Committee on Resources

Witness Testimony

Testimony of
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On behalf of the Sea Grant Association and the Michigan Sea Grant College Program, I appreciate this opportunity to testify regarding the problems associated with the invasion of freshwater and coastal marine environments by aquatic nonindigenous species. Because my background involves extensive research in the Laurentian Great Lakes, I will draw upon several examples from that region as a point of reference. I wish to make three very important points in this testimony. First, that the issue of invasive species is not new, but unhappily one we have faced for almost two centuries. Second, the problem is not confined to the Great Lakes but rather one that concerns both freshwater and coastal marine environments. Third, that the federal funds provided to the university community through Sea Grant have made a very substantial difference in the effort against these unwanted invading organisms.

Invasions Are Not A New Problem

The first point concerns the duration of the nonindigenous species problem. While the zebra mussel in many ways is the poster child of the aquatic nonindigenous species issue, the arrival of that organism in the Great Lakes in the late 1980s only served to heighten awareness of biological invasions that have been a persistent problem in this nation. The settlement of the Great Lakes Basin in the early 1800s began a long series of perturbations to the Great Lakes ecosystem that opened the door to numerous invaders arriving via a myriad of pathways. To date over 139 invaders have arrived and colonized the Great Lakes. No single group of organisms is responsible for this invasion; rather many groups including fishes, invertebrates, water plants, algae, and fish pathogens have invaded the Great Lakes, colonized the system and now raise havoc with the food web. The degree of invasion can hardly be over-emphasized; almost the entire Great Lakes food web consists of nonindigenous species. Most of the organisms in the everyday lives of people who interact with the Great Lakes are invaders from another system. These include carp, alewife, rainbow smelt, coho salmon, chinook salmon, purple loosestrife, and water chestnut.

Rate of Invasion Is Increasing

The pathways of invasion have shifted over time ranging from canals, purposeful introductions, unintentional escapes from ponds and aquaria, and ballast water. Perhaps most troubling is the increase in the rate of invasions to the Great Lakes to the point that the past thirty years has seen the highest invasion rates recorded. The trend of increasing rates of invasions is not unique to the Great Lakes but is common to almost all coastal environments. The great benefits of a shrinking world, a more fluid global economy and a more mobile society have come at a cost to our ecosystems. In short, we are in the midst of a crises of unwanted biological pollution that threatens to overwhelm our accustomed and valued indigenous flora and fauna.

Economic Implications of Aquatic Invasions

The ramifications associated with aquatic nonindigenous species also cause great economic harm to the

American public. On any yardstick, the American public is paying dearly to cope with and attempt to control nonindigenous species. Three examples from the Great Lakes can serve to put this into perspective.

- The costs of controlling zebra mussels by the private sector run in excess of $100 million per year. Control is perhaps a misnomer in this case as most efforts are stop-gap measures intended to keep the zebra mussels in check while researchers search for clues on how to effectively lessen the impact of this organism.
- The control of the destructive sea lamprey costs the U.S. and Canadian governments in excess of $10 million year. Even at that level of perpetual expense, sea lampreys have made a devastating comeback in Lake Huron as they expand their breeding territory into streams and rivers with newly improved water quality. Yet, without the sea lamprey control programs, the Great Lakes fisheries would suffer losses at least ten times as high as the $10 million per year investment.
- One of the latest invaders from Europe, the ruffe, has an enormous impact on the yellow perch populations of the Great Lakes. The current yellow perch recreational fishery in the Great Lakes returns an estimated $400 million per year to the region in economic benefits. The displacement of yellow perch by the undesirable ruffe is well documented wherever the two organisms are in direct competition.

There are other examples of damage to our aquatic ecosystems that are difficult to quantify yet have significant economic implications. Again, drawing examples from the Great Lakes, in the late 1960s and now again in 1996 we have seen massive die-offs of alewives creating deep piles of rotting fish on the beaches during the summer tourism season. Similarly, in the late 1980s and early 1990s, zebra mussel shells accumulated in windrows up to three feet deep on beaches of western Lake Erie, again rendering the beaches almost useless for tourism during the height of the summer, damaging a significant Great Lakes tourism industry.

Aquatic Invasions Are Not Unique To The Great Lakes

My second point is that the residents of the Great Lakes are not alone in facing the problem of aquatic nonindigenous species. San Francisco Bay, much of Florida, Honolulu Harbor, and the Hudson River are some areas that have also suffered their share of biological invasions. For example:

- In San Francisco Bay, over 200 nonindigenous species have been identified. The level of invasion by aquatic nonindigenous species has now reached the point of a new arrival occurring at the rate of one every twelve weeks. Similar to the Great Lakes, San Francisco Harbor has an aquatic food web that is dominated by nonindigenous species.
- On the East Coast, over 110 nonindigenous species have been identified from the Hudson River, many of them making their way from the Great Lakes via shipping canals.
- With the agreement to ship Alaskan crude oil to the Far East, fears have escalated that Prince William Sound will become the next coastal marine environment to be decimated by invasive organisms that travel in ballast water of tankers, posing a potential threat to a multimillion dollar fishing industry.

Also discouraging is the degree to which invasive organisms continue their spread once they have arrived in waters of the United States. From a single site in Lake St. Clair on the U.S. - Canadian border in 1988, the zebra mussel has spread to almost every state east of the Mississippi and now as far west as Oklahoma (see attached map). Further, in three separate incidents, zebra mussels were discovered on recreational boats on trailers at the California-Nevada border. The research community and the public has been truly astounded by the rate at which this seemingly unassuming organism has become a nationwide problem.

Vital Sea Grant Research On Aquatic Nonindigenous Species

This brings me to my third point, which is that federal funds through Sea Grant have made an important difference in our battle with unwanted invading organisms. The material above represents a compelling argument for the need to support a wide variety of research and outreach activities on nonindigenous species. The material that follows makes a strong case for long-term research into aquatic nonindigenous species issues and draws upon the highly successful efforts of Sea Grant supported studies for examples.

Rarely, if ever, are "silver bullet" cures found for nonindigenous species. Considerable study is needed to decipher the basic life cycle and ecology of the organism(s), identify and isolate natural predators/competitors of the organism from its original home range, and develop a specific control protocol that does not cause further widespread damage to the native flora and fauna. This is time-consuming and tedious research. In the case of the sea lamprey, almost twenty years of in-depth research were needed to complete these steps. Even with that thorough background, the current protocol for control is becoming less effective. With more modern research tools and an enhanced coordination of the research community, control protocols for newly arriving invasive species should not take another twenty years to develop but conducting adequate research nonetheless remains a difficult challenge.

The problem of understanding a newly arrived nonindigenous species can be daunting at first. Often an organism does not behave in the same manner in the newly colonized area as it did in its home range, particularly in the absence of natural predators. Initially a wide variety of observations are needed to understand how the new invader will behave in the new territory. This requires a substantial field effort to collect a massive amount of information before beginning the more specific laboratory studies. The Sea Grant network is ideally positioned to tackle such a problem. Sea Grant can tap into a network of over 300 universities spread throughout virtually every coastal and Great Lakes state. In many instances, Sea Grant investigators can work in conjunction with federal laboratories to conduct an intense study at a single location. The strength of Sea Grant is that it can draw upon the talents of a diverse array of investigators covering a wide variety of disciplines in a nationwide network. The demands of studying a newly arrived nonindigenous species are most intense just after arrival. A coordinated network such as Sea Grant can marshal considerable resources in a short amount of time. Let me use the zebra mussel research program as an example.

Example of Sea Grant Approach: The Zebra Mussel Research Program

Zebra mussels were first discovered in North America in 1988. The magnitude of the problem presented by this organism was quickly grasped and in FY91 the first appropriation for Sea Grant research into the problem was made available. The cornerstone of success of the Sea Grant zebra mussel research program was the recognition that a coordinated effort was required that involved a substantial amount of the research community from both within and external to the federal government. Drawing upon a coordinating document developed in 1990, the Sea Grant zebra mussel research program developed research in the following six major categories:

- Biology and Life History
- Effects on Ecosystems
- Socio-Economic Analysis: Costs and Benefits
- Control and Mitigation
- Preventing New Introductions
- Reducing the Spread of Established Populations

Although not equally distributed among categories, the Sea Grant research projects have followed a coordinated approach and fall into all six categories. From these topics, it was evident that the Sea Grant program had the foresight to view the zebra mussel issue in a generic context that might be used against future invaders. This concept proved to be extremely insightful; since 1988 the Great Lakes have suffered from at least three new invasions - the ruffe, the round goby and the tubenose goby.

Many Institutions Involved - Initial research efforts through the FY91 zebra mussel research program were mostly Great Lakes based and in the area of biology and life history. Since then, the Sea Grant zebra mussel program has expanded to include nineteen of the twenty nine Sea Grant programs and supported investigations in all six categories. Research efforts have ranged from studies of salinity tolerance of zebra mussels (Louisiana Sea Grant), genetics of zebra mussels (Ohio Sea Grant), influence of zebra mussels on recruitment of fishes (Michigan Sea Grant), population dynamics of zebra mussels (Wisconsin Sea Grant), potential impact of zebra mussels on aquaculture (Mississippi-Alabama Sea Grant), control of zebra mussel larvae via chemical coagulants (New York Sea Grant), and the overland dispersal of zebra mussels into inland lakes (Connecticut Sea Grant). Many Sea Grant supported investigators have worked collaboratively with federal investigators at facilities like the NOAA Great Lakes Environmental Research Laboratory in Ann

Arbor, Michigan. In addition, local and state jurisdictions have recognized the merit of the coordinated Sea Grant approach and the leveraging of Sea Grant research funds with local support has been enormous.

A Successful Template for Studying Future Invaders - The collaborative approach used by Sea Grant has been such a success in coordinating the expenditure of funds and maximizing their return, that when the next new major threat from a nonindigenous species arrived in the Great Lakes, the ruffe, a Great Lakes Ruffe Initiative was begun, fashioned after the zebra mussel program. This initiative, located at Minnesota Sea Grant, is marshaling a similar coordinated approach to keeping the ruffe under control in North America. Unlike the zebra mussel, which spread with reckless abandon in eight years, the ruffe has so far been confined to only two of the Great Lakes and a program of control might have a chance to make a major impact. Other new invaders that are under investigation are the tubenose and round gobies. The round goby has the capability of eating zebra mussels. Sea Grant investigators are now studying if the expansion of the round goby population will really make a difference in the enormous zebra mussel population.

Critical Need: Preventing New Invasions - Of all the aspects of aquatic nonindigenous species that begs for investigation, none is in more dire need of research than the prevention of new introductions. It is far more cost effective and environmentally sound to prevent the introduction of nonindigenous than to spend millions of dollars on control programs that have a very mixed record of success. Although discouragingly few research proposals are submitted in the area of preventing new invasions, there is good news on the horizon. A major new research project entitled the "Ballast Water Demonstration Project" is now underway with support from a variety of federal and regional funds, including Sea Grant support. This project for the first time draws together the shipping industry, naval architects and biologists in a proactive manner to determine if modifications to the movement of ballast water can greatly reduce the risk of new introductions. The first steps are underway to install devices to filter ballast water as it enters and leaves ships to intercept unwanted organisms before they reach North American waters. Sea Grant researchers working with the Cooperative Institute for Limnology and Ecosystems Research at the University of Michigan and the NOAA-Great Lakes Environmental Research Laboratory are involved in this ground breaking study.

Sea Grant Outreach - Aquatic Nonindigenous Species

I wish to emphasize an area where Sea Grant stands alone in the forum of aquatic nonindigenous species. Of all the various federal, state, local and university endeavors investigating nonindigenous species, only Sea Grant has an existing infrastructure to conduct substantial outreach to the public. This infrastructure consists of a very talented staff of field agents located in numerous coastal counties of the United States who are in constant contact with the members of the public dealing with issues such as invasive organisms day-to-day. These agents work with an in-depth staff of Sea Grant professional editors and writers who can develop high quality materials to keep the public informed on the latest developments surrounding nonindigenous species. An informed public is another key to controlling these organisms.

During the initial phases of the zebra mussel invasion, the public had numerous concerns and questions. In many instances the researchers were ill equipped to answer those questions and could certainly not do so on a person-by-person basis. Sea Grant outreach rose to the occasion through numerous fora demonstrating that a coordinated research program was only part of the equation to attack nonindigenous species. Outreach activities have included:

- A clearinghouse to disseminate the latest research information (New York Sea Grant)
- hosting an annual zebra mussel research conference (New York Sea Grant, Ohio Sea Grant, Wisconsin Sea Grant, Michigan Sea Grant)
- developing a graphics library of aquatic nonindigenous species (Great Lakes Sea Grant network - located at Michigan Sea Grant)
- developing traveling trunks of educational materials (Illinois-Indiana Sea Grant, Minnesota Sea Grant)
- educational videos (Connecticut Sea Grant, Michigan Sea Grant, Minnesota Sea Grant, New York Sea Grant, Ohio Sea Grant, Wisconsin Sea Grant)
- videos to train lay persons to identify zebra mussels and monitor inland lakes for their presence (Wisconsin Sea Grant, Michigan Sea Grant)
- World Wide Web sites on nonindigenous species (all Great Lakes Sea Grant programs)

- distribution of hundred of thousands of flyers informing the public of the salient issues surrounding aquatic nonindigenous species (all Great Lakes Sea Grant programs).

The magnitude and importance of an outreach component in nonindigenous species control has been recognized and accepted by the Sea Grant community. Over the five year history of the zebra mussel program, the annual outlay of funds for outreach activities has grown from $0.5 million in FY91 to $1.3 million in FY95. As aquatic nonindigenous species continue to spread throughout the United States and continue to arrive, the demand on the outreach program will continue to mount. Again, Sea Grant stands alone in meeting this challenge.

Conclusions/Future Support/Endorsement of H.R.3217

In conclusion, I wish to offer my sincerest thanks for the support provided to Sea Grant for the study of nonindigenous species and zebra mussels. In looking toward the future, let me offer two strong endorsements. First, as discussed above, the problem of aquatic nonindigenous species is not new and not region specific. We need a well thought out and coordinated approach to this problem which has plagued many regions of the United States for almost two hundred years. Solutions in the past have not come quickly or easily. Solutions must come from all sectors and will inevitably require activities both in the research laboratory and informing the public through outreach. In short, we need continued support for programs such as the one that Sea Grant has implemented. But, we should have an eye toward the larger magnitude of the problem and broaden the program beyond zebra mussels to include all aquatic nonindigenous species in both fresh and salt waters. To be most effective, Sea Grant's efforts to address the aquatic nuisance species problem requires a stable base of funding that will enable us to continue a coordinated, national effort through research, public education, and outreach. Sea Grant has the capability to accomplish these objectives through its core program, which is highly leveraged with funding from nonfederal sources. Realistically, the $2.8 million that has been appropriated by Congress in recent years, and initially directed toward the Great Lakes alone, is the minimum amount necessary if Sea Grant is to maintain an effective record in addressing this important and growing national problem. Second, the overarching legislation under which many of the salient aspects of the nonindigenous species problem is addressed in H.R. 3217, the National Invasive Species Act of 1996. I respectfully encourage support of this important bill.

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