The National Aquaculture Association (NAA) is the largest national trade association representing a diversity of aquatic animal species producers, including hybrid striped bass, catfish, trout, baitfish, salmon, shellfish, shrimp, alligators, etc. We represent thousands of growers with a combined annual production of nearly one billion dollars. We appreciate the opportunity to testify to the US Commission on Ocean Policy.

Aquaculture is the fastest growing sector of US agriculture, and for good reason. Aquaculture's phenomenal growth and bright prospects can be attributed to an increasing demand for consistent, high-quality wholesome products by American consumers. Additional aquaculture demand is created because many wild stocks have been diminished by over fishing or environmental changes. The challenge for aquaculture is to continue to deliver high quality product while maintaining profitability and environmental compatibility.

A wide variety of aquatic animals and plants are raised commercially in the US and more are being tested for production potential. This is important because Americans are given medical advice to eat more fish yet are faced with a static base of mostly imported expensive products. In the US, aquaculture is often thought of as a single industry but it is important to realize the industry contains a variety of species each with unique production requirements.

The largest and most prominent aquaculture sectors in the US (listed according to pounds raised) are catfish, oysters, trout, crawfish, salmon, clams, tilapia, striped bass, baitfish, and ornamental fishes. Each of these industry sectors have developed over the past 30 to 50 years and, with the exception of baitfish and ornamentals, are generally directed at production for human consumption. The vast majority of aquaculture in the US is in freshwater, primarily catfish and trout.

Aquaculture is used with varying success to conserve endangered fish populations or enhance over-fished populations. Federal and state agencies also produce a variety of fish, using aquaculture techniques, for stocking in public waters. Aquaculture is one of the most viable methods of supplying a growing world and US populations food needs. More recently developed commercial species include hybrid striped bass, marine shrimp and sturgeon. Considerable research is being directed at production of other species such as yellow perch, walleye, sea urchins, abalone, flounder and cod to name a few. Each of these specie specific sectors is successful or has the potential to succeed because of American consumer demand. In short, American consumers enjoy eating fishery products, whether caught or bought.

While US aquaculture continues to grow, it is also challenged by ever increasing competition for resources, a burgeoning population, continued urbanization, competition from foreign products not subject to US regulations, and a wealth of misinformation. Legitimate concerns about aquaculture's environmental impact are sometimes raised, just as there are with all other types of human or domesticated animal impacts. A genuine analysis of aquaculture's impacts must be founded on fact and credible analysis as credibility is dependent upon facts. Unfortunately, many

have raised concerns based on obsolete data or examples of aquaculture calamities in third world countries with weak regulations or enforcement.

Aquaculture in the US is under close scrutiny from regulatory agencies including the Environmental Protection Agency (EPA), the Food and Drug Administration (FDA), the National Marine Fisheries Service (NMFS), the United States Department of Agriculture (USDA), the US Fish and Wildlife Service (USFWS), and numerous state environmental agencies. There is also an unprecedented societal environmental awareness and activism. As our knowledge about ecosystems and watershed management improves, appropriate action by all parties can be taken to ensure sustainability. For example, it is now recognized that to protect the integrity of our water resources, a watershed approach is necessary. If the control focus is on just one element, public policies may be developed that aggravate watershed problems rather than contribute to restoration or sustainability.

Aquaculture practices of the past, both in the US and in many places throughout the world, have evolved rapidly and continue to improve. Production practices are most often determined by the availability of natural resources and various social and economic constraints. As our knowledge about production efficiency has increased, environmental stewardship has ensued. The best actions have often been voluntary. The current regulatory system helps ensure US aquaculture continues to be compatible with state and federal water quality requirements and is compatible with watershed management plans. Before any new regulations are instituted it is essential that existing environmental requirements be applied. Aquaculture has developed in response to societal needs and it continues to develop and apply credible, scientifically sound information throughout the public and commercial domain. With this information, aquaculture can continue to prosper, remain compatible with the environment and benefit the American public.

Regulatory Framework

The US aquaculture industry is developing in an unprecedented environmental and food safety climate. In many respects, this helps ensure the aquaculture industry is environmentally sustainable, while still providing needed rural employment and income. This situation also places a unique challenge upon aquaculture because it must experiment with new species production techniques under close scrutiny. Most other forms of agriculture developed over the past 200 to 300 years and became profitable prior to current constraints. Nevertheless, aquaculture is thriving because it can fit the environmental, social, and economic needs of the communities where it is located.

Clean Water Act (CWA) programs provide regulatory oversight to ensure discharges from aquaculture facilities are compatible with the environment. Because many forms of aquaculture are considered point sources, each source must be covered by a National Pollutant Discharge Elimination System (NPDES) permit. Discharge permits are developed by a state's environmental regulatory agency or by the EPA if the state does not have permitting primacy. Permits developed by EPA must receive a state's approval (401 certification) indicating the federally permitted discharge will comply with the applicable provisions of the CWA and state water quality standards will not be violated. It is incumbent on the state or the federal government to adequately enforce

existing environmental requirements since these are often adequate to meet environmental quality standards.

Concerns about human impacts on water quality are prevalent throughout the US. Many water bodies (not impacted by aquaculture operations) throughout the US have been declared "water quality limited" signifying failure of a water body to satisfy water quality standards and attainment of full designated beneficial uses. For these water bodies, a total maximum daily load (TMDL) is developed. The TMDL attempts to limit pollutants from both point and non-point sources depending upon what a particular water body can assimilate and still meet standards. This is called the water bodies assimilative capacity. Assimilative capacity is determined by a number of physical, chemical and biological factors. Physical factors include river or lake water volume, flow rate management, and sediment volumes. Chemical factors may include nutrient levels (such as phosphorus) and toxic chemicals from industrial discharges. Biological factors include plant composition and abundance, and fish composition. Because these characteristics are peculiar to each water body, the assimilative capacity for each is determined on a site specific basis. National standards must reflect the site specific nature, the integration of these processes and allow considerable flexibility in implementation.

Food safety efforts may also benefit the environment. The FDA has recently (Dec. 1997) instituted a mandatory processor seafood safety program. This program relies on the Hazard Analysis Critical Control Point (HACCP) process to help ensure all seafood's are wholesome for consumers. As part of this program, aquaculturists must ensure their use of therapeutants for aquatic animals are safe. The FDA also carefully scrutinizes drugs to ensure they are safe for the environment before they are approved for use. This is in compliance with the Federal Food, Drug and Cosmetic Act. Any water treatments or algaecides used by an aquaculturist must be approved by the EPA and are regulated under the NPDES permit system. Compounds approved for use by US aquaculturists are listed in the document "Guide to Drug, Vaccine and Pesticide Use in Aquaculture" written in 1994 by the Quality Assurance Working Group of the federal Joint Subcommittee on Aquaculture. This document is currently being revised.

Water (Rearing) Environments

Each aquatic species has specific environmental requirements. The various *salmonids* (salmon and trout) for example require cold (50-60° F), highly oxygenated waters (oxygen greater than 6 mg/L), but the water can be fresh or salt water. Catfish are grown in fresh water but can tolerate a wide variety of water temperatures growing best at water temperatures above 75°F with oxygen concentrations above 4 mg/L. Marine mollusks, such as oysters, and crustaceans, such as shrimp, must be grown in water where salt (NaCl) levels are higher and where the water is saturated with oxygen. Aquaculture is a water dependent industry. Aquaculturists must be good stewards of water use, our success depends on it.

The FDA instituted a mandatory seafood processors safety program to ensure that the US consumer continues to receive safe wholesome seafood. This program relies upon a HACCP plan and is enforced by seafood processors but inspected by FDA. The National Aquaculture Association (NAA) endorses this program and has been instrumental in developing various

aquaculture producer quality assurance programs. The NAA would also like to see the HACCP standards being applied internationally to improve competition in the global marketplace.

Environmental Impacts of Discharge

Depending upon the aquaculture system, water may or may not be discharged into the environment. Pond aquaculturists, such as those farming catfish, striped bass, baitfish, or ornamental fishes typically do not discharge their waters. Evaporation water is replaced by precipitation or pumping from shallow wells. In these culture practices, discharge of water occurs mostly when ponds are completely drained for pond maintenance. This occurs infrequently on an as needed basis. Recirculating water production systems also discharge water regularly but only in very limited quantities. Concentrations of substances may be high, but total load may be quite low.

Raceway culture systems, such as occurs with *salmonids*, do routinely discharge water which may contain elevated (above influent water quality) quantities of nutrients such as phosphorus. The impact of these nutrients is site specific. In some cases, the impact of elevated nutrients is obscured by other factors such as elevated sediment deposition from non-point sources or hydromodifications such as dams. For example, managed river or hydropower schemes often result in a dramatic reduction in the frequency of large magnitude floods which are important for normal river ecosystem function. These factors alone can obscure the significance of elevated phosphorus. In some cases however, the nutrients from an aquaculture facility may cause eutrophication.

Over the past 15 years there have been great improvements in feeding practices, feed formulations and assimilation efficiencies that have resulted in dramatic reductions in nitrogen release per pound of fish raised. This is especially true for the salmon sector. Continued research developments ensure that this trend will continue as this young industry continues to grow.

The impact of aquaculture operations must be determined within the context of a specific water body. Net pen culture, whether in a lake, reservoir or coastal marine area must also be evaluated within a site-specific context. Normal current actions may minimize the potential impact of a specific facility or group of facilities. In all cases, careful evaluation must be made based on site specific evaluations and allow for corrective action to be taken.

Aquatic Animal Feeds

Aquatic animal feeds are specially formulated to ensure economically optimal aquatic animal growth. Feeds are increasingly being formulated to minimize environmental impact. These advances have resulted in the manufacture of feeds that are high in energy and nutrient-dense. This has resulted in improved feed conversion efficiencies (amount of feed to produce one pound of animal) and less waste discharge. This increased attention to feed conversion coupled with the fact that aquatic animals in general are far more efficient at feed conversion than terrestrial animals, has yielded conversions at nearly 1:1 in some species.

An important ingredient in some aquatic animal feeds is fish meal. Fish meal is produced from various pelagic fishes that, with some exception, are not normally consumed by humans. The fish

that are caught to produce fish meal (menhaden and anchovy) are subject to quotas. Quotas are imposed by government agencies to ensure that fish stocks remain sustainable. Additional fish meal is produced from the "by-catch" of the fishing industry. By-catch is unwanted fish that are accidentally netted or caught in the process of fishing for higher value fish than is usually intended for human consumption. Most of this by-catch is currently discarded back into the ocean. While these particular pelagic species are typically not consumed by humans, as a fish meal, they form a significant part of the diet of many different kinds of animals (terrestrial and aquatic) which become human food (Table 1).

Estimated Global Fish Meal Use By Species	Percentage Use
Poultry	36.1
Aquaculture	27.6
Swine	26.3
Other	10.0

Some (commercially grown) aquatic animals grow well with feeds based primarily on plant materials. Catfish feed, for example, contains only 3-5 % fish meal but considerable quantities of soybean meal. Tilapia are planktivores that consume single celled algae and do not require any fish meal in their diets. Bivalve mollusks are filter feeders that utilize the natural foods present in the environment for their sustenance. Because domestication of aquatic species and food technology is a relatively young science, feed optimization has yet to occur. Fortunately, considerable private and university research is underway to provide enhanced feeds for aquaculture species use.

In the past 15 years there have been dramatic reductions in the amount of fishmeal required to grow salmonids. In 1985 food conversion ratios (FCR) averaged 1.7 pounds of dry food to rear a pound of salmon and salmon diets averaged 50% fish meal. By 2000 the average FCR had dropped to 1:1 and fish meal content had declined to 35%. The cumulative result of these advances is that it now takes 60% less fishmeal to rear a pound of salmon than it did 15 years ago. Continued research will ensure that these trends continue.

Pathogens and Disease Control

Farmed aquatic animals are subject to the same diseases that occur naturally in wild aquatic animals. Unfortunately, knowledge about the interaction between pathogens of wild aquatic animals and aquacultured animals is poor. Because aquacultured animals receive considerably more scrutiny than their wild counterparts, more is known about diseases under aquaculture conditions.

Wild fishes are often the source of pathogens causing disease in domesticated species. There are several protozoan parasites, for example, that are resident or endemic in wild fish. These fish may seed parasites into the water that supply an aquaculture facility. The cause of "Ich"

(*Ichthyopthirius multifiliis*) is a classic example. Almost anyone who has a home aquarium has seen Ich breakout when a new fish or aquarium plant is brought in. Birds or other animals may seed the facility with a new pathogen. Similar concerns occur in agriculture where wild bison or elk may serve as a potential reservoir for the organisms causing brucellosis in hoofed domesticated animals. It is because the aquacultured animals are closely confined, that disease may move through a population quickly.

The US Fish and Wildlife Service (USFWS) has recently set out to determine the prevalence of various fish pathogens in wild fish populations. This effort is required to increase knowledge about the interaction of aquatic animal pathogens between wild and aquacultured animals and provide a better accounting of where pathogens occur naturally. The NAA supports these efforts.

Treatment of aquatic animal diseases is difficult. The FDA closely regulates availability of drugs used by aquaculturists. There are only two antibacterial drugs available (Terramycin® and Romet-30®) in the US and these cannot be used for all aquatic species. Several microbicides can be used by aquaculturists including salt (NaCl), iodine (to treat eggs), and copper (EPA approved to treat algae). It is incumbent on each aquaculturist to use these compounds according to state or federal toxics criteria. Various efforts are underway, supported by the FDA, USDA, public and commercial interests to alleviate the lack of drugs or chemicals, but it is a formidable task. The high cost of drug approval is a significant barrier and there is a considerable disparity in the availability of aquatic animal drugs between the US and other countries. Additional efforts are being directed at harmonizing use of drugs internationally. These efforts are being encouraged by the FDA and the NAA. Because drugs should only be used as a last resort, enhanced husbandry (integrated fish health management) and vaccination of aquatic animals against specific pathogens are used for disease prevention. The NAA supports additional efforts directed toward these important farming practices.

The commercial aquaculture industry is concerned about the importation of exotic pathogens into the US. Current regulation of imported animals, including pathogens, under 50 CFR Part 16 and the Lacey Act may not be adequate to protect our resources nor to foster US aquaculture. The NAA, in association with the National Association of State Aquaculture Coordinators (NASAC), is coordinating efforts to further minimize the importation of injurious pathogens. These two groups are working closely to help establish a coherent national aquatic animal health management program. The commercial aquaculture industry is working closely with the US Department of Agriculture Animal Plant Health Inspection Service (USDA-APHIS) and the Office of International Epizootics (OIE) in this effort.

Depredation

Commercially reared aquatic animals can be subject to significant predation by a variety of animals. These include birds, seals, crabs, flatworms and starfish. The economic impact of this depredation is difficult to quantify with precision. The US catfish industry, in association with the USDA Wildlife Control Service estimates that in Mississippi, Alabama and Louisiana cormorants consume $10-30 million worth of commercially raised channel catfish per year. Other birds known to predate on commercially raised aquatic animals include great blue herons, black-crowned night herons, kingfishers and white pelicans.

As aquaculture has prospered, so have various fish-eating birds. In some areas, according to natural resource managers, these birds have increased their numbers dramatically, far exceeding the normal carrying capacity of the area. The increased population of these birds has negatively impacted natural roosting areas and island habitats.

Both *salmonid* net pen culture and molluscan aquaculture operations have also been negatively impacted by depredation. Net pen *salmonid* aquaculture operations are subject to predation by seals (gray and harbor) and sea lions. The seals and sea lions cause net damage allowing fish to escape and they consume fish. Various burrowing shrimps invade oyster growing areas burrowing into the sand causing the oyster to sink and suffocate. Crabs consume large numbers of clam seed each year. Oysters are also subject to predation by starfish. The net loss and financial cost of these depredations have yet to be quantified but is significant.

Control of depredation is difficult and costly. Many trout farmers have completely covered their facilities with wire to prevent bird and other animals access. This method of deterrence can only be used where ice and snow are unlikely to damage the netting. More expansive production systems such as 10 to 20 acre catfish ponds or extensive shellfish beds are not suitable for covering and other methods to limit depredation must be developed. Some clam farms have been completely covered with mesh but this exacerbates fouling problems and is only partly effective. Clam farms on the US East Coast lose at least 30% or more of their planted seed due to predation. The various aquaculture species groups are working with the regulatory community to establish the best control methods possible. The NAA strongly supports this effort.

Exotic Animal Introductions

Introduction of exotic, non-native aquatic animals and plants into the US can, in some cases, cause significant ecological change. Past state and federal actions purposefully introduced exotic plants and animals into the US. Unfortunately, the positive or negative impacts of introductions are difficult to predict. Now, in spite of increased awareness, and a change in introduction philosophies, globalization of trade has increased the challenge of maintaining the biological integrity of the US and its waters.

Unintentional introductions of zebra mussel, green crab, and the Russian round goby occurred through release of ballast water from transcontinental ocean going ships. These aquatic animals are spreading throughout various regions of the US and in some cases, have caused significant harm.

Some imported animals have proven beneficial. For example, the brown trout was imported from Europe and has been widely accepted by the sport fishing community in the US. Similarly, the rainbow trout, native to the Pacific Northwest, has been widely distributed in the US and internationally. It is highly valued by both the sport fishing and aquaculture communities and as far as we know, has had little negative ecological impact.

Various biological controls for weeds or insects from foreign countries are being examined by the USDA and others. Release of some of these control agents into the US are being seriously considered by the USDA. As part of this consideration, a risk-benefit analysis is made. Questions about introductions are not easy to resolve but require careful consideration by all stakeholders. In

the US, importation of aquatic animals or plants is regulated by the USFWS and the USDA. The NAA supports the USFWS and USDA in these efforts.

Conclusion

The National Aquaculture Association supports environmentally sustainable development and operation of aquaculture facilities. The NAA believes aquaculture has prospered and is the fastest growing sector of US agriculture because it is environmentally compatible and aquaculture products are valued by the US consumer. Each aquaculture industry sector has unique production requirements, challenges and potential to impact the environment. Each aquaculture operation must be evaluated within a site-specific and watershed specific framework. Evaluations must be based on credible information. Regulatory and voluntary efforts must be optimized to achieve cost-effective solutions. The NAA believes that if environmentally sound watershed management programs are to be developed, accurate information must be used. Aquaculturists must participate and do their part to ensure a healthy, sustainable environment.

National Aquaculture Association Policies

Bird Depredation

Background

Piscivorous birds can cause significant predation on farm raised fish and shellfish. Several bird species (e.g. blue heron, black crowned night heron, pelican, cormorant and kingfisher) can consume considerable quantities of these animals. Fish not consumed may be physically damaged during attempted predation. Birds may also serve as disease vectors spreading pathogens amongst fish farms or transferring pathogens from the wild to a fish farm.

Control of piscivorous birds can be difficult and expensive. All piscivorous birds are federally protected. Depredation permits can be obtained but these are not usually issued in a timely manner. Bird dissuasion devices (e.g. cannons and/or other scare devices) are of limited success. Exclusion devices such as cages that cover the entire rearing area are expensive, interfere with routine fish rearing activities, and may not readily withstand the rigors of winter weather (i.e. ice and snow). Considerable need exists to develop improved bird management techniques.

NAA Recommends:

1) The U.S. Fish and Wildlife Service manage migratory bird numbers on basis of wild food supply. Where bird numbers exceed wild food supplies, hence allowing for excessive farmed fish depredation, these numbers must be reduced.

2) The USDA Wildlife Services program should be encouraged to actively develop additional control measures.

3) Cumbersome regulatory processes that impede bird control efforts should be removed.

4) Depredation permits should be readily available on a timely basis and should be administered equally by all U.S. Fish and Wildlife regions.

5) Standing depredation orders should be issued for certain species (e.g. double crested cormorant) when requested by the USDA as opposed to the issuance of numerous individual depredation permits.

NAA Environmental Stewardship Policy

Background

Sustainable aquatic animal and plant production requires good resource management. Water received for production should be of suitable quantity and quality for effective production of aquatic organisms.

Environmental stewardship is the responsibility of each aquatic organism producer. Aquatic animal production does have the potential to contribute plant nutrients, settleable and suspended solids, and therapeutants to effluent streams. The impact of these discharges on the receiving stream is highly variable.

Regulatory decisions must be based on credible science and risk assessment. A thorough understanding of aquaculture farm effluent impact must be evaluated relative to upriver conditions, water quality standards, and beneficial uses.

Considerable research is being directed at aquaculture waste management. These efforts are being conducted by U.S.D.A., universities and the commercial industry. Improvements can be expected in feed formulation, solids collections and disposal, water reuse and multiple use.

Policy

The NAA:

1. Encourages environmental stewardship by all aquaculturists.

2. Encourages regulatory decisions on basis of credible science.

3. Encourages risk assessment that includes cost-benefit analysis.

4. Encourages effluent regulation based on site-specific watershed needs.

5. Encourages regulatory decisions that account for beneficial uses and physico-chemical conditions of receiving waters.

6. Encourages efforts that result in development of improved waste management practices.

National Aquatic Animal Health Management Program

Background

Global trade and the possibility of transporting exotic aquatic animal pathogens highlight the need for an effective national aquatic animal health management program. The European Union (EU) is already instituting restrictive programs that will limit the opportunity for aquatic animal pathogen spread. A "competent authority" must be identified in the US if aquaculture animal producers are to participate in EU trade.

State jurisdiction over fish pathogens and the interstate transport of live aquatic animals and aquatic animal products complicates commerce. Conflicting certification requirements and discordant application between public and private aquaculturists may impede commerce. There is a need for greater uniformity.

The development of a national aquatic animal health management program requires participation of commercial, public, and regulatory interests. Food fish, bait fish, and ornamental fishes should be included in program development. Because pathogen inspection programs are expensive, a focus should be placed on user friendly, cost-effective alternatives. A careful risk-analysis for each aquatic animal pathogen should be considered in designing the management program.

National aquatic animal health management programs should encompass all aquaculture interests and take into consideration the developmental stage of respective programs as well as the fact that transfer of pathogens across species is possible. Since all aquatic interests are to be considered for inclusion in this management program, representatives from such groups should be invited to participate in the development process, and in program implementation.

It is the policy of the NAA:

1. To encourage development of a cost-effective, scientifically sound National Aquatic Animal Health Management Program.
2. To encourage broad and early participation by all interest groups in development of a national plan.
3. To foster a program that prevents introduction or spread of adverse pathogens.
4. To encourage a national program which utilizes a risk based inspection process.
5. To encourage APHIS to serve as the lead agency for certification permits and other import/export requirements for aquacultured fish or products.
6. To encourage harmonization of interstate and international transport health certification requirements.

Lacey Act

Background

The Lacey Act was passed to prohibit the international and interstate trafficking of illegally obtained wildlife and fish or parts thereof. A violation of the Lacey Act may constitute a federal felony offense and under federal sentencing guidelines the penalties for even minor infractions can be quite severe.

Interstate transportation of wildlife, fish, or parts thereof that violates a state law in the receiving state or the state shipped from, is a Lacey Act violation. Thus, what may be a misdemeanor state violation in both of the two states involved, is immediately elevated to a federal felony offense, simply because state boundaries were crossed.

The U.S. Fish and Wildlife Service is the agency that enforces the Lacey Act and their Enforcement Division has historically applied this act to the international and interstate movement of private aquacultural products. In part this is because the U.S. Fish and Wildlife Service does not recognize the private ownership of aquacultural products.

The U.S. Fish and Wildlife Service Director's Order Number 27 placed a low priority on using the Lacey Act against aquacultural producers except in instances where disease transmission or non-indigenous fish species are involved. Unfortunately, various Regional Directors are interpreting this order differently complicating interstate transport. This order does not address private ownership of aquacultural products.

Policy:

The NAA

1) Supports legislation to exempt private aquacultural products from the Lacey Act.

2) Supports the U.S. Fish and Wildlife Service acknowledgment that aquaculture products, legitimately reared in private culture, are PRIVATE property, not public. We further support efforts that recognize aquacultured products as private property in federal and state laws and regulations.

3) Supports efforts by the U.S. Fish and Wildlife Service and the USDA to compile and disseminate annually a list of all state and federal regulations that pertain to aquaculture.

Non-Indigenous Aquatic Species

Background

As national and international travel and trade has grown, so has the intentional and non-intentional movement of plants and animals. Not only have many native species been moved around within our own country but more than 30,000 new species have been introduced as well. Many of these species have been intentionally introduced for a wide variety of beneficial purposes such as food and fiber production, vaccine and drug development, companion animals for recreation and plants for landscaping. The movement and trade of non-indigenous species are an essential part of our economy and well being. In fact, researchers recently estimated that fully 98% of the U.S. food supply, valued at over $500 billion annually, now comes from introduced non-indigenous plants and animals.

The USGS has recently compiled a database with over 17,000 entries documenting the introduction of over 500 non-indigenous fish species in the U.S. Three hundred seventeen (317) of these species are native to the U.S. but have been introduced outside of their native ranges. Included in this listing are many highly valuable aquacultured species such as rainbow trout, brook trout, arctic char, channel catfish, striped bass, various Pacific salmon, Atlantic salmon, and ornamental fish. One hundred eighty five (185) non-indigenous fish species have been brought in from foreign countries and 22 of the non-indigenous fish species are due to hybridization. Of the 185 fish species brought in from foreign countries, 71 species have either already established self-sustaining populations in open waters or are believed able to do so. In addition to finfish, numerous species of oysters, clams and mussels and other shellfish, crustaceans, aquatic plants and algae are non-indigenous but highly valued, commercially cultured and economically important.

Not all introductions have been intentional or beneficial. Everything from rats to English sparrows and purple loosestrife to Dutch elm disease continue to have damaging biologic and economic effects. It was recently estimated that harmful introduced species now cost our country $123 billion a year in economic losses. Aquatic plants and animals are no exception to this problem. It was recently estimated that over $5 billion dollars in economic losses can be attributed to the adverse effects of introduced aquatic organisms such as the zebra mussel, Asiatic clam, green crab, and various species of fish.

Public awareness of economic and biologic impact of the zebra mussel became so great that it prompted Congress to enact the "Non-indigenous Aquatic Nuisance Prevention and Control Act" in 1990. This act not only provided the mechanism to address the zebra mussel problem but also provided opportunity to examine other non-indigenous aquatic species. Current resources and activities are primarily focused on such issues as ballast water dumping and other mechanisms of non-intentional introductions, but intentional introductions related to commercial aquaculture are also under consideration. A Presidential Executive Order was recently issued requiring Federal agencies to work collaboratively through an Invasive Species Council to reduce the risk of bio-invaders. The Council will develop a National Invasive Species Management Plan.

NAA's Non-Indigenous Aquatic Species Policy

NAA:

1. Strongly supports the reasonable and unencumbered movement of beneficial aquatic species. Such movement is essential to the sustainability and growth of aquaculture industries.
2. Recognizes that the introduction of some aquatic organisms may have undesirable or damaging effects, in some instances, even on established aquaculture industries themselves.
3. Supports the design and implementation of any reasonable plan or effort to minimize the risk of introduction or dissemination of unknown or clearly undesirable aquatic nuisance species.
4. Demands that any measure or determination of desirability or beneficial value of an aquatic species be based on findings of fact and objective science and that any decisions be based on unbiased assessment of the real and proven risks relative to the potential value and benefits of the introduction or movement.
5. Demands that laws, regulations or policies designed and implemented to prevent the introduction or dissemination of unknown and undesirable non-indigenous aquatic species neither supplant current laws and regulations which provide for the free and essential movement of aquaculture products nor be allowed to be used for the covert purpose of restricting or eliminating commercial aquaculture.
6. Is opposed to any extension of non-indigenous species regulations that attempt to include pathogenic parasites, bacteria or viruses of aquatic animals. Laws, regulations and policies are already established and working on a regional, state, national and international level to address pathogens.

Lead Agency

Policy

The NAA, since its inception, has maintained that aquaculture is agriculture and therefore believes that the US Department of Agriculture should be the lead agency for aquaculture in all matters.

Aquaculture Research

Background

Continued growth, new innovations and competitiveness in aquaculture depend upon focused research programs. Public funds expended on aquaculture research should strive to keep American farmers profitable and competitive in the culture of safe and nutritious food, bait, recreational fish, ornamentals, and other aquatic crops.

Publicly supported researchers and their institutions are facing many challenges in maintaining adequate funding support. They are increasingly looking to supplement grant funding through innovative methods and partnerships including private contracts, joint ventures, licensing of intellectual properties, foreign sources and personal consulting. This approach may help make research institutions more self-sufficient, however, it conflicts with the basic mission and ideals of the land grant institutions to carry out research and provide practical information to American farmers. The function of these institutions must be to continue to find solutions to problems and create, but not control, technology thereby helping maintain the competitiveness of our farmers.

One strength of American aquatic farmers is due to our strong publicly supported research programs. Farmers need to have a stronger role in determining their aquaculture research needs, demonstrating technology or carrying out on-farm research, and being the prime recipients of the results and benefits of publicly supported research. Congress should relieve university researchers from liability issues when collaborating with a farmer or group of farmers so long as there is a level playing field as well as develop mechanisms for farmers to share ideas with universities which may lead to advancements in aquaculture technology.

The NAA:

1. Recommends a publicly supported increase in aquaculture research, demonstration and development funding.
2. Supports direct participation of aquatic farmers and private industry stakeholders in all levels of research planning, carrying out of research programs, and dissemination of results. This includes strong participation by farmer advisory committees within USDA, land grant institutions, and other government agencies and research programs.
3. Encourages improved aquaculture research coordination within the federal government.
4. Supports the ideal that the primary beneficiaries of publicly funded aquaculture research should be American farmers.
5. Encourages Congress to establish methods for farmers to develop their research ideas with the universities in such a manner that the farmer will benefit, the university benefit, and other farmers will benefit without the fear of liability issues.
6. Supports University research that focuses on domestic aquaculture.
7. Encourages federal funding that helps integrate aquaculture with traditional agricultural practices, water reuse, and water management and conservation.

Genetically Engineered Aquatic Organisms

Genetically modified organisms (GMO's) may be defined for various purposes. The NAA defines GMO's as organisms that have been genetically modified by integration of foreign DNA into their genomes using various gene transfer technologies including microinjection, electroporation, transposon integration, or viral infection. Any natural sexual reproduction of organisms causes genetic modification of organisms but these are not ordinarily regarded as a GMO. Natural mating and/or natural recombination does not create a GMO. Selective breeding, hybridization and polyploidy are natural processes and would not be considered a GMO. For the purposes of NAA, a GMO will be defined as those organisms that have had their normal genetic makeup altered by molecular methods of selective gene isolation, characterization, and modification.

Genetically engineered or modified (GMO) aquatic organisms could significantly increase production efficiencies and reduce the environmental impacts of aquaculture with proper containment procedures. Faster growing animals could ultimately increase harvestable fish supplies for human consumption and reduce the use of water, a limited natural resource. This increased production could occur while decreasing the amount of feed fed per fish for each pound of gain. Thus, feed conversion efficiencies could potentially be improved. This would reduce dependence on natural fish meal supplies which might reduce exploitation of wild fish stocks. Other attributes of the fish such as immune system function could also be improved. The consumer might also directly benefit from such modifications by enhancing the nutritional and health benefits of aquatic organisms, increasing carcass yield and other desirable market traits, all with lower costs to the consumer.

Commercialization of genetically engineered aquatic organisms is also highly controversial. Various interests groups propose that genetically engineered aquatic organisms are a threat to the environment, a threat to various endangered species and a threat to human health following consumption. However, there is little scientific data to conclude genetically engineered organisms are harmful to the environment or to human health. Conversely, there is little scientific data to prove genetically engineered aquatic organisms are safe for the environment or human health. There is little scientific data with which to conduct environmental risk analysis making an informed decision difficult.

NAA Policy

1. Encourage a thorough scientifically based investigation into human food safety of genetically engineered aquatic organisms.
2. Encourage a thorough scientifically based investigation into the environmental safety of genetically engineered aquatic organisms.
3. Encourage sound, scientifically based risk analysis by the federal regulatory community.
4. Encourage various continued and vigorous scientific investigations into ways to improve aquatic organism production efficiencies and product quality for consumer's benefit including the use of genetically engineered aquatic organisms.

Approved 8.18.01

Presented by:
Robert B. Rheault, Ph.D
Moonstone Oysters
1121 Mooresfield Road
Wakefield, RI 02879
Tel. 401/783-3360
Fax. 603/215-0905
Email: oysters@ids.net

Contact:
John R. MacMillan, Ph.D
Clear Springs Foods, Inc.
PO Box 712
Buhl, ID 83316
Tel. 208/543-3456
Fax. 208/543-4146
Email: randy@clearsprings.com

Betsy P. Hart
Executive Director
National Aquaculture Association
111 W. Washington Street, Suite 1
Charles Town, WV 25414
Tel. 304/728-2167
Fax. 304/728-2196
Email: bhart@sc.rr.com