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REGARDING THE STATUS OF AQUATIC INVASIVE SPECIES AND RESPONSE EFFORTS IN HAWAII

Chairmen Gilchrest and Honorable members of the Subcommittee on Fisheries Conservation, Wildlife and Oceans, it is an honor to be invited to testify before you today on a matter of vital importance to our Islands, the need to limit the further spread of aquatic nuisance species into our marine and fresh waters. I would like to take this opportunity to share with you the comprehensive and unique aquatic nuisance species challenges and opportunities we face here in Hawaii. Aquatic Nuisance Species are a serious problem in Hawai'i, posing a significant threat to residents and visitors, as well as to Hawaii's native plants, animals, and associated native ecosystems.

As you will have heard in testimony from others here today, Hawaii is facing an ever growing and often extremely challenging crisis from the introduction and spread of alien species both on land and in our waters. Our oceans and nearshore marine resources are important to us for food, education, recreation, culturally, ecologically, physically, and biologically. Over one quarter of all organisms found on Hawaii's reef are found nowhere else in the world. The decrease in biodiversity and the associated decrease in coral cover that has occurred on many of our reefs due to the overgrowth by alien algae is one of many concerns that have been raised at this hearing. Our reefs protect our shorelines from erosion by waves and storms, produce our world famous surf, and are vital to our economy and way of life. Hawaii's nearshore reefs generate about \$800 million in gross revenues annually.

Each year, reefs along Maui's south Kihei coast, contribute \$34 million in gross sales, but over \$20 million is lost each year from the impacts of algal blooms along this shoreline. These blooms decrease hotel and rental income and depress property values. This example illustrates the economic loss for just one coastline on one island and does not account for the total economic loss in the numerous other locations where algal blooms are also occurring.

Hawaii's Invasive Species Council and Initiatives:

The 2003 State Legislature and Governor Linda Lingle took a bold step forward by established the Hawaii Invasive Species Council (HISC), which you have already heard about today. This Council is comprised of State agency department heads co-Chaired by the Department of Land and Natural Resources and the Department of Agriculture, with Counties recently invited to also have seats at the table, to address gaps in Hawaii's invasive species prevention and response measures. As a major component of addressing the numerous problems associated with both terrestrial and aquatic alien species, Governor Lingle introduced Legislation as a part of her administrative package in 2004 requesting \$5 million from State general funds that would be set aside to be used for prevention, response, research and education. It is hoped that the funding can be matched by federal dollars to leverage every dollar and program to its fullest ability. One of the integrated elements of this larger initiative is the focus on aquatic invasive species.

Hawaii's Aquatic Nuisance Species Management Plan:

As those who have testified before me have stated, there are several initiatives underway to work cooperatively to combat the problem of aquatic nuisance species and to limit the spread to other sites statewide. One such example of our comprehensive invasive species response program is the development of Hawaii's Aquatic Nuisance Species Management Plan, which was approved by the National Aquatic Nuisance Species Task Force in December 2003. Using guidance from the Federal Aquatic Nuisance

Species Task Force, as well as input from representatives of State and Federal agencies, industry, non-governmental organizations, and other stakeholders, the State of Hawaii Aquatic Invasive Species (AIS) Management Plan was developed to comprehensively address AIS issues throughout Hawai'i. The effort to develop this plan was led by the Department of Land and Natural Resources with assistance from The Nature Conservancy. Over 150 individuals and agencies had input into the development of this plan in a yearlong and intensive public input process. The plan focuses not only on marine but also on fresh water alien species of concern and outlines a coordinated approach to tackling this problem. It is the first comprehensive plan for aquatic nuisance species that has been developed for a tropical marine ecosystem and our critically important coral reefs.

The goal of the plan is to minimize the harmful ecological, economic, and human health impacts of AIS through the prevention and management of their introduction, expansion, and dispersal into, within, and from Hawai'i. To accomplish this goal, seven objectives relating to AIS have been identified:

- **COORDINATION and COLLABORATION:** Improve the coordination and collaboration of people, resources, and efforts involved with AIS. This is being accomplished at multiple levels, which have been the subject much of the previous testimony such as the Hawaii Invasive Species Council, the Coordinating Group on Alien Pest Species and others.
- **PREVENTION:** Minimize the introduction and spread of AIS into and throughout the waters of Hawai'i.
- **MONITORING and EARLY DETECTION:** Ensure effective programs that allow for the early detection of new AIS and the monitoring of existing AIS.
- **RESPONSE, ERADICATION and CONTROL:** Establish effective systems for rapid response, eradication, control, and restoration. Of all sections of the plan, this one will prove to be the most challenging because marine and fresh water ecosystems are highly complex and elimination of one targeted species is not always an option when it grows in, among, between and on top of other species.
- **EDUCATION AND OUTREACH:** Increase education and outreach efforts to ensure awareness throughout the State on AIS threats and solutions.
- **RESEARCH:** Increase research efforts on key AIS species, associated issues, and economic impacts to allow for more effective management.
- **POLICY:** Ensure State and federal laws and regulations effectively promote the prevention and control of AIS.

The AIS Management Plan is to act as a tool in which to help enhance the coordination of current management efforts, identify remaining problems areas and gaps, and recommend additional actions, which are needed to effectively address AIS issues in Hawai'i. The focus of this plan is the identification of feasible, cost-effective management practices to be implemented by State, federal, county, non-governmental, private, and volunteer entities for the environmentally sound prevention and control of aquatic invasive species in a coordinated fashion. The plan addresses the need for coordinated thinking and planning regarding aquatic aspects of the larger invasive species issue. It is a major step in the development of a comprehensive program to protect Hawai'i's reefs and streams from invasive species. Though this plan specifically focuses on aquatic invasive species, it should be viewed as a component of a larger effort of addressing all invasive species, both aquatic and terrestrial, throughout the State.

The following items are high priority for the initial implementation of the management plan:

- Establishment of a permanent statewide position for an Aquatic Invasive Species Coordinator;
- Establishment of a long-term Aquatic Invasive Species Advisory Council;
- Evaluation and decision upon whether AIS issues and ultimate responsibility will fall under the Division of Aquatic Resources, or a newly formed entity;
- Implement and fund the existing Ballast Water and Hull Fouling Prevention Program;
- Development of a system for streamlined reporting of, and rapid response to newly detected invaders;
- Securing of dedicated, long-term funding for many of the activities within the plan;
- Development of a system for that allows for risk assessment and a way to prioritize AIS;
- Increase knowledge on the biology and ecology of AIS, as well as methods for their control;
- Continue and increase education efforts, especially those focusing on unauthorized release of organisms.

The acceptance of the Aquatic Invasive Species Management Plan by the National Task Force allows Hawaii to qualify for federal funding to implement the plan. While these dollars are welcomed, they are mainly going to be used to continue the coordination efforts and are not enough to seriously address all the high priority actions outlined in the plan. Additional anticipated State and federal funds to address some of these concerns are needed.

DLNR has identified four main organism-types for priority focus including marine algae, the snowflake coral, hull fouling/ballast water and fresh water fish and plants. I would like to take a few minutes to touch briefly on some of the priority aquatic organisms and initiatives that have not been highlighted in previous testimony.

Hawaii's Comprehensive Ballast Water and Hull Fouling Program

This program is a subset of the overall Aquatic Nuisance Species Management Plan.

Background Information:

Ballast water is used in vessels to control the stability and to ensure sufficient vessel displacement for effective propulsion. Ballast water is usually pumped into ballast water tanks when cargo is being offloaded and discharged when the cargo is loaded. When vessel takes on ballast water, they also take on whatever organisms are present in the water. These organisms are transported to another port when the vessel discharges the ballast water to take on cargo. The organisms may become established in the new area and may cause economic and/or health problems for the new area. For this reason, ballast water management is an important issue. Ballast water management is to control the introduction of "new" organisms to areas, by killing or removing the organisms before they are discharged in the ballast water. Currently, open ocean ballast water exchange is the only approved method of ballast water management. But research is being done on a combination of filtering and some other method that kills the organisms remaining in the water after the filtering process. These other methods includes; ultra-violet treatment, chlorination and other biocides, ozone, heat, and sonic treatment.

Hull fouling is the attachment of organisms to the hull of ships, barges, floating dry docks, and other floating or submerged surfaces. These organisms may fragment or spawn (releases eggs) into a new area and become established and may cause economic and/or human problems. Hull fouling is believed to be the main vector for introductions in Hawaii. Hull fouling management would involve making sure vessels or other structures have periodic cleaning of the underwater surfaces, use of effective and environmentally friendly coatings, and to prevent new organisms from being introduced.

Efforts to Date:

Efforts to develop a comprehensive Ballast Water and Hull Fouling Management Program for the State of Hawaii began in September 2001. Supported by federal funds, the comprehensive prevention and management program is being developed in several phases. Activities accomplished during phase I include the hiring a temporary project coordinator that oversees that ballast water and hull fouling regulations are developed. Currently, the coordinator fills a federal contract position. That position is dependant on grants and other "soft money" to continue. The objective should be to have the coordinator's position be a permanent budgeted position.

The coordinator has also established an interagency task force, Alien Aquatic Organism Task Force (AAOTF), whose members are from federal and state government agencies, scientific community, shipping industry, cruise ships and non-government organizations would discuss issues and concerns and make recommendations to DLNR to consider in developing the comprehensive prevention/management program. The task force has drafted administrative rules for the ballast water portion (phase I) which have provisions requiring all vessels entering State marine waters, unless exempt, to have a mandatory ballast water management plan. The draft administrative rules propose that the mandatory plan include procedures for ballast water exchange, ballast water discharge, reporting and sediment disposal. Additionally, the proposed draft administrative rules for the State mirror those of the U.S. Coast Guard regulations for ballast water.

Also a 2-day workshop on hull fouling was organized for the task force in anticipation of future efforts to develop phase II (hull fouling) of the comprehensive management plan.

Where Are We Going?

The Department of Land and Natural Resources through statutory mandate has the legal authority to be the lead agency in preventing the introductions of alien aquatic organisms through the regulation of ballast water discharges and hull fouling, but this mandate is unfunded. Further development and implementation of an effective program will require permanent funds as well as staff designated specifically to this program.

We must also complete the administrative rule process for adoption of rules to implement the ballast water exchange and reporting component of the State's program for preventing alien aquatic organism introductions through ballast water. Explore alternative methods for ballast water treatments for all vessels, which also include both oversea and inter-island vessels and towed platforms. Develop protocol for ballast

water reporting system for all vessels entering Hawaii marine waters and a method for verification of ballast water exchange.

Continue work with the AAOTF to develop the hull-fouling component of the State's comprehensive prevention program. Issues and areas for consideration during the development of this component are data gathering, technical progress and research. Develop a risk matrix for both ballast water and hull fouling to prioritize vessels for management decisions, including boarding inspections.

Finally, we are in the early process of developing an outreach and education program to support implementation of both phases of the comprehensive prevention plan.

An Invasive Soft Coral on Hawaiian Coral Reefs

In the early 1970's, a soft coral was introduced into Pearl Harbor. This soft coral, known as Snowflake Coral or *Carijoa riisei*, is native to the Western Atlantic Ocean. This introduction was believed to be caused either by hull fouling or ballast water.

Since this coral's introduction, it has spread throughout the Main Hawaiian Islands. The extent of its dispersal in Hawaiian waters is still not fully understood and is probably still spreading. In 2001, deep-water surveys off Maui found this alien soft coral to cover >70% of the black coral trees below 230 feet. This invasion may not only impact Hawaii's \$30 million precious coral industry, but may also have major ecological implications to our deep reef communities. However, this coral also exists in shallow water where certain environmental conditions allow for rapid growth. It is usually found underneath overhangs or in highly turbid waters, such as harbors. The Snowflake Coral is now considered the most invasive marine invertebrate on Hawaiian reefs and is considered one of DLNR's priority species.

This coral does not require light as it is non-photosynthetic and feeds on zooplankton and organic particles. This allows the coral to grow under low light conditions such as harbor pilings, ledges, and deeper water. The largest population has been found on the deep reefs off Maui; however, smaller, shallow water populations probably contribute to the expansive dispersal of this coral. The deeper populations of this coral are difficult to study and understand; therefore, increased monitoring and basic knowledge of this species are required in order to develop a local action strategy.

Currently, research by the University of Hawaii is studying the biology and life history of this coral. Part of this research is also looking at the dispersal mechanisms of this coral to gain a better understanding how this coral is spreading throughout the Main Hawaiian Islands. Also, DLNR is examining the black coral fishery to measure any decline in the fishery contributed by this invasive species. Considering the invasiveness of this species, we are now actively developing a local action strategy to address this invasion with researchers, industry and the management agencies.

Freshwater Exotics

Today, more than 50 species of exotic fishes, invertebrates, reptiles, amphibians, and plants are established in our streams and reservoirs. Many of these species were intentionally released with the hope that they would become established and in some way improve the quality of life here in Hawaii, particularly game fish that were effectively restricted to man-made reservoirs. While some of the introductions have proven to be both valuable and innocuous with regard to their impact on native stream ecosystems, others were simply dumped into our streams with no thought given to possible consequences.

Some of the earliest introductions occurred during the 1800's and accompanied the first Asian immigrants to these islands. Most of these species were brought in for food, but a few, like the goldfish, were also brought in for ornamental purposes.

Between the 1900's and the 1960's, many different species of freshwater and marine fish and invertebrates were introduced. Topminnows were released into our streams and reservoirs for mosquito control. Tilapia were brought in to help the sugar plantations control weeds in their irrigation systems and to provide baitfish for the skipjack tuna industry. Gamefish, such as the largemouth and smallmouth bass, trout and tucunare were brought in to provide sport and recreation.

In the 1970's there was a major shift in the way resource managers viewed indigenous species and native ecosystems. Hawaii's fauna and flora were found to be so unique and precious in their own right that the focus shifted from 'improving' these resources to preserving what we had left. Government-sponsored

introductions of exotic species ceased, and requests to import exotic species by institutions and private individuals came under increased scrutiny. But by this time more than 70 different species of aquatic animals had been intentionally released into our streams and nearshore waters, about half of which had become established.

During the 1980's and 1990's, more exotic species began appearing in our streams and reservoirs, virtually all originating from the aquarium trade, some which were clearly harming native stream species and game fish populations. The Asiatic clam, which is widely distributed in streams, reservoirs and taro fields on Kauai, Maui and Oahu, is thought to have been smuggled in by recent Asian immigrants for food purposes.

Some of the impacts these exotics are having on our native freshwater ecosystems are readily apparent. Suckermouth catfish and crayfish, for example, dig holes in reservoir and stream banks, causing erosion and increasing water turbidity. Smallmouth bass are voracious predators that feed on a wide range of prey items, including native fish and shrimp. Even seemingly innocuous species, like the guppy and swordtail, are known to carry parasites and disease that can infect native fish, and it is probable that they are directly or indirectly reducing native fish populations.

With the notable exception of the Asiatic clam, so far, the recent experiences with accidental introductions have been mostly on Oahu. Measures need to be taken to halt their spread to neighbor Islands; to curb further unplanned introductions to all Hawaiian waters, and to effect eradication were possible. The unfortunate reality is that by the time a new species is recognized, it is usually already too well established for complete eradication and has become a permanent addition to the Hawaiian biota, with possible harmful consequences for the natives.

While the rate of introductions was effectively slowed during the 1990's through an extensive public education campaign warning against the release of aquarium fish into the wild, coupled with a cooperative agreement with pet shops and the Humane Society to accept unwanted fish, and legislation that prohibits the release of alien fish in State waters, there is still much to be done. We need to upgrade all of the activities ranging from basic studies and surveys to public education to try to at least hold the line against these threats, which will increase in proportion to the human population growth particularly on the neighbor islands, which as yet have not suffered the same onslaught of aquatic alien species felt on Oahu.

Invasive Freshwater Plants Using Lake Wilson as a Case Study

Since 1957, DLNR has managed Lake Wilson through a cooperative agreement with Castle & Cooke, Inc. as the Wahiawa Public Fishing Area. The privately owned Lake Wilson, also known as Wahiawa Reservoir is the largest freshwater sport fishery in the State with a surface area of about 350 acres. Since its designation as a public fishing area, Lake Wilson has been plagued with the establishment of numerous invasive fish and plants. In the past, frequent removal efforts were undertaken to remove periodic infestations of water hyacinth (*Echhinoria crassipes*). In 2000 after eradicating the most recent water hyacinth infestation, the water fern (*Salvinia molesta*) was first discovered in Lake Wilson. Between November and December of 2002, the *Salvinia* population exploded to cover 90% of the reservoir's surface area (270 acres) and posed the threat of a massive fish kill and potential public health disaster. By May 2003, after a 5-month intensive and coordinated program through the joint efforts of various government agencies (Federal, State, and County), and private organizations, removal of more than 90% of the *Salvinia* from the reservoir was accomplished. The method of removal and control involved a three-prong approach using mechanical, chemical, and manual mechanisms. Continued long-term monitoring and maintenance of Lake Wilson is important in preventing a reinfestation of *Salvinia* from occurring. The multi-agency response and removal effort led by DLNR costs greater than \$1 million dollars. DLNR is exerting considerable effort and expense in carrying out the long-term maintenance program for Lake Wilson. Education also plays a vital role in preventing the introduction of other invasive animal or plant species.

Other freshwater plants are creating problems in various freshwater bodies around the state. On Oahu, these include the water hyacinth (*Echhinoria crassipes*) and water fern (*S. molesta*) in Kawainui Marsh, elodia (*Egeria densa*) in Hoomaluhia, and vallis (*Vallisneria sp.*) in Manoa Stream. Each of these situations is unique and will require a multi-agency approach to address.

Conclusion

In closing, I would like to stress that the management challenges faced by the need to address the ever-growing threat to Hawaii's aquatic systems are significant. However, it is through our multi-agency and community partnerships that we have made great strides in addressing some of these challenges. The

levels of training and the need to consider institutional liabilities and constraints when dealing with people working on, around and in the water are far greater than those faced on land. Having enough boats, divers and the right equipment with the need to use highly trained personnel for some of the removal efforts, makes the cost and response to aquatic invasive species difficult. We need to focus our energies and efforts on ensuring that new introductions are eliminated and use our creative and collective energies to find solutions to respond to those organisms that are currently on our reefs, in our streams and washing up on our beaches.

We need your assistance to ensure that where possible jurisdictional constraints in federal and State laws impede our ability to enforce and coordinate program implementation that we work with you to find solutions to these roadblocks. We need your support for the reauthorization of the Aquatic Nuisance Species Act and all Alien Species legislation to ensure that these programs continue at the federal and national level and continue to achieve the administrative support they currently realize. We need to increase the pot of federal funds that are associated with the Aquatic Nuisance Species Act to ensure that adequate funds are made available to address the ever-increasing threat that these introductions have on our reefs, streams, and way of life. We need additional dollars to be allocated to research through such agencies as the National Science Foundation to ensure that all possible methods to eradicate introduced species are researched and considered. And finally, we need continued collaboration and support of the federal agencies to address these threats by your willingness to continue to fund programs within their agencies.

Again, mahalo for this opportunity to testify before you today.