites.

When waterfowl abundances were added to PCA plots, species that prefer rocky headlands and estuarine open water appeared to favor larger sites with greater amounts of natural vegetation or salt marsh in a 100-m radius around the habitat, and a higher proportion of the habitat perimeter bordered by salt marsh or natural vegetation. On the other hand, salt-marsh and shallow-cove species tended to favor sites with higher amounts of adjacent forested land or structures that could potentially block prevailing winds and sites with more adjacent residential development. Our finding that species inhabiting shallow coves prefer areas with higher residential development seems at odds with the general perception that waterfowl will avoid direct human disturbance (Belanger and Bedard 1990; Evans and Day 2001, 2002; Perry and Dellar 1996). One possible explanation may lie in the amount of hunting activity in these areas. In Rhode Island, waterfowl hunting is often prohibited in coves and

embayments with adjacent residential development, and this, along with the wind-attenuating effect of houses and other structures immediately adjacent to the cove, may offset the effects of human disturbance for species that use these areas.

Table 2. Locations of high waterfowl diversity or abundance in Narragansett Bay during winter. Species richness, or the number of waterfowl species recorded, dominant species, and the total number of waterfowl present are reported for the 2004 survey.

Location	Species Richness	Dominant Species[a]	Total Abundance	Habitat Type
Brush Neck Cove	7	AWIG, ABDU	1831	Salt Marsh
Apponaug Cove	9	CAGO, MALL	497	Salt Marsh
Wickford Harbor	5	BUFF	506	Shallow Cove
Potter Cove[b]	4	COGO, BUFF	307	Shallow Cove
Sabin Point	6	Scaup, COGO	2431	Open Water
Central Narragansett[c]	3	RBME	158	Open Water
Sachuest Point	8	HADU	238	Rocky Headland
Beavertail Point	6	COEI	331	Rocky Headland

a AWIG = American Wigeon, ABDU = American Black Duck, BUFF = Bufflehead, CAGO = Canada Goose, COEI = Common Eider, COGO = Common Goldeneye, HADU = Harlequin Duck, MALL = Mallard, RBME = Red-breasted Merganser
b Prudence Island
c Includes State Pier #5 and Narragansett Town Beach

Summary and conclusions

A total of 42% of the 55 native North American waterfowl species (Bellrose 1980) winters in Narragansett Bay. The average waterfowl density in the Bay is 39 birds per square kilometer, which is comparable to Boston Harbor (36 birds per square kilometer; TASL Online: http://www.gis.net/~szendeh/tasl.htm), but less than Chesapeake Bay (55 birds per square kilometer; http://www.chesapeakebay.net). We found that roughly two-thirds of the waterfowl inhabited estuarine open water and small coves, 22% frequented salt marshes, and only 11% used rocky headlands. Further investigation using abundance-weighted PCA suggested that adjacent land use may be influencing habitat utilization. Future studies will focus on developing models that can estimate waterfowl abundances in coastal vegetated habitats, in the hope of providing insights into the effects of habitat loss and alteration on resident waterfowl populations.

Acknowledgements

I would like to thank Scott McWilliams and Peter Paton from the University of Rhode Island, Department of Natural Resources Science for assistance with the design of this study, as well as guidance during data collection and analysis. Jim Heltshe performed the principal component analysis and Mike Charpentier provided land use summaries. Brad Timm, Kate Bannick, and Heather Burnell provided invaluable assistance with survey work. Mention of trade names or commercial products in this report does not constitute endorsement or recommendation. Although the research described in this article has been funded wholly by the U.S. Environmental Protection Agency, it has not been subjected to Agency-level review. Therefore, it does not necessarily reflect the views of the Agency. This is the Office of Research and Development, National Health and Environmental Effects Research Laboratory, Atlantic Ecology Division contribution number AED-04-133.

References

BCMELP (British Columbia Ministry of Environment, Lands and Parks). 1999. Inventory methods for waterfowl and allied species (Standards for components of British Columbia's biodiversity; no. 18). Ministry of Environment, Lands and Parks, Resources Inventory Branch, for the Terrestrial Ecosystem Task Force, Resources Inventory Committee, May 11, 1999. http://srmwww.gov.bc.ca/risc

Belanger, L., and J. Bedard. 1990. Energetic cost of man-induced disturbance to staging snow geese. *Journal of Wildlife Management* 54:36–41.

Bellrose, F.C. 1980. *Ducks, Geese, and Swans of North America, 3rd Edition*. Stackpole Books, Harrisburg, PA. 540 pp.

Evans, D.M., and K.R. Day. 2001. Does shooting disturbance affect diving ducks wintering on large shallow lakes? A case study on Lough Neagh, Northern Ireland. *Biological Conservation* 98:315–323.

Evans, D.M., and K.R. Day. 2002. Hunting disturbance on a large shallow lake: the effectiveness of waterfowl refuges. *Ibis* 144:2–8.

Ferren, R. *The Birds of Rhode Island*. Unpublished manuscript. Berkshire Community College, Pittsfield, MA.

Morrison, M.L., B.G. Marcot, and R.W. Mannan. 1998. *Wildlife-Habitat Relationships: Concepts and Applications, 2nd edition*. University of Wisconsin Press, Madison, WI. 435 pp.

***Rhode Island Naturalist*, the newsletter of the Rhode Island Natural History Survey Inc., is published twice yearly. RINHS, Room 101 Coastal Institute in Kingston, 1 Greenhouse Road, URI, Kingston, RI 02881-0804**

Perry, M.C., and A.S. Deller. 1996. Review of factors affecting the distribution and abundance of waterfowl in shallow water habitats of Chesapeake Bay. *Estuaries* 19:272–278.

Robertson, G.J., and F. Cooke. 1999. Winter philopatry in migratory waterfowl. *Auk* 116:20–34.

Stott, R.S., and D.P. Olson. 1972. An evaluation of waterfowl surveys on the New Hampshire coastline. *Journal of Wildlife Management* 36:996–1007.

USEPA (U.S. Environmental Protection Agency). 2002. Aquatic stressors: framework and implementation plan for effects research. EPA report no. 600/R-02/074. U.S. EPA, Office of Research and Development, National Health and Environmental Effects Research Laboratory, Research Triangle Park, NC. 179 pp.

Werner, E.E., and D.J. Hall. 1979. Foraging efficiency and habitat switching in competing sunfishes. *Ecology* 60:256–264.

Werner, E.E., J.F. Gilliam, D.J. Hall, and G.G. Mittelbach. 1983. An experimental test of the effects of predation risk on habitat use in fish. *Ecology* 64:1540–1548.

Richard McKinney is an Environmental Scientist with the U.S. EPA Atlantic Ecology Division in Narragansett, RI.

Notes from Field and Study

BY RICHARD ENSER

One goal of the Rhode Island Natural History Survey is to catalog the full complement of biodiversity in the state, hopefully leading to an understanding of human impacts on biological complexity and the actions needed to preserve biodiversity into the future. Completing portions of this catalog has been accomplished for well-known, obvious, or otherwise charismatic groups such as vertebrate animals, vascular plants, and some invertebrate groups such as butterflies. But there remains a large number of organisms yet to be inventoried because there has not yet been a particular expert available to help mentor local naturalists on the nuances of capture and identification. For example, the spiders are a fascinating group of which many people can profess some familiarity and the ability to identify 10, 20, or maybe more species. However, it will take a considerable effort and an expert arachnologist to tackle this group fully given the more than 500 species estimated in this area.

Another way to work on some of the larger groups is to identify particular subgroups, or families whose members share particular characteristics in morphology, behavior, or ecology that help single them out. In this manner the tiger beetles, a rather small family within the Coleoptera, have been well-documented in Rhode Island because individual species tend to use similar habitats, are relatively easy to find and capture, and are not difficult to separate taxonomically.

Diptera (flies and relatives) is a large order of insects estimated to contain more than 2000 species statewide. As such this necessitates the selection of smaller groups for study. One dipteran group that has recently begun to receive increased scrutiny is the family Asilidae, or the robber flies.

Ginger and Charlie Brown, fresh from their successes during the state Odonate Atlas project, were determined to use their field skills in a new arena. They reconnected with Mike Thomas of the Connecticut Agricultural Experiment Station, an expert on robber flies who is preparing a southern New England assessment. In no time they were supplying Mike with Rhode Island specimens.

According to Mike, little is known about the approximate 78 asilid species recorded in Connecticut. There are no field guides or comprehensive texts on the group, although there are a few treatments—including *The Asilidae of Connecticut* by Stanley W. Bromley, published in 1946. What is known is that the robber flies are fairly distinctive predatory insects, many with long abdomens so they superficially resemble damselflies. They lay their eggs in soil and rotten wood, with some species being fairly specific in their selection of wood from only certain tree families. The larvae as well are predators, hunting bark beetles and other large insects.

Mike also explains that some species historically recorded in New England have not been found in recent years, and he suspects at least two that were common in the early 1900s during the agricultural era have probably disappeared. But fieldwork conducted by the Browns in 2004 has resulted in some good rediscoveries. During BioBlitz 2004 in June at the Alton Jones Campus, *Laphria champlanii* was identified after not being seen in New England since 1913. It's a species that perches almost exclusively on Scrub Oak (*Quercus ilicifolia*). In addition, *Echthodopa formosa* was found at the Great Swamp following a nearly 70-year absence. To date, about 48 species of robber flies have been documented in one year's effort in Rhode Island, or about 60% of the expected number. Although the remaining 40% may collectively be more challenging to find, Rhode Island is well on its way toward learning about this varied group of flies and completing another piece of the state's biodiversity puzzle.

***Richard Enser** is the Coordinator of the RIDEM Natural Heritage Program and serves on the RINHS Board of Directors.*

Rhode Island Collections: Freshwater Mussel Collections and Collectors

BY JAY CORDEIRO

This is the final of three articles on Rhode Island freshwater mussels to appear in *Rhode Island Naturalist*. The first (Cordeiro 2003) discussed mussel life history, decline, and threats to freshwater mussels in the state. The second (Cordeiro 2004) provided a state faunal list, delineated habitat requirements, and assessed their conservation status is Rhode Island. This final article in the series will provide insight into Rhode Island mussel collections, give a history of scientific studies of conchology (study of shells; now malacology, study of mollusks), and list eminent local malacologists.

Studies of freshwater bivalves in the state of Rhode Island are limited, and most give greater attention to New England as a whole or to other New England states. Gould (1841; 1870) included freshwater mussels in his *Report of the Invertebrates of Massachusetts* and extrapolated species occurrences to Rhode Island. Linsley (1845) did the same for Connecticut. C.W. Johnson (1915) provided a faunal list of all mollusks of New England, deriving much of his information from Linsley (1845) and Gould (1870). His list, as well as all other published faunal lists, omits *Leptodea ochracea* (Say, 1817) from Rhode Island as it is only documented from museum collection records. Clench (1929) quickly summarized Johnson (1915). R.I. Johnson published extensive monographs on the Unionidae of the southern Atlantic slope as well as middle and northern North America (Johnson 1970 and 1980, respectively). He included no specific Rhode Island locality information, although he did mention Cunliff's Pond and Warwick Pond as sites for *Anodonta implicata* Say, 1829, based on Harvard Museum of Comparative Zoology (MCZ) specimens (Johnson 1946). More recently, limited studies of Rhode Island mussel distributional ecology and growth rate (Anthony et al. 2001, Kesler 1998, Kesler and Bailey 1993, Kesler and Downing 1997) have been conducted.

The history of Rhode Island freshwater molluscan studies is depauperate in terms of the diversity of malacologists. One of the earliest and probably best-known Rhode Island naturalists was Horace Francis Carpenter (Figure 1). A Rhode Island native, he was born in 1842 in Pawtucket. He graduated from Brown University in 1860 in chemistry and was a chemist, conchologist, and mineralogist, refining gold and silver at H.F. Carpenter and Son until 1912 (Figure 2). Carpenter was a pioneer in the precious metals refining industry—discovering the first method for extracting gold and silver from photographic waste, the process for obtaining pure gold for commercial use, and a widely used silver oxidizing fluid. He was an active member of both the Boston Society of Natural History and Providence Franklin Society (circa 1826–1922), frequently giving oral presentations to members of both organizations (Abbott 1973). He was also an early shell, fossil invertebrate, and mineral collection donor to the Roger Williams Park Museum of Natural History (RWPM) in Providence. He donated his natural history library (approximately 250 volumes), and shell (4000 species) and mineral collections (75,000 specimens combined), to the RWPM. Beginning in 1917, Carpenter bicycled to the museum most mornings with baskets of specimens for the museum's collections (Kieron 1999).

Figure 1. Horace Francis Carpenter, 1913 (courtesy Roger Williams Park Museum of Natural History photo archives)

Although he published extensively on Rhode Island mollusks, most notably his series of papers on the *Shell-bearing Mollusca of Rhode Island*, only a few of Carpenter's works focused on freshwater mollusks (Carpenter 1885a–c; 1886a–c; 1887a–b; 1889b–f; 1890a–d; 1902; 1905; 1907), despite his keen interest in the group. Carpenter described four mollusk species (three from Rhode Island), but no freshwater mussels. He has also been erroneously credited as describing several species of marine chitons from Japan and western North America. Famed American malacologists Henry Augustus Pilsbry and William Healey Dall published the descriptions of these species, based on unpublished manuscripts by Philip Pearsall Carpenter, who had died in 1877. H.F. Carpenter noted the many virtues of natural science in his works, among them the benefits of collecting shells by both sexes, a common theme among early naturalists. He states, "The science of Conchology is one in which ladies may

Figure 2. H.F. Carpenter Gold and Silver Refiner and Sweep Smelter building, Providence, Rhode Island (from Carpenter 1889a: back cover)

engage, with much profit and pleasure to themselves and to others. There are many ladies in different parts of Europe who have accumulated quite extensive collections of shells, and who have added largely to our stock of knowledge by their personal researches" (Carpenter 1884). He died in 1937 at age 94 in Edgewood [= Cranston], Rhode Island.

Carpenter's general collection currently resides in the RWPM, while Richard I. Johnson of Harvard's MCZ secured type specimens and much of the mollusk library in 1963 through interaction with Maribelle Cormack, director (1947–1972) of the RWPM. Miss Cormack was instrumental in the growth of the public education and exhibitions at the museum—producing, during her tenure, the Wildlife Hall, Hall of the Pacific, Native American Exhibit, and the Cormack Planetarium. A "triangle trade" was arranged between the RWPM, MCZ, and the Hayden Planetarium at Boston's Museum of Science—the Carpenter library and type specimens were acquired by the MCZ, which, in turn, gave a small monetary donation to the Hayden Planetarium, which donated a variety of special-effects projectors and a film entitled "The Universe" to the RWPM.

Norman Wallace Lermond was a Maine shell collector who collected throughout the United States, the Bahamas, and Cuba, and donated a portion of his collection to the RWPM. He also traded actively with his friend and colleague, Horace F. Carpenter. Born in 1861 in Knox County, Maine, Lermond was an accountant, naturalist, amateur conchologist, and amateur botanist. He ran, unsuccessfully, for governor of Maine on the Socialist ticket in 1900. Lermond founded the Knox Arboretum (later the Knox Academy of Arts and Sciences) and the journal *Maine Naturalist* (now *Northeastern Naturalist*), was co-founder and corresponding secretary of the American Malacological Union (now American Malacological Society), and published a catalog of the Mollusca of Maine (Lermond 1908, 1914) (information from Abbott 1973). He died in spring, 1944, at age 82 in Thomaston, Maine. Although he collected infrequently in Rhode Island, some of his specimens still reside in various natural history museums.

Herbert David Athearn was born in 1923 in Fall River, Massachusetts. He hails from a family of shell collectors from Cape Cod, among them Eleanor W. Athearn, his mother, collector of freshwater and land shells; William D. Athearn, his brother, a marine collector; and Nadine Athearn, his sister-in-law, a marine and later freshwater shell collector with her own natural history supply company and formerly employed at the Woods Hole Oceanographic Institution. During his early adulthood in Fall River and Taunton, Massachusetts, while employed as a postal carrier, he spent many days collecting throughout southern New England. He later moved to Cleveland, Tennessee, where he continued to accumulate what today is probably the largest private collection of freshwater mussels in the world (designated by Athearn as the Museum of Fluviatile Mollusks). Athearn was president of the Boston Malacological Club (1953–1954) and was active in the American Malacological Union (Abbott 1973, Eichhurst 2004). In 2001 Athearn was awarded the William J. Clench Memorial award by the Freshwater Mollusk Conservation Society for his outstanding contributions to freshwater malacology. Athearn's collection contains specimens of freshwater mollusks from around the world, being particularly rich in the fauna of New England (his earliest collected specimens) and the southeastern U.S. where he has lived for much of his life. Athearn described three new species of freshwater mussels, all from Alabama (Athearn 1964). In addition, the freshwater snail species *Elimia athearni* (Clench and Turner, 1956); subspecies *Physa gyrina athearni* Clarke, 1973; *Physa jennessi athearni* Clarke, 1973; and genus *Athearnia* Morrison, 1971 were named in his honor.

Other early contributors to Rhode Island freshwater mussel knowledge include the second director (1904–1908) of the RWPM (following the death of James Southwick in 1904)—Charles Abbott Davis (1869–1908) (Figure 3). He illustrated a freshwater snail described by Carpenter (Davis 1905a), described two local marine bivalve subspecies (Davis 1905a), and published mussel faunal lists for New England (Davis 1905b, 1905c) and the North American holdings of the RWPM (Davis 1904). Davis had a decent collection of shells and was also interested in Rhode Island insects (particularly beetles), but died a relatively young man of 39 years (anonymous 1908; Roger Williams Park Museum of Natural History archives). Short notes on Rhode Island freshwater mollusks were also published by Ford (1884), Hinkley (1886), Morgan (1886), and Baker (1900).

Figure 3. Charles Abbott Davis, 1869–1908 (courtesy Roger Williams Park Museum of Natural History photo archives)

Major collections of Rhode Island freshwater mussels can be found at the RWPM in Providence, Rhode Island (contact curator Marilyn Massaro for Collections access or for donation information); Harvard's MCZ in Cambridge, Massachusetts; Yale's Peabody Museum in New Haven, Connecticut; the American Museum of Natural History in New York, New York; and the United States National Museum (Smith-

sonian Institution) in Washington, D.C., among others. When contributing freshwater mussels to any natural history museum collection, it is always prudent to bear in mind that museum specimens are only as valuable to scientific research as the data that accompany them. Specimen locality data for mussels found in Rhode Island can be submitted to Erik Endrulat at the Rhode Island Natural History Survey for download into the Rhode Island Natural Heritage database. Submission of new locality records is encouraged as the Rhode Island Natural Heritage database contains only three historical occurrence records for freshwater mussels in the state.

Literature Cited

Abbott, R.T. (ed.) 1973. *American Malacologists. A National Register of Professional and Amateur Malacologists and Private Shell Collectors and Biographies of Early American Mollusk Workers Born between 1618 and 1900*. American Malacologists, Falls Church, Virginia. 494 pp.

Anonymous. 1908. [Death of Charles Abbott Davis]. *The Nautilus* 21(11):131.

Anthony, J.L., D.H. Kesler, W.L. Downing, and J.A. Downing. 2001. Length specific growth rates in freshwater mussels (Bivalvia: Unionidae): extreme longevity or generalized growth cessation? *Freshwater Biology* 46(1):1–11.

Athearn, H.D. 1964. Three new unionids from Alabama and Florida and a note on *Lampsilis jonesi*. *The Nautilus* 77(4):134–139.

Baker, F.C. 1900. On a collection of fresh-water shells from Rhode Island. *The Nautilus* 13(10):112–113.

Carpenter, H.F. 1884. An introduction to a series of papers on the shell-bearing Mollusca of Rhode Island. *Random Notes on Natural History* 1(1):5–6.

Carpenter, H.F. 1885a. The shell-bearing Mollusca of Rhode Island. *Random Notes on Natural History* 2(8):62–64.

Carpenter, H.F. 1885b. The shell-bearing Mollusca of Rhode Island. *Random Notes on Natural History* 2(9):70–72.

Carpenter, H.F. 1885c. The shell-bearing Mollusca of Rhode Island. *Random Notes on Natural History* 2(10):76–77.

Carpenter, H.F. 1886a. *Hyalinia wheatleyii*, Bland. *Random Notes on Natural History* 3(11):87.

Carpenter, H.F. 1886b. The shell-bearing Mollusca of Rhode Island. *Random Notes on Natural History* 3(11):85–87.

Carpenter, H.F. 1886c. The shell-bearing Mollusca of Rhode Island. *Random Notes on Natural History* 3(12):95–97.

Carpenter, H.F. 1887a. The shell-bearing Mollusca of Rhode Island. *The Conchologists Exchange* 1(12):76–77.

Carpenter, H.F. 1887b. The shell-bearing Mollusca of Rhode Island. *The Conchologists Exchange* 2(1):2–3.

Carpenter, H.F. 1889a. *A Catalogue of the Shell-bearing Mollusca of Rhode Island*. Second edition. J.A. and R.A. Reid: Providence, Rhode Island. 7 pp.

Carpenter, H.F. 1889b. Notes on *Valvata* (*Lyogyrus*) *brownii*. *The Nautilus* 3(6):67.

Carpenter, H.F. 1889c. The shell-bearing Mollusca of Rhode Island. *The Nautilus* 3(1):11–12.

Carpenter, H.F. 1889d. The shell-bearing Mollusca of Rhode Island. *The Nautilus* 3(2):21–23.

Carpenter, H.F. 1889e. The shell-bearing Mollusca of Rhode Island. *The Nautilus* 3(3):32–33.

Carpenter, H.F. 1889f. The shell-bearing Mollusca of Rhode Island. *The Nautilus* 3(8):92–95

Carpenter, H.F. 1890a. The shell-bearing Mollusca of Rhode Island. *The Nautilus* 4(2):22–23.

Carpenter, H.F. 1890b. The shell-bearing Mollusca of Rhode Island. *The Nautilus* 4(3):35–36.

Carpenter, H.F. 1890c. The shell-bearing Mollusca of Rhode Island. *The Nautilus* 4(4):46–47.

Carpenter, H.F. 1890d. The shell-bearing Mollusca of Rhode Island. *The Nautilus* 4(5):56–57.

Carpenter, H.F. 1902. The shell-bearing Mollusca of Rhode Island. *The Nautilus* 16(2):17–18.

Carpenter, H.F. 1905. New locality for *Lyogyrus brownii* Carpenter. *The Nautilus* 19(4):47–48.

Carpenter, H.F. 1907. Additions to the "Catalogue of the shell-bearing Mollusca of Rhode Island", 1889. *The Nautilus* 21(4):47.

Clench, W.J. 1929. Freshwater shells of New England. *Bulletin of the Boston Society of Natural History* 52:3–8.

Cordeiro, J. 2003. Freshwater mussels in Rhode Island: Part 1. Introduction. *Rhode Island Naturalist* 10(2):1–3.

Cordeiro, J. 2004. Freshwater mussels in Rhode Island: Part 2. Diversity and distribution. *Rhode Island Naturalist* 11(1):4–8.

Davis, C.A. 1904. A numbered check list of North American Unionidae with localities, (after Simpson). *Bulletin of the Roger Williams Park Museum* 11:1–19.

Davis, C.A. 1905a. [138. *Segmentina jenksii*- H.F. Carpenter.] *The Apteryx* 1(3):117.

Davis, C.A. 1905b. The Unios of New England. *The Apteryx* 1(3):94–103.

Davis, C.A. 1905c. The Unios of New England. *Bulletin of the Roger Williams Park Museum* 12: 1–7.

Eichhurst, T. 2004. Shell collecting at Cape Cod: the Athearn Collection. *American Conchologist* 32(1):27–29.

Ford, J. 1884. On the admission of certain new species of mollusks into the fauna of Rhode Island. *Random Notes on Natural History* 1(12):9.

Gould, A.A. 1841. Results of an examination of the shells of Massachusetts, and their geographical distribution. *Journal of Natural History* 3(4):483–494.

Gould, A.A. 1870. *Report on the Invertebrata of Massachusetts*. 2nd ed. Welch, Bigelow, & Co., Cambridge, Massachusetts. v + 524 pp.

Hinkley, A.A. 1886. *Pleurocera neglectum*, Anthony. *Random Notes on Natural History* 3(9):69.

Johnson, C.W. 1915. Fauna of New England. 13. List of the Mollusca. *Occasional Papers of the Boston Society of Natural History* 7:1–231.
Johnson, R.I. 1946. *Anodonta implicata* Say. *Occasional Papers on Mollusks* 1(9):109–116.
Johnson, R.I. 1970. The systematics and zoogeography of the Unionidae (Mollusca: Bivalvia) of the southern Atlantic slope region. *Bulletin of the Museum of Comparative Zoology* 140(6):263–449.
Johnson, R.I. 1980. Zoogeography of North American Unionacea (Mollusca: Bivalvia) north of the maximum Pleistocene glaciation. *Bulletin of the Museum of Comparative Zoology* 149:77–189.
Kesler, D.H. 1998. Freshwater mussels in Worden Pond: is there a problem? *RINHewS* 5(1):4–6.
Kesler, D.H., and R.C. Bailey 1993. Density and ecomorphology of a freshwater mussel (*Elliptio complanata*, Bivalvia: Unionidae) in a Rhode Island Lake. *Journal of the North American Benthological Society* 12(3):259–264.
Kesler, D.H., and J.A. Downing. 1997. Internal shell annuli yield inaccurate growth estimates in the freshwater mussels *Elliptio complanata* and *Lampsilis radiata*. *Freshwater Biology* 37:325–332.
Kieron, M. 1999. The geology and paleontology collections of the Museum of Natural History at Roger Williams Park, Providence. *RINHewS* 6(2):10–11.
Lermond, N.W. 1908. Shells of Maine: a catalogue of the land, fresh-water and marine Mollusca of Maine. Report to the Commissioner of Agriculture, Augusta, Maine. 46 pp.
Lermond, N.W. 1914. Additions to the list of Maine Mollusca. *The Nautilus* 28(2):18–20.
Linsley, J.H. 1845. Catalogue of the shells of Connecticut. *American Journal of Science* 48:271–286.
Morgan, T. 1886. The growth of *Unio complanatus*, Lea. *Random Notes on Natural History* 3(8):61.

Acknowledgements

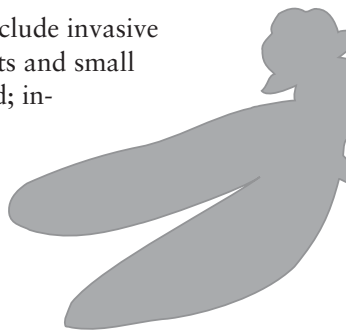
Thanks to Marilyn Massaro (Roger Williams Park Museum) for access to the museum collections and archives as well as continued support; and Richard I. Johnson (Harvard Museum of Comparative Zoology) for correspondence regarding the Carpenter Collection and for manuscript review.

***Jay Cordeiro** is a research zoologist in the Science Division of NatureServe (Boston, MA) and Field Associate in the Division of Invertebrate Zoology at the American Museum of Natural History (New York, NY).*

Ecological Inventory, Monitoring, and Stewardship Program

BY VIRGINIA BROWN

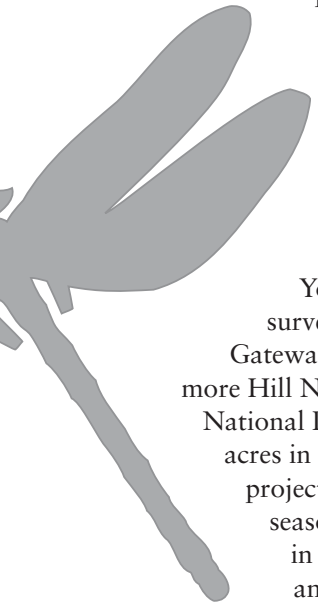
The Rhode Island Natural History Survey's Ecological Inventory, Monitoring, and Stewardship (EIMS) Program is now just over 2 years old. In the last 24 months, EIMS staff have initiated or completed a number of federal, municipal, and non-profit inventory and monitoring projects. Completed projects include rapid ecological assessments for a Rhode Island municipality and two land trusts; botanical inventory for a local land trust; rapid ecological assessment and breeding bird surveys for a local land trust; grassland bird surveys for The Nature Conservancy (TNC); inventory and monitoring workshops for the Audubon Society of Rhode Island; and numerous outreach programs such as field walks, lectures, and participation in various ecological initiatives. Several rapid assessments and inventory and monitoring training workshops for Audubon Society staff were Stewardship Fund projects that received discounts from a revolving fund managed by the Survey.



Projects now underway and ongoing include invasive species mapping and inventory of insects and small mammals for the Army National Guard; inventory of the Odonata of New York metropolitan area National Parks; rapid ecological assessments for two additional Rhode Island municipalities; monitoring of Odonata for TNC; and monitoring of breeding Grasshopper Sparrows and Eastern Meadowlarks for TNC. The EIMS Program also monitors condition of TNC preserves in Rhode Island annually, reporting on such issues as vehicular use, dumping, trail condition, invasive species, rare species, etc. In June 2004, the Survey hired a Data Manager, Erik Endrulat, to take over responsibility for the organization's growing databases (including management of the Rhode Island Natural Heritage Program's database), assist with presentation of data, and oversee data requests.

EIMS Program services have been contracted by a variety of clients and for a variety of purposes. One of our most popular services to date has been the Ecological and Land Management (ELM) Survey. This is a basic rapid ecological assessment that is useful to conservation groups prior to property acquisition, but it has also been used by a number of groups for management planning after land has been acquired. The ELM Survey produces information that is par-

ticularly useful for conservation groups preparing to apply for funds for land acquisition. It is designed to be completed with minimal investment of time to fit within the budget of each conservation group. The ELM Survey reports on general ecological and physical features and condition, aquatic habitats, natural communities, rare species, and invasive species—through field surveys, database searches (particularly for species listed by the Rhode Island Natural Heritage Program), and queries of local biologists and other existing data sets. The ELM Survey also provides suggestions for future biological inventory and/or monitoring on the property, and makes recommendations for land management where appropriate. In some cases, depending upon the budget and goals of the client and/or the general features of the land, we have accompanied the ELM Survey with more focused inventories of particular taxonomic groups such as birds or plants. In 2004 ELM Surveys will be completed or have been completed for four different clients, ranging from land trusts to municipal governments. One land trust contracted RINHS to complete an ELM Survey in preparation for applying for Rhode Island Open Space Bond funds to acquire the property. Information included in our report was incorporated into their Open Space application.



Odonata (dragonfly and damselfly) inventory for the National Park Service (NPS) was initiated in 2004 at three New York metropolitan area parks. Sites being surveyed are Fire Island National Seashore, Gateway National Recreation Area, and Sagamore Hill National Historic Site. In land area, these National Parks encompass approximately 50,000 acres in both New York and New Jersey. This project will require a second complete field season of work in 2005, and will wrap up in 2006. To date, 35 species of dragonflies and damselflies have been recorded at more than 75 sites on NPS land, and 350 voucher specimens have been collected. EIMS staff members and contractors have battled Poison Ivy, ticks, and mosquitoes but have recorded important information on Odonata on federal land. They have witnessed an impressive migration of the magnificent Swamp Darner (*Epiaeschna heros*), and have recorded occurrences of three species tracked by the New York Natural Heritage Program—Comet Darner (*Anax longipes*), Needham's Skimmer (*Libellula needhami*), and Rambur's Forktail (*Ischnura ramburii*).

Back home in Rhode Island, field work associated with the Rhode Island Odonata Atlas project has been completed. More than 13,000 specimens from 1000 distinct sites were collected from 1998 to 2004. Remarkably, over 70% of those specimens and the accompanying data were collected by volunteers. A total of 136 species of dragonflies and damselflies is now known from Rhode Island—a rich and diverse fauna for such a small state. Twenty-three species new to the state were discovered during the Atlas years, and 14 of these were first found by volunteer workers. Fourteen of the state's 136 odonate species (10.3%) have been recommended for listing as "Threatened" or "Concern" by the Rhode Island Natural Heritage Program as a result of this state-wide inventory. A final document detailing the complete results of the Rhode Island Odonata Atlas, with illustrations, is in preparation, and a checklist of the Dragonflies and Damselflies of Rhode Island is now available through the Survey.

Emily Troiano came aboard as our 2004 Coastal Fellow, and has worked tirelessly all summer on Odonata Atlas projects. Emily has mapped over 1000 survey sites electronically, entered approximately 900 records into the Atlas database, worked on collection management and quality control issues, and done some field work of her own.

Many volunteers assisted EIMS staff with projects in 2004, and we want to thank them for their contributions. Kristen Puryear assisted with botanical inventories in Burrillville and Lincoln, and Jeff Backer with the mammal workshop for Audubon Society staff. Again, we thank our dedicated group of Odonata Atlas volunteers for their hard work finishing this project: Diane Ames, Bill Bradley, Alan Bridgman, Charlie Brown, Florence Butler, Rachel Farrell, Linda Lapin, Rudy and Elena Lapin Norman, Rey Larsen, Eugenia Marks, and Chris Raithel.

***Virginia Brown** is Coordinator of the RINHS Ecological Inventory, Monitoring, and Stewardship Program.*

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
Free membership list
10% discount on all publications
Discount on annual conference fee
20% discount on subscription to the journal *Northeastern Naturalist*

For Institutional Members

Rhode Island Naturalist, the newsletter
Participation in the RINHS List-Serve
2 free membership lists
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*

BioBlitz 2004 : The Best Ever

One hundred and ten people scoured the landscape at the 5th RINHS BioBlitz and came up with over 1025 different kinds of organisms, making BioBlitz 2004 the best ever. We recorded 115 vertebrates (including 11 fish, 12 amphibians, 6 reptiles, 65 birds, and 21 mammals), 379 vascular plants, 16 mosses, 64 lichens, and 35 non-lichen fungi. There were also 416 invertebrates counted, including 5 mollusks, 2 annelids, 314 insects (47 odonates, 22 butterflies, 124 moths, 59 beetles, 8 robber flies, and 54 other insects), and 95 other non-insect invertebrates.

Clockwise from top left: Frog (Noel Rowe), Luna Moth (Erik Endrulat), Peter Paton examining net (Noel Rowe), and pasture at Woodvale Farm (Erik Endrulat).

The catch of the day was a rare robber fly, *Laphria champlanii*, netted by RINHS biologist Virginia Brown (see "Notes from Field and Study" on page 6). The most recent records of this species from southern New England are from Lyme, Connecticut in 1910 and Westport Factory, Massachusetts in 1913. This is the second time that an RINHS BioBlitz has come up with an exciting new state record, proving again that the more we look, the more we find.

Howie Ginsberg at the microscope (Erik Endrulat)

Elizabeth MacLachlan was the winner of a pair of Nikon binoculars, donated by Bird Watchers Nature View, for being the person age 16 or under who came closest to guessing how many taxa we would record. Her guess: 1028!

The Rhode Island Natural History Survey is grateful to all of the volunteers who helped throughout the 24-hour event, the staff at the URI W. Alton Jones Campus for their generous sharing of the facility and help with planning, and our other co-sponsors: The Nature Conservancy of Rhode Island, Largess Forestry, and the West Greenwich Land Trust. Additional thanks are due to Lawrence Taft of the Audubon Society of Rhode Island and John Jacques of the Alton Jones Environmental Education Center, for coordinating the public walks on Saturday.

Stay tuned for more information on Bioblitz 2005, tentatively scheduled for June 17th and 18th.

President's Message

"The bend in the road is not the end of the road, unless you fail to make the turn." This insightful adage comes to mind as I think about the road traveled by the Survey this past six months. Even though the curves and bends were collectively more like an LA clover-leaf, our Goodyears never left the road. Turn, we did, and the road ahead looks inviting.

However, "inviting" is not the word I would have chosen to describe the first hairpin turn in our 2004 trip log. Early this spring, Lisa Gould, the only Executive Director the Survey has ever known, announced her decision to step down from that post. As I recall, "yikes" was the name of that turn. Lisa had no intention of leaving the Survey, but did want to slow the speedometer down just a bit by working part-time as a Survey Biologist.

As always, every problem is also an opportunity, and at the end of the "yikes turn" was our opportunity—Dr. David Gregg, the new Executive Director of the RINHS. David's excellent credentials have been described in the accompanying article and in recent press releases, but it was David, not his formal qualifications, that enabled him to outdistance a strong field of applicants. His integrity, humor, common sense, and communication skills put him in our driver's seat. Lisa has driven us expertly through the curves of decade one, and I have no doubt that David will do the same in decade two.

Of the many other turns we had to negotiate, let me recount two. The first of these was the "holy cow" turn. Patty Taylor, our dynamo of an Administrative Assistant, has left for greener pastures, literally. She and her husband will be raising, what else, cows, in the verdant fields of Vermont. They may not be holy (the cows), but they will be in good hands (so to speak). We wish her all the best, and welcome Kira Stillwell, who has taken her place.

Finally, there was the "Star Trek" turn. Space, the final frontier, was indeed a sharp S-curve to be confronted. We carefully cruised through this turn by partnering with the URI Department of Biological Sciences. Ranger Hall on the URI campus now helps house the Survey. Along with the space we retain in the Coastal Institute, our short-term needs have been secured.

Back to Lisa. The turns she has guided the Survey through in its first decade of existence are virtually uncountable. In all cases, Lisa maneuvered us through those slinky curves with grace and aplomb. She has used her considerable organizational skills, a tireless work ethic, and a penchant for natural history to nurture the Survey in its infancy, and to turn the good ideas of a few into a thriving organization for many. Good ideas don't always translate into successful ventures, but the Survey's many successes are a tribute to the resourcefulness and tenacity of our very first Executive Director.

I am sure I speak for all members of the Survey when I offer Lisa our heartfelt thanks, and wish her the very best in all of her future challenges with the Survey, and elsewhere. We hope that all the turns she encounters in the road ahead are no more than ... terns in the road ahead.

Keith

RINHS News

New Executive Director

The Rhode Island Natural History Survey is very pleased to announce the appointment of a new Executive Director, Dr. David W. Gregg. On August 18, David replaced Lisa Lofland Gould, who had been Executive Director of the Survey since its formation in 1994. Lisa will continue to work with the Survey, as Senior Scientist. (See the article by Lisa on page 15).

David Gregg. Photo: Patty Taylor

About his new appointment, Gregg said, "When I first 'met' the Survey at BioBlitz 2000 I had a good feeling. I knew I'd met people who I would be working with in one capacity or another for a long time to come, helping learn about Rhode Island's natural world. I'm pleased and honored to become the director of an organization with such a distinguished record of accomplishments and such a bright future."

"This is a very exciting time for the Natural History Survey," states outgoing director Gould. "The Survey has become the heart of biodiversity information in Rhode Island and its information and services are increasingly in demand. Dr. Gregg is a fine choice to lead the Survey as we move into our second decade."

David, who has served on the RINHS Board of Directors since 2002, has worked in museums since 1990, most recently as executive director of the Spellman Museum of Stamps & Postal History in Weston, Massachusetts, and before that as a Project Manager and Associate Curator at Brown University's Haffenreffer Museum of Anthropology. He is an archaeologist by training, with a Ph.D. in anthropology from Brown University, where he specialized in the archaeology and ethnohistory of the Inupiaq Eskimo of northwest Alaska. He has also studied European archaeology at Oxford University and holds a B.A. in archaeology and history from Colgate University. In Alaska, Gregg worked for the National Park Service and led archaeological survey teams on Cape Krusenstern and in the remote western Brooks Range. His dissertation used archaeological excavations, ethnographic interviews, museum collections, and historical documents to investigate the effects of the Inupiaq's adoption of firearms, which occurred between about 1850 and 1900.

Although trained as an archaeologist, David has been a naturalist by avocation since he was twelve, when he began collecting butterflies and moths in Falmouth, Massachusetts, on Cape Cod. Growing up near Woods Hole, he worked at oceanographic labs and summer schools there. He has contributed to insect research by numerous groups, including the Massachusetts Audubon Society and the Cape Cod Museum of Natural History. He became a member of the RINHS in 2000 after participating in the first BioBlitz, at Roger Williams Park in Providence. He continues to collect insects, and has also developed interests in birds, plants, and virtually every denizen of the landscape.

David lives in Providence, where he has been renovating an East Side bungalow for the last seven years. His other pastimes include fishing and gardening. He is also a board member of the Ralph Waldo Emerson Memorial Association, which manages Emerson's home in Concord, Massachusetts.

Other Staff Changes:

As pointed out in Keith's "President's Message," RINHS Administrative Assistant Patty Taylor has left us for the allure of a Vermont farm and Red Devon cattle. We thank Patty for all her hard work for the Survey, and wish her the best of luck.

Kira Stillwell.
Photo: Helge Weissig

Erik Endrulat.
Photo: Veronica Romer

Patty's replacement in the Survey office is Program Administrator Kira Stillwell. An exercise scientist by training, Kira worked for many years in the areas of cardiology, weight management, and exercise for the elderly. Her most recent position was Clinic Director at the Cancer Prevention Research Center at URI. Kira's involvement with non-profit and grass-roots environmental organizations began in 1998,

when she co-founded the Rhode Island Chapter of the Surfrider Foundation. Kira has remained actively involved in the chapter since and presently serves on the National Board of Directors of the Surfrider Foundation. Discovering a strong passion for this work prompted her to redefine her career focus, subsequently leading her to the North Atlantic Coast – Cooperative Ecosystem Studies Unit where she was their interim Administrative Assistant, and now to the Survey. Kira is a life-long resident of Narragansett where she enjoys surfing, gardening, working on her "Victorian Fisherman's Cottage," and raising her daughter, Bryn.

Other recent additions to the staff include Erik Endrulat, who was hired as the Data Manager earlier this year, and part-time bookkeeper Colleen Glenn. Erik and Colleen are taking responsibility for some of the tasks that formerly kept Patty far too busy. With Kira then able to assume more of the day-to-day oversight of the office and programs, and Lisa continuing some of the science and outreach work she did as Executive Director, David will be able to focus on the tasks that an Executive Director of a growing organization needs to—"executing and directing."

Farewell & Hello

Yes, it's true: I have stepped down from a decade as the RINHS executive director and into a part-time role. In my new capacity as "senior [!] scientist" for the Survey, I will be focusing my efforts on invasive species, our biota databases, and outreach work. Three days a week already seems too few, but I am looking forward to my "days off," when I hope to do more study and writing. Mosses, insects, soils, rocks, poetry, music, history… so little time, so much to explore!

Photo coutesy Lisa L. Gould

Directors of organizations are often singled out for notice, but the reality is that there are always many people standing beside the leader and supporting the life of the organization. That is certainly the case with the RINHS: we have a core group of scientists who envisioned the Survey and brought it into being, a dedicated and very hard-working Board of Directors, an extremely talented staff, a loyal and growing membership, generous and far-sighted donors, wonderful partners such as the University of Rhode Island and The Nature Conservancy… the list is long and growing. I feel so fortunate to have worked with such people and agencies during the past 12 years, and I am very grateful for the experiences and friends those years have brought me.

The mission of the RINHS is simple: we seek to provide information about the state's plants, animals, and habitats, so that when decisions are made about the way land is used in the state or the about way we utilize the state's natural gifts, those decisions are based on solid scientific information. The challenge to us as a non-profit, membership organization is that this is a pretty esoteric mission. We aren't saving whales or buying land—important activities that capture the public's imagination. We are providing the information upon which to understand the ecological necessity of saving the whales, or for targeting which parcels of land to purchase—and then providing information to help manage and steward that land—ultimately, to help keep the state's ecosystems functioning and to maintain its aesthetic appeal and quality of life.

I have sometimes likened the work that we do to owning a library. Let's say that you have just purchased a warehouse of books. Somewhere in all those boxes you know that there are, among other things, a Guttenberg Bible, the complete works of Shakespeare, a signed copy of *Huckleberry Finn*, a first edition of *On the Origin of Species*, and the complete works of Danielle Steele—works of great rarity and value, alongside common things. What do you do with this collection? Do you just let it sit in the boxes and walk away from the warehouse, not ever checking its contents again? Or do you find an appropriate place for the collection, catalogue it, and make sure that the roof is not leaking, the bookworms aren't eating the books, and the visitors to the collection aren't walking away with the pieces? More importantly, do you actually read what's in the library and learn from it?

But the library analogy only goes so far, for books are static and interact with each other only in our imaginations; each living thing, on the other hand, is part of a dynamic community that is constantly changing and reacting to change. The RINHS is trying to bring together the information to understand how the organisms interact and react to stress and change, so that we can better help maintain these systems that support us and keep this part of New England a healthy and beautiful place to live in.

Ours is an exciting and essential mission, and I look forward to continuing to help the Survey fulfill that mission, under the leadership of our new executive director, David Gregg. And I give many thanks to all of you for your friendship and support over the years!

Lisa Gould, Senior Scientist

Focus on RINHS Organizational Members:

Rhode Island Sea Grant - *Science Serving America's Coasts*

BY BARRY A. COSTA-PIERCE

Rhode Island Sea Grant, based at the University of Rhode Island's Graduate School of Oceanography (GSO), supports integrated research, education, and extension programs designed to help people better understand and manage our ocean and coastal resources and maritime heritage. Rhode Island Sea Grant is one of 32 federal-state partnerships that constitute the National Sea Grant College Program—an innovative, university-based program of the National Oceanic and Atmospheric Administration.

The History of Rhode Island Sea Grant

In 1966, Congress created the National Sea Grant College Program, modeled after the Land Grant program, to increase the public's understanding and appreciation of marine resources and their economic value. The Ocean State and its ocean university—the University of Rhode Island—had a seminal role in creating Sea Grant. John A. Knauss, the first dean of GSO, along with then-URI President Francis Horn and Sen. Claiborne Pell, sensed a growing national interest in the Sea Grant idea and organized the first national Sea Grant Conference, which was convened in Newport, Rhode Island in 1965. The following year, the National Sea Grant College Program Act was introduced in Congress by Pell. The first senate hearing on the bill was held at URI—the first time a U.S. Senate hearing was convened at a state university. URI was selected as one of the first four universities officially designated as a "Sea Grant College"—along with Oregon State, Texas A&M, and Washington. Today at least one Sea Grant program is located in each coastal and Great Lakes state.

What the Future Holds

"Rhode Island Sea Grant plays a critical role in helping balance environmental and social issues with issues of economic and resource productivity. It is a fundamental, overarching principle of Rhode Island Sea Grant that the economic prosperity of Rhode Island is inextricably entwined with the improved health of the state's marine and coastal environment." (Sea Grant Draft Strategic Plan 2005–2010)

Currently, more than half of the U.S. population—over 140 million people—resides within 50 miles of the coast. Coastal America produces 32% of the gross national product and 34% of the nation's jobs. Beaches are the leading tourist destination, with coastal states earning 85% of all tourism revenues. Coastal waters are among the most biologically productive regions in the nation, producing more food per acre than the Midwest's best farmlands. But these invaluable resources are under threat. America's coastal population is projected to increase by 25 million people by the year 2015. Polluted runoff causes over 7,000 beach closings and swimming advisories each year. Human sickness and death from eating tainted seafood results in lost wages, lost workdays, and medical treatment estimated at $22 million each year. Coastal storms cost the United States about $7 billion per year.

The flood of people to America's coasts has caused massive changes in coastal ecosystems, to the point that they have become "human-dominated" ecosystems where "natural" biological processes compete with multiple anthropogenic uses of coastlines. Overpopulation and overuse are also threatening the survival of America's traditional working coasts and fishing industries and curtailing the evolution of economically viable aquaculture. Many coastal ecosystems are undergoing major changes, including shoreline armoring, increased pressures on fishing communities, and biological, geological, and chemical changes to aquatic resources due to human activity.

The Rhode Island Senate recently stated that, "Rhode Island is poised to enter into a new era of marine planning, incorporating integrated watershed, coastal, and ecosystem management and sustainable use." Rhode Island Sea Grant is undertaking a year-long strategic planning and organizational development process to guide the organization's investments and address these issues from 2005 to 2010.

Emerging Sea Grant Themes

Rhode Island Sea Grant will accelerate the application of university-based talent to develop and deliver science-based information so that people may better understand, improve, and manage coastal ecosystems, fisheries, and coastal communities. In 2005–2010, Rhode Island Sea Grant will focus on two major themes: sustainable coastal communities and ecosystems, and sustainable fisheries. Rhode Island Sea Grant's goals are to see:

- Coastal communities in Rhode Island as leading examples of an emerging "ecological" society;
- Rhode Island coastal communities and ecosystems contributing to the state's and region's prosperity and overall quality of life;

- Rhode Island Sea Grant fostering an understanding of ecosystem change, coastal ecosystems, and sustainable fisheries, as well as providing a forum to discuss more innovative and proactive laws, policies, and management regimes—all of which contribute to the improved stewardship of coastal resources.

Sustainable Coastal Communities and Ecosystems

Burgeoning Rhode Island shoreline populations have intensified the demand for, and socioeconomic value of, shoreline access, coastal and marine recreation, coastal waters of the highest quality, and environmental aesthetics. At the same time, major urban centers in upper Narragansett Bay are struggling to retain core populations, rebuild their public infrastructures, and increase the quality of life in urban environments—factors critical to the state's economic future.

Additionally, Rhode Island's modernized water-pollution-control facilities have substantially reduced nutrients and major pollutants, such as heavy metals, in Rhode Island's rivers and estuaries. Nevertheless, much remains to be accomplished. Significant concerns remain regarding the state's ability to protect and improve the health of Rhode Island's coastal waters. Rhode Island Sea Grant will work to understand ecosystem change and the need for ecosystem-based management of the state's coastal habitats and ecosystems, focusing especially on the ecosystems of Narragansett Bay, Block Island and Rhode Island Sounds, and the Rhode Island south shore coastal lagoons ("salt ponds"). Rhode Island Sea Grant will also be making substantial new investments to understand and plan for the improved health of the urban coastal ecosystems of upper Narragansett Bay.

Sustainable Fisheries

Rhode Island's commercial and recreational marine fisheries continue to grapple with an evolving regulatory, management, and economic landscape. Major issues include seafood quality and safety, over-fishing, federal requirements to reduce bycatch and marine mammal and turtle interactions, essential fish habitat, habitat alterations from fishing activities, tensions between recreational and commercial fisheries, codes of ethics, and the potential for sustainable fishery certifications for particular fisheries and fishing regions. Rhode Island Sea Grant's investment in fisheries has resulted in the development of better management practices and policies contributing to long-term sustainability of these important businesses.

The future of these investments will be to work with fishermen to conduct cooperative research and assist them in implementing local-level management of local fisheries and other marine resources. In addition, Rhode Island Sea Grant has spearheaded a regional fisheries extension collaborative, hosting workshops to address rights-based management, co-management, and bycatch reduction. The National Marine Fisheries Service recognizes this regional effort as a source of information and works with Sea Grant to develop a better rapport with fishermen and to improve fisheries management.

A Hopeful Future

Our great challenge is to further develop the innovative university-state-federal partnership we call Rhode Island Sea Grant—not only to maintain the tradition of excellence established in its first 30 years, but to go beyond. We must do more. Ecosystem change, the marine economy, and marine resource management problems continue to evolve. We envision that Rhode Island Sea Grant will not only be a trusted partner, but that our organization will become a vital hub for science-based knowledge important for management and the center of new learning for marine issues of the future. Requests for proposals are issued biennially in late January. For the latest program information, visit our web site at http://seagrant.gso.uri.edu.

***Barry A. Costa-Pierce** is Director of Rhode Island Sea Grant and a Professor of Fisheries, Animal and Veterinary Sciences and Oceanography at URI.*

Weaving the Web: Electronic Resources

The Narragansett Bay National Estuarine Research Reserve recently announced the launching of their new website. Available resources include descriptions of Reserve properties on Prudence, Patience, Hope, and Dyer Islands; summaries of on-going research projects and stewardship activities; introduction to their public education programs, conducted in collaboration with the Audubon Society of Rhode Island; and information about public access and recreational opportunities. There are also links to all of the Reserve's federal, state, and local partner organizations. They invite all to check out the website and provide their thoughts about design, content, user-friendliness, etc. Please email all comments to Kim Botelho at ladylorax@gso.uri.edu.
http://www.nbnerr.org

Thanks and Credits

We thank the following people for their contributions to the RINHS library: Jackleen de la Harpe, for *Alpine Wildflowers* and *A Field Manual of the Ferns & Fern-Allies*; David and Teri Gregg for *Flora of Naushon*, *Wildflowers, Volume 1*, and *Ferns, Grasses, Woody and Aquatic Plants, Volume 2*; Peter Lockwood, for *Grasslands of Northeastern North America: Ecology and Conservation of Native and Agricultural Landscapes*; Peggy Sharpe, for *Gray's Manual of Botany* (8th Edition), *Exotica 3 (Pictorial Cyclopedia of Exotic Plants)*, and *New Britton and Brown Illustrated Flora, Volumes 1–3*; the Roger Williams Park Museum of Natural History, for *Ground-water Resources of Rhode Island* and ground-water maps; and Roger Goos, for *The Lichen Flora of the United States*. Spider illustration p. 18 by Richard Enser.

Writers Wanted

We are always looking for your contributions to future issues of *Rhode Island Naturalist*. Our new format is designed 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:

- 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;
- Upcoming conferences, seminars, lectures, workshops, field trips, etc. that have natural history themes or components. Be sure to include: title of event, date, time, location, and contact information (phone, email, and/or web).
- Interesting web sites related to any aspect of natural history. Please include a brief summary and the complete URL.
- Opportunities for volunteers and students. Do you need volunteers for special projects? Offer internships? Have other natural history opportunities you'd like people to know about?
- Any other information you think would be pertinent to the Rhode Island ecological/natural history community.

We publish two issues per year, in spring and fall. The Spring 2005 issue is planned for distribution in April, and our working deadline for submissions is February 1st. 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 rkenney@gso.uri.edu or the RINHS office at info@rinhs.org. Or feel free to contact me if you have any other questions about submitting an article.

Robert D. Kenney, editor

Events Calendar

February 3rd, 7:30 PM. Weaver Auditorium, Coastal Institute, URI Kingston Campus: *2004–2005 Mark D. Gould Memorial Lecture Series on Rhode Island's Fauna, Flora, Geology, and Ecosystems—"Early Successional Habitats—Thickets, Shrublands, and Old Fields: Management and Their Role in Wildlife Diversity."* Lecture by Brian Tefft, Principal Wildlife Biologist, RIDEM Division of Fish & Wildlife. Free and open to the public; refreshments will be served at 7:00 PM. For more information call the RINHS office at (401) 874-5800, or email info@rinhs.org.

April 7th, 7:30 PM. Weaver Auditorium, Coastal Institute URI Kingston Campus: *2004–2005 Mark D. Gould Memorial Lecture Series on Rhode Island's Fauna, Flora, Geology, and Ecosystems—"Art, Aesthetics, and Environmental Activism."* Alex Frost, Director, Science Editors Company.

Please include me as a member of the
Rhode Island Natural History Survey, Inc.

Annual dues (check one) (see page 15 for membership benefits):

____Individual ($25) ____Family ($40) ____Student/Senior Citizen ($15) ____Organizational ($100)

→ Additional donation of $_____

Name_____ Telephone_____

Affiliation_____ Fax_____

Address_____ E-mail_____

_____

Make checks payable to **RINHS** and send to: RINHS, Rm 101 CIK, 1 Greenhouse Road, URI, Kingston, RI 02881
RINHS is a nonprofit 501(c)(3) organization. Dues and contributions are tax deductible to the full extent allowed by law.

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.

To Contact Us…

Rhode Island Natural History Survey
Room 101, Coastal Institute in Kingston
1 Greenhouse Road, URI
Kingston, RI 02881–0804
Tel: 401.874.5800 • Fax: 401.874.5868
info@rinhs.org • www.rinhs.org

Mark your calendars & join us!

The **2005 RINHS Conference** will be held on Friday, March 4th, at Rhodes-on-the-Pawtuxet in Cranston, RI. This year's theme, "**Rhode Island's Forests**," addresses an area of urgent concern in Rhode Island, where suburban development is quickly and irreversibly changing the landscape. The state's changing forests affect animals, waters, and other parts of the environment. Many environmental groups, researchers, and government agencies are grappling with and trying to manage these changes.

The annual RINHS conference is well regarded throughout southern New England for its unique ability to bring together a wide spectrum of individuals (scientists, educators, local, state, and federal agencies, and the general public), all of whom share a vested interest in the past, present, and future health of Rhode Island's natural systems. The Call for Abstracts for posters and the registration form are available at www.rinhs.org.

RINHS BioBlitz 2005 – Join us for an intensive, 24-hour inventory of the biota (plants and critters) in the Mount Hope area of Bristol, RI. A wide array of scientists, amateur naturalists, and folks like YOU who want to help out and learn about the diverse inhabitants of this region form the backbone of this enjoyable annual event. The 2005 BioBlitz will be held Friday June 17th and Saturday June 18th (tentative dates). Stay tuned for more details!

RHODE ISLAND
NATURAL HISTORY SURVEY
Providing Ecosystem Science and Information

Room 101, Coastal Institute in Kingston
1 Greenhouse Rd., URI
Kingston, RI 02881–0804

Non-Profit Organization
Presorted Standard
US Postage
PAID
Permit #47
West Kingston, RI 02892