

RINHewS

The Newsletter of the Rhode Island Natural History Survey

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President's Corner

by John F. Paul

Exciting things have been happening at the Rhode Island Natural History Survey! Memberships are at an all time high, including 15 prominent Rhode Island institutions. If you haven't yet renewed your membership, please support RINHS by sending it in. If you know someone who should belong to RINHS, encourage them to join.

The recent conference, *Ecological Research in Rhode Island: A Continuing Assessment*, held at Chafee Hall at URI, was our best attended; over 330 participated, including 150 high school students from 11 Rhode Island schools (thanks to the support of the Rhode Island Foundation). I want to extend our thanks to URI for providing the facilities for the conference, and to our many sponsors and volunteers. Doug Kraus, lifelong Rhode Island birder and naturalist, joined a select group by being honored as the 1997 RINHS *Distinguished Naturalist*. Tundi Agardy, URI alumnus and Senior Director of Coastal and Marine Programs at Conservation International, presented the plenary lecture on "Assessing Threats to Marine Biodiversity: A Global Perspective." We had 33 oral presentations, 9 posters, and 12 organizational displays. Special thanks to Larry Taft and the rest of the Conference Committee for putting together an excellent conference.

Our first *Biota of Rhode Island* volume is ready to go to press, with the 260-page *Vascular Flora of Rhode Island: A List of Native and Naturalized Plants*. Special thanks to the editors of this volume (Lisa Gould, Rick Enser, Richard Champlin, and Irene Stuckey) for their efforts in putting this together. Members will receive an announcement when it is available for purchase.

Our February lecture, cosponsored with the Barrington Land Conservation Trust, was one of our best attended, with over 110 people coming to hear Mark Bertness of Brown University speak on "The Ecology of New England Salt Marshes." If you haven't taken advantage of our lecture series, then

you've really missed out on some of the most interesting information being presented on Rhode Island's environment.

Over the past year, the Board of Directors has been working with our consultant, Simone Joyaux, to develop our organizational plan to make the Natural History Survey even better. I'd like to share with you the following statement that reflects our vision for the Natural History Survey:

RINHS is:

- a scientifically-based professional association whose members are individuals, families, and organizations, both for-profit and not-for-profit; and
- an effective organization that provides valuable services to its members, community decision makers, individuals, government agencies, and organizations who seek scientific information about the state's biota and natural communities.

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Mission Statement of the Rhode Island Natural History Survey

- To advance scientific knowledge of Rhode Island's biota, ecological communities, and environmental resources.
- To facilitate and coordinate the gathering and dissemination of information on Rhode Island's biota and natural communities.
- To enhance communication among Rhode Island's environmental and life scientists.

Research Reports

The Intertidal Wolf Spiders of Narragansett Bay

by Douglass H. Morse

If asked where to find a spider, most of us would probably first go to a field, a garden, or a roadside to look for the familiar, large, yellow-and-black orb-weaver, the garden spider *Argiope aurantia*. Alternatively, we might head to some dirty corner where we recalled seeing a cobweb or house spider *Theridion tepidariorum*. Probably the intertidal zone of a stony beach would be about the last place that we would expect to find spiders. Yet a common, but often-overlooked species, the wolf spider *Pardosa lapidicina*, occupies many of the stony shorelines of Rhode Island, especially the cobble beaches found in many of the more protected parts of Narragansett Bay (Morse 1997). *Pardosa* is a small, uniformly dark-gray to black cursorial species, with a body length of 6-9 mm (Kaston 1948).

Pardosa has a remarkable behavior—it moves up and down the beach with the tides, often covering as much as 40 meters directly down and back during a single tidal cycle. In addition, it moves about actively hunting food in the intertidal. Its major prey, which it stalks and then jumps on, are seaweed flies *Coelopa frigida* (family Coelopidae) and springtails *Anurida maritima* (Collembola). Initially we expected the abundant small intertidal amphipods to be a major prey item, but *P. lapidicina* apparently can only kill recently-molted amphipods. Although the flies spend their larval and pupal periods in windrows of seaweed at the high-tide line, the adults frequent the low-tide line, where the spiders typically hunt them.

Surprisingly, *P. lapidicina* is confined to the beach exclusively during all but the winter, taking shelter in the adjacent forest only during winter and when the tides of great storms completely cover the beach (during an ordinary tidal cycle, five to six meters of cobble remain dry at the upper end of the beach). We have searched large amounts of forest litter from April to early November without finding *P. lapidicina*, although we have captured other, larger wolf spiders there at those times. A few *P. lapidicina* remain on the upper edge of the beach even during the winter. They shelter under loose stones and sometimes venture on top of them during unusually warm days. In the cold they become nearly torpid

(although they become active within a few seconds, if stimulated).

We do not know why some spiders occupy the litter and others the edge of the beach at this season. The two groups appear to be similar in size and other obvious characters. One might expect that individuals aestivating in the forest litter would experience fewer dangers than those on the shore edge. Still, the shore-edge species appear to have relatively few enemies, and their location might even minimize predation. I have captured short-tailed shrews (*Blarina brevicauda*) in pitfall traps in the edge of the forest during early winter, and these shrews forage actively throughout the winter. They are voracious predators and may exert considerable pressure on spiders in the litter.

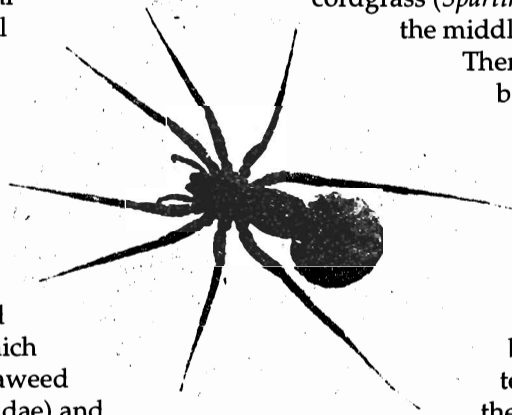
The spiders are remarkably common on some beaches, reaching densities of up to 70/meter of shoreline. They are more common, and more successful, on open cobble than where saltmarsh cordgrass (*Spartina alterniflora*) has colonized the middle reaches of these shores.

There, the grass forms a dense barrier that prevents the spiders from migrating down into the zone below. Stretches of Haffenreffer Beach now covered by cordgrass were open only 15 years ago. It is thus of interest to know whether individuals isolated behind cordgrass retain the tendency to migrate down to the low-tide line. To investigate

this question, we made 0.5 meter-wide strips through the vegetation to see if the spiders would travel through them. The spiders moved directly over the turf to the low-tide line after we cut the cordgrass, before we could remove the turf, suggesting that the migratory trait is innate. Subsequently we found that adults in the spring would readily move over the then-bare turf of the cordgrass zone. However, the juveniles, hatched in mid-summer and tested in the late summer, would have had no previous opportunity to make this movement.

Pardosa reproduces in late spring and summer. Females carry their large egg sac on their spinnerets, and after hatching the young climb onto their mothers' back, where they remain for several days. The sacs themselves initially are a striking pale blue-green, fading to a straw color after a few days.

These coastal populations of *P. lapidicina* appear to be isolated from other populations of this species, which cover much of eastern North America. Over most of its range, *P. lapidicina* is a denizen of rocky streams and bankings, habitats bearing considerable



structural similarity to the cobble beaches of Narragansett Bay. A closely-related species, *P. littoralis*, of similar size, but lighter colored and distinctly striped, occupies salt marshes about the Bay. We have never found the two species together.

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From Distant Shores: Another Invader In The Bay

by Christopher F. Deacutis

Narragansett Bay is no stranger to biological invasions. The Green Crab (*Carcinus maenas*) used shipping commerce to hitch a ride from Europe to the eastern seaboard in the early 1800s, and wreak havoc on natural bivalve populations...an ecological play it is now reenacting on the northwest coast of the United States, much to the dismay and potential economic devastation of aquaculturists. This latest green crab invasion started in San Francisco Bay with ship ballast around 1989, and is now moving north along that coast (Alexander 1997).

A new invader may be making its moves to dislodge the Green Crab from our estuarine shores here in Rhode Island. The Japanese Shore Crab, *Hemigrapsus sanguineus*, has also used shipping as its means of transport, this time from the Far East. A brachyuran crab native to the western Pacific, the Japanese Shore Crab was first noted on the eastern U.S. coast in September 1988 when a female specimen was recorded in Townsends Inlet, New Jersey (McDermott 1991). It is thought to have been introduced to New Jersey via ballast water. Since then, this extremely fecund species has become very abundant along both the New Jersey and the Connecticut intertidal zone (McDermott 1991; Singletary pers. comm.).

Robert Singletary of the University of Bridgeport has been investigating interactions between this invader and other species such as the Green Crab along the Connecticut coast. He has found evidence that this species is beginning to displace the Green Crab's niche (Singletary pers. comm.), as previously predicted by researchers. *Hemigrapsus* may not be significantly affecting one of the mud crabs, *Dispanopeus sayi*, because it seems to prefer drier

bottom type than the mud bottom/rock habitat of the latter crab, but predictions that it may be competitive with several other species including the Rock Crab, *Cancer irroratus* (McDermott 1991), do not bode well for the present crab population mix on the East Coast.

Rhode Island is on the "invade habitat" agenda for this species. Dr. Singletary (pers. comm.) has found this exotic species along the south shore of Rhode Island as well as Cape Cod. There have also been anecdotal sightings within Narragansett Bay over the last year by Chris Powell of the RIDEM Division of Fish & Wildlife, but this is the first officially "bagged" specimen from the Bay that we know of.

During the Estuarine Research Federation (ERF) 1997 field trip to Prudence Island NERR (10/12/97), Dennis Allen of the Baruch Marine Lab spotted and seized an odd-looking crab in the intertidal zone of the cobble beach ~2.5 km south of Pine Hill Point on the western shore of the island. An empty plastic lunchbag was quickly donated by another visitor, and I brought the hapless crab back home to reside in my freezer overnight (much to the dismay of my wife). The crab was preserved the next day in 10% buffered formalin and brought to the ERF conference in Providence, where it was positively identified by Susan Park, an undergraduate student of Ana Dittel (U. of Delaware), as a juvenile Japanese Shore Crab (max. carapace width of 1.6 cm). She just happened to be presenting a poster on this invasive species and its antics in New Jersey! The specimen will reside in the lab collection at the Prudence Island NERR under the watchful gaze of Allan Beck, the Reserve Manager.

A little about the life history of *Hemigrapsus* is in order at this point. This intertidal crab can be quickly identified by the striped pattern on its legs. *H. sanguineus* is the only member of this genus found on the U.S. East Coast, although a related species occurs south of Brazil. In Japan, this species is one of the largest (up to 39 mm carapace width) and most frequently occurring grapsid crabs in the rocky intertidal zone. Females of this species have a life span of at least 3 years, and can have up to 5 broods/yr, with up to 56,000/brood (McDermott 1991)! McDermott found preliminary indications that the species is at least as prolific here, with New Jersey water temperatures allowing for at least 4 broods between June and September, and specimens here showing larger brood sizes per set carapace widths vs data from Japan (McDermott 1991). Embryos show a circatidal hatching rhythm on gravid females, with maximum hatch usually synchronized with maximal spring tides (Saigusa and Kawagoye 1997).

There is a significant ongoing effort to turn Narragansett Bay into a major shipping port on the

East Coast with the planned development of Quonset Point as an international containerized cargo port. With this change in use, there is likely to be an increase of invasive species brought with ballast from more diverse areas of the world by the huge new cargo vessels projected to use the port. The ships expected to use the port are up to 1000 ft long, 140 ft abeam, with a draft of 46 ft (necessitating increasing channel depth to 52' at Quonset), and 70,000 horsepower diesel engines. Cargo is projected to come from places like Singapore through the Indian Ocean into the Red Sea, through the Suez Canal, and across the Mediterranean to Quonset (Donovan 1996).

It will be critical to the growing shellfish aquaculture industry as well as the endemic biological community in Narragansett Bay that both invertebrate and phytoplankton introductions via ship ballast and other sources be kept in check, since successful invading species populations have historically been impossible to contain once they have been introduced. We cannot know what the future holds for the Bay's mix of creatures, but procedures to minimize invasive species introduction will need to be seriously considered and implemented as Narragansett Bay enters a new era of uses in the new millennium.

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Freshwater Mussels in Worden Pond: Is There a Problem?

by David H. Kessler

All too often we forget that our view of what is "natural" lacks historical perspective. To us, a "natural environment" is quite different than what it would have been to Rhode Islanders in 1776. This struck me with particular force in 1990 when I was

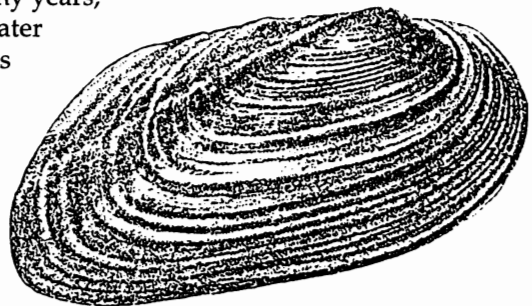
interested in finding data on the freshwater mussels (some people call them clams) of Worden Pond in South County. I heard remarks like, "Oh, things are much different now than they were 20 years ago." "No, there are no papers published, but I remember the water was as clear as gin 20 years ago." But beyond such anecdotal comments, there were no quantitative data. Had Worden Pond mussel density changed? Had the species composition changed? Were they growing differently now from 20 years ago? What if somebody asked me the same questions in 20 years?

By now some of you may be asking, "freshwater mussels, what is he talking about?" I am always amazed by the questions I get at the boat ramp when people find out what I'm doing. "You mean there are mussels in freshwater?" The second most often asked question is, "Can you eat them?" My responses are always, "yes" and "no," respectively. "Then what good are they?" "How long do they live?" are other common questions. Before answering these, let me give you some general information on freshwater mussels

Freshwater mussels, like their marine counterparts, are bivalve mollusks. The native mussels of our lakes and rivers are members of the family Unionidae. Unlike their marine cousins, freshwater mussels (unionids) brood their larvae in special pouches inside their shells. When conditions are right they release these larvae which then must attach to fish in order to survive. Some mussels even have special structures with fake eyespots and flaps that appear as small fish, the effect of which is to lure larger fish nearer. The pinhead-sized larvae, called glochidia, attach to a fish and encyst, where they remain for a week to several months. After this time they drop off and if lucky, begin an independent life. If there are no fish, or fish of the right species, the mussels cannot complete their life cycle.

Once they leave their fish host the small mussels burrow into stream and lake bottoms, where they continually pump large amounts of water through their gills. This water brings them food--in the form of suspended particulate matter--and oxygen. Since they cannot migrate away from unfavorable conditions, and they are capable of living

for many years, freshwater mussels act as wonderful indicators of water



quality.

How long do they live? This question is often asked, but its answer is not simple. In fact, there is some debate on how to correctly age mussels (Kesler and Downing 1997). If you accept the common assumption that the rings of their shells are formed annually, like tree rings, then some three inch-long individuals in Worden Pond may be 30 years old or older!

If you have ever been wading in Rhode Island ponds like Worden, Tuckertown, or Yawgoo, you know that mussels can be abundant. During the summer of 1990, I set out to determine just how abundant. I used a 0.25-m² square quadrat at 480 locations in Worden Pond. Mussels were fairly uniformly distributed throughout the pond. The most common mussel, the Eastern Elliptio (*Elliptio complanata*) occurred at a density of 25.7 individuals per m² (standard deviation of 12.6). Less common were the Eastern Lampmussel (*Lampsilis radiata*), 1.1 ± 0.9 per m² and the Eastern Pond Mussel (*Ligumia subrostrata*), 0.5 ± 0.6 per m² (Kesler and Bailey, 1993). This translates to about 115 million freshwater mussels in Worden Pond.

How fast do they grow? There are two common ways to get at this question. One is to cut the shells and microscopically examine the lines that are assumed to form annually. This provides an age-length relationship from which one can predict growth at a given length. A more direct method is to re-measure individuals on a yearly basis. The problem with this approach is being able to recognize individuals. In addition, mussels are mobile enough that finding the same individual again can be problematic. Thus I mark individuals with bright orange, fast-drying Krylon paint. I measure them for length to the nearest 0.1 mm, number them with a "Sharpie" permanent marker, and return them to the sediment from which they came. Retrieval success is quite high, e.g., of the 203 marked *E. complanata* in Worden Pond sandy substrate in 1991, I found 136 (67%) six years later in 1997. Yearly re-measurement of the same individuals yields growth data.

So, how fast do they really grow? All too often ecologists must answer, "It depends." I was finding that the common mussel of Worden Pond, *E. complanata* seemed to be growing very slowly, if at all, yet the same species was growing much more in Yawgoo Pond. So, in 1996 I marked and measured 100 *E. complanata* from Worden Pond and moved 50 of these to Yawgoo Pond (something you should not do without permission). The following year I re-measured both sets of mussels. Those that had remained in Worden Pond did not grow at all, while those in Yawgoo Pond grew tremendously (see Fig. 1).

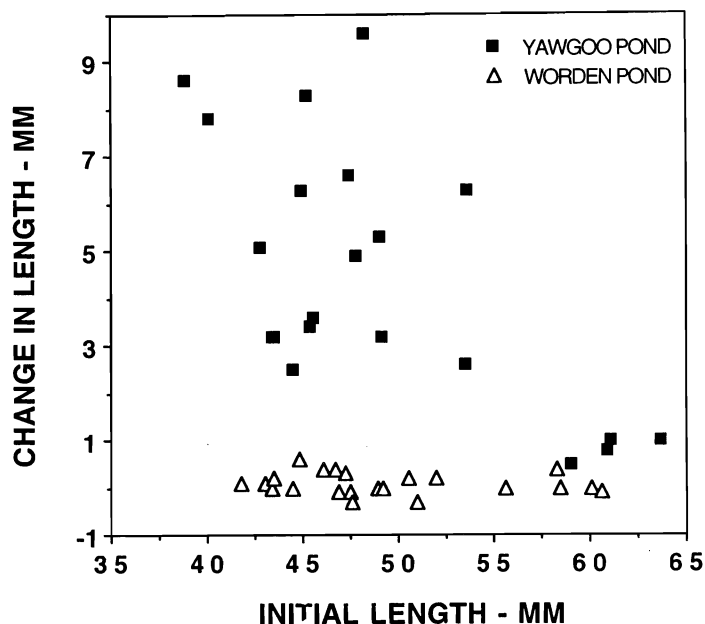


Figure 1. Change in length of *Elliptio complanata* from Worden Pond after one year in Worden Pond and Yawgoo Pond.

Clearly, Worden Pond individuals are not growing, yet are capable of growth when transplanted to Yawgoo Pond. This information helps answer the question, "What good are they?" Past mussel growth in Worden Pond, as determined from examining shell rings, is similar to how they now grow in Yawgoo Pond. This means there has been a change in Worden Pond. While Worden Pond mussels are alive, their growth stoppage is a possible harbinger of changes to come. These mussels have thus provided a practical indicator of subtle water-quality changes.

Besides being affected by water-quality changes, mussels can affect water quality through their filtering activity. If you assume a filtering rate of one liter per hour per mussel (a conservative rate for the Eastern Floater, *Pyganodon cataracta*, (Tankersley and Dimock 1993) common to Yawgoo Pond in southern R.I.), then the potential filtering action of 115 million mussels per day in shallow Worden Pond is immense. Changes in the concentration of particulate organic matter, bacteria, and phytoplankton could impact food-chain and microbial-loop dynamics.

Of the 281 species of freshwater mussels left in the United States (the United States Geological Service places this number at 297 taxa), The Nature Conservancy has classified 55 percent as endangered, threatened, or otherwise rare. This percentage stands

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in stark contrast to only about 7percent of mammals and birds that have been so classified. Freshwater mussels are not charismatic megafauna like tigers and elephants, or fuzzy and cute like pandas, but they are important parts of our local ecosystems. Unless we are careful we will continue to lose them as we degrade the streams and wetlands of Rhode Island, all the while redefining what is "natural."

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Rare and Endemic Rhode Island Beetles

by Derek S. Sikes

During the process of compiling a list of beetle species for the forthcoming Invertebrate volume of the RI Natural History Survey's Biota of Rhode Island project, I came across five interesting records. Three of these records are beetle species that are technically endemic to Rhode Island, the fourth is a species known only from Connecticut and Rhode Island, and the fifth is a species known only from Rhode Island and Indiana. These records should not be considered evidence for Rhode Island being an ecologically unique state, but rather, should demonstrate the sparse and inadequate taxonomic and faunistic knowledge we have of our own backyards.

The above beetles are in three families: the Carabidae, or ground-beetles; the Staphylinidae, or rove beetles; and the Histeridae, or hister beetles. Four of the species were described by Thomas Casey in the late 19th to early 20th century. Thomas Casey (a Rhode Islander), it should be mentioned, is infamous among coleopterists for "over-splitting." He named thousands of North American beetle species during his career, and a large portion of his "species" have, upon careful study by modern taxonomists, been found to represent variants of previously named species.

Thus, the two carabid species, *Olisthopus filicornis* Casey and *Olisthopus innuens* Casey, are most likely

not valid species at all, but are simply waiting for a future taxonomist studying this group to determine to which species (more widely ranging, no doubt) these names actually belong. However, until these names are "sunk" (synonymized under a valid name), they remain on the North American list of Carabidae (Bousquet & Laroche 1993) as known only from Rhode Island, and thus, technically, are endemics. Dr. Bousquet, of the Canadian National Collection of Insects in Ottawa, when queried on this case, agreed that the names probably do not represent good species.

The remaining species are a different and more interesting case because the specialists working on these groups are confident that they are indeed good species. Two belong to a group of beetles that has recently been "demoted" from a family, the Pselaphidae, to a subfamily of the Staphylinidae (Pselaphinae). Both were named by Casey (Casey 1897), which should raise alarms about their validity. However, I have been informed by Dr. D. Chandler of the University of New Hampshire, and a leading specialist on the taxonomy of this group, that these species are indeed valid. The first species, *Biblopectus sobrinus* (Casey), is known from Connecticut and Rhode Island, and the second, *Reichenbachia insolita* Casey (Fig. 1), is known only from Rhode Island, and thus stands as a true Rhode Island endemic. White (1963) states that little is known about the biology of North America's 63 *Reichenbachia* species but that many species are attracted to lights, some appear to be associated with ant nests, and others have been captured in mesic environments such as bogs.

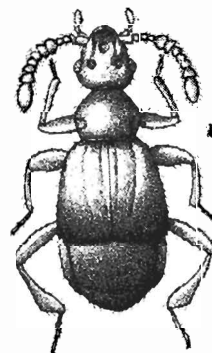


Figure 1. *Reichenbachia* species unknown; ca. 2 mm in length (from White 1963).

The fifth species, *Tribalister striatellus* Fall, is a histerid and reported to be a myrmecophile of *Aphaenogaster* spp. ants (Myrmecinae—ca. 5-7 New England species in this genus). Myrmecophilous insects live in association with ant nests and often prey on their ant hosts, or steal food, and are usually protected by chemically disguising themselves as ants. There are only two species in the genus *Tribalister* in North America and the second species is not uncommon in Florida. The Rhode Island species

has also been recorded from Porter County, Indiana, but, not from any other state, according to Dr. Kovarik, a histerid taxonomist. Dr. Kovarik thinks this species may be of no conservation concern if, as he expects, it can be found in abundance in the right habitats. However, we presently know nothing about the conservation status of these species.

Any biologist would know that there is no ecological reason to expect an organism to be endemic to Rhode Island because adjacent states share essentially the same abiotic environments and there are no natural barriers to dispersal that would isolate populations in Rhode Island. Thus we expect that *Reichenbachia insolita* Casey, the only true Rhode Island endemic of these five species, should also occur in Massachusetts and Connecticut; but it has yet to be found in these states (or if it has been found, I am unaware of the discovery).

It should be mentioned that although there is little reason to think Rhode Island is ecologically distinct from its neighboring states, there is the unusual case of the American Burying Beetle, *Nicrophorus americanus*, which has disappeared from all of its eastern range except Block Island. This federally protected endangered species (although certainly having experienced an enormous range reduction unlike any documented previously or since) is currently known from 5 populations--two to five times as many as the species reported in this article!

What is the explanation for the rarity of the three "good," rare, Rhode Island beetle species? First, pselaphids are minute beetles (rarely more than 3 mm in length) and the histerid species lives in ant nests; thus these species are easily missed by collectors. Also, it is unlikely that identification keys include these species so that local collectors would be unlikely to make proper identifications without the assistance of a specialist. Specimens of these species may currently be sitting in various collections; identified, they would be of great value to the assessment of these species' conservation status.

With more taxonomic work (particularly of the carabid genus *Olisthopus*) and careful surveys of adjacent states we will, I predict, no longer call these Rhode Island beetle species endemic. However, until that time, even one of the smallest states can claim to possess elements of our national biodiversity shared by no other state!

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An Invasive Red Seaweed, Grateloupia doryphora, Spreads throughout Narragansett Bay and Contiguous Waters: An update.

by Marilyn Harlin
and Martine Villalard-Bohnsack

The Rhode Island invasion of *Grateloupia doryphora* attracted local and worldwide attention in 1996-1997 because of its potential impact and because

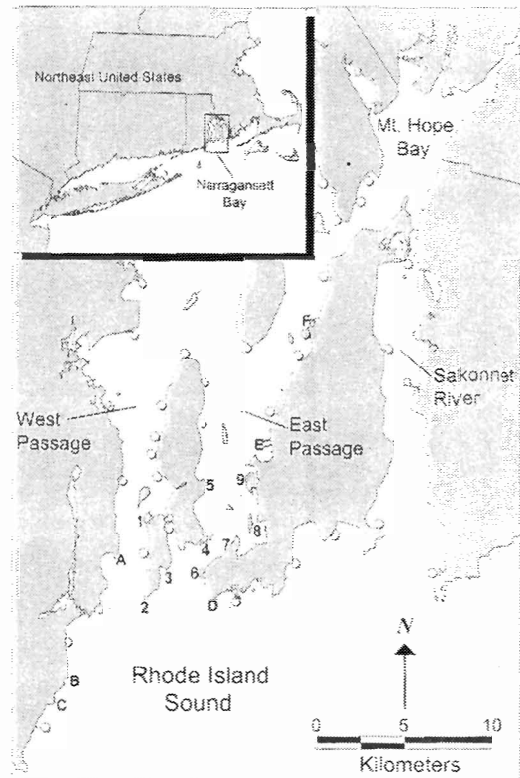


Figure 1. Spreading of *Grateloupia doryphora* in Narragansett Bay and adjoining waters. Numbers indicate nine sites at which this seaweed was found in 1996, and letters indicate six additional sites in 1997-8. Empty circles show areas searched where no specimen was seen.

it had not been known to survive temperatures as low as the ones experienced during New England winters. This large red seaweed (up to 80 cm long)

seems here to stay and is expanding its range (Fig. 1). Since our first report in *RINHewS* 4(1):2-3, its distribution has extended up the east passage of Narragansett Bay to the Naval Base at Melville, over to the west passage at Bonnet Point, and down to Black Point and Breton Reef on Rhode Island Sound.

This species lives in the low intertidal (MLW) and upper subtidal zones, where it has already survived two winters. Thalli do not tolerate either freezing or excessively warm air temperatures when tides are low during these extremes. Young thalli have been seen to arise from crusts both in the field and laboratory, and new blades may also develop from tetraspores and carpospores released into the water—most noticeably in November 1997. November was also the month of largest biomass and percentage cover (Fig. 2). In 1998 we are continuing quantitative comparisons and looking for evidence of greater expansions.

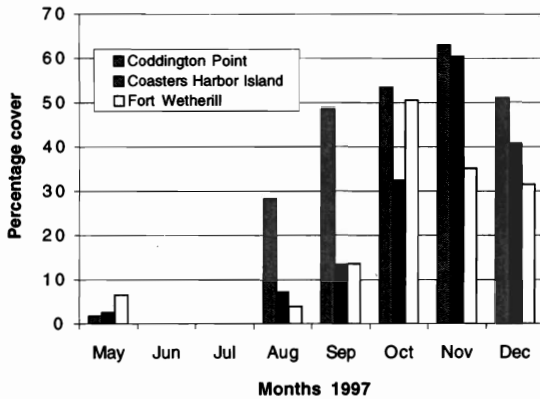


Figure 2. Percentage cover of *Grateloupia doryphora* at three sites in Narragansett Bay. Greatest cover was measured in November 1997. Measurements (from 10 quadrats along 20 m transects) are being continued through 1998.

Removable acrylic substrates with glued sand particles acting as settling surfaces are being placed at study sites. These discs have proved to be effective for examining recruitment of seaweeds. By quantifying relative settlement and expansion on the same plates, we expect to determine whether *Grateloupia* competes with native species.

Marilyn M. Harlin is Professor in the Department of Biological Sciences, University of Rhode Island; *Martine Villalard-Bohnsack* is Professor in the Department of Biology, Roger Williams University.

Roger Goos Wins New England Wild Flower Society Award

by Keith T. Killingbeck

On 16 November 1997, Dr. Roger D. Goos was awarded the New England Wild Flower Society's 1997 Rhode Island State Award. The award is pre-

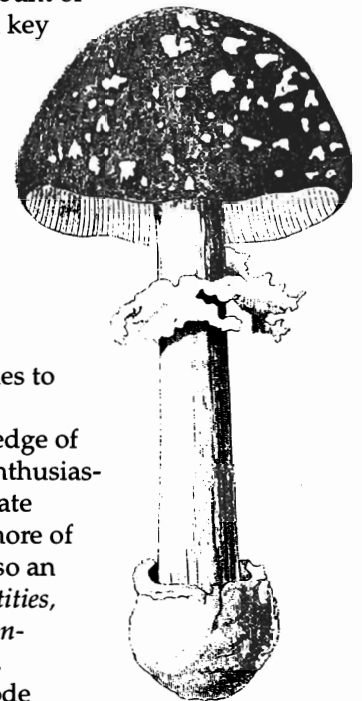
sented annually to "an individual, group, or organization within Rhode Island for significant contribution to the preservation of native plants and/or their habitat in that state." The Rhode Island Wild Plant Society was the proud winner of the 1995 Rhode Island State Award.

That Roger won this prestigious award was no surprise to anyone, except Roger himself. His humility has always served him well in life, and his first reaction to the letter announcing his award and describing his accomplishments was "they must have been writing about someone else." Hardly Roger, hardly.

Roger is Professor Emeritus in the Department of Biological Sciences at the University of Rhode Island (URI), and was the Chair of the Department of Botany at URI for 15 years. He has indeed been the consummate botanist. His publication list is impressive and his national stature is exemplified by the fact that he was elected President of the Mycological Society of America in 1986. He has been a Fulbright Fellow in Portugal and has literally shared his knowledge of fungi all over the world. He has been a wonderful mentor to many graduate students who have studied mushrooms and other fungi at URI, and has taught countless undergraduates the intricacies and excitement of botany.

What you will not see on Roger's resume is the rich history of field trips he has led in Rhode Island to teach and encourage the recognition and appreciation of the fungal "flora" of the state. He has led field trips for groups such as the Audubon Society of Rhode Island and the Rhode Island Wild Plant Society. I am certain that the participants on those trips learned an immense amount of botany. Roger has also been a key figure in helping the Rhode Island Poison Control Center effectively deal with emergency calls regarding cases of mushroom poisoning. All in all, his community service to the state of Rhode Island has been exemplary.

Roger has remained extremely active even after his recent retirement. He continues to publish scientific papers and continues to share his knowledge of mycology and botany with enthusiastic naturalists who are fortunate enough to be part of one or more of his public field trips. He is also an editor of *Viruses & Related Entities*, *Monera*, *Protista*, *Fungi*, and *Non-vascular Plants of Rhode Island*, Volume 3 of the "Biota of Rhode



Island" Project of the Rhode Island Natural History Survey.

Maya Ruetzger-Cruciana, Chair of the Awards Committee for the New England Wild Flower Society, summed up Roger's accomplishments with the following tribute. "Your long and fruitful career researching the fungi has brought greater appreciation of these often-forgotten native flora to both amateurs and academics alike. Through your enthusiasm and encyclopedic expertise, we have acquired important understanding of their complex--and indispensable--role in our ecosystems."

Roger Goos is the quintessential botanist, and the quintessential gentleman. Without question, his long and storied career at URI and his long-standing commitment to the study of fungi made him eminently deserving of the recognition bestowed on him by the New England Wild Flower Society.

Keith T. Killingbeck is Professor in the Department of Biological Sciences at the University of Rhode Island, and is Secretary on the RINHS Board of Directors.

This article, slightly modified, originally appeared in the March 1998 newsletter of the Rhode Island Wild Plant Society.

Valuing Rhode Island's Forested Land

The citizens of Rhode Island value their forest land. Are they willing to pay landowners to keep it that way? This is the question that economists at the University of Rhode Island are attempting to answer. As part of their research, URI economist Stephen Swallow will be looking for landowners who may be willing to cooperate with the study.

The research involves a survey of the public. The survey will ask Rhode Island citizens about how forested land contributes to their quality of life. And the survey will also ask people about their willingness to pay to support programs that help landowners keep land forested, including forested wetlands. In many cases, these questions will ask survey respondents to contribute money toward enrolling additional parcels of land in forest stewardship programs. If survey respondents contribute sufficient funds, their contributions will be matched with federal grant dollars in order to pay an annual fee that has been agreed upon by URI and the cooperating landowners. If survey respondents fail to contribute sufficient funds, then cooperating landowners will be released from the project.

In the next month or so, URI's Professor Swallow will be advertising to request "letters of interest" from landowners. Swallow will be looking for landowners who have parcels of land between 5 and 20 acres and who can demonstrate an intent to harvest timber within the next year or so. Most of the landowners who would qualify for the project

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The President's Corner, continued from page 1

The primary audience for RINHS is individuals and organizations working in/affiliated with the natural history field, biodiversity, flora, fauna, and ecosystems (for example, ecologists, naturalists, environmental educators, consultants, engineers, collection managers, regulators, academics, not-for-profit conservation organizations, decision makers in conservation, and students).

RINHS carries out its mission by providing the following services:

- educational programs and publications to enhance the scientific knowledge related to Rhode Island's biota and natural communities.
- compilation of a biota data base available to help make decisions that are ecologically sound.
- networking opportunities with peers and experts in the field.
- community outreach activities to communicate the meaning and value of natural history to Rhode Islanders.

Finally, a bittersweet note. Tony Vecchio, board member of RINHS and director of the Roger Williams Park Zoo, has accepted the position as director of the Metro Washington Park Zoo in Portland, Oregon. We will miss Tony and his energy, and wish the best for him and his family as they move to the West. The Board of Directors presented Tony with a lifetime membership in RINHS in recognition of his role in shaping our Natural History Survey.

John F. Paul is a researcher at the U. S. EPA Lab in Narragansett, and serves as president of the Rhode Island Natural History Survey.

Rhode Island Odonate Atlas Project



In an effort to expand and enhance knowledge of Rhode Island's dragonfly and damselfly fauna, Ginger Carpenter is organizing the state's first Odonate Atlas Project. Volunteers will assist with collection of specimens from across the state. Currently, 113 species are known to occur in Rhode Island. Although this represents excellent diversity for so small a state, much of the existing data comes from the Pawcatuck Watershed, with lesser amounts from the Blackstone and Moosup Rivers, East Bay, and Block Island. An organizational and training meeting will be held on Saturday, March 28. Anyone interested in participating (even after the March 28 meeting) should call Virginia Carpenter, Director of Science and Stewardship at The Nature Conservancy, at (401) 331-7110.

Rhode Island Collections

The Collections of the Audubon Society of Rhode Island by Nicole Duprey

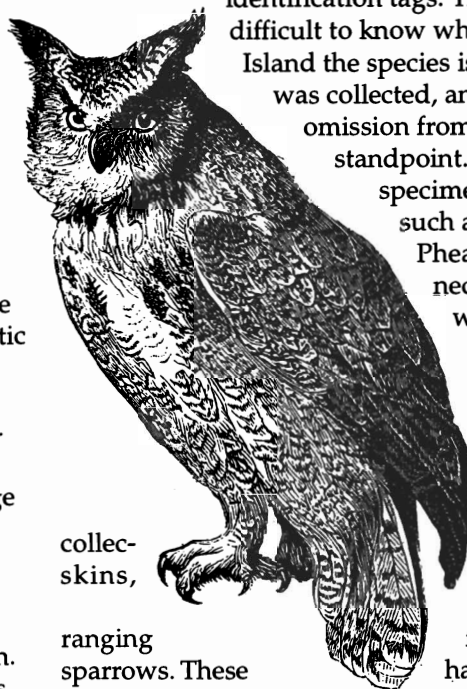
A section of the Hathaway Library of Natural History at the Audubon Society of Rhode Island (ASRI) headquarters in Smithfield, Rhode Island is a treasure trove of collections dating back to the late 1800s. Originally kept in cardboard boxes in the attic of ASRI's former headquarters on the East Side of Providence, these precious collections are now housed in the basement of the new Audubon headquarters, thanks to a grant from the Champlin Foundations, which provided money for the storage rooms and cases. These collections are overseen by Eugenia Marks and cared for by volunteers.

The first storage room in the basement houses rocks, fossils, and bird eggs. The rocks and fossils collection is catalogued and wrapped for protection. This collection was donated to ASRI by a Mr. Wales in the 1960s.

In addition to the rocks and fossils is an extensive collection of bird eggs. Volunteer Connie Costa works painstakingly on cataloging these eggs, to make them useful to scientists and educators. A retired math teacher, Ms. Costa was trained by staff from the Museum of Natural History at Roger Williams Park, and she spends hours matching the numbers on the eggs to the historic nomenclature lists of bird eggs (some of which date from the late 19th century). Some of the eggs are difficult to catalogue because the numbers do not match any lists, probably due in part to the many different collectors. Some of the collectors were hobbyists, amateurs who, in the manner of the late 19th century, routinely collected bird eggs for themselves, while others were scientists.

Various people have donated egg collections to ASRI (many of the collections were found in boxes, packed in sawdust, in old attics or cellars). Some of the bird egg collections were very well maintained, such as the collections from Harry Hathaway (an early ornithologist), Harold Gibbs (Administrator of the R. I. Division of Fish and Game--now RIDEM), and William Sprague. ASRI has approximately five storage shelves filled with Riker boxes that hold the eggs. All these boxes have identification tags which tell the date and place collected, as well as the species of birds from which the eggs came.

In the library and basement of ASRI, there are many stuffed birds which also date from the late 1800s. Ms. Costa cleans and prepares the birds that are brought in. Although some of the mounted birds have useful collection data, many lack complete



collec-
skins,

ranging
sparrows. These
attached, such as date,
species. The skins are treated with arsenic and boron
to preserve them from being eaten by pests, and
stored in trays that are placed in large boxes (skin
cases), donated by the Harvard Museum of Comparative
Zoology.

One outstanding skin collection came from Novio Bertrand of Pawtucket, who brought back specimens from his Arctic expedition to Greenland and the Davis Straits in 1950. His widow donated this collection, which includes storm petrels and fulmars, to the Audubon Society. The skins are valuable both historically and scientifically, because they have dates and places associated with them.

Many other specimens in the skin collection came from Rhode Island. The numbers of some specimens, warblers for example, show their historic abundance in the state. The skins may also demonstrate variations in plumage within a species, due both to seasonal plumage differences as well as genetic diversity. Many of these specimens are quite old (some, dating back to the late 1800s, were prepared by Harry Hathaway and contemporaries), while others were collected by current Rhode Island ornithologists, such as Richard Ferren.

The shell collection is also very interesting. The primary part of the collection came from Dorothy Whitaker of Weekapaug, Rhode Island. Her collection dates back to the 1950s and her original catalogue, with the descriptions of all the shells she found, is also available. Her shells came from around the world, and are kept as a discrete collection.

The shells are kept in Riker boxes, much like the bird eggs. Several of the boxes exhibit the life history of the shells, from their earliest stage to their adult

identification tags. This makes it difficult to know where in Rhode Island the species is from or when it was collected, an unfortunate omission from an historical standpoint. Some of the specimens are not native, such as the Golden Pheasant and Ring-necked Pheasant, which were introduced in Rhode Island for hunting.

The Audubon Society's best collection is of bird skins with approximately 300 skins

from loons to have collection data
place of collection, and

form (for example, one box features stages of the Blue Mussel). Ron Fortunati has computerized the catalogue of shells, including Ms. Whitaker's.

Even though ASRI's collections are no longer systematically acquired, they are useful for educators, students, artists, and scientists alike. The collections may be used for research or teaching purposes, but only at the Audubon Society headquarters building, within guidelines designed to protect the collections. Anyone interested in viewing the specimens should call ASRI at (401) 949-5454 to set up an appointment during normal business hours.

Nicole Duprey works with RIDEM's Narragansett Bay Estuary Program and is an administrative assistant in the RINHS office. We thank ASRI's Eugenia Marks for her help providing information for this article.

Flora Conservanda: New England by Richard W. Enser

The New England Plant Conservation Program (NEPCoP) was initiated under the auspices of the New England Wild Flower Society in 1991. Composed of representatives of state and federal agencies, and many conservation-oriented groups, the goals of NEPCoP are to promote conservation of the region's flora by preventing extirpation and facilitating recovery of endangered plants. The overall policies of NEPCoP are guided by a Regional Advisory Council, but it is the individual State Task Forces that select priority species/populations and direct conservation actions at the state level. The Rhode Island Task Force includes representatives of DEM, The Nature Conservancy, Audubon Society of Rhode Island, RI Wild Plant Society, RI Natural History Survey, University of Rhode Island, Rhode Island College, Brown University, and several other knowledgeable botanists.

An essential element in guiding plant conservation efforts is the compilation of a list of plants of regional concern. Prior to NEPCoP, the New England Botanical Club (NEBC) began compiling state lists of endangered plants in 1975 with the assistance of the U.S. Fish and Wildlife Service. (The Rhode Island contribution was prepared by George Church and Richard Champlin in 1978, and included 123 taxa.) These state lists provided the basis for a regional NEBC list that was published in 1981, although it was understood that many determinations regarding rarity were based on the historic record available in herbaria rather than

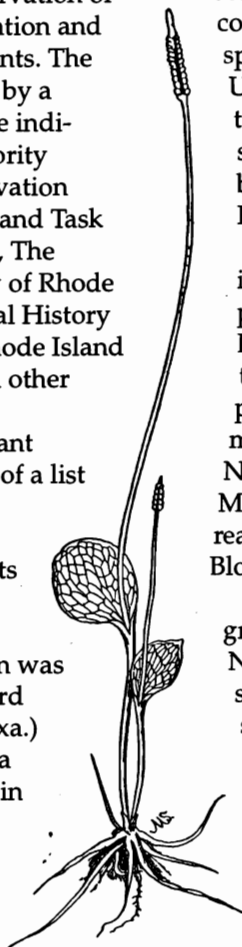
comprehensive field inventory.

The establishment of Natural Heritage Programs or their equivalent in each New England state during the late 1970s facilitated intensive field work on the region's flora which has resulted in a clearer picture of the current status of individual taxa. Newly documented populations led to the addition of plants to state lists, as well as the removal of others determined to be more widespread than previously thought. The information maintained by the Natural Heritage Programs provided the basis for compiling the NEPCoP list of plants in need of conservation, "*Flora Conservanda: New England*," published in 1997.

The NEPCoP list identifies taxa in five divisions. **Division 1** includes taxa which are identified as globally rare/imperiled based on a ranking system developed by the national office of The Nature Conservancy. Plants in this division may be listed as G1, G2, or G3 depending on number of populations and threats, where G1 plants are considered the rarest entities. In Rhode Island, the Sandplain Gerardia (*Agalinis acuta*), currently known from <10 populations worldwide, is the state's only G1-ranked species. In addition, the New England Boneset (*Eupatorium leucolepis* var. *novae-angliae*), known to occur only in Rhode Island and Massachusetts, is considered a G1 plant at the varietal level, the specific *E. leucolepis* being widespread in southern United States. A total of 17 additional Rhode Island taxa are included within Division 1, including the sedge *Schoenoplectus etuberculatus* which has only been found in New England at a single Rhode Island site.

Division 2 includes taxa that are not globally imperiled, but are represented by 20 or less populations (documented since 1970) in New England. Plants in this division may be rare throughout their range, or they may reach the periphery of their distribution in New England. A majority of the Rhode Island taxa included on the NEPCoP list are within this Division, including Maryland Golden Aster (*Chrysopsis mariana*) which reaches the northern periphery of its distribution on Block Island.

Division 3 denotes locally rare taxa. Within this group are plants that may be common in parts of New England, but have one or more populations of some ecological, biological, or possibly genetic significance. Such populations may be disjunct from their primary distributions (suggesting potential genetic isolation), or may occur in an aberrant habitat. This division also includes taxa that are documented by more than 20 populations in New England but are exhibiting demonstrable declines in some states. The measure used for determining disjunction is



separation by more than 50 miles from the primary distribution, and there are no taxa meeting this criterion in Rhode Island. However, three plants were identified that appear to be undergoing marked declines in the three southern New England states: Adder's-tongue (*Ophioglossum pusillum*), Wild Lupine (*Lupinus perennis*), and Swamp Pink (*Arethusa bulbosa*).

Division 4 documents those taxa that formerly occurred in New England but have not been seen since 1970. Six Rhode Island taxa are included in the total of 55 plants determined to be historic in New England. One of these is the Pine-barren Sandwort (*Arenaria caroliniana*) which was last recorded at its only New England site by John Sage in 1912, "....in the salt-marsh back of the sand-dunes at Weekapaug, Rhode Island."

Division 5 houses plants of indeterminate status. Within this group are taxa under review for potential inclusion in the other divisions, but issues have been identified concerning taxonomic distinction or lack of field inventory. Hopefully, identification of these taxa will stimulate research into their true taxonomic and population status.

"*Flora Conservanda: New England*" includes 576 taxa (species and varieties) as outlined below for each division, including Rhode Island numbers in parentheses:

Division 1 (Globally Rare):	57 (20)
Division 2 (Regionally Rare):	273 (68)
Division 3 (Locally Rare):	75 (3)
Division 4 (Historic):	55 (6)
Division 5 (Indeterminate):	116 (32)

Given the state's size, Rhode Island is well-represented in *Flora Conservanda: New England* with 129 taxa (22%). However, it is important to note that 31 of the Rhode Island taxa in Divisions 1, 2 and 4 (24% of the state's entries) are not currently known to occur here (designated as state historic), and 19 others are currently known from only one population. How is a taxon determined to be historical?

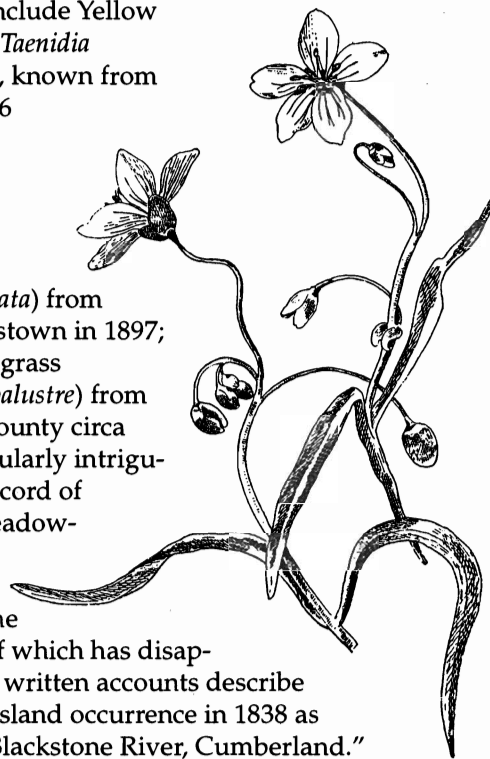
The RI Natural Heritage Program has maintained a list of the state's rare plants since 1979. The development of this list initially involved extensive searching at regional herbaria to acquire an historical perspective of species' distributions. Labels attached to specimen sheets may provide enough directional information to permit relocating the original collection sites and determine if the plant in question is still extant; however, much of the material collected during the mid to late-1800s is inadequately labeled, at times the location identified simply to a town, or in some cases as "Rhode Island." These records can be problematic when they provide the only evidence of the Rhode Island occurrence of a particular taxon.

Examples include Yellow Pimpernel (*Taenidia integerrima*), known from a single 1886 specimen collected in Smithfield; Heartleaf Twayblade (*Listera cordata*) from South Kingstown in 1897; and Arrow-grass (*Triglochin palustre*) from Newport County circa 1878. Particularly intriguing is the record of Virginia Meadow-beauty (*Claytonia virginica*), the specimen of which has disappeared, but written accounts describe the Rhode Island occurrence in 1838 as "Island in Blackstone River, Cumberland."

Some states have adopted an additional listing category of "state extirpated" to identify those species believed to no longer occur in the state either because known populations have been confirmed destroyed, or because their existence on the landscape is beyond practical verification. (In other words, we've looked everywhere it could possibly be without finding it.) Although it is tempting to apply an extirpated status (as an indicator of the level of stress undergone by natural systems), it is impossible to know when a species is truly extirpated, especially a plant. Some species simply remain undetected for long periods of time, such as the Awned Umbrella-sedge (*Cyperus squarrosus*) which was relocated in 1995 on a Warwick pondshore where it was last recorded in 1877. This species may have simply been overlooked, or its propagules may have remained dormant in the seed bank until the appropriate environmental conditions stimulated germination. This mechanism is characteristic of many plants that are dependent on natural disturbances, such as fire, flooding, or drought, to create ephemeral habitats which are exploited by some species for relatively short periods.

Plants also may have their propagules moved to new areas by wind, wave or animal transport. The Federally Threatened Seabeach Amaranth (*Amaranthus pumilus*) was found at two marine beaches in Rhode Island during the mid-1800s, and has since remained undetected. However, recent

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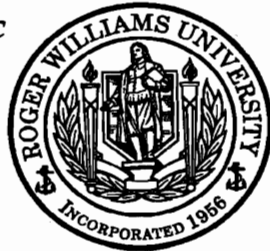


Focus On RINHS Institutional Members:

Roger Williams University:

Center for Economic
& Environmental
Development

by Mark D. Gould



A new acronym for a new building, a new program, and new directions surfaced this past July in Bristol. CEED, the Center for Economic and Environmental Development, was completed by Roger Williams University. The building (41,000 sq ft) houses the marine biology, biology, chemistry, mathematics, and computer science departments as well as the Center. CEED has been designed to continue excellence within RWU's undergraduate programs, as well as to research, propose, and implement new directions for how the environment, economics, and education may be integrated.

Rhode Island is a microcosm of the world, a city-state in which economic prowess and environmental awareness have been woven together (most often by chance) over the years. Rhode Island's economic vigor began with the industrial revolution, when industries developed based upon the natural resource of water power and the availability of skilled workers. From sailing to commerce to mills to quahogs to tourism, the environment has played an important part in the economy. During the 20th century, as energy became less expensive elsewhere, the industrial base of the Rhode Island weakened and the economy stagnated. Through it all Naragansett Bay remained the premier natural resource, albeit somewhat degraded. More recently the state has become a bedroom community for greater Boston, with resulting "boom and bust" cycles; the area is among the first to express an economic downturn and one of the last to recover. But over and over it is to the Bay and its resources that future development is sought, often without regard to the long-term economic and environmental health of the region.

CEED is a program, a building, and a vision. As a program, it is designed to integrate the local communities, the University, businesses, environmental organizations, federal and state agencies, and individuals to better understand the natural systems. The Center for Economic and Environmental Development literally is the equivalent of an umbrella designed to bring together people to better understand their niche and habitat. The Roger Williams

University programs in Science, Business, Engineering, Law, and Architecture are involved in the development of CEED projects. These include the development of technologies and markets, and better utilization of resources. Major undertakings include continuous, real-time scientific monitoring of the Bay, aquaculture projects, and computer simulations of the Bay under different circumstances. Public education, including credit and noncredit programs, is being implemented in: Teacher Certification, Marine Biology Certification, Seafood Handling, Hazardous and Occupational Health, and Museum Certification Study. We also envision a series of events centered on the Bay, especially the East Bay in which people can become more familiar with their environment and economy by means such as clambakes, seminars, workshops, job fairs, and other professional development opportunities.

As a building, CEED houses Roger Williams University's undergraduate education program in the sciences and mathematics. The traditional focus of the University continues to be the training of undergraduates. Undergraduate programs in Marine Biology (one of the first in the country, begun in 1974), Biology, Chemistry, Mathematics, and Computer Sciences are housed within the building which contains a wet-lab with Mt. Hope Bay waters pumped in/out, as well as traditional research labs. These state-of-the-art facilities enable more faculty and undergraduate research (such as in marine biotechnology and aquaculture) dealing with the southern New England area. The building is also designed to stimulate interest in the sciences by hands-on experiences and observations. From the polar bears and whale in the lobby to the marine touch tanks, activities are occurring that foster learning at all ages.

As a vision, CEED will develop long-term sustainable employment opportunities for residents of the East Bay. It is the goal of CEED to minimize conflict between the economic and environmental communities, and bring people together to understand the multiple uses of an environment and the limits that can be employed. The Bay is the greatest natural resource that the area has; complementary uses *are* possible, resulting in long-term sustainable entrepreneurial ventures, businesses that reinvent and reorient themselves, and the development of connections between the classroom and laboratory with the world from which people make their living.

Mark D. Gould is Director of the Center for Economic and Environmental Development at Roger Williams University in Bristol, Rhode Island. He also serves on the Board of Directors of the RINHS.

Flora Conservanda, continued from page 12

findings on Long Island indicate this species colonizes new sites by ocean transport of fruits and seedlings, and the potential remains for its reappearance on the Rhode Island shore.

Although we may not be able to strictly assign an "extirpated" status, from a conservation perspective it is of little concern whether a particular species found once in the 1800s might still be here or not. Of more concern should be those species that were documented as formerly widespread, but have today declined to critical levels, or disappeared.

One candidate for the "poster child" of Rhode Island rare plants might be the Seaside Buttercup (*Ranunculus cymbalaria*). This plant of upper salt marsh edges and other brackish habitats was widely distributed in Rhode Island at the turn of the century, being reported in Narragansett Bay from Portsmouth, Bristol, East Providence, and the "covelands" of Providence. During his visit to Block Island in 1895, William Whitman Bailey described this plant as "abundant" in the marshes around Great Salt Pond. It was last collected by Elmer Palmatier in 1948 from a site near Potters Cove in South Kingstown, and since then Seaside Buttercup has not been found anywhere in the state. The loss of this species, and others that inhabit brackish and fresh tidal marshes, is indicative of the degree to which Rhode Island's coastal habitats have been degraded. In addition to filling of marshes, damming of tidal rivers, and bulkheading of waterfronts, it appears that the construction of permanent breachways and the resulting alteration of tidal regimes and salinity levels may have been another factor responsible for the decline of Seaside Buttercup.

Ranunculus cymbalaria does not appear in the 1997 edition of *Flora Conservanda: New England*, but when the list is revised in five years this species will certainly be one addition, as similar declines are being documented in Connecticut and Massachusetts. Beyond what the authors hope the NEPCoP list may offer in the way of directing conservation actions, the publication of *Flora Conservanda* also serves as a painful reminder of losses already sustained, and the arduous task ahead of preserving the region's remaining natural heritage.

Flora Conservanda: New England was published as an issue of *Rhodora*, the journal of the New England Botanical Club. Copies may be obtained for \$9.00 from the New England Wild Flower Society, 180 Hemenway Road, Framingham, MA 01701.

Richard Enser is the coordinator/botanist of the RI Natural Heritage Program, and chairman of the RI State Task Force of NEPCoP. He also serves as Vice-president on the RINHS Board of Directors

Valuing Forested Land, continued from page 9

will currently have some land that is not already enrolled in existing programs promoting forest stewardship. The cooperating landowners will need to offer to enroll a portion of their land in a forest stewardship program, and to modify their original harvest plans to include additional forest management practices that promote wildlife habitat, water quality, or reduced wetland impacts. In exchange, URI would pay landowners an annual fee during the period of cooperation.

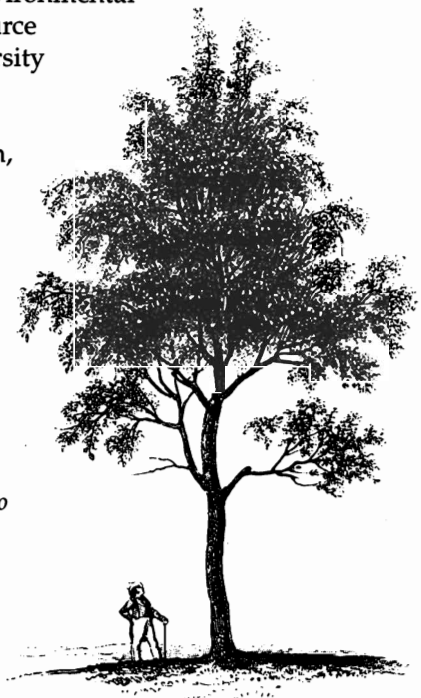
Professor Swallow will be working with a group of professional foresters, scientists, and volunteers to select land that is most suitable for the research project. Criteria will include proof of landowner's right to enter contracts concerning timber harvest and how the landowner's parcel fits in with the research project. Parcels will be chosen to provide a range of characteristics, such as forest type, suitability for wildlife habitat, and scenic qualities. At least one parcel of land will either be a forested wetland or adjacent to a wetland site. In addition, Swallow is looking for at least one parcel of land that is adjacent to an existing wildlife reserve (such as a RIDEM Management Area, or property of a non-profit conservation group or land trust).

The research is expected to provide forest conservators' groups with information that demonstrates a real, economic commitment by citizens who want to keep the forested landscape from being converted to other uses.

For more information, contact Stephen Swallow, Department of Environmental and Natural Resource Economics, University of Rhode Island, 5 Lippitt Road, Suite 319, Kingston, RI 02881 (office 401-874-4589).

This article originally appeared in the newsletter of the Rhode Island Forest Conservators Organization.

Stephen Swallow also serves on the RINHS Board of Advisors.



RINHS Institutional Members: Special News & Events

Humboldt Field Research Institute announces the 1998 Eagle Hill Advanced and Professional-level Seminars and Workshops in: Quaternary Geology and Geomorphology Field Camp; Research participation: Coastal Ecosystems in Time; Mosses, Liverworts, and Sphagnum Mosses; Bryophyte Ecology; Herbarium Techniques: Collecting and Curating Vouchered Specimens; Aquatic Entomology; Amerindian Ethnobotany in Maine; Dragonflies and Damselflies of the Northeast; Sedges, Rushes, and Grasses; Ecology Field Studies for Educators; Aquatic Flowering Plants; Plant Ecology; Community Ecology: Analysis and Assessment I & II; Earth and Space Science for Educators I & II; Water Quality Assessment; Wetland Identification, Delineation, and Classification; Applied Ecological Restoration; Mayflies: Ephemeroptera; Guild of Natural Science Illustrators Master Class; Scientific Writing and Communication; Biology of Spiders; Forest Ecology; Field Pteridology: Ferns and Fern Allies; Fall Mushroom Foray I & II; Natural Lichen and Plant Dyes; Fall Botany; Science of the Professional Botanical Survey; Lichens and Lichen Ecology. For information contact Humboldt Field Research Institute, P.O. Box 9, Steuben ME 04680; (207) 546-2821; email humboldt@nemaine.com; <http://maine.maine.edu/~eaghill>

Portsmouth Abbey School, the Marine and Environmental Studies Program, has established a long-term monitoring program in the East Passage of Narragansett Bay as well as in a freshwater pond on the campus property. Parameters being monitored include temperature, dissolved oxygen, carbon dioxide, phosphates, nitrates, pH, and salinity; climatic conditions and sea states are also being recorded at sampling times. The Program has plans to expand the monitoring to include plant and invertebrate species.

Individuals who would like to participate in this project on a regular basis are welcome to join in the effort. An internship for URI students is already in place; contact Linda Gaulin at the URI Office of Internships and Field Experience at (401) 874-2160.

Institutions and individuals that might like to work with the Marine and Environmental Studies Program at Portsmouth Abbey should contact Bruce Moravchik at (401) 683-6862; email: cpk101@uriacc.uri.edu

The Rhode Island Wild Plant Society will host its first annual Plant-a-thon on Saturday, May 16. Join in the fun to see how many blooming things you can find on that day, and help raise funds for RIWPS programs. Other summer events include the Spring Plant Sale at URI on June 6, a 5-day Wild Plant Identification Course (taught by RINHS Executive Director Lisa Gould), a grasses workshop, and many other walks and events. For information and registration, contact the office at (401) 783-5895.

Save The Bay and the Barrington Land Conservation Trust are hosting a salt marsh restoration project on Saturday, April 18, Sunday April 19, and Saturday April 25, to restore the Pic-Wil Preserve salt marsh along the Providence River in Barrington. Volunteers are needed to help

with all aspects of the restoration from digging a small creek to replanting salt marsh vegetation. For information contact Wenley Ferguson, Save The Bay, (401) 272-3540.

Trout Unlimited--Narragansett Chapter seeks volunteers for fry stocking in a salmon restoration program. The Federal and State supported Pawcatuck River Anadromous Fish Restoration Program will continue this spring, 1998, with the Sixth Annual Atlantic Salmon Fry Stocking Project. In cooperation with Trout Unlimited's Narragansett Chapter, RIDEM's Division of Fish & Wildlife is seeking volunteers to assist with stocking 375,000 juvenile salmon (fry) in assigned streams in the Pawcatuck Watershed.

The fry, from adult salmon spawned in the fall of 1997, will be provided by the N. Attleboro (MA) National Fish Hatchery. Some schedule flexibility on the part of volunteers is necessary because the rate of fry development at the hatchery is variable. The stocking event is tentatively scheduled for either the weekend of April 25 & 27 or May 2 & 3.

Volunteers should expect to spend most of the day carrying small buckets of salmon fry and distributing them into appropriate habitat of tributaries in the watershed. Chest waders or hip boots are recommended. A lunch will be provided by Trout Unlimited.

This restoration program is a cooperative effort between the U. S. Fish and Wildlife Service, RIDEM's Division of Fish and Wildlife, and the Narragansett Chapter of Trout Unlimited. John Brown from Trout Unlimited will serve as volunteer coordinator; he may be reached at (401) 783-4209. Additional questions may be directed to Senior Fisheries Biologist Dennis Erkan at the Great Swamp Field Office at (401) 789-0281; email derkan@edgenet.net

The URI Cooperative Extension Education Center and the URI Master Gardener Association will present their third annual "Spring into Action with the Gardening Experts" on Saturday, April 25, 8:30 a.m. to 3:00 p.m., in the Learning Landscape Gardens at the University of Rhode Island, Kingston, RI. For information call (401) 874-2900.

The URI Environmental Data Center and the City of Warwick announce the creation of a large scale, high resolution database for a six square-mile area along Narragansett Bay. The backbone of the database is a 1:1,200 digital orthophotography (6 inch pixel size) in true color and color infrared film. Other data (buildings, impervious surface, parcels, etc.) have been added to the database. The data has been used to experiment with wetland mapping, hydrological modeling, and non-point pollution assessment.

The project may be accessed from the World Wide Web: www.edc.uri.edu/gis (click on Warwick Ortho Project).

1998 Earth Day Cleanup

Join your friends and neighbors to help make your neighborhood a better place to live--organize or participate in an Earth Day Cleanup! Target date is April 18, but support is available from the R. I. Earth Day Committee on other dates. Call Eileen Marino at 1-800-CLEANRS, ext. 4435 for information.

Upcoming Conferences & Seminars

April 2 *Going South for the Winter: Perils Facing Neotropical Migratory Birds*, an RINHS lecture by **P. A. Buckley** (USGS Patuxent Wildlife Research Center), 7:30 p.m., Moses Brown School, Providence, RI. Free. (401) 874-5800. Cosponsored by Moses Brown School.

April 4, 23, and May 6 *Vernal Pools for Educators*, one-day workshops held in Wellfleet, Northfield, and Byfield, MA, sponsored by the Wright Center for Innovative Science Education, Tufts University. Geared for middle and high school teachers, this workshop is to help get teachers involved in vernal pool studies as a science or interdisciplinary activity.

Other workshops sponsored by the Wright Center: *Frontiers in Science Education*, June 18-21, Byfield, MA *Oceanology for Educators*, June 24-26, in Marian, MA *Art and Science for Educators*, August 2-5, Byfield, MA *Space Science for Educators*, August 5-8, Byfield, MA

For information call the Wright Center at (617) 628-5000 x 5394; email wright_center@emerald.tufts.edu

April 6, 7, & 8 *Coastal Studies programs* (habitat explorations) at Portsmouth Abbey School, Portsmouth, RI sponsored by Save The Bay. Contact Morgan Hardwick-Witman at (401) 272-3540.

April 13-18 *Reimagining of Ecology: art and design in community with nature*, a week-long symposium hosted by the Rhode Island School of Design and The Orion Society, to explore the role of the arts in informing social and environmental change. The symposium week will feature over 30 accomplished artists, in exhibitions and programs designed to engage public awareness of ecological, aesthetic, historical, mythical, literary, artistic, and scientific concepts of nature. All events are free and open to the public; for a complete program call (401) 454-6451.

April 18 *Wildflowers Across New England: In the Wild and In the Garden*, a lecture by Henry Art (Williams College, Williamston, MA), 10 to 11:30 a.m., Tower Hill Botanic Garden, Boylston, MA. (508) 869-6111.

April 28 *The Biology of the Rocky Shore*, a free workshop for teachers led by Prudence Island naturalist Kim Botelho at Portsmouth Abbey School in Portsmouth, RI, 3:30-4:30 p.m. Co-sponsored by the R. I. Environmental Education Association and ASRI; for information call ASRI at (401) 949-5454.

May 9+ *Wetland Training Workshops*: The Rhode Island Association of Wetland Scientists (RIAWS) in association with the Audubon Society of Rhode Island (ASRI), is planning four one-day field-intensive wetland training workshops. These workshops are geared for training high school teachers and local government staff to learn more about the structure and functioning of both freshwater and tidal wetlands in Rhode Island.

The four training workshops will take place on ASRI refuges as follows: May 9, Parker Woodland, Coventry; June 6, Eppley Forest, West Kingston; September 19, Touisset Marsh, Warren; October 17, Eppley Forest.

A maximum of 20 participants will be accepted for each workshop on a first-come, first-served basis. Advanced high school students may also be accepted, pending available class space. The workshops will consist of brief in-class presentations followed by a full day in the field, where participants are expected to actively collect and compile botanical, soils, hydrologic, and habitat data. A nominal \$20 fee is requested to cover costs of training materials. Teachers, municipal staff, and students interested in participating may contact Jim Turek at (401) 272-8100 (business hours).

May 10 *Salamanders, Turtles, and Snakes, Oh My!*, a field trip at the Lloyd Center for Environmental Studies, S. Dartmouth, MA, 1 to 5 p.m. Contact Mark Mello at (508) 990-0505.

May 10-June 12 *Smithsonian Institution's Biodiversity Measuring, Monitoring, and Research* course, Conservation and Research Center, Front Royal, Virginia. An intensive, 5-weeks course. For information contact Christopher Ros, (202) 357-4793; email cjr@ici.si.edu Homepage: <http://www.si.edu/organiza/museum/ripley/simlab/start.htm>

May 25-30 *Annual Meeting of the Society for the Preservation of Natural History Collections: Collections on the Move: Strategies for the New Millenium*. University of Alberta, Edmonton, Alberta, Canada. For information contact (403) 492-5834; email lisa.barty@ualberta.ca

May 30-31 *Annual Open House at the National Weather Service Office*, 495 Myles Standish Blvd., Taunton, MA, 10 a.m. to 5 p.m. on May 30; noon to 5 p.m. on May 31. The Rhode Island-Bristol County Observer Network (RIBCON) will be participating in the event, which will feature educational displays and information about how to become involved in weather observers' networks. For information contact Raymond Vincent at (401) 421-8382.

June 6 *Rhode Island Wild Plant Society Spring Plant Sale*, URI Greenhouses, Flagg Road, Kingston, RI. Members only 8:30-9:30 a.m.; general public 9:30 to noon.

June 7 *Wildflower Festival*, Connecticut State Museum of Natural History, University of Connecticut, Storrs, CT, 1 to 5 p.m. More than 200 live wildflowers and ferns will be featured, along with slide talks by experts and hands-on activities for children. \$5/adult; \$2/child.

The Museum also offers tours of its greenhouses, which shelter one of the northeast's largest plant collections. For information call (860) 486-4460.



Opportunities for Volunteers & Students

Audubon Society of Rhode Island, 12 Sanderson Road, Smithfield, RI 02917, welcomes volunteers to help with property surveys and inventories, checking property bounds, doing trail maintenance, and serving as trail wardens. Contact Properties Manager Dave Rodrigues at (401) 949-5454.

Blackstone River Valley National Heritage Corridor Commission, in conjunction with the Massachusetts Audubon Society, EPA-Region 1, the Toxic-free Diet Program, RIDEM, and other local groups in the Blackstone River watershed, seeks volunteers to help assist and organize stormdrain stenciling in their communities, on Saturday, May 16, from 9:00 a.m. to noon. For information contact Alison McDeedy (BRVNH) at (401) 762-0250, or Donna Williams (MA Audubon) at (508) 753-6087.

Coastal Institute, URI Narragansett Bay Campus, Narragansett, RI 02882 seeks volunteers and student interns to assist with a variety of marine and environmental education activities. Contact the Office of Marine Programs at (401) 874-6211.

GREEN VOLUNTEERS, *the World Guide to Voluntary Work in Nature Conservation*, has published its 1998 edition. The guide contains about 120 projects worldwide where people can volunteer for short or long term. The Guide is an excellent resource for students for finding new research opportunities. For more information visit the website at: www.greenvol.com

For more information on how to include your project (needing volunteers) in the next edition (free of charge), contact Green Volunteers at greenvol@iol.it

Johnson & Wales University, 8 Abbott Park Place, Providence, RI 02903 is seeking sites and site supervisors for students during winter 1998-1999. Thanks to an endowment from Alan Shawn Feinstein, 1000 students (mostly sophomore business majors) per year will be placed in positions to work from 1-4 hours per week for 8-10 weeks, where they will help with activities such as organizing walks, public events, or educational fairs. For information contact Matthew McConeghy at (401) 598-1766.

Lloyd Center for Environmental Studies, P. O. Box 87037, S. Dartmouth, MA 02748, (508) 990-0505 has spring and summer internships for students who have completed their sophomore year of college. Positions available with housing & stipend of \$100/week. Send cover letter, resume, & two letters of reference. Positions available:
(1) 4 Education Interns to work with school children, youth groups, and adults in programs teaching about the coastal zone.
(2) 1 Research Intern for field surveys of Lepidoptera in pine barrens and coastal bogs.
(3) 1 Administrative Intern to assist in membership development and publicity.

Massachusetts Audubon Society, South Great Road, Lincoln, MA 01773; (781) 834-9661. The Coastal Waterbird Program needs 6 Piping Plover/Tern monitors for the 1998 breeding season, and 2 Coastal Waterbird Monitors/

Naturalists during the summer. Weekly stipend of \$210. Also needed are volunteer Coastal Waterbird Interns (12) and Coastal Plain Pond Interns (3), for a minimum of 32 hours/week during the internship period.

For all positions, send cover letter and resume to Scott Hecker at the above address, ASAP.

The Nature Conservancy, Rhode Island Field Office, 45 S. Angell Street, Providence, RI 02906 is looking for volunteers to monitor Piping Plover and Least Tern sites in Rhode Island. Unique opportunity to help endangered species. Contact Griff Venator at (401) 331-7110.

The Newport Aquarium, 18 Market Square, Newport, RI 02840 needs enthusiastic and responsible summer interns to educate visitors about marine animals, assist with school groups, help care for marine animals, and conduct beach tours. Students with a background or interest in natural sciences, marine studies, or education are encouraged to apply and participate in this fun and rewarding summer experience. Contact George Klein at (401) 849-1340.

Rhode Island's National Wildlife Refuges: Ninigret, Trustom Pond, Pettaquamscutt Cove, Sachuest Point, and Block Island Refuges need your help counting wildlife, banding birds, constructing nesting boxes, maintaining trails, leading nature walks, and assisting refuge visitors. The program offers you several areas of opportunity; these include biological, visitor interpretation, education and orientation, maintenance, and miscellaneous skills. For more information contact Pamela Hess at (401) 364-9124.

Rhode Island Natural History Survey, C.E. Education Center, 3 E. Alumni Avenue, URI, Kingston, RI 02881, seeks a volunteer to help with the newsletter and other Survey projects. Computer skills (especially PageMaker and database experience) are particularly welcome. Contact Lisa Gould at (401) 874-5800.

Roger Williams Park Museum of Natural History, Elmwood Avenue, Providence, RI 02905 has a number of collection-related projects for (unpaid) student internships; projects include identification, nomenclatural updating, cataloging, and conservation of the museum's 10,000 specimen herbarium and 80,000+ mollusk collection.

Opportunities to work with other natural and physical science collections exist as well. Independent research that earns college or graduate credit toward degree completion is encouraged and welcomed. For information contact: Marilyn Massaro, Curator, (401) 785-9457 ext. 248.

Roger Williams Park Zoo in Providence, RI has an intern program designed for people considering a career in the zoo world. It provides initial zoo experience and exposure to different zoo careers. Interns spend a minimum of 4 days/week for 10 weeks in the program. Admission to the program is based on an application and interview. For information contact: Curator of Education, Roger Williams Park Zoo, Elmwood Ave., Providence, RI 02905; (401) 785-3510 x 353.

Rose Island Lighthouse Foundation, P. O. Box 1419, Newport RI 02840 has part-time paid positions to guide at the lighthouse in the summer, 20-40 hours/week. Training begins July 7, then the job runs July 16-Labor Day. Interest in education, lighthouses, history, birds, native plants,

Opportunities, continued from page 17

and/or marine biology is helpful. Enthusiasm and reliability are required. Contact Charlotte Johnson, Executive Director, at (401) 847-4242.

Save The Bay, 434 Smith Street, Providence, RI 02908 has unpaid/college credit award internships in all departments including: environmental education, habitat restoration, citizen monitoring, environmental policy, and nonprofit administration including program planning, communications, and development. Many volunteer opportunities are also available. For an application and more information, contact Kathryn King, Internship & Volunteer Coordinator, at (401) 272-3540.

See also p. 15 for description of a salt marsh restoration project to be held in April--volunteers are needed!

The Sierra Club, RI Chapter has many interesting opportunities for volunteers. The chapter is always looking for people interested in leading outings to natural areas. The RI Chapter is also active in issues related to the protection and restoration of natural resources, through education, media, lobbying, and electoral work. Anyone interested in calling or writing public officials or writing letters to the editor is encouraged to join our activist network.

The RI Chapter also has a large slate of natural history based outings throughout the year. Call the RI Chapter at (401) 521-4734, or write: Sierra Club, RI Chapter, 10 Abbott Park Place, 4th Floor, Providence, RI 02903.

Trout Unlimited--Narragansett Chapter seeks volunteers for fry stocking in a salmon restoration program, either the weekend of April 25 & 27 or May 2 & 3. For more information see the article on p. 15.

URI Learning Landscape, C. E. Education Center, URI, Kingston, RI 02881 is looking for volunteer educators for Fall 1998, to help teach elementary school children in a hands-on environmental education program focused on the soils, water, plants, and wildlife of Rhode Island. The program runs Wednesday, Thursday, and Friday mornings September-November, with training in September. Contact June Kinigstein at (401) 874-5706.

URI Watershed Watch begins 1998 volunteer training on April 4 (Chafee Hall, URI), with field training sessions on April 18 and May 2.

Training for the new Pawcatuck Stream Monitoring project will begin April 1 at the Wood-Pawcatuck Watershed Association headquarters in Hope Valley, RI. Coordinated by the WPWA and the North Stonington Citizen's Land Alliance, volunteers are sought to monitor the stream flow at a number of river sites throughout the Pawcatuck watershed.

For information contact Linda Green or Elizabeth Herron at (401) 874-2905; email RIWW@uriacc.uri.edu

Wood-Pawcatuck Watershed Association, 203 Arcadia Rd., Hope Valley, RI 02832 seeks volunteers to help with WPWA's Opening Day event on April 11, and at the Trails Day cleanup at Browning Mill Pond on June 6. For information call the WPWA office at (401) 539-9017; email rooks@brooktrout.gso.uri.edu

Rhode Island Natural History Survey, Inc.

Cooperative Extension Education Center
3 East Alumni Ave., URI, Kingston, RI 02881
Telephone: (401) 874-5800; Fax 401-874-2259
Email: RINHS@URIACC.URI.EDU
Website: <http://www.edc.uri.edu/rinhs/nathist.htm>

Advisors to the Rhode Island Natural History Survey:

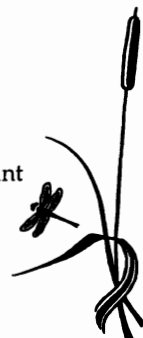
David H. Abedon, R. I. Cooperative Extension
Peter V. August, URI Dept. of Natural Resources Science
Allan D. Beck, Narragansett Bay National Estuarine Research Reserve
David Blockstein, Committee for the National Institute for the Environment
J. Allan Cain, URI Department of Geology
Virginia A. Carpenter, The Nature Conservancy
Richard W. Enser, RIDEM Natural Heritage Program
Howard S. Ginsberg, USGS-Biological Resources Division
Mark D. Gould, Center for Economic and Environmental Development, Roger Williams University
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Weaving the Web: Electronic Resources

Botany online: Internet Directory for Botany (IDB), a collection of links and information about all aspects of the plant kingdom, arranged in easily navigable and searchable forms. Links are given to arboreta, herbaria, botanical gardens, and university botany and biology departments. Checklists of flora, taxonomic databases, and image collections are also gathered here. <http://herb.biol.uregina.ca/liu/bio/idb.shtml>

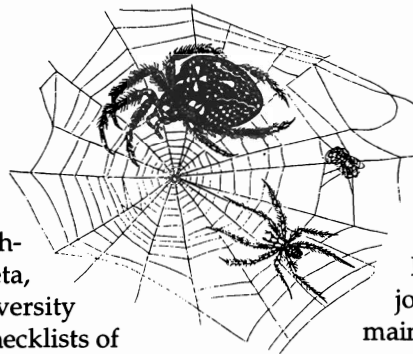
Committee for the National Institute for the Environment offers great information resources on environmental topics such as biodiversity, climate change, energy, agriculture, forestry, marine issues, international laws and treaties, and much more. Website: <http://www.cnie.org>
For the on-line library: www.cnie.org/biodi/bioframe.htm

Cornell University biodiversity and biological collections site: <http://muse.bio.cornell.edu>

Dragonflies and Damselflies of Cape Cod website, including information about odonates and hundreds of photographs of species found in New England: <http://www.capecod.net/~bnikula/onz.htm>

Earthwatch Institute Expedition Guide: <http://www.earthwatch.org/x/Xolson.html>!

Environmental Protection Agency (EPA) announces over 6,000 EPA publications now available over the Internet. From the National Environmental Publication Information Site (NEPI) you can search and view these full image scanned publications and OCR text from the EPA public access server at: <http://www.epa.gov/cincl/>



For information about the server, click on the hypertext link "About the Search Engine."

Environmental Careers Bulletin website: www.ecbonline.com

Humboldt Field Research Institute: information about the Eagle Hill Field Seminars and the regional journal *Northeastern Naturalist*: <http://maine.maine.edu/~eaghill>

The International Society for Conservation GIS (SCGIS) announces its website: <http://www.scgis.org>. The site contains information on how to join SCGIS, who its members are, and many useful conservation GIS links.

Lloyd Center for Environmental Studies website: <http://www.ultranet.com/~lloydctr>

Starfish, a collection of free databases to help college and university faculty integrate environmental and sustainability issues into their teaching. Website: <http://www.starfish.org>

The Nature Conservancy 1997 Species Report Card: the State of U.S. Plants and Animals, is available at website <http://www.springer-ny.com/journals/ecosystems>.

U. S. Department of Agriculture's Working Group on Water Quality website, describing recent efforts to reduce agricultural nonpoint-source pollution. <http://www.na.usda.gov/progress.html>

Urban Wildlife Resources website: <http://www.erols.com/urbanwildlife>

USGS Biological Resources Division has initiated a new electronic clearinghouse for Biological Data, a part of the National Biological Information Infrastructure (NBII) effort to increase access to biological data and information. <http://www.fgdc.gov/>



√ Please include me as a member of the
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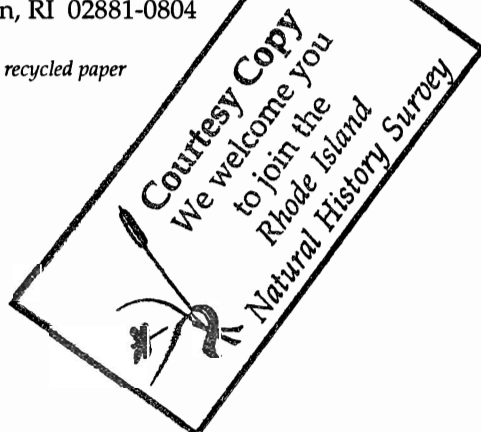
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Northeastern Naturalist: New Member Benefit

RINHS members may now subscribe to the regional journal, *Northeastern Naturalist*, at a 20% discount (\$24/year regular subscribers; \$16/year students). Check out your renewal notice for detailed information.

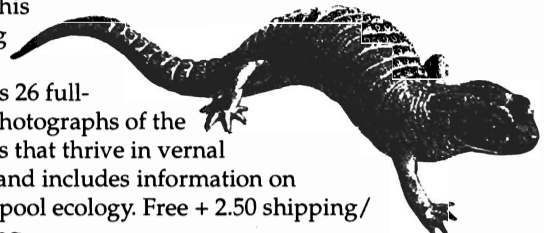
**RINHS Publication Listing Expands
New on the RINHS Publication Listing:**

Animal Care from Protozoa to Small Mammals, by F. Barbara Orlans. 1977. Addison-Wesley Publishing Company, Boston, MA. ISBN 0-201-05484. An indispensable reference for anyone who needs to know the details of raising and caring for a wide variety of organisms, with a focus on humane and ethical care. Also a goldmine of information for science projects and classroom use. Softbound. 374 pp. \$22.00 + 3.95 shipping/handling.

Caterpillars of Eastern Forests, by David L. Wagner, Valerie Giles, Richard C. Reardon, and Michael L. McManus. 1997. Forest Health Technology Enterprise Team, Forest Service, U.S.D.A., FHET-96-34. 113 pages, paperbound. Information on the life history, ecology, rearing, and photography of caterpillars, with 245 species descriptions and 210 color photographs. Free + 3.95 shipping/handling.

Vernal Pool Life, a poster prepared by Wright Center for Science Education, Tufts University, in conjunction with the MA Natural Heritage Program, Vernal Pool Association, Environet, and the SweetWater Trust. 1997. 11" wide x 38" long. This striking poster features 26 full-color photographs of the animals that thrive in vernal pools, and includes information on vernal pool ecology. Free + 2.50 shipping/handling.

Brooklyn Botanic Garden books on invasive plants, gardening with native plants, butterfly gardens, and more, will be available in early April. Watch for coming announcements.



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