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What's Inside...

- *Conflicts of Interest in the Paper Wasp
- *Decline of Lobster Fisheries
- *RI Cilioprotist Diversity
- *Distinguished Naturalist Awards
- *What's in a Name?
- *RINHS Web Publications Program
- *and lots more...

Vernal Pools: Nature's Laboratory

BY GAYTHA A. LANGLOIS

Vernal pools, those ephemeral ponds that magically appear at winter's end, serve as breeding grounds for spring peepers and small salamanders, and also provide an excellent opportunity to involve students and teachers in an important scientific enter-

prise. Vernal pools are essential to the survival of several amphibian species, but are threatened by human activities such as forest clearing, land development, and road building. Low water tables and continued drought conditions in Rhode Island have brought additional stress, along with significant road-kill of migrating amphibians in the early spring. Fortunately, many vernal pool protection programs have been developed, involving federal and state environmental agencies and university and school educators. Because vernal pools are often small and widely dispersed, utilizing college and school classes to gather data is an effective tool for assembling information quickly, while also enlisting the support of family and community groups for protection of these valuable aquatic resources.

What Is a Vernal Pool?

Vernal pools—also called *spring ponds* or *ephemeral wetlands*—are essential

in the lives of many invertebrates and amphibians. Described as “a contained basin depression lacking a permanent above-ground outlet,” a vernal pool in the Northeast will “fill with water with the rising water table of fall and winter, or with the melt water and runoff of winter and spring snow and rain” (Vernal Pool Association 2002), and may be covered with ice or snow in midwinter. Water usually remains only for a few months; the pools are often drying by early summer and completely dry by late summer. Some experts have observed that “vernal” implies the presence of water only in the spring, and that pools containing water in fall/winter should properly be called “autumnal pools” (Rhode Island Vernal Pools 2002), and definitions of vernal pools vary among the New England states. However, the term “vernal pool” is widely accepted.

Because of their periodic drying, vernal pools do not support breeding fish populations. Many organisms evolved to utilize these temporary ponds for breeding as a means to avoid early predation by fish, although their reproductive strategies had to adapt toward more rapid development in the race against time before desiccation (Table 1). “Obligate” vernal pool species are reliant upon vernal pools for some phase of their reproductive cycle, with some species even seeking out their “birth pool” in which to reproduce. “Facultative” vernal pool species preferentially use vernal pools but can reproduce elsewhere. It becomes imperative to adequately document the existence of

each type of organism within a vernal pool in order for the pool to qualify for legal protection.

Vernal pools are also important to the forest community because the “nutrients from fallen leaves support a food web rich in invertebrates and amphibians... and which includes reptiles, birds, and mammals, but not fish. By the time the pool dries, the nutrients from the leaves have cycled through the animal life and returned to the forest” (Vernal Pools 1997). Vernal pools may be located in wooded areas, open fields, or even suburban neighborhoods. As suburban development relentlessly encroaches on open-space areas, it becomes incumbent on policymakers to develop more effective programs for protecting vernal pools.

How Can We Protect Vernal Pools?

Protection of vernal pools is widely recognized as being crucial to their future survival and possibly to preventing the extinction of several endangered species. The protection programs have a three-pronged approach: (1) identification, certification, mapping, and recording of the location of the vernal pools; (2) assistance to migrating amphibians on “First Night” in the early spring; and (3) research on the biological and ecological dynamics of the pools and their species. Given the perennial shortage of public funds for



environmental protection, a collaboration of educators, policymakers, scientists, conservation organizations, and individual caretakers is needed to make these programs a reality.

The Natural History and Endangered Species Program (NHESP) of the Massachusetts Division of Fisheries and Wildlife provides a well-developed program for identification, certification, and legal protection of vernal pools (<http://www.state.ma.us/dfwele/dfw/nhesp/nhvernal.htm>). Rhode Island's Endangered Species Program and the Natural Heritage Program (both in the RI Department of Environmental Management) maintain data on endangered vernal pool species such as the Blue-spotted Salamander and spadefoot toads, and efforts are underway to add vernal pool data to the RI Geographic Information System maps of state wetlands (details at <http://www.state.ri.us/dem/programs/benviron/water/wetlands/vernal.htm>). Vernal pools are protected in Rhode Island as "special wetlands" under the Freshwater Wetlands Act. The National Park Service (NPS), in conjunction with other organizations, works with teachers and students in northern Rhode Island and southern Massachusetts to document vernal pools and their native species (details at <http://www.nps.gov/blac/index.htm>). Certified vernal pools are eligible for special protection during forest removal or land development, so it is extremely important to document as many of these vulnerable ecosystems as rapidly as possible.

Conservation and educational organizations assist in protection: for example, the Audubon Society of Rhode Island (ASRI), the Massachusetts Audubon Society, The Nature Conservancy, the Norman Bird Sanctuary in Newport, the University of Rhode Island (URI), and the Vernal Pool Association (VPA). The Norman Bird Sanctuary's "cover board project" in the spring of 2002 attempted to capture information about the migration patterns of a number of amphibians including the Redback Salamander (Orwiler 2002). The VPA is a collaboration of teachers and students at Reading High School in Massachusetts, conservation organizations, and a number of governmental agencies. The VPA website (http://www.vernalpool.org/vernal_1.htm) describes the characteristics of a vernal pool, lists and characterizes the key species likely to be found in southern New England, and provides information about certification of vernal pools, educational

Table 1. Species utilizing vernal pools for breeding habitat and survival.

Common Name	Obligate or Facultative	Scientific Name	Conservation Status
Spotted Salamander	Obligate	<i>Ambystoma maculatum</i>	R NHESP
Wooded Salamander	Obligate	<i>A. opacum</i>	R NHESP
Mottled Salamander	Obligate	<i>A. latipes</i>	NHESP
Blue-spotted Salamander	Obligate	<i>A. lateralis</i>	NHESP
Unicolorated Hellgram Salamander	Obligate	Family Ambystomatidae	NHESP
Four-toed Salamander	Facultative	<i>Desmognathus quadripedatus</i>	NHESP
Wood Frog	Obligate	<i>Lithobates sylvaticus</i>	R NHESP
Gray Treefrog	Facultative	<i>Hyla versicolor</i>	R NHESP
Northern Spring Peeper	Facultative	<i>Amphispiza caerulea</i>	R NHESP
Green Frog	Facultative	<i>Lithobates clamator</i>	NHESP
Leopard Frog	Facultative	<i>L. sylvaticus</i>	NHESP
Pickerel Frog	Facultative	<i>L. palustris</i>	NHESP
American Toad	Facultative	<i>Bufa americana</i>	R NHESP
Brown Spadefoot	Obligate	<i>Scaphiopus holbrookii</i>	NHESP
Red-spotted Newt	Facultative	<i>Necturus maculatus</i>	NHESP
Pink-spotted Newt	Obligate	<i>Necturus p.</i>	NHESP
Fredonian Barking Toad	Facultative	Family Bufonidae	NHESP
Gray-bellied Toad	Facultative	<i>Bombina orientalis</i>	NHESP
Common Frog	Facultative	<i>Bombina p.</i>	NHESP
Water Scorpion	Facultative	Family Zygoptera	NHESP
Dragonfly nymph	Facultative	<i>Zygoptera</i>	NHESP
Whirligig B-tadpole	Facultative	<i>Whirligig</i>	NHESP
Ring-necked Pudding	Facultative	Family Liliaceae	NHESP
Water Scorpion	Facultative	Family Hemiptera	NHESP
American Toad	Facultative	Family Bufonidae	NHESP
Spadefoot Toad	Facultative	<i>Scaphiopus</i>	NHESP
Wood Frog	Facultative	<i>Lithobates</i>	NHESP
Blind Frog	Facultative	<i>Desmognathus</i>	NHESP
Pickerel Frog	Facultative	<i>Lithobates</i>	NHESP

*Rare species

workshops, and scientific investigations. A "Field Guide to the Animals of Vernal Pools," also available at the website, covers the identification and natural history of most of the vertebrates and invertebrates found in New England's vernal pools.

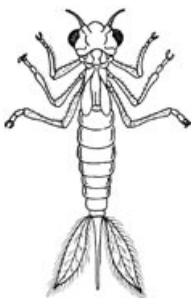
One effort encouraged and coordinated by vernal pool protection programs is to ensure the successful migration of amphibians in the spring, aiming at the season's first rainy night with an air temperature of at least 40 °F, usually in early March. On such a "First Night," teams of organized volunteers arrive with buckets, flashlights, and police escorts at crucial "crossing" areas where amphibians will be hopping and crawling across well-traveled highways to reach their favorite vernal pools. This simple practice saves thousands of amphibians from being killed on the road before they are able to reproduce.

Ongoing research on vernal pools in New England includes studies in the Department of Natural Resources at URI. One study conducted by William Crouch, under the direction of Peter Paton, focused on "producing a better understanding of the seasonal movements of amphibians which are using certain vernal pools in southern Rhode Island" (Rhode Island Vernal Pools 2002). The other, carried out by Dennis Skidds and directed by Frank Golet, is designed to "test

the accuracy of the Calling Amphibian Survey of the North American Amphibian Monitoring Program” and to determine what features of the pools—size, depth, vegetation, geology—can be used to “predict when and for how long a given pool will be flooded” (McLeish 2001). When the hydroperiod is known, it is possible to predict whether a pool is going to be a good breeding habitat for certain species. This information can then be used to determine the pool’s priority for protection. At the University of Massachusetts, wildlife biologist Scott Jackson has noted that once breeding begins in early March, “some vernal pools will host a few dozen to several hundred salamanders and hundreds of thousands of frogs” and “males tend to migrate first, with females following” (University of Massachusetts Press Release 2000).

Bryant College Vernal Pool Project

As part of our Environmental Science Minor program in the Department of Science and Technology at Bryant College, we have identified a vernal pool nestled in a wooded area in the middle of campus. Documentation has been prepared for certification of this vernal pool, which the students named the “Ranger Dan Vernal Pool” to recognize the tireless efforts of Dan Meharg, a ranger with the NPS Office in Woonsocket, RI.



On April 26, 2001, Dan Meharg, Bryant College Ecology students, and I sampled our vernal pool. We photographed the pool and the egg masses found, which included those of the Spotted Salamander and the Wood Frog. In addition, Wood Frog tadpoles were also identified. At that time, a water depth of approximately 1.3 meters was observed. Recent observations in October 2002 showed that there were still about 0.3 meters of water in the center of the pool. The vernal pool was located in a clearing in 1972, but over the past 30 years, secondary succession has surrounded it with woodland.

We are planning further studies of this vernal pool for the spring of 2003, working with the NPS and ASRI, to chronicle the peak of migration in March, identify egg masses of rare and endangered species, and quantify the extent and duration of the hydroperiod. In addition, we will maintain a website to post photographs and data from the pool as part of our Bryant College Wetlands Project (“Vernal Pool Study” at <http://web.bryant.edu/~wetlands>).

What Can You Do?

Why not involve your students or neighbors in the identification of vernal pools in your community? At the very least, why not volunteer to assist migrating species on their way to a vernal pool? These unique ecosystems are not only under duress and in need of protection, but also present an unparalleled opportunity to collect data that can be directly utilized for designing better protection programs.

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Conflicts of Interest in the Paper Wasp *Polistes dominulus*: A European Invasion

BY ELISABETH ARÉVALO

Social insects of the Order Hymenoptera provide remarkable examples of reproductive altruism. Wasp colonies are composed predominately of females; queens are the sole egg-layers and workers complete all other tasks. In paper wasps of the genus *Polistes*, female roles are not predetermined at birth, so all females have the potential to become queens. These organisms are characterized by a haploidiplod system; in other words, females are diploid (2n) while males are haploid (n), which means that females develop from fertilized eggs and males from unfertilized eggs. Although virgin workers can lay male eggs, queens often monopolize reproduction.

At the establishment of a colony, subordinate females fight amongst themselves and the most aggressive wins, becoming queen. If colony members are united by bonds of relatedness, queen death is also likely to be an event of great importance: which member should then take over reproductive control of the colony? The changes following queen death have the potential to expose most of the kinds of latent conflicts in social insects, e.g., who should be queen, who should lay male eggs, how the sex ratios are controlled, or whether females should work or found new colonies.

Chemical signals, mainly cuticular hydrocarbons, have been described as nestmate-recognition pheromones that have an important role in discriminating between colony and non-colony members (Sledge et al. 2001). Social insect colonies are usually composed of close relatives, and castes of non-reproductive females can be explained by kin selection. Recently, however, Queller et al. (2000) described a unique case: the paper wasp *Polistes dominulus*, a common and widespread palearctic species distributed from Spain to China. Queller and colleagues showed that 35% of Old World *P. dominulus* subordinates were unrelated, meaning that they gain no benefit when the queen lays eggs. As in social vertebrate groups, the only benefit attained by these non-reproductive females is when the queen dies and they vie

to replace her.

Polistes dominulus was observed for the first time in the United States in Cambridge, MA in 1980, and its first US capture was around 1981 (Hathaway 1981). Since then, its distribution throughout the country has significantly increased, with recent sightings as far as southern California (Russo 1996). During the summer of 2002, 33 *P. dominulus* nests were monitored and behavioral interactions of the wasps were recorded at the W. Alton Jones Campus of the University of Rhode Island, in West Greenwich, RI.

At the beginning of the study (late May), half of the nests were designated controls and the other half experimental. After a month of observation, the egg-layers (identified behaviorally) were removed from the experimental nests. All nests were then allowed to develop until the adult males first emerged (end of August), when the nests (including eggs, pupae, and larvae) and adult wasps were collected.

From a subset of those nests (13 control and 12 experimental), adult females were genetically screened in the laboratory with powerful molecular markers, microsatellites (short DNA sequences, 2–6 bp, tandemly repeated, widely distributed across the genome), to estimate relatedness among colony members.

The results showed a higher percentage of single-foundress New World *P. dominulus* colonies (79%) than Queller et al. (2000) had reported for Old World populations (13%). In



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addition, New World *P. dominulus* populations showed a loss of genetic variability when compared with Old World populations. The recent colonization event of these populations can explain this reduction of genetic variability.

Polistes dominulus represents an ideal example of an invasive species. A high degree of plasticity might represent an alternative strategy to such a species when dealing with new environments. These wasps seem to have adapted well to new environmental conditions, allowing a quick expansion of their distribution. Clear adaptations to new genetic status might allow females to move from one nest to the other. A study by Nonacs and Reeve (2002) showed that a subset of foundresses adopt a “sit-and-wait” strategy, waiting until matured orphaned nests are available and then taking control, which potentially allows them to become the egg-layers; otherwise, they would become subordinates. Genetic “bottlenecks” can explain how non-reproductive workers continue with an altruistic behavior even when relatedness within colonies is lower due to loss of nest-mate recognition cues (Hanfling and Kollmann 2002). Different environmental conditions, lack of natural predators, and unique genetic characteristics have allowed this species of paper wasp to accomplish a very successful invasion of a new environment.

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The Decline of the Area 2 Lobster Fishery: Failure Amongst Fishery Management Successes

B Y M A R K G I B S O N

The American Lobster (*Homarus americanus*) fishery prosecuted by Rhode Island citizens is conducted both in inshore waters (Narragansett Bay and adjacent sounds) and offshore in the submarine canyons of the US continental shelf. The Rhode Island inshore fishery occurs in Management Area 2, which stretches roughly from Cape Cod, MA to Long Island, NY. The Area 2 fishery for lobster has declined sharply in recent years. Fishery landings and resource abundance in the RI Division of Fish and Wildlife (RIDFW) survey have both dropped to low levels (Figure 1).

Figure 1. Lobster abundance in the RIDFW trawl survey in Narragansett Bay waters and inshore landings, 1979-2002



A fishery once valued at \$17–18 million dollars in the early 1990s is now worth about \$4 million. A number of factors have been suggested for the recent decline, including oil spills, disease, increased predation, pollution, and over-fishing. A long-term fishery independent survey conducted by the University of Rhode Island Graduate School of Oceanography (URIGSO) shows that lobster abundance has declined previously, suggesting to some that the decline is just part of a natural “cycle” (Figure 2).

The recent drop in abundance can be traced to a decline in newly settled lobster in the mid-1990s (Figure 3). In the first summer following hatching, larval lobsters spend several weeks in the water column before settling as miniature adults. Once recruited to the bottom, settlers can be sampled by SCUBA divers using suction samplers. Settler abundance trended downward from 1990 to a low point in 1996. It is generally accepted by biologists that lobsters take 6–8 years to reach legal size, so the 1995–1996 settler low is consis-

Figure 2. Lobster abundance index from the URIGSO trawl survey at Fox Island and Whale Rock

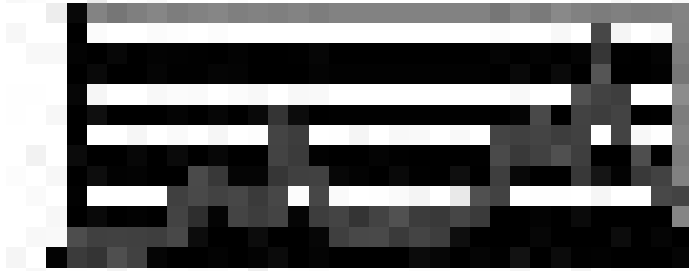


Figure 3. Rhode Island newly settled lobster index of abundance



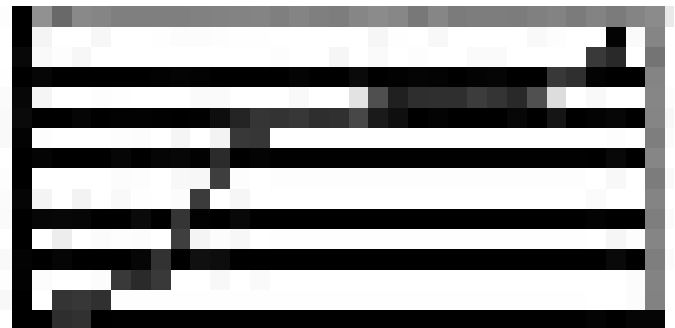
tent with the low abundance of adults in 2002. It should be noted that although there was some improvement in 1997–1998, 2 of the last 3 years in the series (including 2002) indicate low settler abundance. Adult lobster abundance could remain below average for some time.

The source of Rhode Island lobster larvae is unknown, but larvae are likely to come from both local and offshore females, with the latter delivering larvae to suitable inshore substrate via winds and ocean currents. Because of intense fishery removals, inshore females are predominantly sub-legal, first-time spawners whereas offshore stock has a higher proportion of older, larger females. It may be that changing oceanographic conditions have reduced the larval subsidy from offshore females, leaving only the limited inshore spawning stock to effect reproduction. American Lobsters were declared overfished coast-wide by scientific review panels in 1996 and 2000. Currently, fishery exploitation rates are 2–3 times higher than that allowed for maximum sustainable yield (MSY). The Atlantic States Marine Fisheries Commission (ASMFC) has jurisdiction over US lobster management and is developing remedial measures to end overfishing and rebuild stocks.

In addition to overfishing and reduced larval supply, health problems have surfaced in the inshore population. RIDFW scientists, sampling catch on commercial lobster vessels,

have noticed a sharp increase in the incidence of shell disease (Figure 4). The proportion of infected individuals varies by season and sex but exceeded 25% overall in 2002. Lobster shell disease is an infection of the exterior integument of the animal by chitin-metabolizing bacteria. Infestations, particularly of ovigerous females with old shells, can be severe. It is unclear at this point how shell disease influences lobster mortality rates and population dynamics. Heavily infected ovigerous females have been observed dead in commercial traps by RIDFW scientists, and ovigerous females have undergone premature molts with subsequent loss of the egg clutch. On the other hand, some infected animals have been observed to molt normally and emerge with clean new shells. Additional research is needed to quantify the impact, but it is clear that shell disease is reducing stock productivity and limiting fishery yields.

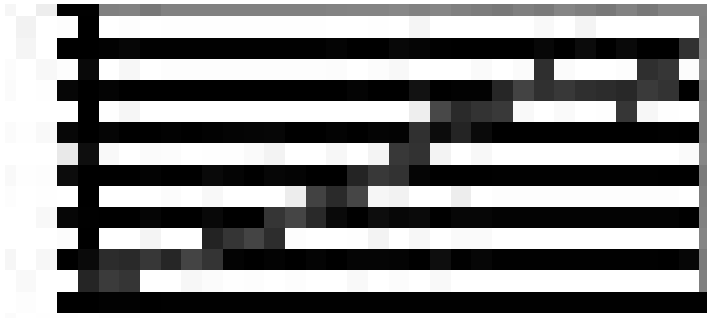
Figure 4. Incidence of shell disease in RI inshore lobster from RIDFW sea sampling



In addition to factors associated specifically with lobster, multi-species interactions may be occurring, as Federal and state requirements to end overfishing have produced remarkable recoveries in many coastal fish stocks. Populations of Striped Bass, Scup, Summer Flounder, and Black Sea Bass are rebuilding. Striped Bass are known to prey on lobster, and RIDFW scientists have observed lobster in stomach samples of fish taken for PCB analysis. The Striped Bass stock along the Atlantic coast has increased by a factor of 5 since 1982 (Figure 5), leading some fishers to believe that the bass are a major factor in the lobster stock decline.

As with shell disease, we cannot yet quantify the increase in fish predation on lobster population dynamics. Finfish can prey on all life stages of lobster except possibly the very largest adults. Elevated natural mortality rates from predation can reduce lobster stock productivity.

Figure 5. Atlantic coast Striped Bass population size from ASMFC virtual population analysis

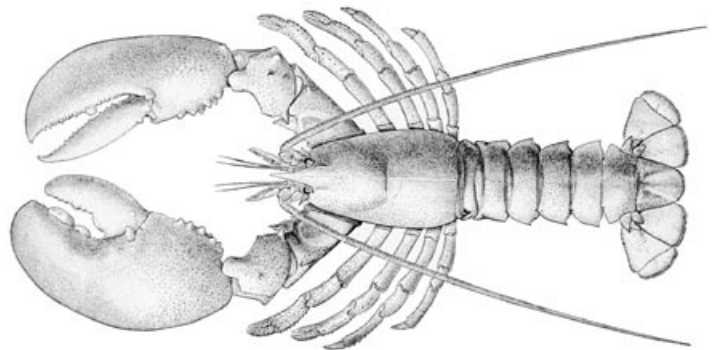


It should be clear from the title of this article that the author considers the Area 2 lobster decline to be a fishery management failure, not a set of unfortunate and inevitable circumstances. How can that be reconciled with the evidence presented above for causative agents other than overfishing? The answer is simple and can be found in the original 1996 peer review of lobster stock status. There, prominent National Marine Fisheries Service (NMFS) scientists showed with simple models that a lobster stock that temporarily sustained very large landings under favorable recruitment conditions would collapse abruptly when those conditions deteriorated and fishing effort remained high (ASMFC 1996). The factors leading to reduced recruitment are irrelevant—continued heavy fishing annihilates the remaining stock. It is now widely accepted by scientists that precautionary management is required in the face of stock fluctuations and that it is counterproductive to debate the causative agents of a stock decline (FAO 1996; Rosenberg 2003). A management paradigm that reinforces overfishing involves quick liberalization in response to optimistic data but delayed response to pessimistic stock data (Rosenberg 2003).

The operational amendment to the ASMFC lobster management plan was adopted in 1997 (ASMFC 1997). The 1996 peer-reviewed stock assessment and knowledge of overfishing, increasing abundance, and impressive fishery landings were in hand. Credible scientists questioned the sustainability of the fishery. Despite the warnings of 1996, the approved plan did little to directly limit catch or reduce fishing mortality rate. Management plans, developed by area with strong industry input, focused on trap limits and minimum size increases. Not surprisingly, the trap limit of 800 was later found to be about twice that deployed by the average fishermen from Rhode Island. Moreover, the required increase in minimum size from 82.6 mm to 85.7 mm was trivial compared to a potential maximum size of 150 mm, known from the seminal work of Herrick (1909) to

have existed in 1894. Importantly, the overfishing definition became a plan objective rather than something to be avoided at all costs. NMFS scientists repeated their warnings in the ASMFC (2000) stock assessment report, as did the peer reviewers. By then, the collapse of the Long Island Sound (LIS) lobster fishery was underway. This was attributed to an observable disease problem even though the amount of gear deployed by Connecticut and New York fishers had increased from 160,000 to 550,000 traps in the 10 years prior to the collapse. Ironically, this stock had been judged to be the most resilient of all the areas based on a small size at first reproduction. No management action beyond implementation of the original plan occurred. It was not until the fall of 2002, when Area 2 data indicated a collapsing fishery, did the ASMFC act. A new plan amendment was authorized for development in February of 2003. The amendment will cover only Area 2, not those areas already collapsed (LIS), showing signs of deterioration (offshore), or yielding unsustainable catches (Gulf of Maine).

It is too late to apply precautionary management to the great abundance of lobster that nature provided to Area 2 in the early 1990s. Stock rebuilding will be difficult, take time, and involve emergency measures. There is little doubt, however, that more lobsters would be present now had overfishing been aggressively eliminated then. A decisive management action to reduce fishing mortality during good recruitment would have extended the size composition of the stock and increased egg production prior to the downturn; even if survival conditions were reduced, more eggs would have meant more recruits. In essence, the stock would have been afforded more buffering capacity. Just as a stock portfolio requires diversity to weather market fluctuations, a fish stock may need diversity in size-age composition for long-term persistence (Secor 2000). This diversity is attained by fishing in a precautionary manner to keep fishing mortality rate low regardless of the ultimate cause of stock fluctuations. Lobster resources offshore and in the Gulf of Maine are still in reasonably good condition. These areas should be included



in the new ASMFC amendment and required to substantially reduce fishing mortality rates. Time will tell whether Rosenberg's (2003) alternative will be seriously embraced in the management of American Lobster stocks: "The language of precaution is widely used in international agreements, but implementation lags behind. Changing this requires altering our concept of the oceans, from a resource to be used to a system to be managed wisely."

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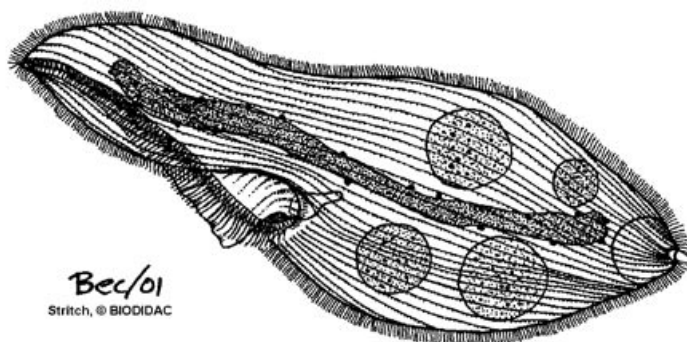
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Cilioprotist Diversity at BioBlitz 2002, Marion Eppley Wildlife Sanctuary, West Kingston, RI

BY LINDA A. HUFNAGEL,
AMY SALAMONE, AND LYNN PATTERSON

An effort is underway at the University of Rhode Island (URI) to develop rapid data collection methods for a study of microbial diversity in Rhode Island's waters and soils. The organisms to be characterized are a group of eukaryotic microbes known as the cilioprotists. These are mainly free-living, phagocytic protists that use bacteria and smaller protists, such as flagellates, as a food source, and thus are



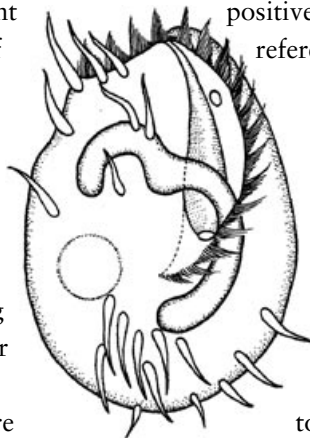
important in the microbial food web that channels nutrients and energy toward the growth of small invertebrates and, ultimately, larger aquatic and soil organisms. Furthermore, cilioprotists contribute directly, or indirectly through endosymbionts, to degradation of dead organic matter, help to reduce the load of potentially harmful bacteria and viruses in aquatic environments, and are also used as bio-indicators of water and soil condition. Issues that relate to the diversity and community structure of cilioprotists and their role in ecology of diverse habitats have recently been reviewed by Foissner et al. (1999).

Cilioprotists are therefore central to the health of Rhode Island's aquatic and soil environments, which are increasingly threatened by encroaching urbanization. Over 10,000 species of cilioprotist have been identified worldwide, many of which should occur in Rhode Island waters and soils. Studies indicate that at least that many have not yet been discovered, even in well-studied habitats. Foissner (personal communication), for example, has described over 100 new species in soils of central Europe. It is therefore likely that many new species await discovery in southern New England, especially in little-studied, specialized habitats (such as acidic bogs).

Many basic questions include the extent of cilioprotist diversity, the forces that have shaped it, the specific kinds of ciliates to be found, and the rate of cilioprotist evolution. Many of Rhode Island's habitats are relatively young, established only since the last ice age. How did this region come to be repopulated with cilioprotists? Have new species evolved here since then? Measurements of microbial diversity may also be useful in characterizing the impacts of urbanization on the Rhode Island environment. A suggested relationship between the diversity of ciliate species inhabiting a specific habitat and its general health, with greater diversity indicating better habitat health (fewer toxins, etc.), calls for further exploration.

The purpose of our current research is to test new approaches to identification of ciliate species and measurement of cilioprotist diversity by using imaging technology, such as videomicroscopy and high-resolution fluorescence microscopy, in combination with genetic “fingerprinting” techniques. Our goal is to establish methods that yield rapid results and can be used with the assistance of relatively inexperienced volunteers.

Normally, cilioprotists are identified based on details of cell morphology, including size, shape, nuclear morphology, color, and specific arrangements of cilia and other organelles at their surface. The microbes are usually fixed, stained, and photographed or sketched to record these features, a time-consuming approach that reveals only static information. Swimming, feeding, contractile, and mating behavior of the cells is lost, as well as behavior of specific organelles, such as the beating of cilia and movement of intracellular components including mitochondria and pigment granules. With videomicroscopy, however, all of the cilioprotists encountered by microscope in a specific sample are videotaped. Videotaping is rapid and creates a permanent record of cellular morphology, behavior, and movement, from which species diversity can potentially be quantified. By contrast, the even newer approach of genetically fingerprinting ciliates reveals nothing about their phenotypic properties; to be used for species identification, it must be combined with the microscopy methods by which the species are initially characterized.



An earlier study of cilioprotist diversity was conducted during BioBlitz 2001 at the Norman Bird Sanctuary, Middletown, RI, where one of the present authors (L.A.H.), who is well acquainted with the cilioprotists and their distinguishing features, found and videotaped about 70 different species of ciliate in a total of 14 different water and soil samples (Hufnagel 2002). The present study employed the same collecting and analysis methods, but fewer samples were collected, and the videotaping and analysis was conducted by a newly trained undergraduate volunteer (A.S.).

During BioBlitz 2002 on June 22 at the Marion Epley Wildlife Sanctuary, West Kingston, RI, 6 water samples were collected from the edge of Laurel Lake, the Queens River, small streams with fairly stagnant water, and a couple of swampy locations near the lake and main trail, and transported to the laboratory in pint-sized Ziploc bags. (No soil samples

were taken.) About 100 ml from each sample, including a small amount of organic debris such as leaves, soil, or moss, were placed in small polyethylene containers with loosely fitting lids, and several grains of rice were added to each container. The samples were then monitored almost daily for about 7 weeks using a dissecting microscope, and sketches were drawn of each ciliate species encountered in culture. In addition, samples were taken from culture by Pasteur pipet, placed on a slide and cover-slipped for viewing with an Olympus phase-contrast microscope fitted with 10X and 20X brightfield objectives and 40X and 100X phase-contrast objectives. Whenever ciliates were found on the slides, they were videotaped on VHS medium at all magnifications, using darkfield, brightfield, and phase-contrast settings of the condenser lens.

From the 6 original samples, a total of about 30 different species of ciliate were encountered. These were identified positively or tentatively to genus level using standard references such as *Protozoology* by Richard R. Kudo and *The Ciliated Protozoa* by John O. Corliss. The greatest diversity (13 species) was found in the fairly clear water of Laurel Lake. A close second was a small muddy stream near the main trail (8 species). The smallest diversity was seen in a sample from stagnant dirty water near the lake. This lack of diversity may, however, be due in part to the presence in the culture of larger predatory invertebrates; this problem will need to be addressed in future studies, perhaps by introducing a filtration step into culture set-up.

The genus encountered most frequently was *Glaucoma*. Other genera encountered more than once were *Cyclidium*, *Paramecium*, *Pleuronema*, *Halteria*, and *Stentor*. Genera that were tentatively identified include *Espejoia*, *Platyne-matum*, *Holophrya*, *Philaster*, *Chilodonella*, *Holotricha*, *Uronema*, *Aspidisca*, and *Colpidium*.

Data for many of the ciliates found during BioBlitz 2002 has been entered into our Rhode Island Cilioprotist Micrograzer Survey database (©RICMS), which was recently established online with the help of collaborators from the URI Department of Computer Science. We are currently processing our analogue videotapes to prepare digital video clips and still images for inclusion in the database, using Final Cut Pro, Adobe Premiere 6.0, Adobe Photoshop LE, and Cleaner software, available from the Information and Instructional Technology Service at URI. The video clips (.mov format)

can be viewed with Quicktime software, available to most potential users of the database. The database can be accessed via our Rhode Island Coastal Micrograzers website, <http://athena.cs.uri.edu:8080/ricms> (interested users must apply online for a password).

Comparing the results from BioBlitz 2002 and BioBlitz 2001 (Hufnagel 2002), we observed the following: In 2001, 14 samples analyzed over a period of 5 weeks yielded 70 species of cilioprotist, for an average of 5 species per sample. In 2002, 6 samples analyzed over 7 weeks yielded about 30 species, also for an average of 5 species per sample. Thus, had more samples been taken in 2002, it is likely that more cilioprotist species would have been encountered. Foissner (personal communication) has found that at least 10 samples from the same location are needed to reach saturation in terms of detecting all the species to be encountered from a single location. Although his methods of species identification and diversity analysis differed somewhat from ours, and his sampling took place over a period of time whereas ours was performed on 1 day, our results seem consistent with Foissner's. In future studies, however, we plan to increase the number of samples taken at one time from a single location and to test other sampling strategies, such as use of traps and pre-placement of slides to capture sessile species.

With ciliated protists, accurate species identification and

description of new species depends on details of their ciliary arrangements. In many cases, videotaping can provide enough information to identify an organism to the genus level but not to species; in other cases, even similar genera are difficult to distinguish on videotape. For this reason, we plan to incorporate standard, though time-consuming, silver-staining procedures in future experiments to provide images that can be used for accurate identification of species and some genera. In addition, we are developing new, more rapid staining procedures that we hope will speed up data collection and analysis.

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Linda A. Hufnagel is a Professor in the Department of Cell and Molecular Biology, University of Rhode Island. Amy Salamone and Lynn Patterson participated in this study as undergraduate students; A.S. graduated in December 2002.



Researchers in the makeshift lab during BioBlitz 2002 at the Eppley Wildlife Sanctuary.

President's Message



Names. Sometimes they are hard to come by—at least the right ones. *Rhus* or *Toxicodendron*? Baltimore oriole or northern oriole? Rhode Island Natural History Survey or ... ? Yes, even the moniker of our own organization has recently received a backwards glance from the Board of Directors.

Perhaps glance is not the right word. Passionate introspection comes closer. Why the quandary, you ask? Two questions should answer that. “Excuse me, but what do you survey?” “By the way, what is natural history?” These questions, asked by everyone from reporters to granting agencies, are the reason for revisiting our most visible feature: our name.

In this age of polls and pollsters, a “survey” is most commonly taken to be a measure of public opinion, not “to view or consider comprehensively.” And how many of us would fire back “the study of natural objects” when pressed to define natural history. Yet “Survey” and/or “Natural History” appear in the names of the 13 other organizations in the United States with missions similar to ours. We fully realize that our name is not completely self-explanatory, but the Board, to a person, voted to retain our original name. The catch is, we also added a “tagline” that appears below RINHS: *Providing Ecosystem Science and Information*.

While embracing the comfort and continuity of our original name, we also reached out to grab a less cryptic descriptor that might better indicate exactly what it is that we do. Preserving the old and injecting the new has a symmetry that is inherently appealing.

Bedecked with the badge of a re-tooled name, we pushed forward to examine the name of our publication: *RINHewS*. Cryptic in its own right, and imminently unpronounceable, its demise was met with strong approval. Its replacement: the *Rhode Island Naturalist*. Geographically correct, naturally natural, descriptive, and pronounceable ... a keeper.

If all that tinkering were not enough, even our logo could not escape the eye of change. Transformed by Barbara Dawson from Fund Consultants into a bold four-panel graphic surrounded by our name and tagline, the logo is but one more step in our sincere commitment to raising awareness of the Survey and its mission.

And that is the real reason for this expenditure of energy and inspiration: elevating our “apparency” and better representing who we are and what we do. We may never have the name recognition of the Beatles, or even the beetles, but we are making an impact on the state of Rhode Island.

By the way, the rumor that all Board members were required to change their names is a stretch of the truth ... but please refrain from asking for Rex when you call my number.

Keith

Hugh Willoughby RINHS Distinguished Naturalist, 2003

TEXT BY ROBERT BUSHNELL

Mention Hugh Willoughby's name to anyone in Rhode Island with an interest in natural history, and they will likely respond, "I know Hugh. He's been a good friend of mine for years. He's the one who got me interested in..." That interest might be birds, dragonflies, mammals, wildflowers, geology, or any one of the many areas of Hugh's expertise. Hugh's passion for the natural world is contagious, and that, along with his wonderful sense of humor, is his trademark.

Hugh has always been a teacher. He considers himself fortunate to have had so many outstanding students over the years and measures his good fortune by the number of his students who have gone on to pursue successful careers in the natural sciences. He humbly says that his only claim to legitimacy as a Distinguished Naturalist is that he has introduced scores of people to an interest in the natural world, noting, "So many folks just never seem to notice this world until some fascinating facets have been pointed out to them." That introduction has often been enough to kindle a lifelong interest in nature.

Born in Worcester, Massachusetts, Hugh, along with his parents and three siblings, moved at the age of 5 to Riverside. It was about this time that Hugh's humor and interest in birds first surfaced, when pointing out the window, he proclaimed to his father, "See da waxwing!" His father, a fine amateur naturalist and a renowned genealogist, was a professor of psychology at Brown University. His mother was an outstanding teacher, and for many years was a highly regarded tutor of children with special needs.

While still in high school, Hugh, a National Merit Scholar, tutored fellow students in such diverse subjects as US history, elementary Spanish, German, algebra, and geometry. At Brown University, he established reading proficiency in French, German, and Spanish, and played first bassoon in the Brown-Pembroke Orchestra for 4 years. Hugh received his undergraduate honors degree as the Francis Wayland Scholar of the class of 1953. With typical Willoughby wit, he says that his degree in geology has proved to be a good foundation for his other outdoor studies.

After graduation he spent 2 years in the US Army during the Korean conflict, but was fortunate, he says, "to have no foreign duty other than in Texas!" While in the Army he was selected to be a Troop Information Leader, where he gained valuable experience in lesson preparation. Hugh says that this experience helped him to overcome his tendency to panic in public-speaking situations. His friends, however,

cannot imagine Hugh ever having this tendency!

After his discharge from the military, Hugh worked as a claims adjuster for the Liberty Mutual Insurance Companies for several years. He began his career in public education in a 1-year position as head of a middle-school science department. As testament to his scholarship and versatility, he then pursued a career as a high-school English teacher and guidance counselor at East Providence High School. After earning a master's degree in guidance and counseling, he moved to the Counseling Center at the University of Rhode Island. Later he returned to East Providence High School as a guidance counselor before retiring in 1986.

Hugh served on the Board of Directors of the Audubon Society of Rhode Island, where, as Chairman of the Field-trip Committee, he was instrumental in turning the annual Block Island Weekend into a major fundraiser. He also served as a Leader on Block Island for 37 years, and for most of those



years gave his famous Sunday morning “sermon.” Hugh offered presentations on a variety of subjects ranging from geology to field botany to insights into avian migration as observed on Block Island. Ever on the lookout during these talks, an American Bittern flying overhead once interrupted Hugh’s banter. After pointing out the bittern to the group, Hugh reminded his listeners “that you have to take the bittern with the sweet.”

Hugh devised a similar, though smaller, annual excursion to Nantucket Island, which he co-led for 14 years. Pursuing the same purposes, he has taught several courses for the Audubon Society of Rhode Island, including birding, field botany, and geology. Over the years Hugh has also become legendary for his editing skills. Woe betide anyone who tangles with “CommaRule3” (Hugh’s email handle)! Hugh was editor and publisher of prize-winning books in genealogy during the 1970s, and he is currently the Senior Technical Reviewer for the American Birding Association, for which he has done editorial work since 1971.

Hugh is a self-taught naturalist. In this respect he has been both a good student and an excellent teacher. He is a voracious reader with an amazing memory for detail. Add this to his love of field identification and observation, and the result is someone well prepared to teach others. Two traits that enhance Hugh’s ability to teach and to instill curiosity in his diverse groups of students are his ability to relate to people and his exceptional humor. He is comfortable talking about flowers with a small child, or helping an older person learn to use binoculars correctly. More importantly, people are comfortable talking to Hugh. He is always interested in hearing what someone has to say, or to answer any question. He has always made a point of learning the names of every individual on a walk or trip that he leads, and he never forgets a name!

No discussion of Hugh would be complete without mentioning his legendary humor. Hugh is the master of the pun, the one-liner, the double entendre, and most other forms of humor. A simple rule to use when you are in a conversation with Hugh is, “Watch what you say! It may be used against you!” Several members of the Audubon Society’s Properties Committee look forward to property tours just to be entertained by Hugh’s jokes. In addition to being subjected to his quick wit, the committee expects to hear samples of Hugh’s repertoire of humorous commentary. Veteran Willoughby-watchers might recognize some of his standbys, such as “Sanctuary much!”, “I’ve told you a million times not to exaggerate!”, “A dump of gulls”, “The bird was in that tree 5 minutes before I got here!”, or “That bird showed up a minute after I left!” The committee van might go over

a bump in South County and provoke Hugh to comment, “They’ll never get rid of these bumps until they learn to build a highway across a kettle hole!”

It is his wealth of knowledge and this wonderful humor that have enabled Hugh Willoughby to teach so much to so many. By sharing his passion for the natural world, he has done more than most to ensure that future generations will carry out his charge to care for the wild things. Those of us who have been fortunate enough to be his students are indebted.

RINHS Conferences Rock On

Assessing Change in Rhode Island’s Ecosystems was the theme of the Rhode Island Natural History Survey’s 8th conference, held at historic Rhodes-on-the-Pawtuxet in Cranston on March 7, 2003. One hundred and sixteen teachers and high-school students joined the other registrants to bring our numbers to 291 participants, making the conference one of the biggest we’ve held.

Hugh Willoughby received the 2003 Distinguished Naturalist Award “for his dedication and enthusiasm in sharing his appreciation and understanding of the natural world,” and Harry Hathaway, “the Dean of Rhode Island Ornithologists,” received the posthumous Distinguished Naturalist Award (see articles, pp. 12-15). Keynote speakers were William Michener, from the Long Term Ecological Research Network Office of the University of New Mexico, who spoke on *The Science Environ-*

ment for Ecological Knowledge: Understanding Change through Information Technology, and Robert Costanza of the Gund Institute of Ecological Economics at the University of Vermont, who spoke on *Ecological Economics: Reintegrating the Study of Humans and the Rest of Nature*. The keynote speeches were followed by 10 shorter presentations on *The Changing Physical Environment* and *The Changing Species Composition*. Over 40 posters and organizational displays rounded out the rest of the conference. Check the RINHS website—www.rinhs.org—for abstracts of all the oral and poster presentations.

The RINHS thanks the Virginia B. Butler Fund of the Rhode Island Foundation and the University of Rhode Island Coastal Institute for their generous sponsorship of the 2003 conference.

Harry S. Hathaway Distinguished Naturalist, 2003 Posthumous Award

TEXT BY RICK ENSER

When one considers the most important and influential naturalists in Rhode Island history, high on that list—if not, indeed, at number one—would be Harry S. Hathaway. Respected by his contemporaries as the “Dean of Rhode Island ornithologists,” it is without question that Hathaway contributed more to the understanding of the state’s avifauna than any other individual, and came to play a central role in Rhode Island ornithology for more than 50 years.

Harry was born in Providence on May 22, 1869. When his father was appointed Superintendent of Public Parks in 1875, the family moved into the Betsy Williams Cottage at Roger Williams Park, where they lived for 7 years. During the country’s hundredth anniversary in 1876, Harry placed the first spadeful of earth on the “Centennial Elm” planted near the cottage. By his own admission, Harry became interested in birds at the age of 13 when a classmate brought a bluebird’s egg to school, which he bought for 3 cents. The same year, his mother gave him a copy of Stearns and Coues’s *New England Bird Life*, which became a stimulus for his studies and the first item in his library. Throughout his life, the collection of books he amassed was renowned as the best assemblage of ornithological literature in the state, and on his death it became the basis of the library at the Audubon Society of Rhode Island (ASRI).

Realizing the importance of natural history collections, Harry continued collecting bird’s eggs while still in high school, vowing to acquire specimens of all of the state’s nesting birds. Also in

tune with the era, he acquired a shotgun and began collecting and preparing skins of birds; this material now exists as the principal part of the ASRI collections. More importantly, Harry bridged the old period of collecting birds and the more modern period of optical field birding, being the first to emphasize the importance of finding nests and documenting rare nesters, as well as monitoring all species and compiling that data in detailed notes. As Harry stated in his autobiography:

In the early days of my collecting on foot I could visit nearby localities only. Later I acquired a bicycle which took me further afield with Mr. Fred E. Newbury as my companion in our quest of bird’s eggs. Later still I purchased a motor cycle which was replaced by an automobile, a Buick, bought in 1911. Thus the whole state became my field and I have been able to explore quite thoroughly the localities likely to expose new birds.

Throughout his many years of Rhode Island field study, Harry compiled a daily journal of his ventures, which now stands as one of the state’s most valuable natural history accounts. Within these volumes we learn of his discoveries, including his additions to the State checklist: Atlantic Murre, Rough-winged Swallow, Acadian (Boreal) Chickadee, Bicknell’s Thrush, Greater (Hoary) Redpoll, Newfoundland (White-winged) Crossbill, Labrador (Ipswich) Savannah Sparrow, and Hudson Bay Sharp-tailed Sparrow. More importantly, he contributed several new breeding records for the state, including Rough-winged Swallow, Black-throated Blue Warbler, Northern Waterthrush, Hooded Warbler, Canada Warbler, and Henslow’s Sparrow.

In 1887, Harry entered Brown University where his interest in the natural sciences led him to a zoology course taught by Alpheus Spring Packard and to a botany class with William Whit-

man Bailey. On graduation, however, he realized the limited opportunities for employment in “zoological pursuits,” so he accepted a position with the Merchants National Bank of Providence, initially as a messenger. He remained with the bank for 35 years, retiring in 1924. Coinciding with his retirement, the Audubon Society acquired the estate of Walter H. Kimball in Charlestown, and knowing Kimball’s wishes for the property to be preserved as a bird sanctuary, Harry agreed to oversee its development for that purpose. During the summers of 1924 and 1925, he instructed visitors, cut trails, erected birdhouses, and planted hundreds of trees and shrubs as the first manager of the Kimball Wildlife Refuge.

Harry had spent his first vacation at Quonochontaug in 1895, where he honed his expertise in shorebirds, passing almost every day “tramping on the marshes.” Later, he acquired a cottage on the beach where he spent the summer months and began to compile his observations along with those of other bird students in the state, amassing a comprehensive record of more than 50 years of Rhode Island ornithological history. The Great Hurricane of 1938 swept across Quonochontaug and ripped through his home, carrying away furniture including the antique maple desk where he kept the card catalog and journals of a lifetime of bird records. Miraculously, the desk was discovered 3 days later on the edge of the marsh a mile and a half north of the house. Although the records were soaked, they were legible and nothing was missing, although a bookcase containing several volumes on birds was lost. This incident compelled Harry to have his records transcribed by Harold N. Gibbs to insure their safety, and four copies were prepared for the State Library and ASRI.

In addition to his journals and records, Harry published several articles during his lifetime, including “The American Osprey” (*Bulletin of the Roger Wil-*

liams Park Museum, 1905) and “Notes on the Occurrence and Nesting of Certain Birds in Rhode Island” (*The Auk*, 1913). In his autobiographical sketch, Harry modestly conceded that “the pursuit of a hobby is a desirable addition to one’s daily life, and from my experiences I can say with conviction that the study of birdlife still offers almost unlimited opportunities.” He foresaw a volume on Rhode Island birds, saying, “It is my fond hope that my notes may form a part of the nucleus for such a volume so that I may feel that I have contributed to the knowledge of future students of Rhode Island Bird Life.”

Although few of us knew Harry Hathaway, we can gain some insight into his personality from a short memorial article written by Harold Madison, in which he stated: “To all he gave courteous and meticulous attention; nay, even more, he gave unreservedly of his experience and knowledge. From the time-consuming tasks we imposed upon him he did not flinch; for his was a labor of love the results of which he lived to see recorded for all time.”

It is with great honor and respect that the RINHS salutes Harry S. Hathaway for his invaluable contributions to an understanding of ornithology.



Rhode Island Collections: The E. Philip Sheridan Zoo Library and Resource Center at Roger Williams Park Zoo

For many years, the library at Roger Williams Park Zoo functioned thanks to volunteer Alice Forstrum, a board member of the RI Zoological Society, but the small collection of 300 books was difficult to safeguard and maintain, and a classification system was sorely needed. In 1989, Adrienne Miller took over as Registrar for the zoo and manager of the library, and instituted the novel Forstrum-Miller color-coded catalogue still used today.

In 1990, a plan to increase the collection was set in motion by a small grant, and the zoo newsletter ran a request for donations to the library. Philip Sheridan (1917–2000), a zoo member and retired board member of the RI Zoological Society, responded by donating more than 50 natural history references from his private collection, beginning a 10-year partnership that helped to make the library a valuable resource for zoologists. A professor of English with a fondness for exotic animals such as tropical birds, fish, and tortoises, Mr. Sheridan was a respected amateur botanist and zoologist. His background in literature, education, and natural history fostered his interest in the zoo library as a place for people to learn about animals and their environments.

Today, the E. Philip Sheridan Zoo Library and Resource Center houses 4,000 books, 31 journals/periodicals, over 100 videos, American Zoo and Aquarium Association newsletters and publications, teaching materials, and an extensive photograph and slide collection. One book by Melissa S. Tulin, *Aardvarks to Zebras: A Menagerie of Facts, Fiction, and Fantasy about the Wonderful World of Animals*, almost says it all—but not quite. Beside volumes on invertebrates, fish, reptiles,

amphibians, birds, and mammals, the library has extensive sections on animal conservation, behavior, and care, environmental conservation, evolution, prehistoric life, habitats, man and nature, zoos, and nature studies and photography.

The reference section houses historic volumes dating back to the late 1800s—it is interesting to compare today’s changes in taxonomy and evolving perceptions of wildlife and zoos to the standards of the 19th century. The oldest dated text, *Curiosities of Natural History* by Franklin T. Buckland, was published in 1875. (Interestingly, two copies of Charles Darwin’s books, *The Origin of Species* and *On the Structure and Distribution of Coral Reefs*, are undated.) As the library looks to the future, computers will play an ever-increasing role. Computerization of the collection was initiated in 1998 by a University of Rhode Island Library Science intern who earned credit toward her master’s degree for the project. In 1999, Patricia Fredericks was hired to manage the collection, and the zoo is presently working to provide zoo-wide computer access to the catalog.

Located in the Sophie Danforth Center on the zoo grounds, the E. Philip Sheridan Zoo Library and Resource Center is open Monday through Saturday, 9 AM–4 PM. Librarian Patricia Fredericks is available Monday and Tuesday 9 AM–4 PM and Wednesday 9 AM–noon. The collection is accessible as a reference library for students and teachers from elementary school through college. Books can be checked out by zoo staff, active docents, and RIZS members.

Focus on RINHS Organizational Members: New Residency Fellowships at Eagle Hill

Although many members of the RINHS are familiar with and/or have attended some of the advanced natural history seminars or scientific illustration workshops at the Humboldt Institute at Eagle Hill in Maine, most are not familiar with two new residency fellowship programs that are just being phased in. Both focus on interdisciplinary aspects of the natural history sciences.

Cosmos Seminars at Eagle Hill: A Search for New Research "Harmonics"

The Cosmos Seminars serve as a forum for scholars who are interested in meeting with colleagues to explore, develop, and share new ideas, especially ideas stemming from the inter-relatedness of the natural history sciences with other aspects of human cultural endeavor, e.g., literature, art, architecture, history, philosophy, religion, applied technology, or social sciences. Central to each Seminar is undertaking a collaborative writing project that would significantly benefit from dynamic and intensive discussions among the scholars. The Cosmos Seminars are dedicated to Alexander von Humboldt's conviction that the natural sciences can and must be a leading aspect of general culture and must cooperate in this mission with the arts and humanities. In keeping with Humboldt's thinking, the Cosmos Seminars are intended to respond to today's increasingly cross-cultural, interdisciplinary, and transdisciplinary framework of thought and action. Each Cosmos Seminar embraces a collegially vigorous undertaking coordinated by one individual who is responsible for 1) selecting a topic, 2) extending an invitation to two colleagues, and 3) coordinating discussions and the collabo-

orative writing effort by this core group. Each of these individuals is invited to Eagle Hill as a guest of the Foundation for the duration of the Seminar, which may be 1 week or more, depending on the scope and needs of the proposed Seminar. Unless otherwise requested by the coordinator, each Seminar will be considered a closed event limited to three individuals; at the discretion of the coordinator, however, additional people may be invited to join the Seminar, either through personal invitation or open application (sponsoring arrangements are flexible; see <http://www.eaglehill.us/fcgeninf.html>).

Fine Arts and Craftsmanship at Eagle Hill: "Aspects of Nature"

Throughout the history of man, nature has been a source of inspiration. Each age has found artistic responses that spring as much from an emotional response to nature as from the intellectual background and prevalent artistic trends of the time. The Eagle Hill Foundation, in collaboration with the Humboldt Institute, offers an inspiring and aesthetically pleasing retreat-like setting at their facilities on the summit of Eagle Hill overlooking the coast of eastern Maine, within which artists can explore "aspects of nature" through art. Residencies, apprenticeships, workshops, and retreats give artists a full range of opportunities to be creative, learn, and share with others their insights into the many interrelationships between nature and art. Art residencies are the core of the new art programs at Eagle Hill. These are open to advanced and professional artists who would like to explore new ways of seeing and portraying nature. In their application forms, potential artists-in-residence are asked to convey how they imagine they might like to spend their time while at Eagle Hill, i.e., by sharing their creative ideas, indicating possible choices of media, and commenting about possible works of art they might like to undertake. In each case, works of art should draw their inspiration from the natural

landscapes and/or flora and fauna of inland and/or coastal eastern Maine. Residencies provide accommodations, meals, and studio space for a period of 2 or more weeks, depending on the scope and needs of the artist. Proposed works do not necessarily need to be fully completed while at Eagle Hill, but should at least reach a reasonable level of planning or completion. All works, when finished, are displayed in the gallery at Eagle Hill and posted in the Foundation's pending gallery website until their final sale. Artists receive a standard gallery commission on sales. At their discretion, artists-in-residence may accept students and/or apprentices (see <http://www.eaglehill.us/fageninf.html>).

A Crisis in Natural History Training: Not at Eagle Hill!

Each summer since 1987, regional and national authorities in the field of natural history have come to the Humboldt Field Research Institute to lead intensive weeklong field seminars and workshops in their specialties. Programs are offered for advanced and professional audiences, well-qualified undergraduate and graduate students, and amateur naturalists. Many of the programs at the Institute are rarely offered by other institutions. They represent an exceptional value in education because they are efficient and intensive in focus. This is possible largely because instructors are leading authorities in their fields and all participants are keenly interested in the given subject. With a limited number of participants, instructors can individualize the program for the week, and participants have the opportunity to let instructors know what their special interests are ahead of time. These programs are of particular interest because they focus on the classical natural history of one of North America's most spectacular and pristine natural areas: the coast of eastern Maine from Acadia National Park to Petit Manan National Wildlife Refuge and beyond. Programs for 2003

are shown in the box to the right (<http://www.eaglehill.us/mgeninf.html>).

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Benefits of membership in the Rhode Island Natural History Survey

For Individual, Family, and Student Members

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

For Institutional Members

- Rhode Island Naturalist*, the newsletter
- Participation in the RINHS List-Serve
- 2 free membership lists
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- 10% discount on all publications
- 1 free registration at annual conference

Programs at Eagle Hill, Summer 2003

- Field Ecology of Coastal Maine (a 2-week seminar for undergraduates) ... Edward W. Fisher
- Inventory and Monitoring of Amphibians and Reptiles ... Bryan Windmiller
- Dragonflies and Damselflies: Systematics and Biomonitoring ... Paul-Michael Brunelle
- Origin, Distribution, and Identification of Northeastern US Freshwater Fish Assemblages ... David Halliwell
- Bryophytes and Bryophyte Ecology ... Nancy Slack
- Microlepidoptera: Systematics and Study Techniques ... Brian Scholtens
- Advanced Sphagnum Field Studies ... Richard Andrus
- Lichens and Lichen Ecology ... David Richardson
- Vascular Plant Identification: Wetland and Upland Species ... William Sipple
- EPT Taxa: Ephemeroptera, Plecoptera, and Trichoptera ... Steven Burian
- Sedges, Rushes, and Grasses II ... Anton A. Reznicek
- Field Ecology of Coastal Maine (a 2-week seminar for teachers) ... Edward W. Fisher
- The Genus Carex: Identification, Ecology, and Continent-wide Distribution ... Anton A. Reznicek
- Calicioid Lichens and Fungi: Their Role in Assessing Forest Continuity ... Steven Selva
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- Aquatic Flowering Plants ... C. Barre Hellquist
- Ethnobotany: Personal Choices in the Use of Medicinal Plants ... James A. Duke
- The Night Sky: Starlore and Astronomy ... William F. Nichols
- Medical Botany for Pharmacists and the Medical Community ... James A. Duke
- Crustose Lichens of Coastal Maine ... Irwin M. Brodo
- Preparing Plant Specimens for Study and Exchange Purposes ... Steven R. Hill
- Bryophytes of Offshore Islands of Eastern Maine ... Norton G. Miller
- Forest Ecosystem Interpretation ... Norman A. Richards
- Advanced Mycology: Fungi and Their Associates ... Donald Pfister and Meredith Blackwell

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

Annual dues (check one) (see above for membership benefits):

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Name _____

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Make checks payable to RINHS and send to: RINHS, Rm 101 CIK, 1 Greenhouse Road, URI, Kingston, RI 02881
RINHS is a nonprofit 501(c)(3) organization. Dues in excess of \$4 (for annual subscription to the newsletter) and contributions are tax deductible to the full extent allowed by law.

Lichens of Rhode Island first book in new RINHS Web Publications Program

The newest publication from the RINHS is *Rhode Island's Foliose and Fruticose Lichens* by Don Flenniken. This book contains color photographs, habitat notes, and distribution maps for over 90 species of lichens found in Rhode Island. In addition to being an important survey of a group of environmentally sensitive organisms that are understudied in our area, Don's book stands out in another significant way—it's available for free on the RINHS website.

A fundamental goal of the Rhode Island Natural History Survey is to make information about local environmental science as widely available and as useful as possible. To help achieve this goal, we have expanded our publications program to include electronic-only publications, made freely available online at the www.rinhs.org website. This new program is meant to augment, not to replace, the traditional book publications program of the Survey, which itself is growing with great success.

One of the main reasons we are pursuing web publications is the reduced cost of electronic-only publishing compared to print publishing. This does not mean that this program is without cost, but it does mean that we can consider publishing manuscripts that would be prohibitively expensive for us to publish and distribute as printed books. As the first volume published through the Web Publications Program, *Rhode Island's Foliose and Fruticose Lichens*, which contains more than 90 color photos, is an ideal example of the usefulness of this medium.

We hope to greatly expand the Web Publications program in the next year, and seek your support and feedback to make this a success. In addition to current unpublished manuscripts, we are considering republishing important historical books and some of our own print publications online. Please contact us with your suggestions and consider making a donation to support this project.

Rhode Island's Foliose and Fruticose Lichens: online at www.rinhs.org/webpubs/lichens, also available on CD-ROM for \$10 plus shipping and handling.

RINHS Web Publications homepage: www.rinhs.org/webpubs

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Thanks and Credits:

The RINHS is very grateful for the following recent donations: Odonate collection of 11,000 specimens, from TNC-RI; Irene Stuckey RI mollusk collection, from Lisa Gould; Circle of the Sea: Creations from Oceania, from the Museum of Natural History at Roger Williams Park; and Museum Wise, a publication of the Society for the Preservation of Natural History Collections, from Peter August. **Illustration credits:** damselfly nymph p 3, Blepharisma p 8, Euplotes p 9 from BIODIDAC, <http://biodidac.bio.uottawa.ca>; Homarus americanus p 7 from NOAA Photo Library, National Marine Fisheries Historic Image Collection.

Events Calendar

All of June. Art Exhibit and Sale at the Audubon Society of RI's Environmental Education Center in Bristol, RI, with works by local natural history artist Joseph Koger. Joe's artwork features detailed drawings and oil paintings of native birds in their natural habitats. A percentage of the sales will go to ASRI. The art exhibit is free with the price of admission to the Center. For more information call (401) 245-7500 or visit www.asri.org.

June 10th 7:30 PM. Salt Ponds Coalition Summer Seminar: *Green Hill Project Update*, with Rob Adler, EPA; Galen McGovern, Project Manager; and Lorraine Joubert, URI Cooperative Extension. Cross Mills Library, Charlestown. For information call (401) 322-3068.

June 20th 3:00 PM – June 21st 3:00 PM. Rhode Island Natural History Survey's BioBlitz 2003, Pardon Gray Preserve, Weetamoo Woods, Ruecker Wildlife Refuge, Sapowet March, and Babbitt Memorial Wildlife Area, Tiverton, RI. Exploration, activities, and fun for scientists, volunteers, and spectators. Headquarters at Pardon Gray Preserve on Route 77 in Tiverton. See article on back cover for full details and contact information!

June 27th and July 11, 6:30 PM. *Salt Ponds Coalition Beach Walk* with Art Ganz, Marine Biologist, Quonochontaug East Beach Association Beach, Charlestown. For information call (401) 322-3068.

July 8th 7:30 PM. Salt Ponds Coalition Summer Seminar: *Salt Ponds Update* with Jan Reitsma, Director of RIDEM. Cross Mills Library, Charlestown. For information call (401) 322-3068.

All of August. Art Exhibit — *WATER'S EDGE: A Close-Up Look at Nature along New England's Rocky Coast*, at the Audubon Society of RI's Environmental Education Center in Bristol, RI, with works by local artist Marie Stile and emerging regional artist Christopher Traylor. Both artists will display a selection of paintings depicting New England's coastal landscape and rocky outcroppings. The show is free with the price of admission to the Center. A percentage of the art sales will go to ASRI. For more information call (401) 245-7500 or visit www.asri.org.

August 6th 10:00 AM. Salt Ponds Coalition:

Quonnie Marsh Walk with Dave Monk, Naturalist. Quonochontaug Marsh, Charlestown. Also held on September 21st at 11:00 AM. For information call (401) 322-3068.

August 9th 9:00 AM – 2:00 PM. URI Master Gardener *Veggie Garden Open House*, CE Education Center, URI, Kingston, RI. For more details, call (401) 874-2900.

August 12th 7:30 PM. Salt Ponds Coalition Annual Meeting and Summer Seminar: *Restoration of Water Quality and Eelgrass Habitat through Groundwater Nitrate Removal*, with Scott A. Nixon, Professor of Oceanography at URI. Cross Mills Library, Charlestown. For information call (401) 322-3068.

September 9th 7:30 PM. Salt Ponds Coalition Summer Seminar: *The Invaluable Coastal Marine Lagoons of RI: The Challenges to Sustainability and How Sea Grant Can Make a Difference*. Dr. Barry A. Costa-Pierce, Director and Professor of Fisheries, RI Sea Grant College Program at URI. Cross Mills Library, Charlestown. For information call (401) 322-3068.

September 13th and 14th. *Raptor Celebration*. Celebrate the majestic beauty of raptors at the Audubon Society of Rhode Island's Environmental Education Center in Bristol, RI. There will be a number of raptor presentations throughout both days. The celebration is sure to be fun as well as educational. For more details, call (401) 245-7500.

September 18th 5:30 PM. Rhode Island Natural History Survey Annual Meeting, followed at 7:30 PM by the first lecture in the 2003–2004 Mark D. Gould Memorial Lecture Series on Rhode Island's Fauna, Flora, Geology, and Ecosystems. The featured speaker will be Virginia Brown, Coordinator, RINHS Ecological Inventory, Monitoring, and Stewardship Program, on *The Odonata Atlas of Rhode Island*. For information contact (401) 874-5800; info@rinhs.org.

September 19th – 20th. An INVASIVE PLANT SUMMIT FOR NEW ENGLAND is being planned for a location in central Massachusetts. Sponsors include the University of Connecticut, New England Wild Flower Society, and the Silvio O. Conte National Fish & Wildlife Refuge. The main focus of the summit will be the development of an early warning system for the region as well as current research pertaining to the biology and control of invasive plants. For more information contact Cynthia Boettner, Silvio O. Conte National Fish

and Wildlife Refuge, (413) 863-0209 x 6; Cynthia_Boettner@fws.gov.

September 20th (Rain Date: September 21), 10:00 AM – 3:00 PM. URI Cooperative Extension's *Annual GreenShare Field Day*, held in the URI Learning Landscape Gardens, Kingston, RI. The public is invited to the 13th Annual GreenShare Field Day. This free event features garden tours, lectures and demonstrations, plant sales, free soil pH testing, music, food, and lots of activities for kids. For more information, call (401) 874-2900.

September 20th 10:00 AM – Noon. *Quonnie Beach Cleanup*, International Coastal Cleanup Day. Quonochontaug Beach, Charlestown. Volunteers from more than 117 countries and 50 US states participate. Be part of our local International Coastal Cleanup Day—join us at Quonnie Beach! For more information contact the Salt Ponds Coalition at (401) 322-3068.

October 18th and 19th 10 AM – 4 PM. *3rd Annual Audubon Bird Carving and Wildlife Exposition*. Top bird and wildlife carvers from throughout the northeast will display and sell their work at the Environmental Education Center in Bristol, RI. Demonstrations daily. Admission \$5/adult, \$3/child (4–12yrs.), under 3 free. For more details, call (401) 245-7500.

November 5th 7:30 PM. Second lecture in the 2003–2004 RINHS Mark D. Gould Memorial Lecture Series on Rhode Island's Fauna, Flora, Geology, and Ecosystems. The featured speaker will be Marcie Marston, Associate Professor, Roger Williams University, on *The Spread and Ecological Impact of an Invasive Red Alga, Grateloupia turururu, along the Southern New England Coast*. The Center for Economic and Environmental Development, RWU, Bristol, RI. For information contact (401) 874-5800; info@rinhs.org.

December 6th 9:00 AM – 4:00 PM. *Audubon Society of Rhode Island's Annual Holiday Craft Show and Tree Sale*. Local crafters featuring environmentally oriented crafts will be on display and sale at three ASRI locations: the Environmental Education Center in Bristol, Powder Mill Ledges in Smithfield, and Caratunk in Seekonk. Freshly cut local Christmas trees will also be on sale.

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 Contact Us...

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info@rinhs.org • www.rinhs.org

Join us for BioBlitz 2003!

BioBlitz 2003 promises to be the best ever. Encompassing the Tiverton Land Trust's Pardon Gray Preserve, the Town of Tiverton's Weetamoo Woods, ASRI's Emilie Ruecker Wildlife Refuge, RIDEM's Sapowet Marsh, and the Babbitt Memorial Wildlife Area, there will be a wealth of habitats to explore. From upland forest (with a regionally unique oak-holly forest), hemlock rocky ridge, Red Maple swamp, open fields, wet meadow, streams, and ponds to coastal habitats such as salt and brackish marshes, tidal creek, and cobble and sandy shores, naturalists of all stripes will have plenty to do!

BioBlitz 2003 will be in progress from 3:00 PM on Friday, June 20 to 3:00 PM on Saturday, June 21. The headquarters will be centered at the Pardon Gray Preserve on Route 77 in Tiverton. Nature walks, activities for children, and other events will be available for the public on Saturday, from 10:00 AM to 3:00 PM. The public is also welcome to bring picnics on that day, watch the scientists in action, and cheer on the final tally at 3:00 PM.

The Nature Conservancy of Rhode Island, the Tiverton Land Trust, and the Audubon Society of Rhode Island are co-sponsoring BioBlitz 2003 with the RI Natural History Survey.

Everyone is welcome to participate. Scientists with taxonomic expertise form the core of a BioBlitz, but volunteers of all sorts are needed to assist out in the field, do data entry, greet the public, and help in myriad other ways. What better way can you think of to celebrate the summer solstice than spending a few hours in one of the most beautiful corners of Rhode Island, helping to highlight the state's amazing biological diversity? To sign up, contact the RINHS

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NATURAL HISTORY SURVEY

Providing Ecosystem Science and Information

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