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Aquatic Exotic Species: A Fisheries Management Dilemma!

by

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Exotic species issues are frequently getting the attention of the news media because many Americans are directly or indirectly impacted to the tune of billions of dollars in damages per year (OTA 1993). Usually the report is about the discovery of a new introduction, a range expansion of a previous introduction, the economic or ecological impact of the invaders, and the frustrating efforts to eradicate the species. In this article, the authors will attempt to summarize some of the exotic aquatic species issues that relate to the fresh water and marine sport and commercial industries, and recommend the necessary actions to be taken to address this issue.

What are exotic species?

The word **exotic**, for many, implies "from a far off or different location," but that is not a requirement. Exotic, in ecological terms, means "non-native" or "non-indigenous" to the natural geographic range to which it has been introduced (either accidentally or intentionally). The term non-native is confusing since it includes new non-natives and naturalized non-native species. Because of the way humans value some species over others, "desirable" exotics (naturalized or not), such as brown trout, may be given similar or more management protection as native species. On the other hand, naturalized "undesirable" exotics such as the sea lamprey in the Great Lakes continue to carry the stigma of nuisance species. The "desirable" versus "undesirable" determination for an exotic species is obviously in the eyes of the beholder and is usually driven by the perceived economic value for the specific species.

The definition of **species** may also need clarification. The Endangered Species Act (ESA) helped clarify the species definition in that unique natural strains of a species in a specific geographic range are covered by the Act. Therefore, introduction of a non-native *strain* of a native species would make it an "exotic." This is an important ecological concept because it recognizes that introduced non-native strains hybridize with the native species and alter the behavior and/or survival of the native strain.

Selected Aquatic Exotics of Concern

Shellfish

The veined rapa whelk (*Rapanosa venosa*), or Asian rapa whelk recently discovered in North American waters, may pose a potential threat to commercially important East Coast bivalves and the industries that depend on this fishery. This mollusk is a species of predatory marine snail native to the Sea of Japan that has found its way into portions of the Chesapeake Bay. It was

introduced into the Black Sea in the 1940s, and eventually into other waters contiguous with the eastern Mediterranean Sea. The first documented collection of *R. venosa* in North America was made in 1998 near Hampton Roads, Virginia in the lower portion of the Chesapeake Bay (Mann and Waters 1998). Additional collections have since been made, and the number of sightings continues to increase. Recently, viable *R. venosa* egg cases were found by researchers from the Virginia Institute of Marine Science, verifying the successful reproduction by the rapa whelk in



Rapa whelk, *Rapanosa venosa*. Photo courtesy of Virginia Institute of Marine Science.

continued on page 6

The Atlantic States Marine Fisheries Commission was formed by the 15 Atlantic coastal states in 1942 for the promotion and protection of coastal fishery resources. The Commission serves as a deliberative body of the Atlantic coastal states, coordinating the conservation and management of nearshore fishery resources, including marine, shell and anadromous species. The fifteen member states of the Commission are: Maine, New Hampshire, Massachusetts, Rhode Island, Pennsylvania, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, and Florida.

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Upcoming Meetings

Year 2000

1/11:

ASMFC American Eel Technical Committee, Best Western Old Colony Inn, 615 First Street, Alexandria, Virginia; (703)739-2222.

1/12:

ASMFC Northern Shrimp Section, Portland, Maine.

1/12 & 13:

Mid-Atlantic Take Reduction Team, Washington, DC area.

1/19 & 20:

New England Fishery Management Council, Sheraton Tara, Danvers, Massachusetts.

1/21 & 22:

2000 Long Island Fishermen's Forum, Suffolk County Community College, Eastern Campus, 121 Speonk-Riverhead Road, Riverhead, New York. For more information, contact Christopher Smith or Sonia Tulipano at (631)727-3910.

1/25 - 27:

Mid-Atlantic Fishery Management Council, Holiday Inn Select, Old Town, Alexandria, Virginia; (701)519-0897.

1/27 - 30:

Massachusetts Lobstermen's Association Annual Weekend and Trade Show, Tara Hyannis Hotel and Resort, Hyannis, Massachusetts.

2/7 - 10:

ASMFC Meeting Week, Radisson Hotel Old Town Alexandria, 901 North Fairfax Street, Alexandria, Virginia; (703)683-6000.

3/2 - 4:

Maine Fishermen's Forum, Samoset Resort, Rockport, Maine.

3/6 - 10:

South Atlantic Fishery Management Council, Tybee Island, Georgia.

3/13 - 17:

Fifth Marine and Estuarine Shallow Water Science and Management Conference, Atlantic City, New Jersey. For more information, contact either Ed Ambrogio at (215)814-2758, or Ralph Spagnolo at (215)814-2718 or spagnolo.ralph@epa.gov

The holiday season and the end of the year are, for many people, a time of looking back, of remembering. A few months ago I landed at Chicago's O'Hare Airport, on the F concourse of Terminal 2. Walking toward the main terminal, I suddenly realized that I was coming to the fork where the E and F concourses come together. Through a short hallway connecting the concourses near the point of the fork, I could see a gate. Gate E3. I stopped and watched for a moment, and remembered.

December 20, 1983. The Dunnigans were flying from New England to California to spend Christmas with lots of other Dunnigans. 1983 had not been a great year – business was tough and I had totaled my car two days before the trip. The day itself had not gone well either. We were *supposed* to go to Dallas, changing planes and arriving in Orange County by noon. But Dallas was closed by ice storms; and we were rebooked on a flight leaving three hours later to Las Vegas that made a stop in Chicago.

Chicago that day was overcast, covered by a blanket of white snow, and cold. Very, very cold. Our plane taxied into Gate E3. After the delay in Boston, the five of us needed to get off the plane for bathrooms and a quick bite to eat. Coming back to the gate, something was surely amiss. Passengers were milling around, and there were not a lot of smiles on their faces. The plane had a problem. The airline would try to fix it and let us know. Really.

After the first hour, we began to get the idea that this was going to be a very long day indeed. It started snowing outside. With the holiday rush blossoming all around us, the terminal was becoming very crowded. It would be easy for a child to get lost. We decided to stay put. Terminal 2 is in an older part of O'Hare, and the gate areas are very small. We moved over to a corner against the wall and a window, just to the left of the jetway door. A young mother had already sat down with her two infant children, and we used our joint carry-on luggage to set off a small encampment. This mother needed help, and our kids played with her little ones; and watched them while the mom grabbed a break a few times.

The snow began falling harder. There were not many food choices nearby. Thank goodness we had brought plenty of food for the kids. Our nine-year-old got pretty good at making runs to the candy and peanut counter and the small soda stand. We shared what we had with

our young new friends in the corner. About once each hour I would go to the desk to see if there was any news. I do not recall the name of the angel working for United Airlines at Gate E3 that day. But he was the kindest, most compassionate — and most patient! – airline agent I have ever met. He managed an untenable situation by being nice to people. Folks, I'm sorry, but it does not look like we'll be able to fly this plane today. Well, we don't have a lot of aircraft sitting around waiting for emergencies. We're trying to find another one. Will we be able to fly in this blizzard? Not to worry! The temperature is dropping and as soon as the sun goes down it will get *too cold to snow!*

And amazingly, a peace settled around Gate E3. No one seemed to be upset. We were sharing stories about where we were going, whom we would see, and how we would spend the holidays. And finally, yes, they had located a plane. But the taxiways were so filled with slow-moving traffic, that it would take the plane an hour to get from the hangar to our gate. We settled in some more.

And then the plane was here. After five hours, we began to break camp. Our kids helped the young mother get her children and things down the jetway. We got settled. And finally the plane backed slowly away from the gate. It was another 45 minutes in traffic before the jet finally lumbered down the runway and lifted into the air, to the applause of all on board. And applause again as we touched down in Vegas. But our adventure was not over. We still had a connection to make. And there were only twenty minutes until the last scheduled flight out that night to Orange County. And it was on the other side of the airport terminal!

My oldest son and I sprinted ahead. I had images of using my body to block the jetway door from closing while my wife and the other two children caught up. But as we arrived at the gate, out of breath, we saw Nothing. No passengers. No gate agents. No sign of life. A young woman was stretched out on the floor, sleeping. Then an airline gate agent walked by. No, she didn't think the last flight had left yet. So we waited, and about twenty minutes later another agent came to the next gate over. Our sched-

continued on page 4

From the Executive Director's Desk (continued from page 3)

uled flight had left hours ago. But everything had been backed up by the bad weather. There were still two more flights to Orange County coming through Las Vegas that night, but the next had just left Houston and wouldn't arrive for another hour and a half.

So we made that flight. And finally arrived in California at 11:30 PM. It was twenty hours since we had left our home in New England. And unbelievably but perhaps fittingly, in the days before computers and bar codes on baggage claims, the first five pieces of luggage to come off the belt were ours!

1999. I sat for a while in one of the seats at Gate E3 on that day earlier this year, and soaked it all in. I could not believe how small the gate area was. Passengers were boarding a flight to Richmond. Memories came alive of our long day there sixteen years ago: of the young mother and her infants; of the candy and peanut and soda stands, still unchanged; of the amazingly warm and helpful gate agent; of the way that we all made the best of what we had and shared our stories with those around us. And I remembered being overwhelmed by the good grace and cheerfulness of our three children. Despite the adversity, the Lord blessed that day with the spirit of the holidays. And that wonderful day said so much to us about the meaning of this season, that it still stands out in our family memories with the warmth and fondness that make this time of year so special.

Merry Christmas, everybody!

MSC Discusses Aquaculture, Fish Hatcheries, and More

The Management and Science Committee (MSC) met on November 1 & 2, 1999, in Mystic, Connecticut to discuss issues involving aquaculture, compliance reporting in the Interstate Fisheries Management Program (ISFMP), national fish hatcheries, scientific and display permits, and other issues important to the Commission's member states.

The MSC recommended to the Commission's Executive Committee that the Commission have a positive, proactive role in aquaculture for those species where the Commission has fishery management plans (FMPs) or will develop/amend FMPs with consideration for those species that might effect species under Commission FMPs. As such, the MSC recommended development of: (1) aquaculture sections in relevant Commission FMPs; (2) a coastwide aquaculture directory; (3) a marketing and tracking system for aquaculture marketed products;

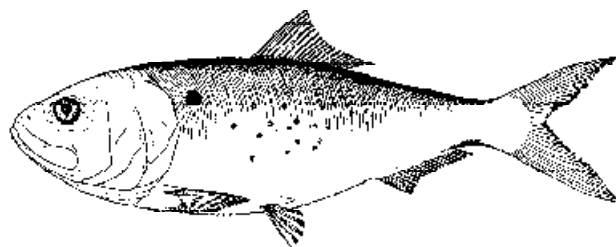
and (4) an aquaculture data collection module in the Atlantic Coastal Cooperative Statistics Program. The Executive Committee tabled action on these recommendations until its next meeting to allow state members further time to evaluate the implications of these recommendations.

The MSC and the ISFMP Policy Board approved a standard format for submission of all FMP compliance reports by state members. This format will assist states in standardizing the provided information and will also assist the species management boards in reviewing compliance criteria for individual species. The MSC has compiled information on issuance of scientific and display permits by all state and federal fishery management agencies. Commission staff are currently developing a database of this information to assist the MSC in determining if any problems currently exist with issuance of permits by multiple jurisdictions and the potential magnitude of these problems. This issue will be further addressed by the MSC in spring 2000.

The MSC discussed a resolution on the importance of national fish hatcheries adopted by the Gulf States Marine Fisheries Commission. The Committee recognized the importance of fish hatcheries in assisting fisheries management of several Atlantic coast species. The Committee referred this issue to the MSC Aquaculture Subcommittee to examine the efficacy of fish hatcheries as management tools and suggest possible directions for the Commission.

The MSC is currently developing two workshops to be conducted in the year 2000: (1) workshop to develop alternative methods for use of regulatory discards, and (2) workshop to examine the potential for multispecies assessment for Atlantic sea herring and Atlantic menhaden. Other issues being addressed by the MSC include: fish health; gear impacts on submerged aquatic vegetation, conducted jointly with the Commission's Habitat Committee (see related article on page 10); compilation of information on various fisheries-dependent and fisheries-independent data sources; compilation of information to characterize Atlantic coast commercial and recreational fisheries; and compilation and prioritization of research needs for all Commission-managed species.

For more information, please contact Dr. Lisa Kline, Director of Research & Statistics, at (202)289-6400, ext. 305 or lkline@asmfc.org.



ASMFC Forms Interstate Tagging Committee for Implementation of a Cooperative Atlantic Coast Tagging Program

In May 1999, the Atlantic States Marine Fisheries Commission Executive Committee approved the Cooperative Atlantic Coast Tagging Program, which establishes the Interstate Tagging Committee. The goal of the program is to improve the utility of scientific and angler-based tagging data for use in stock assessments and fisheries management, and includes protocols for the operation of quality tagging programs.

By following standard protocols in the design and conduct of such programs, data may be of a higher quality and could be utilized for purposes beyond what is often single purpose design. Collection of tagging data using consistent formats may also provide greater compatibility of data among various tagging programs and more extensive use of data for stock assessment and management purposes. Additionally, use of consistent protocols by angler-based tagging programs (programs conducted by nonmanagement agencies) could help to enhance the contribution of collected data to address specific management efforts.

Specifically, the tagging program protocols established by the program identify six areas of emphasis that all tagging programs should attempt to follow, including a mechanism to ensure coordination among all agencies/organizations/citizen groups conducting tagging programs (see accompanying article in shaded box). This need includes two components: (1) internal coordination within a program to cooperate with similar programs, and (2) regional coordination to maintain and improve the quality of tagging data. Regional coordination will be accomplished through the Interstate Tagging Committee, which is composed of representatives from the 15 Atlantic coastal states, the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and representatives of long-standing citizen tagging programs such as the American Littoral Society.

The Committee will be responsible for providing professional guidance to organizations interested in designing a new tagging program, providing summary reports of annual activities, and developing standards for angler training and program certification. The Committee will also attempt to coordinate standard tagging protocols among programs including tag numbering sequences, tag color, and other tag features to reduce overlap. A certification program will be developed by the Committee to assist agencies/organizations/citizen groups in meeting the standard tagging protocols as outlined.

The first meeting of the Interstate Tagging Committee is slated for early 2000. At that time, the Committee will begin to address the tasks outlined above. For more information, please contact Geoff White, Fisheries Research Specialist, or Dr. Lisa Kline, Director of Research & Statistics, at (202)289-6400.

Recommended Tagging Program Protocols

I. Tagging programs should have established objectives for the program and at a minimum include the following:

Stated Purpose of Program (*stated need*): Programs must have identifiable and stated objectives which directly relate to scientific or management purposes.

Tagging programs should address valid scientific questions such as:

- Movement/migration of fish.
- Growth rates and patterns of fish.
- Defining management units (individual stocks) of fish.
- Evaluate reporting rates of tagging programs.
- Measuring fishing mortality rates.
- Measuring tag retention rates.
- Measuring tag event mortality.
- Application to specific fishery management plans (or other management documents).

The following program objectives should be avoided: Competitive tagging unless conducted under an organized scientific entity.

- Speed tagging.
- Personal/private data collection.
- Blanket (nontarget) tagging.

Programs should specifically identify species to be tagged prior to initiation of tagging. Programs should not be initiated to tag a broad range of species in a generalized manner (unless guided by a federal or state fisheries management agency).

Tagging programs should identify a specific time-line for conducting tagging and should provide a strong long-term commitment to continuation of the program (see below).

II. Tagging programs should incorporate minimum design standards consisting of the following:

A. Tag Specifications

Tag type/color specifications. If possible, tag specifications (tag type and color specifications) should be developed and possibly keyed to specific species. These

continued on page 7

Aquatic Exotic Species: A Fisheries Management Dilemma!

(continued from page 1)

Chesapeake Bay waters, and demonstrating the increased likelihood of a self-sustaining population becoming established within the Bay. Most directly, this invasive could have detrimental effects upon the shellfish industry in eastern United States waters by preying upon commercially valuable bivalve species, including oysters, clams, and mussels. Currently, a bounty system is in place in the Virginia waters of the Chesapeake Bay, with the intent of paying whelk collectors a small "reward" (\$2 to \$5) for the whelk and information on where the whelk was collected (location, bottom type/substrate, water depth, etc.).

In the 1980s, the zebra mussel (*Dreissena polymorpha*), an invasive bivalve species, was discovered in Lake St. Clair in the heart of the Great Lakes watershed (Hebert et al. 1989). This species is a native of the Ponto-Caspian region (the Black and Caspian Seas), and was most likely transported to North America as free-swimming larvae (veligers) in the ballast tanks of transoceanic ships. The rate of expansion for the zebra mussel, as well as the eventual overall ecological and economic impacts that it would have

were not apparent at the time of its initial discovery. However, this species is now found throughout all five of the Great Lakes, the Mississippi and Missouri



Zebra mussel, *Dreissena polymorpha*.

River drainages, as well as the Ohio and Hudson River drainages (USGS 1999). In many areas, zebra mussels dominate the macrobenthic biomass. The mussel attach to rocks, debris, other shellfish, plants, and most objects. They do exceptionally well in the interiors of water intake pipes and structures, causing severe fouling. It is estimated that municipalities and water treatment and generating facilities have to spend millions of dollars per year to deal with zebra mussel infestation problems. In addition, zebra mussels have changed the energy flow in food webs in the infested areas. The filtering capacity of the zebra mussel is high, with a single mussel capable of filtering approximately two liters of water per day. Reduced growth rates are anticipated in some pelagic larval fishes although Trometer and Busch (1999) reported no changes in the young-of-the-year growth rates of ten western Lake Erie species. Increased water clarity (transparency) that has resulted from this algal filtration has resulted in increased light penetration to greater

depths, allowing vegetation to colonize areas which were once beyond the range of light required to maintain growth.

Crustaceans

Several non-native crustacean species have recently been identified in eastern United States coastal waters. The Chinese mitten crab (*Eriocheir sinensis*) is native to the coastal rivers and estuaries of the Yellow Sea, and was first discovered in North America in San Francisco Bay in 1992. Since then, the crab's range has expanded greatly within central California, with population explosions occurring in several tributaries of the Sacramento River drainage (Veldhuizen and Stanish 1999). The general biology, reproductive strategy, and method of dispersal makes this species a prime threat to estuaries and tidal rivers from the mid-Atlantic bight southward to the Gulf of Mexico. In addition to the crabs collected in California, an individual specimen was collected in Hawaii in the 1950s, and in Louisiana in 1987. Mitten crabs have also been found in Lake Erie and the Detroit River, although the Great Lakes specimens were probably transported (possibly in ballast water) as larvae or adults, as the lack of salinity in the lake's waters would prevent successful reproduction and egg development (Cohen and Carlton 1997). Damage from mitten crabs includes burrowing into and eventually undermining riverbanks and levees, clogging screens and partitions covering water intake pipes, fish predation, and fouling of commercial fishing nets.

Since the 1990s, another introduced crab species, the green crab (*Carcinus maenas*) has been blamed for the collapse of the soft-shell clam industry in Maine. In 1989, this crab was also found in San Francisco Bay. Damage from green crabs results from their heavy predation upon bivalves as well as upon other crab species. They also compete directly with native fish and bird species for a variety of other prey organisms.

From its first sighting near Cape May, New Jersey in 1988, the shore crab (*Hemigrapsus sanguineus*) has also expanded along the East Coast from Cape Cod, Massachusetts to the Chesapeake Bay. This crab, from the Northern Pacific Ocean, was probably released with ballast water. It is speculated that this small crab (adults @ 35mm) will compete with native crabs for habitat and food.

Finfish

Introductions of numerous non-native fish species also plague the coastal states of the United States. One example of such an introduction is the Asian swamp eel (*Monopterus albus*) from Eastern Asia. The first field collections of adult Asian swamp eels in continental North America were made from spring-fed ponds at the Chattahoochee Nature Center near Atlanta, Geor-

continued on page 8

Recommended Tagging Program Protocols (continued from page 5)

tag specifications (i.e. which types of tags and tagging methods work best for different species) should be utilized by all tagging programs.

B. Specific information to be printed on all tags should include:

- **Unique** alphanumeric numbering for each tag program
- Address *or* toll free number for returning tags
- Agency/organization/citizen group identifier
- Reward information

C. Tagging programs should collect minimum data elements consisting of:

- Area or location of release
- Date of release
- Tag number
- Length of fish at release and units of measure
- Contact information (name, etc.) for tagger and agency/organization

D. Verification (quality assurance/quality control) procedures should include:

- Rapid follow-up to the person returning the tag report. Follow-up should include provision of minimum data (place and date released, size, condition) and provide recognition for involvement (i.e., reward, letter, patch, hat, certificate) in a timely manner.
- Mechanisms to respond rapidly to the individual who tagged the fish. Information provided should include date, location, species, size (as applicable), method of capture, and disposition of fish.
- Random data audits to ensure accuracy of tagging information.
- Local knowledge of the fish species and fisheries by the person conducting quality assurance/quality control.
- "Angler friendly" tag reporting procedures to facilitate returns.

E. Tag non-reporting/loss (shedding) rates of all tag types and tagging methods should be evaluated. Studies should be conducted by management/scientific agencies for new tag types, tagger experiences, etc.

F. Recapture Procedures: No recommendation.

III. Tagging programs should consider the following data management issues:

- Summary tagging data should be made widely available through letters, newsletters, web-based access, etc. This summary information should be provided directly to all participants in the tagging program.

- Data management by angler-based tagging programs should be coordinated through a management agency or scientific institution to ensure direct application of tagging data to management programs.
- All tagging data should be verified within the tagging program for errors (through bounds checks, audits, etc.) to check for quality of data input.
- Procedures for recapture should incorporate the fate or disposition of the fish, such as whether the fish was released with the tag, released after removing the tag, or if the fish was killed.

IV. Agencies/organizations/citizen groups conducting tagging programs should provide dedicated commitment to meet the objectives of the program and to fulfill obligations to tag recapturers and taggers. Specific aspects of this commitment should include:

- Meet program objectives for the duration of the tagging program.
- Provide for staffing requirements.
- Provide program equipment and other required resources including computer hardware/software, tagging equipment, incentive rewards, etc.
- Fulfill tag recapture requests after completion of the tagging program.

V. All tagging organizations should develop and implement a training program.

All tagging programs should provide a means for taggers to be trained or instructed on appropriate tagging procedures. These programs should be conducted by a knowledgeable and experienced tagger and/or through written materials or video.

VI. Tagging programs should incorporate provisions to adequately communicate with volunteer taggers, individuals who report recaptures, and management agencies.

Mechanisms to ensure communication should include:

- Dissemination of publicity and reward information is essential to increase tag return rates.
- Outreach to taggers
- Feedback to taggers regarding appropriate tagging methods, etc. (update training)
- Feedback to recapturers
- Incorporation of professional guidance regarding tagging techniques
- Incorporation of tagging data in stock assessment activities and fishery management plans where appropriate

Aquatic Exotic Species: A Fisheries Management Dilemma!

(continued from page 6)

gia in 1996 (Starnes et al. 1998). Soon after in 1997, swamp eels were found in southern Florida, inhabiting canals, ditches, and ponds in the vicinity of Miami and Tampa Bay. This invader is now considered established within the State of Florida (Fuller et al. 1999). Currently, according to scientists with the U.S. Geological Survey, the range of the swamp eel is expanding, and it is capable of entering and colonizing the Florida Everglades. This fish species can thrive in a variety of habitats, (even ditches and road culverts) and can survive in very shallow water (several inches). A key feature is its ability to breathe air. The Asian swamp eel can reach lengths of three feet or more, and are piscivorous (fish-eating). The swamp eel is an aquarium species in North America and may have been introduced into Florida as a result of an aquarium release.



Sea lamprey, *Petromyzon marinus* on trout. Photo courtesy of Great Lakes Fishery Commission.

One of the most destructive of the early documented exotic invaders was the sea lamprey (*Petromyzon marinus*). This species, native to the marine and coastal environment, found its way into the Great Lakes and other interior lakes and destroyed the multimillion dollar fisheries for cold-water species. Most notably, the sea lamprey caused great mortality to native Great Lakes salmonids, including the lake trout and perhaps the Atlantic salmon, as well as the introduced Pacific salmonids, such as the rainbow trout, coho salmon, and the king (or "chinook") salmon. Control of sea lamprey abundance requires expenditures of millions of dollars annually.

Plants

The non-native plant species, giant salvinia (*Salvinia molesta*) has been discovered in waterways of coastal Texas and Louisiana, posing a new threat to aquatic ecosystems within the southern United States. This plant is considered a free-floating aquatic fern, and reproduces vegetatively. As the plant grows and matures, portions of the stems fragment and new plants develop from buds. Giant salvinia is capable of withstanding periods of dewatering and thermal stress (low temperature) with the formation of dormant buds. This plant is currently listed as a "Fed-

eral Noxious Weed," making its importation, sale and distribution an illegal activity (NIS Act 1996).

The common coastal green alga, *Caulerpa taxifolia*, found in abundance along our southern coast, has gone through a transformation in the Mediterranean Sea and become a "terrorist super plant." It is feared that the introduction of this strain of *C. taxifolia* into the United States could lead to the colonization of large expanses of American coastal waters. It out competes native flora for habitat, and is capable of synthesizing and releasing a chemical that is toxic to potential predators, as well as other algae, and has been labeled the "killer algae" (Meinesz 1999). Reductions in the numbers of native invertebrates, fish, bacteria, algae, and parasites have all been documented in areas that *C. taxifolia*^(Med. Clone) has colonized. This plant was listed as a "Federal Noxious Weed" in March 1999 (NIS Act 1996). For additional information on this species, please see an article by Keppner et al. (1999) in the ASMFC's *Habitat Hotline Atlantic*.

Resource Management Implications

The ultimate success of fisheries management may be significantly impacted by the management success of those dealing with exotic species prevention and habitat protection and restoration. The overall negative impact of exotics is estimated to be a close second to habitat losses in the recovery and maintenance of the health and natural biodiversity of ecosystems (NRC 1995). Similar results were reported by Busch and Lary (1996) who noted that the loss of physical habitat had a similar impact on the health of a large aquatic ecosystem as that contributed by the loss of native species. However, an expansion into holistic aquatic resource management is complicated in that different departments or agencies usually manage or regulate fisheries, others manage habitat,



Common coastal green alga, *Caulerpa taxifolia*. Photo courtesy of Alexandre Meinesz/University of Nice-Sophia Antopolis.

continued on page 9

Aquatic Exotic Species: A Fisheries Management Dilemma!

(continued from page 8)

and different agencies regulate the prevention of non-native species and "commerce."

The ecological concerns raised by non-native species should also apply to non-native strains. Problems related to the release of non-native strains have not received much publicity. However, non-native strains can cause ecological problems and need to be included in the conceptual approach used for the prevention of introductions of exotic species. Specific examples of potential problems that could be caused by the use of non-native strains can be found from Maine to Florida (i.e., Atlantic salmon, shellfish, and sturgeon culture). Activities such as aquaculture, stock enhancement, or species restoration frequently rely on the use of non-native strains or strains of unknown origin in areas that also support native strains of the specific species. Therefore, escapees or releases can breed with the wild strains and impact the wild strain's natural survival.

Further complicating the holistic approach to management, already made difficult by the institutional structures of the agencies, is the assumption that programs addressing habitat and exotic species issues frequently deal with somewhat surreal, grand-scale concepts such as *ecosystem health, natural biodiversity, system productivity and/or watershed management*. However, each management activity needs to focus on the tools and concepts available to its management. Therefore, although holistic resource management is a good goal for the new millennium, we can make progress by instituting a step by step approach to limiting stresses by introduced exotic species on the historic fishery resources. This approach should include (in alphabetical order):

- Aquaculture licensing, including strict requirements and performance bonds to prevent release or escapes of strains or species not native to the location.
- Identification of potential harmful species to provide focused transfer prevention.
- Imports of live products to be licensed with requirement that they will not be released unless appropriately authorized.
- Intentional introductions required to obtain approval and documentation on their risk and trade-offs.
- Mandatory ballast water treatment when crossing eco-regions.
- Restoring the natural biodiversity and abundance of native species to limit opportunities for exotics.

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Green crab, *Carcinus maenas*. Photo courtesy of Department of Fisheries and Oceans/Canada.

President Signs Budget

On November 29, 1999, President Clinton signed into law H.R. 3194, a bill making consolidated appropriations for the fiscal year (FY) ending September 30, 2000, and for other purposes. The bill originally proposed funding for the District of Columbia, but the text of four outstanding appropriations bills were incorporated into the proposal on November 18, 1999. The remaining eight regular appropriations bills were enacted independently by the end of October 1999. Appropriations for the Departments of Interior and Commerce were included in the omnibus package.

In most cases, the omnibus budget appropriations reflect the original appropriations bills for the Interior and Commerce Departments. Funding for the Resource Management section of the Interior Department is \$716 million for FY 2000. Those funds are earmarked for several programs, though none of them Atlantic coastal in nature. However, the conference report does stipulate a \$300 thousand decrease in the U.S. Fish and Wildlife Service's (USFWS) coastal program. USFWS will administer \$23 million in the Cooperative Endangered Species Conservation Fund, a \$16 million increase over the original appropriations bill.

Within the Commerce Department budget, the National Oceanic and Atmospheric Administration (NOAA) is allocated \$1.688 billion for FY 2000, which represents a \$30 million increase over the original Commerce appropriations bill. Allocations under this heading are similar to those funding levels described in the August/September 1999 issue of *Fisheries Focus*. Exceptions to this include: a seven million increase to the NOAA procurement, acquisition and construction account (\$596 million in the omnibus budget); and an eight million increase to the Pacific Coastal Salmon Recovery (\$58 million in the omnibus budget).

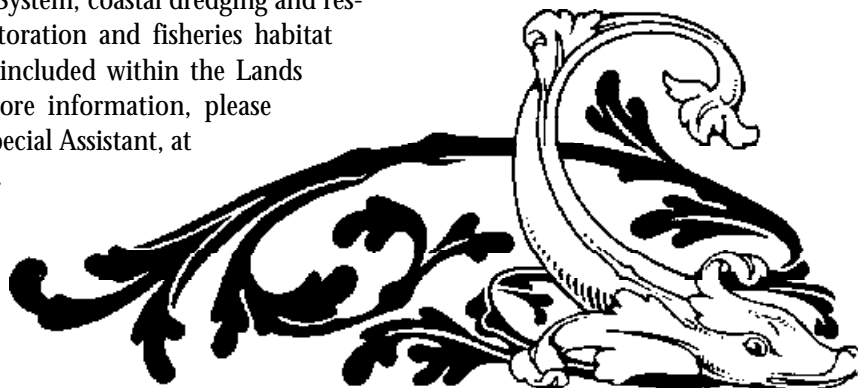
The President is proud of the inclusion of the Lands Legacy Program, a broad range of environmental initiatives proposed in his original budget request. The several programs within the USFWS and NOAA budgets are included in the Lands Legacy Initiative. In the NOAA budget, programs under the Coastal Zone Management, the Marine Sanctuaries, the National Estuarine Research Reserve System, coastal dredging and restoration, Coral Reef Restoration and fisheries habitat restoration programs are included within the Lands Legacy Initiative. For more information, please contact Lori Goodwin, Special Assistant, at (202)289-6400, ext. 314.

ASMFC Guidelines for Evaluating Fishing Gear Impacts to SAV

At a special joint meeting of the Commission's Habitat and Management and Science Committees, the draft report *ASMFC Guidelines for Evaluating Fishing Gear Impacts to Submerged Aquatic Vegetation and Determining Mitigation Strategies* was approved and forwarded for Commission review. The report was prepared to fulfill the charge of the Commission's Submerged Aquatic Vegetation (SAV) Policy, which calls for the development of "technical guidelines and standards to objectively determine gear impacts, and develop standard mitigation strategies." The joint meeting was held on November 2, 1999, during the Commission's Annual Meeting in Mystic, Connecticut.

The report includes: information on SAV key life history and ecological characteristics that are especially pertinent to determining fishing gear impacts; the relative ability of marine SAV species to recover from injuries to key features and overall estimates of injury recovery potential; and impacts from fishing activities (e.g., leaf shearing, seed or flower shearing, below-ground impacts, burial, turbidity). In addition, the report describes fishing gear impacts to SAV on a gear-by-gear basis and identifies fishing gear types used in state waters and their impacts to SAV. The report presents four mitigation strategies of which only two are presently considered to be proven effective, namely avoidance and minimization. Management actions to implement the two strategies are described and a decision tree is presented to help managers identify appropriate mitigation strategies for fishing gear impacts to SAV.

The draft report was reviewed and discussed during the meeting and was approved by both Committees with some minor modifications. A revised report is in preparation for review by the Commission's Interstate Fisheries Management Program Policy Board later this winter, and is expected to be available in January 2000. After Commission adoption of the guidelines, the Habitat Committee will work with the ISFMP Policy Board to determine options for guideline implementation. To obtain a copy of the revised report, please contact Leuвет Stevens, Executive Secretary, at (202)289-6400.



Commission Adopts Fast-tracking Resolution and Reviews Habitat Program Progress

The Habitat Committee met on November 1, 1999, during the Commission's Annual Meeting in Mystic, Connecticut to review 1999 Habitat Program activities and plan for activities in 2000. In addition, the Committee, and later the Commission, approved a resolution expressing concern over streamlining/fast-tracking of industrial recruitment permits for economic development. Fast-tracked industrial recruitment may attempt to circumvent comprehensive environmental impact assessments which may jeopardize fishery resources and/or their habitats. The resolution calls for governors and legislatures to direct their respective state government agencies to incorporate the ability to raise environmental concerns at the earliest possible time in the economic development process to ensure that these issues are adequately addressed during expedited permitting processes.

The Habitat Program's highlight for 1999 was completion of the Program's Strategic and Management Plan. The Plan documents the program history and guidance for Commission habitat activities to be accomplished during the next 5-10 years. Other notable accomplishments for the year included adoption of essential fish habitat (EFH) in joint Commission/Council fishery management plans (FMPs), publication of the newsletter *Habitat Hotline Atlantic*, identification of methods for development and review of FMP habitat sections, and continued implementation of the Commission's Submerged Aquatic Vegetation (SAV) Policy.

EFH designations were adopted for jointly managed species including herring, bluefish, black sea bass, and summer flounder. In support of the EFH mandates required by the Magnuson-Stevens Act, the Interstate Fisheries Management Policy Board determined that the Commission would adopt EFH designations identified by the regional fishery management councils for species managed jointly by the Commission and the councils. The Commission coordinated with the councils to ensure that EFH designations and appropriate information for joint species was incorporated into Commission FMPs.

With advice from the Habitat and Fishery Management Plans (HFMPs) Committee, the Habitat Committee determined that the best way to identify habitat section writers for FMPs was through seeking partnerships with other agencies or organizations similarly concerned about fish habitat issues. Contracting with academia was identified as the second alternative for providing authors, however, funding has not been available for this approach.

The report *ASMFC Guidelines for Evaluating Fishing Gear Impacts Submerged Aquatic Vegetation and Determining Mitigation Strategies* was prepared as part of continued implementation of the Commission's SAV policy. The report was approved for

Commission review at a joint meeting of the Habitat and Management and Science Committees held on November 2, 1999 (see accompanying article opposite page).

Habitat Program activities proposed for the year 2000 include: continued publication of *Habitat Hotline Atlantic*; continued coordination on Magnuson-Stevens Act EFH mandates; development of one or more FMP and source document habitat sections; development of guidelines for identifying horseshoe crab spawning and juvenile habitat; establishment of a mapping protocol for FMP habitat sections; and implementation of the guidelines and standards for mitigating fishing gear impacts.

If you would like to be added to the *Habitat Hotline Atlantic* newsletter mailing list, or for more information on the Commission's Habitat Program, please contact Robin Peuser at (703)998-8090.

ISFMP Makes Some Shifts in Species Coordinators

As of December 1, 1999, species assignments in the Interstate Fisheries Management Program (ISFMP) have shifted: Heather Stirratt will now also be the FMP Coordinator for weakfish and tautog. The table below outlines the staff members responsible for all ISFMP species.

Coordinator	Species
Robert Beal	Black Sea Bass, Bluefish, Scup, Striped Bass, Summer Flounder
Joseph Desfosse, Ph.D.	Atlantic Herring, Atlantic Menhaden, Sharks & Spiny Dogfish, South Atlantic species, Winter Flounder
Thomas O'Connell	Horseshoe Crab
Amy Schick	American Lobster, Northern Shrimp
Heather Stirratt	American Eel, Atlantic Sturgeon, Shad & River Herring, Tautog, Weakfish

*The staff of the Atlantic
States Marine Fisheries
Commission joins in
wishing you the
happiest of holidays
and a healthy and
prosperous New Year!*



Atlantic States Marine Fisheries Commission
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