Habitat Hotline Atlantic

Issues of Concern for Atlantic Marine Fish Habitat **March 2001, Volume VIII, Number 1**

Fiber Optic Cables: Issues for Marine Habitat & Fisheries

by
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Fiber optic cables (FOCs) are increasingly becoming the primary means of transmitting telecommunications over long distances throughout the world. Because FOCs are able to carry a much greater bandwidth than wire, microwaves, or satellites, they are rapidly replacing those means of voice, video, and data transmission for long-distance communications. In addition, FOCs have the advantage of being relatively small, are unaffected by electromagnetic interference or voltage irregularities, do not create the delay inherent in satellite communications, and cannot be compromised by electronic eavesdropping.

A FOC is typically two to three inches in diameter. Most of the cable consists of insulation and metal sheathing or armor. The glass fiber core, which transmits the light signal, may be only one-half inch in diameter. In-line, direct current (DC) powered amplification repeaters, which maintain the strength of the light signal, are placed at regular intervals along most FOCs.

The capacity of a FOC is measured in *giga*bits (one billion) per second. Often, a FOC will begin operation at one capacity and later be upgraded. While the first FOCs carried on the order of 45 *mega*bits (one million) per second, new "third generation" cables are projected to carry as much as 400 gigabits per second. FOC systems are typically constructed in what is termed a "ring structure" that allows the system to continue to operate, or "self heal," in the event part of a FOC is damaged. The most frequent cause of damage to a FOC is from fishing boats and associated gear. The estimated useful life of a FOC is reported to be 25 years, although none currently in operation are nearly that old.

FOCs are being placed both on land and across oceans and waterways. Since 1988, when the first FOC was laid across the Atlantic Ocean, an estimated 230,000 miles of oceanic FOCs have been installed. The sites where FOCs come onshore are termed "landings." A landing consists of a means to bring the cables from the water to the land, such as underground conduits, to a receiving building containing the electronic equipment necessary to send and receive the FOC signal and generators to provide the DC power for the amplifiers.

FOCs traditionally have been owned and operated by consortiums of companies. However, many new or proposed FOCs are now being financed primarily by private companies that are, in turn, stockholder held. Capacity on these investor-owned FOCs is made available to any carrier on a flexible or "as needed" basis. In this way, carriers do not have to commit capital on a long-term basis to construct new FOCs, but instead can sell or purchase capacity when required.

AT&T recently (1999) installed nine, four-inch conduits in Florida. Those conduits not used by AT&T will be sold or leased to other cable conglomerates or investors. Five cables have been installed and the capacity "sold." The other four conduits are awaiting a "need" and a paying customer. It is reported that the price to utilize a conduit is approximately $3 million. Typically, the costs of constructing a FOC are reported to be from $26,000 to $46,000 per mile. A disruption in a FOC is reported to result in a loss to the operator of $5,000 or more per minute.

Numerous FOCs are being installed within the state of Florida, and the Department of Environmental Protection is seeing an increase in the number of proposed off-shore installations, including one for an offshore cable parallel to the coast to provide fiber optic communications to the Atlantic Seaboard states (see Figure 1). The company representing that proposal has stated the shore parallel installation, as opposed to a traditional terrestrial route, was desirable because of ease of construction, space limitations and fees associated with using existing road, bridge, and railroad rights-of-way, and compliance with local governmental regulations. It was reported that the offshore route may result in a savings of $800-$900 million.

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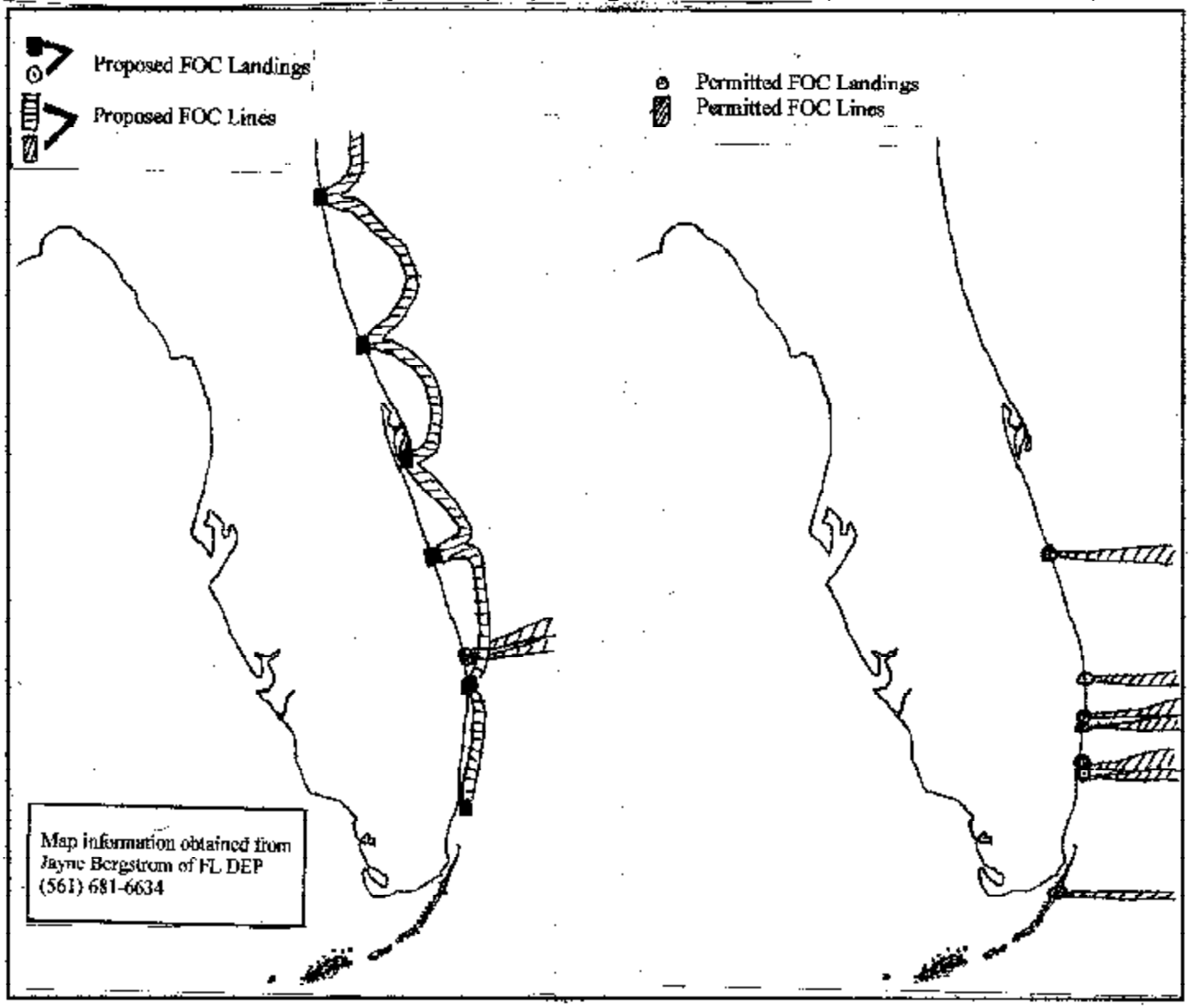
Figure 1. Proposed and Permitted Fiber Optic Cable (FOC) Landings and Lines in Florida.



Construction Techniques

Offshore, FOCs are generally laid directly on the seafloor. FOCs may be routed within abandoned pipelines or their alignments in areas such as the Gulf Coast. Landfall is made by routing the cable into a trench, access hole, or conduit. Installation of the access hole or conduit can be by a variety of techniques including traditional open trench dredging, entrenchment using hydrojets or a plow, or directional drilling. Once the access hole or conduit is in place and buried, new cable arrivals can involve digging (dredging) open an existing conduit and pulling in the new arrival.

Onshore, the cables are installed underground using much the same variety of trenching and/or boring techniques as used offshore. To the extent possible, projects typically use existing road and railroad rights-of-way for cable installation. However, right-of-way availability may become limited as the number of cables increases. Crossings of wetlands and other surface waters are typically made through a technique of directional drilling from upland to upland. This involves drilling a hole under wetlands or through underlying sediments to place the FOC between land points. Excavated material, consisting of drilling lubricant mud and material removed from the hole for the conduit, may be deposited at the upland end of the drilling operation or removed to an off-site location.

Regulatory Programs

Florida's regulations governing FOCs vary depending on where the installation is occurring in the state; i.e., in the Panhandle within the boundaries of the Northwest Florida Water

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Management District (NWFWMD) or elsewhere in the state. In either case, the jurisdiction of the permit program extends offshore to the limits of the state's territorial waters.

In the Panhandle, within the boundaries of the NWFWMD, a Department wetland resource permit (WRP) is required for the construction, installation, repair, and removal of FOCs within surface waters of the state. These surface waters are described to include the Gulf of Mexico, bays, bayous, sounds, estuaries, rivers, streams, natural lakes that are greater than 10 acres in size and not owned entirely by one person other than the state, and all natural and man-made tributaries to these waters to the landward extent of wetland vegetation contiguous with these waters. Permits are not required for exempt activities that do not involve dredging or filling, or for construction in isolated wetlands or uplands.

Elsewhere in the state, the installation, alteration, operation, maintenance, removal, and abandonment of FOCs are subject to the environmental resource permit (ERP) requirements, and the applicable Department and Water Management District (Suwannee River, St. Johns River, Southwest Florida, and South Florida WMDs) rules. Generally, any installation or repair of a FOC involving the disturbance of the soil surface or otherwise affecting surface water flows, whether in uplands, wetlands, or other surface waters, is considered to be a "work" that requires an ERP.

Environmental Issues

It would appear that, in general, even the proper installations of FOCs produce environmental impacts. However, in certain cases a higher level of concern is warranted based on site-specific conditions. Direct environmental concerns include but are not limited to cable sweeping and crushing of coral and other hard bottom communities, damage to bottom resources and organisms during cable repairs, dredging and/or filling, "frac-outs" or other losses of drill hole lubricants, erosion of tunneling spoils, and improper disposal of cable laying materials and construction waste. Indirect concerns include interference with fisheries, the ecotourism diving industry and other legally recognized uses of public trust land, water and resources. See Table 1 for a more detailed description of environmental concerns associated with FOC installations.

The initial cable lay for the AT&T project in South Florida resulted in damage to hard bottom communities and was cited for non-compliance by the Broward County Department of Natural Resources and the USACOE. A 1996 AT&T FOC project in the Virgin Islands caused significant damage to coral reefs and marine life as a result of a "frac-out." The Virgin Islands Department of Planning and Natural Resources cited the operation for numerous violations, which resulted in an $8 million settlement, and requirements for corrective actions. In addition the Department of Justice levied a $1.8 million fine.

Most of the problems noted above are associated with the initial installation of the cables. The long-term environmental effects, such as habitat modification, are not as well documented. As part of the AT&T application, their consultants prepared an anecdotal report entitled, "Short-term and Long-term Effects of Placing Fiber Optics Cable on the Benthic Community of the Sea Floor Over the Continental Shelf" that provides some information on long term effects.

Conflicting Uses

As the number of both offshore and terrestrial cables increases, the potential for increasing conflicts between the use of submerged lands for cable installations and for other uses may arise including:

- Commercial and recreational fishing activities. On the Pacific Coast, conflicts have arisen between cable installation and commercial fishing operations with fishing gear cutting or becoming entangled on the cables.
- Other recreational activities. An issue raised in a recent southeast Florida installation was whether the offshore laying of the cables over hard bottom communities would negatively effect the enjoyment of scuba divers.
- Beach renourishment borrow areas. The installation of conduits and laying of cables over offshore areas that may be potential sources of sand may adversely affect the viability and cost of beach renourishment projects.
- Interference with other public purpose uses such as sewer outfalls and pipelines.
- Interference with archaeological research and treasure salvage activities.

Recommendations

Identify corridors, particularly for offshore connections. The concept of pre-identified corridors for placement of FOCs should be evaluated, such that impacts on resources and conflicts with other uses can be minimized. Any review of potential corridor locations should distinguish between temporary impacts to traditional uses (e.g., exclusion of diving activities during cable installation for safety reasons) and permanent impacts to traditional uses (e.g., exclusion of certain areas as sources of beach sand or restrictions on fishing activities to avoid snagging of cables). It is recommended that the identification of acceptable corridors be done through a request for proposal (RFP) process. Until the concept of corridors can be fully evaluated, easements should only be issued for the number of conduits and cables for which the applicant can clearly demonstrate a specific, defined need, such as a cable contract for use of a conduit if capacity is unavailable on existing cable.

Monitor/evaluate impacts of FOC installation and placement on fish habitat. In particular, important nursery habitat areas, such as submerged aquatic vegetation, should be monitored for damage and recovery, since recovery can take years depending on the species, location, and injury. In Flordia, permit and easement conditions require monitoring, including post lay video of damage to reef and other hardbottom communities.

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Table 1. Environmental Concerns Associated with Installations of Fiber Optic Cables (FOCs). The following list is not presented in any order of priority.

Environmental Concerns Associated with Installing Fiber Optic Cables

(1) Cable "sweeping" and crushing of coral and other hard bottom communities. During installation, cables can crush, abrade, or cut living hard and soft corals from the bottomlands. Sometimes,selecting routes to avoid bottom communities can minimize this type of impact. Impacts may also be ameliorated by the use of divers to assist in moving cable after placement or mitigated for by inspection by divers or remotely operated vehicles (ROVs) during or after installation. However, even with the most up-to-date navigational and mechanical propulsion positioning equipment, it is generally acknowledged that operating in the three-dimensional wave climate of a shallow coast can result in unavoidable impacts where the selected route involves live bottom communities. Pre-construction environmental impact evaluation and analysis of proposed alternative routes can minimize but not completely eliminate these impacts. However, it must be noted that the preferred routes are to a large degree dictated by the location of existing and available upland electronic processing, handling, and distribution facilities.

(2) Cable damage during repairs. The practice of grappling to recover and repair damaged cable has the potential of causing additional impacts to bottom resources and to organisms which have colonized the cable itself. This is particularly true since the repaired cable is not returned to its original location but forms an "offset" loop which deviates from the original location by the depth of the water column. The industry has reported that cable breaks result in a cable coiling on the bottomlands, potentially resulting in significant impacts.

(3) Cable damage to submerged aquatic vegetation (SAV) or emergent aquatic vegetation (wetlands). Impacts to SAV or wetlands generally occur in shallow coastal areas, estuaries, rivers, or other waters of the state. Open trench excavation causes the most significant direct adverse impacts. Newer "directional" drilling technology can minimize these impacts.

(4) Dredging and/or filling for cable installation at offshore "landings." When a directionally drilled conduit exits the submerged bottom, the exit location may be left exposed, buried for protection, or covered naturally by coastal processes. When the latter two occur, dredging is required to excavate and expose the conduit for cable installation.

(5) Directional drilling "frac-outs" or other losses of drill hole lubricants or accidents. When drilling encounters certain subsurface conditions like fissures or frangible substrate, the pressurized fluid "mud" used to lubricate the drill hole can escape into the surroundings. Such escape may cause turbidity plumes and subsequent burial or smothering of sensitive resources, and the release of potentially toxic compounds associated with the drilling muds lubricants and additives.

(6) Directional drilling site impacts such as discharge of "make-up" water, erosion of tunneling spoils, and loss or spillage of drill hole lubricant. Directional drilling is conducted from an upland site. The severed spoil material removed from the drill hole is usually stockpiled at this site or is pumped directly into trucks or other containers in the uplands for eventual disposal off-site. Stockpile runoff can result in spoil material running or eroding into surface waters, but can be minimized through the use of best management practices (BMPs).

(7) Disposal of cable laying material and drilling, dredging, or other construction waste and debris. Improper disposal of cable laying materials and construction equipment can damage coral reefs and seagrass beds.

Early Indications of Lobster Decline in Gulf of Maine

Scientists from the University of Maine and the Bigelow Laboratory for Ocean Sciences in West Boothbay Harbor, Maine, have found early indications of a decline in the lobster population in the Gulf of Maine. "The abundance of juvenile lobsters in key lobster producing regions of mid-coast Maine appears to be declining," say Robert Steneck of the School of Marine Sciences at University of Maine and Lew Incze and Richard Wahle of Bigelow. "We expect landings in those regions and possibly elsewhere to decline sometime during the next two to four years. Given that lobsters are the single most valuable species in Maine's fisheries, we think it is important to alert the lobster industry, state managers, policy makers and the general public to our findings."

Steneck, Incze and Wahle have been working for more than a decade to develop a means of predicting lobster abundance and landings by independently monitoring three different lobster life stages: 1) larvae in the water, 2) newly settled individuals on the bottom, and 3) older juvenile lobsters. Their research has measured linkages between each of these three successive stages. If significant changes occur in the abundance of lobster larvae, those changes should immediately translate to changes in that year-class on the bottom. A couple of years later, changes should be evident in the older juvenile lobsters as well. Trends can be detected by going to the same locations and using the same methods over many years.

Since 1995, the scientists found, newly settled lobsters on the bottom have been declining in the Boothbay monitoring region. Similar trends were detected in larvae in New Hampshire and new settlers in Rhode Island. The larvae and settlement studies suggest widespread declines at least west of Penobscot Bay. No larval monitoring has been done east of there.

Scientists and many lobstermen agree that they have seen more egg-bearing lobsters over the past decade than ever before. In the most recent lobster stock assessment, there is evidence that the reproductive potential of lobster stocks is currently high. The scientists say, however, that the decrease in larval lobsters and year-classes on the bottom must be the result of other factors, possibly changes in the ocean environment itself which could affect survival or delivery of the larval stages to the ocean bottom. "Just as we cannot explain the dramatic increase in lobster abundances and landings over the past two decades throughout the Northeast, from Delaware to Newfoundland, Canada, we cannot explain the pending decline," says Steneck. "Further, larvae and young-of-the-year lobsters in Rhode Island and Maine are showing similar patterns of change despite being located in two oceanographically and reproductively distinct systems separated by Cape Cod. Thus the environmental factors responsible appear to be very wide-spread."

The scientists suggest that the lobster industry and state agency managers need to develop a response to this trend. "As scientists, we feel it's important to alert the public and stakeholders. No one has prior experience with the type of data we have. So we can't be sure how closely the harvest will follow our findings. However, if the patterns we see turns out to be accurate predictors of declining harvest and are primarily controlled by the environment, then some traditional management actions, such as increasing egg production, may do little or nothing to reverse the situation."

This is the first scientific prediction ever made for the future population size of the American lobster. The same method has been used successfully to predict the abundances of the western Australia rock lobster, says Steneck, with a 90% success rate over the past 20 years.

Source: MarineSci, Science and Engineering News from the University of Maine—Website address: http://www.umaine.edu/mainesci/Archives/MarineSciences/Steneck-lobster.htm.

Horseshoe Crab Reserve Created--Area Closed to Fishing

NOAA's National Marine Fisheries Service has banned fishing for horseshoe crabs in federal waters off the mouth of Delaware Bay. The ban provides additional protection for local stocks and ensures that declining populations of migratory shorebirds have an abundant source of horseshoe crab eggs to feed upon when they stop to rest in Delaware Bay before moving north to their Canadian nesting areas. The agency published a final rule that implemented the closed area on March 7, 2001.

All Atlantic coastal states have reduced their horseshoe crab bait catch by 25 percent under guidelines established by the Atlantic States Marine Fisheries Commission in its horseshoe crab fishery management plan. The ASMFC had also recommended a prohibition on fishing for horseshoe crabs in federal waters within a 30 nautical mile radius of the mouth of Delaware Bay.

The area closed to fishing for horseshoe crabs is roughly rectangular in shape and encompasses nearly 1,500 square miles of federal waters off the mouth of Delaware Bay (see map on next page). It adjoins state waters south of Pecks Beach, New Jersey to just north of Ocean City, Md., and is designated as the Carl N. Schuster Jr. Horseshoe Crab Reserve, in honor of an imminent horseshoe crab biologist and researcher.

"The closure will offer protection for horseshoe crabs in federal waters, particularly for the Delaware Bay stock," said Bill Hogarth, acting director of NOAA Fisheries. "Improving protection for horseshoe crabs will promote long-term sustainability for fisheries that depend on horseshoe crabs for bait, research and medical purposes, and ensure an ample supply of horseshoe crab eggs for food for migratory shorebirds."

"The NOAA Fisheries regulation is a good example of how the federal government and states can work together cooperatively to manage our nation's important marine resources," said John H. Dunnigan, executive director of the ASMFC's Interstate Fisheries

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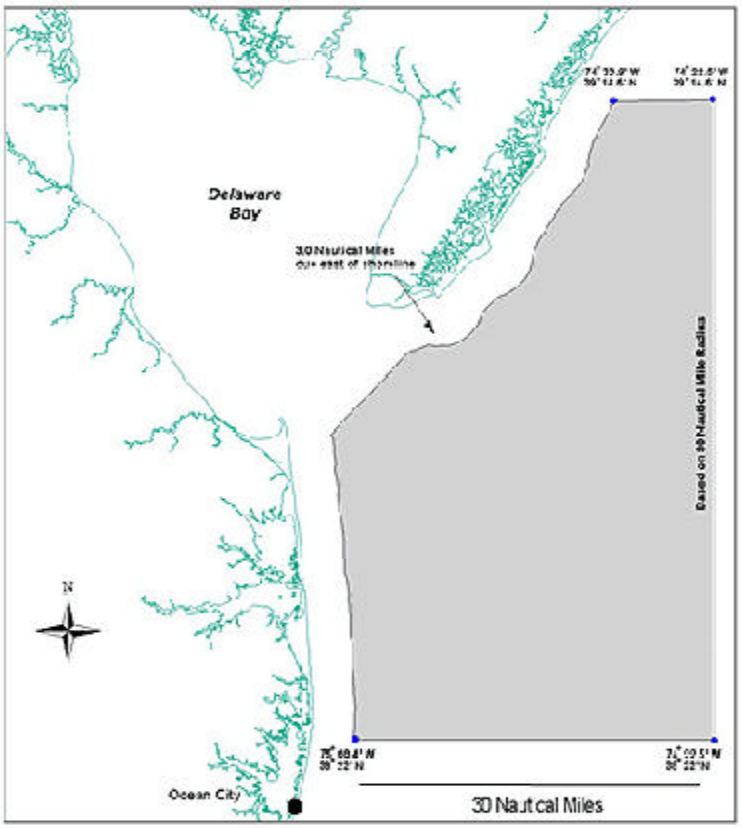
Management Program.

Because there is little information available for coast-wide stock assessment of horseshoe crab abundance, and there have been recent increases and shifts of reported mid-Atlantic landings of horseshoe crabs from state to federal waters, NOAA Fisheries managers consider it important to implement the no fishing area for horseshoe crabs to protect the Delaware Bay horseshoe crab population. The managers also said that they will propose permitting and reporting requirements for vessels that catch horseshoe crabs in federal waters, and dealers that sell them, along with prohibiting at-sea vessel transfers of horseshoe crabs which are not currently counted among state quotas.

Map of the Carl N. Shuster Jr. Horseshoe Crab Reserve



The regulations have been put in place under the authority of the Atlantic Coastal Fisheries Cooperative Management Act which gives the Department of Commerce authority to implement federal measures compatible with the interstate commission's fishery management plans.

Horseshoe crabs are an ancient group of marine animals related to spiders. They are bottom-dwelling and are found in near-shore and continental shelf habitats from Mexico to Maine. They are most abundant from Virginia to New Jersey, with their center of abundance being around the Delaware Bay area. Horseshoe crabs move inshore in the spring, especially into beach areas, to spawn. They prefer to lay their eggs on sandy beaches within bays and coves that are protected from surf. Eggs take about a month to hatch and, upon hatching, larvae spend about a week swimming in the water column before molting and assuming their bottom dwelling life history. NOAA Fisheries estimates that in 1999 about 3 million horseshoe crabs worth about $3 million in landings were collected along the U.S. Atlantic coast for use as bait in eel, whelk, and catfish fisheries.

NRC Studies Effects of Bottom Trawling on Seafloor Habitat

The National Research Council's Ocean Studies Board is conducting an 18-month study on the Effects of Bottom Trawling on Seafloor Habitats. This study will be the first in a series that will evaluate available data related to the physical and biological effects of fishing on marine habitats and ecosystems. This first study will (1) summarize and evaluate existing knowledge on the effects of bottom trawling on the structure of seafloor habitats and the abundance, productivity, and diversity of bottom-dwelling species in relation to gear type and trawling method, frequency of trawling, bottom type, species, and other important characteristics; (2) summarize and evaluate knowledge about changes in seafloor habitats with trawling and cessation of trawling; (3) summarize and evaluate research on the indirect effects of bottom trawling on non-seafloor species; (4) recommend how existing information could be used more effectively in managing trawl fisheries; and (5) recommend research needed to improve understanding of the effects of bottom trawling on seafloor habitats.

The study committee includes: John Steele, *Chair*, Woods Hole Oceanographic Institution; Peter Auster, University of Connecticut; Elva Escobar Briones, Universidad Nacional Autonoma de Mexico; Jeremy Collie, University of Rhode Island; Joseph T. DeAlteris, University of Rhode Island; Linda Deegan, Marine Biological Laboratory; Stephen J. Hall, Australian Institute of Marine Science; Gordon Kruse, Alaska Department of Fish and Game; Carrie Pomeroy, University of California, Santa Cruz; Kathryn A. Scanlon, U.S. Geological Survey; and Priscilla Weeks, University of Houston, Clear Lake.

Four meetings are planned. The first meeting was held February 5-7, 2001 in Boston, Massachusetts. The second meeting was held March 5-6, 2001 in Galveston, Texas. The third meeting is scheduled for May 31 – June 2, 2001 in Anchorage, Alaska and may have some closed sessions. The fourth meeting, scheduled for July 30 – August 1, 2001 in Washington, DC, will be a closed meeting.

A final report will be issued at the end of the project. The project is funded by the National Oceanic and Atmospheric Administration's National Marine Fisheries Service. For more information search website: http://ww4.nationalacademies.org/cp.nsf under current projects (using Ocean Studies Board or bottom trawling) or contact Susan Roberts, study director, at sroberts@nas.edu or 202-334-2714.

Conferences

March 31, 2001—**The Sixth International Wildlife Law Conference** will take place at the Washington College of Law, American University, in Washington, DC. The event is sponsored by the American Society of International Law's Wildlife Interest Group (ASIL WIG) and co-sponsored by the Washington College of Law, American University, Kluwer Law International, and the Detroit College of Law at Michigan State University. The themes for the conference's three panels are: The Effectiveness of International Fisheries Conventions; The United Nations Convention on the Law of the Sea: Selected Issues; and Implementation and Compliance with Sea Turtle Conventions and Agreements. The Journal of International Wildlife Law & Policy (www.jiwlp.com) will publish longer versions of some of the presentations from the conference, and ASIL WIG, in cooperation with Earthscape of Columbia University, will publish an online version of the conference proceedings. More information about the conference is available at: www.eelink.net/~asilwildlife/programs2.html.

April 16-20, 2001—**The George Wright Society Biennial Conference on Research and Resource Management in Parks and on Public Lands** is scheduled to take place in Denver, Colorado. This is the 11th conference in a series that has been held every two years. The George Wright Society is organizing and is the primary sponsor of the conference. It is an interdisciplinary conference on parks and protected areas, including marine, estuarine, freshwater, and other aquatic sanctuaries. The GWS conference brings people together to share problems and information, hear new perspectives, and contemplate critical questions about the future of protected areas. A proceedings, in book and CD format, will be published by December 2001. For additional conference information visit the website: www.georgewright.org/2001.html or contact The George Wright Society at 906-487-9722.

April 24-27, 2001—**The First International Congress on Marine Science and Technology** will take place in Pontevedra, Spain. The conference focus on "Oceanology and Human Development Between the Coastline and the End of the Continental Margin," includes four theme areas on coastal processes, human impact on the coastal strip, marine technologies, and coastal policies and integrated management. Topics include fishery resources, fish-farming , and specially protected marine reserves. More information is available at the website: www.fomar.org/.

May 20-25, 2001—**The Sixth Indo-Pacific Fish Conference** is scheduled to take place in Durban, South Africa. Convened every four years, the conference will cover most aspects of the ichthyology of Indo-Pacific fishes (e.g., systematics, evolution, genetics, ecology, biology, behaviour and biogeography). Symposia with the usual themes of pelagic, deep-sea, chondrichthyan, larval, coastal, reef and estuarine fishes will be held. In addition, symposia on marine aquarium fishes, systematics of western Indian Ocean fishes, diversity of reproductive mechanisms in fishes, fish tagging and conservation of Indo-Pacific fish diversity by use of marine protected areas, are planned. The proceedings of the 6th IPFC will be published in a special issue of the journal *Marine and Freshwater Research.* Additional information about the conference is available at the website: www.seaworld.org.za.

May 21-24, 2001—**The 52nd International Tuna Conference** will be held at the University of California's Lake Arrowhead Conference Center. The conference is sponsored annually by the U.S. National Marine Fisheries Service and the Inter-American Tropical Tuna Commission. It is a forum for discussing progress in research on all aspects of tunas and other large pelagic marine species. Further information is available at the website: http://swfsc.ucsd.edu/tunaconf.html or by contacting Mark Maunder at email: mmaunder@iattc.org, phone: 858-546-7027 or Sharon (Ronnie) Hunt at email: mmaunder@iattc.org, phone 858-546-7026.

May 30 – June 1, 2001—**EPA Forum on Managing Contaminated Sediments at Hazardous Waste Sites** will be held in Alexandria, Virginia. This forum will facilitate an open exchange of information and viewpoints concerning cleanup of contaminated sediments. Panelists and participants will discuss the key science and policy issues for making the most appropriate site-specific risk management decisions that are consistent with current federal laws and regulations. Panel topics include: Community Involvement (issues such as, fish consumption advisories, closed or impaired commercial fisheries, restricted waterway uses), Effects on Human Health and Ecological Resources, Site Characterization, Remedy Effectiveness,(such as dredging, capping, monitored natural processes), Monitoring, and Risk Management Frameworks. For more information contact Joan Fisk at 703-603-8791 or visit the website: http://www.epa.gov/superfund/new/events.htm.

June 18-20, 2001—**CoastGIS 2001: Managing the Interfaces,** the fourth international symposium on computer mapping and GIS for coastal zone management will take place in Halifax, Nova Scotia, Canada. CoastGIS 2001 is being held under the auspices of the Marine Cartography Commission of the International Cartographic Association and the Commission on Coastal Systems of the International Geographical Union. In addition, three Canadian organizations are sponsors, the Coastal Zone Canada Association, the Atlantic Coastal Zone Information Steering Committee and the Geomatics Association of Nova Scotia. More information is available at the website: http://agc.bio.ns.ca/coastgis2001/.

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Conferences

June 21-26, 2001—**The Second Symposium on Marine Conservation Biology** will be held by the Marine Conservation Biology Institute (MCBI) in San Francisco, California. Cosponsors include Society for Conservation Biology, the President's Council on Environmental Quality and U.S. Department of the Interior. The *Second Symposium* will be an international forum for researchers and students in natural and social sciences, marine resource managers and others interested in the science of protecting, restoring and sustainably using biodiversity in the world's estuaries, coastal waters, enclosed seas and open oceans. Symposium topics include, but are not limited to: biodiversity, alien species, ecosystem mapping, population dynamics, oceanography, climate change, human effects on marine systems, marine protected areas, large-scale management strategies, and effects of fishing on marine ecosystems and biodiveristy. Major funding for this event comes from the Pew Charitable Trusts and the David and Lucile Packard Foundation. Registration and additional information are available online at www.mcbi.org.

July 15-19, 2001—**Coastal Zone 01** will take place in Cleveland, Ohio. This 12th biennial international symposium on coastal and ocean management will feature important lessons learned by coastal managers around the world and models of successful partnerships. Conference themes include: Sustainable Coastal Communities, Maritime Transportation and Commerce, People and the Coast, and Energy and the Environment. For more information on the conference visit the website: www.csc.noaa.gov/cz2001/ or contact: Jan Kucklick at the NOAA Coastal Services Center (phone 843-740-1279; email: Jan.Kucklick@noaa.gov.

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