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What's Inside...

Plant Invasions in Rhode Island Riparian Zones

BY SUZANNE M. LUSSIER AND SARA N. DA SILVA

Riparian zones are the corridors of land adjacent to streams, rivers, and other surface waters, which serve as transitional areas between terrestrial and aquatic systems. Their vegetation provides valuable wildlife habitat while enhancing instream habitat and water quality (Planty-Tabacchi et al. 1996, Tabacchi and Planty-Tabacchi 2001). Intact riparian woodlands serve as filters for runoff that could otherwise bring silt and pollutants to streams, and the overhanging trees shade and cool the water, reducing temperature extremes experienced by resident fish and invertebrates.

Residential development can be a source of stress on riparian zones. Clearing of trees results in fragmentation of forests and more open, sunlit edges; leaky septic systems, pet waste, and lawn fertilizers may add nutrients to runoff; and landscape plants may include nonnative species. All of these factors can encourage the growth of invasive plant species (Roth et al. 1996). Invasive plant species are considered a major threat to natural ecosystems throughout the world, out-competing native flora and causing ecological damage (Vitousek et al. 1996). Being opportunistic, they are often the first plants to colonize disturbed patches of soil and forest edges. Several researchers have found that riparian zones support a greater abundance and diversity of invasive plants than other habitats (Brown and Peet 2003, Burke and Grime 1996, Gregory et al. 1991).

Streams within urban and suburban watersheds characteristically carry higher nutrient loads following storm events as the first flush of overland runoff transports nonpoint-source (nutrient) pollution into the stream corridors (Burke and Grime 1996). Upstream runoff fertilizes seeds that wash downstream and settle on the disturbed soil along the banks. These fertile riparian zones are attractive to all kinds of wildlife, which transport seeds on their fur or in their beaks and digestive systems, simultaneously spreading and fertilizing them.

Encouraged by a new U.S Environmental Protection Agency initiative to study the effects of alteration or loss of habitat on resident wildlife species (USEPA 2002), we focused our research on the relationship of residential land use with stream quality, riparian vegetation, and presence of breeding birds. In this study, a part of that larger effort, our goals were to determine how forest fragmentation, structure of riparian vegetation, and the presence of invasive plant species may be important factors for breeding bird habitat in Rhode Island subwatersheds.

Methods

Selecting the Study Sites

By using hydrographical and land use/land cover data from the Rhode Island Geographic Information System (RIGIS, http://www.edc.uri.edu/rigis/), we characterized eight subwatersheds by their percentage of residential land use (4–59%). Stream corridors were delineated using orthophotos and verified with on-site latitude/longitude readings from a Geographic Positioning System (GPS). We also calculated the edge-to-area ratio for each riparian zone to obtain a measure of forest fragmentation by creating an artificial 500-m perimeter around each site using a GIS. At these same sites we have previously described the water quality and condition of the streams and the breeding bird habitat (Lussier et al. 2002, MS).

Our eight subwatersheds were categorized into three groups classified as low, medium, and high residential land use. Wood River (WR, in Richmond), Adamsville Brook (AB, Tiverton), and "Donovan Brook" (DB, Tiverton) were all between 4 and 17% residential land use, and served as our reference or low sites. Annaquatucket River (AR, North Kingstown), Buckeye Brook (BB, Warwick), and "Gorton Brook" (GB, Warwick) were in the medium residen-

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tial land use category (24–38%); and Tuscatucket Brook (TB) and "Passeonkquis Brook" (PB), both in Warwick, had the highest level of residential land use (53–59%). [Stream names in quotation marks were assigned by the authors because no official names were available.]

The riparian zones were defined as intact vegetated corridors not subject to clearing or mowing immediately adjacent to the stream reach. Rhode Island law specifies a 100-ft buffer of protection from development for streams less than 10 ft wide (RIDEM 1998). We compared the vegetation structure within the protected buffer of our three land-use groups by determining what plants were growing in three plant zones (or layers): herbaceous plants (ground cover), shrubs/saplings (understory), and tree canopy (overstory). We established perpendicular transects every 10 m along a 100-m stream reach and randomly chose three transects to measure the vegetation. Each transect was 2 m wide and 20 m long on each stream bank. We made ten observations in each 2-m^2 block for a total of 200 per transect. At each observation we measured the heights of shrubs and trees and tree diameters, recorded the presence or absence of canopy cover, and identified every vegetative species along with its associated layer (ground, shrub, tree). Vegetation was characterized according to density (number of plants per square meter), species richness (number of species), and native or nonnative status. Species were defined as invasive following Mehrhoff et al. (2003).

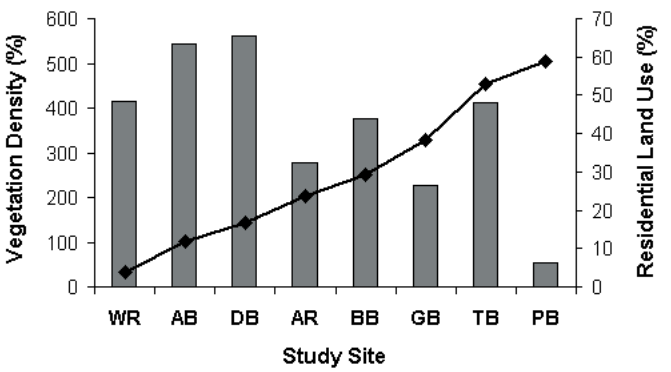

Figure 1. The density of riparian vegetation (percent coverage, gray bars) at eight riparian study sites in Rhode Island significantly decreased with increasing residential land use (diamonds and solid line). See text for identification of the study locations.

Results

Vegetation Density

The total density of vegetation within a riparian zone can easily be greater than 100% because of overlapping layers of bushes, saplings, and trees. We found that the density of total vegetation decreased significantly with increasing residential land use (Figure 1), while the density of invasive plants increased significantly (Figure 2). Sites with low residential development had total vegetation density of 416–560%, including all three layers, with less than 4% invasive species. At sites with medium residential density, the mean total vegetation density was 293%, of which the invasive species comprised 60%, mostly at the shrub level. At sites with high residential density, the mean total vegetation was as low as 53%, a third of which were invasive. Invasive species penetrated the canopy, shrub, and ground layers and were associated with decreased plant biodiversity. Not surprisingly, along with the increased density of vegetation from invasive species, the number of invasive species also increased (Figure 2).

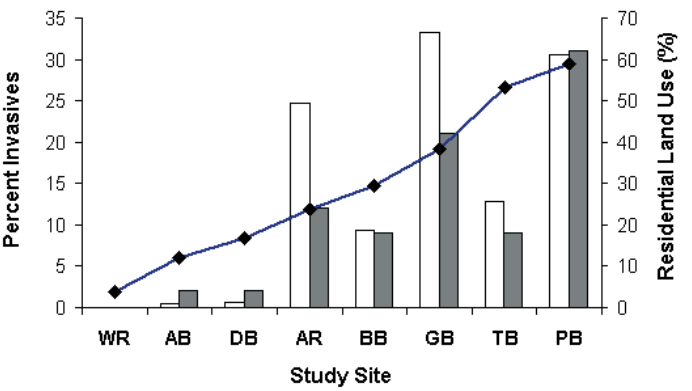

Figure 2. The number of invasive plant species (percent of total plant species, white bars) and their density (percent coverage, gray bars) increased significantly with increasing residential land use (diamonds and solid line).

Dominant Plant Species

At our sites, there were some noticeable differences in the dominant plant species (defined as those with >10% occurrence) at all three layers of vegetation (tree, shrub, ground). Sites with low residential density had no invasive species that were dominant. But at sites with medium and high residential density, nearly a third of the dominant species were invasive, and they occurred at all layers (Table 1).

Vegetation Extent

Besides the increase in the percentage of invasive species with residential development, the area covered by these species also increased (Figure 2). Eleven invasive species were identified within our riparian zone transects (Table 2). Multiflora Rose, a shrub, was the most intrusive plant, totaling 44% of the area covered with invasive species. Together, Multiflora Rose and Asiatic Bittersweet, a woody vine, comprised 73% of the total area covered by invasive plants within our study sites. The remaining nine species each encompassed between 0.2% and 7% of the total invasive-species coverage.

Vegetation as Food Sources for Birds

We observed that with increasing residential density, there was also a significant increase in the percentage of riparian

Table 1. Dominant (>10% occurrence) and invasive* plant species by layer at low, medium, and high residential density.

Sites	Trees	Shrubs	Ground-Cover
Low Residential Land Use (4–17%)	Red Maple White Pine White Oak Hickory Ironwood Red Oak	Sweet Pepperbush Common Greenbrier Highbush Blueberry Northern Arrowwood	Common Greenbrier Canada Mayflower Cinnamon Fern Wintergreen Moss
Medium Residential Land Use (24–38%)	Red Maple American Elm Eastern Sycamore Speckled Alder Hop Hornbeam Tree of Heaven*	Asiatic Bittersweet* Northern Arrowwood Japanese Knotweed* Multiflora Rose* Sweet Pepperbush Highbush Blueberry Spicebush Serviceberry	Poison Ivy Skunk Cabbage Multiflora Rose* Moss Asiatic Bittersweet* Grass Sensitive Fern
High Residential Land Use (53–59%)	Red Maple Norway Maple* Black Oak American Elm Eastern Hemlock	Multiflora Rose* Spicebush Asiatic Bittersweet* Slippery Elm Japanese Knotweed* Yew Common Greenbrier	Jewelweed Asiatic Bittersweet* Poison Ivy Common Greenbrier Multiflora Rose* Skunk Cabbage Virginia Creeper

vegetation (including invasives) providing food (as fruits or berries) for frugivorous birds such as sparrows, vireos, and thrushes. However, while the total number of species of plants providing food remained relatively constant among the sites, there were significantly more invasive plant species (Figure 2), demonstrating a change in plant species composition with increased residential development.

Forest Fragmentation

Our measure of forest fragmentation was based on the ratio of forest edge to area of the riparian zone within an arbitrary perimeter of 500 m (established using a GIS) around the stream reach. The percent residential land use was significantly correlated with the edge-to-area ratio fragmentation measure (Figure 3).

Discussion

Our results showed that riparian zones with residential land use greater than 24% had less dense vegetation, more invasive plant species covering a greater area, and more forest edge habitat from a fragmented landscape.

Implications of Landscape Fragmentation and Vegetation Structure for Birds

Numerous studies have reported on the negative consequences of fragmentation. Increased edge, associated with fragmentation of woodlands in developed areas, contributes to predation on birds in deciduous forests of the eastern U.S. (Hansen and Urban 1992). Birds that nest on the ground, such as the Wood Thrush (*Hylocichla mustelina*), or near forest edges, such as the American Redstart (*Setophaga ruticilla*), are especially vulnerable (Small and Hunter 1988). Schmidt and Whelan (1999) found that habitat fragmentation and disturbance increased the prevalence of exotic plant species (commonly used, imported landscaping plants), which may be attractive for nesting, but result in higher predation on songbirds. The structure of exotic plant species resulted in lower nest heights, which allowed terrestrial predators to reach the nests more easily.

Native vegetated habitat has a complex structure and provides foraging, protection, and nesting sites for different types of birds (Cody 1985). As land becomes increasingly urbanized, fragmentation increases and plant structure becomes simpler (Hennings and Edge 2003). Shrubs are generally the first layer of plants to be cleared within a residential area bordering a riparian zone. Shrubs also happen to be the largest food source for birds along the stream corridor, and generally produce an ample supply of berries for foraging birds (Sanders 1998). At our stream riparian sites, we found the greatest declines in vegetation in the shrub layer, which also had the greatest percentage of invasive plant species.

Value of Invasives as Wildlife Food Sources

The implications for invasive plant species as food sources for birds are less clear. Our most plentiful invasive species were Multiflora Rose and Asiatic Bittersweet, both of which reproduce via berries that provide food for many avian species. However, some studies have indicated that berries

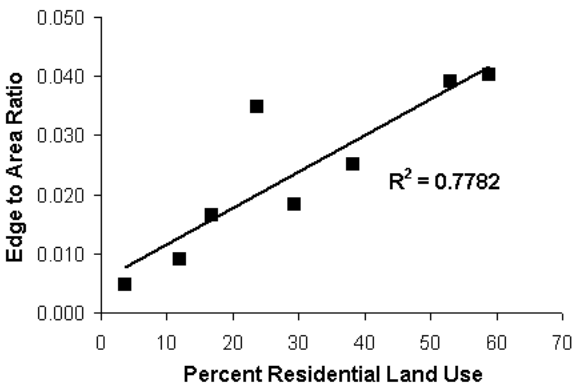

Figure 3. Forest fragmentation, represented by edge to area ratio (m:m2), was positively correlated with increasing residential land use.

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Table 2. Comparison of vegetation coverage (% of total transect area) by 11 invasive species at 8 riparian study sites. The last column is the proportion of the total area covered by invasive species that is occupied by that species, combined across all sites.

Riparian Invasive Vegetation	WR	AB	DB	AR	BB	GB	TB	PB	% Invasives
% Residential Land Use	**4%**	**12%**	**17%**	**24%**	**29%**	**38%**	**53%**	**59%**	
Multiflora Rose (*Rosa multiflora*)	1%		29%	16%	4%	2%	28%	31%	44%
Asiatic Bittersweet (*Celastrus orbiculatus*)				26%	3%	34%	6%	5%	29%
Black Locust *(Robinia pseudoacacia)*							17%		7%
Japanese Knotweed *(Polygonum cuspidatum)*						15%		1%	6%
Norway Maple (*Acer platanoides*)					1%			9%	4%
Tree of Heaven (*Ailanthus altissima*)				9%					3%
Japanese Barberry (*Berberis thunbergii*)		<1%		2%		6%			3%
Morrow's Honeysuckle (*Lonicera morrowii*)				4%	1%	3%			3%
Autumn Olive (*Elaeagnus umbellata*)				<1%		1%			<1%
False or Dull-leaf Indigo (*Amorpha fruticosa*)						1%			<1%
Climbing Nightshade (*Solanum dulcamara*)							<1%	<1%	<1%
Total % Cover among all vegetation	**1%**	**<1%**	**29%**	**57%**	**9%**	**62%**	**51%**	**46%**	

from certain plant species lack the fatty acids required to sustain migrating birds and that the food quality of native and invasive species is quite variable (Barton 2004, Pierce 2003). Tallamy (2004) found that insects are more attracted to native plants than to exotic plant species, so the volume of insects available as a food resource for migrating and breeding birds may decrease as exotics replace native species. As the invasives crowd out native plant species, the amount of nutritious food for migrating birds could be compromised.

Studies have shown that with increasing development, there is often a decrease in the number of bird species with specific dietary requirements (such as insectivores associated with interior forests) and a concomitant increase in species of omnivorous birds associated with forest edges and more tolerant of human activities (Brooks et al. 1991, Lussier et al. MS).

Conclusions

Residential development is correlated with forest fragmentation and invasive plant species in riparian zones, which tend to be more vulnerable to invasion. Non-native plants from nearby neighborhoods often escape and establish themselves in the adjacent riparian corridors (Planty-Tabacchi et al. 1996). We found that Multiflora Rose was the dominant invasive species among our riparian sites; it was found in areas with as low as 17% residential land use. The second most prolific invasive species, Asiatic Bittersweet, was found in areas with residential density of only 24%.

Structurally, invasive shrubs may not be as adequate or as protective as native shrub species for nesting birds. The added vulnerability of increased fragmentation of riparian forest edges bordering housing developments could increase predation of their nests by wild and domestic animals. Because these invasive plant species provide a food source for birds, it is important to understand the implications of the quality of that food. We encourage more research into the possible benefits to bird populations from preserving and protecting riparian corridors from fragmentation and replacing invasive plant species with native species in adjacent residential areas.

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References

Barton, D. 2004. Invasive plants—why should we be concerned? *Natural New England* 18:6–9.

Brooks, R.P., M.J. Croonquist, D.E. Arnold, C.S. Keener, and E.D. Bellis. 1991. Analysis of wetland-riparian corridors. Final report no. DACW-89-M-2335. U.S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg, MS. 112 pp.

Brown, R.L., and R.K. Peet. 2003. Diversity and invasibility of southern Appalachian plant communities. *Ecology* 84:33–39.

Burke, M.J.W., and J.P. Grime. 1996. An experimental study of plant community invasibility. *Ecology* 77:776–790.

Cody, M.L. 1985. An introduction to habitat selection in birds. Pp. 4–56, *In* M.L. Cody (Ed.). *Habitat Selection in Birds*. Academic Press, San Diego, CA.

Gregory, S.V., F.J. Swanson, W.A. McKee, and K.W. Cummins. 1991. An ecosystem perspective of riparian zones: focus on links between land and water. *Bioscience* 41:540–551.

Hansen, A.J., and D.L. Urban. 1992. Avian response to landscape pattern: the role of species' life histories. *Landscape Ecology* 7:163–180.

Hennings, L.A., and W.D. Edge. 2003. Riparian bird community structure in Portland, Oregon: Habitat, urbanization, and spatial scale patterns. *The Condor* 105:288–302.

Lussier, S.M., C. Wigand, S.N. daSilva, M. Charpentier, S.M. Cormier, and D.J. Klemm. 2002. A watershed approach to understanding anthropogenic influences on streams and their receiving salt marshes. Poster presentation at the annual meeting of the North American Benthological Society.

Lussier, S.M., R.W. Enser, S.N. daSilva, and M. Charpentier. MS. Effects of habitat disturbance from residential development on breeding bird communities in riparian corridors. (In review).

Mehrhoff, L.J., J.A. Silander, Jr., S.A. Leicht, E.S. Mosher, and N.M. Tabak. 2003. IPANE: Invasive Plant Atlas of New England. Department of Ecology & Evolutionary Biology, University of Connecticut, Storrs, CT, USA. http://www.ipane.org

Pierce, B. 2003. Migrating song birds have picky ways of discerning food options. *Natural New England* 15:32–33.

Planty-Tabacchi, A., E. Tabacchi, R. Naiman, C. Deferrari, and H. Decamps. 1996. Invasibility of species-rich communities in riparian zones. *Conservation Biology* 10:598–607.

RIDEM (Rhode Island Department of Environmental Management). 1998. Rules and regulations governing the administration and enforcement of the freshwater wetlands act, April 23, 1998. Office of Water Resources, Providence, RI. http://www.state.ri.us/dem/pubs/regs/REGS/WATER/WETLND98.PDF

Roth, N.E., J.D. Allan, and D.E. Erickson. 1996. Landscape influences on stream biotic integrity assessed at multiple spatial scales. *Landscape Ecology* 11:141–156.

Sanders, T.A. 1998. Breeding bird community composition in relation to riparian vegetation structure in the western United States. *Journal of Wildlife Management* 62:461–473.

Schmidt, K.A., and C.J. Whelan. 1999. Effects of exotic *Lonicera* and *Rhamnus* on songbird nest predation. *Conservation Biology*. 13:1502–1506.

Small, M.F., and M.L. Hunter. 1988. Forest fragmentation and avian nest predation in forested landscapes. *Oecologia* 76:62–64.

Tabacchi, E. and A. Planty-Tabacchi. 2001. Functional significance of species composition in riparian plant communities. *Journal of the American Water Resources Association* 37:1629–1637.

Tallamy, D.W. 2004. Do alien plants reduce insect biomass? *Conservation Biology* 18:1689–1692.

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.

Vitousek, P.M., C.M. D'Antonio, L.L. Loope, and R. Westbrooks. 1996. Biological invasions and global environmental change. *American Scientist* 84:468–478.

***Suzanne Lussier** is a Research Aquatic Biologist with the U.S. EPA Office of Research Development, National Health and Environmental Effects Research Laboratory, Atlantic Ecology Division, in Narragansett, Rhode Island. **Sara da Silva** was an EPA student intern and M.S. candidate at the University of Rhode Island at the time of this study, and is now employed as an Environmental Scientist at Nelson, Pope & Voorhis, LLC, in Melville, New York.*

Paleostratigraphy in the Campus Freezer: Re-discovery of an Early Gray Seal Stranding from Block Island, Rhode Island

BY ROBERT D. KENNEY

Four species of seals occur regularly along the coasts of southern New England: Harbor Seal (*Phoca vitulina*), Gray Seal (*Halichoerus grypus*), Harp Seal (*Pagophilus groenlandicus*), and Hooded Seal (*Cystophora cristata*) (August et al. 2001, Nawojchik 2002, Reidman 1990, Waring et al. 2004, Wynne and Schwartz 1999). In Rhode Island waters, Harbor Seals are resident in many parts of Narragansett Bay from fall through spring (Schroeder 2000), while the other three species are considered to be occasional visitors. We actually know very little about the distributions of these species in the ocean. In the water they are extremely difficult to see, so typical aerial or shipboard marine mammal surveys record seal sightings very rarely. Nearly all of our information comes from two sources (although we have learned a great deal about some other seal species by tagging and telemetry studies):

- Observations of haul-out sites—Seals regularly climb out of the water onto rocky ledges, remote sandy beaches and shoals, or sea ice. Seals haul out to give birth ("pupping") and to nurse their pups, for molting, and also simply for resting. There are a number of known Harbor Seal haul-outs around Narragansett Bay and on Block Island (Schroeder 2000), but none for the other three seal species.

- Stranding records—Dead seals, or seals that are sick, starving, injured, or otherwise debilitated, may be encountered on the shore. Recovery of carcasses or recovery and rehabilitation of live-stranded seals is the responsibility of a network of institutions coordinated through the National Marine Fisheries Service. Stranding response for Rhode Island is handled by Mystic Aquarium in Connecticut, which maintains all stranding records dating back to 1979. Prior to that, stranding response and data collection was much less organized and coordinated, with the available records archived at the American Museum of Natural History (Smithsonian Institution) in Washington, D.C.

Gray Seals are found only in the North Atlantic. There are three separate populations: a Canadian stock that occurs from Massachusetts to Labrador, a European stock that occurs from France to Russia and west to Iceland, and a third stock within the Baltic Sea (Bonner 1981, Davies 1957, Rice 1998, Ronald and Gots 2003). There are two principal pupping concentrations of the Canadian stock: one in the Gulf of St. Lawrence and the other on Sable Island offshore of the south coast of Nova Scotia. Pupping occurs in December–February. Pups are weaned in about 18 days, which is followed by a post-weaning fast of 10–28 days (Hall 2002). There is a post-breeding pelagic feeding period in February–April, followed by a haul-out for molting in May or June, then another dispersed feeding period until the next winter's pupping season begins (Lesage and Hammill 2001). Juveniles are known to disperse more widely than adults during the feeding phases of the annual cycle (Ronald and Gots 2003).

Gray Seals were formerly more abundant in Rhode Island waters than they are at present. Archeological investigations of Native American trash middens on Block Island have uncovered Gray Seal bones (Waters 1967). More recently, however, Gray Seals were essentially unknown in Rhode Island for most of the 20th Century. In *The Mammals of Rhode Island*, Cronan and Brooks (1968) reported that there were no records of the species from Rhode Island or nearby, but that there was one record from farther south, so that it was theoretically possible for them to occur in our local waters.

The species apparently had been nearly extirpated in the northeastern U.S. by the 1960s (Andrews and Mott 1967, Rough 1995). They were hunted extensively, primarily for bounties paid by state authorities in both Maine and Massachusetts. The seals are the terminal host of a nematode parasite ("sealworm," *Pseudoterranova decipiens*) that infests cod and other commercial fish species (Templeman 1990). Seals are also perceived as competitors with commercial fisheries.

Andrews and Mott (1967) described a small Gray Seal colony that pupped during the first half of the 20th Century on Muskeget Island—a low sandy island off the west end of Nantucket—in Massachusetts. Hunting reduced annual pup production from 14–19 in the early 1950s to only 1 by the end of 1960s (Rough 1995). From 1971 through 1979, no pups were observed and adults were scarce. During the 1980s, the numbers of seals increased and they spread to other shoals and islands around Nantucket Sound, with pupping resuming in 1988 (Rough 1995). The colony has since grown substantially, with several hundred pups born annually and over 5,000 seals present (Waring et al. 2004). In addition, Gray Seals have now established at least two pupping colonies in Maine, with a total of about 1,600 animals (Waring et al. 2004). These increases parallel the pattern observed in Canadian waters, where the total population was estimated at 191,800 seals in 1997, with a steady increase in Sable Island pup production of 12.6% per year (Lesage and Hammill 2001, Stobo and Zwanenburg 1990, Zwanenburg and Bowen 1990).

As the numbers of Gray Seals in Maine and Massachusetts have increased since the 1980s, so has their occurrence in southern New England. The animals we see here tend to be dispersing juveniles during the late winter and spring. The first recorded stranding in Rhode Island was a 110-cm juvenile male that live-stranded at Vaill Beach on the south shore of Block Island on 10 May 1986 (Nawojchik 2002). It was rehabilitated and released the following month.

Figure 1. Head of the 1980 Gray Seal specimen prior to necropsy. Note the elongated snout and somewhat horse-like profile (all photos by the author).

In the spring of 2004, there was a clean-out and inventory of the walk-in freezer in the Aquarium Building on the URI Bay Campus. At the time, I had two dolphins and a Harp Seal in there that I had neglected to properly tag and that were in danger of being moved to the nearest dumpster. While I was in the freezer tagging those specimens, I noticed a sort of vaguely seal-shaped bundle wrapped in burlap and tied with rope, on a shelf way in the back and nearly buried in the accumulated frost. It already had a tag, but even with my glasses I couldn't

Figure 2. Head of a Harbor Seal specimen during a necropsy. Note the relatively short snout and convex, puppy-like profile.

Figure 3. Skull of the 1980 Gray Seal specimen. Note the elongated snout and how the teeth in the rear of the jaws resemble the large canine teeth at the front.

read it in the dim light inside the freezer. When I took the tag out into the hallway where the light was brighter, I could see that it read "harbor seal, Block Island, March 3, 1980." Interesting—but mainly because it had managed to avoid previous freezer clean-outs for 24 years.

In July 2004, I took both frozen seals and one frozen dolphin to the Shoals Marine Lab in Maine for comparative anatomy dissections by the Marine Vertebrates students. When we unwrapped the supposed Harbor Seal, it was quickly obvious that it was not a Harbor Seal at all, but a Gray Seal. It very clearly had the elongated snout of a Gray Seal (Figure 1) and not the short, convex, puppy-like profile of a Harbor Seal (Figure 2). Examination of the cleaned skull (Figure 3) confirms the identification—the premolars and molars are triangular and similar to the canines rather than flattened and multi-cusped as in Harbor Seals (Wynne and Schwartz 1999).

The animal was a juvenile male, measuring 143 cm in total length (snout to the end of the hind flippers) and 130 cm in standard length (snout to the tip of the tail). The carcass had been well-worked by scavengers—the eyes, most of the subcutaneous musculature on the head, and the entire internal contents of the chest cavity had been eaten away. The gut was completely empty. Although no definitive cause of death could be determined by the necropsy, starvation was at least a contributing factor. The animal was clearly emaciated (Figure 4), with a blubber layer that was only about 2 mm thick. Starved or starving juvenile animals are the most common stranded individuals encountered for all of the seal species in southern New England (Nawojchik 2002, H. Medic, Mystic Aquarium, pers. comm.).

It is not at all surprising that the graduate student who collected the specimen in 1980 would have misidentified it as a Harbor Seal. At that time, every seal stranding in the state was a Harbor Seal, so there was no reason to expect anything different. While a fully grown adult male Gray Seal would have been substantially larger at 230 cm than the largest adult Harbor Seal (190 cm), this individual was the same size as a large juvenile or small adult Harbor Seal (Wynne and Schwartz 1999). Finally, the severely scavenged, decomposed, emaciated, and sand-encrusted condition of the carcass likely also contributed to the misidentification.

Between 1979 and 2000, Mystic Aquarium recorded four Gray Seal strandings on Block Island—all live-stranded juveniles: May 1986 (male, released after rehabilitation), March 1988 (male, released after rehabilitation), April 1990 (male, released after rehabilitation), and April 1990 (female, died five days after capture) (Nawojchik 2002). There were also Gray Seal strandings along the south shore of Rhode Island in 1990, 1993, 1994 (three), and 1995 (two) (Kenney and Nawojchik 1996). The 1980 stranding reported here pre-dates the earliest Rhode Island Gray Seal stranding in

Figure 4. Dr. Wayne Lord, forensic pathologist with the FBI (and the April 2006 speaker in the RINHS Mark Gould lecture series) explaining necropsy methods to students at the Shoals Marine Lab. The 1980 Gray Seal specimen is in the center; note the obviously emaciated condition where the outlines of the breastbone, ribs, shoulders, neck, and hips can be easily seen through the very thin blubber layer.

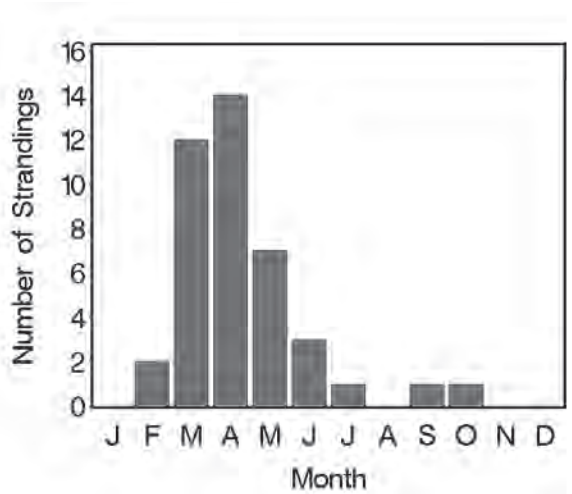


Figure 5. Gray Seal strandings in Rhode Island, 1980–2005, by month (data courtesy of Mystic Aquarium & Institute for Exploration and the Northeast Regional Stranding Network).

Mystic's database by six years. In the Smithsonian's stranding data from years prior to 1979, there were similarly no records for Rhode Island, Connecticut, or New York (J.G. Mead, pers. comm.). There were two early stranding records from New Jersey, in April 1973 and April 1978. There is also an anecdotal report of a possible Gray Seal seen in eastern Long Island in about 1980 (S. Sadove, Long Island University, pers. comm.).

The March 1980 Block Island stranding represents the earliest evidence in the state for the recovery of the regional Gray Seal population from near-extirpation, and one of the earliest records from the southern New England region outside of the immediate vicinity of the Massachusetts colony. Like the majority of subsequent strandings, it was a juvenile in late winter and stressed by starvation. The total 1980–2005 Gray Seal stranding record from Rhode Island includes 41 animals, with a clear peak in March–May (Figure 5). It seems quite likely that the 1980 animal was born in Massachusetts. There were no tags on the animal's flippers, no evidence of damage where a tag might have been lost, and no other sort of markings that could be observed. From 1977 to 1990, there was a Canadian research program that tagged every newly weaned Gray Seal pup on Sable Island with a numbered metal tag attached to a rear flipper, with 3,250 pups tagged in 1980 (Lesage and Hammill 2001, Stobo et al. 1990). The April 1973 New Jersey stranding was marked with a numbered brand (J.G. Mead, pers. comm.), therefore it was a Canadian-born seal.

It will be interesting to watch future trends in the southern New England Gray Seal population. It is possible that Native Americans on Block Island hunted them while the seals were hauled out on the island during pupping (alternatively, they may simply have made use of the occasional stranded seal). Sandy Point at the north end of Block Island seems to me at least superficially similar to the pupping areas in Massachusetts and on Sable Island, so it would not be a complete surprise to find Gray Seal mothers and pups there on some cold winter day in the near future.

References

Andrews, J.C., and P.R. Mott. 1967. Gray seals at Nantucket, Massachusetts. *Journal of Mammalogy* 48:657–658.

August, P.V., R.D. Kenney, and T.P. Husband. 2001. Mammals. Pp. 60–66, *In* P.V. August, R.W. Enser, and L.L. Gould (Eds.). *Vertebrates of Rhode Island*. Biota of Rhode Island, volume 2. Rhode Island Natural History Survey, Kingston, RI.

Bonner, N. 1981. Grey seal *Halichoerus grypus* Fabricius. Pp. 111–144, *In* S.H. Ridgway and R.J. Harrison (Edc.). Handbook of Marine Mammals, Vol. 2: Seals. Academic Press, London, UK.

Cronan, J.M., and A. Brooks. 1968. *The Mammals of Rhode Island*. Wildlife Pamphlet No. 6. Division of Conservation, Providence, RI. ix + 133 pp.

tDavies, J.L. 1957. The geography of the gray seal. *Journal of Mammalogy* 38:297–310.

Hall, A. 2002. Gray seal *Halichoerus grypus*. Pp. 522–524, *In* W.F. Perrin, B. Würsig, and H.G.M. Thewissen (Eds.). *Encyclopedia of Marine Mammals*. Academic Press, San Diego, CA.

Kenney, R.D., and R. Nawojchik. 1996. Marine mammals in Rhode Island. Poster presented at the Rhode Island Natural History Survey annual conference: "Sharing the Knowledge: The Use of Ecological Information in Rhode Island."

Lesage, V. and M.O. Hammill. 2001. The status of the grey seal, *Halichoerus grypus*, in the Northwest Atlantic. *Canadian Field-Naturalist* 115:653–662.

Nawojchik, R. 2002. Marine mammals and sea turtles of Block Island, Rhode Island. Pp. 169–181, *In* P.W. Paton, L.L. Gould, P.V. August, and A.O Frost (Eds.). *The Ecology of Block Island*. Rhode Island Natural History Survey, Kingston, RI.

Reidman, M. 1990. *The Pinnipeds: Seals, Sea Lions, and Walruses*. University of California Press, Berkeley, CA. xxiii + 439 pp.

Rice, D.W. 1998. *Marine Mammals of the World: Systematics and Distribution*. Special Publication No. 4. Society for Marine Mammalogy, Lawrence, KS. ix + 231 pp.

Ronald, K., and B.L. Gots. 2003. Seals: Phocidae, Otariidae, and Odobenidae. Pp. 789–854, *In* G.A. Feldhamer, B.C. Thompson, and J.A. Chapman (Eds.). *Wild Mammals of North America: Biology, Management, and Economics*, second edition. Johns Hopkins University Press, Baltimore, MD.

Rough, V. 1995. Gray Seals in Nantucket Sound, Massachusetts, Winter and Spring, 1994. Contract report no. T10155615. Marine Mammal Commission, Washington, DC. 31 pp.

Schroeder, C.L. 2000. Population Status and Distribution of the Harbor Seal in Rhode Island Waters. M.S. thesis. University of Rhode Island, Kingston, RI. xiii + 197 pp.

Stobo, W.T., B. Beck, and J.K. Horne. 1990. Seasonal movements of grey seals (*Halichoerus grypus*) in the Northwest Atlantic. Pp. 199–213, *In* W.D. Bowen (Ed.). *Population Biology of Sealworm (*Pseudoterranova decipiens*) in Relation to its Intermediate and Seal Hosts*. Canadian Bulletin of Fisheries and Aquatic Sciences No. 222. Dept. of Fisheries and Oceans, Ottawa, Ontario.

Stobo, W.T., and K.C.T. Zwanenburg. 1990. Grey seal (*Halichoerus grypus*) pup production on Sable Island and estimated of recent production in the Northwest Atlantic. Pp. 171–184, *In* W.D. Bowen (Ed.). *Population Biology of Sealworm (*Pseudoterranova decipiens*) in Relation to its Intermediate and Seal Hosts*. Canadian Bulletin of Fisheries and Aquatic Sciences No. 222. Dept. of Fisheries and Oceans, Ottawa, Ontario.

Templeman, W. 1990. Historial background to the sealworm problem in eastern Canadian waters. Pp. 1–16, *In* W.D. Bowen (Ed.). *Population Biology of Sealworm (*Pseudoterranova decipiens*) in Relation to its Intermediate and Seal Hosts*. Canadian Bulletin of Fisheries and Aquatic Sciences No. 222. Dept. of Fisheries and Oceans, Ottawa, Ontario.

Waring, G.T., R.M. Pace, J.M. Quintal, C.P. Fairfield, and K. Maze-Foley (Eds.) 2004. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments—2003. NOAA Technical Memorandum NMFS-NE-182. National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole, MA. vii + 287 pp.

Waters, J.H. 1967. Gray seal remains from southern New England archeological sites. *Journal of Mammalogy* 48:139–141.

Wynne, K., and M. Schwartz. 1999. *Guide to Marine Mammals & Turtles of the U.S. Atlantic and Gulf of Mexico*. Rhode Island Sea Grant, Narragansett, RI. vi + 114 pp.

Zwanenburg, K.C.T., and W.D. Bowen. 1990. Population trends of the grey seal (*Halichoerus grypus*) in eastern Canada. Pp. 185–197, *In* W.D. Bowen (Ed.). *Population Biology of Sealworm (*Pseudoterranova decipiens*) in Relation to its Intermediate and Seal Hosts*. Canadian Bulletin of Fisheries and Aquatic Sciences No. 222. Dept. of Fisheries and Oceans, Ottawa, Ontario.

***Dr. Bob Kenney** is an Associate Marine Research Scientist and Adjunct Professor at the URI Graduate School of Oceanography, specializing in marine mammal and sea turtle research. He also serves on the RINHS Board of Directors and as the editor of* Rhode Island Naturalist.

Wandering Hooded Seals

BY HEATHER MEDIC

A freezer-burned Gray Seal is not the only unusual seal occurrence in southern New England in recent years. Beginning in the 1990s, there have been region-wide increases in two species of seals that one would more likely encounter on the sea-ice off Canada or Greenland—Harp Seals (*Pagophilus groenlandicus*) and Hooded Seals (*Cystophora cristata*). Over Labor Day weekend of this year, a young-of-the-year Hooded Seal, called a "blue-back" because of its color pattern, was sighted in the Norwalk River in western Connecticut. Unlike most of the ice seals we see in our region, this animal appeared perfectly healthy, and was happily eating fish in the river.

This is not the first report of a Hooded Seal in Connecticut; it is not even the first report of a Hooded Seal in late summer in Connecticut. The first Hooded Seal picked up by the Mystic Aquarium and Institute for Exploration's (MAIFE) Marine Mammal and Sea Turtle Stranding Program was on East Matunuck State Beach in South Kingstown, Rhode Island in June 1993. Our first Connecticut stranding occurred in April 1994 in Norwich. Since then, strandings have occurred regularly in Rhode Island and Connecticut, as well as in New York and New Jersey and further north (Harris et al. 2001, McAlpine et al. 1999). There are also much earlier reports of Hooded Seals in our region, including one in the Providence River (Cronan and Brooks 1968), one in New York Harbor (Connor 1971), and one that was shot in a creek in Eastchester, New York in the early 19th Century (DeKay 1842).

Figure 1. A blue-back Hooded Seal that had stranded at Mackerel Cove, Jamestown, Rhode Island, during its stay in Mystic Aquarium's rehabilitation facility (photo courtesy of Mystic Aquarium).

About Hooded Seals

The Hooded Seal is appropriately named for the black inflatable sac, or "hood," which hangs over the nose of adult males. A male can also inflate his nasal septum out one nostril like a big, red balloon. The inflated hood and septum are visual displays, used mainly during breeding. Hooded Seals are the largest of the seals that occur in New England waters, with males as big as 2.7 m and 375 kg, and females reaching 2.2 m and 300 kg. Adults are blue-gray with black blotches, black faces, and light bellies; females have smaller blotches so appear somewhat lighter (Wynne and Schwartz 1999). Pups are born at about 1 m long and weighing 15 kg, and have solid blue-gray backs, very dark faces, and creamy or silver bellies. The blue-backs molt into their adult coats at about 15 months of age (Reeves and Ling 1981).

Hooded Seals are found only in the North Atlantic Ocean, ranging from the Gulf of St. Lawrence in eastern Canada north to Baffin Island, Greenland, Iceland, and Svalbard (Lavigne and Kovacs 1988, Reeves and Ling 1981). Pupping occurs on drifting pack ice, in four separate aggregations known as "herds." The "Front" herd is the largest, occurring east of Newfoundland and Labrador. The second Canadian herd is the "Gulf" herd that pups in the Gulf of St. Lawrence. The other two are the Davis Strait herd between Greenland and Baffin Island and the "West Ice" herd off eastern Greenland. Pupping for all herds occurs in late March, and mating takes place immediately after the pups are weaned. Hooded Seals have the shortest weaning time of any mammal, averaging just 4 days (Bowen et al. 1985). Adults and older juveniles from all four herds aggregate on the ice to molt (shed the fur and outer skin layer) in the Denmark Strait between Greenland and Iceland, mainly in late June and July (King 1983, Reeves and Ling 1981).

Hooded Seals disperse widely and are generally regarded as solitary in nature, except during molting and mating. They prefer deeper water and occur farther offshore than Harp Seals (Campbell 1987, Lavigne and Kovacs 1988, Sergeant 1976). Blue-backs are known to wander farther than adults, and farther than other seal

species, occurring as far south as Portugal and the Caribbean (Lavigne and Kovacs 1988, Mignucci-Giannoni and Odell 2001, Sergeant 1976). Nearly all of the recent stranding and sighting records in southern New England have been blue-backs (Figure 1). Strandings here are most common in January–April, which would be yearlings after their first winter, but they have occurred in all months of the year.

Mystic's Stranding Program

The Stranding Program here at MAIFE responds to all calls about marine mammals and sea turtles—dead or alive—in Rhode Island and Connecticut. The live-stranded Hooded and Harp Seals seen in our facility and by others along the U.S. East Coast are mostly juveniles—emaciated, dehydrated, and in need of immediate medical assistance. We are learning much more about how the behavior of ice seals differs from that of the typical seals of the region—Harbor Seals (*Phoca vitulina*) and Gray Seals (*Halichoerus grypus*). It is normal for seals to rest on land. While Harbor and Gray Seals usually select isolated ledges and shoals as haul-outs, avoiding people, ice seals are more likely to haul out on ice patches, sandy beaches, lawns, boat ramps, and docks. This makes it far more likely that people will encounter them.

We have also seen that young ice seals frequently eat rocks and sand when there is no snow or ice for them to eat. No one knows for sure why they do this. A large volume of rocks and sand in the stomach creates a blockage that often requires surgery to correct. In 2002, one seal had 2.5 pounds of "beach" removed from its stomach, and was eventually released in good condition. Without this surgery the animal would not have been able to eat and would probably have died very quickly. Seals get their fresh water from the fish that they eat, and without feeding, dehydration, starvation, and a variety of diseases soon set in.

At MAIFE, we used to wait for 24 hours before responding to a call about a live-stranded seal, giving the seal time to go back into the water on its own. Over the last two years, however, with the help of a dedicated group of trained volunteers, we have been responding to sighting calls within hours. By responding to calls faster we are able to educate the public and local and state officials about the dangers of getting too close to a resting seal. We are also able are able to move a relatively healthy (but usually very hungry) ice seal off a sandy beach before it has time to eat sand and rocks. By responding to calls sooner we have seen fewer seals coming into rehabilitation with more than one or two rocks in the stomach, and surgery has not been needed since that last one in 2002.

To see a healthy blue-back Hooded Seal in a local river at an unusual time of the year, just enjoying itself and filling up on the local fish, was really exciting. We ask anyone who sees a marine mammal or sea turtle in Rhode Island or Connecticut to give MAIFE's Stranding Program a call at (860) 572-5955 x107. We are trying to expand our program beyond only the sick, injured, and dead animals, so we are very interested in getting your calls about healthy animals like this one.

References:

Bowen, W.D., O.T. Oftedal, and D.J. Boness. 1985. Birth to weaning in four days: remarkable growth in the hooded seal, *Cystophora cristata. Canadian Journal of Zoology* 63:2841–2846.

Campbell, R.R. 1987. Status of the hooded seals, *Cystophora cristata*, in Canada. *Canadian Field-Naturalist* 101:253–265.

Connor, P.F. 1971. *The Mammals of Long Island, New York*. New York State Museum and Science Service Bulletin 416. University of the State of New York, Albany, NY. 83 pp.

Cronan, J.M., and A. Brooks. 1968. *The Mammals of Rhode Island*. Wildlife Pamphlet No. 6. Division of Conservation, Providence, RI. ix + 133 pp.

DeKay, J.E. 1842. *Zoology of New York, or the New York Fauna; Comprising Detailed Descriptions of All the Animals Hitherto Observed Within the State of New York, With Brief Notices of Those Occasionally Found Near Its Borders, and Accompanied by Appropriate Illustrations. Part 1, Mammalia*. W.A. White and J. Visscher, Albany, NY. 146 pp.

Harris, D.E., B. Lelli, G. Jakush, and G. Early. 2001. Hooded seal (*Cystophora cristata*) records from the southern Gulf of Maine. *Northeastern Naturalist* 8:427–434.

King, J.E. 1983. *Seals of the World*. Cornell University Press, Ithaca, NY. 240 pp.

Lavigne, D.M., and K.M. Kovacs. 1988. *Harps and Hoods: Ice Breeding Seals of the Northwest Atlantic*. University of Waterloo Press, Waterloo, Ontario, Canada. 174 pp.

McAlpine, D.F., P.T. Stevick, L.D. Murison, and S.D. Turnbull. 1999. Extralimital records of hooded seals (*Cystophora cristata*) from the Bay of Fundy and northern Gulf of Maine. *Northeastern Naturalist* 6:25–230.

Mignucci-Giannoni, A.A., and D.K. Odell. 2001. Tropical and subtropical records of hooded seals (*Cystophora cristata*) dispel the myth of extant Caribbean monk seals (*Monachus tropicalis*). *Bulletin of Marine Science* 68:47–58.

Reeves, R.R., and J.K. Ling. 1981. Hooded seal *Cystophora cristata* Erxleben, 1777. Pp. 171–194, *In* S.H. Ridgway and R.J. Harrison (Eds.). *Handbook of Marine Mammals, Volume 2: Seals*. Academic Press, London, UK.

Sergeant, D.E. 1976. History and present status of populations of harp and hooded seals. *Biological Conservation* 10:95–117.

Wynne, K., and M. Schwartz. 1999. *Guide to Marine Mammals & Turtles of the U.S. Atlantic and Gulf of Mexico*. Rhode Island Sea Grant, Narragansett, RI. 120 pp.

***Heather Medic** is the Stranding Coordinator at the Mystic Aquarium and Institute for Exploration in Mystic, Connecticut.*

Notes from Field and Study: *Carex kobomugi*

BY RICHARD ENSER

Since the 1950s, when this column's predecessor first appeared in the Audubon Society of Rhode Island's *Narragansett Naturalist,* "Notes from Field and Study" has traditionally reported on new discoveries in natural history, the first collection or observation of a species, or maybe an unusual natural phenomenon. For example, Roland Clement wrote about his experiences with Black Rat Snakes (*Elaphe obsoleta*) in the first column published in the July–September 1958 issue, and later notes included many bird records of distinction, such as Jim Baird's description of a Magnificent Frigatebird (*Fregata magnificens*) in Middletown in 1959. I expect the column was conceived to be celebratory, reporting publicly with pride that Rhode Island could now be considered in the range of a particular species. But to paraphrase an observation from the movies, "You can learn an awful lot from being out in the field, but it ain't always pretty." Some discoveries are not to be celebrated, such as the accounts of fish kills caused by pollution, and wildlife kills due to pesticides in two issues from 1963.

This column fits in the latter, non-celebratory category, having to do with a different threat to biodiversity—the spread of invasive species. An invasive plant that you may not have heard of is the Asiatic Sand Sedge (*Carex kobomugi*), which was actually first discovered in Rhode Island on East Beach in Charlestown by Richard Champlin in 1981. This native of Asia may have first found its way to the western Atlantic when used as packing material to ship porcelain, but it was also imported purposely and used in the Mid-Atlantic states for erosion control. (Until very recently, some agencies were still promoting the use of *C. kobomugi* for dune stabilization). Although capable of producing viable seed, *C. kobomugi* spreads vegetatively by underground runners, thus representing a control nightmare in the same way as *Phragmites* and other successful invaders.

From the Mid-Atlantic, *C. kobomugi* has gradually spread northward into southern New England, although its distribution at this time seems to be limited to only a few sites in this region. Its method of arrival in Rhode Island is conjectural, but it may simply have washed up, pieces of plants broken off from other populations and transported by ocean currents. Although we are not sure how much Sand Sedge was present on East Beach when Richard first found it, a survey conducted in September 2005 shows that it has spread into six individual colonies, collectively covering about three acres. In some spots the Sand Sedge completely dominates in natural blowouts, and it grows on the fore- and back dunes with Beach Grass (*Ammophila breviligulata*) and other native plants.

Some might wonder why there is concern about a plant that appears to be effectively binding the dunes and reducing coastal erosion. Of course, if allowed to, the natural dunes are quite capable of providing this service on their own, but can it ever be considered a good idea to introduce any exotic species into a natural community, especially one so capable of rapid growth? Although the biological impacts of this new invasion are not well understood, anecdotally *C. kobomugi* appears to readily occupy open non-vegetated portions of dunes which are preferred habitats of tiger beetles, robber flies, and other burrowing insects. This faunal community is dependant on the periodic disturbance of wind and waves to create openings, which can be quickly eliminated by the spread of *Carex kobomugi*, thus adding to the stress these species already endure from off-road vehicles and foot traffic.

Eliminating *C. kobomugi* from East Beach will be a difficult enterprise, considering the most effective means is by digging and removing all plants and underground parts. Because control measures may be just as damaging to the natural community as letting the plants subsist, the solution at East Beach may be to simply prevent further spread. At the same time, diligence along the rest of the Rhode Island coast can be effective in the early discovery of new beachheads for Asiatic Sand Sedge so they may be eliminated before becoming problematic. For photos and more information, visit the species account on the IPANE web page at http://webapps.lib.uconn.edu/ipane/browsing.cfm?descriptionid=121.

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

President's *Message*

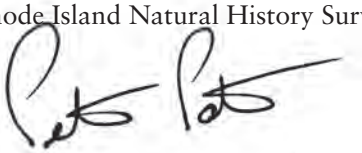
Starting my tenure as President, I want to first thank several distinguished members of the Board who recently stepped down. First, Julie Sharpe has been a core member of the Board for the past several years. She was instrumental in raising key funds that helped sustain RINHS over some lean times, she helped organize a series of successful fund raising events, and she played an important role in getting people to join and participate on the Board. Second, Peter Lockwood, botanist extraordinaire, has played a vital role on the Board over at least the past six years. Among other duties, he served as Treasurer, Secretary, and an active participant in BioBlitz. He always was a voice of reason at Board meetings, an advocate for Staff members, and I think the only Board member capable of playing a mean bagpipe. Third, we will miss Larry Taft, who was most recently Secretary for the Board. As most of you know, Larry was recently named Executive Director of the Audubon Society of Rhode Island (ASRI), which obviously made it difficult for him to continue to serve on the Board. Our congratulations to Larry on his new position—we know he will do an excellent job at ASRI.

Last, but certainly not least, I want to thank my predecessor, Keith Killingbeck, for serving as President of the Board for the past three years. He led the Survey through a time of major transition. During his tenure, there literally has been an exponential growth in the budget of RINHS, which had a total income of $737,548 and total expenses of $620,427 for fiscal year 2004. Keith has done a tremendous time steering RINHS through this transition period, and we all owe him a heartfelt thanks for his time, energy, and leadership.

I also wanted to thank four people who recently joined the Board (Ann DiMonti, Tom Dupree, Malia Schwartz, and Stan Tragar), and those who will continue to serve on the Board and as Advisors. I am looking forward to working with all of them, along with the RINHS staff. I just hope we can continue the success initiated by the founders, Lisa Gould (Senior Scientist and former Executive Director), and David Gregg (current Executive Director).

As I embark on my voyage as President of the Board of Directors, I also want to introduce myself. I was raised in Denver, where I spent much of my youth exploring the mountains of Colorado and Wyoming. I went to Lewis and Clark College in Portland, Oregon for my undergraduate degree, where I had my first taste of natural history. On weekend-long field trips, I explored the deserts of eastern Oregon with my eccentric field biology professor, Doc McKenzie. His passion for the flora and fauna of the region rubbed off on everyone around him and I caught the bug. Walking through sagebrush country, searching for Sandhill Cranes and Prairie Falcons, I realized that ornithology was the elixir I was seeking. After graduation, I hitchhiked down to California (in those days it was a safe venture), and arrived unannounced at Point Reyes Bird Observatory. It was there I learned the intricacies of banding birds, which landed me a job in Hawaii studying endangered forest birds for 4 years on the Big Island. My final year there, I studied Cattle Egrets as an air-strike hazard at the airport in Hilo, which I used as research for my thesis at Colorado State. For the next 5 years, I worked in northern California for the US Forest Service studying the effects of logging old-growth timber on vertebrates (birds, mammals, and amphibians). I switched directions for my Ph.D. at Utah State, and studied the breeding biology of Snowy Plovers at Great Salt Lake. After graduating, I landed a consulting job for the National Park Service, developing bird monitoring protocols in Denali National Park in Alaska, where I was fortunate enough to spend two summers surveying birds throughout much of the Park. While in Denali, I interviewed for a job opening at URI, and was offered a faculty position in 1995.

Now I have been a faculty member in the Department of Natural Resources Science at URI for 10 years. I live in Richmond along the Beaver River, where I band Saw-whet Owls every fall. My wife, Suzanne, who I met at Utah State, is the biologist for the National Wildlife Refuges in Rhode Island. Both of our children, Kayla (9), and Emma (7), were born in Rhode Island (Westerly Hospital), and prod me to catch the wicked waves at Narragansett Town Beach. The Paton family is part of Rhode Island now. Rhode Island is a gorgeous part of North America, with incredible biodiversity at our footsteps. I am proud to be a member of the Rhode Island community and excited to be a part of the Rhode Island Natural History Survey.



The Invasives Beat: What's here and where is it?

BY LISA L. GOULD

All natural historians know that nothing stays the same. Whether it's coastal erosion or the movement of a pathogen across a continent, ecosystems are constantly changing. The spread of non-native organisms around the globe is one such major change: thanks in large part to modern transportation systems and global commerce, new introductions are continuous.

In the May 2005 *Rhode Island Naturalist*, this column reported on results to-date of the Invasive Plant Atlas of New England (IPANE; www.ipane.org) surveys in Rhode Island. Additional IPANE surveys were conducted this summer, and most yielded more of the previously recorded culprits such as Asiatic Bittersweet, Multiflora Rose, Autumn Olive, and Japanese Barberry. This year's surveys also revealed new invaders, however, some that we knew were beginning to spread and others that had not been previously recorded.

Female imago of Winter Moth, climbing up host tree. Photo by Hannes Lemme, Germany. www.invasive.org

Garlic Mustard (*Alliaria petiolata*) has grown on Aquidneck Island for decades but until recently it was not reported on the mainland. Unfortunately, IPANE surveys have now documented it in Foster, Providence, South Kingstown, and Richmond. Garlic Mustard is well known for its negative impact on native understory wild flowers and on butterfly reproduction (e.g., see the work of Bernd Blossey [2003] and his colleagues at Cornell). Blossey (2005) notes that he has never seen a Garlic Mustard population without the presence of the invasive Asian earthworm *Amynthas hilgendorfi*; he believes that the earthworm precedes *Alliaria* invasion and prepares the soil for the mustard to move in. In their research on invasive plants, Blossey and his colleagues have found numerous non-native invertebrates—earthworms, planaria, ants, and many others—in northeastern ecosystems. Many of these species have not even been identified, much less studied to understand their interrelationships with or impacts upon native organisms.

Another serious invader reported this summer is Japanese Stiltgrass (*Microstegium vimineum*), which has been found in Hopkinton, Charlestown, and South Kingstown. Stiltgrass is an annual grass that can form dense patches on roadsides, in woodlands and swamps, and along stream banks. It is believed to have been introduced in packing material for porcelain being shipped from Asia. The first U.S. record is from Tennessee in 1919; Stiltgrass has since spread from Texas to Florida and north to southern New England and Minnesota. Similarly to Garlic Mustard, the Asian earthworm can always be found in conjunction with Stiltgrass (Blossey 2005).

From the insect world, a very unwelcome invader is reported by Catherine Sparks, Acting Chief of RIDEM's Division of Forest Environment. Its identification confirmed by Heather Faubert of the URI Biocontrol Lab, the Winter Moth (*Operophtera brumata*) has now crossed the border from Massachusetts and caused significant damage to trees in Barrington, Bristol, and Warren, where some street trees, especially Norway Maple (*Acer platanoides*), were as much as 50% defoliated. The Division of Forest Environment and the Division of Agriculture's Cooperative Agricultural Pest Survey (CAPS) will conduct surveys in November and December to monitor its spread; damage is expected to be more extensive in 2006 (C. Sparks, pers. comm.). For images and information on this European pest, visit http://massnrc.org/pests/pestFAQsheets/winter%20moth.html.

Finding Garlic Mustard, Japanese Stiltgrass, and the Winter Moth on the mainland was no surprise—we knew they were coming. The summer's IPANE work has documented several other plant species, however, that we had not been aware were spreading into natural areas, including the Memorial Rose (*Rosa wichuraiana*) and English Oak (*Quercus robur*). Several other cultivated species have been recorded at some distance from landscaped sites, including Autumn Clematis (*Clematis paniculata*), Japanese Spirea (*Spiraea japonica*), European Turkey Oak (*Quercus cerris*), and Japanese Snowball (*Viburnum plicatum*). Further assessment is needed to determine if any of these species are actually invasive or potentially so in Rhode Island, using the criteria established by the Rhode Island Invasive Species Council. To view the criteria, visit http://www.uri.edu/ce/rinhs/invasives/listing_criteria.htm.

The biggest surprise of the summer has been recognition of the extensive spread of European Gray Willow (*Salix cinerea* spp. *oleifolia* or *Salix atrocinerea* according to some authorities; it is also commonly known as the Gray Florist's Willow). This species had already been recorded in Rhode Island by both Gordon Tucker (pers. comm.) and Richard Champlin. Concerned about its spread in critical habitats on Cape Cod, U.S. Forest Service botanist Tom Rawinski came to Rhode Island to see if the plant were spreading here, especially in the state's coastal plain pond-shore communi-

ties, which are home to numerous plants and animals on the state's Natural Heritage List. Sure enough, many Gray Willows were found growing along the edge of Long Pond in the Matunuck Hills of South Kingstown, and subsequent IPANE surveys have documented its presence on Conanicut Island, where it is multiplying on the bluffs at Beavertail State Park and Fort Wetherill. Additional observations in South Kingstown, Hopkinton, and Richmond indicate that this willow is rapidly spreading in Rhode Island; it has become common in damp edges. Tom Rawinski notes that *Salix cinerea* "has been a remarkably successful stealth invader…it's probably in every county in New England and New York" (Rawinski 2005).

Why wasn't the rapid expansion of this plant noticed before? *Salix cinerea/S. atrocinerea* shares common characteristics with Large Pussy Willow (*Salix discolor*), Small Pussy Willow (*Salix humilis*), and Beaked Willow (*Salix bebbiana*). Few people bother to key these out to the species level, and most people have been unaware that non-native pussy willows were naturalizing [I should note that neither Rawinski nor I claim to be experts at *Salix* identification; voucher specimens of the European Gray Willow collected in Rhode Island this summer are being sent to North American willow taxonomist George Argus, of the Canadian Museum of Nature, for verification].

The "stealth" spread of the European Gray Willow and the work being done by researchers such as Bernd Blossey exemplify the need for more eyes in the field, more trained taxonomists for every organism group, and more research on the ecological impacts of introduced species. We invite you to join in the work that the Survey and its partners are doing to prevent the spread of new invasives and understand their impacts.

To help share information about invasive species science, news, and events, RINHS has established a listserv, RIINVASIVES. To subscribe, send a message to LISTSERVE@LISTSERV.URI.EDU with the following message in the body of the text: SUBSCRIBE RIINVASIVES Your Name

Literature Cited

Blossey, B. 2003. Ecology and Management of Invasive Plants Program: Garlic Mustard. Cornell University, Ithaca, NY. http://www.invasiveplants.net/invasiveplants/InvasivePlants/GarlicMustard/ garlicMustard.asp.

Blossey, B. 2005. Why does it matter who you are and where you came from? A story of invasive plants and their native relatives. Keynote address to the New England Invasive Plant Summit, Sept. 16–17, 2005, Framingham, MA.

Rawinski, T. 2005. 6. European Gray Willow (*Salix cinerea*): A message from Tom Rawinski, USFS. Invasive Plants Newsbriefs 14, New England Invasive Plant Group [NIPGro], 25 August 2005.

Rhode Island Collections:

The Paleozoology Collections of the Museum of Natural History, Roger Williams Park

BY MICHAEL W. KIERON

Most of my time at the Museum of Natural History since beginning as a volunteer in 1992 has been devoted to the Herculean task of reorganizing the Museum's great mineral collection. With the mineral collection finally in some semblance of order, I was able to start systematically arranging the Paleozoology collection upon joining the curatorial staff in 2005. Much of the paleontology collection was in the same wooden drawers and trays that I brought downstairs to the newly renovated storage area about 10 years ago. The collection was originally arranged stratigraphically, but transferring them to our new mobile storage units gave me the opportunity to arrange the collection taxonomically—enhancing its accessibility.

The collection began in 1896 with the appointment of James M. Southwick (1846–1904) as the Museum's first director. He previously co-owned a natural history store in Providence and was able to make the earliest contributions to the collection. During this period, James H. Clarke (c. 1833–1904) added over three thousand fossils to the collection, including a large number of Paleozoic corals, brachiopods, and mollusks. Some of the first donors were James Angus (1819–1903), who donated a number of corals and brachiopods, and Herbert Scholfield (1872–1921), who donated a wide range of invertebrates including several from the Carboniferous of Rhode Island.

Charles Abbott Davis (1868–1908) became director after Southwick's death in 1904. Davis was an avid naturalist; he contributed many specimens that he collected from the eastern United States and began the first organization of the paleontology collection. Harold L. Madison (1878–1947) succeeded Davis after his early death in 1904 and received the Carpenter collection, the museum's largest donation. Horace F. Carpenter (1842–1937) donated mostly minerals and mollusks, but he also had a number of fine brachiopods, corals, and crinoids from New York State and the Midwest.

In 1925 William L. Bryant (1871–1947) succeeded Marie Gaudette (1894–1966), who was interim director following the departure of Madison. Bryant came from the Buffalo

Museum of Science where he had been director since 1909, prior to which he had been a practicing attorney. His particular research and collecting interest was fossil fish from the Paleozoic, and he was able to obtain many rare and valuable specimens from important sites such as the Ordovician Harding Sandstone and the Devonian at Beartooth Butte. When Bryant died in 1947 he was replaced by Maribelle Cormack (1902–1984), who had little interest in paleontology. The only significant paleontological donation during this period was the Albert Barney collection of Tertiary and Pleistocene fauna around Port Charlotte, Florida that consists of cetaceans, sirenians, large terrestrial mammals, reptiles, and fish. This brief account of the history of the collection passes over the hundreds of private and institutional contributors who have donated and still are donating fossils, but without them the collection would lack its great taxonomic breadth.

Beginning with invertebrates, the Anthozoa comprise several thousand specimens. Most of the corals are from the Devonian of New York, Illinois, and Ohio but the collection also includes several British specimens. One of the more interesting suites in the collection is devoted to the Devonian Hamilton Group around Moscow, New York donated by the Rev. H. H. Thomas. The group is currently arranged just to class but will be organized to family level when time permits.

The brachiopod collection consists of an equally large number of specimens ranging from most of the eastern and midwestern United States. A remarkable suite of brachiopods from the Ordovician of Cincinnati, Ohio was donated by Charles Schlemmer. Rev. H. H. Thomas also donated many spiriferid brachiopods from the Hamilton Group. Also included in this collection are a number of Pennsylvanian brachiopods from Rhode Island. As with the coral collection, more refined organization and identification will be undertaken in the future.

The fossil mollusk collection comprises about 450 lots and varies widely stratigraphically and geographically. Some of the more interesting bivalves include unionids from the Carboniferous of Rhode Island, clams from the Gay Head Cliff, and a collection of ostreids from the Lower Cretaceous of Texas. Most of the gastropods are from the Paleozoic, but the collection includes several suites from the Eocene, one from Hampshire, England and another from Bakersfield, California. The collection also contains a number of cephalopods from around the world with one from Texas that fills a drawer. When they say everything in Texas comes big, this specimen was surely included!

The collection also contains many hyoliths from the classic Lower Cambrian site at Hoppin Hill in North Attleboro, Massachusetts. The true affinities of hyoliths are still under debate, so we are treating them separately from the mollusks. Many of the hyoliths were documented to have been collected at Shaler's sites 2 and 3 and may hold considerable historical significance.

The arthropod collection consists mostly of trilobites collected in New York, Ohio and Canada, with two fragments of Cambrian trilobites from Hoppin Hill. The most important arthropods in the collection are a blattoid wing from Pawtucket collected in 1888 and two plates with conchostracan shrimp, also from Rhode Island. Other interesting arthropods include a pair of phyllocarids from New York and a spider with its web in copal (an amber-like resin) from New Zealand.

Some of William L. Bryant's research specimens of *Americaspis americana* and *A. bitruncata,* though they are labeled with the obsolete genus name *Palaeaspis*. These fossil jawless fishes lived more than 400 million years ago.

Crinoid stems and calyxes from the Midwest along with a good number of blastoids comprise most of the echinoderm collection. Included among that number are crinoid heads that would exhibit well if properly prepared. As my passion is collecting British minerals and fossils, my favorite part of the collection includes several echinoids and urchin spines in chalk from Dover, England,

The museum's vertebrate holdings begin with three drawers containing the remains of some of the earliest known taxa. Gifts from the U.S. National Museum, the specimens were used by William L. Bryant for his research on early fishes, and some of the specimens have been illustrated in his papers. The collection consists mostly of dermal plates and scales from *Eriptychus americana, Astraspis desiderata,* and the enigmatic *Dictyorhabdus priscus,* but I have no doubt that detailed study of our rich pieces can yield additional taxa.

There are three drawers containing dorsal shields, scales, and bone fragments of *Americaspis americana* and *Americaspis bitruncata* from the Silurian Landisberg Sandstone of Perry

County, Pennsylvania (some are shown in the accompanying photo). These cyathaspids were donated by Princeton University in 1926 for more of Bryant's research and some of the specimens are large matrix pieces showcasing possible group mortality. Also with the donation were several *Cyathaspis wardelli* (which, in part, has been renamed *Vernonaspis bryanti*).

Another gift from Princeton includes a great volume of Devonian fish remains from Beartooth Butte in Wyoming; with this material Bryant described about twenty new species. The designated types were sent back to Princeton, perhaps as a condition or expression of thanks for granting him the opportunity to work on this wonderful material. The type material is now housed at Yale's Peabody Museum of Natural History, which recently acquired the orphaned Princeton University collection. Over fifty lots remain in our hands, including Bryant's glass-plate negatives representing his personal study collection, which should be of some research interest. The current work needed for this collection is to update the nomenclature—*Euryaspis* has since been changed to *Bryantolepis*—and to positively identify the unlabelled specimens.

While still at the Buffalo Museum of Science, Bryant developed a keen interest in the Devonian fish from Escuminac Formation in Quebec and he collected a number of these including the antiarch *Bothriolepis canadensis* and the dipnoid *Scaumenacia curta*. There are small squares taken out of some of the *Scaumenacia* for thin section, showing his affinity for microstructure. Other early fish Bryant obtained include dermal plates and thin sections of *Corvaspis* and *Tesseraspis*, along with a dorsal shield of *Coccosteus* from England. He also acquired an excellent group of osteostracans from the Silurian of Estonia, collected by the famous vertebrate paleontologist William Patten (1861–1932).

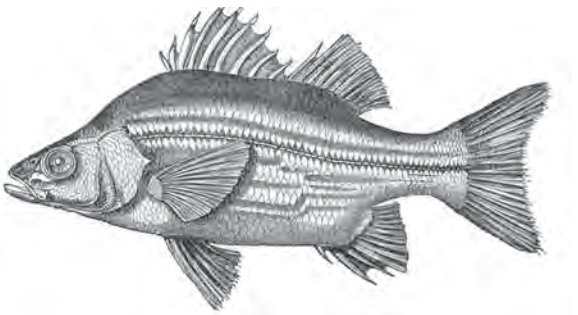
The next group of fossils is our collection of shark teeth. Most are the *Cacharodon megalodon* that children love, but we have a fair variety of smaller species and some vertebrae. We also have a few from the Gay Head Cliffs, including one tooth still in matrix. The next several drawers are of Triassic fish from Durham, Connecticut. These were collected in the 19th Century and consist of *Redfieldia* and *Semionotus*. The fish holdings conclude with Eocene clupeids and Pleistocene fish remains from Florida.

Our reptile collection is relatively small, consisting mostly of dinosaur footprints in addition to some alligator, turtle, and tortoise remains. The sole dinosaur bone is a piece of a *Triceratops* mandible donated by the author. We also have two plaster casts of *Oviraptor* eggs collected during the first Gobi Expeditions. Also in the one of the dinosaur drawers is currently our only avian fossil, a feather from the Eocene Green River Formation in Colorado.

We know little about collector and teacher Emma Pfanner (1859–?) except that she collected extensively around Shannon County, South Dakota. Most of the material she donated consists of skulls and bones of oreodonts, probably *Merycoidodon*, but includes the tortoise *Stylemys* and the rhino *Hyracodon*. More may be found when we make a detailed analysis of the bones. The most interesting find among the other artiodactyls is a *Bison* molar found along the Pettaquamscutt (Narrow) River, the only Ice Age mammal from Rhode Island in the collection. Perissodactyls in the collection included *Hyracodon* and *Equus* dentition with some bones. Cetaceans are represented by a number of large vertebrae from the Miocene of South Carolina, and some dolphin jaws and teeth came with the Barney collection from Port Charlotte, Florida. The museum has a collection of mammoth teeth from Florida, Alaska, and Mexico, with a mastodon molar on display. A set of sirenian ribs has teeth marks that most closely match those from an alligator. Not to leave out the Xenarthra, Mr. Barney donated a set of *Glyptotherium* scutes.

I've only described the tip of the iceberg of the paleozoology collection—much work still needs to be done. Priorities include nomenclature changes, identification, and refined classification, especially with the brachiopods and corals. The collection continues to grow, enhancing its value to researchers, educators, and exhibitions alike. We welcome any questions or appointments to see our collection first hand.

Michael W. Kieron *is curatorial assistant at the Museum of Natural History, Roger Williams Park, Providence, Rhode Island. He can be reached at (401) 785-9457 x246.*



BioBlitz 2005 : Mount Hope, Bristol

BioBlitz 2005 took place June 17 and 18 at Mount Hope, Bristol, Rhode Island. Land owners Mount Hope Farm Trust and Brown University together provided 550 contiguous acres, including a mix of terrestrial habitats—fields, several forest types, several stages of succession from agricultural land—and interesting coastal habitats, as well as small but nonetheless interesting freshwater wetland and aquatic habitats. Mount Hope Farm Trust and Brown University's Haffenreffer Museum of Anthropology and Department of Ecology and Evolutionary Biology hosted. Other event sponsors included the ESS Group and Largess Forestry.

One hundred and two volunteers participated and succeeded in turning up at least 972 species in a 24-hour period that seemed to fly past. Here's what we found: Mammals 20; Birds 77; Fish 6; Reptiles 4; Amphibians 7; Spiders 46; Crab/Lobster/Shrimp 11; Odonates 22; Lepidopteran 98; Coleopteran 51; Other Insects 77; Other Non-vertebrates 38; Vascular Plants 352; Algae 31; Lichens 88; Other Plants 4; Fungi 40.

It was our second largest tally in the six-year history of Rhode Island's BioBlitz, but readers will probably note that with only 200-some insects we were lucky to get that high. We continue to be hampered by our lack of expertise in the Arachnida, Hymenoptera, and Diptera, among others. Nonetheless, vascular plants carried the day, with Don Flenniken's and Doug Greene's lichen tally and Rey Larsen's Odonata tally helping, too. Unfortunately, we also lacked the expertise to take full advantage of the marine communities, although they made possible a good tally of molluscs and of algae.

The weather threatened rain and the temperatures dipped at night, but the conditions did not deteriorate further and by late morning Saturday it was a beautiful day. The sudden sun made possible a last-minute gold rush on the insects that brought in some key species. Even considering the weather, the overnight moth and beetle trapping results were disappointing. This may have been an indication that biodiversity has been limited by ecological succession near the Haffenreffer Museum, where most of the trapping took place. The most exciting find was probably the large Striped Bass caught by rod from the shore, showing there are lots of fun ways to contribute to BioBlitz!

Clockwise from top right: Gary Plunkett & Doug McGrady hunting for wild plants; Noel Rowe with a big fungus; an array of marine algae from Mt. Hope Bay; David Gregg, RINHS Executive Director and bug hunter— sharing the fun with some up and coming naturalists. Photos courtesy David Clayton.

This year, we tried some things for the first time. Because of the land's historical associations and the presence of a museum on the site, we examined the land's history more than we have in the past. We displayed historical ground-level and aerial photographs and included in the public program a presentation on land use history by Brown anthropologist Ninian Stein. Because the Haffenreffer Museum operates a wireless internet node, we also experimented with making BioBlitz into a live web event. Although in the end there were technical problems, we learned enough to say we definitely want to try this again next year. The Friday dinner has become a high point of the BioBlitz and this year was no exception. It was a great way to meet other naturalists attracted by the BioBlitz, to catch up with old friends, and to exchange tips on the Mount Hope terrain.

Ecological Inventory, Monitoring, and Stewardship Program:

Bringing Watershed Health and Land-Use History into the Classroom

BY KRISTEN PURYEAR

This summer the EIMS program has been busy coordinating an environmental assessment of the Branch River watershed, as part of a project funded by the Narragansett Bay Estuary Program and the U.S. Environmental Protection Agency. The grant is through a program called Ecosystem Science in Community Action, and our primary goal was to conduct an integrated watershed assessment and outreach project within the Branch River watershed in partnership with the Rhode Island Rivers Council, Rhode Island Land Trust Council, and Blackstone River Coalition.

There are three components to the project, 1) to collect scientific data about the biota of the watershed, 2) to conduct outreach efforts within the watershed communities, through volunteer recruitment and educational presentations, and 3) to give communities more ideas and tools to act as better stewards of their land and water. As a part of our outreach efforts we brought a presentation on water quality and watershed stewardship to 24 high school seniors at Burrillville High School. They were both students and researchers, as the results of their in-class exercise will be used as real data for our land-use assessment of the watershed.

Students were led through discussion of the concepts of watersheds and watershed stewardship. We emphasized how a watershed represents an integration of biology, chemistry, and geology with social, economic, and political factors, and therefore serves as an important interface between humans and their environment. Land use and land-use history are parameters that not only reflect that relationship but also affect it. For example, physical characteristics like soil type may determine where agricultural fields are located. The operation of a mill on the river at the turn of the century may have attracted people to settle into villages nearby, villages that later became larger towns and cities. Alternatively, poor water quality may discourage people from living near the river or revitalizing old mill sites.

Watersheds have also become a popular focus for stewardship through volunteerism, education, and inter-community projects. The Burrillville students, most of whom are now thinking about what to pursue after graduation, were encouraged to recognize that they would always be members of a community *and* a watershed, no matter what career paths they take.

The students conducted an exercise that was designed to introduce them to the Branch River watershed. We focused on land use and land-use history and the impact these factors have had on their watershed over time. We used topographic maps, aerial photos, and road maps to identify the watershed boundaries and familiarize students with its location, extent, and current land uses. Three different maps were created for this exercise using Geographic Information Systems (GIS) and aerial photos. Each map showed the same section of the watershed in Burrillville, as it existed in 1939, 1988 (approximately the year these students were born), and 1995. Land-use types were mapped for each year and converted to appear as pixelized shapes. Land uses were color coded into six categories: Urban/Developed, Agriculture, Forest, Wetland, Water, and Sand (gravel pits).

The students were asked to measure the area of each land-use type on their map, and were given rainfall runoff values to determine how much runoff would go to the river given the different fractions of land use. Groups were asked to report their results and answer questions such as: What land use represented the largest portion of the map? What land use do you think potentially has the biggest impact on water quality? What land use do you think is most likely to be different 20 years in the future?

During the discussion, real data from the Branch River watershed assessment were used to illustrate points about the impacts of development on habitat. We discussed what the results of seven years of Odonata surveys and research suggest about relationships between open space and dragonfly/damselfly habitat (work currently being conducted by Virginia Brown). We also looked at the results of an impervious-surface analysis completed by Dr. Y.Q. Wang (work done for the BayWAG project). Finally, I shared some of the preliminary results from my compilation of aquatic macroinvertebrate and fish survey data from the Branch River. Using this available information and the land-use values calculated by the students, we were able to create a much clearer picture of watershed health and water quality for the Branch River. Students were encouraged to brainstorm and think of other biological research that might tell us even more. They were also asked to think "outside the box" and propose other steps that could be taken to protect healthy habitats, restore degraded ones, and improve water quality for recreational use as well as for the plant and animal life.

As we wrapped up the class, students were encouraged to keep in mind the framework of a watershed and the concept that "We all live downstream" as they choose a future after

high school. Whether as town planners, teachers, scientists, engineers, or dedicated community stewards, these students will have a chance—and now hopefully the tools—to make informed choices and important decisions regarding the health of their watersheds and their communities into the future.

***Kristen Puryear** is the Conservation Biologist with the RINHS Ecological Inventory, Monitoring, and Stewardship Program.*

RINHS News

On a beautiful early fall afternoon on September 19th, a small group of faculty, staff, students, and friends gathered at URI's W. Alton Jones Campus in West Greenwich to honor Bob Shoop, a 2004 RINHS Distinguished Naturalist Award winner. The research area of the campus has now formally been named the "C. Robert Shoop Ecological Research Reserve." Outgoing RINHS president Keith Killingbeck unveiled a bronze plaque fixed to a large granite boulder that now permanently marks the entrance to the Reserve. The plaque bears a relief sculpture of Shoop, along with a brief inscription high-lighting the research he conducted in the Reserve and the legacy he left behind for the rest of us.

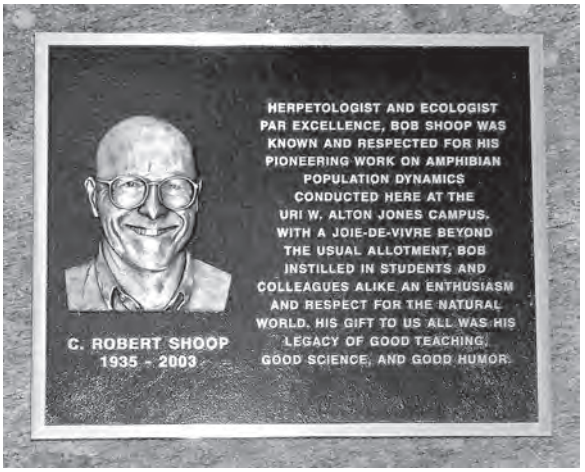


photo by R.D. Kenney

Weaving the Web: Electronic Resources

Freshwater Biodiversity Assessment: In response to the rapidly declining status of freshwater habitats and their species, the IUCN Species Survival Commission (SSC) has established a Freshwater Biodiversity Assessment Program. It aims to put in place a factual underpinning to support efforts to conserve and manage freshwater biodiversity. Website features include:

- regional biodiversity assessments (biodiversity assessment in eastern Africa's inland waters and Pan African freshwater, Madagascar endemic freshwater fish assessment and Mediterranean endemic freshwater fish assessment)
- identifying important freshwater biodiversity sites
- freshwater fish specialist group
- demonstrating links between biodiversity and livelihood.

http://www.iucn.org/themes/ssc/programs/freshwater/

Freshwater Biodiversity Network: DIVERSITAS, an NGO focused on bringing together biological, ecological, and social sciences to address key questions that underlie the limited understanding of the current situation) has established a Freshwater Biodiversity Network, which aims to:

- provide quantitative estimates of species numbers for all freshwater groups on each continent and/or in major eco-regions
- initiate pilot case studies in geographic areas that require additional investigation to address freshwater biodiversity and to identify evolutionary patterns of freshwater biodiversity
- elucidate the role of freshwater microorganisms for ecosystem functioning and services, and their social and economic values
- evaluate freshwater biodiversity conservation methods develop concepts and materials to educate people regarding the importance of biodiversity in the context of freshwater resources.

This website provides information about links, publications, activities and news.

http://www.diversitas-international.org/cross_freshwater.html

U.S. Wetlands: Two web sites from U.S. federal agencies provide lots of information about freshwater and coastal wetlands in the United States. The highlight of the U.S. Fish and Wildlife Service's National Wetlands Inventory page is a wetlands mapper. Beginning from a map of the entire country, you can zoom in to a scale of only a few meters (I was able to find the small wetland behind the house at the end of my block—Ed.). There is also information on wetland plants and status & trends, special features for students and teachers, and a publications library. **http://wetlands.fws.gov/** The U.S. Geological Survey's National Wetlands Research Center has a comprehensive web site of wetlands information. Currently the "hot topic" is Hurricane Katrina (the Center is located in Lafayette, Louisiana)—emergency response, recovery, and restoration. There are downloadable fact sheets on wetland habitats, plants, and animals, threats to wetlands, and management strategies; education and outreach resources including "The Fragile Fringe" teacher's guide; and a searchable publications database. **http://www.nwrc.usgs.gov/**

The URI Office of Marine Programs (OMP) just launched a new and improved website featuring all of the projects, resources, and opportunities OMP offers:

- The Narragansett Bay Classroom: Coastal Field Trips, Interpretative Programs, Public Programs, and Educator professional development opportunities such as the "Oceans à la Carte Workshop for Educators" on November 19.
- Local/National/International Projects: Census of Marine Life, ARMADA Project, Teachers Experiencing Antarctica and the Arctic, National Ocean Sciences Bowl, RI Teacher at Sea, Metcalf Institute for Environmental Reporting and the GK–12 Program.
- Marine Science Resources: educational websites—Discovery of Sound in the Sea, Discovery of

Estuarine Environments, and Discovery of Coastal Environments; Visitor Center, Educational Resource Room, and the Educational Kit Loaning Library.

- Calendar of Events: public lectures and events, workshops for educators and other programs sponsored by OMP can be found on OMP's calendar.

The Office of Marine Program's targeted audiences include educators and students at all levels, the general public, journalists and the media, and scientists and engineers. **http://omp.gso.uri.edu**

Online Encyclopedia of Marine Life: NOAA's National Marine Sanctuary Program (NMSP) has unveiled a new free online resource that highlights the diverse marine life of America's ocean and Great Lakes treasures. The "Encyclopedia of the Sanctuaries" offers photos, streaming video and important facts for more than 100 key animal and plant species from each of the national marine sanctuaries. The "Encyclopedia of the Sanctuaries" allows users to search for their favorite species or browse the wildlife of each sanctuary by category, ranging from spiny lobster to killer whales and from white-tipped reef sharks to sea anemones. The encyclopedia entry for each species includes a photo, quick facts, information about its diet, habitat, distribution and status, and links to outside resources for more information. Many of the entries also offer engaging, high-quality video clips of species in their natural habitats, making the "Encyclopedia of the Sanctuaries" an entertaining and informative resource for educators, students of all ages, zoos and aquaria, science and technology centers, and natural history museums. The online encyclopedia was developed by NOAA in partnership with the National Marine Sanctuary Foundation and The Ocean Channel, Inc., a California-based news-media corporation. It is part of a continuing effort to enhance the public's understanding and appreciation of the ocean environment. The project was funded through an education grant provided by the National Marine Sanctuary Program. **http://marinelife.noaa.gov/**

Reptiles and Amphibians: The Center for North American Herpetology (CNAH) web site is a centralized repository of information on the North American herpetofauna. A sampling of only the home page includes taxonomic information on 596 species, abstracts of current research, news, meetings calendar, job openings, links to academic and research organizations, a library of PDF papers for free download, and links to several hundred other herpetological web sites. **http://www.cnah.org/index.asp**. The Global Amphibian Assessment was a global survey of frogs, toads, salamanders, and caecilians, sponsored by IUCN-The World Conservation Union, NatureServe, and Conservation International. The data were used in creating this web site, with information on 5,743 species world-wide. Each species account includes a range map, as well as information on habitat, ecology, status, current and potential threats, and conservation measure. **http://www.globalamphibians.org**

RI Natural History Directory

- search browse add/modify about -

Have you visited and signed up for the on-line directory yet?

What is it? A clearinghouse for information on people and organizations interested in plants, animals, geology, and ecosystems in the region.

Who can be in it? Any person, organization, or program active in or knowledgeable about the study of natural history in Rhode Island. Those who work in the environmental field; those who want to.

Why? Provide networking opportunities for yourself, your company, your program, and to tell others of your interests & collections.

How?

1) Log on: www.rinhs.org/directory
2) Register
3) Enter as much or as little info as you want
4) You're in!

RINHS 11th Annual Conference

Stewarding Rhode Island's Natural Heritage

Friday, March 3, 2006
Rhodes-on-the-Pawtuxet, Cranston, RI

Rhode Island's animals, plants, and ecosystems are its natural heritage, legacies of its distinctive history, and valuable resources for its future. For this year's conference, RINHS seeks papers, posters, and research relevant to the status and management of RI's and the surrounding region's natural heritage. Oral and poster presentations will be organized into categories such as conservation, restoration, vertebrates, invertebrates, geology, plants, invasive species, and ecosystems.

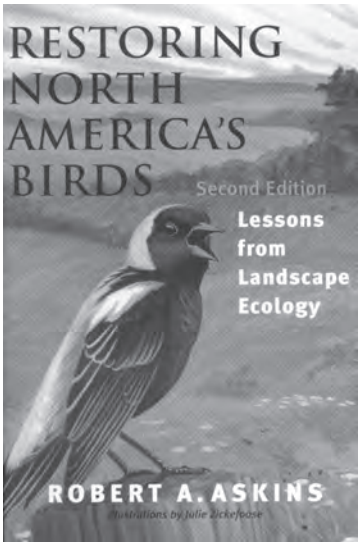
RINHS conferences are well regarded throughout southern New England for their unique ability to bring together a wide spectrum of scientists, educators, students, naturalists, local, state, and federal agencies, and the general public, all of whom share a vested interest in improving and preserving the health of Rhode Island's natural systems. The conference is an excellent venue for researchers and organizations to showcase what they are doing and to create new relationships.

For more information and to access the Call to Abstracts, visit the RINHS website at www.rinhs.org. We hope to see you in March!

Events Calendar

January 26th & 27th. Ronald Reagan Building and International Trade Center, Washington, DC: The National Council for Science and the Environment (NCSE) invites participants in the 6th National Conference on Science, Policy, and the Environment: *Energy for a Sustainable and Secure Future*. The Conference will explore central issues relating to energy and society at the intersection of science, policy and the environment. Participants will develop an agenda for science to help guide the decisions that promise to transform our common energy future. Visit www.NCSEonline.org to register, obtain the latest program updates, and view links to travel and lodging options. There are many opportunities available for organizational participation, including conference sponsorship, hosting an exhibition, or displaying a poster. General conference questions may be directed to conference 2006@NCSEonline.org.

February 9th, 7:30 PM. "Conservation Across Landscapes: The Importance of Large Nature Preserves" in Weaver Auditorium, Coastal Institute, URI Kingston Campus. Lecture three, in the 2005–2006 *Mark D. Gould Memorial Lecture Series on Rhode Island's Fauna, Flora, Geology, and Ecosystems*. Dr. Robert Askins, Director of the Goodwin Niering Center for Conservation Biology and Environmental Studies at Connecticut College (http://ccbes.conncoll.edu/), and author of *Restoring North America's Birds: Lessons from Landscape Ecology*, will discuss habitat fragmentation resulting from suburban development and sprawl, and its effect on biological diversity. Challenges such as this are faced around the globe from the forests in Japan, to the grasslands in North America, and tidal marshes in New England. The survival of many species depends on large areas of habitat and in many parts of North America conserving such areas can only be accomplished when private landowners, lumber companies, commercial developers and state/federal agencies work together. This lecture is free and open to the public. Doors open with refreshments at 6:45 PM. For more information call the RINHS office at (401) 874-5800, or email programadmin@rinhs.org



March 3rd. Rhodes on the Pawtuxet, Cranston, RI: The 2006 Rhode Island Natural History Survey Annual Conference, *Stewarding Rhode Island's Natural Heritage*, will provide an open forum for a wide cross-section of topics, from a diverse group of presenters. Simultaneous sessions will insure that there is something for everyone throughout the day. Start preparing now! Our call for abstracts—for both poster and oral presentations—is available at www.rinhs.org.

March 11th, 8:30 AM–3:30 PM. University of Rhode Island, Memorial Union, Kingston, RI: 3rd Annual Land & Water Conservation Summit, *Working together to protect our communities*, co-sponsored by the Rhode Island Land Trust Council, Rhode Island Rivers Council. This conference will offer updates on Rhode Island legislation, three workshop sessions with dozens of practical workshops to choose from, lunch & keynote address, RI Land Trust Council business meeting, and time for viewing displays and networking. The Summit would be worthwhile for leaders and members of local land trusts, watershed councils, and other conservation organizations; municipal officials (conservation commissions, planning boards, zoning boards); state agency representatives; businesses; and all interested citizens. For details about the program and registration, contact either of the sponsoring organizations: RILTC at (401) 331-7110 x39, rfriday@tnc.org; RIRC at (401) 714-2313, megkerr@cox.net.

March 25th , 9:00 AM–4:00 PM. Cape Cod Community College, West Barnstable, MA: The 11th annual Cape Cod Natural History Conference, organized by MassAudubon's Wellfleet Bay Wildlife Sanctuary, is a full-day conference featuring presenters from environmental organizations across Cape Cod, speaking on a diversity of natural history topics. Learn about local research projects, conservation efforts, and local environmental organizations. Participants will be able to ask questions as time permits and will receive a summary of presentations. Advance registration fee is required; the registration fee is $20. Call (508) 349-2615 to request a registration form or for additional information.

March or April (date and location TBD). The 2006 Annual Audubon Society of RI Birders' Conference will be held in March or April. The date and location will be announced in December, and program details will be available in February. For inquiries, contact Eugenia Marks at the Audubon office in Smithfield at 949-5454 or by email at emarks@asri.org, or visit their home page at http://www.asri.org.

April (date TBD), 7:30 PM. Brown University (room TBD), Providence, RI: *2005–2006 Mark D. Gould Memorial Lecture Series on Rhode Island's Fauna, Flora, Geology, and Ecosystems—"Ecological Principles in Crime Scene Investigations."* Lecture by Wayne D. Lord, Supervisory Special Agent, Federal Bureau of Investigation, Washington, DC. 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.

On-going. The Rhode Island Wild Plant Society provides opportunities through field trips, walks, workshops, courses, and lectures to learn about native plants and their habitats while enjoying the outdoors. The full calendar with all the details can be found at http://www.riwps.org/programs/programCalendar_main.htm. Preregistration is necessary for most RIWPS events. For information, or to register, please contact the RIWPS office at (401) 453-3777 or office@riwps.org.

On-going. The Rhode Island chapter of The Nature Conservancy (TNC) recently opened several new hiking trails at its 841-acre Francis C. Carter Memorial Preserve in Charlestown, Rhode Island. Habitats on the Carter Preserve include oak forest, pine barrens, wetlands, and grassland. TNC encourages passive recreation such as hiking, bird watching, nature study and photography on the Preserve, and also offers walks with a TNC naturalist. Programs are free and open to the public. Registration is required so that participants can be contacted in the event of cancellation or changes. Call (401) 331-7110 to register. For the most up-to-date calendar of programs, visit http://nature.org/wherewework/northamerica/states/rhodeisland/events/.

On-going. The Audubon Society of Rhode Island offers a wide variety of programs year-round at 15 refuges around the state. There are educational and fun programs birders, beginners, families, children, and anyone who wants to learn more about the natural world. The Education Department runs many after-school, school break, and summer camp programs as well, and also offers a number of teacher workshops. For the full calendar of programs, workshops, and other offerings, visit http://www.asri.org.

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
P.O. Box 1858
Kingston, RI 02881-1858
Tel: 401.874.5800 • Fax: 401.874.5868
info@rinhs.org • www.rinhs.org

Get Ready for Bioblitz 2006!

BioBlitz in 2006 will be held from 3:00 p.m. Friday, June 9, to 3 p.m. Saturday, June 10, at the Cumberland Monastery, off Diamond Hill Road in Cumberland, Rhode Island. As was the case with BioBlitz 2005, this BioBlitz will be on property with a distinctive history that we should find has contributed significantly to the modern biological profile. The Cumberland Monastery, now owned by the town of Cumberland and the site of a public library and other offices, is the former site of the Abbey of Our Lady of the Valley, a Trappist order. The parcel, around 500 acres in size, was bought in 1900 by a French-Canadian religious community whose Nova Scotia abbey had been destroyed by fire. The first monastery building on the site was erected in 1902 with substantial buildings being added over the next 40 years. Much of the building stone was quarried on site by the brothers themselves. The brothers also maintained extensive agricultural works, with associated barns and other buildings. Most of the abbey buildings burned in 1950 and the town purchased the property. The Cumberland Monastery also encompasses the site of an important episode in King Philip's War. Here Narragansetts and other Indians are reputed to have killed prisoners taken during their victory over colonial troops at Attleboro in March 1676. A 1928 monument marks the spot, called Nine Men's Misery.

Some of the abbey's agricultural features, including large fields, have been maintained while others have undergone ecological succession since abandonment. The Monastery includes a wide range of habitats including hay fields, abandoned fields, farm ponds and wetlands, a small tributary of the Blackstone, and a variety of forests. There are areas with high levels of human disturbance or where invasive plants pervade and other areas of comparative natural stability. The interior site should give quite a different suite of birds, insects, and small mammals than most previous Rhode Island BioBlitzes and the characteristic northern Rhode Island soils should yield unusual plants, lichens, and fungi.

Groups which have already signed on to help bring about BioBlitz 2006 include the Town of Cumberland, the Cumberland Conservation Commission, and the Blackstone River Watershed Council. If your group is interested in the biodiversity of Rhode Island or of the Blackstone River, or in the role of volunteers in biological inventory, monitoring, and education, and you would like to be an official participant in BioBlitz 2006, contact David Gregg at the Survey office. There will also be opportunities for organizations to display at the event.

As usual, we are encouraging all people with a burning desire to "see what's out there" to participate in BioBlitz and help us answer that question as a group. Science Central will once again be a great crossroad for people working on every conceivable taxon from amphibians to zebras (but probably not too many zebras). There will be another Friday dinner, a special area for students and teachers, public programs all day Saturday, and a big countdown of species at 4 p.m. Saturday. As in past years, we are searching for people to contribute to important taxonomic groups for which we currently have no experts: Arachnida, Hymenoptera, and Diptera, to name three. If you start studying now, you could well be the most qualified person present when June rolls around. Look for registration information in the mail or on the Survey web site.

RHODE ISLAND
NATURAL HISTORY SURVEY
Providing Ecosystem Science and Information

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Kingston, RI 02881-1858

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