July / August, 1977 New Jersey OUTDOORS

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from the editor

Guest Editorial

The Jerseyshore

This issue is mainly about the Jerseyshore – and some of the wildlife that inhabits this area. It is also about the recreational opportunities provided by the seashore environment and this wildlife resource.

Long before New Jersey's beaches and coastal areas became popular resort communities, gulls, terns, herons and skimmers inhabited the barrier beaches and dune forests. They, too, spent their summers at the "Jerseyshore." However, the birds, unlike the humans that descend on our beaches during the summer, do not spend their time enjoying the good life and loafing in the sun. On the contrary, they are actively engaged in the demanding task of raising a family – feeding young, defending a nesting territory, and trying to withstand the adverse effects of weather, winds, and tides.

Their most difficult task, however, is trying to adapt their behavior and nesting requirements so as to avoid conflicts with people. Sometimes people carelessly use the beaches for picnics, dog walking, as a freeway for motorized vehicles and for unrestricted development and industrialization without any knowledge or desire to share the area with the resident wildlife.

Only a few shore communities, such as Stone Harbor, have been farsighted enough to set aside refuge areas for their resident colonial waterbirds. As a consequence, our shorebirds, particularly the sand nesters, have been under severe pressure at the nesting sites. Two species, the least tern and the black skimmer, are currently being considered for designation as endangered species in New Jersey.

Fortunately for the birds, concerned conservation organizations such as Atlantic Audubon Society, Jersey Shore Audubon and the New Jersey Beach Buggy Association have joined with private and state biologists in an effort to protect and restore the nesting locations of these beleaguered birds. The past efforts of one such group are presented on page 18.

in this issue

Go where the fluke are biting. Read "Summer Flounder – A Fish for all People" by fisheries biologist Pat Festa. Then biologist William Figley discusses "New Jersey's Saltwater Sportfishing" and tells us how to obtain "Angler's Guide" from the U.S. Government Printing Office.

More on the Jerseyshore — Birders Sharon Ann Brady and Wade Wander give us "A Closer Look at New Jersey's Gulls." Another seashore resource enjoyed by many is covered in "Clamming It Up" by Alfred J. Mottola. Robert R. Fales writes about the elusive "Ghost Crab" and J. Albert Starkey leads us to the "Trail of the Horseshoe Crab."

A picture story about a recent clam transplant on Tuckerton Creek is covered by biologist Tom McCloy. Photos by Harry Grosch. In the article, "Caution! Birds Nesting" wildlife/people conflicts are discussed by Mark Pokras and Jerry Schoenleber of Stockton State College. Author Wendy Beard tells us about the year-around indoor-outdoor educational programs for adults and children at The Wetlands Institute in Stone Harbor.

Not to be accused of neglecting the fresh water fishing resource, we included a discussion of the fishery on Farrington Lake in Middlesex County by fisheries biologist Robert W. Stewart.

A novel and refreshing summer recreational activity called "Watercourse Exploration" is presented by Bert Nixdorf, president of the Outdoor Club of South Jersey. Once you try "waterwhacking" in a cool Pine Barrens stream, you'll always return for more of the same.

Toe Tanne

the summer flounder

By Pat Festa Senior Fisheries Biologist

The summer flounder, or fluke (Paralichthys dentatus) is quite likely the most popular of New Jersey's salt water sport fish. This popularity stems from its widespread geographical distribution, its excellent table qualities, and its eagerness to attack a baited hook. The summer flounder can be found from Sandy Hook to Cape May from late May through early September. During this period, the fish inhabit virtually all our coastal bay and inlet waters as well as near shore ocean areas.

Summer flounder are susceptible to a variety of angling methods. At times, they can be taken very successfully with artificial lures, especially small or medium-size bucktail jigs. It usually pays, however, to sweeten the hook with a bit-o-bait. Two- to four-inch strips

George Athanosios displays a very respectable catch.

PHOTOS BY AUTHOR



of mackerel or squid, or whole baitfish such as spearing (silversides) or killifish have proven to be effective baits. The flounder appear to prefer moving baits and boat fishermen who drift their baits along the bottom are usually more successful than those who fish from an anchored boat. In the bays, the fish inhabit areas of medium depth around sandy bars and flats. Channel edges adjacent to shallow flats often provide excellent fishing.

Summer flounder grow to considerable size. New Jersey's current rod-and-reel record is a 19 lb., 12 oz. "doormat" caught off Cape May in 1953. Fish weighing more than 25 pounds have been taken in the commercial fishery. Average weights in New Jersey's sport fishery range from three quarters of a pound to two pounds.

While in inshore waters, summer flounder feed on a variety of small fishes and crustaceans. Sand shrimp occur frequently in the diet of fish utilizing New Jersey bays and this abundant food organism contributes significantly to the rapid growth observed for summer flounder over the summer months. Studies indicate that as much as 50 percent of the species' annual growth occurs between early June and the end of August.

Summer flounder move offshore in early fall and spawn near the continental shelf during October and November. Female summer flounder are ready to spawn at age four.

Commercial fishing in offshore areas is accomplished with trawl nets which are dragged along the ocean floor. The summer flounder is a favorite of New Jersey's commercial fleet because of the high market demand and high price that it commands. During 1958, the commercial fleet harvested more than eight million pounds of fluke.

The level of abundance of summer flounder along our coast has fluctuated considerably over the history of record-keeping on the species. A sharp decline in the population occurred in the mid-1960's. By 1969 the commercial harvest had dropped to 1.2 million pounds and catches within the sport fishery fell to 0.26 summer flounder per angler-trip in 1970. Because of concern for the species the Division of Fish, Game and Shellfisheries initiated a number of studies in the early 1960's to identify various aspects of the species' life history and to gain other information relative to its management. A tagging program provided significant information on the movement of summer flounder stocks which utilize New Jersey waters. It was found that they winter to the South along the continental shelf and that individual fish usually return to the same inshore areas year after year; however, there is a tendency for a portion of the population to move somewhat north and eastward during subsequent summers.

A creel census of the summer flounder sport fishery in Great Bay has been conducted during the summer months for the last ten years. Catch rates have fluctuated from a low of 0.26 fluke per angler-trip

CATCH RATES RECORDED FOR THE SUMMER FLOUNDER SPORT FISHERY IN GREAT BAY

	Mean Galcin/		Mean Gaten/
Year	Angler Trip	Year	Angler Trip
1967	0.57	1972	2.10
1968	0.39	1973	2.27
1969	0.32	1974	1.78
1970	0.26	1975	3.81
1971	0.70	1976	3.30

(a completed fishing trip by one person) in 1970 to a high of 3.81 fish per trip in 1975.

Changes in catch rates primarily reflect changes in the abundance of fish. Recent years have seen high population levels and excellent fishing success. There is some question, however, as to how long the present trend can continue. A recent report by the National Marine Fisheries Service indicates that summer flounder populations in the Middle Atlantic States are being overfished and that the reproductive capacity of the species is possibly being reduced. Their estimates show a United States harvest of approximately five million metric tons by the commercial fishery and more than twenty million metric tons of summer flounder by the sport fishery during 1974. Since the sport fisherman accounts for nearly four out of every five flounder harvested, the avoidance of another population decline may well require some regulation of the sport fishery.

Length frequency data on more than 18,000 fish have been collected by Division personnel in the Great Bay survey. The information clearly demonstrates that success in our present sport fishery is dependent upon the abundance of two-yearold fish. With the fishery relying on this newly recruited year class, a situation is created where the angler depends almost entirely on the spawning success of given year. It is thus impossible to predict the quality of fishing from year to year on the basis of previous population levels.

Preliminary estimates indicate that as much as 59 percent of the two-year-old class is harvested each year. These fish are removed from the population before they have reached spawning age.

The summer flounder is a fish for all people. Good catches can be made with a minimum of equipment and expertise. In years of abundance, the experienced fisherman can often catch a dozen or more in a single outing; at the same time, a fluke has been the "first fish" for many youngsters. For the traveler from Philadelphia or Montreal, the summer flounder often provides a self-procured taste of the Jersey shore while for local residents, it can contribute a substantial and inexpensive portion of the weekly diet.

It is to be hoped that management and research efforts of the Division of Fish, Game and Shellfisheries and of the newly created Middle Atlantic Fisheries Management Council will serve to maintain tain this species for future generations of New Jersey fishermen.

Barry Preim of the Marine Fisheries Section, Nacote Creek Station, interviews a successful Great Bay angler at Captain Mike's Marina.

Mr. Fluke came through to provide a successful first trip for these two young ladies.



New Jersey's

Saltwater Sportfishery

BY WILLIAM FIGLEY Assistant Fisheries Biologist

Saltwater sportfishing provides recreation for millions of people and generates hundreds of millions of dollars of revenue for New Jersey's economy. The purpose of this and a succeeding article will be to piece together some of the basic information which is available regarding the number of saltwater fishermen, the time they spend fishing, the monies they spend in the pursuit of their sport, and the quantity of fish and shellfish they harvest.

A 1973 survey by the National Geographic and Atmospheric Administration (NOAA) estimated that more than 1.5 million residents and 1.1 million nonresidents go saltwater fishing in New Jersey. Saltwater anglers spend an average of 12 days per year fishing; thus, the state's coastal environment provides about 30 million days of recreational fishing activity annually.

The 1970 National Survey of Fishing and Hunting estimated that saltwater fishermen spent an average of \$129 per year on food, lodging, bait, fishing gear, boats and motors, charter fees, and other fishing-related expenses. On the average, anglers fished 12 days a year at a cost of \$10.77 per day. Expanding this estiHARRY GROSCH

mated average annual expenditure per fisherman to cover New Jersey's 2.6 million saltwater anglers, yields a rough estimate of over \$325 million in revenues generated for the state's economy by saltwater sportfishing.

A recent survey by the Division of Fish, Game, and Shellfisheries and the Division of Motor Vehicles indicates that 125,834 motorboats were registered in the state during 1976. An additional few thousand vessels over 25 feet in length were documented with the U.S. Bureau of Customs. Of the registered boats, 4,632 are used for commercial purposes and 121,202 for pleasure. About 75 percent of the registered pleasure motorboats, more than 90,000, are operated primarily in saltwater-coastal rivers and creeks, bays, and the ocean. Ocean County alone accounted for more than 38 percent of the state's total motorboat use. Boat use in other coastal counties was as follows: Monmouth, 11 percent; Cape May, 10 percent; Atlantic, 8 percent; and Cumberland, 3 percent. Surveys conducted by the Division demonstrate that fishing, crabbing, and clamming comprise the predominant share of boating

					Total Ma	n-days of	Activity			
		Fishe	ermen a	nd Crabbers	Clammers/	Boaters/				
Estuary Year	Bank	Boat	Commercial	Oystermen	Sailors	Bathers	Hunters	Others	Total	
Great Bay	1969	13,510	79,058	0	6,841	24,803	1,276	1,795	2,414	129,698
Great Egg Harbor Upper Barnegat	1971	7,641	28,637	0	1,331	26,378	2,464	721	396	67,568
Bay	1972	17,588	80,118	0	1,521	89,258	19,317	707	5,329	213,838
Little Egg Harbor	1975	16,364	110,261	0	39,666	54,112	7,910	118	1,279	236,814
Maurice River	1976	15,986	15,179	3,058	3,390	8,152	1,624	733	4,596	52,718

Table 1. Total estimated man-days of activity on various New Jersey estuaries (Division of Fish, Game and Shellfisheries).

activity, accounting for well over 75 percent of all boating activity in coastal estuaries (Table 1). Boat use in the ocean is oriented almost exclusively toward fishing.

New Jersey has a large and active party and charter boat fleet. At present, there are 101 party and 253 charter boats operating out of ports from Perth Amboy to Fortescue. Disregarding the 6 party and 19 charter boats located in Delaware Bay, the rest of the state's party and charter fleet made 3,659 full-day party, 3,369 half-day party and 7,026 charter fishing trips during a 70-day period during the summer of 1975 (National Marine Fisheries Service). In comparison, 104,223 private boat fishing trips were undertaken in



the ocean during the same period. In addition to the party and charter fleet, more than 2400 livery boats are available for rent in coastal estuaries.

A 1975 telephone survey of state residents over 18 years old conducted by the Eagleton Institute and Cook College estimated that there were 494,000 ocean boat fishermen, 232,000 surf fishermen, 484,000 estuary fishermen, and 645,000 crabbers residing in New Jersey. Including residents under 18 years old and non-residents would undoubtedly more than double these estimates.

A DEP report entitled "Outdoor Recreation in New Jersey" illustrates the high recreational demand which fishing and boating place on coastal counties (Table

Table 2.
Recreation demand in New Jersey:
Average weekend day in the peak season
during 1970 (Department of Environmental
Protection).

	Number of participants						
Area	Fishing	Boating	Water Skiing	Sailing			
North Shore	42,100	29,800	5,900	2,600			
South Shore	71,700	46,000	8,300	4,200			
Delaware Bay	4,600	3,900	900	300			

2). The report stresses that by 1985, demand for recreational saltwater fishing will have increased 27 percent, boating 46 percent, and water skiing 67 percent.

Although fishing pressure will steadily increase year after year, the area of ocean and bay waters to be fished will remain the same. New Jersey now has 395,000 acres of estuaries, 229,000 acres of ocean waters under state jurisdiction, and 121 miles of ocean beach.

In order to provide for the expected increase in fishing demand, existing coastal waters must be made more accessible to fishermen. At present, the facilities available to saltwater fishermen and boaters include *Continued on page 12*

Walter Chubb of Pleasantville with a six pound, 14 ounce fluke caught off Margate City.

A CLOSER LOOK AT NEW JERSEY'S GULLS

BY WADE WANDER AND SHARON ANN BRADY

PHOTOS BY THE AUTHORS

Although the 1975 appearance of the rare Ross Gull lured thousands of birders to Massachusetts and catapulted gulls into temporary national prominence, these abundant and boisterous birds still go largely unnoticed. Living in a coastal state, most New Jerseyans are well aware that we have a more than ample population of "seagulls"; but most people are *not* aware of the variety of species, plumages, behaviors, and habitats that make gulls one of our most fascinating groups of birds.

To begin with, the name "seagull" is really misleading, for all New Jersey species but one are birds of the coast and estuaries rather than of the open sea. In fact, unless there is a fishing fleet operating in the area, gulls are almost totally absent out of sight of land. Actually, many species of gulls are quite common inland. Several species, such as Franklin's Gull, even breed in the interior of North America. Another, the California Gull, is, oddly enough, the state bird of Utah (because a hungry flock saved early Mormon settlers from an equally hungry plague of locusts)! In New Jersey, gulls can be found inland anywhere, anytime, but are most often seen making their daily rounds from the coast to reservoirs and lakes, or in plowed fields eating insects.

"Seagull" is misleading in another way by its common usage to denote *all* gulls, regardless of species. This is unfortunate, as even a casual New Jersey observer can expect to find five species of gulls – Herring, Ring-billed, Laughing, Great Blackbacked, and Bonaparte's – while a truly diligent birder may turn up six more – Iceland, Black-headed, Glaucous, Little, Lesser Blackbacked, and Black-legged Kittiwake. Though they differ in many ways, all 11 species do exhibit "delayed maturity"; depending on its species, an individual bird, although

Great Black-backed Gull-Adult (in flight). From below this species is easily identified by its robust body; long, heavy wings; and extensive black on underwings. the size of an adult, takes from two to four years to reach sexual maturity and the accompanying adult plumage. During this time, juvenile gulls display an endless variety of intermediate plumages—so much so that you'll hardly ever see two identical immature gulls. Even the adults of most species will alternate summer and winter plumages —so it's quite a challenge to be able to accurately identify every species in any plumage!

All the standard field guides, such as Peterson's A Field Guide to the Birds, Robbins', et al. Birds of North America, and Pough's Audubon Water Bird Guide, illustrate species and plumages not pictured here and provide more detailed information on gull identification.

Of the common species, the Herring Gull is the Starling of the gull world. Although they are numerous enough along our shoreline, the best place to see really astounding numbers of Herring Gulls is in garbage dumps, where their ecological role as opportunists and scavengers has enabled them to be one of the few species to benefit from man's waste-disposal methods. Although the Herring Gull is increasing as a breeder in New Jersey, like most other gull species found here it is much more common in winter.

New Jersey's most ubiquitous gull—and the one most commonly seen inland—is the Ring-billed, a denizen of every location from plowed fields to parking lots, golf courses to country lakes. The Ringbilled Gull does not breed in the state but is nevertheless quite common here during the summer, because there are two or three years' worth of immature birds just loafing around until they grow up.

The Laughing Gull, on the other hand, does breed here—in several immense colonies in our southern salt marshes. Throughout the summer its raucous "laugh" is one of the most familiar sounds all along Continued on page 30

Great Black-backed Gull – Immature. First-year birds such as this are similar to immature Herring Gulls, but much lighter on head, neck, base of tail, and underparts.



fresh from the water



CLAMMING IT UP BY ALFRED J. MOTTOLA



Clamming is a large industry in New Jersey, but that shouldn't stop any reasonably energetic person who likes the outdoors, the bays, and some vigorous exercise, from clamming for the fun of it. Whether large or small, clams fresh from the water are so amazingly sweet and tender as to delight any connoisseur, and, on a good day, Paul and I can easily harvest enough for ourselves, our families, and our friends.

It's surprisingly easy to do, too.

First of all you will need a license, which costs about \$6.50 and is good for one year. To find out where to get one (and a dated identification button), telephone the Marine Police. They have checked us frequently about boating regulations and our license and are polite and efficient, concerned only with protecting the public from unsafe shellfish. Bearing in mind that it is illegal to clam at night and on Sundays, you should also ask for a "condemned areas chart" since the fine for harvesting in offlimits areas is \$100 and you certainly won't want to have to pay that.

In warm weather you can easily go clamming in just a bathing suit; we also wear two pairs of banlon socks, which protect our feet but at the same time make it easier to feel the clams on the bottom than it would be if we wore sneakers. For winter clamming, hip boots and rubber gloves are necessary, as well as suitably warm clothes.

We use clamming rakes all year round, but there are times when the sand is so hard even a pneumatic drill wouldn't help. Another thing we find very useful while in the water is to keep baskets placed in car inner tubes tied to our waists with rope. This is convenient because the baskets are always floating at our sides, and when freshly dug clams are placed in them, the clams actually begin to wash themselves.

Paul and I prefer to go clamming at low tide, keeping in mind that tides in the back bays may differ as much as one to two hours from those in the ocean. A few times we've been caught in less water than our small boat draws and had to wait more than an hour and a half for the tide to rise so we could get moving again.

Though it's fun, don't expect clamming to be simple. You'll hit as many good days and bad days as you'll hit good and bad areas. Also, keep in mind that you (and possibly your neighbors and friends) are going to have to open, wash, and eat the clams yourselves, so if you're having a particularly lucky day, gauge yourself and harvest only as many as you think you'll be able to use. If your day isn't so lucky, all you can do is tell yourself it'll be better the next time. Along the same lines, if you aren't going to be able to open the clams as soon as you get home, place them in a bucket of cold water; as with the basket in the inner tube, they'll begin to clean themselves and, when you do get to them, will be a bit easier to open.

The added bonus to clamming is of course the scenery. The water has its own constantly changing moods and personality, and the wildlife – from the snowy egret to the great clouds of brant – is a continuous delight. There are surprises, too, such as hoisting up a horseshoe crab, or snagging a small flounder with your rake. You might even collect some bloodworms for fishing.

Clamming is hard work and not always as rewarding as you might wish, but if you try to approach it with a casual, open attitude, and can enjoy your surroundings as much as your main reason for being there, it might be just the new adventure you're looking for.

PHOTOS BY AUTHOR





ROBERT R. FALES Ecology Program, Rutgers University

One of the largest semiterrestrial crustaceans on the Atlantic coast can be found right in our own back yard. Seemingly spurning its aquatic cradle, the ghost crab (*Ocypode quadrata*) spends much of its life out of water (returning to the sea only to breed, moisten its gills, and escape predators) foraging on and tunneling in the open sandy beaches that stretch from Rhode Island to Brazil. Although the crabs were wide ranging in New Jersey earlier in the century, habitat destruction resulting from commercial beach development has limited them to relatively isolated shores.

Ghost crabs, which may attain a span of ten inches between the tips of their outstretched legs, are well adapted for their life on land, having gill chambers modified for "breathing air," good protective coloration, and excellent mobility. An encounter with these crafty crustaceans is likely to be a frustrating experience. When approached, they depart with olympic speed. If chased, they display an agility that would make a backfield coach swoon—cutting, dodging, changing speed and direction effortlessly. If a crab is pursued too closely, it may simply flatten out in any sandy depression, its camouflage making it seem to disappear. Unless the observer's attention is caught by resumed movement or by shadows cast by the crab's upraised eyestalks, detection can be difficult short of stepping on it by mistake.

Even though the crabs must return to the ocean several times daily, they seem to have an aversion to it. Moistening of the gills is accomplished by anchoring their bodies on the beach with spine-tipped legs and allowing spent waves to wash over them gently. Usually, ghost crabs literally must be chased into the water before they will fully enter it; the reason is that they are not adapted for aquatic life. They can move only clumsily along the bottom, buffeted by the force of every wave and easy prey for passing fish such as striped bass. If they remain too long, they drown because their modified gills cannot satisfy their bodies' oxygen demands while under water.

Egg-carrying females, found in New Jersey from April to July, are less reluctant about being inundated and submerge themselves periodically when the sea is calm. A submerging female flips onto her back and, using her mouthparts, forces water over the greenishyellow eggs attached to her abdomen. The exact reasons for this behavior are unknown, but wetting and cleaning of the eggs are good possibilities. When the eggs are ready to hatch, the female re-enters the sea, where the larvae are released to drift with the plankton. There the young undergo a series of molts and metamorphose into the juvenile crabs which leave the water to assume life on land.

Beginning at dawn and continuing through most of the daylight hours, tunnel building and renovation seems to be the ghost crab's favored activity. Young crabs make short vertical burrows close to the ocean

By photoflash, Ocypode quadrata partakes of a seafood dinner.



Caught in the act of renovating its living quarters, a crab pauses for a portrait. PHOTOS BY AUTHOR



 Δ Typical active burrows signatured by their owners' footprints.

 ∇ Ghost crab being enveloped by the wash of a dying wave.



and are often forced to evacuate with the rising tide; new burrows must therefore be dug almost every day. Older individuals tunnel above the high-tide mark as far as a quarter of a mile inland in every conceivable sandy location, even in the steep faces of dunes. Their burrows are deep, extending down two to four feet, usually at a 45° angle to the surface, and are relatively permanent.

Sand from each excavation is scooped and held in the crook of several legs or the large claws, then carried out to be spread into a fan-shaped deposit at the opening. By sitting quietly near active burrows, one can watch this routine. Each crab emerges with its burden and pauses in the entrance as if to study the observer. The busy builder then tosses away the sand and descends to repeat the process. Later in the morning, the extracted sand is landscaped and any mounds or irregularities smoothed out. During all this time, the observer must be careful not to move or allow a shadow to fall near the workers. It is doubtful that the crabs' eyes can form images as we know them, but they are able to detect motion and changes in light intensity quite well. If disturbed, the crabs usually sulk within their burrows for some time. As the noon hour approaches, the crabs seem to tire of their labors and the mouths of many burrows are plugged with damp sand while the owners rest inside; especially among the young, however, there are always a few stalwarts that remain active. 'As the afternoon wanes, the crabs re-emerge and continue construction until dusk, when foraging begins.

Ghost crabs are scavengers and predators and will eat virtually anything that cannot get away. After dark, the crabs rummage through the sea wrack left by the tide and ingest any bits of algae or carrion upon which they chance (at this time, the crabs may be more closely observed because they briefly "freeze" in the glare of a flashlight). If a large item such as a fish is found, the crabs make temporary burrows within an inch or two of it and remain for several days, if possible, until the food is consumed. Ghost crabs prey extensively on the tiny amphipod beach fleas or hoppers that are found within the wrack and under driftwood. They are also able to capture the mole crabs (*Emerita talpoida*) which burrow just under the surface of the sand within the wave zone. Ghost crabs seeking them will follow a receding wave down the beach, dig quickly near the water's edge, then race back up the beach ahead of the next wave. Successful predators dismember the smaller prey and eat the soft tissues. In the Florida Keys, ghost crabs even have been seen preying on newly hatched tern chicks.

Ghost crabs can be found on the beach as late as October if the weather is warm, but they disappear soon afterward for the winter. No indisputable evidence has been found yet, but it is believed that they hibernate throughout the cold months in deeper-thannormal burrows. Wherever they go and whatever the circumstances, the ghost crabs reappear with the spring ready to entertain the patient naturalist and perplex the potential predator.

Continued from page 5

New Jersey's Saltwater Sportfishery

County	Number Marinas	Number Slips	Number Rental Boats	Party Boats	Charter Boats	Number Lifts	Number Ramps	Yachi Clubs
Hudson, Middlesex	23	1,067	32	1	6	13	11	25
Monmouth	83	5,635	195	25	94	37	31	11
Ocean	199	13,848	1,298	31	80	103	75	19
Atlantic	71	3,359	162	6	12	28	20	3
Cape May	80	4,547	421	32	42	47	13	7
Cumberland, Salem	29	1,646	292	6	19	15	13	2
Totals	485	30,102	2,400	101	253	243	163	67

Table 3. Fishing and Boating Facilities by County

485 marinas (capable of harboring 30,000 boats), 67 yacht clubs, 163 boat ramps, and 243 lifts (Table 3). Despite this seemingly large number of facilities, fishermen must often wait several hours to launch their boats during the spring run of Delaware Bay weakfish; the Manasquan River supports a tremendous flow of boat traffic, yet has a paucity of boat ramps; surf fishermen must walk miles because of the lack of parking and access to the Sea Bright sea wall; in many areas, commercial and residential development of the shoreline has progressed to the point where only limited areas remain for bank fishing and crabbing.

Existing facilities will have to be improved and new ones created where needed. Additional access facilities should include boat ramps, parking lots, fish walks on bridges, overnight campsites, strategic bank fishing areas, and rights-of-way to beaches and jetties. The development of adequate access facilities for fishermen and boaters will not only ease the access problems which now exist, but will also provide for use of the marine environment by a greater number of people.

HARRY GROSCH



ANGLERS' GUIDE

The "Anglers' Guide to the United States Atlantic Coast" is an 8-volume atlas of saltwater sportfishing grounds from Maine to Florida. These guides (printed in color) were compiled by two fisheries biologists from the National Marine Fisheries Service, Bruce L. Freeman and Lionel A. Walford. Information presented in the guides was obtained from hundreds of fishermen-charter and party boat captains, commercial netters and sportsmen, outdoor writers, tackle shop owners and biologists from State and Federal fisheries agencies. The end product is a comprehensive guide for the saltwater angler, illustrating fishing grounds for over thirty species, wreck locations, significant bottom contours and access facilities and providing valuable information regarding fish habits, angling techniques and geographical and historical descriptions of each coastal area.

The two volumes (Sections III and IV) pertaining to New Jersey coastal waters are listed below:

Anglers' Guide to the United States	@\$1.70
Atlantic Coast Section III - Block	
Island to Cape May, New Jersey	
Stock No. 0320-00071	
Anglers' Guide to the United States	@\$1.60
Atlantic Coast Section IV - Delaware	
Bay to False Cape, Virginia	
Stock No. 0320-00072	

Copies of all eight volumes (each $16\frac{1}{2} \times 14$ inches) are available from the Superintendent of Documents, U.S. Government Printing Office in Washington, D.C., 20402.

There's no excuse now for not knowing where the fish are – or at least where they should be.





trail of the horseshoe crab

BY J. ALBERT STARKEY

The horseshoe crab, whose scientific name is *Limulus polyphemus*, has been crawling out of the water to deposit its eggs on the beaches for millions of years. This harmless creature is not really a crab but is more closely related to the spiders. It is sometimes referred to as a "living fossil" because it is believed to have existed in its present form for 175 to 200 million years.

Horseshoe crabs are very temperature tolerant and so have been able to establish themselves in the coastal waters of North America from Maine to the Gulf of Mexico. They live on muddy or sandy shores below low-water level. Each crab, as it continues to grow, sheds its shell several times during its life. These cast-off shells may be seen on the beaches at any time of the year, frequently with various species of mollusks attached.

Following the reproductive pattern of countless generations, the horseshoe crabs come ashore in the bays and inlets of the New Jersey coast. In the Delawware Bay area they appear at the time of the full moon and accompanying spring tides of late May or early June. The warmer waters of late spring promote migration from the deeper waters to the land for their annual reproductive activities.

Millions of horseshoe crabs may be seen swimming onto the beaches with the high tide; the few days of higher tides at the time of the full moon permit the crabs to deposit their eggs farther up the beaches. Usually the female reaches the waterline attended by one or more males. The female is much larger than the male—very large individuals may measure 18 to 20 inches from front of shell to tip of tail. The successful male attaches himself to the shell of the female with the aid of two specialized claws which hook onto the rear edge of her shell.

The female scoops a shallow pit in the sand near the high-water line, where she deposits several hundred eggs on which the male releases his sperm. The quiet motion of the water carries sand into the pit and covers the eggs. The crabs return to deep water with the receding tide. The young crabs will emerge from the eggs in four to six weeks and spend their early lives in the shallow waters of the mud flats.

The eggs of horseshoe crabs are relished by gulls and shore birds, who wait for enough morning light to dig them out and eat them. Many of the egg deposits do not become completely covered with sand, allowing the birds to find them easily. It formerly was a common practice for local farmers to scoop out the eggs and feed them to chickens and hogs.

Many adults do not succeed in returning to the deeper water. Some are inverted by wave action.



horseshoe crab with hitch hikers

Usually a crab can easily right itself by vigorously thrashing its long tail. If this is not successful, the shell becomes full of sand and the crab succumbs to the hot sun on the drying beach. Others attempt to bury themselves in the sand of the beach but are not totally successful; they become tired and immobilized by the sand which dries about them and die before the next high tide.

Horseshoe crabs were much more abundant years ago; the numbers reaching New Jersey's Delaware Bay shores are noticeably reduced in recent years. Studies being done along the Delaware, Maryland, and Virginia shores indicate somewhat lesser numbers there also.

Records as early as 1880 indicate that horseshoe crabs were collected yearly by the millions from the beaches of Cape May County. They were dumped into pens where they were allowed to dry completely, after which they were ground into fine particles and used for fertilizer. The last commercial operation of this kind closed in the 1950's.

Though no longer harvested commercially, the horseshoe crab today is serving man through important contributions to medical science. Its pale blue blood clots quickly when exposed to minute amounts of toxins that may contaminate certain medications, intravenous fluids, or blood components, and therefore can be used as a diagnostic tool in detecting such contaminants. The blood (which is extracted without harming the crab) also aids research in such diseases as spinal meningitis, cancer, and influenza.

A most interesting and helpful friend, the horseshoe crab, and if we spare our tidal lands from development and pollution he will continue to leave his trail along our beaches for many more millions of years.



PHOTOS BY THE AUTHOR

pair of horseshoe crabs



TUCKERTON CREEK HARD CLAM RELAY

Preliminary investigations of Tuckerton Creek by shellfisheries biologists revealed an extensive hard clam resource estimated at one million clams. The proposed dredging of a navigation channel threatened this valuable resource. In order to salvage the hard clam resource, a relay program was initiated. This relay program was necessary because Tuckerton Creek is presently condemned for the harvest of shellfish.

So all clams were transferred from Tuckerton Creek and planted on leased lots in approved waters of Little Egg Harbor. The clams must remain planted for a minimum of 30 days, during which time they purge themselves of bacteria and viruses. Following the depuration period, samples are collected and examined for bacterial contamination. If the clams are within acceptable bacterial limits, the beds are opened for harvest.

Over 1.15 million clams were relayed from the condemned waters of Tuckerton Creek to waters approved for depuration. Eighty nine shellfishermen participated in the program and harvested over 900,000 clams from the proposed dredge area. An additional 250,000 clams were harvested from other areas of the creek and cove.

This program provided work and additional income for many shellfishermen. These factors, combined with the utilization of a valuable resource that would have otherwise been destroyed, made this a beneficial program for the resource and the citizens of New Jersey.

PHOTOS BY HARRY GROSCH



A clammer going out to plant clams.







Environmental News



"MISS FREEDOM" BEGINS LIBERTY PARK-ELLIS ISLAND RUN. Governor Brendan Byrne (left) and DEP Parks and Forestry Director Alfred Guido frame a view of Liberty State Park on the Jersey City waterfront with the World Trade Towers of New York City in the background. The picture was taken from the deck of the Circle Line's newest ferry boat, "Miss Freedom," on her maiden voyage to Liberty State Park following her christening on May 12. The Governor, commenting on the many months of effort to get the boat trips started, said, "I commend the state department of Environmental Protection, the National Park Service and Circle Line Cruises for the fine work they have done in establishing this new ferry service." Regular boat service began on May 14. "Miss Freedom" makes three trips a day from Liberty State Park: At 10:30 a.m., 12:30 p.m. and 2:30 p.m. The ticket price of \$2.50 for an adult and \$1.50 for a child under 12 includes the boat ride and a guided tour of Ellis Island by National Park Service rangers. Or, riders from Liberty park can take a Harbor Cruise instead of going to Ellis Island, the prices are the same.

DEP ISSUES PCB REPORT

- Warns against eating fish caught in Hudson River and Upper New York Bay
- Finds fish caught elsewhere in New Jersey safe to eat

A preliminary report issued by DEP in mid May has confirmed results previously obtained by the N.Y. Department of Environmental Conservation that certain fish in the Hudson River contain polychlorinated biphenyls (PCBs) in excess of federal standards. The DEP study also shows that some species in the Upper New York Bay likewise are contaminated.

Assistant DEP Commissioner Glenn Paulson advised the public to limit the eating of fish caught in these areas to once a week. He also recommended that pregnant women not eat any fish taken from the Hudson River area and that the fish not be fed to infants.

Paulson emphasized, however, that there have been only low levels of PCBs elsewhere in New Jersey and that no harmful levels of the insecticide Kepone were found in fish anywhere in the state.

The DEP report shows that certain species of fish, including young bluefish, white catfish, white perch and striped bass, caught in the Hudson River contain PCBs in excess of the U.S. Food and Drug Administration (FDA) standard of 5.0 parts per million (ppm). The high PCB readings in the study ranged from 6.4 ppm in striped bass to 17.9 ppm in perch. Blueclaw crabs, American shad, alewife herring, menhaden and soft clams in the area also were found to contain PCBs but in concentrations below the FDA standard. In general, high concentrations were found in fish with high fat content and in fish collected farther upstream.

Dr. Peter Preuss, DEP special assistant for toxic and hazardous substances, said, "No precautionary measures are necessary for fish taken from areas other than the Hudson River and Upper New York Bay. Throughout the rest of New Jersey, PCB levels were generally low."

DEP also analyzed fish, shellfish and sediment samples for Kepone contamination, *Continued on page 16D*



ROCCO D. RICCI NAMED DEP ACTING COMMISSIONER

Governor Byrne on May 6 named Rocco D. Ricci as acting commissioner of Environmental Protection to succeed Commissioner David J. Bardin. Ricci, 46, of East Brunswick, has been with the department as assistant commissioner since June 1974 and was promoted to first deputy commissioner in September 1975. He also had served as acting director of DEP's Division of Water Resources, which handles all aspects of the state's water resources.

Prior to joining state government, Ricci was with the federal Environmental Protection Agency (EPA) for 11 years where he was responsible for the sewerage construction grant program for Region II, embracing New Jersey, New York, Puerto Rico and the Virgin Islands. He also supervised the technical review of all discharge permits or compliance schedules for air and water pollution control facilities in the region.

A licensed professional engineer, Ricci received his civil engineering degree from Polytechnic Institute of Brooklyn, graduating cum laude. After a tour of Army duty, he received his master of civil engineering degree from New York University in 1959.

Ricci and his wife, Joan, are the parents of three daughters, Irene, Catherine and Anne.

BARDIN IN WASHINGTON

David J. Bardin resigned from the position of Commissioner of Environmental Protection to join the Federal Energy Administration (FEA) as deputy administrator. He had served as DEP's top executive for three years, beginning in May 1974. Bardin's significant actions and contributions in the many areas of environmental concern in New Jersey gained him state and national acclaim.

DEP TO ENFORCE NATIONAL STANDARDS FOR AIR POLLU-TION CONTROL

DEP will start enforcing national air pollution standards and the control of hazardous emissions from plants and industries throughout the state. Acting Environmental Protection Commissioner Rocco D. Ricci said the federal Environmental Protection Agency (EPA) has granted the authority to New Jersey in response to the state's request in June 1976.

"I am pleased that EPA reacted favorably to our request," Ricci said. "This action will expedite implementation of air pollution control programs required by the Clean Air Act and will prevent duplication of effort by federal and state governments."

Ricci said DEP will be responsible for carrying out the programs and assuring compliance. "Prior to this delegation," said Ricci, "state inspectors would have to refer violations of federal law to the EPA office in New York. A federal inspector would then have to be dispatched to record the violation. The industry also had to obtain federal as well as state permits. This has now been consolidated.

The transfer of authority involves two federal programs, Standards of Performance for New Stationary Sources (NSPS) and the National Emission Standards for Hazardous Air Pollutants (NESHAPS).

The stationary source standards will control emissions for new industries including chemical and acid-producing plants, incinerators, metal smelters, sewage treatment plants and fertilizer industries. The hazardous emissions controlled thus far are asbestos, mercury, beryllium and vinyl chloride.

The new enforcement responsibilities are not expected to increase DEP's workload significantly since the department is already performing the essential elements of the review and surveillance requirements of the program.

CAFRA RULES ADOPTED

The department recently adopted formal procedural rules to be used in implementing the state's Coastal Area Facility Review Act (CAFRA). The new rules spell out DEP's procedures for the CAFRA permit application process and help to define the legislative purposes of the act. Decisions will continue to be made after an informal, public process open to all. Only in rare controversies will it be necessary to add formal, quasi-judicial processes. The rules streamline the Environmental Impact Statement process. Also, the definition of "facility" has been clarified to exclude minor projects such as small road paving and sewer pipeline extensions.

Informal CAFRA public hearings are held on each permit application. Developers are urged to contact DEP's Office of Coastal Zone Management (OCZM) for prior conferences to aid in the design and development of acceptable projects with the appropriate information in the environmental impact statements. These pre-application conferences have helped many builders/developers save time and money. Copies of the regulations are available by writing CAFRA Rules, OCZM, Box 1889, Trenton 08625.



PATRIOT'S PATH - A 27-MILE LONG PARK A-BUILDIN'. It would be hard to find a better example of cooperative planning within a region than the Patriot's Path project in Morris County. Communities located along the Whippany River and the Morris County Park Commission have coordinated their efforts on planning the lineal park and applying for funds. When complete, Patriot's Path will be a barrier-free facility linking national, county and municipal parks in the area. The project was recently approved for an \$85,000 Green Acres grant for development of three sections of the trail. Approximately 3.3 miles of the eight-foot-wide path will be paved and landscaped. The project also includes a new basketball court and tot lot at Abbett Playground in Morristown. The Morris County Park Commission and the municipalities of Morris, Hanover and Morristown will match the state grant to cover the totals \$170,000 cost of the project. The sections to be developed are shown in the map above. (Section One: From Washington Valley Road along the Whippany River to Speedwell Lake within Morris Township. Section Two: At Abbett Playground in Morristown. Section Three: From East Frederick Place to Clemens Lane along the Whippany River within Hanover Township.) This is third in a series of grants for Patriot's Path. Under the 1971 Green Acres Program, two land acquisition grants helped purchase close to 60 acres.

WATER POLLUTION CONTROL STATUTES MODERNIZED

Two pieces of legislation signed into law by Governor Byrne on April 25 have modernized New Jersey's water pollution control statutes. The Water Pollution Control Act (Senate bill-1222) became Chapter 74, P.L. 1977; and the Water Quality Planning Act (S-1223) became Chapter 75, P.L. 1977.

These new statutes consolidate the state's water pollution authority into one comprehensive, workable framework. The laws give the state the authority necessary to run a modern water pollution control program in harmony with existing federal statutes. They repeal 24 archaic and conflicting water pollution statutes dating back to 1897.

The Water Pollution Control Act establishes a system of state permits designed to gradually restore and then maintain New Jersey's surface and groundwater quality. When fully implemented, the law will require persons whose discharges could harm the waters to obtain a permit prior to discharge. The law contains a series of enforcement options. The Commissioner of Environmental Protection is authorized to commence civil actions to attain any one or a combination of specified remedies. The Commissioner may also assess a civil penalty of not more than \$5,000 for each violation, or seek a court assessment of up to \$10,000. Persons willfully or negligently violating the provisions of the law are guilty of a misdemeanor and are subject to a fine of \$2,500 minimum to \$25,000 maximum per day and/ or imprisonment for a year. In the case of a second offense, the minimum and maximum fees are doubled as is the possible prison sentence. Other regulatory and administrative provisions are included in the law.

The Water Quality Planning Act empowers DEP and county governments, where appropriate, to conduct comprehensive water quality planning programs in order to restore and maintain the chemical, physical, and biological integrity of the waters of the state. The act authorized the preparation of areawidwide water quality plans (usually according to county boundaries).

TROUT LIMIT CHANGED

DEP's Division of Fish, Game and Shellfisheries reminds anglers that the daily bag and possession limit on trout in most state waters changed from six to four trout on June 1. The four trout limit will be in effect until the close of the season on March 12, 1978. Fishing enthusiasts should consult the "Summary of 1977 Fishing Laws" for exceptions.

Note: Free fishing licenses are available to New Jerseyans age 70 or over. For information write to the division at Box 1809, Trenton 08625.



HISTORIC OXFORD FURNACE. Oxford Furnace in Warren County was the first hot blast iron furnace in the United States in 1834. During the following 50 years of continuous operation, the furnace was one of the technological leaders in the manufacture of iron. Oxford furnace has been nominated to the National Park Service for inclusion on the National Register of Historic Places. The furnace ruins, located on Washington Avenue in Oxford Township, originally were proposed as part of a pending historic industrial district designation (nearby are iron mines—a former gristmill and the iron-master's mansion). The ruins are now being singled out to expedite federal review in an attempt to preserve the furnace. Inclusion on the National Register makes an area eligible for federal historic preservation funds. Register sites also have some measure of protection from government-sponsored encroachments.

NUCLEAR MEDICINE TECHNOL-OGISTS SLATED FOR STATE TESTING

Nuclear medicine technologists would be required to obtain state certification under proposed rules announced by DEP on May 10. These technologists, acting under a physician's direction, administer radioactive drugs for diagnostic testing.

According to DEP's Bureau of Radiation Protection, the use of radiopharmaceutical drugs for diagnostic and therapeutic purposes has increased dramatically in recent years. Since 1972, there has been a 90 percent increase in nuclear medicine procedures performed in New Jersey's hospitals and clinics. The bureau's studies show that many of the technologists have little or no formal education in the nuclear medicine field, and that no federal or state agency currently requires licensing, certification or testing before they begin working.

The rules, which are scheduled for public hearing in July, were prepared by the state Commission on Radiation Protection and its Nuclear Medicine Advisory Group in cooperation with DEP. They are designed to prevent unnecessary radiation exposure by training technologists in the proper administration of the drugs. Technologists would be required to take a state exam and be certified in order to practice.

SOLID WASTE MANAGEMENT

Guidelines contract let: The department has awarded an \$18,500 contract to Louis Berger and Associates, Inc. of East Orange, an engineering consultant firm, to assist the state in the development of regional solid waste planning guidelines and regulations. The guidelines will explain the methods and procedures to be used by the 22 solid waste districts (21 counties and the Hackensack Meadowlands Development District) in preparing acceptable plans for efficient and environmentally safe solid waste management.

Districts placed in planning groups: Regulations were proposed by DEP in late May placing each of the 22 solid waste management districts into one of three planning categories. The designation as to all groups to be implemented on the effective date of the Solid Waste Management Act (Chapter 326, P.L. 1975), slated for July 1.

The law requires each district to design its own plan, and permits development of joint district solid waste management plans. Grouping areas with similar operations and needs will aid in the eventual preparation of joint projects. In addition, it will smooth administration of the program by facilitating the distribution of 50 percent matching fund planning grants and later will pace the reviewing process when the completed plans are submitted to DEP. (The matching grant *Continued on page 16D*

ROOFING COMPANY FINED \$150,000 FOR AIR POLLUTION

VIOLATIONS

A New Jersey superior court has levied fines totaling \$150,000 against the Lloyd A. Fry Roofing Company for violations of the state's air pollution control standards at its Kearny (Hudson County) plant. The company was ordered to pay a cash fine of \$37,500 for excessive particulate emissions from its plant located on Route 7. In addition, the company must post a \$112,500 performance bond to ensure that required air pollution control equipment is installed by September 30. For every day the company is not in compliance with the regulations after that date, a \$1,000 penalty will be deducted from the performance bond.

Paul Arbesman, director of DEP's Division of Environmental Quality, said the order, granted by Judge Frederick G. Krentz in Jersey City, culminated four years of court actions against the Fry company beginning in October 1973. The company was fined \$2,500 at that time and ordered to submit a schedule for installing control equipment to reduce emissions. DEP inspections showed that the equipment was not installed by the November 1976 deadline and Deputy Attorney General David Harris again brought the case before Judge Krentz resulting in the new fine.

The Fry company plans to install equipment which will duct emission fumes to the company's asphalt heater burner. DEP expects that this will eliminate the visible particulate fumes and odors which have been a source of complaints over the years.

DEP SIGNS ORDER WITH UNION CARBIDE FOR GROUNDWATER SAMPLING

DEP in late April signed a consent order with Union Carbide Corporation requiring the company to establish a \$60,000 fund to be used by DEP for groundwater investigations in Dover Township (Ocean County) during the next five years.

The order, issued by Ocean County Superior Court Judge Henry H. Wiley, resolved a suit started by the department 16 months ago which charged Union Carbide with contaminating a large underground water supply in Dover Township.

The fund will be used for sampling groundwaters in the township and, if necessary, for treatment and purification to protect the groundwaters from contamination.

According to the complaint filed by Deputy Attorney General Lawrence Stanley, a contractor hired by Union Carbide removed truckloads of liquid chemical wastes from its Bound Brook plant and dumped more than 6,000 drums at two sites in Dover during 1971. The hauler allegedly dumped approximately 2,000 drums in the town's landfill and 4,500 drums on privately owned property on Lakewood Road.

The suit charged that spillage from the improperly dumped wastes seeped into the Cohansey aquifer, which is a major groundwater recharge area and the prime source of water for human consumption in Dover. *Continued on page 16D*



FREE PAMPHLETS FOR BOATERS

The following informational pamphlets covering topics of interest to boaters are available free of charge from DEP's Bureau of Marine Law Enforcement: Personal Flotation Devices (explains the different types); Whistle Signal Card (explains the various signals for the rules of the road); Oughta Be A Law (explains the pollution laws on the waterways); Facts To Know About N.J. (explains the boating laws of New Jersey under Title 12, but does not give the statutes): Fire Extinguishers (basic types approved for marine use); Squall Line (shows various cloud formations to be aware of while out on the water); Count Pounds Not People (dangers of overloading a vessel) and Anchoring in Channel (law violation); Ski Rules (explains what the ski team is and that water skiing is a day time sport only) and Ski Signals (hand signals for the skier to use to signal boat operator); Fun Afloat (briefly explains the rules of the road); Trailers (explains basic lights and positions, also how to handle boat trailer while backing); and Boating Safety Hints for Hunters and Fisherman (explains the weather, making a float plan and equipping the boat). In addition, two U.S. Coast Guard pamphlets are popular with boaters: Federal Requirements for Recreational Boats (CG-290) and the Pocket Guide for Visual Distress Signals (CG-152).

Please request the pamphlets by title. Write to the Brueau of Marine Law Enforcement, Box 1889, Trenton 08625.

BOAT NOISE

The regulations to curb excessive boat noise, explained in these pages of the NJO May/June issue, went into effect on July 1. Copies of the regulations are available from Edward J. DiPolvere, chief of DEP's Office of Noise Control, 380 Scotch Road, Trenton 08628.

PRESIDENT CARTER'S EARTH WEEK MESSAGE

When President Jimmy Carter proclaimed the week of April 17 as Earth Week 1977 he said the concern it symbolizes "must become a part of our public and private philosophies." He asked educators to consider introducing "an ecological perspective" into all branches of learning to encourage graduates to protect "the health of our planet." The President cited the depletion of resources, pollution and the generation of unnatural substances in the industrialized world's patterns of production. He said that since the beginning of this decade man has begun to realize that the earth's resources were limited, and "we have begun to see that we are its stewards, not its masters."

Governor Byrne recently signed an executive order creating a commission to help direct the development of Liberty State Park. The commission will hold public hearings to invite public opinion on the development of the waterfront complex. Former U.S. Commerce Secretary John Conner was named chairman of the 10-member panel which includes representatives from environmental groups as well as from the real estate, industrial, banking, investment and professional communities.

TOXIC SUBSTANCES ARE TARGET OF WATER STUDY

A one-year study of the state's groundwater supplies to test for possible contamination by cancer-causing and other toxic substances was launched by DEP in May. The department has contracted with Rutger's University's Department of Environmental Science to carry out the project at an estimated cost of \$162,000.

The project has four objectives: 1) To conduct a general survey of groundwater supplies, analyzing for possible contamination by toxic or carcinogenic compounds; 2) To sample groundwater around landfills which have received chemical wastes to test for leachate contamination; 3) To sample selected polluted groundwater to determine the extent of contamination; and 4) To sample chlorinated groundwater to determine the effect of chlorination on the concentration of hydrocarbons.

Samples will be taken in all 21 counties, and the results of the analyses submitted to DEP monthly. Two formal reports will be presented to DEP: the first after seven months, and the second, final report, after completion and interpretation of all analytical work.

ROUND VALLEY ACCESS ROAD READY IN TIME FOR FUN SEASON

The access road to Round Valley Recreation Area opened on schedule — in time for the Memorial Day weekend, traditional start of the summer season. The road will service Round Valley (which opened for it's first full season this year, having been completed in late 1976) via a new signalized intersection on Route 22, Hunterdon County. The new road, which is a three-quarters of a mile in length, includes a bridge over the ConRail track.

Round Valley Recreation Area, a most attractive public facility, is completely barrier free (wide walks, ramps, sanitary facilities with safety rails). It will accommodate approximately 3,000 persons daily. Activities include fishing, camping, picknicking and swimming. Parking fees: \$3 on weekdays, \$5 on weekends and holidays. Walk-in fee for those 12 years and older, 50 cents.

Both Round Valley and nearby Spruce Run recreation areas will be operating on a five day basis: Round Valley—Saturday through Wednesday and holidays; Spruce Run— Sunday through Wednesday and holidays.

All and the state

Auto emissions control VO-TECH TEACHERS RECEIVE TRAINING

A statewide training program in the latest specifics of auto emissions control technology was held for currently-employed vocational-technical (vo-tech) teachers during May and June. The program was co-sponsored by DEP and the state department of Education. The free seminars, held in various parts of the state, combined classroom instruction with actual, "hands-on" experience. The vo-tech teachers are expected to provide similar instruction to their students. To aid their teaching, each school sending a faculty member to the seminars received without charge a set of instruction materials. The state awarded certificates to the seminar attendees and will do the same for students receiving auto emissions control training from seminar "graduates" at the schools where they teach. These certificates will have a dollars-and-cents value in the job market, because they will indicate that the bearer has received special training in timely automotive skills. And the environment will benefit, too-for more clean running cars mean less air pollution and less gas used:

Continued from page 16A

PCB REPORT

but found no excessive concentrations anywhere in the state. "Thus far the Kepone readings are all well below FDA's action level of 0.1 ppm," Preuss said.

Though the study is continuing, the preliminary findings were announced by DEP to advise the public prior to the start of the major fishing and crabbing season. (New York state issued a similar advisory for the Hudson River.)

Continued from page 16C

SOLID WASTE

program to be administered by DEP is subject to the availability of funds. It is anticipated that \$750,000 will be appropriated for Fiscal Year 1978.)

The law contains a timetable for districts, setting starting dates for planning and for submission of the final product. The groupings and anticipated starting dates are available from Bart Carhart, DEP, Solid Waste Management Administration, Box 1390, Trenton 08625.

Continued from page 16C

UNION CARBIDE ORDER

According to the complaint, the spillage caused 140 wells in the Pleasant Plains section of the township to be condemned by DEP, and groundwater from the Cohansey aquifer in other parts of the township was severely damaged or diminished in value.

The order also provides for dismissal of the complaint without any admission to the charges by the company.

FARRINGTON LAKE Middlesex County

BY ROBERT W. STEWART Assistant Fisheries Biologist

Farrington Lake, located just outside of Milltown on the border between the Townships of North Brunswick and East Brunswick, is one of the water supply reservoirs for the New Brunswick area. It is an artificial impoundment formed in 1926 by the damming of Lawrence Brook and is an excellent example of the multiple use role a municipal water supply reservoir can play as it provides many hours of enjoyment to fishermen, boaters, hikers, birdwatchers, nature lovers, etc.

The lake is currently being managed to provide a warmwater sport fishery, the more important species being largemouth bass, chain pickerel and various pan-fishes, as well as a recreational spring fishery for hatchery reared trout. Landlocked herring (alewives) were introduced as a forage species and subsequently have established a limited population. Channel catfish were also introduced as an additional sport fish and although they have not established a spawning population, a few large fish in excess of 18 inches are still being caught each year.

There is, at least, one boat livery present that is located on Church Lane. Also, car top boats can be launched at Oakmont Avenue and Church Lane. However, only electric motors are permitted. Bait is available from local sporting goods dealers.

The immediate margin of the lake consists of about 65 percent forest, 20 percent grass land (lawns), 5 percent parkland, 5 percent brush and 5 percent swamp.

The littoral, or shallow area, is comprised of roughly 80 percent gravel, 5 percent mud, 5 percent sand and 10 percent muck and organic debris.

Location: Approximately one-half mile south of Milltown paralleling Riva Avenue.

Physical Features:

Area: 290 acres	Maximum Depth: Approximately 12 feet
Elevation: 32 feet	Mean Depth: 6 feet

Chemical Features:

Oxygen: Sufficient to a depth of at least 10 feet at all times of year

pH: Slightly acidic - 6.7

Biological Features:

Vegetation: Extensive in littoral portion of the reservoir to a depth of approximately 4 feet.

Water Color: Clear, with a brownish tint



Fish and Fishing:

- Rainbow Trout: Good, during the April and May stocking period. A few holdover fish are taken.
- Largemouth bass: Good, growth rate is average for this region of the state with the legal length of 9 inches being reached during the third summer of life.
- Chain pickerel: Good, growth is satisfactory with fish reaching an average length of 12 inches by their third year.
- Black crappie: Excellent, growth rate very good with the best fishing occurring during the spring.
- Channel catfish: Poor, introduced during the early 1960's. However, several good size fish are taken each year.
- Yellow perch: Fair, very abundant but their growth rate is below average.
- Sunfish: Good, adequate population with a satisfactory number of fish in excess of 5 inches available.
- Brown bullhead: Excellent, abundant population with above average growth rate. This species provides a major fishery in this reservoir.

The following twenty species of fish have been sampled during division surveys.

Rainbow trout Largemouth bass Chain pickerel Black crappie Yellow perch Bluegill Pumpkinseed Mud sunfish Bluespotted sunfish Blackbanded sunfish Channel catfish Brown bullhead Slender madtom Eastern creek chubsucker Alewife Golden shiner Common shiner Spottailed shiner Banded killifish Fusiform darter

New Jersey State Library

Youth Conservation Corps students erecting warning signs around a least tern colony on Brigantine Island.



CAUTION! BIRDS NESTING

BY MARK POKRAS, AND Instructor JERRY SCHOENLEBER, Student Stockton State College

Imagine, if you will, a south Jersey beach on a sunny June morning. A cool breeze is coming off the water. On the beach, tens of thousands of seabirds stretch their wings and MARK POKRAS

fly off to fish in local bays and offshore waters. This was Brigantine Island back before America became a nation.

Two hundred years later, Brigantine's beaches look much the same. However, they're now bordered with houses instead of beach plum and dune plants. Where are the seabirds? Instead of the countless flocks described by Audubon, today's seabirds are counted by tens.

Certainly much of this decrease in bird numbers has occurred because many of the beaches are no longer available to species which nest on sand. People have found that these shore areas are great places for recreation. Unfortunately, human use of the beaches is at its peak just when the birds need the areas to nest-from late May until August.

During the last five or six years, researchers up and down the East Coast have focused their attention on one seabird in particular, the Least Tern. The smallest member of the gull family, the Least Tern is only 9 inches long. It arrives in our area in mid-May from its wintering grounds along the coasts of Central and South America. This species has shown a serious decline in numbers in recent years.

In remote areas along the coast, the Least Tern still follows its ancient lifestyle. Nests are established high on the beaches among the pebbles and consist simply of shallow depressions made in the sand. Here the terns lay two speckled eggs that blend with the sand so well that they're almost invisible from just a couple of feet away. The young, once they hatch, share this characteristic camouflage. This coloration helps protect eggs and young from predators, but even under the best of circumstances, gulls, crows, raccoons, and other predators take their toll. An even bigger problem for these sand nesters is the occurrence of storm tides which wash much higher than normal and periodically destroy eggs and young not old enough to fly. But these natural forces are things that the terns have lived with for millions of years. So scientists figured that there must be something else causing tern populations to drop off so sharply.

It appears now that the decline in the Least Tern's population can be traced mainly to the effects of people. We mentioned earlier the fact that terns can no longer nest in many of their traditional locations. Another big problem is rats. Wher-ever people live, they leave trash, which sooner or later brings rats. So now there are rats on the barrier beaches, and the terns have no defense against them. One of New Jersey's largest Least Tern colonies has traditionally been on Holgate, the southern end of Long Beach Island. Until 1974, this active colony was quite successful. For some reason we don't yet understand, rats



Least terns nesting on upper beach in washed-out areas of shell and cobble sparsely vegetated with dune grass.



Least tern nests with eggs and young are well camouflaged sandy scrapes among shell and rubble and easily crushed by a careless foot.

moved from nearby towns into the colony in 1975 and ate most of the eggs and young birds. Since then, this nesting area has been deserted.

Near the south end of Brigantine Island, there are several small tern colonies remaining, even though the wave of new home construction has come closer to wiping them out each year. After watching these colonies for three years, we decided that the major problem wasn't rats, but human disturbance. People used the "empty" expanses of sand to walk their dogs, ride motorbikes, etc. It's not that the people didn't care—they just didn't pay attention to the almost invisible nests underfoot and the tiny adult birds calling overhead. If the adult birds are kept from incubating their eggs and young for as little as five or six minutes, the morning's chill or the hot afternoon sun can kill the developing chicks.

We decided to do an experiment during the summer of 1976 to find out just how much of a problem human disturbance really was in southern New Jersey. Within the last few years, Ms. Jonnie Fisk and the Massachusetts Audubon Society have greatly increased the productivity of tern colonies on Cape Code simply by posting signs around each colony asking people to keep out. We received permission from John Rogge, Mayor of the City of Brigantine, to post a tern colony on the island. The Youth Conservation Corps at Brigantine National Wildlife Refuge constructed interpretive signs, and with their help we erected these signs around our experimental colony. Having signs asking people to stay out was a start-but nothing can replace the personal touch. So, the Brigantine Refuge YCC's and the Atlantic Audubon Society arranged to have one or two people at the colony seven days a week during the entire breeding season. In this way, we could educate local people by explaining the problems as well as guarding the colony. Once local residents understood the problem, most of them were quite receptive and found other places to walk their dogs and play.

The result? In the posted and guarded colony, more than 25 young birds spread their wings and flew away. The previous year, the same colony had fledged only four or five young birds. Nearby unposted and unguarded colonies also were quite unsuccessful.

So where do we go from here? This year, the Atlantic Audubon Society has created a 30-minute slide talk on the Least Tern and its problems. We hope to present this *Continued on page 26*

watercourse exploration

BY BERT NIXDORF

Or How to Beat the Heat and Simultaneously Appreciate the Pleasures of Waterwhacking a River... Walk, Wade, Swim, or Float. Explore, Discover, Enjoy the Fascinating Flora and Fauna Along a Waterway in the Pine Barrens — A Frog's Eye View...

Have you ever walked down a river, in the river, for a couple of hours? Call it a water hike. I prefer to call it "watercourse exploration." Why walk it when a canoe is drier, easier, and safer, maybe? What about snakes? Muck? Fallen trees? Debris? Poisonous plants? So! Do you really know Nature's way? Do you really know the Pine Barrens? Or a pine barrens stream? The Wading River, the Oswego, or the Batsto? The Mullica? Come, let's walk down a river. The pleasure, knowledge, and insight gained repay a thousandfold the "explorer" who undertakes such an endeavor.

The idea was conceived several summers ago with a group of companions in an attempt to enjoy pine barrens hiking, while at the same time avoiding the excessive heat and humidity so characteristic of July and August. The group was engaged in a hike-and-swim outing several miles below Chatsworth, along a shaded sand road which borders the Wading River. Inspired by the hot sun and the high humidity, we took advantage of several nice "dipping" places along the way. "Why don't we do just this sometime?", someone queried, as we were coursing upstream a short way and returning again to the starting point, aided along by the gentle and refreshing current. We passed much of the afternoon repeating this watercoursing up and down the stream several times, at different points along our five-mile route. The more we did this, the more evident it became that the oppressive heat and humidity were becoming much less noticeable, and that we were enjoying a

PHOTOS BY LINDA MCCONNELL



kind of euphoria.

Ah, the idea! A hike in the water! How far? How long? How cold would it be after an hour or so? What about lunch? Footing? Water depth, for maybe a mile or two? What about obstacles below the water surface? Safety? What about younger children? Could they do it? Endurance? Snapping turtles? Many questions had to be answered before taking a group watercoursing. What should the activity be called? Watercourse exploration? That's it! The first time we'd scout it out, we'd surely discover a thing or two, hopefully the answers to all our initial questions. Watercourse exploration! Explore and discover! Discover what? Explore and find out!

THE WADING RIVER

So, on a lazy summer's day a pine barrens-aficionado friend of mine and I decided to scout out a section of the Wading River, possibly for future use in an organized group watercourse exploration. The sector we chose was from Stormy Hill, near Chatsworth, to Frank's Ford, two and a half miles by road, Ford Road. With no idea of what confrontations with nature could be in store, nor how long we'd be in the water before reaching our destination, we started out early, about 9:30 in the morning, with a bag of snacks (hopefully waterproofed), a wrist watch (not waterproofed) to time our progress at strategic points, and a section of the U.S. Geodetic Survey topographical map, all secured in a watertight plastic jar, additionally secured against leaking water by several rounds of masking tape. We wore old sneakers for protection against possible cutting objects or rough footing. The day was one of ideal conditions-a bright, cloudless sky, and a relatively high humidity, with the temperature in the high 80's.

Discovery! The Wading River, a waterway aptly named. Seldom was the water above the kneecaps or thighs of a six-footer. The fact is, we soon began to wish for deeper water (and this varies with the amount of summer rains and upon the stream bed contour variations). We kicked, or waterwhacked, our way along, *Continued on page 24* "One can soak up some sun on a sand bar in the solitariness of a seemingly tropical setting."



Class on a salt marsh field trip.

MARION GLASPEY

THE WETLANDS INSTITUTE: a combined effort of research and education

BY WENDY BEARD

An interesting silvery-grey building suddenly emerges above the reed-grass as one drives east along the boulevard toward Stone Harbor. Once in the clearing the driver observes that this curious structure is covered with white-cedar shakes and that, rising above it, is an observation tower crowned by an iron osprey. Near the roadside, a sign catches the driver's eye. The car slows-

VISITING HOURS, TUES.-SUN. 1-5 pm PUBLIC LECTURES, SAT., 8:15 pm

"Wednesday, two o'clock. Why don't I stop and see what this place is?"

Once inside, the visitor is surrounded by a myriad of fish tanks and display cases; an osprey looms directly overhead; to the right is a large room with light streaming in through window walls which overlook the marsh on two sides; to the left is a wing labeled LABORATORIES. This, the visitor soon learns, is The Wetlands Institute, dedicated to estuarine research and education, both formal and public.

HISTORICAL BACKGROUND AND PERSPECTIVE

Estuaries with their associated salt marshes and bay waters are one of the most productive environments known to man. Some 70 percent of all species of commercially harvested fish and shellfish spend at least part of their life cycle in estuaries. Estuaries provide young bass, weakfish, and flounder with protection from predators and strong water movements, and with food in the form of shrimp, crabs, worms, and shellfish. Many birds, including herons, gulls, ospreys, and waterfowl depend also upon estuaries for food and/or nesting sites.

The State of New Jersey recognized the importance of salt marshes and the need to conserve them in the adoption of the Wetlands Act of 1970. Others have also long recognized the importance of wetlands. In the late 1960's the World Wildlife Fund, an international conservation organization, purchased approximately 5,000 acres of southern New Jersey wetlands for the purpose of preservation. These wetlands were later acquired by the State under its Green Acres program. However, a 34-acre plot which included an already-filled building site was donated by the World Wildlife Fund for the establishment of a private nonprofit institution which, through research and education, would increase and disseminate information on wetlands, thus helping to ensure their survival. A Board of Trustees was assembled and a corporation formed, funds were raised, and the building was completed in 1971. The trustees felt that the research and educational aims of The Wetlands Institute could best be met if a university administered the programs. A number of schools were asked to submit proposals, and of those which responded, Lehigh University was selected.

RESEARCH PROGRAMS

Lehigh and Wetlands Institute personnel are involved in a number of research projects, including:

• A five-year fish survey to determine which fish utilize the Stone Harbor estuary, and to gather information on feeding and growth patterns of these fish

- Studies on key members in the estuarine food chains, including the opossum, shrimp, and killi-fish
- Studies to determine the effects on marine life of such pollutants as oil, heavy metals, and the thermal effluents from power plants.

These and other research projects are aimed at increasing our understanding of estuarine ecosystems so that intelligent decisions can be made concerning the future of these productive areas. Also contributing to this end is the dissemination of scientific information to the public. The Wetlands Institute has designed a number of educational programs to meet this need.

EDUCATIONAL PROGRAMS

Free public lectures with topics on marine life and man's effects on the marine environment have been an integral part of the Institute's programs from the start. Lectures are offered twice a week in the summer months and on a less frequent basis from September through May. In addition to the lecture series, groups are invited to visit the Wetlands Institute and enjoy a movie or slide show on salt marshes, a tour of the facility, and, if weather and the size of the group permit, a salt marsh field trip. Specimens are collected on the field trips and brought back to the lab for closer examination and discussion. More than one hundred groups ranging in size from ten to a hundred people and representing schools, scouts, nature centers, and senior citizens visit the Institute each year. Continued on page 27



The Wetlands Institute.

Mini-course in marine ecology, children represent members of a salt marsh food chain.

Continued from page 21

watercourse exploration

occasionally coming to deeper spots from time to time, when we could actually swim.

Discovery! A terrific stream bed – all sand. Delightful! Opps! Ouch! . . . didn't see that submerged tree limb. Discovery! Don't be overconfident about sandy bottoms or the lack of underwater obstacles; the moment you do, your ankle may collide with a tree stub. What lies ahead? Smooth or rough going? Debris? Strange as it may seem, debris is seldom found on the streambeds of these heavily canoe-travelled pine barrens waterways. Most manmade debris (an occasional camera or unopened bottle of beer) appears to have resulted from canoe turnovers, which brings to mind an advantage of doing a watercourse on foot. You're already in the drink!

"See and think with your feet" is an admonition apropos for those starting out on a watercourse exploration. Whatever obstacles there are in watercoursing can be best avoided, and the accident risk minimized, by being ever-mindful of a potential shin-skinner or ankle twister. Feeling or "seeing" one's way with cautious feet is strongly advised — and wear old sneakers, too. Don't go barefooted. Not that watercoursing is a chore or a danger. But now and then, depending on how one finds an obstacle or how an obstacle finds one (!), waterwhacking might be termed a "butt-buster."

As with any exciting outdoor ac-



tivity, there is an element of risk and challenge, terminated with a sense of accomplishment, fulfillment, satisfaction, and complete relaxation from the tensions and routines of the work week.

Discovery! Suddenly-after three hours-the tree-canopied stream. enters an open area at a larger sandbar, where Tulpehocken Creek flows into the mainstream. At this juncture a high ridge of land, 20 to 30 feet almost straight up, lies ahead of us to the southwest of the bend. On top is Hawkins Bridge Campground, in the Wharton Tract. Discovery! Fatique and hunger have besieged us. Rest. Lunch. Soybean gorp for some sustaining protein energy. Climbing the bank of the campground we found dangleberries galore! Dangleberries (Gaylussacia frondosa) constitute the largest, sweetest, and most easily identified member of the huckleberry family and the writer's favorite.

The sun's now getting hot on our dried-off bodies, and we're ready to continue our exploration of the Wading River. Walk, wade, or swim. Up to this point we had knee-deep to waist-deep water. From the campground to the end the water becomes more nearly waist-deep much of the way, but seldom deeper. Frank's Ford-another hour by waterwhacking. We enjoyed swimming in the deeper water, and without any obstacles it was easy going-sheer enjoyment. Still another discovery! A fine swimming hole, over one's head by a good half-foot or more, just before rounding the bend where pilings protruding above the surface mark Frank's Ford. The last twenty minutes before reaching the Ford was a pure, unadulterated summer "afternoon delight." Four hours! We had explored a river. We had made, discoveries.

THE BATSTO RIVER

More discoveries. Deeper water most of the way. A more shaded route. A more serpentine coursing. All these characterize the route from Hampton Furnace to Rider's Crossing, once a railroad pickup stop for cranberries hauled down from Hampton Bogs, just north of Hampton Fur-

nace. This watercourse, about two hours in the water, is in several ways more interesting than our first. It's noticeably colder than the Wading River, even in mid- to late August. It has a lot more shaded canopy overhead for most of the route. It may have a slower current much of the way, too, making it obligatory to propel oneself more often, providing more exercise, but at the same time offering ample opportunity to explore the fascinating plant life along its banks. The Batsto has more undulating streambed than the Wading, and there are fewer convenient resting spots, such as sandbars, where one can soak up some sun in the solitude of a seemingly tropical setting. Sandbars and grassy spots are more abundant and easier to find along the other pine barrens streams, particularly along the Wading and along the Oswego. Frank's Ford to Evans Bridge affords numerous such sunning places; so does the Skit Branch, to be mentioned later. Of course, the frequency of these sand bars varies with the amount of summer rain and the water level at any given time of summer.

Another difference which seems to make this course more interesting is the variety of trees, shrubs, and flowers. Such plants as the chokecherry, naked witherod, waterlily, pickerel weed, sabatia, pipewort, bladderwort, golden club, not to overlook the exquisite little pine barrens plants, the sundew and the endangered curly grass fern, all contribute to an exciting day of physical activity and nature study, too. Whenever you get too hot botanizing, just plop back into the water again, hippopotamus-style, and move on downstream! All this adds up to further knowledge and appreciation of the pine barrens, which in the minds of the unknowing is "nothing but a wilderness" (and is) "of no value."

The Batsto River winds about considerably, reaching waist depth or more only ten minutes or so after leaving the starting point just below the dam south of Hampton Furnace. This is true even in a dry season when the water is low. Foliage creates an almost tropical canopy of green along nearly the entire length of the river from Hampton Furnace

to Rider's, two and a half hours downstream. A real treat is afforded the watercourse explorer about 30 minutes from the outset. Discovery! The "bathtub" and the "sandbox" makes an interesting and convenient first resting place. Any schoolchild who witnesses this and learns the whys and wherefores, to be explained shortly, has a tremendous firsthand experience to take back to school for science class. At an abrupt right turn of the Batsto the water suddenly becomes noticeably warm and deep. At the bend the current has worn a deep cut in the river; at the same point, a feeder branch empties into the bend. This is the Skit Branch, which pours tepid water into the Batsto. The temperature change is abrupt-you can't miss it. One woman, with chattering teeth and goosepimples the size of peas, after being "subjected" to a heavy cloud cover and temperatures in the high 70's-lower than desirable when watercoursing the Batsto, upon reaching the "bathtub," remarked, "it was like stepping into Heaven." How is this sudden change explained?

The Skit, which has its source not far southwest from Lake Oswego, is generally quite shallow and mostly exposed to full sunlight as it flows over a solid floor of sand toward its juncture with the Batsto, about threetenths of a mile southwest of the Furnace-High Crossing Hampton Road. This shallow water is warmed by the hot summer sun and is also kept warm by the buildup of heat in the sandy streambed under it, as if the water were "on simmer." The current of the Skit pushes sand along, but only to the point of joining the Batsto, where the strong counter-current prevents the sand from flowing into the bend. Consequently, a "plateau" of sand is created, and quite a sizeable one at that; this is the "sandbox," a truly delightful stopping point, and a warm one, too! The continuous buildup of heat in this sand aids in warming the water flowing over it and into the Batsto's "tub." Such a pleasant discovery makes the exploration worthwhile, just to this point, even though about two hours remain before reaching the railroad crossing at Rider's. Incidentally, and interest-Continued on page 28

New Jersey State Library

Continued from page 19 BIRDS NESTING

talk in many of the public schools from Brigantine Island to Ocean City before the birds begin to nest this year. In addition, we are trying to get permission to post and monitor virtually every colony from Ocean City to Long Beach Island.

We need your help. If you and your family use the beaches, please take care. Avoid those open sandy areas around the dunes where birds might be nesting. If you take a 4wheel-drive vehicle onto the beach, stay as close to the water as you can and as far as possible from the dunes. Most important of all, if you see signs asking you not to go into a certain area, please heed them. With your help, perhaps we can keep one more species from disappearing and ensure that the Least Tern and other seabirds will always remain on the coast of New Jersey.

The New Jersey Division of Fish, Game and Shellfisheries' Endangered and Nongame Species Project is coordinating a statewide program to post and monitor colonial waterbird colonies along our beaches this summer. Please cooperate in protecting these sites by avoiding disruptive activities near the nests and encouraging others to heed the signs.



The division's program to protect shorebirds by posting warning signs has been conducted in cooperation with the New Jersey Beach Buggy Association.



La Depuis d' la la la la

New Jersey's Biggest Trees

This article, which lists the largest trees in the state, was scheduled to appear in this issue. But it will be printed in the September/October issue as a pullout booklet.

Continued from page 23 THE WETLANDS INSTITUTE

Formal and public education courses are also given periodically. Lehigh University offers two six-credit courses in the summer. One course, entitled "Biology of Marine Animals," is geared for college students; the second course, "Ecology of Wetlands," is designed for secondary teachers. In fact, teachers may apply for scholarships which cover tuition and lodging in the on-site dormitories. Both courses meet five days a week for five weeks and include lectures and daily field trips. Lehigh also offers one-credit mini-courses during the year in specific areas of interest.

In addition, several non-credit courses are offered on a cost-covering basis. An adult education course entitled "Marine Ecology" is very popular. Lectures on marine life feature slides and live demonstrations. Field trips are taken to the salt marsh, tidal mudflats, beach, and floating docks. One trip to the floating docks was particularly exciting – too many people flocked to one dockside and proceeded to submerge the dock! Sponges, jellyfish, and shrimps were collected nonetheless, at the sacrifice of a few wet feet. Other adult education course offerings have included "The Natural History of Cape May County," "Birding in New Jersey," "What You Always Wanted to Know About Fish and Now Have a Chance to Learn," and "Astronomy."

Courses are not limited to adults. During the summer, mini-courses in marine ecology are offered for children. These are five-day courses which concentrate on local plants and animals, their habitats and habits. Courses are grouped according to grades, from kindergarten through twelfth grade. For the first age group, K-2nd, nature walks (and runs), drawing, and stories comprise a major portion of the activities. Last summer, this age group presented a program for their families on the final day of the class. Part of the program involved a demonstration of the salt marsh food chain. Each child represented a food chain member and wore a sign depicting his or her identity. Some children wore costumes to further illustrate their new identity. A girl representing Detritus (decomposed plant matter which forms the base of the salt marsh food chain), wore brown paper on her arms and a brown hat with a large "D" pasted on it. Can you imagine a walking, talking Detritus? Or a truly "laughing" Gull? Food chain members were asked what they ate, and then came forward to connect to their food by holding hands. Rehearsal produced a mess of laughing children but, under the eyes of parents, the food chainers were stunning. Older age groups are less prone to folly and participate in longer field trips, lectures, movies, and discussions.

Several educational brochures have been developed by Institute personnel. A poster with illustrations and information about local molluscs is available, as well as a brochure on the life history of the Blue Crab. A big attraction for the youngsters is a "Seashore



A close look reveals a marine worm with translucent tentacles and red gills.

Puzzles and Games' booklet which contains an assortment of games including crosswords, scrambled words, and fill-in-the-dots, all pertaining to some aspect of marine science.

IN SUMMARY

Whatever the rage, individuals are always surprised and fascinated by the abundance and variety of life observed in the field. It takes patience and a discerning eye to begin to see and appreciate the subtle life which abounds in the marine environment. A close look at the edge of the marsh might reveal a marine worm extending translucent tentacles from a mud tube in search of food, or a grass shrimp ravaging over plant stalks for bits of detritus. Public education programs at the Wetlands Institute are aimed at increasing one's appreciation and understanding of the marine environment. Learning how to see and interpret, and then give perspective to what is seen is an integral part of these programs. Also important is the incorporation into the programs of up-to-date scientific information which is generated by research. Dr. Sidney S. Herman, Director of the Institute, summarizes this dynamic interaction: "The Wetlands Institute provides a unique opportunity for the scientist to exchange information directly with the public. Scientific information gained from current research projects is used in the development of meaningful educational programs."

A REMINDER VISITING HOURS, TUES.-SAT. 1-5 p.m. If you happen by the Wetlands Institute, stop in for a visit.

Continued from page 25

Watercourse exploration ingly, the word "Batsto" is of Swedish origin, but is commonly thought to be an Indian word; in either case, it means "bathing place."

From here to Rider's the water is warmer than it had been up to the Skit's entry. However, not everyone would necessarily agree, since in another two hours many calories are burned up, by the greater amount of self-propulsion-that is, swimmingnecessitated by deeper water. Also, mere immersion in the water for periods of time lowers body heat. Depending on the individual's body chemistry and build or on the amount of "blubber" he possesses, a watercourse explorer could be pleasantly comfortable until the end, or he could be a shivering, shaking chattering soul who can only quaver. "How far is it to the end?" Finally, just beyond the "little Sargasso Sea" lies the termination point, Rider's Crossing, a railroad trestle. Just a word about the "little Sargasso Sea." so named by the author. Though it may be distasteful or "icky" to some, it does provide an aesthetic appeal delicately white waterlilies with floating atop the surface, as the watercourser approaches the final few hundred feet.

Discovery! The Skit provides an ideal watercourse exploration route for children. For a shade over a quarter mile (about six-tenths of a mile round-trip) children as young as preschool age can safely walk to the "sandbox" and "bathtub" in the hand of a reassuring parent or older sibling. This is a perfect way to introduce the little people to nature and to the pleasures of wading in a clean, unpolluted flow of pine barrens water. They all appreciate the differbetween a fresh-flowing ences stream, and a motionless, overly warm, and often dirty backyard plastic pool. And wait until you see their delighted expressions and spiced-up curiosity when a turtle or a frog crosses their path, when they smell the aroma of swamp azalea or of sweet pepperbush, or when they can pick and enjoy the blueberries which grow along many pine barrens streams.

Upon the return trip from the "sandbox," parents will find that children have gained much confidence. Little people will have a much-relaxed hand grip or even want to "do it all by myself." This is the ultimate; and the writer has personally witnessed this rapid, all-in-an-afternoon changeover from apprehensive dependency to independency. Explore, discover, learn, enjoy!

Watercoursing offers a frog's eye view of many of the little prizes of Nature, and of the pine barrens especially. Frog's eye view! What about snapping turtles? ... or snakes? During the season when the water is warm enough for human bodies to enter the water and stay in it for a couple of hours or more, the snappers have already concluded their winter's hibernation and have moved out of the muck. They aren't a likely hazard. Besides, contrary to what many people believe, watercourse exploration does not necessitate one's tramping through muck. True, there's muck to be found, but only where there is plant life in or near the main streambed. As noted earlier, most of the walking and wading where feet come in contact with the streambed itself is upon sand or fine gravel; in some places it's pebbly. A truly nice pebble bar lies not far north of Harrisville, in the Oswego River, while nearby there are many opportunities to find the different varities of the unique sundew family. So, from May through most of October it just doesn't pay to worry oneself about snapping turtles. On land, near bodies of water, small ponds, or in swampy areas, snappers can certainly be seen from time to time, usually in or near a nesting location. Unless you're an expert, leave the snapper alone-he's vicious. In several summers of watercoursing the writer has not once come across a snapping turtle while on an exploration.

Snakes alive! Most commonly seen are the garter, the ribbon, the pine, the black, and the water snake, all totally harmless. No fear or apprehension is in order for any of them, even if you come upon a coiled up and loudly hissing pine snake; this is purely a defensive action to ward off intruders. As with most wild animals, the snake will take off before you find him. Water and pine snakes are sometimes seen on a foothike or on a watercourse, usually sunning themselves on a tree limb or in an open spot along the stream bank. But such a sighting is infrequent; and when one is made, it provides a point of interest on the day's outing, as did a ribbon snake seen by a group of hikers last summer. The snake, in the middle of the group's route of travel, was about to devour a toad which appeared to be four times too large to go through the jaws of this medium-sized specimen. The hikers accidentally startled the creature; and the toad got away. However, a nine-year-old hiker, sympathetic to the snake's predicament, retrieved the toad and placed it down on the road again, just a few inches from the snake. JAWS!! Captured again, as some squeamish hikers turned their eyes the other way! End of episode!

FLOATING DOWN THE RIVER

A variation of the "walk, wade, or swim" is floating. Floating is for those who enjoy all the aspects of a watercourse exploration, but who prefer less physical exertion and want an easier means of achieving that euphoric kind of relaxation which is so easily attained in the pine barrens. Inner tubes, styrofoam and plastic floats, air mattresses, surfboards, and rubber boats can provide the means of transport. One of the advantages of floating is the ability to avoid most of the underwater obstacles which may otherwise be encountered by the walk-wade-swim approach. If the water level is low, even the inner tube floater may be pushed by the current into a snag near the surface and get a "low strike" in a spot which will instantly clarify the term "butt-buster"! If using an inner tube, it's better to use two tied together atop one another. In this way it's unlikely, as one sits down in the arrangement, that the derriere will protrude below or even to the water level. Another advantage of floating is that it opens the door for all ages to take part. On one organized trip the youngest participant ever to do a watercourse exploration was a little fellow of 13 months. In a rubber boat, with his youthful parents as boatmen, he cruised down the Wading River for two hours, missing

much of what there was to be seen. But still he made a discovery! What a way to take a nap! He fell asleep and stayed that way for almost the entire trip. All was not lost for our little friend. Not only did he get his sleep; but he was being conditioned to the thrilling experience of the outdoors, even though he may not have been able to tell about it or to think about it at such an early age. Educators will tell you that education begins with early conditioning at home. This family togetherness and the outdoor environmental influence will be impressive and lasting on our young "explorer."

Needless to say, the tone of this article and the references to group activity will indicate to the reader that organized group outings resulted

from those preliminary scoutings of some of the pine barrens waterways. The Outdoor Club of South Jersey has been doing watercourse explorations for the past four years, last summer (1976) having scheduled the largest number to date, eight of them between mid-June and mid-September. Watercourse explorations solved the problem of slim participation on summer hikes, and now account (along with moonlight hikes) for the largest participation counts during the 12-month period of weekly activities. A typical watercourse exploration or float trip in the pine barrens will bring out between 50 and 100 "explorers." The Outdoor Club of South Jersey has perhaps the widest range of activities of any club in New Jersey; and it boasts a paid membership of over 700 persons and families.

In conclusion, if the reader thinks that the idea of a watercourse exploration sounds like something strange, even weird, or maybe enticing, he may be interested in some of the comments made after the first watercourse exploration by an organized group. We quote: "Unique" ... "Beautiful" ... "Exciting" ... "Adventurous" ... "Out-of-the-ordinary" ... "Innovative" ... "Fantastic" ... "WOW!"

> For information: Outdoor Club of South Jersey 9 Randolph Drive Mount Holly, N.J. 08060

"... complete relaxation from the routines and tensions of the work week."

Continued from page 7

NEW JERSEY'S GULLS

the seashore. The Laughing Gull is unique among New Jersey Gulls in that it leaves for a Florida vacation in late fall and is unusual here in winter.

Our largest and most impressive gull, the Great Black-backed, is rapidly expanding its range southward and has recently begun breeding in New Jersey. Like the Herring Gull, the Great Black-backed is a bird of the garbage dumps and seashore, where it dominates other gulls by virtue of its large size and aggressive behavior. It is our most predatory gull, frequently raiding nesting colonies of other seabirds and occasionally killing rats and even birds as large as Black Ducks.

Bonaparte's Gull, in contrast, is among our smallest gulls, light and graceful on the wing. The best time to observe it is in winter, when you'll find flocks of up to a thousand or more Bonaparte's Gulls along the coast. When migrating to and from its breeding colonies, this species may sometimes be seen briefly on our larger inland lakes. Interestingly, the Bonaparte's Gull uses a nesting site unique among gulls, most species of which are ground-nesters; the birds you see here were fledged from nests in spruce or fir trees in northwest Canada!

Among the six rarer species, the Iceland and Glaucous gulls (informally called "white-winged" gulls because of the absence of black in their primary flight feathers) are winter visitors from the far north. In New Jersey, immature rather than adult birds are most often seen, usually at garbage dumps in the company of Herring

Ring-billed Gull—Adult. Looking like a smaller version of the Herring Gull, this species differs by having yellow legs and black ring on yellow bill. "Winter hoods" are visible on these birds; head is white in summer.



Laughing Gull-Adult. Unmistakable in summer with its dark red bill, broken white eyering, black head, and dark gray mantle. Winter adults (seldom seen here) lose the black headdress, retaining only a grayish cap across back of head.



Herring Gull – Adult. A large gull with medium-gray back and upper wing surface (mantle), black wingtips, pink legs. In summer the head and breast are pure white; winter birds, such as this one, display a mottled brownish "hood".





Ring-billed Gull-Immature. Marked by its black-tipped pink bill (no ring), brown splotches on gray mantle and upper breast.

Gulls. A day's birding in the Hackensack Meadowlands might produce up to half-a-dozen Icelands and maybe one Glaucous—out of 10,000 Herring Gulls!

The Bonaparte-like Black-headed and Little gulls are rare but regular winter visitors – from Europe! They are not "dump birds," but do display equally unsavory tastes in their preference for sewer outlets in Raritan and New York bays.

The Black-legged Kittiwake is our one gull that is unusual within sight of land—although it occurs in flocks of thousands well offshore in winter. During strong easterly winds, however, it might be seen in small numbers from any location along the Jersey coast.

Although a really skillful birder might spot something like a Franklin's Gull, or with some real luck even a Yellow-legged Herring Gull, the rarest of New Jersey's "regular" gulls he's likely to see is undoubtedly the Lesser Black-backed Gull. One or two individuals of this European species, a smaller version of our Great Black-backed, are reported every winter in our area.

Despite the many species and their varied plumages, perhaps the most fascinating aspect of gulls is their behavior. Even an assemblage of resting gulls is constantly active with comings and goings, squabbles and preenings. Usually, however, gulls are preoccupied with feeding; perhaps, as Henry Beston empathized in *The Outermost House*, they can never do more than "dull the edge of their hunger." So gulls are past masters at scrounging a meal, whether by begging scraps

Glaucous Gull – Immature. Larger than a Herring Gull. The nearly snow-white plumage of this second-year bird is in striking contrast to the grays and browns of most other gulls. First-year birds are very pale, mottled brown. Adults acquire a pale gray mantle but retain the white wingtips. Plumages of the smaller Iceland Gull are similar.



Great Black-backed Gull – Adult. Its large size and black wings and mantle contrasting with snow-white head, tail, and underparts make this lordly bird our easiest gull to identify. Plumage is the same in winter.

from homebound fishing boats, blitzing incoming garbage trucks, or shattering clams with a "bombs away" over rock or road. Although a gull locating a promising food source may perform distinctive aerial maneuvers to inform other gulls of his discovery, the pandemonium of feeding, fighting, and food stealing that soon erupts, with its cacophony of piteous and outraged screeching, would convince anyone that each and every gull lives indeed at the edge of starvation.

Studies of gulls' intriguing repertoire of displays and calls were among the important early contributions to the development of ethology (the study of "natural" animal behavior), and scientists such as Dr. Joanna Burger of Rutgers University continue to study new aspects of gull behavior today. So the next time you see a flock of "seagulls," stop, take a closer look, and enjoy the varied appearances and behavior of these fascinating birds. We're sure you'll find in them an unexpected beauty and an interesting array of personalities.

Here is a list of some of our favorite locations to observe gulls: **Hackensack Meadowlands** – For sheer numbers of Herring and Great Black-backed gulls. Also the area with greatest numbers of "white-winged" gulls.

Liberty Park – Its location on New York Bay makes this park a good place for Black-headed and Little gulls.

Raritan Bayshore – Particularly in the vicinity of South Amboy in late May or early June, this is the best area to see Black-headed and Little gulls. Hundreds of Bonaparte's winter here.

Sandy Hook – Great Black-backed and Herring gulls are predominant here. Good for Laughing Gulls in summer and Bonaparte's in winter. White-winged gulls may occasionally be seen.

Shark River and Manasquan River – Just about any species is possible at either estuary – both sport a history of rarities. At the docks along Channel Drive in Point Pleasant Beach the gulls are exceptionally approachable – good for close-up looks and photographs.

Island Beach State Park and Barnegat Inlet – Another area where it's wise to be alert for anything, but especially good for Bonaparte's Gulls and Kittiwakes.

Delaware Bayshore (especially Reed's and Moore's beaches)—One of the most spectacular sights in New Jersey birding is the tremendous concentration of Laughing Gulls here in May and June.

FRONT COVER

Sunrise at Sandy Hook - Photographed by Al Nunes-Vais

INSIDE BACK COVER

A Field of Wild Mustard at Allamuchy - Photographed by Robert McDowell

BACK COVER

New Jersey Shorebirds – Photographed by Arthur Panzer



