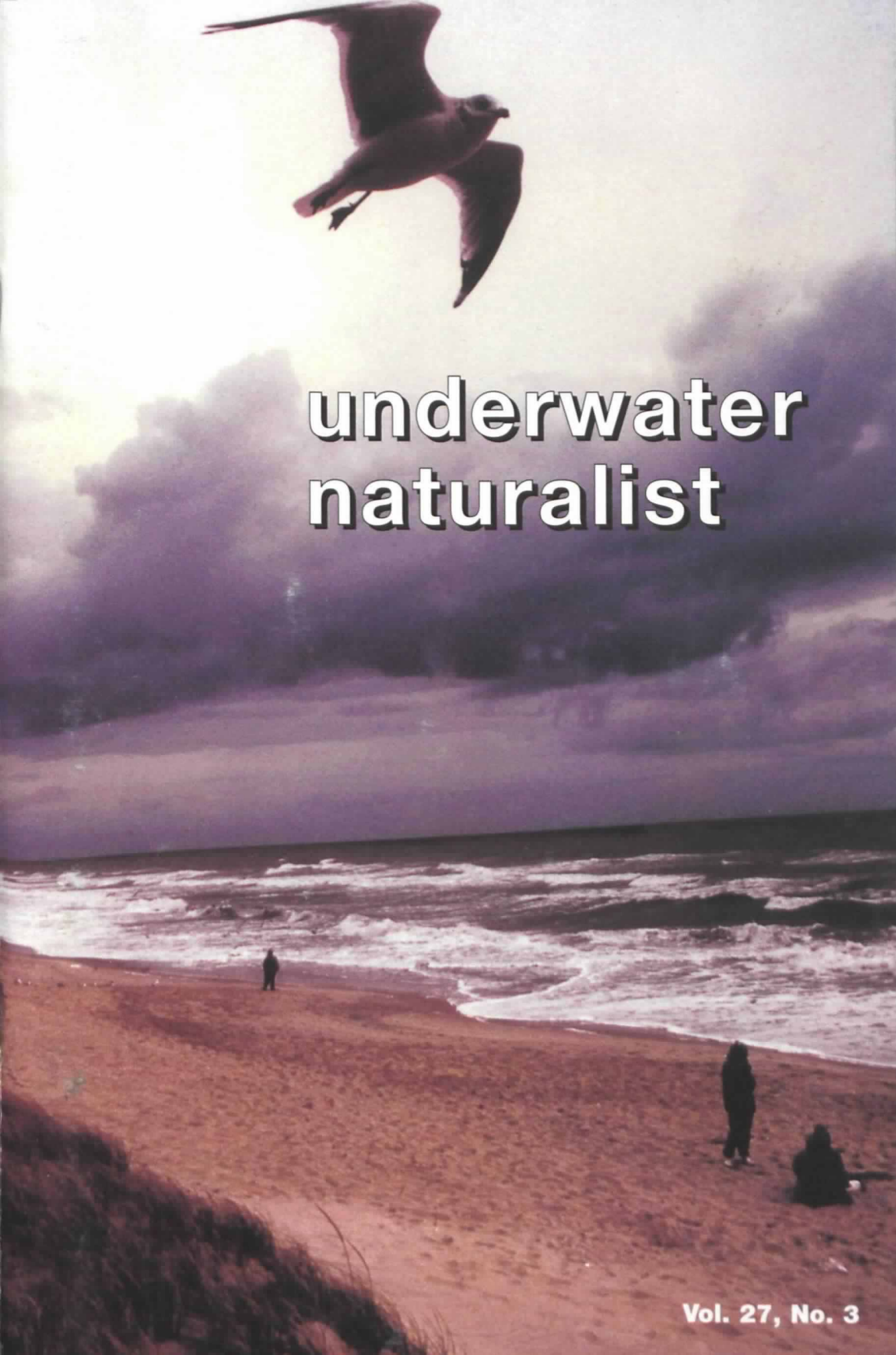


underwater naturalist

Vol. 27, No. 3

AMERICAN LITTORAL SOCIETY REGIONAL OFFICES

The Society maintains regional offices where members may keep up with local issues and events. Call the chapters for newsletters and local field trip information.

New Jersey
Highlands, NJ 07732
732-291-0055

South Jersey
P.O. Box 1306
Tuckerton, NJ 08087
609-294-3111

Institute of Coastal Education
3419 Pacific Ave.
Wildwood, NJ 08260
609-729-9262

NY/NJ Harbor Baykeeper
52 West Front St.
Keyport, NJ 07735
732-888-9870

Northeast Region
28 West 9th Road
Broad Channel, NY 11693
718-318-9344

Southeast Region
4154 Keats Drive
Sarasota, FL 34241
941-377-5459

Delaware Riverkeeper
P.O. Box 326
Washington Crossing, PA 18977
215-369-1188

Project ReefKeeper
2809 Bird Ave., Suite 16
Miami, FL 33133
305-358-4600

Jamaica Bay Guardian
28 West 9th Rd.
Broad Channel, NY 11693
718-318-9344

Lake Pontchartrain, Louisiana, six years before Katrina. See pages 15-18 for a report on the impacts of the twin Gulf storms on Mississippi's oyster coast.

Bulletin of the
American
Littoral Society

40 Years of Fish Tagging

Volume 27, Number 3

Cover Photo: by Martha Kitzmiller
In winter, the ocean is likely to act up. Here it pounds the beach at Cape Henlopen, at the northern end of the Delaware coastline.

Underwater Naturalist is the bulletin of the American Littoral Society, Sandy Hook, Highlands, NJ, 07732, and is mailed to members only as part of their dues. $35 for individuals, and $50 for clubs.

Note: Past volumes of Underwater Naturalist and individual articles are available on microfiche from UMI, Ann Arbor, MI 48106.

SANDY HOOK URCHIN SOURCE?

Please forward this note to Dave Grant, author of "The Arrival of Arbacia," in Underwater Naturalist 27(1).

Over an eight-year period, 1996-2004, we found an average of 1914 of these purple urchins per square meter (sea floor footprint) of experimental reef habitat on the Barnegat Light Reef Site (off Long Beach Island, NJ). The urchins ranged in size from BBs to golf balls.

The Sandy Hook Reef, which has over a million cubic yards of reef material, may also provide a home for urchins. From that reef, urchins could easily be carried into Sandy Hook Bay.

Bill Figley
Reef Coordinator
NJ Division of Fish and Game
Port Republic, NJ

ARE STRIPED BASS SNOWBIRDS?

I guess it's a simple question, but I've never received a straight answer: where do east coast striped bass go in the winter?

Ted Terlizzi
Port Jefferson, NY

(Ed.: There is no straight answer. As with many fishes, striped bass generally move north toward colder water in the summer and south come fall, but that's a simplification. While big populations over-winter in the Hudson, Delaware, and Chesapeake estuaries, and masses of fish are found at that time off Cape Hatteras, it is safe to say that they can survive cold (and maybe foodless) winters throughout their range, which is from Canada to Louisiana. The new edition of Fishes of the Gulf of Maine includes these mentions of over-wintering sites: rivers in Nova Scotia, the Gulf of St. Lawrence, many smaller rivers from Maine to the Chesapeake and on to Cape Hatteras, including rivers emptying into Long Island South, and in the Mullica River in New Jersey where a 50-foot hole dredged for road fill in the 1950's turned out to be friendly for winter bass. Then there is the one lone bass captured some 50 miles south of Martha's Vineyard in 400 feet of water in February of 1949. South of Hatteras and into the Gulf of Mexico striped bass remain in the home river for the entire life cycle and migrate up and down the river instead of going to sea. Just to make life more interesting, 90% of coastal migrating stock of striped bass are female, but south of Delaware Bay it's 50/50. Maybe the striped bass's motto should be: "Keep 'em Guessing.")

DISTURBING OSPREY NESTS

Alan Poole's interesting article about a Littoral Society fish tag in an osprey nest, (Underwater Naturalist 27(2), reminded me of a youthful misdeed. Three off us rowed out to a small salt marsh island in Virginia to investigate an osprey nest (we called them fish hawks) in a dead cedar tree. We did this by climbing the tree and then trying to reach into the nest over its wide lip. I suppose we dreamed of taking home a baby osprey as a pet. The adult ospreys came at us in a fury - diving and shrieking. We defended ourselves by swinging oars at the birds. Happily, we missed the adults and abandoned our quest. I just hope the kid(s) pulled through.

Fred David
Little Creek, Virginia

Marine Life Colonization Of New Jersey Reefs

By BILL FIGLEY

INTRODUCTION

New Jersey has an extensive ocean reef-building program. Since 1984, when it took over a small, community-based reef building project, it has deployed over 5.2 million cubic yards of materials, including rock, concrete, ships and barges, Reef Balls, concrete pipe, and various other materials on 14 ocean reef sites, located from Sandy Hook to Cape May – that's the equivalent of a three-foot high pile of solid material covering 500 miles of two-lane highway.

While fishermen and divers love the reefs, the objective of the program is to create hard-substrate habitat for marine life. Some species of fish and invertebrates either require or prefer hard surface substrates over soft ones, such as sand and mud. Since 99 percent of New Jersey's sea floor consists of sand or mud, these reef-associated species may be limited in habitat, restricted to a few rocky out-croppings and hundreds of shipwrecks. The intent of NJ's Reef Program is to increase the abundance of reef-associated species indigenous to our coastal waters by providing more structured habitat on a small portion (0.3%) of New Jersey's sea floor.

The epifaunal invertebrate community (animals living on hard surfaces, not in the water or in the sand or mud) is an important component of ocean reefs, usually providing the basis of the food chain that supports harvestable fishery resources and comprising the vast majority of life, by numbers and biomass, inhabiting reefs. Our intention was to inventory the invertebrates and juvenile fish inhabiting New Jersey reefs. We did not examine adult fish populations.

Figley is principal fisheries biologist with the NJ Department of Environmental Protection's Division of Fish and Wildlife.

STUDY METHODS

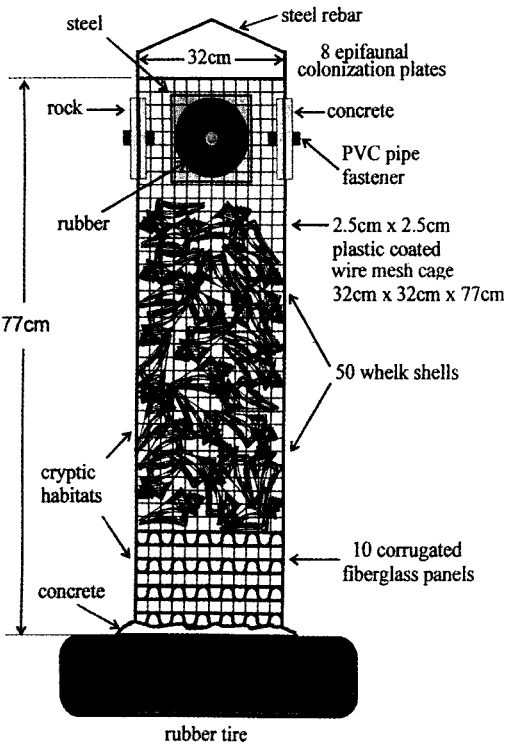
The collection of mobile epifauna, which includes crabs, shrimps, worms, snails, starfish and juvenile fish, is challenging since these animals are small, cryptic and often hide in holes and crevices in reef structures or among sessile epifaunal growth. The use of divers to observe such marine life and to quantify their population size underwater on New Jersey reefs is impractical because of typically poor visibility and the cryptic habits or large population numbers of many of the species. Therefore, we decided to use specially designed, miniature reef habitats as experimental sampling units that could be placed on the sea floor and later retrieved by divers, disassembled, and the components returned to the lab for analysis. The experimental habitats were designed to afford extensive colonization surfaces for sessile epifauna and varied hiding spaces for mobile epifauna, including juvenile fish. Thus, all of the living components of the reef community that we were investigating could be collected simultaneously in a few hours and brought back to the lab, where a thorough, detailed analysis could be completed.

The Experimental Reef Habitat Sampling Unit

The structural components of the experimental habitat consisted of a rectangular closed box (height: 77 cm, width: 32 cm x 32 cm, or 30" x 12.5" x 12.5") made of 12.5 gauge plastic-coated wire of 2.5 cm (1") square mesh imbedded vertically into

a base made from a truck tire filled with concrete. The base was used only for ballast.

Ten corrugated fiberglass roofing panels were placed inside the wire mesh box. Each layer was rotated 90° to produce a honeycomb effect. Approximately 50 large whelk shells were placed on top of the panels to provide an additional, complex maze of hiding spaces, cavities and attachment surfaces. The upper portion of the box consisted of a hollow chamber completely enclosed by the wire mesh. Two plates each of four different materials -- rubber, concrete, steel and rock -- were attached back to back to the upper chamber of the box, with one plate outside and one plate inside the mesh. The plates represented four common reef-building materials and served as colonization substrates for sessile epifauna.



The reef habitat sampling unit

Study Site

The study site was the Barnegat Light Reef Site, located 3 nautical miles offshore of the New Jersey barrier islands at a depth of 17 m (55 feet). The sea floor consists of coarse sand, gravel and pebbles. In October 1996, we placed 30 experimental reef habitat sampling units on the study site from a motorized barge.

Habitat Retrieval

In October of each year after, divers retrieved experimental habitats. For retrieval, each of these units was quickly enclosed within a plastic drum, which sealed with the tire base to trap the organisms inside. Since the study focus was to collect smaller organisms associated with the reef, we assumed that when divers approached the unit with the barrel most of the vulnerable species would seek shelter within the unit and not swim out into the open. As stated, we accepted not sampling larger mobile fish that would avoid the divers. Once enclosed, each unit was raised to the surface using an inflatable lift bag attached to a rebar ring extending from the top of the unit. The unit was then winched into the boat and placed inside a plastic tub. After removing the drum, the wire mesh was cut open. The various components of the habitat and their accompanying marine life were placed in plastic bags. During the study, 10 experimental habitats were retrieved and analyzed. We continue the study with the remaining habitats.

Lab Analysis

Various techniques were employed to remove and examine organisms from the different structural components of the unit. All mobile invertebrates and individual sessile organisms, such as anemones and mussels, were removed, sorted by species, counted, and damp weighed in

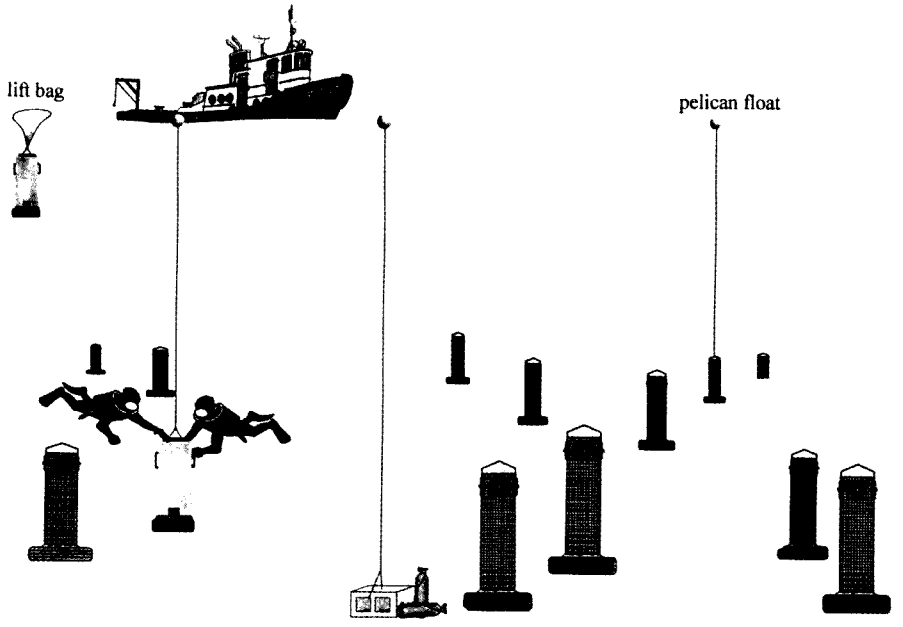


Figure 2. Divers sent the encapsulated habitats to the surface using an air lift bag.

Habitat retrieval – Divers descend 55 feet to enclose experimental habitats in plastic drums for their trips to the surface.

aggregate. The surface areas covered by colonial encrusting bryozoan, hydroid, stone coral and sponge colonies were estimated using sheets of clear plastic with a 1 cm-square grid.

RESULTS

Species Diversity

During the 60-month study, a total of 143 different species were identified on the experimental reef units; no plants were observed on the units. These species included representatives from 9 phyla. The most diverse phyla included crustaceans (44 species), polychaetes (43) and mollusks (33). The habitats attracted 7 colonial and 136 individual-organism species, 108 mobile and 35 sessile species, and 136 invertebrate and 7 vertebrate species. There were 38 species strongly associated with soft sediments. These were probably present in the experimental habitats because they had settled into the sandy sea floor, or sediment had settled within lower sections of the units during some storm event, thus providing a habitat for these species, too.

Abundance and Biomass

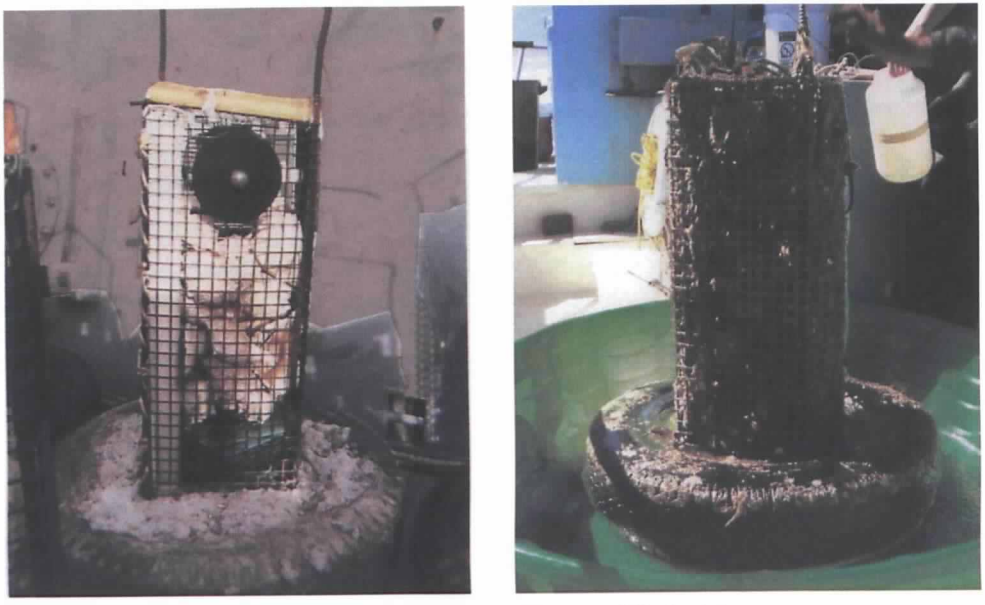
The abundance of colonial invertebrates – sponges, corals, hydroids, bryozoans – was measured in terms of surface area covered. Over the 60-month study, the mean surface area coverage of all colonial species amounted to 85,035 cm^2 per m^2 of habitat sea floor footprint. (Note – The "foot print" of the reef unit is used as a measurement term so that the reef unit results can be realistically compared to the surface area of the sea floor covered, and all the organisms that might be typically found living in or on that sediment.) Individual, non-colonial organisms – such as mussels, barnacles, and crabs — were counted; the mean abundance of individual organisms was 432,022 per m^2. Over

the course of the 60-month survey, only blue mussel spat – small, recently set mussels less than an inch long — numbered more than 100,000 individuals per m^2.

The mean total damp-weight biomass of all marine life collected from the unit averaged 58,358 g per m^2 of experimental reef habitat footprint. Mollusks were the dominant phylum, representing 54.8 percent of the total unit biomass, followed by crustaceans (22.1 percent) and coelenterates (13.8 percent). Other important phyla included: bryozoans (3.5 percent), polychaetes (3.1 percent), echinoderms (2.9 percent) and fishes (2.2 percent). Nematodes and sponges represented a combined total of only 0.1 percent of the overall biomass.

nated by the sessile barnacle and mobile Jonah crab. Eleven species of crab accounted for a mean of 3,545 individuals per m^2. All life stages of crabs, from megalops larvae to adults, were present within the unit. Some crabs had grown so large — over 40 mm (1.5") carapace width — that they could not pass through the mesh and spent their entire lives inside the experimental habitats. The cavities of the unit provided escape cover for juvenile American lobster, which had a mean abundance of 22 individuals per m?. Only 35 percent of the species were represented by more than 100 individuals per m^2.

Seven species of fish were captured on the habitats, with cunner being the most numerous. During all sampling periods



Reef habitat before (left) and after exposure. The tire filled with concrete serves as an anchor.

For mollusks, blue mussel was by far the dominant species in terms of biomass, followed by two species of slipper shells, types of snails. Crustaceans are important forage species for marine food and game fish; their mean abundance was 135,489 individuals per m^2 of unit footprint, domi-

combined, the mean number of fish was 134 per m^2. These included only small fish, less than 165 mm (6.5") in total length, that were able to swim through the 2.5 cm (1")-square mesh at sometime prior to collection. Most of these were juvenile fish. The actual number of fish

inhabiting the experimental habitats may be much greater, since larger, more active fish congregating around the unit may have been scared away by the divers. Divers observed large, adult fish retreat from around the experimental habitats at their approach. The only important game species was black sea bass with a mean abundance of 5 fish per m^2. Other fish captured were seaweed blenny, conger eel, rock eel, radiated shanny, and ocean pout.

The mean standing stock biomass of all species inhabiting experimental reef habitats fluctuated between 35,716 and 94,064 g/m^2 of unit footprint during the four sampling years, with 2001, the second year of this study, showing the greatest biomass. Colonial organisms showed a steady increase in biomass over time, while individual organisms accounted for most of the variation between years.

Colonization Plates

Over the 60-month study, 18 genera of sessile epibenthic invertebrates were found attached to the colonization plates, including 6 colonial and 12 individual genera. Although mobile invertebrates were also observed on the plates, they were not included in the plate analysis. In terms of mean total biomass, colonization was greatest on concrete (1,004 g/m^2), followed by rock (943 g/m^2), rubber (833 g/m^2) and steel (730 g/m^2). However, none of the differences was statistically significant.

Discussion

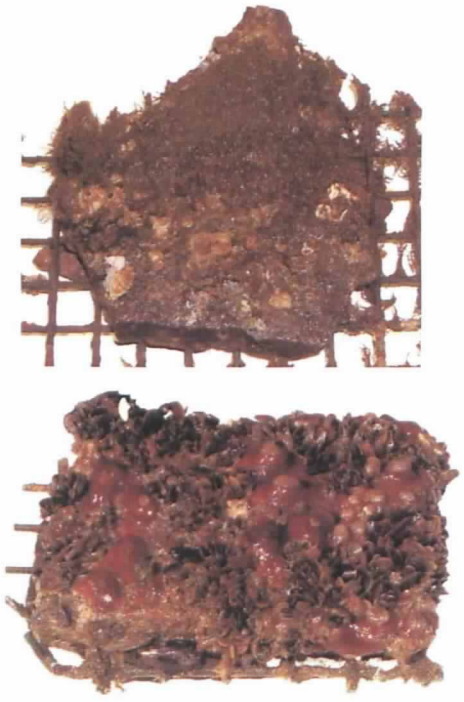
While most investigations regarding reef biology are focused on fish and a small number of harvestable macroinvertebrates, these animals, as upper-level consumers, represent in terms of species diversity, abundance and biomass, a relatively small portion of living reef communities. Danovaro, et al. (2000) refers to such investigations as the "top-down approach" of examining reef community secondary productivity. Studying the largely overlooked components of a reef's biological community is far more important to understanding the overall productivity of a reef, its function as a food web and its influence upon the surrounding marine environment (Steimle et al. 2002). In the current study, small fishes retained by the barrel-covered mini reef units, represented only 2.2 percent of overall biomass, and lobster accounted for only 0.3 percent of overall biomass. The ratio of forage base to small fish biomass was 45.4; in other words, for every gram of fish, there was 45.4 grams of potential food organisms on the reef. The ratio suggests that a complex reef habitat can provide an extensive forage base for small fish. Since adult fish are not included in this survey, we did not calculate a complete ratio between forage and fish.

Lobster

Our study also demonstrated the importance of cryptic habitat as escape cover for juvenile lobster. Over the 60-month study, a mean of 22 young lobster (rostrum to telson length: 24-145 mm) were observed per m^2 of experimental habitat footprint. With an extensive sandy sea floor, it is reasonable to assume that the scarcity of cryptic habitat for young lobster may be the limiting factor for the lobster population in New Jersey. The potential for man-made reefs to increase survival and recruitment of lobster may be substantial. Conservation of existing shipwrecks as habitat is equally important (see Underwater Naturalist Vol.1, No 3).

Colonization Substrates

The rate and extent of colonization by sessile epibenthos is influenced by the type of substrate. Smooth or slippery surfaces, such as glass, may make attachment difficult and, therefore, decrease the fouling rate. The presence of toxins, such as active lime in fresh concrete, zinc on



Marine life growth on rock colonization plates located outside mesh (top) and inside mesh (below).

metal surfaces or anti-fouling ingredients in paint, also reduces fouling. In general, rough substrates are considered best for bio-fouling.

In an experiment evaluating a variety of reef substrates, Chang and Pearce (1995) ranked their study materials in terms of biological colonization rates in the following order:

Rubber > Concrete >Steel > Wood > Aluminum

During the current study we examined 4 common reef-building materials and found the following rank:

Concrete > Rock > Rubber > Steel

(Note: The study materials reported in Pearce and Chang's "Saucers in the Sea" —Underwater Naturalist, 5(3) – laid flat on a frame, while the panels in these reef units were attached vertically to the unit. This may explain some of the differences.)

However, the differences in the mean biomass of the four materials were not statistically significant. Thus, it is reasonable to conclude that all of the reef-building structures used in New Jersey – rocks, concrete pieces, tires (not used anymore), concrete Reef Balls, metal (not wood) ships and Army tanks, whether natural or man-made — provide substrate of similar value to the fouling community and would be expected to produce similar biomasses of encrusting marine life per unit of substrate surface area.

Succession

It is generally noted that fast-growing, short-lived species are usually the first fouling organisms to colonize temperate reefs, followed by slow-growing, long-lived species which eventually replace the initial colonizers. In the current study, hydroids, bryozoans, mussels and barnacles quickly colonized the experimental habitats. Slower growing species such as stone coral increased in abundance over time. Sponge had a very low biomass in all sample periods and may take a much longer time period before it attains a significant level of abundance. We think that the rise in polychaete worms and nematoda abundance over time was primarily a function of the unit's sinking into the sandy bottom and accumulating silt or sand, where these species thrive, in unit spaces.

Enhancement Value

A review of databases suggests that the sandy sea floor off New Jersey has two biological community abundance levels (Frank Steimle, James J. Howard Marine Laboratory, National Marine Fisheries Service). One community is dominated by surf clams and sand dollars, the other by a mixture of polychaete worms, crustaceans and less-domineering mollusks. In a dense population of surf clams or sand dollars, the wet weight biomass of the area can be about or greatly exceed 500 g/m^2. When neither of these two

species is abundant, the wet weight benthic community biomass is commonly an order of magnitude less or about 30-50 g/m?.

Comparing our study to those of the

Crabs of all life stages are abundant on reef habitats.

sandy sea floor, the biomass enhancement ratios of the mussel-dominated experimental reef habitats (57,075 g/m^2, minus fish biomass) vs. sand sediment infauna range from 24 to 123 times for surf clam-dominated sand substrates and 771 to 2,195 for polychaete/crustacean-dominated sediments. Simply stated, this means that marine life is much more abundant on reef habitats than it is on the sandy sea floor.

Application of Results

The reef materials currently used by the Reef Program to build reefs – rocks, concrete and steel – all provide suitable substrate for the colonization of sessile, encrusting marine life. Reefs can be more productive by designing structures with greater surface area. Greater surface area per sea floor footprint can be achieved by increasing structure profile, by using hollow structures and by having irregular, rather than flat, substrates.

Reef structures should also be complex, with a variety of openings, crevices and chambers. Complexity provides the protective habitat needed by mobile invertebrates and young fish. Most reef structures, such as vessels, concrete pieces and Reef Balls, do not optimize surface area or complexity. Off New Jersey, loose rock piles, may represent the most complex reef structure because of their irregular surfaces and numerous small openings. The surfaces of the rock piles are much more functional than the deep cores.

From an ecological perspective, the best tactic in building reefs is to create habitats heavily dominated by species from the lower levels of the food chain. The higher the forage base to fish biomass ratio, the closer the reef community will resemble a natural marine food chain. By using reef structures that do not concentrate large numbers of adult fish in small areas, fishing mortality can also be reduced. Furthermore, complex reef habitats may increase survival of young fish and lobster, which eventually will recruit to and benefit fisheries.

Literature Cited

Chang, S. and J.B. Pearce. 1995. Epibenthic communities at three temperate reef sites:

measures of species association, abundance and substrate preference. pp. 334-

Ecoset '95. International Conference on Ecological System Enhancement

Technology for Aquatic Environments, Japan International Marine Science and Technology Federation.

Danovaro, R., C. Gambi, A. Mazzola and S. Mirto, 1999, Influence of artificial

reefs on the surrounding infauna, analysis of meiofauna. Abstract. Proc. 7th International Conference on Artificial Reefs. Sanremo, Italy.

Steimle, F., K. Foster, R. Kropp and B. Conlin. 2002. Benthic macrofauna productivity enhancement by an artificial reef in Delaware Bay, USA. ICES Journal Marine Science, 59:S100-S105.

Acknowledgments

Jeff Carlson, Barry Preim and Stacey Reap participated in field collections and laboratory analysis. Linda Barry and Jennifer Daetsch performed the majority of lab analysis and data preparation. Frank Steimle, National Marine Fisheries Service, assisted with field collections, specimen identification and report review. Captain Roger Hoden and George Dreher retrieved the experimental habitats underwater. Millie Rivera and Kathy Smallwood typed the manuscript. Barry Preim created the graphics.

Table 1 Individual organisms inhabiting 1m² of experimental reef habitat

Phylum	Representatives	Number of taxa	Abundance number/m²	Biomass g/m²
Molluska	Bivalves, snails	33	178,339	24,974
Arthropoda	Crabs, shrimps, lobster, isopods, amphipods, barnacles	44	135,490	12,883
Cnidaria	Anemones	2	4,627	3,221
Annelida	Worms	43	16,626	1,793
Echino-dermata	Starfish, urchins	4	2,687	1,665
Chordata	Fishes, tunicates	9	202.5	1,276
Nematoda	Primitive worms	1	94,051	25

Table 2 Colonial organisms inhabiting 1m² of reef habitat

Phylum	Representatives	Number of taxa	Abundance cm²/m²	Biomass g/m²
Cnidaria	Corals, hydroids	3	34,054	3,443
Ectoprocta	Bryozoa	1	49,039	2,017
Porifera	Sponges	3	1,943	44.1

Coastal Invaders from Oz

by JIM DUGGAN

Australian Pines (C. equisetifolia) *alongside a road in Indian River County, Florida.*

Over the centuries, colonial settlements were established in the Americas, Caribbean, Pacific Islands and Australia, to name a few. Today, there are still large numbers of people immigrating to these destinations. As a by-product of such past and present colonizations, native flora and fauna, intentionally or inadvertently, were also relocated.

For instance, in Australia, the Prickly Pear Cactus *(Opuntia stricta)*, was introduced as a floral curiosity in the 1920's. It spread over 67 million acres in the state of Queensland to the point its natural enemy, the *Cactoblastus* moth, had to be introduced. Today, the cactus is still not well controlled and is considered a pest in many Australian states.

Similarly, in Florida, extensive urbanization and development has occurred, particularly along waterways and coastlines, where landscape and seascape views are highly sought. Florida has a mild climate and ample rainfall throughout much of the year, providing a suitable habitat for many exotic species (27% of Florida's 3,448 named plants are introduced). As a result, exotic plant species have drastically increased in numbers, displacing and competing with many of the native plants. Two prolific groups of plants that were introduced from Australia were the Australian pines *(Casuarina sp.)* and paperbark trees *(Melaleuca sp.)*. Both of these introduced groups of plants thrive throughout South Florida in a variety of habitats. They are considered serious pests, threatening endemic flora and fauna.

Mr. Duggan, a previous employee of the National Marine Fisheries Service 1978-81, 1983-86, has resided in Australia since 1986. He has been employed over this time as a pharmaceutical representative with Merck, Sharp and Dohme. He lives in Tasmania.

The Australian Pine

The Australian pine, as most Floridians commonly call it, is native to Australia. The name *Casuarina* was given to this group of trees due to its resemblance of the slender, pendulous branchlets to the feathers of an Australian flightless bird, the cassowary. In Australia, it thrives inland, along the coast and along rivers. There are close to 40 species in Australia, none considered pests.

These evergreen trees are not true pines *(Pinus)* but are flowering plants whose "needles" are actually composed of fused edges of whorled leaves. These trees can attain heights in excess of 150 feet and thrive in most areas, including the Everglades, sandy shores, roadsides, wetlands and very nutrient-poor soils. They have the ability to grow in poor soils due to their association with nitrogen-fixing microbes, which supply these trees with nitrates, an essential nutrient of most plants. They produce many small woody cones containing seeds, which are dispersed by wind and water.

Australian pines with thick "pine needle" leaf litter. Notice lack of any vegetation under the tree.

The Problem

In Florida, three species of Australian pine were introduced at the beginning of the century by the U.S. Department of Agriculture's experimental station at Homestead, Florida. These were *C. equisetifolia* (Horsetail, Beefwood, and Coastal She-Oak), *C. glauca* (Scalybark Beefwood, Swamp She-Oak) and *C. cunninghamiana* (Cunningham Beefwood, River Oak). They were planted to function as windbreaks around houses and along roads, similar to the way poplars are used in Tasmania, Australia, as windbreaks for hop farms. As previously indicated, these trees pose no problem in Australia. In fact, they have several beneficial attributes. For example, the river oak has been used as a timber and as a vegetable dye for wool, revealing colors of gold, green and grey, while the swamp she-oak produces a drab light reddish dye. In Florida, the prime concern with these trees is their heavy colonization along the coast, displacing such native vegetation as sea grapes *(Coccoloba unifera)* and coastal shrubs including the coco plum *(Chrysobalanus icaco)*.

Australian pines are cold intolerant, growing only south of Orlando. They are strongly established along the Florida coast and in some areas of the Everglades. *Casuarina equisetifolia* seeds commonly wash up on newly exposed sand, where dredge soil has been dumped or on beaches where storm overwash has killed existing vegetation. Gaining a foothold, it

invades the grasslands behind the coastal dunes, as it is more salt tolerant than native woody species. Subsequently, the dense shade and thick needle layer on the ground under these trees, prevent germination and growth of native plant species that would otherwise provide food for native birds and mammals. Even when erosion occurs along the shore, the roots of these trees are so dense that marine turtles and American crocodiles are unable to dig their nests in the sand.

Possible Solutions

The Everglades National Park instituted an eradication program for the Australian pine in the 1960's, after these trees began spreading along beaches, following several hurricanes that hit the area.

At present, there is no biological control available. Manual removal of seedlings, saplings and small trees is one alternative. Large trees are cut down and treated with herbicides. Application methods with herbicides include injection, cut stump, Frill/Girdle and Foliar.

Fire is sometimes effective in dense stands; however many trees still resprout from their bases. Despite the negative aspect of these trees in Florida, many people continue to grow them around their homes as windbreaks and hedges. Their roots aid in retaining sand and have helped build up and stabilize the Florida Keys.

The Paperbark Tree

The paperbark tree *(Melaleuca quinquenervia)* is posing the greatest botanic threat to the Everglades ecosystem. Known as the broad-leaved paperbark tree in Australia or the punk tree, cajuput-tree or white bottlebrush tree in Florida, this exotic from Australia is posing an ominous threat to southern Florida.

In Australia, paperbark trees are planted in gardens as their flowers attract many native birds and mammals. The broad-leaved paperbark tree prefers coastal, swampy areas from Queensland to Sydney. It grows to a height of 80 feet and its white bottlebrush flowers yield a light to dark amber honey. This tree is exploited in New Caledonia for its essential oil, known as *niaouli,* which is exported and is similar to Cajuput Oil. More recently, two naturally occurring alcohols have been isolated -- nerolidol and linalool -- both being distilled commercially in Northern New South Wales. Historically, Australian aboriginals chewed young leaves for treatment of head colds. The prolific growth of this plant in areas subjected to mechanical clearing along the Queensland coast categorizes it as weed. Control may require better cultivation and replacement with improved pastures to retard establishment of these trees.

In Florida, its sensitivity to freezing temperatures limits this species to the southern half of the state. This species can attain a height of 50 feet, particularly in wet sites, where it readily invades sawgrass marshes and cypress swamps.

The Problem

This tree was first introduced in 1906 by a forester, J. C. Gifford, at his home in Biscayne Bay, Florida. Shortly thereafter, these trees established themselves in the adjacent Everglades area. The reason for the introduction was to "drain the swamp" (Everglades), when Florida's Governor Napoleon Bonaparte Broward stated that the greatness of such drainage projects was to promote growth in the state. Little did he know how successful this project would be. Over 20% of the Everglades area is now infested and within 30 years, most of the natural land could be overtaken. The melaleuca was also introduced as an ornamental landscape tree, agricultural windrow and soil stabilizer along canals. The potential for spread in South Florida is unlimited, particularly in sawgrass dominated areas. Everything south of Lake Okeechobee, excluding the saline areas, could be affected. One of the major concerns and reason for this rapid spread is its method of propagation and ability to survive. These trees may flower as many

Bottlebrush flowers of the broad-leaved paperbark tree (Melaleuca quinquenervia).

as five times annually, within three years of germination. In Florida, the optimal flowering periods are summer and autumn. The white bottlebrush flowers are pollinated by insects in Florida, while in Australia they are also pollinated by birds and small mammals. After death or severe desiccation, the tree's mature woody capsules, containing 200-300 very small seeds, are released. Thus fire, freezing, drought, herbicide treatment and breakage can all cause stress to the plant, resulting in the release millions of seeds.

Possible Solutions

At present, there are no biological controls and physical controls such as fire and flooding, are not completely understood or easily managed. Use of mechanical control has been limited to manual removal of seedlings, as heavy equipment is not appropriate in native areas due to inaccessibility and because non-target vegetation disturbances are likely to occur. Thus herbicidal measures such as Garlon 3A, offer the only practical and feasible means of limiting expansion of the paperbark tree. Any of these practices, however, can cause stress and with such a tremendous reproductive ability, millions of seeds would be quickly released into the area, perpetuating the already serious problem. Once released though, the seeds remain viable for only a year or so.

Potential biological agents are currently being screened in Australia and Florida, with a great interest in a psyllid *(Boreioglycaspis melaleucae)*, a leaf-blotching mirid bug *(Eucerocoris suspectus)*, a gall fly *(Fergusonina sp.)* and a moth *(Poliopaschia lithochlora)*. The psyllid and the mirid have been imported into Florida under quarantine.

No single insect species, however, is likely to provide suitable biological control. At present, this tree is a Federal noxious weed and a Florida prohibited plant. Such restrictions have helped reduce importation of the plant to the U.S.; however more financial support and continued *Melaleuca* management is required.

This may not be an "Invasion from Mars" but the outcome, ecologically in South Florida at least, has already been devastating to the local and endemic flora and fauna.

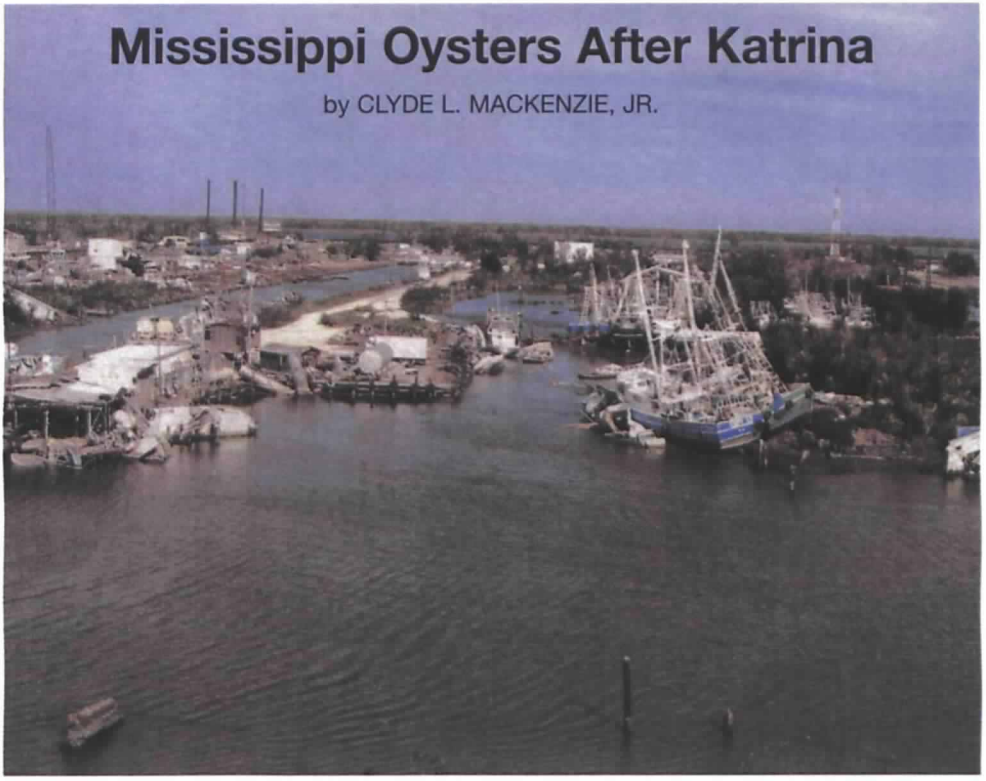
This problem may act as a reminder as to why U.S. and Australian Customs and Quarantine Services as well as those in other countries, must *strongly prohibit and restrict* the transport and importation of foreign plant and animal matter.

For further information, one can consult the Brevard County Extension Service, Cocoa, Florida and the Florida Cooperative Extension Service/Institute of Food and Agriculture Sciences, University of Florida.

Mature seed capsules on branchlet of paperbark tree.

Mississippi Oysters After Katrina

by CLYDE L. MACKENZIE, JR.



Hurricane Katrina struck the Mississippi coast on August 28-29, 2005, with wind gusts of 165 miles an hour and a 35-foot-high crush of water. Seventy-five days later I went there to examine the condition of its oyster industry. I had been there twice before.

In 1975, I was detailed by the National Marine Fisheries Service for five weeks to advise the Mississippi Marine Conservation Commission about how to restore the local oyster industry after Hurricane Camille hit the coast in 1969. At that time, one Mississippi oyster reef had a cover of mud that we cleared off by towing boards over the reef, allowing the oysters to settle and grow for subsequent harvesting.

The author is a fisheries biologist at the Sandy Hook Lab and has done extensive work on shellfish habitat. His previous article here was about the cockle fishery in Central America. He took the pictures.

The other reefs were in pretty good condition and did not require cleaning.

In 2003, I surveyed this coast to determine the status of its reefs, oyster boats, and processing plants. I spent one day aboard an oyster dredge boat, the Miss Enda, which got its daily limit of 30 sacks (100 pounds of oysters per sack). The captain told me he usually earned a bit more money in the shrimp season which was to follow, and that he made as much as $10,000 in a night of trawling for shrimp. However, the catches are typically far smaller than this, and the shrimping industry has been hurting because large supplies of Asian-grown shrimp have been flooding the United States markets. Many Mississippi shrimp fishermen have had to rely more and more on the oyster fishery for income

In recent years, Mississippi has been one of our country's leading oyster producers, landing 800,000 bushels in 2003.

Oyster reef "touching" – oystermen feeling bay bottom to check on the presence of reef structure after Katrina.

It trailed only Louisiana's production of 2.7 million bushels and Texas's production of 1.3 million bushels. Total oyster production for the remaining area stretching from Alabama to Connecticut, including Chesapeake and Delaware Bays, was about 900,000 bushels.

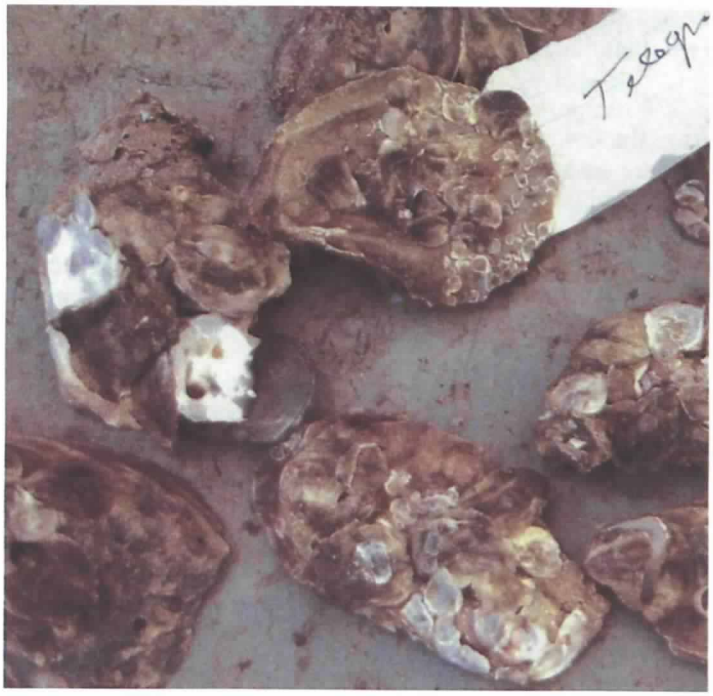
Mississippi's principal oystering area runs for three miles from just off the coast and due south of the small city of Pass Christian, about 50 miles east of New Orleans, the nearest large city. Four large reefs there cover several thousand acres. The oysters on all the reefs lie on banks of shells that extend 4 to 15 feet below the reef surface. Water depths over the reefs are mostly 9 to 13 feet. Oyster larvae in good numbers set on the reefs' shells and oysters every summer.

The Department of Marine Resources surveys oyster reefs with a special-purpose 65-foot steel-hull vessel built in 1970. After Katrina, its crew found that nearly all the oysters on the reefs were washed ashore or killed; thus, Department Director, "Corky" Perret, shut the industry down for the 2005-2006 season.

One day in November, I went out on a reef survey with the friendly crew of the Miss Enda. We made two or three dredge hauls on each reef and found heavy oyster sets on all shells, a range from 3 to 20 spat (baby oysters, if you will, 1/4th to 1 inch long) per shell; the relatively small stock of oysters that survived the hurricane obviously produced huge quantities of oyster larvae. The oyster fishermen and Department personnel count on this set to grow to harvestable size within two years.

The Department has hired about 140 unemployed oyster fishermen (two per boat) to map the oyster reefs with the expectation that some reefs were damaged and will require rebuilding. I was able to spend a day on a commercial oyster boat to observe the mapping operation first hand.

This boat with a crew of two tongers was about 18 feet long with a 50-horsepower outboard engine. At set points, laid out on an area map prepared made by the Department, the fishermen used a fiber-



A set of new, young oysters (spat) on oyster shells just months after Katrina.

glass pole an inch and a half in diameter to feel the bottom. Two to three touches from the drifting boat were sufficient. Tongers for many years, they were able to tell whether the bottom was hard or soft (easy to tell) and whether it had large or small shells (more difficult and beyond my ability to tell).

These fishermen harvest oysters the hard way, not like the 125 boats that use dredges. One crewman began college but dropped out, although he was doing well scholastically, to return to the fishing lifestyle and heritage he loves. The strong attachment of both fishermen to the reefs, the oysters, and the waters was apparent as I listened to them talk. They wanted the best for the reefs, and they were proud of their oysters. Most of the oyster fishermen have no intention of leaving the area even though a few were living in tents because their houses were destroyed. They thought highly of this program (they were back out on the reefs earning some money) and anticipated that the Department might come up with more money to keep them employed to clean debris off the reefs until the oysters were large enough to harvest.

I checked the water salinity: 21 parts per thousand. That's a bit high for oysters because drills (boring gastropods) and a shellfish disease called Dermo, usually kill most oysters in salinities above 15 parts per thousand. The biologists in the Department anticipated that the salinity over the reefs would drop after the next rains.

The day after the poling, Bradley Randall, the Department's oyster field man, drove me over to see the only shucking factory operating now in Mississippi. Before Katrina, there were 10. The factory, located on the inland side of Pass Christian on high ground, received little damage from Katrina. There were 26 men and women shucking oysters and another crew of about five people washing and packing them. The oysters had been trucked in from Galveston Bay, Texas, the only estuary now producing large quantities of oysters along the Gulf Coast. Hurricanes Katrina and Rita just missed damaging Galveston Bay. Oyster production nationwide this year will be the lowest in history with low supplies on the Gulf and the East Coasts, and a weaker market demand. The Mississippi oyster processing factories should be up and running by the time the oysters on its reefs are ready for harvesting.

(Oysters on the Gulf Coast are eaten fried on a plate, as po-boys on a long roll,

or raw on the half-shell or laid out on a leaf of lettuce. I managed to sample some of them all.)

Katrina also damaged Mississippi's other fisheries. Many boats in the shrimp and blue crab-potting fleets were sunk or blown ashore. Ice was not available to preserve these products anyway. Sport fishing is big business in the Gulf. Sport fishermen from the Midwest and other areas come to the coast and hire guided boats to catch white (sand) trout, speckled trout (spotted seatrout), red and black drum, southern kingfish, and flounders. The fish catches were three times as large on oyster reefs compared with plain sand and mud bottoms. Now sport fishing for out-of-staters has been shut down temporarily because the motels are filled with construction and relief workers, and the boats and docks are unavailable.

But locals I chatted with were optimistic about the future. The docks, homes, motels, stores, and casinos along the shorefront will be constructed more sturdily than they were before, and the oyster reefs, already settled with juvenile oysters, signal a recovering future for the oyster industry. The shrimp fishery should be in full swing by next summer when the boats and docks have been rebuilt, and as reefs are restored, sport fishing will get back to normal.

GET HOOKED ON FISH TAGGING

For free brochure and information, contact American Littoral Society, Sandy Hook, Highlands, NJ 07732, or phone Pam at 732-291-0055. Check out our website www.littoralsociety.org/tag.htm

WE'RE LOOKING FOR MANY NEW MEMBERS

And it's easy. Use the coupon to join up for activities, publications, and field trips. Learn about the coastal environment and how to protect it. As a new member, you get the current magazine and newsletters in a busy packet of information.

You can mail this coupon, make a copy of it, or supply the information requested separately. You can also join by email: Check our website at: www.littoralsociety.org.

Here is my membership application (please make check out to **American Littoral Society**)

Name _____

Address _____

City _____ State ____

Zip Code _____

email _____

My phone number is:

Day ( ) _____

Eve ( ) _____

___ Individual (Includes family) $35

___ Senior $25

___ Library $40 ___ Club $50

Mail to American Littoral Society, Highlands, NJ 07732. Dues are tax deductible.

You can use this form for a gift membership. Put in the new member's name and address and give us your name for a card, we include it in the membership packet.

From Sea to Seining Sea

By KATHLEEN A. NOLAN

This article and the one following describe littoral zone field trips for students that get them out of doors and down near or into the water to learn firsthand about marine life and different ways it can be sampled. It's live animals in the wild, even wild along the edge of this country's most urbanized waterfront.

When I was a kid, we caught minnows on Malletts Bay in Colchester, Vermont, on Lake Champlain. I have no idea what species we were collecting—we used them as bait for perch and sunfish. I was amazed at these slippery, silvery creatures trying to get out of our net—and how easy it was to catch them.

Many years later, and moving to live and work in urban areas has taken me away from those more idyllic times. I did a college stint with the National Marine Fisheries Service and was introduced to commercial seining for menhaden, in Casco Bay and the Gulf of Maine off the coast of Portland. I remember the pogy boats with their big pink floats that looked like those large exercise balls. They held up a net as it was fed out into the water from a dory. The net was slowly drawn into a circle, and ropes on the bottom and top were drawn, hence the term "purse seining." Here was commercial seining at its most abundant—thousands of pounds of fish on one fishing trip.

I was reintroduced to seining on a smaller scale when I collected fish for my PhD project with the specific intent of landing American shad. (I looked at the genetics of American shad from nine Atlantic coast rivers.) Everett Nack, a venerated Hudson River fisherman, honored me with the privilege of catching these considerably larger beauties—plus a host of other creatures, including alewives and a large turtle. Nack was working with his son from the Pennsylvania Fish Commission, who was trucking shad to restock the Susquehanna River.

Another fisherman who belongs to the last remaining family allowed to seine legally for American shad on the Delaware River was Fred Lewis. (I had the good fortune of meeting his grandson at a shad conference sponsored by the Hudson River Foundation in Baltimore a few years ago.)

That was seining and meeting for a purpose. I was able to seine again on a more "for pleasure" basis a few years later on the Platt River in Nebraska. I was attending the Association of Biology Laboratory Education annual conference, and a preconference fieldtrip enabled us to seine for local fish. A year later I pulled a seine at Troy, New York, on the Hudson with my friend, Bob Schmidt, to catch blueback herring for a research project. Schmidt, along with Karim Limburg, has been seining in the Hudson River for years, with a special interest in what lives in the Hudson's tributaries. They have mapped current spawning sites for river herring (blueback herring and alewives), finding that present spawning sites have shrunk historically because of water quality degradation or blockage by dams.

Schmidt stretched the net across a tributary, and his student assistant and I held

Dr. Nolan is associate professor of biology at St. Francis College in Brooklyn, NY. Joseph Pamtaleo took the photographs.

the net at the other end We were able to catch the fish we needed for the project. That is when it dawned on me that I needed seining to be a part of my life, and the lives of my students, mostly commuters from Brooklyn and other New York City boroughs. I also am the director and an instructor of our three-week Summer Science Academy for New York City high school students (more victims for my seining trips.)

I have now taken over 150 students seining for their first time at the Salt Marsh Nature Center in Brooklyn, a part of Jamaica Bay, across from Marine Park. Just like the book "A Tree Grows in Brooklyn," fish grow and flourish there too. I could have perhaps taken my students seining in places with more varied terrain, but I wanted my students to experience seining in Brooklyn.

I had trepidations the first few times about this seining venture, not wanting to look like a fool if we didn't catch anything. The first group I took was my ecology class at St. Francis College. I ordered a seine and three pairs of overall waders from Carolina Biological Supply in North Carolina, booked a date at the center with the New York City Parks and Recreation Department to use the facilities, and showed up on a crisp April day. I bought broomsticks to tie the seine to. Our ranger gave us a spiel about the park and what the rangers do, directed us to the site, and pretty much left us to do our thing. The first seine brought in nothing. Neither did the second. We hit the jackpot on the third try, and pulled up silversides and snails. The students were able to identify them from a small field guide. On subsequent seines, we scored a jellyfish.

I next seined in July with my Summer Science Academy, traveling to the site by subway and bus. The temperature was in the 80's, and the humidity was high. The grass was greener, however, and a burned area we had seen in April had grown over. This time we borrowed Parks Department gear and hauled it to the site in a wheelbarrow.

Despite the warm weather, I had the students wear the waders because I wasn't sure about the water quality and, anyway,

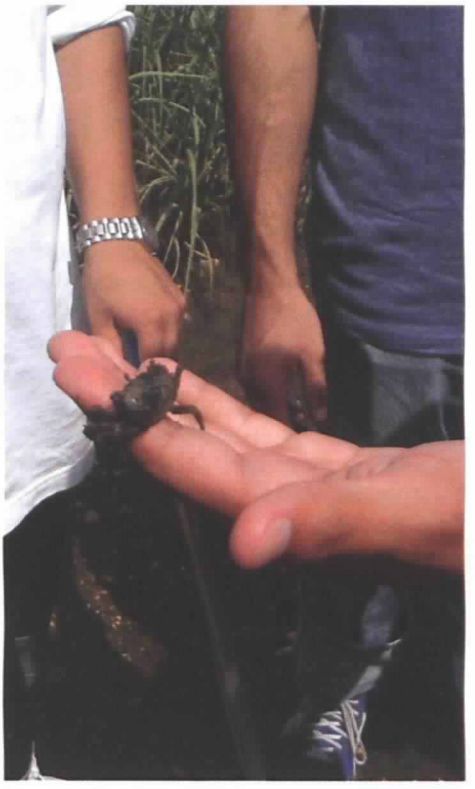
St. Francis students check their seine catch.

the waders are part of the seining experience. The kids loved it. Again, we had some empty nets, but this time we netted occasional crabs and killifish in addition to the silversides and jellyfish. Some of the students had never seen Darth Vader-like horseshoe crabs before, and they enjoyed trying to dig in the mud for the fiddler crabs that make the numerous holes we observed in the mud. We also collected shells and noted that ribbed rather than blue mussels are found more frequently in this sheltered spot. Gulls drop mollusks on nearby rocks to open them, which explains some of the shattered shell fragments found about.

I was interested to note that, when attending either the New York Aquarium in Coney Island or the Norwalk Aquarium in Connecticut after they have been seining, the students are jaded about the salt marsh exhibits. "Oh, we caught that stuff and actually saw it in the wild—we don't need to see it here."

A third forum for my seining interest has been pre-service teachers. Our college recently received a grant from the New York/New Jersey Harbor Estuary Program to foster stewardship of the estuary in elementary school students at the same time that language arts are being taught. We have found that our non-science oriented pre-service teachers at St. Francis College, as I suspect is the case elsewhere, do not have a strong background in estuarine science. We have developed a vocabulary list and teaching ideas for these teachers-in-training that they can use with their future students. We have taken pre-service teachers seining so they will pass this legacy onto their students.

Seining is a easy and effective way to reveal an invisible world to these urban students. During the six times our groups have visited the Salt Marsh Nature Center, (and the additional time I took an ecology class seining off Fire Island), we have always caught fish, and almost always



Among the marsh creatures, a fiddler crab.

other creatures as well. It is an activity that two do at a time, and everyone gets to try.

New York City Parks rangers will conduct trips for students for a nominal fee and they will provide waders, nets, and binoculars, or you can bring your own. The Salt Marsh Nature Center has a small library, a diorama of the various birds seen in the salt marsh, and bathroom facilities, and is air-conditioned, which makes it a nice place to take a break from the hot summer sun. The Center itself has a one-mile trail loop with boardwalk bridges overlooking the marsh. There are still stands of the cord grass *Spartina*, although the *Phragmites* is winning at the moment. The rangers conduct activities year-round, including canoeing trips and overnight camping trips. Their website is: http://www.saltmarshalliance.org/smnc.html.

The River That Moves Two Ways: An Overview of the Ecological Importance of the Hudson River

By BILL FINK

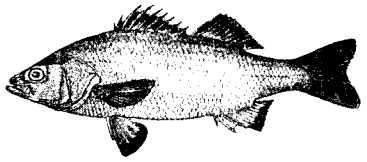
Please take a moment to consider the length of a few of the world's great rivers. Leading the pack is the mighty Nile, clocking in at 4132 miles. A close second is the Amazon at 4000 miles. The Yangtze is a formidable 3915 miles, while our very own Mississippi is a solid 2348 miles long. Way down near the bottom of the list is the Hudson River, a scant 315 miles from start to finish.

It begins on the slope of Mount Marcy in the Adirondacks of upstate New York. There, nestled in the snow and ice, is a tiny pond, discovered in 1872 by Verplanck Colvin. He was an admirer and early explorer of the Adirondacks, and to him, the little pond, shrouded in clouds, appeared like a tear of the clouds, and so named it. The overflow of this little spring-fed lake joins countless rivulets, brooks, and streams, until about 10 miles away from Lake Tear of the Clouds, it becomes the Hudson River.

The Hudson is an estuary, generally defined as a branch or an arm of the sea. It is tidal about 120 miles upriver to the dam at Troy, meaning the river rises and falls as the ocean tides change. Since the Hudson River is connected to the Atlantic Ocean, incoming or flood tides make the lower Hudson saline, or brackish. Conversely, when the tide changes (approximately every 6 hours and 20 minutes), fresh water from the upper Hudson comes downstream, creating a river that is part freshwater and part saltwater.

Our Native American Indians observed the ebb and flow of the Hudson and called

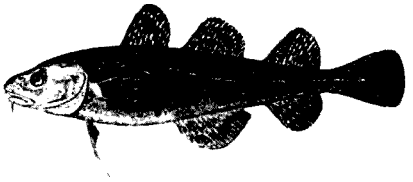
The author lives in Brooklyn; he is marine education coordinator for the Battery Park City Park Conservancy.



White Perch

Muhheakunnuk, meaning "great waters constantly in motion," or "the river that runs two ways."

The Hudson is a great nursery and spawning ground, home to over 200 species of fish. The most prized and sought-after is the striped bass (*Morone saxatilis*), a beautiful fish known for its fighting ability, its size and weight, and its great taste at the dinner table. The striper is an anadromous fish that spends its adult life in the open sea, but returns to fresh water to spawn. Biologists estimate that there are well over 17 million striped bass in the Hudson. To catch one, you'll need a rod and reel, some bait or lures, and knowledge of the rules and regulations concerning stripers that are available from local bait and tackle shops or the Department of Environmental Conservation (DEC).



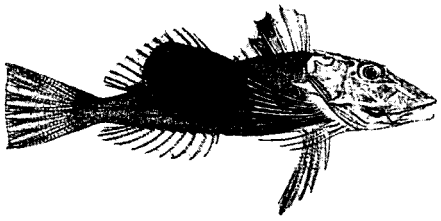
Tomcod

The Hudson has made a most amazing recovery in recent years and is one of New York's most successful environmental undertakings. In the 1960s, the *New York*

Times ran an extensive article on the river, "Hudson River is Dead." It was then more like an open sewer, loaded with industrial and human waste, not fit for fishing, swimming, or general recreation.

A number of events then occurred:

The Clean Water Act, enacted in 1972, made industrial polluters liable for heavy fines if they continued to pollute the river.



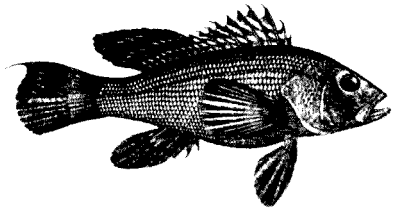
Sea Robin

The city and state began an ambitious program building sewage treatment plants.

The public became aware of the importance of protecting the oceans, rivers, forests, and open land.

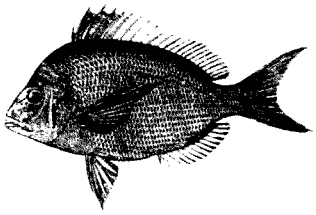
This was the aptly named "green movement," spearheaded by people like Pete Seeger whose sloop "Clearwater" played host to thousands of kids and adults as it sailed the Hudson, informing them of the wonders of the estuary.

Little by little, these measures changed the quality of the Hudson, and today, for



Black Sea Bass

example, New York City hosts a yearly "Swim Around Manhattan" race. In the village of Croton-on-Hudson, a sandy beach offers swimming to the public, and anglers regularly haul stripers, blackfish, sea bass, porgies, and many other species



Porgy

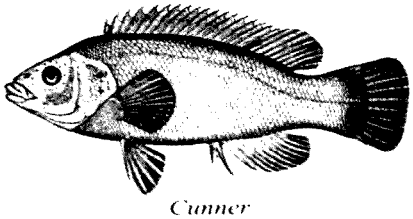
from the river.

Children, too, have the opportunity to not only learn about the Hudson, but to actually use a rod and reel and catch fish. At the Battery Park City Parks Conservancy in lower Manhattan, school kids have been participating in one of New York City's most unusual and dynamic programs.

A teacher will bring a class of about 25-30 students, grades 3-12, to the fishing site where they first take part in a discussion covering the history, geography, ecol-

Oyster Toadfish

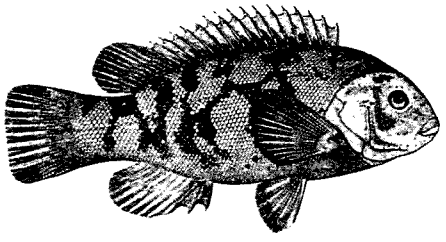
ogy, and environmental considerations that affect the Hudson River. Then, a Master Angler demonstrates the safe and correct use of a rod and reel. The kids then walk to the railing, drop their baited hooks to the bottom (about 40 feet) and wait for a bite. Soon after the loud cries and shouts of "Fish On!" are heard all over lower Manhattan.



Cunner

This program adheres to a catch and release policy. In order for children to see how different species of fish swim and react differently, fish are placed in a 25 gallon aerated tank. At the end of the class session, everything, including mussels, seaweed, crabs, and barnacles, is returned to the Hudson.

Records are kept at each session. This includes the species and number of each fish caught, water temperature, wind direction, tide, air temperature, salinity, and turbidity. The hooks that are used in the program have their barbs flattened so that injury to fish is minimal. In the spring and fall of 2004, over 600 students participated in this marine education and fishing program. They caught and released 1021 fish.



Blackfish

The Hudson River has made a remarkable recovery since the dark days. It is now a common site to see schools of bait fish (spearing, anchovies, bunker) near the surface. Every now and then, schools of fish break water in effort to escape predators. It is not unusual for kids to catch horseshoe crabs, jelly fish, sea stars, and once in a while, seahorses. And all of this happens off Battery Park City, within sight of the Statue of Liberty.

The river that moves two ways is New York City's connection to the ocean, a natural resource that is a combination of salt and fresh water, a vast nursery and home to millions of fish, birds, and animals. It is up to all of us to take steps to insure that the Hudson River improves even further, and never returns to what it was so recently.

Battery Park City Parks Conservancy

Marine Finfish Caught and Released at BPCPC

April, May, June, September, October, November 2004

Type of Fish	*Number*
Blackfish	26
Bluefish	2
Cunner	748
Fluke	5
Oyster Toadfish	5
Porgy	92
Sea Bass	46
Sea Robin	2
Sculpin	38
Snapper Blue	3
Striped Bass	46
Tomcod	4
White Perch	2
Winter Flounder	2
Total	***1021***

Notes:
3 blackfish were 13" to 14", weighing about 2.75 lbs. each
1 striped bass was 14" weighing 2 lbs.
1 fluke was 16 1/2", weighing about 3 lbs.
In addition to finfish, numerous jellyfish (sea nettles, comb jellies, and one sea star) were landed and released.

References:
Robert H. Boyle, *The Hudson River: A Natural and Unnatural History*. Norton & Co., 1974.
Stauune, Panetta, and Forist, *The Hudson*. Rutgers University Press, 1996.

Tagging Report

by PAM CARLSEN, *ALS Tagging Director*

In early November the Littoral Society and the Hudson River Foundation put together a Friday striped bass charter fishing trip for Raritan Bay and the close-in waters of the New York Bight. It was to be strictly tag-and-release, but the weather kicked up and the venture was canceled. Chris Letts and Tom Lake, two Hudson Valley residents, came down for the trip a day ahead of time. Rather than go home without a saltwater adventure, they hit the local surf. Here is Lake's report.

On Thursday, while waiting for Chris to arrive, I checked out the local beaches that had fishing access. This was the first time I had been there in the off- season. I have been to Monmouth County many times over the years , but always in warm weather when you need a wad of cash to get on the beach. I found a good access in Long Branch, another at Monmouth Beach (across the road from the Monmouth Beach Cultural Center), and yet another in Sea Bright.

I checked into the Atlantic Highlands Marina. Our boat (the Captain Dave) looked nice, but the wind was 25-35 mph out of the northwest; the Bay looked like tossed salad. Chris Letts arrived and we headed to Monmouth Beach. We were somewhat sheltered in the lee of the dunes, so conditions were not bad. With the wind at my back, I think I could have reached the Azores with a three-ounce diamond jig.

There were a half-dozen others on the beach casting, but nothing happened until sunset about 4:45 or so, when the surf went nuts. It was a sneak attack. No gulls. No top-water. No schools of bunker fleeing up onto the sand. On one retrieve Chris's rod just doubled and he was into a bluefish. For the next 30-45 minutes we were into them, all 8-12 pounds. Nothing smaller. We were rigged for bass so we lost two lures each right off the bat. Heavy-duty leaders solved that.

We landed seven blues and lost a few more. We kept four, the largest 12-pounder I caught on a huge pencil popper that I'd had in my bag for years and had never caught a fish. I think we could have caught blues on anything we threw out there. In 45 minutes the fish moved on. No gulls, not bait that we could see, no indication that they were gone except that the hits became fewer.

We flipped a coin and Chris won, so he filleted the blues Thursday night in the bathtub of his motel room. If anyone had walked in on us, they would have thought we had just committed the crime of the century - or were involved in some sick, pagan ceremony. I had a box of freezer zip-locks, so we had eight superb fillets to give away on the boat Friday.

But the boat was cancelled. So the next morning we went surf fishing again. Nothing at Sea Bright or Long Branch. At Monmouth Beach, on my first cast at around 6:30 a.m., I hooked up; it was a nice bass, 21", which I tagged and released. Later I had caught a smaller one and had a larger bass follow my lure. That was it. No more bass. No blues. I hung around, talking to fishermen — one told me that he had seen a "40-pound" bass caught on a black Bomber plug. So I bought a black Bomber plug at Sports Authority (no sense taking chances), filled the tank with cheap Jersey gas, and got back to Monmouth Beach around four for a last shot. As I headed on to the beach, 8-10 fly-fishermen came off, with that hang dog look. None had seen a fish or a rise. Offshore, boats fished near flocks of birds. There were a few patches of working gulls up the beach (always up the beach!) to my left. As I worked my way toward them, they either dissipated or moved farther

away, as usual. Someday I'll learn to wait for them. By now, the wind had died almost completely; the sky in the west was flame orange with pink sky and clouds to the east. The waxing moon was up and bright, and Mars was winking at me. Catching fish would only have added a distraction.

Sunset was at 4:43 and by 5:00 I was wishing I had my headlamp (it was back in the truck). I was using the swimming plug that I had caught the bass on at sunrise (one-ounce Yo-Zuri Mag Darter). On my "last cast," I was nailed 75 feet off the beach. Bass. It was a spirited fight, but not the tackle busting ride bluefish give you. I slid the fish up on the sand. It was just a shade under 20". A nice fish. I tagged it, released it, and headed off.

Dawn and dusk. The magic hours. We've got to do this again.

Other Taggers, Other Shores

There is a wise old saying, "It's fishing, not catching." Many times this is evident from the notes we receive from taggers, especially as winter approaches.

The Connecticut team of Bob Kyker and Fred Stunkel wrote, "This season still remains the slowest and smallest (size of bass) I can ever recall. Fred and I have to try diamond jigging out in the deeper water soon. It paid off for us last November." And from Fred, "The winds have been devastating the past week, giving us no chance to get out. I predict that the bass will be around until December." But then there's always hope. Dean Sisson from Rhode Island wrote, " I spoke to you yesterday by phone and said the fishing was slow. It changed this morning.lots of bass. Fishing is great. Please send more tags. Check enclosed." In November, Jim McFarland wrote, "Great weekend of fishing (Hampton Bays area of Long Island, NY). My cousin, Bob and I have had quite a year of striper fishing." Farther out on the island in early December, Art Schweithelm wrote," I probably won't get out again this year. Beautiful day at Montauk, yesterday. Had 12-14 nice bass on herring we jigged. Only thing missing was the diving gannets. Saw a bunch of them but the bait wasn't concentrated enough to get one of those diving shows going." Fishing, catching, and birding—a good day on the water.

A.L.S. has forty years of great fishing stories and faithful taggers. One such person is Jack O'Keeffe, who wrote, "Just received the 40th Anniversary of fish tagging issue of the Underwater Naturalist. It made me nostalgic about my days in Connecticut tagging stripers. My first tag was placed on 7/28/74. I had recaptured a tagged striper and it turned me on to the program. According to my records, I have tagged 2,810 fish. There have been 145 returns (5.16 return rate), which is a little above the overall program results." Jack now lives in Stuart, Florida, where he continues to fish and tag with no regard to the seasons.

Field Notes

Underwater Naturalist is an equal-opportunity journal. Some articles that you read here have been assigned, but most arrive without warning. Beginning with Volume 1, Number 1 in 1962, we have encouraged members to send us brief, informal notes of observation they have made. Many of us keep logs or field diaries (fishermen are famous for keeping notes, weather, tides, and, of course, relative fishing success). If something strikes you as a worthy occurrence to share with others, let us know. In other words, these "Field Note" pages are wide open for business.

Codfish Siphon Browsing

by CAPT. AL ANDERSON

On several occasions in the spring of 2005, in depths over a 100 ft. on the Middle Bank area of Stellwagen Bank in the Gulf of Maine, a number of small codfish (sub-legal size), upon boating, regurgitated masses of unidentified material. Upon closer inspection later on, the material was recognized to be partially digested siphons of bivalve mollusks.

A 16-inch cod and its recent meal of clam siphons.

The enclosed photo is one of a 16-17" codfish on the covering board of the Prowler showing several dozen distal portions of what I believe to be regurgitated siphon tubes of juvenile clams (species yet to be determined.) These flattened sections measure approx. 0.75 cm in length, and approx. 0.75 cm in width, and have a distinct, reddish pigmentation. They appeared to be composed of equal size in-current and ex-current tubes, some with more pigment than others, perhaps a result of exposure time to codfish digestive juices.

Capt. Anderson runs fishing boats out of Narragansett, RI, inshore for striped bass and offshore for cod, and has been an active ALS fish tagger. He wrote recently about overwintering striped bass in the Thames River.

In a communication, Robert C. Bullock, Assoc. Dean, College of Arts & Sciences, University of Rhode Island, indicated that a number of fish worldwide have been reported to nip off bivalve siphons. In the Atlantic, flatfishes have been noted for this behavior, but little appears to have been published about this benthic behavior for codfish *(Gadus morhua)*.

Bigelow and Schroeder's "Fishes of the Gulf of Maine" indicates codfish are capable of detecting food on the bottom by taste buds in both barbell and pelvic fin rays. Food can also be uncovered by removing gravel in the mouth or rolling stones aside. Interesting to note that for a siphon to be nipped off, the clam may have had to be in the fish's mouth, as the cutting teeth of a cod are far back from the front of the jaw. It's unsure, however, how a cod can mouth a clam, without the siphons being retracted. Chances are we won't know until the identify of the clams can be determined.

In the photo, a 12-ounce sinker, Blue Fox red gill teaser, and baited hook (clam) are in front of the fish next to a rod holder.

Trends and Serendipities

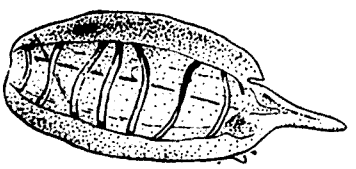
By PETER MARTIN

Over the last 45 years I've spent a lot of time on or near the shores of Long Island. My focus has varied over the years in nature and intensity, depending on my interests and opportunities at the time (fishing vs. diving vs. birding), but I try to be mindful of all the wonders that appear. The following occurrences are of special interest to me, but I haven't heard much about them from others.

During August and September near the barrier beach, one can often see airborne flocks of laughing and ring billed gulls bobbing erratically over a wide area of land. These opportunists are feeding on swarms of flying ants which are easy to overlook unless you're splattering their fat filled bodies on your windshield (the ants, not the gulls). I've also witnessed amazingly dense swarms of various dragonflies keying on mosquitoes over late summer salt marshes. But, on August 13, 2000, I came upon an aggregation of dragonflies along Jones Beach that extended over two miles with thousands of individuals of at least three species in view at all times.

They were darting and feeding on flying ants from ground level up to about 20 feet (I caught and released a few dragonflies carrying prey in their basket of legs and had ants visible in the air and landing on me.) No gulls were involved. Perhaps I've overlooked smaller episodes of this predation

During September the water around Long Island's South Shore inlets is often murky. However, occasionally a body of clear oceanic water moves in, usually only briefly, but often brings an opportunity to see a host of pelagic visitors. I recall once in the early seventies snorkeling outside Jones Inlet in water where the visibility exceeded 30 feet and small jacks and rudderfish followed me as bonito and albacore shot by. Also, I could actually see where I had been diving all those years. More recently, on October 12, 1998, a body of clear water moved into Fire Island Inlet, bringing a host of exotics, most spectacular of which was a queen triggerfish. A day later, this water was gone but clear water moved into Jones Inlet soon after. Some eddies concentrated chains of salps (like swimming through Jell-O), but more unusual were hordes of one-inch long moving "things." It was some "new to me" type of crustacean and I collected some. At home, under magnification they weren't crustaceans. They were completely unfamiliar to me. Coastal field guides didn't help. I wondered, "arrow worms, tusk shells, and giant rotifers?" I was embarrassed. Then I remembered a wonderful word from a course 30 years ago; Pteropods, winged feet. Of course. To Miners Guide and yes, *Cresses conica*, I think. A normally pelagic invertebrate, and how beautiful! as they flew through the aquarium! The next day, the winds had picked up, the water looked empty, and there were windrows of the corpses of



SALP

Salp (from Gosner's "Field Guide to the Atlantic Seashore").

ALS member Peter Martin lives in Bellmore on Long Island, NY, and is, obviously, a frequent visitor to the islands' shores.

these wonderful sea creatures strewn on the beach and docks. But once in a lifetime?

Now, for some possible trends. *Donax sp.* are a beautiful, delicate bivalve, more abundant to the South. I see some (coquinas) most years along some ocean beaches. This summer there were hordes along some sections of Fire Island. They were even the main component of the gull's regurgitated pellets at times.

And how about those ghost crabs? I usually notice a few in the summer, usually small, or just a few burrows in the upper beach.

This past summer I found them in more areas, once having dozens of burrows in sight at one time with crabs up to adult 2.5-inch body size, along a section of Jones Beach.

What about american eels? In the early seventies elvers were abundant in the early spring in salt marsh creeks and you could find dozens of 2-3 inch eels under a single rock in the western sound at low tide. I haven't found one in years. Have the populations of adult eels declined drastically?

Also, the invasion of Japanese shore crabs is now well known . But have you noticed an almost total absence of the formerly abundant green crabs (also an invader), and various mud crabs when you raise a rock and notice these beautiful new monsters scuttling away?

And, finally, a passing. My mother recently died. On the morning after her last, difficult night, I visited Cold Spring Harbor Fish Aquarium for some solace. A young woman with a child came by. The little boy was full of energy and questions. What kind of fish is that? "A catfish" she answered. "I know" he persisted, but what kind of catfish? She rolled her eyes and appealed to me. "A channel catfish" I answered. He focused his attention on me and politely unleashed a barrage of questions covering all the exhibits he had seen and listened thoughtfully to what answers I could provide. His mother eventually tried to move him along, apologizing. "No need," I said, "my pleasure, his peppering is not pestering." I mentioned my mother's passing and how helpful today were my memories of how, when I was her son's age, my parents regularly took me to this hatchery to "look at fish," even though they were not nearly as interested as I was. I still like "looking at fish" and always remember my parents taking the time to support my interests in this way. The mother and I agreed that regardless of your interest in fish, this kind of time is a pleasure and a wonderful investment of time.

About the Awning Clam

by STEVE ROSENTHAL

During a recent ALS Annual Meeting at Gloucester, Massachusetts, I overheard an interesting sounding conversation in the parking lot at the end of our visit to Parker Island National Wildlife Refuge, in Newburyport. Some members were discussing a strange "mussel" that one of them had found on the beach. Naturally, this itinerant conchologist's ears perked up, and I asked to see the shell. In fact it was not a mussel at all, but a partial specimen of the boreal awning clam, *Solemya borealis*.

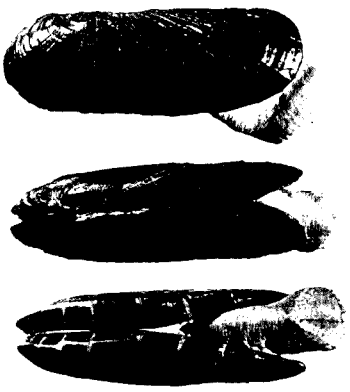
Rosenthal writes: "I have a master's in zoology from Duke, and have worked in a totally unrelated capacity at Pfizer for 15 years...I have collected seashells throughout the US and (more so in recent years) around the world. Despite doing so for 35 years, I have yet to see a comlete specimen of Solemya borealis.

If you know anything about this strange group of shells (and not many people do, which is why it was suggested I write this), you would know how it could confuse a lot of experienced naturalists. Awning clams of the genus *Solemya* are among the most primitive bivalves, and are put in a separate subclass, the Protobranchs (a conspicuous manifestation of this is that they will almost always appear on the first "Clam" page of any comprehensive taxonomically-ordered field guide).

Typical clams are filter-feeders: they have siphons that pump water into the mollusc's body, where plankton are filtered out and swallowed. The siphons of protobranchs are unique in that they possess tentacle-like appendages that actually sweep potential food material from the bottom into the animal's siphon, so in a sense they are actually deposit feeders. Some more recently published information notes that the gut of *Solemya* is greatly reduced and that the animals get their nutrition from chemosymbiotic bacteria harbored within their gills. I don't know if this would apply to our shallow water species, or just the deeper water ones, but it seems that the two processes might complement one another in providing nutrients for the bacteria...the same literature notes *Solemya* on the west coast are fond of polluted areas.

The most conspicuous feature of the genus is the extremely fragile, thin cigar-shaped shell, which is overlain by a thin brown fibrous outer shell layer called a periostracum. In the "awning" clams this periostracum is longer than the shell itself, and extends past it, hence the name "awning" clams. These shells live in burrows within muddy bottoms, but can also swim through the water by forcing water out their shells like scallops; I have never seen this behavior myself, but it would explain why sometimes I have found these normally infaunal clams sitting alive on the surface of the mud.

Solemya borealis reaches 2.5-3 inches in length, and is said to live offshore in water 20-200 or more feet deep from Nova Scotia to Connecticut. Because it is so fragile, it does not seem to be found often on the beach as a complete specimen. The one found at Parker Island was a half of one half of the bivalved shell. Most of my references list this shell as "moderately common offshore." I know (second-hand) of only one collector who has found intact specimens on the beach (serious amateur collectors have to have both halves of any clam shell for it to "count";



Awning Clam

scientists are more lenient). Anyhow, this person has apparently found two on the Massachusetts coast, both after extremely rough weather that washed a whole lot of other species ashore too. Many years ago, at Manomet, Mass., I found a paired specimen, with the halves (or "valves") joined together, but the lower half of each valve was gone, suggesting something might have bitten the shell in half. The shell is so thin and brittle it is likely no defense against predation.

The other species of *Solemya* found in the Northeast, *Solemya velum*, has a similar shell, but reaches only about an inch in size. Unlike *Solemya borealis*, it is found in sheltered bays and coves, rather than the open coast. It is also a much easier shell to find. In New York it can be found beached or alive on (or in) the mud in reasonable numbers in suitable habitats--

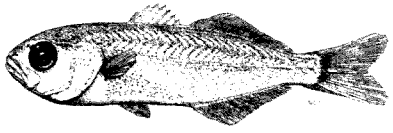
especially during the early spring, which might be when they are breeding. The bay side of Jones Beach State Park (Nassau County), and Shinnecock Bay (Suffolk County) are good places to look. My friend Rich Kelly and I once found them beached alive on the bay side of Jones Beach by the dozens during rough weather one gray cold wet day in March, and our friend (and fellow ALS member) Dave Johnson had an interesting experience while looking for them in Shinnecock Bay. He was walking out on the mud at low tide, and did not see any shells, but when he walked back they could now be found lying on the wet mud in the impression of his earlier footprints, having appeared there from out of nowhere. The vibrations in the sediment from his tromping may have flushed them out of their burrows (they can swim, after all), but we never quite figured that one out.

Snapper Bluefish: The Crucial First Year

by HOLLY JANTZ

The sharp glare of silver caught my eye so quickly that I had no time to think. I was out surfing on an unguarded beach with a friend; she realized what was happening and screamed for me to keep my arms and legs on my board and out of the water. We were being rushed by a school of fish so fierce that they are known as the 'Piranhas of the Atlantic." Bigelow and Schroeder (1953) quoted Dr. Goode saying, "It is perhaps the most ferocious and bloodthirsty fish in the sea, leaving in its wake a trail of dead and mangled mackerel, menhaden, herring, alewives, and other species on which it preys." Fishermen know them as "choppers" and kids call the young ones "snappers. "

Those who have never experienced their wrath know them as "blues." They can grow to 3.5 feet long, weigh up to 30 pounds and live 12 years. Like birds of a feather flocking together, bluefish of the same size travel together. Young bluefish grow rapidly in the estuaries, while older, and larger, bluefish chomp their way through the open ocean with razor-sharp teeth.



Although my fingers and toes were spared two summers ago, this past summer, I found myself involved in a research project working with first-year snappers. I worked as an intern with scientists from NOAA catching these fierce fish in Sandy Hook Bay. We expected to find first-year bluefish in the estuary because it provides a protective nursery for the little, but aggressive, fingerlings to eat and grow. Our research was the first step in determining the patterns of spawning cycles, feeding habits, and growth rates of these important sport and food fish.

Most of the literature on this key predator indicates that bluefish spawn once in the spring and once in the late summer (forming two cohorts, as the fishery biologist would say). More recent literature

Jantz is education specialist for Clean Ocean Action at Sandy Hook. She is a graduate of Rutgers. Illustrated is a one-inch bluefish seined in 1993, Great Bay, NJ, illustrated by Susan Kaiser; from "The First Year in the Life of Estuarine Fishes in the Middle Atlantic Bight," by K.W. Able and M.P. Fahay.

reports they spawn throughout the summer. To better understand the spawning cycle, we had to spend the summer fishing. (Somebody had to do it.)

Every two weeks we would seine and gillnet 18 sites in the river and bay. We considered any bluefish smaller than 200mm (7.86 inches) a juvenile. Our data indicates that there is a continuous arrival of first-year bluefish into the river and bay between late May and late July. This gives some support to the current research which indicates that bluefish spawn continuously throughout the summer .

To better understand their growth and survival rates, we also analyzed what the snappers were feeding on during their time in the estuary. According to the scientific literature, during the summer and early fall, juvenile bluefish achieve astounding growth rates, primarily due to their ability to switch from a diet of invertebrates to fish.

The smallest fish we caught were eating a wide assortment of invertebrates. It was common to find mysid, grass, and sand shrimp in their stomachs. As the snappers grew, their teeth were put to better use and their diets consisted of juvenile silversides, anchovies, weakfish, and surprisingly, winter flounder .

As summer progressed they grew to about 6 inches and at this size consumed more fish and fewer invertebrates. This is exactly what we were hoping to observe. The rapid growth rate and large size attained during the estuarine growth phase of bluefish is critical to their successful fall migration to warmer water, overwintering success and avoidance of predators, like their larger cousins.

Our fish were growing at an average of 1.34 mm per day, or about 1.5 inches per month. This is similar to growth rates reported in other estuaries along the Middle Atlantic Bight. On average, bluefish grow about 10" their first year.

The condition of the estuary that the first-year bluefish grow in is undoubtedly important to their survival rates. Without a healthy estuary, the bluefish surely will not make it to live out their legacy as Atlantic "piranhas."

Although I was cautious before starting this project, I knew that finding answers to even the most basic life history questions is vital to the long term survival of all creatures. The snappers certainly left their mark on me both literally and physically.

Additional research, as well as a longer sampling period and a wider geographic study area, will contribute to the understanding of bluefish spawning seasons, diet, and feeding behavior. Armed with nets--and band-aids--I'm ready to dive into the bay and take on this year's cohort of snappers--fingers first.

GUIDELINES FOR SUBMISSION

UNDERWATER NATURALIST is the Society's journal. We encourage you to submit articles, pictures, observations, comments, compliments, or criticisms. Please follow these guidelines:

SUBJECT MATTER: Write about anything you think other members are interested in – fish behavior, habitats, sea birds, reefs, beaches and dunes, wetlands – basically, the littoral and its wildlife. Features articles run 2000-4000 words (5-10 double-spaced typed pages); field notes and other casuals can be up to 1500 words. Letters are always welcome.

ART WORK: We welcome photographs; color is our first choice, black and white is okay. In order of preference: color slides, color prints, and digital photos. At least up till now, we have had little luck getting good reproduction from emailed digitals. If you submit some, be ready to provide the highest definition possible. (Note: Unless otherwise requested, we keep all accepted art until it is published).

HOW TO SUBMIT: Double-spaced manuscripts, a disk and a printed copy. Incorporate sources in your article. We edit for clarity using Strunk & White's "The Elements of Style" as our guide. We favor clear wording over specialized terminology. Send your work with a stamped, self-addressed envelope so we can acknowledge its receipt. Please include a daytime phone number, your email address, and one- or two-sentence biography. With permission we will include your email address in the biography.

☐ We do not pay for articles but we do send you five author's copies when published.

Field Note

Introduction Of The Marine Toad To Carriacou, Grenada, WI

by DONALD DORFMAN

Bufo marinus – they can weigh half a pound.

Most introductions of non-endemic species to new areas can produce negative consequences. The marine toad, *Buffo marinus,* was apparently accidently introduced to Carriacou in 1999, or 2000, possibly included in a shipment of gravel from Grenada.

Carriacou is the largest island in the Grenadines, with a land mass of 14 square miles, and a population of 6,000. It is part of the tri-island country of Grenada, Carriacou, and petite Martinique, in the eastern Caribbean.

In a field survey performed during 2000, the presence of the marine toad was reported as likely, but not observed (Environmental Assessment Report 2000 Of High North National Park, Carriacou. By LEC for the KIDO Foundation). In September 2000, the presence of the toad was observed on Mount Royal, at an elevation of 775 feet. There are few permanent ponds on this island. A drought season extends from January through June, followed by a rainy season. The average annual rainfall is 51 inches, which occurs from July through December.

A study of six fresh waster ponds was made during August, 2001. Ten toads were collected, by hand, along the pond edges. These were frozen, weighed, and their stomach contents analyzed. All of the toads collected were males. Their weights ranged from 97 to 190 grams. Eight of the toads had eaten millipedes; others contained beetles and/or vegetation.

The average weight of each millipede eaten was six grams. Thus, a toad is capable of eating at least half its body weight

Dr. Dorfman is on the science faculty at Monmouth University and a frequent field note contributor to this journal.

each day. Collections were made between 7-9:00 p.m., and toads may continue to feed actively until daybreak.

In some countries these toads were introduced to control pests, but in certain areas the toads have themselves become pests. For example, the larger marine toads (females) can feed on small snakes. They may, in turn, be eaten by snakes, but these toads secrete a toxin that can poison snakes. This same secretion has killed dogs and cats that attempted to eat the toads.

The marine toads appear to be distributed throughout Carriacou. It would be of interest to continue the study of the diet of the toads on Carriacou to determine how their food habits would change when and if they exhaust their present principal food supply of millipedes.

Some residents on Carriacou fear an increase in the numbers of rats if the population of snakes was reduced or eliminated as a result of the introduction of the toads.

Table 1.
Stomach content of marine toads collected on Carriacou, Grenada, WI

Pond	Sex	Stomach contents	Total Weight (gms)
Brunswick	a) Male	2 millipedes	149
	b) Male	2 millipedes	190
Botanical	a) Male	10 millipedes, vegetation	190
Gardens	b) Male	Vegetation	97
Hospital	a) Male	2 millipedes, vegetation	129
Belvedere	a) Male	8 millipedes, 1 anole (=lizard)	144
Dover	a) Male	4 millipedes, a anole	174
Craigston	a) Male	2 beetles, vegetation	170
	b) Male	2 beetles, vegetation	104
	c) Male	1 millipede, 1 beetle	134

Up the Shrewsbury River (NJ) without a proofreader.

THE SAME OLD BAD JOKES

The joke goes: the definition of insanity is doing the same thing repeatedly and expecting different outcomes. Seems like a large percentage of federal and state decision makers overseeing the nation's response in the wake of our most active hurricane season in a long while haven't heard it.

Anyone following the news coverage "in the wake" of Katrina and Rita has been treated to an interesting dance between a robust public offering of ideas on how to avoid a repeat of the environmental damage, loss of life and blows to the social fabric of Gulf coast communities and a seemingly irresistible submission to the status quo. New Orleans (as the icon of Gulf coast towns) has been rebuilt, redesigned, and even abandoned or transformed into a Cajun Mount St. Michele's on the editorial pages of papers of every stripe, between neighbors and friends at the dinner table and elsewhere throughout our national dialogue. We were heartened by the frequency with which the (formerly) protective role of Lousiana's (long gone) wetlands was recognized. Bold proposals were advanced to close and restore Mr. Go - the ever expanding, dredged back door channel to New Orleans through which much of the storm surge traveled - and "new urbanist" planners called for redesigning the city to accommodate Mother Nature by essentially ceding back much of the low lying area. Even FEMA (the Federal Emergency Management Agency) proposed redefining regulatory floodplains to accurately reflect areas that actually flooded. Tying these ideas together was the promise of a new relationship with the Mississippi delta and its coastal resources, one in which there was a closer semblance of détente with the forces of nature that shape the region.

And then the tide rolled back in. Most of the progressive ideas washed out like so much flotsam and jetsam: appropriations for post-storm recovery passed without significant wetlands restoration funding, efforts to more accurately define hazard areas succumbed to demands for assurances that the city would be open for business reinvestment. The resettlement of known flood-prone neighborhoods was left to individual choice, not public policy. Admittedly, choices that affect people's homes and the future of one of America's emblematic cities are among the hardest on which to stake out new directions for the future. However, failing to seize the opportunity to change the status quo in this instance may leave the same communities (and the same people) vulnerable to the same hazards and potentially the same tragic events in the future. So far, no one has provided a new punch line - an answer as to why we should expect a different outcome.

Tim Dillingham

Book Reviews

COLLAPSE; HOW SOCIETIES CHOOSE TO FAIL OR SUCCEED

Jared Diamond

Viking Press, New York, 2005 575p.

Nothing sums up Diamond's work as well as its front piece, Shelley's "Ozymandias." All that remains of many a mighty empire of the past is decay.

The collapse of societies that once flourished long ago (Easter Island, the Mayans, the Norse in Greenland, for example) hold lessons for today. Unsustainable use of natural resources, especially deforestation with its concurrent soil erosion, and depletion leading to food shortages, coupled with unexpected changes in climate, have reduced a number of old cultures to rubble and are presently carrying others to the brink of disaster. This is especially true in third-world countries where the chaos caused by overpopulation and resource shortages coupled with war and disease has led to a breakdown in society as in Haiti and Rwanda.

More advanced societies are not immune. Diamond points out serious problems in the United States, Australia, and China. The scope of his inquiry could well be extended to a more thorough examination of the United States which is currently suffering from "empire fever" and overextending its reach abroad without concurrently addressing internal overconsumption, pollution, and fiscal overextension.

Diamond's choices and omissions have come under fire by one critic who feels the book is a "hodgepodge of case studies, glued together with speculation and questionable analogies." That those studies are generally too extensive and some specifically too isolated seems a fair assessment but the judgments drawn from them are on the mark.

The case studies have a common theme. Unkind fate awaits a group or nation that disregards cumulative environmental damage, whether as a result of not anticipating a problem, not perceiving the problem once it has arrived, not getting to the solution, or ignoring the solution either because it is too expensive or costly. *(David K. Bulloch)*

IN A PERFECT OCEAN: THE STATE OF FISHERIES AND ECOSYSTEMS IN THE NORTH ATLANTIC OCEAN

D. Pauly and J. Maclean

Island Press, 2003, 175 p. paper

Although it's likely that you have heard bits and pieces of the story of fisheries decline in the North Atlantic and its effects on fishermen, fish, and coastal/oceanic ecosystems, Pauly and Maclean bring it all together in a manner that will leave you shaking your head at the collective stupidity of all concerned.

Both international and U.S. legislation and rule-making have had little influence on the destruction of important fish stocks and their habitats. We are now facing (but have yet to face up to) a massive effort that will be accompanied by considerable dislocation to undo past damage and avoid future problems.

The past fecundity of the North Atlantic ocean is legendary, especially regions like the Grand Banks on the western side and parts of the North Sea and banks off Iceland on the eastern side. Their present conditions are deplorable. The authors flesh out what we have to do to revive affected waters with the caveat that what was once there may not return to its former abundance.

If you choose to read it, let's hope it bestirs you to do something about it. We cannot cure the problems on the eastern side of the Atlantic but, working with Canada, by new legislation and revamping of our current fishery management programs we can try to bring back the former importance of these waters. *(DKB)*

ONE WITH NINEVEH POLITICS, CONSUMPTION AND THE HUMAN FUTURE

Paul and Anne Ehrlich

Island Press, 2004, 447 p.

The title of the Ehrlich's new book is taken from Kipling's "Recessional" about the arrogance of empire and its fugitive nature. Nineveh was the capitol of the Assyrian empire and the probable home of the hanging gardens of Babylon. When rediscovered in 1840 it was a desolate land and had been so for over 2000 years.

Ehrlich's past books, mainly dire warnings on overpopulation, suffered a great deal of criticism for what were called their scare tactics and insufficient evidence to back up their claims. That mistake has not been repeated in their current work.

Their main point is the growing and unsustainable use of world resources. World population and consumption in wealthy countries exacerbate this trend. The rapid growth of technology and the widespread culture of materialism is also pushing the world in the wrong direction.

Along with presenting the problems, the Ehrlichs outline solutions. From that point alone, the book is worth a thorough reading. Whether you agree with the solutions or not, they do provide a starting point for discussion on what we and the governments that represent us can do to insure a sustainable future. *(DKB)*

THE AMERICAN HORSESHOE CRAB

Edited by Carl N. Shuster Jr., Robert B. Barlow, and H. Jane Brockmann

Harvard University Press 427 p.

One of the most common procedures used in medicine today is based on the processed blood of a single species of wild animal, the horseshoe crab. Thousands of times a day scientists, clinicians and drug manufacturers use the procedure in settings from third-world clinics to major international pharmaceutical corporations to help manufacture drugs, produce vaccines and detect infection. Even the space vehicles roving across the Martian landscape were tested with horseshoe crab blood to ensure we didn't contaminate Mars with our own terrestrial bacteria. Millions of human lives have been saved from gram-negative bacterial diseases by processed horseshoe crab blood worth over $15,000 a quart.

But what about the animals themselves, the horseshoe crabs who make this all possible? They are declining up and down the East Coast. The old paradigm suggests that fishermen using the crabs as bait are to blame, not only for the decline in horseshoe crabs, but for the decline in the many often endangered shorebirds who depend on horseshoe crab eggs to fuel their transcontinental migrations.

There is a new paradigm emerging, namely that collecting horseshoe crabs for the biomedical industry can be just as damaging to the future of the crabs as killing them for bait. But it is a far more subtle process. You don't see draggers heavy with horseshoe crabs pulling into port. You see a few fishermen catching a thousand horseshoe crabs at a time, holding them in pens and returning them alive to deep water a day after they have been bled. What you don't see is that in some cases a hundred percent of the crabs have been poached from federal waters, a quarter of the crabs have been introduced from other locations, and none of the females have been allowed to spawn. The females have essentially been removed from the breeding population because they have been taken from their mating beaches during the critical two-day spawning window on either side of the new and full moon high tides of spring.

Now we have an exquisite new book that details most of what is presently known about these fascinating animals. It is a landmark achievement written by some of the most well respected researchers in the field. But don't expect to find too much about the new paradigm. You can find more than you might want to know about the development of the horseshoe crab body

plan through the last 400 million years of evolution but next to nothing about some of the conservation research that has been done in the last five years.

Another problem with the book is that it was written by a committee of scientists and industry leaders who didn't want to contradict each other. They have written wonderful chapters on research on the animal's visual system that led to a Nobel Prize in 1976, the mating behavior of the animals in the wild, diseases of the creatures and the industry based on their blood. But it would have been instructive to have included articles written by conservation scientists and the government regulators who been trying to protect the crabs and deal with the economics and politics which have led to several court cases over managing the species. Their writings, though in some cases more pertinent to today's critical conservation issues, mostly appear in the non-peer reviewed gray literature and are thus invisible and rarely cited by more established scientists.

Carl Shuster, the lead author, has written a fascinating chapter on the fertilizer industry that decimated Delaware Bay's horseshoe crabs from the 1880's to 1950. But it would have also been instructive to have someone write a chapter about today's bait and sushi industry, which is decimating the animals once again. He could have shown why using horseshoe crabs for bait is no longer tenable. Fishermen freely admit that other species work just as well for bait as horseshoe crabs. Plus, if you keep a horseshoe crab alive and bleed it for biomedical purposes a horseshoe crab is worth over $2,500 over it's lifetime for lysate. If you chop it up and use it dead for bait a horseshoe crab is are worth about 50 cents.

However, the bait industry continues to have a wide-ranging impact on horseshoe crabs. Draggers fish up and down the East Coast and can avoid regulation by landing their catch in states with high quotas, then load them into trucks and drive them back to their own states for resale.

The lysate industry, on the other hand, has a more concentrated impact on specific populations. In many ways the lysate industry suffers from some of the same problems as salmon aquaculture. Native crabs are not allowed to spawn, alien crabs are introduced, mortality is high, and gravid crabs are released back into the bacteria-filled environment with compromised immune systems that will not regenerate for at least six months. Reproduction in some of these important collecting areas has dropped to virtually zero. At least one area, Pleasant Bay in Massachusetts, has seen a heartening recovery since the establishment of a horseshoe crab reserve in the Cape Cod National Seashore in 2001.

But all in all I quibble. This is a remarkable book written by some of the best practitioners in the field. It is a welcome palliative to some of the academic books published in the 1970's that explicated all the details of the crab's visual and immune systems but treated the animals themselves as a black box. This book starts and finishes with the behavior of these remarkable animals who have saved the lives of millions of humans and immeasurably increased our knowledge of biology and medicine. Both scientists and nonspecialists will appreciate that the book is well illustrated and written with as little jargon as possible. They will want to keep it on their shelves and refer to it often. *(William Sargent)*

THIS IS BIOLOGY
Harvard University Press 1997, 323p. paper
WHAT EVOLUTION IS
Basic Books 2001 318p. paper
WHAT MAKES BIOLOGY UNIQUE?
Cambridge Press 2004, 232 pp.
Ernst Mayr

All three books were published within seven years of each other. In that time the writer also co-authored a large volume on birds of the South Pacific. If you do not

find that remarkable, consider that in mid-year 2004 the author turned one hundred years of age.

Over a lifetime in natural history, Mayr has done a number of exceptional things. As a newly minted PhD in zoology at age 23, who had additionally completed all the pre-clinical coursework for an M.D., he headed for the highlands of New Guinea. As successful as that expedition was, his "outside reading " in philosophy during that trip was a flop. He was looking for a coherent philosophical approach to the life sciences and came to the conclusion it had yet to be written.

He found the only integration toward a generalized viewpoint in biology lay with Darwinian concepts. The evolution of life is a given; not a theory but a long sequence of accepted facts gleaned, for the most part, from the geological record. . What Darwin supplied was a series of theories on the forces that shape evolution and led to the living world we find ourselves in today.

Biology today is being rapidly revisited at the molecular level. Much of the present work on DNA, RNA, proteins, and alike is closely akin to approaches in chemistry. But knowing the building blocks does not allow one, except in hindsight, to foresee the properties of new structures and the effects those building blocks might engender in new combinations. The cell, the organ, the organism, the attributes of each organism and the relationships among organisms lead to the complexity and diversity we see around us every day. We also run up against "black holes" like consciousness, for which we have yet to have an explanation.

Unlike the rest of the cosmos, the living, animate world on earth and especially mankind is the center of attention in a number of areas of thought; religion, philosophy and science among them. In **This Is Biology,** Mayr separates biology into two realms: functional biology which is akin to the natural sciences both in methods and outlook; and historical narrative, more closely allied with the geological sciences. Most of the evidence of evolution falls into the latter category. Evolutionary theory requires discarding a number of concepts of the past and the building of new ones, many of which Darwin supplied but have been enhanced by modern genetics and molecular biology. Mayr is fully cognizant of the disconnect created by these concepts relative to human behavior. The last chapter titled "Can Evolution Account for Ethics?" helps resolve this.

For the student of biology, **What Evolution Is** will be the most useful, reiterating the nuts and bolts of change, specifically the physical evidence, variation, natural selection, adaptation, speciation and diversity. If you think you have gotten short shrift in school with respect to this subject there is no better place to get a thorough review of classical and current thought.

What Makes Biology Unique delves into the differences, both in reality and conceptually, that separate biological thinking from the outlook used in exploring the inanimate world. A number of old scientific ideas as well as modern notions in the physical sciences must be put aside prior to forging a coherent philosophy of biology. If you have read the two previous books, you will find repetition but you will also find ideas gelled into a more succinct form. There are a few new wrinkles: a critique of Kahn's concept of scientific revolution, a discussion of the species problem, and the origin of humans. He closes with some words on one of today's conjectures "Are we alone in the universe?"

This trio of books should help guide both layman and professional through the labyrinth of thought that has both clarified and muddied the biological waters. All are rich reads. Mayr gets to the point quickly and leaves it to you to think through the implications. *(DKB)*

ANOTHER ROUND OF QUESTIONS TO BE ANSWERED

Readers continue to mail in coastal questions, wishfully thinking they can stump the experts here. We have given only one wrong answer over the years, when we said that sea level is rising. Recent data from the PR firm representing Systems Manufacturing Our Kilowatt Energy (SMOKE) indicate that sea level is actually dropping slightly. Of course, this is great news for the Seashore Overdevelopment Corporation (SOC). But enough palaver, let's open the mailbag:

Q: Does Donald Trump scuba dive?

A: We tried to get in touch with the Donald himself. No luck, so we posed the question to his press agent who responded thus: "Of course he scuba dives, and he's good at it. He was the first person in the world to scuba dive. One time he dived 2250 feet on 55 pounds of air. Another time he speared the world's record fish. And, he snorkels off Palm Beach, where he plans to build the tallest condo on the East Coast. You could say he 'dons" his facemask and fins and goes looking for 'trump'et fish. The Donald loves that joke! And so do all of us who work for the man. You know: he laughs, we laugh."

Q: Why do they give hurricanes peoples' first names?

A: Originally, hurricanes were named after fish: Alewife, Black Sea Bass, Carp, Damselfish, Eel, Fluke, Guppy, etc, but that idea didn't fly. Then they tried marine invertebrates: Abalone, Beach Flea, Clam, Decapod, Eared Goose Barnacle, Fiddler Crab, Gribble, etc. Again no soap. So we're stuck with Al, Babs, Chuck, Dot, Eddie, Flo, Gus, etc. How about just numbers?

Q: I think jetskis are dumb and dangerous. Are they legal?

A: Jetskis aren't either dumb or dangerous. They just sit there in the lot waiting to be bought or rented, so it's not really fair to be judgmental about them (remember the slogan: guns don't kill people, people kill people). Just substitute jetskis for guns. As to your question, it depends on what you mean by legal.

Q: I went to London recently (not to see the Queen) and was shocked at the lack of culinary skills among British chefs -- I mean: Bubble and Squeak, Spotted Dick, and Bangers and Mash. It was bad stuff. Then I had Fish and Chips. Wow! What's the recipe?

A: We wired Blodgett Palmer-Smithson who lives in Cottswold Mews, Shropshire-on-Devon, England for help. Here's his answer: "Ripping jolly query, chap! Here is how we do it over here: Deep fat fry some chunks of white fish in pork lard (cod, haddock, or ling will do). Separately, shallow fat fry thick slices of white potato in beef lard. Put the fish and "chips" together, add lots of salt and pepper and a dash of vinegar, and, as you Yanks are wont to say, 'Dig in!' Pip pip, rather, and all that. By all means avoid those things you eat on your side of the pond, 'French fries' I believe you call them, limp pre-formed sticks of mushy instant potatoes cooked in some sort of neutral, healthful oil and drowned in catsup. No wonder you're no good at football (which I believe you call 'soccer'). Well, I must be off, tea time you know, followed by a smashing cricket match. Cheers."

Q: Can fish swim backwards?

A: There is no real evolutionary benefit (specially in Kansas) for fish to swim the wrong way, seeing as how they are built to go forward extremely well. But, it is well known that under severe stress tuna can and do swim backwards sometimes. It's not a sane thing for a fish to do, as indicated by the fact that "tuna" spelled backward is "a nut."

Q: What's the difference between the east coast and the west coast?

A: The short answer is, "About 3000 miles." The long answer is that the east coast has more hurricanes, fewer shark bites, better surf fishing, fewer buffed surfers, hotter sand, shallower water, and higher incidence of skin cancer. The west coast has bigger shoreline gated communities, but, as you go north, more joggers, loggers, socialists, Birkenstock wearers, granola crunchers, and better, more expensive coffee.

D.W. Bennett

AMERICAN LITTORIAL SOCIETY 2006 FIELD TRIP SCHEDULE

June 9-11 Montauk Summer Weekend -- Leaders: Don Riepe, Mickey Cohen, Rob Villani
A weekend of hiking, birding, tide pools, butterflies, rocky cliffs, a visit to Montauk Light, and an optional whale watch. And this is peak orchid and heather blossom time.

August 14-18 Gulf of Maine Deep Water Cruise for Marine Mammals – Leader: Bob Quinn
Not your typical whale watch. This is a 100-mile cruise offshore in the productive waters of the Gulf with scientists to look for whales, dolphins, sea turtles, sharks, and birds. Three nights onboard and a day ashore.

August 17-20 Cape Ann Whale Watch – Leaders: Don Riepe, Mickey Cohen
Onshore and offshore around historic Gloucester. Canoeing on the Ipswich River, half-day whale watch trip, a sunset river cruise, and a visit to the Parker River Wildlife Refuge, with a lobster dinner in there somewhere.

August 25-September 1 Bonaire – Leader: Tony Totah
Eight days of clear tropical water in the Dutch Caribbean for scuba and snorkel among a wide variety of large and small marine inhabitants. And a great place for underwater photography.

September 12-18 Prince Edward Island and Bay of Fundy – Leader: Bob Quinn
The renowned high tides of the Bay of Fundy and the peaceful, sunny coast of Prince Edward Island for rocky shores, birds, and wildflowers, plus a charter boat trips (seals, whales, birds). The trip starts in Bangor, Maine.

October 12-15 45th Annual Meeting, Chincoteague VA
Once more to the Virginia coast – hikes, birds (during fall migration), beaches and dunes, wetlands, netting from boats, lighthouse, surf, tide flats, a seafood feast, and, yes, the Chincoteague ponies, all within the sprawling Chincoteague National Wildlife Refuge.

November 22-27 Cozumel – Leader: Tony Totah
This is classic underwater activity. There will be six scheduled dives, plus a night dive, and a quick course in coral reef ecology – pinnacle reefs, drop offs, and effortless drift diving. For divers and snorkelers.

November 29-December 18 New Zealand – Leader: Bob Quinn
Twenty days to cover this island country of mountains, waterfalls, rocky and sandy shores, home to killer and sperm whales, penguins, wading birds, snow fields, albatross, glaciers, and lush temperate forests.

For details, check your field trip schedule, phone for another copy, or go to the Society's website (www.littoralsociety.org), or phone or email Pat at 732-291-0055; Pat@littoralsociety.org.


AMERICAN LITTORAL SOCIETY
SANDY HOOK
HIGHLANDS, NEW JERSEY 07732
NON-PROFIT ORG.
U.S. POSTAGE
PAID
Permit No. 51
Red Bank, NJ